Code: UKCAL-CWF-CON-EIA-APL-00001-A029

Application Document 14

Part 4: Caledonia South Report to Inform Appropriate Assessment

Caledonia Offshore Wind Farm Ltd

5th Floor Atria One, 144 Morrison Street, Edinburgh, EH38EX

Application Document 14 Part 4: Caledonia South Report to Inform Appropriate Assessment

Code	UKCAL-CWF-CON-EIA-APL-00001-A029
Revision	Issued
Date	18 October 2024

Reports to Inform Appropriate Assessment (RIAAs) have been drafted to inform the Caledonia North and Caledonia South applications. Due to the interlinkages between both applications, the contents within each (Parts 1 to 4 of the RIAAs) are identical, with Caledonia North and Caledonia South, as well as the Proposed Development (Offshore), considered within both documents.

Table of Contents

List of Figures

List of Tables

Acronyms and Abbreviations

AA	Appropriate Assessment
AEoSI	Adverse Effect on Site Integrity
BDMPS	Biologically Defined Minimum Population Scales
BERR	Business, Enterprise and Regulatory Reform
CaP	Cable Plan
CLV	Cable Laying Vessel
CRM	Collision Risk Modelling
cSAC	candidate SAC
CTV	Crew Transfer Vessel
DAS	Digital Aerial Survey
DEA	Drag Embedded Anchor
DECC	Department of Energy and Climate Change
DESNZ	Department for Energy Security and Net Zero
DE	Desing Envelope
DP	Decommissioning Programme
ECJ	European Court of Justice
EDPR	EDP Renewables
EIAR	Environmental Impact Assessment Report
EMF	Electromagnetic Fields
EMP	Environmental Management Plan
EOWDC	European Offshore Wind Development Centre
EPS	European Protected Species

FCS	Favourable Conservation Status
FHG	Functional Hearing Groups
FWPM	Freshwater Pearl Mussel
FWTG	Floating Wind Turbine Generator
HF	High Frequency
HRA	Habitat Regulations Appraisal
IROPI	Imperative Reasons of Overriding Public Interest
JNCC	Joint Nature Conservation Committee
JUV	Jack-up Vessel
LAT	Lowest Astronomical Tide
LMP	Lighting and Marking Plan
LSE	Likely Significant Effect
MHWS	Mean High Water Springs
MMMP	Marine Mammal Mitigation Plan
MoM	Minutes of Meeting
MPA	Marine Protected Area
MPCP	Marine Pollution Contingency Plan
MSL	Mean Sea Level
MU	Management Unit
NAF	Nocturnal Activity Factor
NETS	National Electricity Transmission System
NSN	National Site Network
OECC	Offshore Export Cable Corridor
OfTI	Offshore Transmission Infrastructure

OnTI	Onshore Transmission Infrastructure
ORJIP	Offshore Renewables Joint Industry Programme
OSP	Offshore Substation Platform
OTU	Operational Taxonomic Unit
OWF	Offshore Wind Farm
PEMP	Project Environmental Monitoring Programme
PS	Piling Strategy
pSPA	potential SPA
PTS	Permanent Threshold Shift
O&M	Operation and Maintenance
RIAA	Report to Inform Appropriate Assessment
RSPB	Royal Society for the Protection of Birds
SAC	Special Area of Conservation
SSC	Suspended Sediment Concentration
SEL	Sound Exposure Level
SEPA	Scottish Environment Protection Agency
SMP	Seabird Monitoring Programme
SNCB	Statutory Nature Conservation Body
SPA	Special Protection Area
SPLpeak	Peak Sound Pressure Level
SOV	Service Operation Vessel
SoS	Secretary of State
TP	Transition Piece
TTS	Temporary Threshold Shift

UXO	Unexploded Ordnance
VMP	Vessel Management Plan
WRF	Weather Research & Forecasting
WTG	Wind Turbine Generator
ZoI	Zone of Interest

10 Assessment of the Proposed Development (Offshore)

This document is Part 4 of the Caledonia South Report to Inform Appropriate Assessment (RIAA) and contains the assessment of the Proposed Development (Offshore) along with the transboundary statement and conclusions of the assessment. The introduction, consultation and overview of impacts considered within the assessment are presented in Part 1 (Sections 1-7), for the assessment of Caledonia North see Part 2 (Section 8) and for the assessment of Caledonia South see Part 3 (Section 9).

10.1 Summary of HRA Screening

10.1.1 Screening Alone

10.1.1.1 As noted in Part 1, the first stage of the Habitats Regulations Appraisal (HRA) process is Screening, this being the process followed to identify the potential for Likely Significant Effect (LSE) from the Proposed Development (Offshore), alone or in-combination with other plans or projects, on designated sites. Screening for the Proposed Development (Offshore) alone was initially undertaken alongside the EIA Scoping process, with the original HRA Screening Report issued in September 2022 for consultation (Application Document 12). Subsequently, updates have been made in the RIAA since the screening was undertaken and are documented in Part 1 (Section 2).

10.1.1.1 The Screening Report (Application Document 12) includes details of all consultation carried out during the Screening process (as summarised within Section 5). The Screening information for the Proposed Development (Offshore) alone is summarised in Table 10-1, as adapted from the Screening Report.

10.1.1.2 Table 10-1 summarises, on a site-by-site basis, the features screened in for potential LSE from the Proposed Development (Offshore) alone. Zones of Influence (ZoI) used for the screening of sites within the Screening Report can be seen in Table 7-1 in Part 1, Section 7. Information on sites/features/effects screened out from potential LSE is contained within the Screening Report but is not reproduced in full here in the interests of brevity. The Screening Report also includes screening for potential LSE for benthic ecology, which confirmed that no potential for LSE alone has been identified for this receptor group. The sites screened in can be seen in Figure 10-1, Figure 10-2 and Figure 10-3.

Table 10-1: Sites and Features screened in for the assessment of Adverse Effect on Site Integrity (AEoSI) for the Proposed Development (Offshore). "*" Identifies species which are part of an assemblage feature only.

Designated Site	Distance to the Proposed Development (Offshore) (km)		Features Screened In	Potential for LSE Identified		
	Caledonia OWF	Caledonia OECC		Construction	Operation and Maintenance (O&M)	Decommissioning
Marine Mammals						
Moray Firth Special Area of Conservation (SAC)	57.7	37.7	Bottlenose dolphin (*Turisops truncatus*)	Underwater noise; Collision risk and vessel disturbance; and Changes to prey.	Underwater noise; Collision risk and vessel disturbance; and Changes to prey	Underwater noise; Collision risk and vessel disturbance; and Changes to prey.
Offshore and Intertidal Ornithology						
East Caithness Cliffs SPA Special Protection Area (SPA)	51.4	64.3	Herring gull (*Larus argentatus*)	-	Collision risk	-
			Great black-backed gull* (*Larus marinus*)	-	Collision risk	-
			Kittiwake (*Rissa tridactyla*)	Distributional responses	Distributional responses; and Collision risk.	Distributional responses
			Guillemot (*Uria aalge*)	Distributional responses	Distributional responses	Distributional responses
			Razorbill (*Alca torda*)	Distributional responses	Distributional responses	Distributional responses

Designated Site	Distance to the Proposed Development (Offshore) (km)		Features Screened In	Potential for LSE Identified		
	Caledonia OWF	Caledonia OECC		Construction	Operation and Maintenance (O&M)	Decommissioning
			Herring gull (Larus argentatus)	-	Barrier effects (see section 7.3.6)	-
			Fulmar (*Fulmarus glacialis*)	-	Barrier effects (see section 7.3.6)	-
Moray Firth SPA (see section 7.3.8 for distributional responses and 7.3.10 for migratory collision)	79.3	62.6	Common scoter (*Melanitta nigra*)	Distributional responses	Distributional responses; and Migratory collision risk.	Distributional responses
			Eider (*Somateria mollissima*)	Distributional responses	Distributional responses; and Migratory collision risk.	Distributional responses
			Goldeneye (*Bucephala clangula*)	Distributional responses	Distributional responses; and Migratory collision risk.	Distributional responses
			Great northern diver (*Gavia immer*)	Distributional responses	Distributional responses; and Migratory collision risk.	Distributional responses
			Long-tailed duck (*Clangula hyemalis*)	Distributional responses	Distributional responses; and	Distributional responses

Designated Site	Distance to the Proposed Development (Offshore) (km)		Features Screened In	Potential for LSE Identified		
	Caledonia OWF	Caledonia OECC		Construction	Operation and Maintenance (O&M)	Decommissioning
					Migratory collision risk.	
			Red-breasted merganser (*Mergus serrator*)	Distributional responses	Distributional responses; and Migratory collision risk.	Distributional responses
			Red-throated diver (*Gavia stellata*)	Distributional responses	Distributional responses; and Migratory collision risk.	Distributional responses
			Scaup (*Aythya marila*)	Distributional responses	Distributional responses; and Migratory collision risk.	Distributional responses
			Slavonian grebe (*Podiceps auritus*)	Distributional responses	Distributional responses; and Migratory collision risk.	Distributional responses
			Velvet scoter (*Melanitta fusca*)	Distributional responses	Distributional responses; and Migratory collision risk.	Distributional responses

Designated Site	Distance to the Proposed Development (Offshore) (km)		Features Screened In	Potential for LSE Identified		
	Caledonia OWF	Caledonia OECC		Construction	Operation and Maintenance (O&M)	Decommissioning
			Shag (*Gulosus aristotelis*)	Distributional responses	Distributional responses	Distributional responses
North Caithness Cliffs SPA	89.4	123.3	Guillemot	Distributional responses	Distributional responses	Distributional responses
			Razorbill*	Distributional responses	Distributional responses	Distributional responses
			Puffin* (*Fratercula arctica*)	Distributional responses	Distributional responses	Distributional responses
			Kittiwake*	Distributional responses	Distributional responses collision risk	Distributional responses
			Fulmar	-	Barrier effects (see section 7.3.6)	-
Troup, Pennan and Lion's Heads SPA	59.8	26.2	Guillemot	Distributional responses	Distributional responses	Distributional responses
			Razorbill*	Distributional responses	Distributional responses	Distributional responses
			Herring gull*	-	Collision risk	-

Designated Site	Distance to the Proposed Development (Offshore) (km)		Features Screened In	Potential for LSE Identified		
	Caledonia OWF	Caledonia OECC		Construction	Operation and Maintenance (O&M)	Decommissioning
			Kittiwake*	Distributional responses	Distributional responses; and collision risk.	Distributional responses
			Fulmar (*Fulmarus glacialis*)	-	Barrier effects (see section 7.3.6)	-
Pentland Firth Islands SPA	65.2	101.1	Arctic tern (*Sterna paradisaea*)	-	Migratory collision risk	-
Moray and Nairn Coast SPA	59.0	38.9	Bar-tailed godwit (*Limosa lapponica*)	-	Migratory collision risk	-
			Greylag goose (*Anser anser*)	-	Migratory collision risk	-
			Pink footed goose (*Anser brachyrhynchus*)	-	Migratory collision risk	-
			Redshank (*Tringa totanus*)	-	Migratory collision risk	-
			Dunlin* (*Calidris alpina*)	-	Migratory collision risk	-
			Oystercatcher* (*Haematopus ostralegus*)	-	Migratory collision risk	-

Designated Site	Distance to the Proposed Development (Offshore) (km)		Features Screened In	Potential for LSE Identified		
	Caledonia OWF	Caledonia OECC		Construction	Operation and Maintenance (O&M)	Decommissioning
			Red-breasted merganser* (*Mergus serrator*)	-	Migratory collision risk	-
			Wigeon* (*Anas penelope*)	-	Migratory collision risk	-
Moray and Nairn Coast Ramsar	58.9	38.9	Greylag goose	-	Migratory collision risk	-
			Pink footed goose	-	Migratory collision risk	-
			Redshank	-	Migratory collision risk	-
Copinsay SPA	80.9	117.1	Kittiwake*	Distributional responses	Distributional responses; and collision risk.	Distributional responses
			Great black-backed gull	-	Collision risk	-
			Guillemot*	Distributional responses	Distributional responses	Distributional responses
			Fulmar	-	Barrier effects (see section 7.3.6)	-

Designated Site	Distance to the Proposed Development (Offshore) (km)		Features Screened In	Potential for LSE Identified		
	Caledonia OWF	Caledonia OECC		Construction	Operation and Maintenance (O&M)	Decommissioning
Hoy SPA	94.1	128.0	Great black-backed gull	-	Collision risk	-
			Great skua (*Stercorarius skua*)	-	Collision risk	-
			Guillemot*	Distributional responses	Distributional responses	Distributional responses
			Puffin*	Distributional responses	Distributional responses	Distributional responses
			Kittiwake*	Distributional responses	Distributional responses; and collision risk.	Distributional responses
			Fulmar	-	Barrier effects (see section 7.3.6)	-
Buchan Ness to Collieston Coast SPA	102.4	78.0	Kittiwake*	Distributional responses	Distributional responses; and collision risk.	Distributional responses
			Fulmar	-	Barrier effects (see section 7.3.6)	-
Auskerry SPA	94.3	130.5	Storm petrel (*Hydrobates pelagicus*)	Distributional responses	Distributional responses	Distributional responses

Designated Site	Distance to the Proposed Development (Offshore) (km)		Features Screened In	Potential for LSE Identified		
	Caledonia OWF	Caledonia OECC		Construction	Operation and Maintenance (O&M)	Decommissioning
Dornoch Firth and Loch Fleet SPA	77.0	72.5	Bar-tailed godwit	-	Migratory collision risk	-
			Greylag goose	-	Migratory collision risk	-
			Osprey (*Pandion haliaetus*)	-	Migratory collision risk	-
			Wigeon	-	Migratory collision risk	-
Dornoch Firth and Loch Fleet Ramsar	77.0	72.5	Bar-tailed godwit	-	Migratory collision risk	-
			Greylag goose	-	Migratory collision risk	-
			Wigeon	-	Migratory collision risk	-
Rousay SPA	123.0	159.2	Guillemot*	Distributional responses	Distributional responses	Distributional responses
			Kittiwake*	Distributional responses	Distributional responses; and collision risk.	Distributional responses

Designated Site	Distance to the Proposed Development (Offshore) (km)		Features Screened In	Potential for LSE Identified		
	Caledonia OWF	Caledonia OECC		Construction	Operation and Maintenance (O&M)	Decommissioning
			Fulmar	-	Barrier effects (see section 7.3.6)	-
Marwick Head SPA	117.3	152.0	Guillemot	Distributional responses	Distributional responses	Distributional responses
			Kittiwake*	Distributional responses	Distributional responses; and collision risk.	Distributional responses
Calf of Eday	119.9	156.0	Guillemot*	Distributional responses	Distributional responses	Distributional responses
			Kittiwake*	Distributional responses	Distributional responses; and collision risk.	Distributional responses
			Fulmar	-	Barrier effects (see section 7.3.6)	-
Cromarty Firth SPA	122.0	105.9	Bar-tailed godwit	-	Migratory collision risk	-
			Greylag goose	-	Migratory collision risk	-
			Whooper swan (*Cygnus cygnus*)	-	Migratory collision risk	-

Designated Site	Distance to the Proposed Development (Offshore) (km)		Features Screened In	Potential for LSE Identified		
	Caledonia OWF	Caledonia OECC		Construction	Operation and Maintenance (O&M)	Decommissioning
Cromarty Firth Ramsar	122.0	105.9	Bar-tailed godwit	-	Migratory collision risk	-
			Greylag goose	-	Migratory collision risk	-
			Common tern* (*Sterna Hirundo*)	-	Migratory collision risk	-
			Dunlin*	-	Migratory collision risk	-
			Knot* (*Calidris canutus*)	-	Migratory collision risk	-
			Oystercatcher*	-	Migratory collision risk	-
			Red-breasted merganser*	-	Migratory collision risk	-
			Redshank*	-	Migratory collision risk	-
			Scaup* (*Aythya marila*)	-	Migratory collision risk	-
			Wigeon*	-	Migratory collision risk	-

Designated Site	Distance to the Proposed Development (Offshore) (km)		Features Screened In	Potential for LSE Identified		
	Caledonia OWF	Caledonia OECC		Construction	Operation and Maintenance (O&M)	Decommissioning
West Westray SPA	131.7	167.9	Guillemot	Distributional responses	Distributional responses	Distributional responses
			Razorbill*	Distributional responses	Distributional responses	Distributional responses
			Kittiwake*	Distributional responses	Distributional responses; and collision risk.	Distributional responses
			Fulmar	-	Barrier effects (see section 7.3.6)	-
Inner Moray Firth SPA	127.4	107.9	Bar-tailed godwit	-	Migratory collision risk	-
			Greylag goose	-	Migratory collision risk	-
			Red-breasted merganser	-	Migratory collision risk	-
			Redshank	-	Migratory collision risk	-
			Curlew* (*Numenius arquata*)	-	Migratory collision risk	-

Designated Site	Distance to the Proposed Development (Offshore) (km)		Features Screened In	Potential for LSE Identified		
	Caledonia OWF	Caledonia OECC		Construction	Operation and Maintenance (O&M)	Decommissioning
			Goldeneye*	-	Migratory collision risk	-
			Oystercatcher*	-	Migratory collision risk	-
			Scaup*	-	Migratory collision risk	-
			Teal* (*Anas crecca*)	-	Migratory collision risk	-
			Wigeon*	-	Migratory collision risk	-
Inner Moray Firth Ramsar	127.4	107.9	Bar-tailed godwit	-	Migratory collision risk	-
			Greylag goose	-	Migratory collision risk	-
			Red-breasted merganser	-	Migratory collision risk	-
			Redshank	-	Migratory collision risk	-
Fowlsheugh SPA	161.3	136.9	Razorbill	Distributional responses	Distributional responses	Distributional responses

Designated Site	Distance to the Proposed Development (Offshore) (km)		Features Screened In	Potential for LSE Identified		
	Caledonia OWF	Caledonia OECC		Construction	Operation and Maintenance (O&M)	Decommissioning
			Kittiwake	Distributional responses	Distributional responses; and collision risk.	Distributional responses
			Fulmar	-	Barrier effects (see section 7.3.6)	-
Cape Wrath SPA	175.3	209.2	Puffin*	Distributional responses	Distributional responses	Distributional responses
			Kittiwake*	Distributional responses	Distributional responses; and collision risk.	Distributional responses
			Fulmar	-	Barrier effects (see section 7.3.6)	-
Sule Skerry and Sule Stack SPA	154.8	188.6	Gannet	Distributional responses	Distributional responses; and collision risk.	Distributional responses
			Puffin	Distributional responses	Distributional responses	Distributional responses
			Storm petrel	Distributional responses	Distributional responses	Distributional responses

Designated Site	Distance to the Proposed Development (Offshore) (km)		Features Screened In	Potential for LSE Identified		
	Caledonia OWF	Caledonia OECC		Construction	Operation and Maintenance (O&M)	Decommissioning
Fair Isle SPA	160.6	198.5	Gannet*	Distributional responses	Distributional responses; and collision risk	Distributional responses
			Razorbill*	Distributional responses	Distributional responses	Distributional responses
			Puffin*	Distributional responses	Distributional responses	Distributional responses
			Great skua*	-	Collision risk	-
			Kittiwake*	Distributional responses	Distributional responses; and collision risk	Distributional responses
Sumburgh Head SPA	202.4	240.2	Kittiwake*	Distributional responses	Distributional responses; and collision risk.	Distributional responses
			Fulmar	-	Barrier effects (see section 7.3.6)	-
Foula SPA	222.5	260.4	Great skua	-	Collision risk	-

Designated Site	Distance to the Proposed Development (Offshore) (km)		Features Screened In	Potential for LSE Identified		
	Caledonia OWF	Caledonia OECC		Construction	Operation and Maintenance (O&M)	Decommissioning
			Kittiwake*	Distributional responses	Distributional responses; and collision risk.	Distributional responses
			Puffin	Distributional responses	Distributional responses	Distributional responses
			Fulmar	-	Barrier effects (see section 7.3.6)	-
North Rona and Sula Sgeir SPA	242.6	276.4	Gannet	Distributional responses	Distributional responses; and collision risk.	Distributional responses
			Storm petrel	Distributional responses	Distributional responses	Distributional responses
			Kittiwake*	Distributional responses	Distributional responses; and collision risk.	Distributional responses
			Puffin*	Distributional responses	Distributional responses	Distributional responses
			Fulmar	-	Barrier effects (see section 7.3.6)	-
Mousa SPA	220.1	258.1	Storm petrel	Distributional responses	Distributional responses	Distributional responses

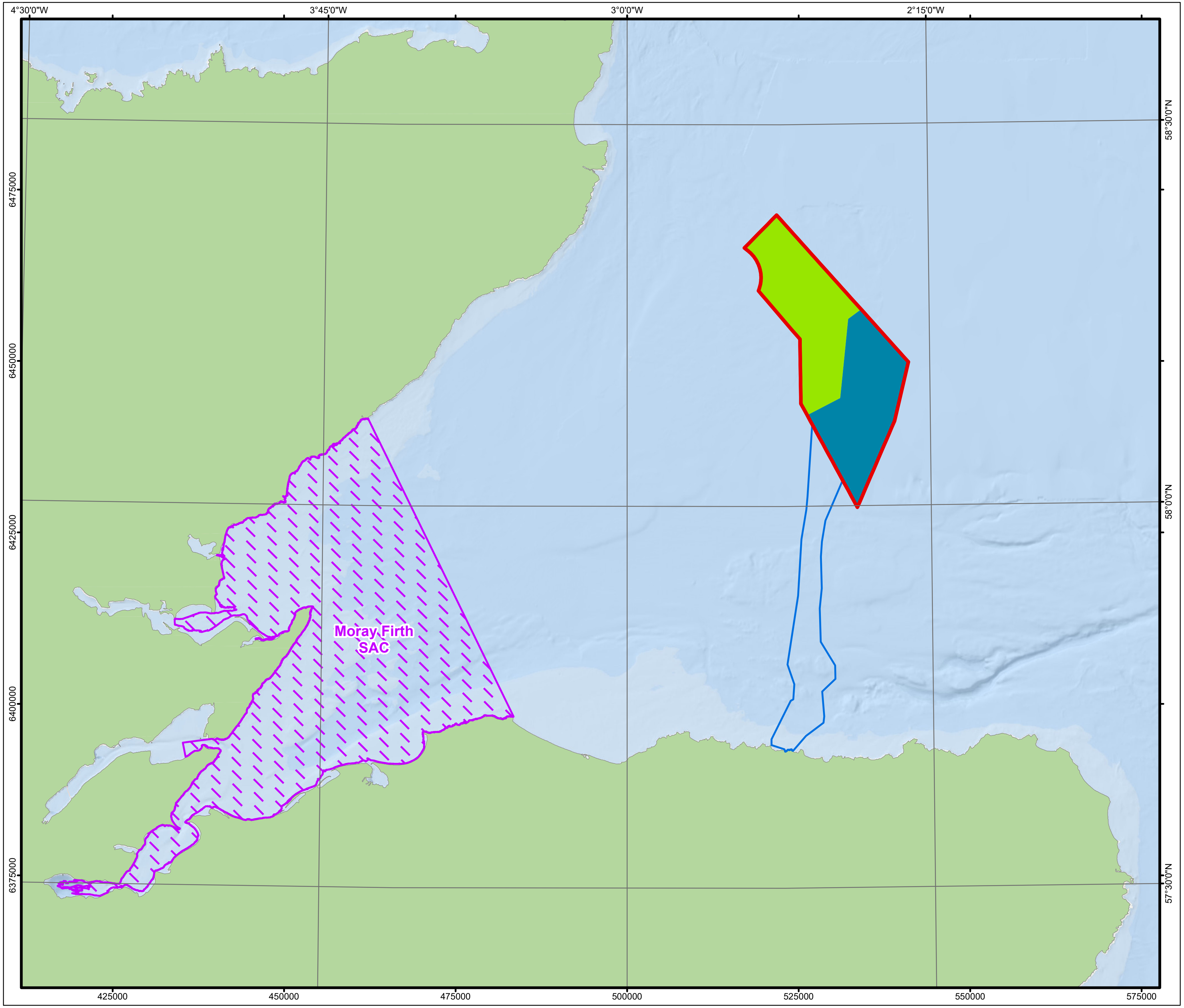
Designated Site	Distance to the Proposed Development (Offshore) (km)		Features Screened In	Potential for LSE Identified		
	Caledonia OWF	Caledonia OECC		Construction	Operation and Maintenance (O&M)	Decommissioning
Forth Islands SPA	268.7	244.0	Gannet	Distributional responses	Distributional responses; and collision risk.	Distributional responses
			Razorbill	Distributional responses	Distributional responses	Distributional responses
			Kittiwake*	Distributional responses	Distributional responses; and collision risk	Distributional responses
Noss SPA	237.6	275.5	Gannet	Distributional responses	Distributional responses; and collision risk.	Distributional responses
			Great skua	-	Collision risk	-
			Kittiwake*	Distributional responses	Distributional responses; and collision risk.	Distributional responses
			Puffin*	Distributional responses	Distributional responses	Distributional responses
			Fulmar	-	Barrier effects (see section 7.3.6)	-

Designated Site	Distance to the Proposed Development (Offshore) (km)		Features Screened In	Potential for LSE Identified		
	Caledonia OWF	Caledonia OECC		Construction	Operation and Maintenance (O&M)	Decommissioning
St Abb's Head to Fast Castle SPA	272.2	247.8	Kittiwake*	Distributional responses	Distributional responses; and collision risk.	Distributional responses
Ronas Hill – North Roe and Tingon SPA	281.4	319.1	Great skua	-	Collision risk	-
Farne Islands SPA	300.9	230.6	Kittiwake*	Distributional responses	Distributional responses; and Collision risk	Distributional responses
Fetlar SPA	290.5	328.4	Great skua	-	Collision risk	-
			Fulmar	-	Barrier effects (see section 7.3.6)	-
Hermaness, Saxa Vord and Valla Field SPA	324.9	362.9	Gannet	Distributional responses	Distributional responses; and collision risk.	Distributional responses
			Kittiwake	Distributional responses	Distributional responses; and collision risk	Distributional responses
			Great skua	-	Collision risk	-

Designated Site	Distance to the Proposed Development (Offshore) (km)		Features Screened In	Potential for LSE Identified		
	Caledonia OWF	Caledonia OECC		Construction	Operation and Maintenance (O&M)	Decommissioning
			Fulmar	-	Barrier effects (see section 7.3.6)	-
Handa SPA	207.5	241.3	Kittiwake	Distributional responses	Distributional responses; and collision risk.	Distributional responses
			Great skua	-	Collison risk	-
			Fulmar	-	Barrier effects (see section 7.3.6)	-
Shiant Isles SPA	293.5	325.7	Kittiwake	Distributional responses	Distributional responses; and collision risk.	Distributional responses
			Fulmar	-	Barrier effects (see section 7.3.6)	-
St Kilda	408.8	442.6	Great skua	-	Collison risk	-
			Fulmar	-	Barrier effects (see section 7.3.6)	-
	483.5	459.2	Gannet	Distributional responses	Distributional responses; and	Distributional responses

Designated Site	Distance to the Proposed Development (Offshore) (km)		Features Screened In	Potential for LSE Identified		
	Caledonia OWF	Caledonia OECC		Construction	Operation and Maintenance (O&M)	Decommissioning
Flamborough and Filey Coast SPA					Collision risk	
			Fulmar	-	Barrier effects (see section 7.3.6)	-
Coquet Island SPA	335.3	310.8	Fulmar	-	Barrier effects (see section 7.3.6)	-
Ythan Estuary SPA	117.6	93.1	Sandwich tern (*Thalasseus sandvicensis*)	Distributional responses (Caledonia OECC) Section 7.3.8	-	-
Migratory Fish						
River Spey SAC	58.87	26.96	Atlantic salmon (*Salmo salar*); Sea lamprey; and Freshwater pearl mussel (*Margaritifera margaritifera*).	Underwater noise	Electromagnetic Fields (EMF).	Underwater noise
Berriedale and Langwell Waters SAC	49.34	56.85	Atlantic salmon	Underwater noise	EMF	Underwater noise

Designated Site	Distance to the Proposed Development (Offshore) (km)		Features Screened In	Potential for LSE Identified		
	Caledonia OWF	Caledonia OECC		Construction	Operation and Maintenance (O&M)	Decommissioning
River Thurso SAC	69.80	98.70	Atlantic salmon	Underwater noise	EMF	Underwater noise



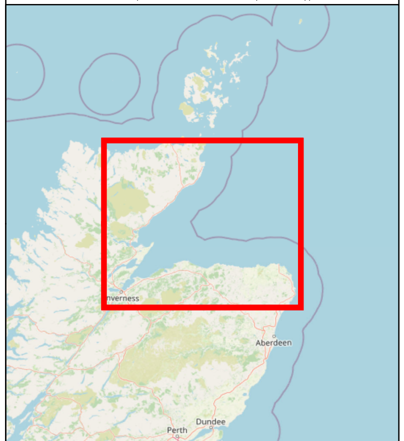
Caledonia OWF

Caledonia North Site

Caledonia South Site

Offshore Export Cable Corridor

Special Area of Conservation (SAC)



0 5 10 15 20 km

01	26/09/2024	Approved	EV	BB	DH
REV	DATE	DOC STATUS	ORIGIN	REVIEW	APP

CONTRACTOR DRAWING NO
UKCAL1_GO_WNF_HRA_MAP_00169

CONTRACTOR REV
01

GEODETIC PARAMETERS
WGS 84 / UTM zone 30N (EPSG: 32630)

DRAWING TITLE

Figure 10-1: Proposed Development in Relation to Designated Sites Screened in for Marine Mammals

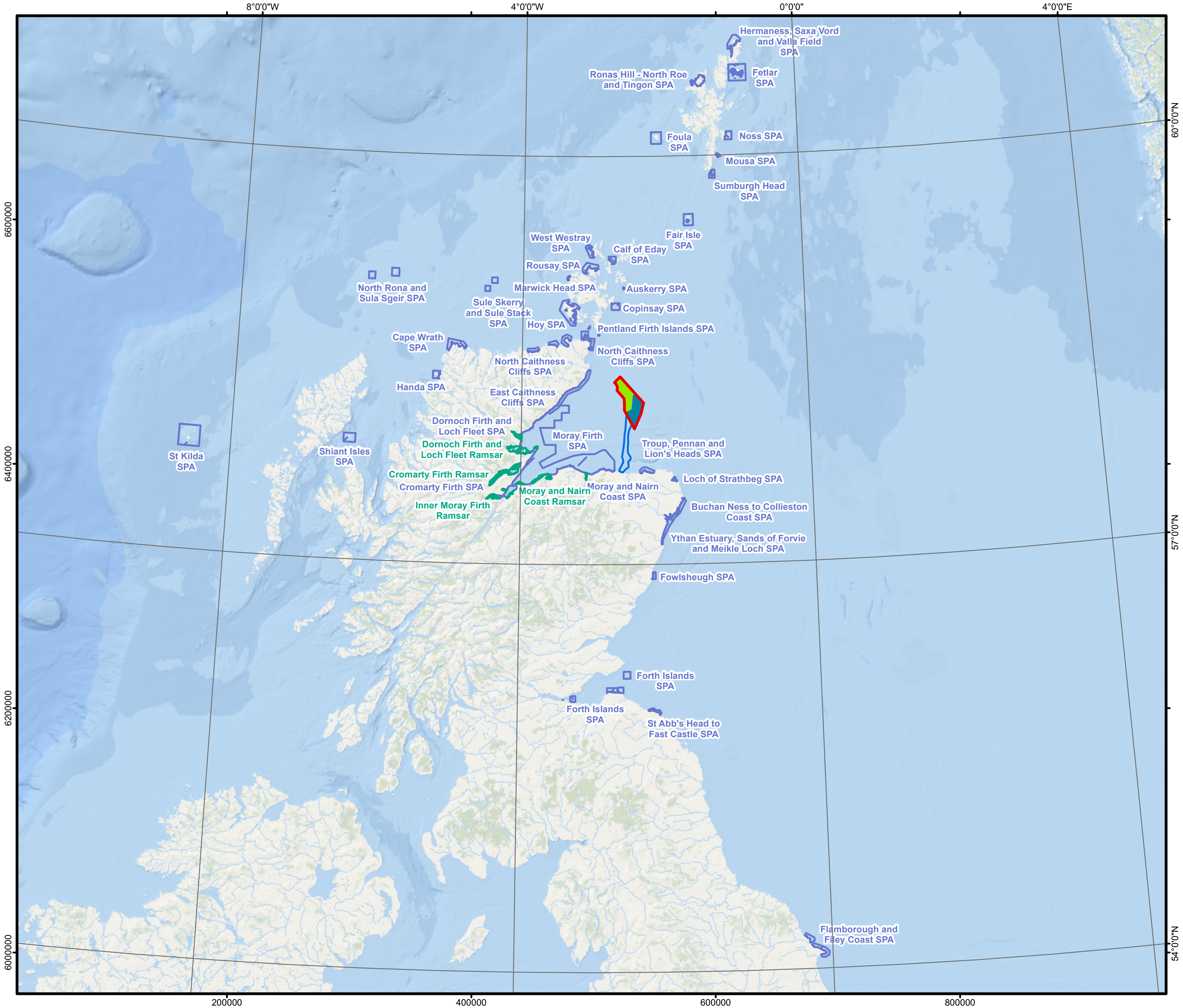
STATUS
Approved

SCALE
1:750,000

DRAWING NUMBER
N/A

SHEET NO
01 of 01

REV
N/A



Caledonia OWF
Caledonia North Site
Caledonia South Site
Offshore Export Cable Corridor
Special Protection Area (SPA)
RAMSAR Site

Service Layer Credits: © OpenStreetMap (and) contributors, CC-BY-SA
Esri, Garmin, GEBCO, NOAA NGDC, and other contributors
© Caledonia Offshore Wind Farm Ltd © 2024. This document is the property of contractors and sub-contractors and shall not be reproduced nor transmitted without prior written approval.

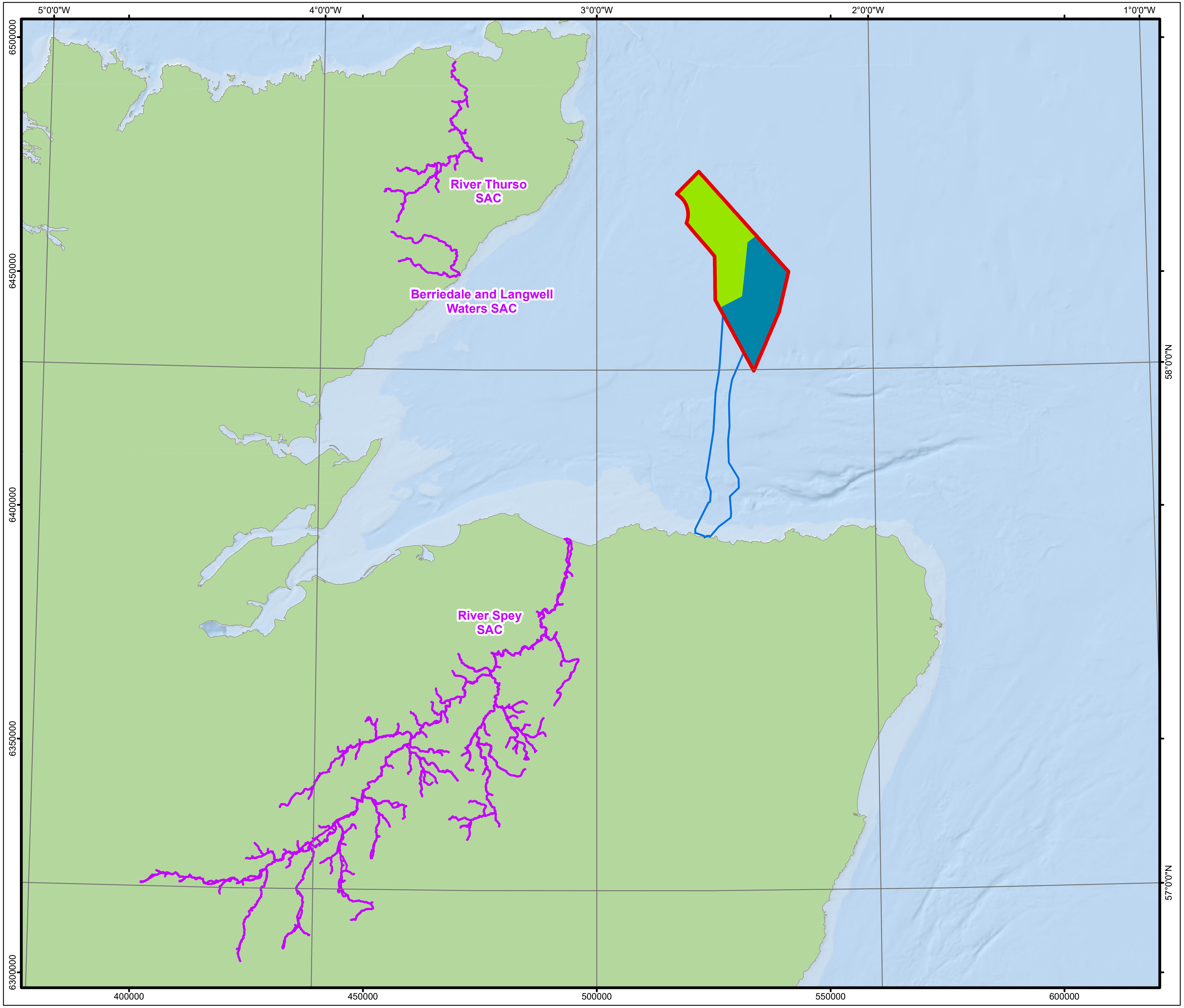
0 50 100 150 km

REV	DATE	DOC STATUS	ORIGIN	REVIEW	APP
01	26/09/2024	Approved	EV	BB	DH

CALEDONIA Offshore Wind Farm

GoBe APEM Group

CONTRACTOR DRAWING NO UKCAL1_GO_WNF_HRA_MAP_00170	CONTRACTOR REV 01
GEODETIC PARAMETERS WGS 84 / UTM zone 30N (EPSG: 32630)	
DRAWING TITLE Figure 10-2: Proposed Development in Relation to Designated Sites Screened in for Offshore and Intertidal Ornithology	
STATUS Approved	SCALE 1:4,250,000
DRAWING NUMBER N/A	SHEET NO 01 of 01 / REV N/A



Caledonia OWF
Caledonia North Site
Caledonia South Site
Offshore Export Cable Corridor
Special Area of Conservation (SAC)

0 10 20 30 40 km

01	26/09/2024	Approved	EV	BB	DH
REV	DATE	DOC STATUS	ORIGIN	REVIEW	APP

CALEDONIA Offshore Wind Farm
GoBe APEM Group

CONTRACTOR DRAWING NO UKCAL1_GO_WNF_HRA_MAP_00171	CONTRACTOR REV 01
GEODETIC PARAMETERS WGS 84 / UTM zone 30N (EPSG: 32630)	
DRAWING TITLE Figure 10-3: Proposed Development in Relation to Designated Sites Screened in for Migratory Fish	
STATUS Approved	SCALE 1:1,100,000
DRAWING NUMBER N/A	SHEET NO 01 of 01 / REV N/A

10.1.2 Screening In-Combination

10.1.2.1 The Habitats Regulations include a requirement for the Competent Authority (in this case the Scottish Ministers) to carry out a HRA in respect of the LSE of a plan or project alone or in-combination with other plans or projects, where these are not directly connected with or necessary to the management of the site. Screening for the Proposed Development (Offshore) alone is summarised above in Section 10.1.1, with the in-combination screening conclusions confirmed here.

10.1.2.2 With respect to in-combination impacts the worst-case scenario is for Caledonia North and Caledonia South to be built concurrently. Caledonia North and Caledonia South individually, are not considered in-combination with other OWF schemes. Therefore, the in-combination assessment has only been considered for the Proposed Development (Offshore).

10.1.2.3 The following list has been applied to the Proposed Development (Offshore) when identifying plans and projects for consideration in-combination (taking account of relevant advice, such as the DTA 2015 guidance (DTA, 2015[1]), which addresses which plans and projects to include):

- the incomplete parts of projects that have been started but which are not yet completed;
- projects given consent but not yet started;
- projects that are subject to applications for consent;
- projects that are subject to outstanding appeal procedures;
- any known unregulated projects that are not subject to any consent;
- ongoing projects subject to regulatory reviews, such as discharge consents or waste management licenses;
- any development that has recently been completed but where any residual effects may not form part of the environmental baseline; and
- policies and proposals that are not yet fully implemented in plans that are still in force; and draft plans that are being brought forward by other public bodies and agencies.

10.1.2.4 A full review of such plans and projects has been conducted for the Proposed Development (Offshore), with each individual topic chapter for the EIAR having undertaken screening of the full list of projects, plans and activities, to identify those relevant to individual receptor groups. The relevant plan/ project screening tables for the receptor groups discussed within this Report to Inform Appropriate Assessment (RIAA) are presented within the following EIAR chapters (it should be noted that the screening tables in the subsequent chapters include more species within receptor groups than those considered within this assessment):

- Volume 2, Chapter 6: Offshore Ornithology;

- Volume 2, Chapter 7: Marine Mammals; and
- Volume 2, Chapter 5: Fish and Shellfish Ecology.

10.1.2.5 With respect to in-combination effects within the HRA process, the Screening Report identified plans and projects to be considered within this RIAA. The specific plans and projects relevant to individual receptors draw on those identified within the individual EIA Report chapters, as highlighted above, together with any additional plans or projects relevant to the designated site(s) under consideration. The intention of in-combination screening is to determine, for the plans and projects relevant to each receptor group, which of the designated sites screened in for determination of potential LSE alone may be affected by a spatial and/ or temporal overlap of effect from a relevant plan or project.

10.1.2.6 While it is considered that where an LSE exists from the Proposed Development (Offshore) alone there also exists a potential for LSE in-combination, there is also a possibility that a conclusion of no LSE alone may still result in an LSE when considered in-combination with other plans and projects.

10.1.2.7 The in-combination assessment was deferred to the RIAA where the approach taken being that any designated site that was screened in alone will also be considered in the RIAA in-combination assessment.

10.1.2.8 Where a designated site was screened out alone, the site was automatically screened in for consideration in the RIAA in-combination assessment. However, an exception to this approach was in instances where a theoretical pathway exists but there is no conceivable way that this could result in any tangible effect on a qualifying feature of a European site, and therefore screening alone concluded that there is no pathway for effect. This includes effects which are deemed trivial in terms of scale, extent, duration and magnitude. This approach was taken on the basis of guidance from the UK Planning Inspectorate which states: an effect pathway that is considered to be inconsequential should be considered immaterial due to its inconsequential or 'trivial' scale and would not result in a conceivable effect (paragraph 3.16 (1) of Advice Note 10 version 9 (Planning Inspectorate, 2022[2]) or real risk to the European site's conservation objectives.

10.1.2.9 The list of projects and plans identified at screening, to be included for assessment in-combination, was based on the following:

- Level of detail available for project/ plans;
- Potential for an effect-pathway-receptor link;
- Potential for a physical interaction; and
- Potential for temporal overlap, where construction activities are taking place at the same time.

10.1.2.10 The approach to be applied to the in-combination assessment of the identified plans and projects is outlined below.

10.1.2.11 A tiered approach is applied to reflect the different levels of uncertainty associated with the project design and timeframes for the projects identified for assessment. The allocated 'Tiers' reflect the current stage of the relevant projects within the planning and development process. This allows the in-combination impact assessment to consider several future development scenarios, each with a differing potential for being ultimately built out. Appropriate weight may therefore be given to projects within each Tier in the decision-making process when considering the potential in-combination impact associated with the Proposed Development (Offshore). The Tiers are presented in Table 10-2.

10.1.2.12 It is noted that there is significant variability in project certainty between a project in planning but not yet submitted, a project under construction and a project in operation, specifically as regards the 'final' project design and construction programme. Experience from other offshore wind projects over many years indicates that the project as assessed on application (in terms of Worst Case Scenario (WCS) and the overall construction window) is almost always much greater in terms of predicted impact/timeframe than a project at the point of construction, for example, constructed projects generally have fewer turbines, a more clearly defined (and often shorter) construction window and so on.

Table 10-2: Tiers applied for the in-combination assessment for the Proposed Development (Offshore).

Tier	Description
Tier 1	Under construction or will become operational following baseline characterisation; Permitted application(s), but not yet implemented; and Submitted application(s), but not yet determined. (For these plans, projects or activities detailed project information is available in the public domain)
Tier 2	Projects where a scoping report has been submitted and there is sufficient detail within the scoping report to support in-combination assessment (For these plans, projects or activities some detailed or high level project information is available in the public domain)
Tier 3	Projects where a scoping report has not been submitted; Projects identified in the relevant Development Plan (and emerging Development Plans – with appropriate weight being given as they move closer to adoption) recognising that there will be limited information available on the relevant proposals; and Projects identified in other plans and programmes (as appropriate) such as other ScotWind development consents/approvals, which set the framework for future development consents/approvals, where such development is reasonably likely to come forward.
Tier 4	Projects identified in other plans and programmes where such development is proposed by assessment cannot be progressed as there is limited or no information available in the public domain.

Marine Mammals

10.1.2.13 The screening exercise identified the designated sites and relevant plans and projects to include for in-combination assessment. On a highly precautionary basis, the screening range used to identify projects was based on the species-specific management units. For Marine Mammals, the plans and projects screened into the in-combination assessment are provided in Table 10-3.

10.1.2.14 Each project, plan or activity has been considered and screened in or out based on effect-receptor pathway, data confidence and the temporal and spatial scales involved. The long-list of projects was screened to remove all projects that have:

- No temporal overlap; and
- No effect-receptor pathway.

10.1.2.15 The following criteria were used to identify projects to be screened into the marine mammal short list:

- Project must fall within species-specific Management Unit (MU);
- If a project has submission documents available in the public domain and has provided the quantitative assessment for relevant species, it is

included; however, if a project screened out a relevant species it is not considered further for this species; and

- If a project doesn't have submission documents available in the public domain, it has been assigned to a SCANS IV block that it overlaps with; if the density of the relevant species is not provided for a SCANS IV block that the project is assigned to (e.g. there were no sightings of relevant species in this block), it is not considered further for this species.

10.1.2.16 Additionally, in line with NatureScot advice, the final marine mammal short list includes only projects within Scottish waters. All projects where no construction data were available were scoped out due to low data confidence.

Table 10-3: Marine mammals in-combination project shortlist for the Proposed Development (Offshore).

Development Type	Project	Status	Tier
Offshore Wind Farms	Berwick Bank	Concept/early planning	1
	Green Volt	Consented	1
	Salamander	Concept/early planning	1
	Moray West[i]	Under Construction	1

Offshore and Intertidal Ornithology

10.1.2.17 The Screening Report (Application Document 12) identified the designated sites and relevant plans and projects to include for in-combination assessment. On a highly precautionary basis, the screening range used to identify projects was based on plans or projects that have potential construction or operation periods that temporally or spatially overlap with that of the Proposed Development (Offshore). For offshore and intertidal ornithology, the plans and projects screened into the in-combination assessment are provided in Table 10-4. In order to reduce repetition, the in-combination assessment has been carried out for the Proposed Development (Offshore) as a whole within section 10.3.2. Details of qualifying features where LSE could not be ruled out in-combination and details of the inclusion of projects within the in-combination assessment are outlined within Section 10.3.2.

[i] Moray West is in active construction at the time of conducting this RIAA, however temporal overlap with the Propoded Development (Offshore) is extremely unlikely, see https://marine.gov.scot/sites/default/files/8460005-dbha03-mww-pln-000001_moray_west_cop_and_cms_rev09.pdf.

Table 10-4: Offshore and Intertidal Ornithology in-combination project shortlist for the Proposed Development (Offshore).

Development Type	Project	Status	Tier
Offshore Wind Farm	Aberdeen (EOWDC)	Operational	1
	Arven	Concept/early planning	3
	Aspen	Concept/early planning	3
	Ayre	Concept/early planning	2
	Beatrice	Operational	1
	Beech	Concept/early planning	3
	Bellrock	Concept/early planning	3
	Berwick Bank	Concept/early planning	1
	Bowdun	Concept/early planning	2
	Broadshore	Concept/early planning	2
	Buchan	Concept/early planning	2
	Campion	Concept/early planning	3
	Cedar	Concept/early planning	3
	Cenos	Concept/early planning	2
	Culzean	Concept/early planning	1
	Flora	Concept/early planning	3
	Forthwind	Consented	1
	Green Volt	Consented	1
	Havbredey	Concept/early planning	3
	Hywind	Operational	1
	Inch Cape	Under construction	1
	Kincardine	Operational	1
	Marram	Concept/early planning	2
	Moray East	Operational	1

Development Type	Project	Status	Tier
	Moray West	Under construction	1
	Morven	Concept/early planning	2
	Muir Mhor	Concept/early planning	2
	Neart Na Gaoithe	Under construction	1
	Ossian	Concept/early planning	1
	Pentland Floating OWF	Concept/early planning	1
	Salamander	Concept/early planning	1
	Scaraben	Concept/early planning	2
	Sinclair	Concept/early planning	2
	Spiorad na Mara	Concept/early planning	3
	Stoura	Concept/early planning	3
	Stromar	Concept/early planning	2
	Talisk	Concept/early planning	3
	Other Celtic & Irish Sea OWFs off England, Wales, Scotland, Ireland and the Isle of Man	Various OWFs in the Celtic and Irish Sea and the east coast of Ireland, either in an early planning or concept phase, under construction or decommissioning, or are operational with the potential for ongoing effects.	Various tiers ranging from 1-3
	Other Channel OWFs off the coast of England and France	Various OWFs in the Channel off the coasts of England and France, either in an early planning or concept phase, under construction or decommissioning, or are operational with the potential for ongoing effects.	Various tiers ranging from 1-3
	Other North Sea OWFs off Belgium, Netherlands, Germany, and Denmark	Various OWFs in the North Sea, either in an early planning or concept phase, under construction or decommissioning, or are operational with the potential for ongoing effects.	Various tiers ranging from 1-3

Development Type	Project	Status	Tier
	Other English east coast OWFs (e.g. Blyth, Dogger Bank OWFs, Hornsea Project Four, Hornsea Project Three, Outer Dowsing, Dudgeon and Sheringham Shoal Extension, Norfolk Vanguard West, Norfolk Vanguard East, East Anglia Three, East Anglia Two, East Anglia One North, North Falls, Five Estuaries.)	Various OWFs on the east coast of England, either in an early planning or concept phase, under construction or decommissioning, or are operational with the potential for ongoing effects.	Various tiers ranging from 1-3

Migratory Fish

10.1.2.18 The Screening Report identified the European sites and relevant plans and projects to include for in-combination assessment. On a highly precautionary basis, the screening range used to identify projects was based on a 100km buffer from the designated site. For migratory fish, the plans and projects screened into the in-combination assessment are provided in Table 10-5.

Table 10-5: Migratory fish in-combination project shortlist for the Proposed Development (Offshore).

Development Type	Project	Status	Tier	SACs within 100km
Offshore Wind Farms	Ayre	Concept/Early Planning	3	River Thurso; and Berriedale and Langwell Waters.
	Broadshore	Concept/Early Planning	2	River Spey; River Thurso; and Berriedale and Langwell Waters.
	Flora	Concept/Early Planning	3	River Dee
	Moray West	In Construction	1	River Spey; River Thurso; Berriedale and Langwell Waters.
	Pentland Floating	In-planning	1	River Thurso And; Berriedale and Langwell Waters.
	Sinclair	Concept/Early Planning	2	River Spey;

Development Type	Project	Status	Tier	SACs within 100km
				River Thurso; and Berriedale and Langwell Waters.
	Stromar	Concept/Early Planning	2	River Spey; River Thurso; and Berriedale and Langwell Waters
	West of Orkney	In Planning	1	River Thurso; and Berriedale and Langwell Waters.
Tidal Energy Sites	Ness of Duncansby	Pre-planning	3	River Thurso; and Berriedale and Langwell Waters.
	Westray South	Pre-planning	2	River Thurso
Cables	Shetland HVDC Link	Proposed	2	River Spey; River Thurso; and Berriedale and Langwell Waters.
	Orkney Interconnector	Proposed	2	River Thurso; and Berriedale and Langwell Waters.
	Orkney Caithness	Proposed	2	River Thurso; and Berriedale and Langwell Waters.

10.2 Assessment of Adverse Effects Alone

10.2.1 Overview

10.2.1.1 This assessment presents the alone assessment for the Proposed Development (Offshore). It is worth noting that this assessment includes the combined areas of Caledonia North and Caledonia South, reflecting a combined maximum of 140 WTGs.

10.2.2 Marine Mammals

Assessment Criteria

10.2.2.1 This section presents an assessment of the adverse effects from the Proposed Development (Offshore) on sites designated for marine mammal features where a LSE has been identified within the Screening Report. Consultation and screening advice received from various Statutory Nature Conservation Bodies (SNCB)s has been received and considered, and the only qualifying species and their designated sites screened into this assessment is bottlenose dolphin at the Moray Firth SAC (57.7km from the Caledonia OWF and 37.7km from the Caledonia OECC).

10.2.2.2 The assessment is presented within the context of the conservation objectives of the Moray Firth SAC with each effect discussed in turn below, including the relevance for the features identified.

10.2.2.3 The potential effects considered are as follows:

- Construction, O&M and Decommissioning phases:
  - Underwater noise;
  - Collision risk and vessel disturbance; and
  - Changes to prey.

Worst Case Scenario

10.2.2.4 Table 10-6 below summarises the WCSs considered for marine mammals, as described within Volume 2, Chapter 7: Marine Mammals. The full project description is provided in Volume 1, Chapter 3: Proposed Development Description (Offshore) for full reference.

Table 10-6: Worst case Scenario for Marine Mammals for the Proposed Development (Offshore).

<table>
<tr><th>Potential Impact</th><th>Assessment Parameter</th><th>Explanation</th></tr>
<tr><td colspan="3">Construction</td></tr>
<tr><td rowspan="2">Underwater noise</td><td>Low order deflagration:
▪ 0.25 kg donor
Unexploded Ordnance (UXO) Timeline
▪ 4 months at North, 4 months at South, up to two clearance events within 24 hours.</td><td>The type, size and number of possible UXO items as well as exact duration of UXO clearance operations is not known at this stage. A detailed UXO survey will be completed prior to construction. It will be provided as a part of a separate licencing process post-consent when detailed survey data is available.

WCS is based on Applicant experience from Moray East and Moray West. The maximum number of UXOs (to be provided post-consent) to be encountered within the Proposed Development (Offshore) and the charge donor for low order deflagration will result in the greatest potential impact.</td></tr>
<tr><td>Piling timeline:
Depending on the construction scenario (concurrent construction or sequential construction) as well as a potential gap during the installation, piling is anticipated to take place between 2028 and 2037.

Spatial WCS:
▪ 144 monopiles (140 Wind Turbine Generators (WTGs), 4 Offshore Substation Platform (OSP))
▪ Max 6,600 kJ hammer energy
▪ 14 m diameter pile
▪ Two piles per day
▪ Concurrent piling at two locations (at the same time)
Total of 72 piling days</td><td>Installation of monopile foundations will require the highest hammer energy and therefore it represents the worst-case spatial scenario.

The temporal WCS is a sequential installation of Caledonia North (fixed jacket foundations) and Caledonia South (a mix of fixed jacket and floating foundations). It could take up to 515 days in total to install, across six years (there may be a gap between installation of the Caledonia North and Caledonia South of up to five years).</td></tr>
</table>

Potential Impact	Assessment Parameter	Explanation
	Temporal WCS (combination of fixed and floating): 105 fixed foundations with pin piles for jackets (101 WTG, 4 OSPs) ▪ Max 4,400kJ hammer energy ▪ Four legs per jacket ▪ 4 m diameter piles ▪ Four piles per day ▪ 105 piling days (assuming four pin piles/day) 39 floating foundations with pin piles for anchors (WTGs only, installed within the Caledonia South Site) ▪ Max 2,000kJ hammer energy ▪ Three legs with six tendons per leg ▪ 18 anchors per WTG ▪ A total of 702 anchors ▪ Max 4.8 m diameter piled anchor ▪ Up to two piles per day ▪ 410 piling days (assuming average of 1.71 anchor/day) **A total of up to 515 piling days**	
	Site preparation: ▪ Dredging and rock placement **WTGS:** ▪ Pre-installation dredging, drilling, vibropiling **Offshore cables:** ▪ Cable laying, trenching, dredging, rock placement **Offshore Construction Timeline:** ▪ Total of up to six years for the Proposed Development (Offshore)	The WCS is informed by the type of activity and associated spatial scale of impact as well as the duration of construction.

Potential Impact	Assessment Parameter	Explanation
	Geophysical surveys will include (source levels provided for SPLpk): ▪ Multi-beam echosounder (MBES; 210-240dB re 1µPa for multiple beams and 197dB re 1µPa for a single beam; 200 to 400 kHz) ▪ Side-scan sonar (SSS; 210dB re 1µPa; 300 to 900 kHz) ▪ Sub-bottom profiler (SBP; 210-220dB re 1µPa, 2 to 15 kHz) ▪ Ultra-short baseline (USBL; 187 – 206dB re 1µPa, 19 to 34 kHz) ▪ Ultra-high resolution seismic (UHRS; 200-226 dB re 1µPa, 100 Hz to 5 kHz) Duration and frequency of geophysical surveys will be provided as a part of a separate licencing process post-consent.	The WCS is informed by the source level and expected sound frequency and overlap with marine mammal hearing ranges.
Vessel collision risk	▪ Max 25 vessels on site at once, including installation, cable lay and support, export cable, guard, CTV, scour installation vessels. ▪ Max 3,992 vessel transits. ▪ List of potential ports: Aberdeen City, Aberdeenshire (Peterhead, Fraserburgh), Moray (Buckie), Highland (Cromarty, Nigg, Wick, Ardersier). **Offshore Construction Timeline:** ▪ Up to six years for the Proposed Development (Offshore)	The WCS is informed by the maximum number of vessels on site at any one time as well as the duration of construction. Offshore construction timeline assumes each phase takes three years to construct.
Vessel disturbance	Refer to vessel collision risk above, parameters applied to the assessment of vessel disturbance are the same.	The WCS is based on maximum number of vessels and duration of construction as per vessel collision risk above.
Change in prey availability	Refer to Volume 2, Chapter 5: Fish and Shellfish Ecology (Impacts 1-5)	The WCS for impacts which are specific to fish and shellfish, and which may therefore have an indirect effect on marine mammals, are presented within

Potential Impact	Assessment Parameter	Explanation
		Volume 2, Chapter 5: Fish and Shellfish Ecology, Impacts 1-5.
O&M		
Underwater noise	**Operational timeline:** ▪ 35 years **Fixed WTGs:** ▪ 63 x 25 MW WTGs ▪ Geared turbine **Floating WTGs:** ▪ 29 x 20 MW WTGs **Cables:** ▪ 29 x inter-array cables ▪ 230 mm diameter cables of aluminium or copper **Mooring line (catenary systems):** ▪ 174 mooring lines ▪ Material: Top section is chain, Mid section is fibre rope, Bottom section is chain	The WCS for operational noise is related to the size of the WTGs and type of turbine. Tension on mooring lines is important in driving the pinging noise as well as the material used, with catenary design with chains being the worst-case scenario.
Vessel collision risk	▪ Max five vessels on site at once, CTVs and SOVs will be used for planned activities and other type of vessels will depend on the type of unplanned activity. ▪ List of potential ports: Aberdeen City, Aberdeenshire (Peterhead, Fraserburgh), Moray (Buckie), Highland (Cromarty, Nigg, Wick, Ardersier). **Operational timeline:** ▪ 35 years	The WCS is informed by the maximum number of vessels on site at any one time as well as the duration of O&M.
Vessel disturbance	Refer to vessel collision risk above, parameters applied to the assessment of vessel disturbance are the same.	The WCS is based on maximum number of vessels, location of ports and duration of O&M phase.

Potential Impact	Assessment Parameter	Explanation
Changes in prey availability	Refer to Volume 2, Chapter 5: Fish and Shellfish Ecology (Impacts 6-11)	The WCS for impacts which are specific to fish and shellfish, and which may therefore have an indirect effect on marine mammals, are presented within Volume 2, Chapter 5: Fish and Shellfish Ecology, Impacts 6-11.
Decommissioning		
Underwater noise	At the end of the operational lifetime of the Proposed Development (Offshore), it is anticipated that all structures above the seabed level will be completely removed. The decommissioning sequence will be the reverse of the construction sequence. The parameters therefore are the same as for the construction phase.	The WCS is equal or less than that of the construction phase (see considerations above)
Vessel collision risk		
Vessel disturbance		
Change in prey availability		

Moray Firth SAC

10.2.2.5 The Moray Firth SAC, which includes bottlenose dolphin as a qualifying feature, is the only SAC for marine mammals screened into the assessment with potential for LSE. This site is 57.7km away from the Caledonia OWF, and 37.7km away from the Caledonia OECC.

Conservation Objectives

10.2.2.6 The conservation objectives of the site associated with the bottlenose dolphin feature are:

- To ensure that the qualifying features of Moray Firth SAC are in Favourable condition and make an appropriate contribution to achieving Favourable Conservation Status.
- To ensure that the integrity of Moray Firth SAC is maintained or restored in the context of environmental changes by meeting objectives:
  - The population of bottlenose dolphin is a viable component of the site;
  - The distribution of bottlenose dolphin throughout the site is maintained by avoiding significant disturbance; and
  - The supporting habitats and processes relevant to bottlenose dolphin and the availability of prey for bottlenose dolphin are maintained.

10.2.2.7 The assessment of these conservation objectives is presented individually split by phase.

Site Status

10.2.2.8 The Moray Firth SAC is located in the inner Moray Firth in north-east Scotland and lists bottlenose dolphins as a qualifying feature. The Moray Firth supports the only known resident population of bottlenose dolphin in the North Sea, but other UK resident populations are found in the Shannon Estuary, Republic of Ireland (Rogan *et al*., 2018[3]) and Cardigan Bay, Wales. These populations consist of the coastal ecotype and individuals from these populations occur within these sites year-round (Hague *et al*., 2020[4]).

10.2.2.9 In Scottish waters, this population is primarily found in highly coastal waters, typically within 2km of the shore and in water depths of less than 30m, with particular preference for water depths between 2 and 20m (Thompson *et al*., 2015[5]; Quick *et al*., 2014[6]). This is supported by acoustic monitoring and habitat modelling using the East Coast Marine Mammal Acoustic Study (ECOMMAS) data, which found that occupancy rates throughout the survey range were generally higher for the acoustic monitoring stations (C-PODs) situated closer to shore (Palmer *et al*., 2019[7]). With this preference for coastal distribution, it is unlikely that individuals will be present within the offshore boundary of the Proposed Development (Offshore), however, they are anticipated to be present within the nearshore area of the Caledonia OECC and the wider coastal regional area.

10.2.2.10 Mark-recapture analysis of photographs collected during photo-identification surveys indicates that the Moray Firth SAC supports an estimated number of 94 individuals (as of 2022; Cheney *et al*., 2024[8]). Despite the population declining by 4.9% from 122 individuals in 2017, the population trend is still considered stable over longer timescales (2001-2022) with some inter-annual variability (Cheney *et al*., 2024[8]).

10.2.2.11 It is well documented that the range of this population extends beyond the boundary of the Moray Firth SAC (Cheney *et al*., 2024[8]), acknowledging that sightings of known individuals from this population have been recorded in English waters (Aynsley 2017[9]; Citizen Fins 2022[10]). In more recent guidance, the Moray Firth SAC population is considered synonymous with the Coastal East Scotland (CES) MU population. The population estimate of 224 (214-234 95% CI) (Inter-Agency Marine Mammal Working Group (IAMMWG), 2023[11]; Arso Civil *et al*., 2021[15]) has recently been updated to 245 (224-268 95% CI) (Cheney *et al*., 2024[8]). Where the CES MU is cited in this document, the most up-to-date population estimate of 245 individuals has been used.

10.2.2.12 The Moray Firth SAC is an important area for this species, being used by over 50% of the population, though the number of dolphins utilising areas beyond the SAC and even beyond the CES MU boundary has been increasing (Cheney *et al*., 2018[12]; 2024[8]).

10.2.2.13 For the neighbouring Greater North Sea (GNS) MU, large-scale, dedicated surveys have covered the Proposed Development (Offshore) site periodically, such as Small Cetaceans in European Atlantic waters and the North Sea (SCANS)-I, -II, -III, and -IV, which were conducted in 1994, 2005, 2016 and 2022, respectively, have been used to estimate abundance estimates. The Proposed Development (Offshore) is located in SCANS-III survey block S and SCANS-IV survey block CS-K. One-hundred and fifty-one (95% CI=0-527) bottlenose dolphins were estimated in SCANS-III survey block S (Hammond *et al*., 2021[13]), but no bottlenose dolphins were observed within SCANS-IV survey block CS-K and therefore no population estimates were available (Gilles *et al*., 2023[14]).

10.2.2.14 Bottlenose dolphins were recorded in low numbers during the site-specific DAS (conducted monthly from May 2021 to April 2023), with two encounters recorded in May 2022. In addition, there were 39 unidentified dolphins and/or porpoise, and three unidentified dolphins (all during year 1 of surveys). These surveys confirm the presence of bottlenose dolphin in the Project Development (Offshore), noting that the Caledonia OECC was not surveyed and so presence in this area is unknown. Due to the spatial footprint of the DAS, the density across the wider GNS MU (from SCANS surveys) has been used to inform bottlenose dolphin density in the relevant impact areas.

10.2.2.15 As established above, it is assumed that all bottlenose dolphins present within the Moray Firth are from the CES MU population and the probability of bottlenose dolphin occurrence within the Moray Firth (based on Thompson *et al*., 2015[5]) was scaled to 50% of the current CES MU population size (Arso

Civil *et al*., 2021[15], Cheney *et al*., 2024[8]). Outside of the Moray Firth, all bottlenose dolphins within 2km of the mainland coastline were assigned to the CES MU (Quick *et al*., 2014[6]) and this area assumed a density of 0.142 dolphins/km^2 (value derived by assuming the remaining 50% of the CES population is distributed uniformly within this 2km buffer). See Volume 7B, Appendix 7-1: Marine Mammal Baseline Characterisation for more details on how bottlenose dolphin densities were derived.

Construction and Decommissioning

Underwater Noise

10.2.2.16 The Screening Report (Application Document 12) determined that the potential for LSE in relation to underwater noise during decommissioning would be similar to, and potentially less, than that outlined in the construction phase. The potential for effect during decommissioning would fall within, and be no worse than, the degree of effect during construction, with any such decommissioning being subject to the relevant licensing requirements at that time. Therefore, the conclusions for the construction phase are considered to apply to decommissioning.

10.2.2.17 There are a number of sources of underwater noise associated with the Proposed Development (Offshore) alone during construction, with these identified within Volume 2, Chapter 7: Marine Mammals, and those screened in for potential LSE (in line with Table 10-1) being:

- Underwater noise from percussive piling;
- Underwater noise during UXO clearance;
- Underwater noise from geophysical and seismic survey; and
- Underwater noise from other construction activities.

10.2.2.18 The approach taken in this RIAA is to assess each of these effects individually, with a conclusion of the effect from underwater noise drawn based on all four sources.

Underwater Noise from Percussive Piling

10.2.2.19 Underwater noise from the piling of the Proposed Development (Offshore) has been detailed in the following chapters:

- Volume 2, Chapter 7: Marine Mammals; and
- Volume 7B, Appendix 7-3: Marine Mammals Underwater Noise Assessment Methodology.

10.2.2.20 Volume 7B, Appendix 7-3: Marine Mammals Underwater Noise Assessment Methodology provides the technical evidence base for underwater noise, with the EIA chapter providing the full context for bottlenose dolphin in relation to the potential for injury. Auditory injury is addressed in the EIAR through consideration of the risk of onset of Permanent Threshold Shift (PTS). The threshold values applied for PTS are provided in Table 7-1.

Project Mitigation

10.2.2.21 Project specific mitigation for underwater noise is identified in Table 6-1 and includes the following:

- M-11:
  - Development of and adherence to a Piling Strategy (PS) (applicable where piling is undertaken). The PS will detail the method of pile installation and associated noise levels. It will describe any mitigation measures to be put in place (for example, soft starts and ramp ups, use of Acoustic Deterrent Devices) during piling to manage the effects of underwater noise on sensitive receptors.
- M-16:
  - Development of and adherence to a Marine Mammal Mitigation Plan (MMMP). This will identify appropriate mitigation measures during offshore activities that are likely to produce underwater noise and vibration levels capable of potentially causing injury or disturbance to marine mammals (piling, UXO clearance, geophysical surveys; see Volume 7, Appendix 13: Caledonia North Draft Marine Mammal Mitigation Protocol and Volume 7, Appendix 14: Caledonia South Draft Marine Mammal Mitigation Protocol). This will be developed alongside the PS and referred to in European Protected Species (EPS) licence applications.
- M-96:
  - Unexploded ordnance (UXO) hazards will be avoided where practicable and appropriate. If avoidance is not possible, decision making will relate to removal, with disposal in-situ considered if avoidance or removal is not possible. If disposal is required, and where practicable and appropriate, low-order deflagration will be the preferred method. The indicative mitigation measures for UXO clearance are provided in the draft MMMP (M-16), however, Licensing of UXO clearance works will be subject to a standalone Marine Licence and EPS licence application. At the post-consent stage, these applications will provide details of measures to minimising impacts on marine mammals where appropriate.

10.2.2.22 It is highlighted that the above measures (M-11 Piling Strategy, M-16 Marine Mammal Mitigation Plan) will outline the proposed high-level approach to mitigation, and provide a framework for committing to specific mitigation measures in the post-consent stage once the project design is refined.

10.2.2.23 Following best and established practice, the above measures are primarily focused on managing and mitigating any risk of a PTS in hearing (injury) in bottlenose dolphins associated the Moray Firth SAC.

Assessment of Piling Noise

10.2.2.24 As identified within Part 1 (Section 7.2), piling installation will generate underwater noise at levels that could expose bottlenose dolphin to the risk of injury and behavioural disturbance, during the construction stage. Underwater noise modelling has been undertaken to determine the extent of underwater sound propagation from impact piling and injury ranges (see Volume 7, Appendix 6: Underwater Noise Assessment). The worst-case scenarios for auditory injury to all species presented in this section are based on modelling locations with the most precautionary impact ranges and the highest number of animals potentially impacted. For the full set of results (all modelling locations, all foundation designs and sets of densities) please see section 7.2 of the Volume 7B, Appendix 7-3: Marine Mammals Piling Results (Auditory Injury and Disturbance). For the assessment of disturbance using iPCoD only, the worst-case scenario also takes into account the temporal spread of installation when determining the worst-case (Volume 7B, Appendix 7-4: Marine Mammals Population Modelling (IPCoD)). It should be noted that the predictions for PTS onset presented in this section assume that all animals within the PTS-onset range are impacted, which will overestimate the true number of impacted animals. In addition, the sound is modelled as being fully impulsive irrespective of the distance to the pile, which is highly precautionary, resulting in predictions that are unlikely to be realised.

Auditory Injury

10.2.2.25 Under the worst-case piling scenario (Table 10-6, spatial worst-case scenario), with piling mitigation in place (M-11 and M-16 as established above), the predicted maximum instantaneous auditory injury (unweighted SPLpeak for PTS onset) impact range for bottlenose dolphin from piling was 50m for the installation of a monopile at model location 8. Considering the cumulative PTS onset (weighted SELcum) thresholds, the predicted maximum impact range for bottlenose dolphins during a single monopile piling event was calculated at <100m for the same location. Based on the established density estimates, these impact ranges would result in <1 individual being impacted within the CES MU (and therefore the Moray Firth SAC as above), however given that the SAC lies 57.7km away from the Proposed Development (Offshore) Site, there is no predicted overlap with the SAC. Furthermore, the modelling demonstrated that there would be no overlap of the PTS impact ranges for concurrent piling and the maximum impact range would be the same as for single pile driving.

10.2.2.26 Considering the Moray Firth SAC population (n = 245), and taking a precautionary approach, assuming the <1 individual impacted is from the CES MU, there is a potential risk of auditory injury (PTS onset) to <0.4 % of the Moray Firth SAC population.

10.2.2.27 If PTS were to occur on any individuals as a result of piling noise, it is expected to result in a "notch" of reduced hearing sensitivity in exposed individuals within a frequency range that is unlikely to significantly affect the fitness of individuals (i.e. its ability to survive and reproduce). As such, current scientific understanding is that PTS would not result in significant impacts to the fitness of individual bottlenose dolphins, for either adults or calves (Booth *et al*., 2019[16]).

10.2.2.28 It is considered that the risk of noise induced auditory injury from piling will be highly localised, as established above. Furthermore, the establishment of project mitigation (M-11 and M-16) will further reduce the likelihood that animals are within the potential impact zone. Given the very small impact ranges for the species, and the proposed mitigation measures in place, the risk of auditory injury to any individual associated with the Moray Firth SAC is considered negligible, and therefore there will not be a population level impact.

10.2.2.29 In consideration of the conservation objectives outlined in paragraph 10.2.2.6, it is considered that auditory injury (i.e. PTS) arising from pile driving should not occur, will not impact on the viability of the population of bottlenose dolphin associated with the site.

10.2.2.30 **Therefore, it is concluded that auditory injury (i.e. PTS) arising from pile driving, should it occur, will not result in an Adverse Effect on Site Integrity (AEoSI) on the bottlenose dolphin feature of the Moray Firth SAC.**

Behavioural Disturbance

10.2.2.31 The number of bottlenose dolphins predicted to be disturbed within the Moray Firth SAC (synonymous with the CES MU as stated above) by a single pile driving event on any given day is a maximum of 56 individuals (22.86% of the SAC population) from location 8. During concurrent piling piling (i.e. two piling events taking place within Caledonia North at the same time), up to 58 individuals may experience disturbance (23.67% the SAC population) from locations 1 and 8. Considering the neighbouring GNS MU, the number of bottlenose dolphins predicted to be disturbed by a single pile driving event on any given day is a maximum of 39 individuals (1.93% of the GNS MU). During concurrent piling, up to 37 individuals may experience disturbance (1.83% GNS MU).

10.2.2.32 To determine potential impacts on the population over time, iPCoD modelling was undertaken for the GNS MU and CES MU (synonymous with the SAC population).

10.2.2.33 The worst-case scenario, identified through the iPCoD modelling, was where the North and South of the Proposed Development (Offshore) is installed with a 5-year break between the completion of installation in the North and the commencement of installation in the South. Furthermore, the disturbance values used in the modelling were based on the worst case across piling locations in the North and piling locations in the South:

- Modelling for the CES MU:

- 48 bottlenose dolphin per day for installation of pin piles at jackets in the North;
- 52 bottlenose dolphin per day for installation of pin piles at jackets in the South; and
- 46 bottlenose dolphin per day for installation of pin piles at anchors (South).

- Modelling for the GNS MU:
  - 30 bottlenose dolphin per day for installation of pin piles at jackets in the North;
  - 35 bottlenose dolphin per day for installation of pin piles at jackets in the South; and
  - 27 bottlenose dolphin per day for installation of pin piles at anchors (South).

10.2.2.34 With respect to the neighbouring GNS MU, the level of disturbance was not significant and did not result in any long-term population impacts, including the population trajectory.

10.2.2.35 Disturbance from piling can occur over a large spatial extent. The probability of the effect is high close to piling, but decreasing to low levels further from source. The duration of the effects is medium term (piling will occur over a maximum 451 days). The effect will occur at a moderate frequency, intermittently across a period of up to three years. As shown by the iPCoD modelling, disturbance effects could impact a small proportion of the neighbouring GNS MU population, but the population trajectory would not be altered and therefore the effect has an overall low consequence.

10.2.2.36 However, for bottlenose dolphins within the CES MU population (synonymous with the SAC population), behavioural disturbance resulting from the worst-case scenario may affect a larger proportion of the population, leading to a deviation in size of up to 7.7% when compared to the un-impacted population. While the impacted CES MU population size is reduced compared to the un-impacted population size, it continues to increase in size even throughout the piling activities.

10.2.2.37 It is important to note that the assessment undertaken is highly precautionary, inherent to adopting the harbour porpoise dose-response function (see Volume 7B, Appendix 7-2: Marine Mammals Underwater Noise Assessment Methodology for a discussion of assessment limitations).

10.2.2.38 The assessment outcomes (in terms of the spatial and temporal scale of the effect) are in line with disturbance response of bottlenose dolphin to offshore construction activities including impact piling reported in the literature (e.g. Pirotta *et al*., 2013[53]; Graham *et al*., 2017b; Fernandez-Betelu *et al*., 2021[17]).

10.2.2.39 Furthermore, the relatively dynamic social structure of bottlenose dolphins (Connor *et al*. 2001[18]) and the fact that they have no significant predation threats and do not appear to face excessive competition for food with other marine mammal species, have potentially resulted in a higher tolerance (compared to porpoise) to perceived threats or disturbances in their environment, which may make them less sensitive to disturbance.

10.2.2.40 Given the distance between the Proposed Development (Offshore) and the known distribution of bottlenose dolphins associated with the SAC (namely the SAC and a 2km buffer from the coastline), the potential likelihood of individuals being exposed to disturbance is low. Furthermore, while there remains the potential for disturbance to affect individual behaviour this is unlikely to result in an overall change in individual energy budget since animals are predicted to compensate for time lost due to disturbance (New *et al*., 2013[19]). Thus, it is considered that bottlenose dolphins are not particularly adversely affected by disturbance and no change to vital rates is expected.

10.2.2.41 **It is determined that there is no AEoSI on the bottlenose dolphin feature of the Moray Firth SAC with respect to behavioural disturbance caused by piling from the construction and decommissioning of the Proposed Development (Offshore) alone.**

Assessment of Underwater Noise During UXO Clearance

10.2.2.42 If UXOs are found within the Caledonia OWFand Caledonia OECC, a risk assessment will be undertaken and items of UXO will be either avoided by equipment micro-siting, moved, or disposed of in situ.

10.2.2.43 In line with the advice received in the Scoping Opinion, the Applicant has considered alternatives to high order detonations alongside the effectiveness of these techniques. The UXOs found within the Moray West Offshore Wind Farm site were cleared using a low order deflagration technique, with 100% success rate (Ocean Winds, 2024[20]). As such, given that low order deflagration is a viable and effective method to be applied during UXO clearance at the Proposed Development (Offshore) and Caledonia OECC, and the embedded mitigation M-96 mentioned above, the potential effects of high order clearance are not considered further.

10.2.2.44 As the detailed pre-construction surveys have not yet been completed, it is not possible at this time to determine how many items of UXO will require clearance. As a result, a separate Marine Licence will be applied for post-consent for the clearance (where required) of any UXO identified. In order to define the design envelope for consideration of UXO within the EIAR, a review of recent information has been undertaken. Current advice from the UK SNCBs is that the Southall *et al*. (2019[35])criteria should be used for assessing the impacts associated with UXO clearance on marine mammals, and this advice has been followed for this assessment. However, the suitability of these criteria for UXO is under discussion.

10.2.2.45 Using both the Effective Deterrence Range (EDR) methodology and using TTS as a proxy for disturbance, a low-order clearance scenario has been modelled assuming a donor charge of 0.25 kg. The unweighted UXO clearance source levels are presented in Table 10-7. UXO clearance is defined as a single pulse and thus, both the weighted SELss criteria and the unweighted SPLpeak criteria from Southall *et al*. (2019[35])have been presented and animal fleeing assumptions do not apply. Full details of the underwater noise modelling and the resulting auditory injury (PTS-onset) impact areas and ranges are detailed in Volume 7, Appendix 6: Underwater Noise Assesment.

Table 10-7: Summary of the unweighted SPL_{peak} and SEL_{ss} source levels used for UXO clearance modelling

Charge weight	Unweighted SPL_{peak} source level dB re 1 μPa @ 1m	Unweighted SEL_{ss} source level dB re 1 μPa^{2}s @ 1m
0.25kg	269.8	215.2

Auditory Injury

10.2.2.46 The low-order clearances, although significantly lower in level compared to the high-order events, still demonstrate similar time spectral characteristics (Lepper *et al*., 2024[21]). Most of the acoustic energy produced by a high-order clearance is below a few hundred Hz, decreasing on average by about SEL 10 dB per decade above 100 Hz, and there is a pronounced drop-off in energy levels above ~5-10 kHz (von Benda-Beckmann *et al*., 2015[22], Salomons *et al*., 2021[23]). Spectograms for low order clearance events show sharp transient time and arrival of higher frequency components first, with detectable energy up to 7 kHz (Lepper *et al*., 2024[21]). However, there is a rapid drop off to lower frequency containing most of the energy of the signal within levels up to 3 kHz (Lepper *et al*., 2024[21]).

10.2.2.47 The primary acoustic energy from the low order clearance is below the region of greatest sensitivity for bottlenose dolphin (8.8 to 110kHz). If PTS were to occur within this low frequency range, it would be unlikely to result in any significant impact to vital rates of bottlenose dolphins, and therefore individuals are not considered particularly sensitive to this nature of auditory impact.

10.2.2.48 A PTS in hearing is expected to result in a "notch" of reduced hearing sensitivity in exposed individuals within the frequency range of the sound. In the case of UXO clearance this would be in the low frequency component of the species hearing range, which is unlikely to significantly affect the fitness of individuals (specifically, its ability to survive and reproduce).

10.2.2.49 As UXO clearance is defined as a single pulse, both the weighted SELss criteria and the unweighted SPLpeak criteria (Southall *et al*., 2019[35]) were considered. The maximum PTS impact range of UXO clearance on bottlenose dolphins is estimated to be 60m, when considering the unweighted SPLpeak criteria, and the adoption of the 'low-order' clearance technique and no at-source mitigation.

10.2.2.50 As there is no spatial overlap between this SAC and the PTS-onset impact ranges of UXO clearance works on bottlenose dolphins, it is considered that there are no spatial impacts on the SAC directly. Furthermore, regarding wider connectivity with the GNS population, due to very localised impact ranges, the impact would not extend beyond the Moray Firth and therefore it is anticipated that there is a very low (near negligible) chance that any bottlenose dolphins from the GNS MU are at risk of experiencing PTS from UXO clearance.

10.2.2.51 The extent and duration of the impact (underwater noise during low order UXO clearance) is expected to be localised (up to 60m) and short-term. The effect is unlikely to occur due to the application of embedded mitigation (specific measures to be agreed post-consent as a part of the final MMMP) that will ensure that animals are outside of the injury zone before the commencement of the clearance activities. As the consequence, it is anticipated that no animals will experience injury and therefore the impact will not alter respective population trajectories.

10.2.2.52 **Together, the low sensitivity of the species, the very localised scale of the impacts, and the mitigation measures in place are considered sufficient to reduce the risk of auditory injury caused by UXO clearance to negligible, and to conclude that there is no AEoSI on the bottlenose dolphin feature of the Moray Firth SAC caused by auditory injury from UXO clearance.**

Behavioural Disturbance

10.2.2.53 Following the WCS for UXO clearance (Table 10-6), the maximum number of bottlenose dolphin estimated to be disturbed is <1, and <0.01% of the CES MU (and Moray Firth SAC population by proxy as established above). Due to very localised impact ranges, the impact would not extend beyond the Moray Firth and therefore it is anticipated that zero bottlenose dolphins from the GNS MU are at risk of experiencing disturbance from UXO clearance.

10.2.2.54 The maximum range of TTS effects (and therefore behavioural disturbance effects) was 100m for bottlenose dolphins. Given these ranges, it is anticipated that for any identified UXO to have a significant impact on the SAC population, it would have to be located within or on the border of the Moray Firth SAC, which is outside of the project boundary and therefore there is no anticipated effects on the SAC.

10.2.2.55 The extent and duration of underwater noise during low order UXO clearance is expected to be localised and short-term. There is potential for the behavioural disturbance effect to occur if animals are in the close vicinity of the noise source (100m), but responses are expected to be temporary and reversible. Given this, no population level effects are expected.

10.2.2.56 It is noted in the JNCC (2020[24])guidance that, although UXO clearance is considered a loud underwater noise source "...a one-off explosion would probably only elicit a startle response and would not cause widespread and prolonged displacement...". Therefore, it is expected that disturbance from a single noise event would not be sufficient to result in any changes to the vital rates of individuals.

10.2.2.57 The embedded mitigation includes the commitment to low order deflagration. Following application of this embedded measure, the effect of disturbance from UXO clearance on all species is considered to be negligible.

10.2.2.58 **Together, the low sensitivity of the species, the very localised scale of the impacts, and the mitigation measures in place are considered sufficient to reduce the risk of behavioural impacts caused by UXO clearance to negligible and to conclude that there is no AEoSI on the bottlenose dolphin feature of the Moray Firth SAC caused by behavioural impacts from UXO clearance**.

Underwater Noise from Geophysical Surveys

10.2.2.59 A series of high-resolution geophysical surveys will be undertaken in the construction phase within the Proposed Development (Offshore) and Caledonia OECC. High-resolution geophysical surveys are non-intrusive and will utilise towed equipment such as SSS, SBP, MBES, magnetometer, USBL and UHRS to gather detailed information on the bathymetry, seabed sediments, geology, and anthropogenic features (e.g., existing seabed infrastructure, UXO) that exist across the Proposed Development (Offshore).

10.2.2.60 An essential step in assessing the potential for effects on relevant species is a consideration of their auditory sensitivities. Bottlenose dolphin are considered as part of the HF hearing group and the appropriate auditory injury criteria from Southall *et al*. (2019[35]) is applied here.

10.2.2.61 Prior to an evaluation in relation to each item of equipment, the overlap between typical survey equipment operating characteristics and bottlenose dolphin functional hearing capability is considered within in Table 10-8. Table 10-8 presents typical values for geophysical surveys for large offshore wind farms, but equipment specific values will vary between different survey contractors. Where there is no overlap between the generated noise and the functional hearing of an individual, there is no potential for disturbance effects to occur. The acoustic signals from high frequency geophysical sources (e.g. MBES, SSS) are above the hearing range of bottlenose dolphins and not impulsive enough to have the potential to result in hearing injury. In the assessment it will be also required to consider PTS-onset thresholds for impulsive noise which are described in detail in Volume 7B, Appendix 7-2: Marine Mammals Underwater Noise Assessment Methodology.

Table 10-8: Comparison of typical noise emitting survey equipment operating characteristics and overlap with the estimated hearing range of bottlenose dolphins.

Equipment	Estimated source pressure level (dB re 1μPa)	Expected Sound Frequency	Consideration of BND (HF cetacean as per Southall *et al.*, 2019[35])
MBES	210–240 dB re 1μPa (SPL_{peak}) for multiple beams* (Lurton and Deruiter, 2011[25]) 197 dB re 1μPa (SPL_{peak}) for a single beam at an operational frequency of 200 kHz (Risch *et al.*, 2017[26])	200–400 kHz (Hartley Anderson Ltd, 2020[27])	Above hearing range
SSS	210 dB re 1μPa (SPL_{peak}) (Crocker and Fratantonio, 2016[28]; Crocker *et al.*, 2019[29])	300 & 900 kHz (Crocker and Fratantonio, 2016[28])	Above hearing range
SBP	210–220 dB re 1μPa (SPL_{peak}) (Hartley Anderson Ltd, 2020[27])	Frequency selectable. Typically 2–15 kHz with a peak frequency of 3.5 kHz (Hartley Anderson Ltd, 2020[27])	Within hearing range
USBL	187 – 206 dB re 1 μPa (Jiménez-Arranz *et al.* 2020[30])	19 – 34 kHz (Jiménez-Arranz *et al*. 2020)[30]	Within hearing range
UHRS	200 – 226 dB re 1 μPa (Hartley Anderson Ltd, 2020[27])	100 Hz to 5 kHz, and average approx. 1.5 kHz (Hartley Anderson Ltd, 2020[27])	Within hearing range
* The higher the frequency of operation, the lower the source level tends to be.			

10.2.2.62 A magnetometer is used to measure the variation in the earth's total magnetic field to detect and map ferromagnetic objects on or near the sea floor along the survey's vessel tracks. Magnetometers are mounted in a gradiometer format to measure the magnetic gradient between the two sensors. The magnetometer is a passive system and, therefore, does not emit any noise, it is therefore scoped out of assessment.

10.2.2.63 Additionally, given the hearing sensitivities of bottlenose dolphins and the estimated source pressure levels dictated within Table 10-8 above, the MBES and SSS have been scoped out of further assessment.

Auditory Injury

10.2.2.64 The source levels of SBP, USBL, and UHRS equipment are all considered to be below the PTS thresholds for bottlenose dolphins, as established within Volume 7B, Appendix 7-2: Marine Mammals Underwater Noise Assessment Methodology.

10.2.2.65 Although the operable sound frequencies of SBP overlap with the hearing range, when the equipment is emitting higher frequency sounds, the source level tends to be lower (Lurton and Deruiter, 2011[25]), and thus is less likely to exceed the PTS-onset threshold. At the PTS-onset threshold, a 6 dB elevation of the hearing threshold somewhere within the SBP frequency range (2 to 15 kHz) is likely to affect only a small region of bottlenose dolphin hearing, which is unlikely to result in changes to vital rates.

10.2.2.66 The operational frequencies of USBL (19 to 34 kHz) also overlap with hearing ranges bottlenose dolphin. Despite the overlap, the sound frequencies of USBL are outside estimated peak sensitivity for bottlenose dolphin and, at the PTS-onset threshold, a 6 dB elevation of the hearing threshold somewhere within the USBL frequency range is likely to affect only a small region of hearing which is unlikely to result in changes to vital rates.

10.2.2.67 The operational frequencies of UHRS (100 Hz to 5 kHz) shall mostly operate below that at which harbour porpoise and dolphin species are most sensitive to auditory impact. Therefore, whilst there is a risk of auditory injury, this risk is expected to be negligible.

10.2.2.68 Furthermore, the Proposed Development (Offshore) has committed to implementing a MMMP (M-16). Although the exact mitigation measures contained with the MMMP are yet to be determined, they will be in line with the latest relevant guidance at the time of this stage of the Proposed Development (Offshore). Due to the highly localised spatial extent of the impacts, the MMMP is anticipated to fully mitigate the risks of auditory injury to bottlenose dolphins.

10.2.2.69 **Therefore, it is considered that, due to the highly localised spatial extent, lack of sensitivity of bottlenose dolphins to the equipment used, and the implementation of appropriate mitigation (M-16), there is no risk of AEoSI from auditory injury on the bottlenose dolphin feature of the Moray Firth SAC from geophysical and seismic surveys.**

Behavioural Disturbance

10.2.2.70 JNCC *et al*. (2010[31])EPS Guidance concluded that the use of SBPs could cause localised short-term impacts on behaviour such as avoidance. SBPs are highly directional, with noise levels outside of the main beam considerably lower and therefore with limited horizontal propagation of noise levels. Any response will likely be temporary; for example, evidence from Thompson *et al*. (2013[32]) suggests that short term disturbance caused by a commercial two dimensional seismic survey (a much louder noise source (peak-to-peak source levels estimated to be 242-253 dB re 1μPa at 1 m) than SBP) does not lead to long-term displacement of bottlenose dolphins, only a potential finer-scale re-distribution of individuals however no significant impact on the number of animals using the SAC. Additionally, CSA (2020[33]) demonstrated that the maximum distance to the disturbance threshold (120dB SPLrms) was 141m for a medium sub-bottom profiler so it is not anticipated to result in any significant disturbance or contribution to the thresholds.

10.2.2.71 With respect to both USBL and UHRS, a sound source verification exercise carried out by Pace *et al*. (2021[34]) showed that the potential for behavioural disturbance within a limited spatial extent (i.e. a few hundred metres). It is possible that the UHRS may be audible to bottlenose dolphins and therefore their use may have the potential to cause disturbance. The majority of acoustic energy will be directed at the seabed rather than being emitted horizontally which reduces the impacts of noise emissions on nearby marine mammals. UHRS is designed to have a highly focused beam that aims directly at the seabed, meaning there is limited horizontal transmission of noise. The equipment often used focused beam widths (less than 15 degrees) which limits horizontal propagation within the water column therefore minimising potential disturbance.

10.2.2.72 Furthermore, the Proposed Development (Offshore) has committed to implementing a MMMP (M-16). Although the exact mitigation measures contained with the MMMP are yet to be determined, they will be in line with the latest relevant guidance at the time of this stage of the Proposed Development (Offshore). Due to the highly localised spatial extent of the impacts, the MMMP is anticipated to fully mitigate the risks of behavioural disturbance to bottlenose dolphins.

10.2.2.73 **Therefore, it is considered that, due to the highly localised spatial extent, lack of sensitivity of bottlenose dolphins to the equipment used, and the implementation of appropriate mitigation (M-16), there is no risk of AEoSI from behavioural disturbance on the bottlenose dolphin feature of the Moray Firth SAC from geophysical and seismic surveys.**

Underwater Noise from Other Construction Activities

10.2.2.74 Whilst percussive piling and UXO clearance are considered to be the greatest sources of underwater noise, other construction activities will also produce underwater noise. This includes cable laying, dredging, drilling, rock placement and trenching.

10.2.2.75 Using the non-impulsive weighted SELcum PTS thresholds from Southall *et al*. (2019[35]), PTS impact ranges of <100 m for all marine mammal species for each non-piling construction activity are estimated, ie impacts will be highly localised. It is also considered that any impacts will occur intermittently over the medium term (the duration of construction, six years). Effects are unlikely to occur as associated vessel noise is anticipated to deter animals from the injury zone. Consequently, it is anticipated that no animals will experience injury and, therefore, impacts will not alter the population trajectory, overall having a negligible effect.

Cable Laying

10.2.2.76 Underwater noise generated during cable installation is generally considered to have a low potential for effect to bottlenose dolphin due to the non-impulsive nature of the noise generated and the fact that any generated noise is likely to be dominated by the vessel from which installation is taking place (Genesis, 2011[36])(see the vessel disturbance assessment beginning in paragraph 10.2.2.84). The outcomes of the vessel disturbance assessment determine that there would be little impact to vital rates.

10.2.2.77 Furthermore, a report conducted by Business, Enterprise and Regulatory Reform (BERR) in conjunction with Department for Environment, Food, and Rural Affairs (DEFRA) (BERR and DEFRA, 2008[37]) assessed the potential effects of cabling methods used for OWFs. A range of cable types and installation techniques, such as burial ploughs, machines, ROVs, and sleds, was assessed, as well as methodologies such as jetting, rock ripping, and dredging. It was determined that it is "highly unlikely that cable installation would produce noise at a level that would cause a behavioural reaction in marine mammals".

Dredging

10.2.2.78 Dredging is described as a continuous broadband sound source, with the main energy below 1 kHz; however, the frequency and sound pressure level can vary considerably depending on the equipment, activity, and environmental characteristics (Todd *et al*., 2015[38]). Dredging will potentially be required for seabed preparation work for piled anchors as well as for export cable, array cable and interconnector cable installations. The source level of dredging has been described to vary between SPL 172 190 dB re 1 μPa @ 1 m with a frequency range of 45 Hz to 7 kHz (Evans, 1990[39], Thompson *et al*., 2009[40], Verboom, 2014[41]). It is expected that the underwater noise generated by dredging will be below the PTS-onset threshold (Todd *et al*., 2015[38]) and thus the risk of injury is unlikely. For bottlenose dolphins, their hearing sensitivity below 1 kHz is relatively poor and thus it is expected that a PTS at this frequency would be unlikely to affect vital rates.

Drilling

10.2.2.79 The continuous sound produced by drilling has been likened to that produced by potential dredging activity; low frequency noise caused by rotating machinery (Greene, 1987[42]). Recordings of drilling at the North Hoyle Offshore Wind Farm suggest that the sound produced has a fundamental frequency at 125 Hz (Nedwell *et al*., 2003[43]). For bottlenose dolphins, the hearing sensitivity below 1 kHz is relatively poor and thus it is expected that a PTS at these low frequency ranges would be unlikely to affect vital rates.

Rock Placement

10.2.2.80 Underwater noise generation during rock placement activities is largely unknown. One study of rock placement activities in the Yell Sound in Shetland found that rock placement noise produced low frequency tonal noise from the machinery, but that measured noise levels were within background levels (Nedwell and Howell, 2004[44]). Therefore, it is highly likely that any generated noise would be dominated by the vessel. For bottlenose dolphins, the hearing sensitivity below 1 kHz is relatively poor and thus it is expected that a PTS at these low frequency ranges would be unlikely to affect vital rates.

Trenching

10.2.2.81 Underwater noise generation during cable trenching is highly variable and dependent on the physical properties of the seabed that is being cut. At the North Hoyle OWF, trenching activities had a peak frequency between 100 Hz – 1 kHz and in general the sound levels were only 10-15 dB above background levels (Nedwell *et al*., 2003[43]). For bottlenose dolphins, the hearing sensitivity below 1 kHz is relatively poor and thus it is expected that a PTS at these low frequency ranges would be unlikely to affect vital rates.

Conclusion of Underwater Noise from Other Construction Activities

10.2.2.82 **Given the minimal potential for impact and lack of sensitivity of the species, a conclusion of no AEoSI to on the bottlenose dolphin feature of the Moray Firth SAC in relation to underwater noise during from all non-piling, UXO or survey construction activities from the Proposed Development (Offshore) alone.**

Conclusion of Underwater Noise

10.2.2.83 **Due to the highly mobile and transient nature of bottlenose dolphin, the localised impact ranges from underwater noise and the implementation of mitigation (where necessary), it is considered that there is no AEoSI on the bottlenose dolphin feature of the Moray Firth SAC. Therefore, subject to natural change, the population of bottlenose dolphin will be maintained in the long-term with respect to underwater noise from construction and decommissioning from the Proposed Development (Offshore) alone.**

Assessment of Vessel Disturbance (Underwater Noise and Physical Presence)

10.2.2.84 The following assessment primarily focuses on the potential for effects resulting from vessel disturbance during the construction and decommissioning phases. The Screening Report (Application Document 12) determined that the potential for LSE in relation to vessel disturbance during decommissioning would be similar to and potentially less than those outlined in the construction phase. Effectively, that potential for effect during decommissioning would fall within, and be no worse than, the degree of effect during construction, with any such decommissioning being subject to the relevant licensing requirements at that time. Therefore, the conclusions for the construction phase are considered to also apply to decommissioning.

10.2.2.85 Vessel disturbance to marine mammals is driven by a combination of underwater vessel noise and the physical presence of the vessel itself (e.g. Pirotta *et al.* 2015[53]). Disturbance from vessels is therefore assessed in general terms separately from underwater noise assessments, covering disturbance driven by both underwater noise and vessel presence.

10.2.2.86 The presence of vessels will be a factor for vessels operating on site during all phases of the development as well as vessels transiting to site from port. Disturbance from vessel noise is only likely to occur where increased noise from vessel movements associated with the construction of the Proposed Development (Offshore) is greater than the background ambient noise. The magnitude and characteristics of vessel noise varies depending on ship type, ship size, mode of propulsion, operational factors and speed with vessels of varying size producing different frequencies, generally lower frequency with increasing size.

10.2.2.87 Vessel noise from medium to large-sized construction vessels (travelling at a speed of 10 knots) will result in an increase in the level of non-impulsive and continuous sound within and around the Proposed Development (Offshore), typically with an estimated source level of 161 to 168 SEL_{cum} dB re 1μPa@1m (rms), and in the frequency range of 10 to 100Hz, although higher frequencies will also be produced (Erbe *et al*., 2019[45]). OSPAR (2009a[46]) summarise the general characteristics of commercial vessel noise as continuous noise dominated by sound from propellers, thrusters and various rotating machinery. In general, noise from support and supply vessels (50 to 100 m in length) are expected to have broadband source levels ranging 165 to 180 dB re 1μPa, with the majority of energy below 1 kHz (OSPAR, 2009b[47]). Large commercial vessels (>100 m in length) produce relatively loud and predominately low frequency sounds, with the strongest energy concentrated below several hundred Hz.

10.2.2.88 During the construction phase of the Proposed Development (Offshore) there may be up to 3,992 return trips made by up to 25 project vessels on-site simultaneously. This will include vessels which are Restricted in Ability to Manoeuvre (RAM). It is assumed that construction vessels will be on-site throughout the entire duration of the construction phase.

10.2.2.89 The area surrounding the Caledonia OWF already experiences a relatively high level of vessel traffic. Within the Shipping and Navigation Study Area within Volume 2, Chapter: 9 Shipping and Navigation, there was an average of approximately 17 vessels recorded per day during the winter 2023 survey with fishing vessels making up the largest percentage of vessel traffic at 28% followed by cargo vessels at 24%. Approximately 11 vessels were recorded per day within the Caledonia OECC study area with fishing vessels making up the largest percentage of vessel traffic at 26% followed by oil and gas at 18% and cargo vessels at 18%. During the summer 2023 survey there was an average of approximately 30 vessels recorded per day with cargo vessels making up the largest percentage of vessel traffic at 25% followed by wind farm vessels at 23%. Approximately 15 vessels were recorded per day within the Caledonia OECC study area with recreational vessels making up the largest percentage of vessel traffic at 42% followed by fishing vessels at 22%. Therefore, the increase in vessel activity as a result of construction is therefore not considered novel to the area.

10.2.2.90 Critically, potential disturbance from vessel movements would only occur on bottlenose dolphins associated with the SAC population if vessel transits to/from the chosen port overlap with known bottlenose dolphin habitats (e.g. the core SAC area/within 2km of the coast), or if bottlenose dolphin movements overlap with the Proposed Development (Offshore) area which is considered highly unlikely (as established within paragraphs 10.2.2.8 to 10.2.2.15). It is considered that there is no pathway for vessel noise within the Proposed Development (Offshore) boundary to reach the core habitat of the SAC and therefore no pathway for effect from this type of vessel noise. The assessment below focuses on the vessel noise generated from vessel transit movements through the SAC to/from the chosen port.

10.2.2.91 With regards to behavioural changes due to vessel movements through the known habitats for bottlenose dolphin, studies on the interactions of bottlenose dolphins with vessels have shown various responses. A number of studies have shown behavioural effects to include disruption of socialisation and resting behaviours and changes in vocalisation patterns (Koroza and Evans, 2022[48]; Lusseau, 2003[49]; Pellegrini *et al.,* 2021[50]; Pirotta *et al*., 2015[53]). In some areas bottlenose dolphin presence has been positively correlated with vessel presence (e.g. Anderwald *et al*., 2013[51]; Gregory and Rowden, 2001[52]), which could also contribute to overall disturbance. Repeated disruptions may result in an overall reduced energy intake.

10.2.2.92 In the Moray Firth, a passive acoustic monitoring study showed that the presence of vessels resulted in a short-term reduction in foraging activity by 49%, with animals resuming foraging after the vessel had travelled through the area, suggesting that disturbance was limited to the time the vessel was physically present (Pirotta *et al*., 2015[53]). In this context vessel disturbance can be considered to have a transient effect on bottlenose dolphin.

10.2.2.93 Bottlenose dolphins have also been observed tolerating vessel disturbance, particularly in areas where vessel traffic has always been high (Pirotta *et al*. 2013[54]). As outlined above, vessel traffic in the area is high and therefore a tolerating response, linked to habituation, may be observed in the Moray Firth.

10.2.2.94 In a modelling study by Lusseau *et al*. (2011[55]), it was predicated that increased vessels movements associated with offshore wind development in the Moray Firth did not have a negative effect on the local population of bottlenose dolphins, although it did note that foraging may be disrupted by disturbance from vessels. Mathematical modelling was also conducted by New *et al*. (2013[56]) to simulate the complex interactions of the bottlenose dolphin population in the Moray Firth and determine whether an increased rate of disturbance from vessel traffic from proposed offshore developments was biologically significant. The study statistically modelled an increase in vessel traffic from 70 to 470 vessels per year and found that an increase in commercial vessel traffic alone will not result in a biologically significant increase in disturbance, because dolphins have the ability to compensate for their immediate behavioural response. Therefore, their health and vital rates were predicted to be unaffected (New *et al*., 2013[56]). These two studies suggest that an increase in vessel traffic from offshore wind in the Moray Firth will not lead to significant disturbance in the Moray Firth SAC.

Project Mitigation

10.2.2.95 The potential for vessel disturbance could result from construction vessels, support vessels or crew transfer vessels (CTVs) being in the Proposed Development (Offshore) area or transiting to and from the site. Increased vessel movement during the construction phase could potentially disturb bottlenose dolphin in forms of underwater noise and physical presence of vessels.

10.2.2.96 As identified above, the conservation objectives for the Moray Firth SAC include maintaining species distribution throughout the site by avoiding significant disturbance (2b). Whilst vessel presence may result in temporary exclusion of bottlenose dolphin from a localised area around each vessel or vessel cluster, the mobile nature of the animals is such that they will continue to use these areas after the vessel has moved away.

10.2.2.97 The Proposed Development (Offshore) will implement Vessel Management Plan (VMP)(M-13) which, depending on construction port locations, will implement Code of Conduct (following the WiSe Scheme; NatureScot, 2017[70]).Which will reduce the risk of vessel disturbance by including agreed transit routes and controlling the speed and movement of vessels, resulting in slower moving vessels travelling more predictable routes which are less likely to cause disturbance.

Conclusion of Vessel Disturbance

10.2.2.98 **The potential for vessel disturbance at the Proposed Development (Offshore) is minimal, given the distance to the SAC. While vessel disturbance may occur from transiting vessels, given the localised and transient nature of the impact, together with the proposed mitigation, it is considered that there is, therefore, no AEoSI on the bottlenose dolphin feature of the Moray Firth SAC and therefore, subject to natural change, the population of bottlenose dolphin will be maintained in the long-term with respect to vessel disturbance from construction and decommissioning from the Proposed Development (Offshore) alone.**

Collision Risk

10.2.2.99 The following assessment primarily focuses on the potential for effects resulting from collision risk during the construction and decommissioning phases. The Screening Report (Application Document 12) determined that the potential for LSE in relation to collision risk during decommissioning would be similar to and potentially less than those outlined in the construction phase. Effectively, that potential for effect during decommissioning would fall within, and be no worse than, the degree of effect during construction, with any such decommissioning being subject to the relevant licensing requirements at that time. Therefore, the conclusions for the construction phase are considered to also apply to decommissioning.

10.2.2.100 During construction of the windfarm, a potential source of impact from increased vessel activity is physical trauma from collision with a vessel. In general, three consequences of vessel collision are defined: direct (injuries to the animals that are the immediate result of collision), long-term (a decrease in the fitness of the animal over time), and population consequences (Schoeman *et al*., 2020[57]). With regards to injuries, both fatal and non-fatal injuries between marine mammals and vessels have been documented (Laist *et al*., 2001[58]; Vanderlaan *et al*., 2008[59]; Cates *et al*., 2017[60]). Fatalities from ship strikes, however, often go unreported (Authier *et al*., 2014[61]). For non-fatal injuries, evidence of animals which have survived ship strikes with non-fatal injuries from propellers has been widely documented (Wells *et al*., 2008[62]; Luksenburg, 2014[63]).

10.2.2.101 Although many species of marine mammals are able to detect and avoid vessels, it is unclear why some individuals do not always move out of the path of an approaching vessel (Schoeman *et al*., 2020[57]; refer to Section 10.2.2.85). It has been suggested that behaviours such as resting, foraging, nursing, and socialising could distract animals from detecting the risk posed by vessels (Dukas, 2002[64]). It is also possible that animals do not hear vessels when they are near the surface. It should be noted that much of the evidence on collision risk has focussed on collisions between large vessels and large whales (e.g. Laist *et al*., 2001[58]), and that data on collisions with smaller marine species is scarce (Schoeman *et al*., 2020[57]). Increased detectability and predictability are predicted to be factors that reduce collision risk (Nowaceck *et al*., 2001[65]; Lusseau, 2003[66]; Lusseau, 2006[67]).

10.2.2.102 Dolphins are small and highly mobile, and are generally able to detect vessels, as evidenced through a wealth of observed behavioural responses to vessels. Bottlenose dolphin response to vessels including avoidance behaviours (Nowaceck *et al*., 2001[65]), no change despite vessel presence (Mills *et al*., 2023[68]), and attraction responses. Given their ability to detect and respond to vessels, it is expected that they will largely avoid collision.

10.2.2.103 There is currently a lack of information on the frequency of occurrence of vessel collisions with bottlenose dolphins in UK waters. Nonetheless, there is no evidence from bottlenose dolphins stranded in the North Sea to suggest that injury from vessel collisions is a significant cause of marine mammal mortality. Furthermore, a review of relevant literature did not reveal any instances of coastal bottlenose dolphin death as a result of collision with vessels associated with offshore wind construction. Indeed, despite an increase in the number of vessels associated with offshore wind in Scotland over the past decade, there have been no stranded bottlenose dolphin in Scotland where cause of death was associated with physical trauma (anthropogenic) (SMASS, 2024[69]). Therefore, mortality of bottlenose dolphins from vessel collisions it is not considered to be a significant cause of mortality in UK waters, nor is it expected to increase with increasing vessels for offshore wind development.

10.2.2.104 Further factors are known to reduce the likelihood of collision risk to bottlenose dolphin. Including the fact that vessels associated with the wind farm will remain predominantly on site, which is located 10s of kilometres from the core habitat of the SAC feature. Whilst bottlenose dolphin could undertake movements outwith the SAC, the amount of time spent at the Proposed Development (Offshore) site and so exposed to vessels there is considered to be extremely low. Therefore collision risk is likely only if the vessel transit routes overlap with the core bottlenose dolphin area. It is important to note that vessels for the Proposed Development (Offshore) will follow established routes when transiting. Furthermore, whilst vessels are transiting, they typically maintain a steady speed and course, which would contribute to increased detectability and predictability by bottlenose dolphin, further reducing risk of collision (Nowaceck *et al*., 2001[65]; Lusseau, 2003[66], 2006[67]).

10.2.2.105 Overall, given the SMASS (2024[69]) data indicates the physical trauma from anthropogenic sources is not a contributing factor to bottlenose dolphin strandings, the assessment concludes that collision risk is viewed as negligible, although they have a high sensitivity to the impact should it occur.

Project Mitigation

10.2.2.106 Project specific mitigation M-13 and M-12 as detailed in Table 6-1 apply to all sources of collision risk.

10.2.2.107 The Proposed Development (Offshore) will implement a Vessel Management Plan (VMP)(M-13) which, depending on construction port locations, will implement Code of Conduct (following the WiSe Scheme, including advice to operators to not deliberately approach marine mammals; NatureScot, 2017[70]).Which will reduce the risk of vessel collision with marine mammals by including agreed transit routes and controlling the speed and movement of vessels, resulting in slower moving vessels travelling more predictable routes which are less likely to cause disturbance.

10.2.2.108 Following best and established practice, the above measures are primarily focused on managing and mitigating any risk of collision of bottlenose dolphins within the Moray Firth SAC.

Conclusion for Collision Risk

10.2.2.109 **Given the minimal potential for collision risk and the localised nature of the impact, it is considered that there is, therefore, no AEoSI on the bottlenose dolphin feature of the Moray Firth SAC and therefore, subject to natural change, the population of bottlenose dolphin will be maintained in the long-term with respect to collision risk from construction and decommissioning from the Proposed Development (Offshore) alone.**

Changes to Prey

10.2.2.110 The following assessment primarily focuses on the potential for effect resulting from changes to prey during the construction and decommissioning phases. The Screening Report (Application Document 12) determined that the potential for LSE in relation to changes to prey during decommissioning would be similar to and potentially less than those outlined in the construction phase. Effectively, that potential for effect during decommissioning would fall within, and be no worse than, the degree of effect during construction, with any such decommissioning being subject to the relevant licensing requirements at that time. Therefore, the conclusions for the construction phase are considered to also apply to decommissioning.

Project Mitigation

10.2.2.111 Project specific mitigation for changes to prey is identified in Table 6-1 and include the following:

- M-8;
  - Development of and adherence to an Environmental Management Plan (EMP). The EMP will set out mitigation measures and procedures relevant to environmental management, including but not limited to the following topics: Chemical usage, invasive non-native marine species, dropped objects, pollution prevention and contingency planning, and waste management.
- M-9;
  - Development of and adherence to a Marine Pollution Contingency Plan (MPCP). The MPCP will identify potential sources of pollution and associated spill response and reporting procedures.
- M-11; and
  - Development of and adherence to a PS (applicable where piling is undertaken). The PS will detail the method of pile installation and associated noise levels. It will describe any mitigation measures to be put in place (for example, soft starts and ramp ups, use of Acoustic Deterrent Devices) during piling to manage the effects of underwater noise on sensitive receptors.

- M-12
  - Development of and adherence to a Project Environmental Monitoring Programme (PEMP). The PEMP will set out commitments to environmental monitoring in pre-, during and post-construction phases of the Proposed Development (Offshore).

Assessment of Changes to Prey

10.2.2.112 Given that bottlenose dolphin are dependent on fish prey, there is the potential for indirect effects on this feature as a result of impacts upon fish species or the habitats that support them. During construction and decommissioning these impacts include:

- Mortality, injury, behavioural impacts and auditory masking arising from noise and vibration;
- Increases in suspended sediment concentrations and deposition;
- Release of sediment contaminants;
- Accidental release or spills of construction materials for chemicals from vessels; and
- Temporary seabed habitat loss / disturbance.

10.2.2.113 Impacts to prey resources will be largely restricted to the boundaries of the Proposed Development (Offshore) and bottlenose dolphin associated with the SAC are unlikely to spend any significant time within the Proposed Development (Offshore) boundary. Therefore, it is anticipated that there is unlikely to be any indirect impacts on bottlenose dolphin associated with the Moray Firth SAC, or the population as a whole. Furthermore, within Volume 2, Chapter 5: Fish and Shellfish Ecology, it was determined that there are no significant adverse effects on any fish because of the Proposed Development (Offshore), therefore ensuring that there will be no significant direct impacts on bottlenose dolphin prey species, and no indirect impacts on bottlenose dolphins themselves.

10.2.2.114 Bottlenose dolphin from this population feed on cod, salmonids, whiting, haddock, saithe, herring, mackerel, mullet, eels, flatfish species, squid species and octopus species for food (Santos *et al.,* 2001[71]; NatureScot, 2024[72]). This demonstrates a very highly varied diet, and that bottlenose dolphin can be considered as generalist feeders (Evans and Hintner, 2013[73]). Bottlenose dolphin therefore have access to a wide variety of prey species across a wide foraging area, therefore any small changes at the Proposed Development (Offshore) site will not have an indirect on bottlenose dolphin associated with the Moray Firth SAC.

Conclusion of Changes to Prey

10.2.2.115 **Given the generalist diet of bottlenose dolphin, the localised nature of the impact distant to key foraging habitat, and the lack of significant impacts on prey species themselves, it is considered that there is no AEoSI on the bottlenose dolphin feature of the Moray Firth SAC. Therefore, subject to natural change, the population of bottlenose dolphin will be maintained in the long-term with respect to changes in prey from construction and decommissioning for the Proposed Development (Offshore) alone.**

O&M

Underwater Noise

10.2.2.116 Operational WTGs will produce underwater noise as a result of vibration from the rotating machinery in the turbines, which is transmitted through the structure of the foundations.

10.2.2.117 Studies have been undertaken to demonstrate that a very low amount of underwater noise is generated by operational WTGs, with a limited spatial footprint and overall negligible effects on marine mammals (including Madsen *et al*., 2006[74]; Teilmann *et al*., 2006[75]; CEFAS, 2010[76]; Brasseur, *et al*., 2012[77]). This is further evidenced when using the noise modelling Specifically, that the non-impulsive weighted SELcum PTS and TTS thresholds from Southall *et al*., (2019[35]) resulted in estimated PTS and TTS impact ranges of <100 m for bottlenose dolphin (being the minimum range feasible when producing modelled outputs for the SELcum values – in other words the potential range of effect is within that distance, not necessarily out to that distance).

10.2.2.118 For an individual to be impacted by the generated noise given the localised nature of effects, it is considered that an individual would need to stay within the <100m range for a prolonged period of time (minimum of 24 hours). Given the ecology of bottlenose dolphin, this is considered to not be a likely effect.

Conclusion for Underwater Noise

10.2.2.119 **It is considered that the range of effect is suitably small that it will have a negligible effect, and there is no potential for any overall effect from the Proposed Development (Offshore). Therefore, given the range of effects from operational noise, the distance to the Moray Firth SAC and the available habitat for bottlenose dolphin associated with the site, it is considered that there is no AEoSI on the bottlenose dolphin feature of the Moray Firth SAC in relation to operational noise from the Project alone during O&M. Therefore, subject to natural change, the Moray Firth SAC will be maintained in the long-term.**

Collision Risk

10.2.2.120 The following assessment primarily focuses on the potential for effects resulting from collision risk during the (O&M) phase.

Assessment of Collision risk

10.2.2.121 A full assessment of collision risk is provided above for the construction and decommissioning phases. Given the lower level of vessel activity estimated during the O&M phase (Table 10-6), it is not expected to increase the likelihood of collision.

10.2.2.122 The adoption of a VMP (Table 6-1) that includes preferred transit routes and guidance for vessel operations in the vicinity of marine mammals will minimise the potential for collision.

Conclusion for Collision Risk

10.2.2.123 **Given the minimal potential for collision risk and the localised nature of the impact, it is considered that there is, therefore, no AEoSI on the bottlenose dolphin feature of the Moray Firth SAC and therefore, subject to natural change, the population of bottlenose dolphin will be maintained in the long-term with respect to collision risk from O&M from the Proposed Development (Offshore) alone.**

Vessel Disturbance

10.2.2.124 The following assessment primarily focuses on the potential for effects resulting from vessel disturbance during the O&M phase.

Assessment of Vessel Disturbance

10.2.2.125 A full assessment of vessel disturbance is provided above for the construction and decommissioning phases. Given the lower number of vessel activity estimated for the O&M phase (Table 10-6), it is not expected to increase the risk of disturbance by vessels.

10.2.2.126 The adoption of a Vessel Management Plan (Table 6-1) that includes preferred transit routes and guidance for vessel operations in the vicinity of marine mammals will minimise disturbance.

10.2.2.127 **Therefore, it is concluded that based on the assessment for the construction and decommissioning phases, there is no potential for AEoSI on the bottlenose dolphin feature of the Moray Firth SAC.**

Conclusion of Vessel Disturbance

10.2.2.128 **Given the minimal potential for vessel disturbance and the localised nature of the impact, it is considered that there is, therefore, no AEoSI on the bottlenose dolphin feature of the Moray Firth SAC and therefore, subject to natural change, the population of bottlenose dolphin will be maintained in the long-term with respect to vessel disturbance from O&M from the Proposed Development (Offshore) alone.**

Changes to Prey

10.2.2.129 The following assessment primarily focuses on the potential for effects resulting from changes to prey during the O&M phase.

Assessment of Changes to Prey

10.2.2.130 A full assessment of changes to prey is provided above for the construction and decommissioning phases. Given the levels of underwater noise, lower levels of vessel activities and lack of potential for suspended sediment during O&M, the likelihood of changes to prey is less at the O&M phase than the construction and decommissioning phase of the Proposed Development (Offshore).

10.2.2.131 The adoption of the project mitigation listed in the assessment for changes in prey during the construction and decommissioning phase will minimise the impact of prey species.

10.2.2.132 **Therefore, given the reduced impact compared to the construction and decommissioning phases (which concluded no AEoSI), it is concluded that based on the assessment for the construction and decommissioning phases, there is no potential for AEoSI on the bottlenose dolphin feature of the Moray Firth SAC.**

Conclusion for Changes to Prey

10.2.2.133 **Given the highly adaptable diet of bottlenose dolphin, the localised nature of the impact, and the lack of significant impacts on prey species themselves, it is considered that there is no AEoSI on the bottlenose dolphin feature of the Moray Firth SAC. Therefore, subject to natural change, the population of bottlenose dolphin will be maintained in the long-term with respect to changes in prey from O&M of the Proposed Development (Offshore) alone.**

Conclusion of Assessment of Marine Mammals from the Proposed Development (Offshore) Alone

10.2.2.134 **One designated site was identified to have a potential for AEoSI from the Proposed Development (Offshore), the Moray Firth, designated for bottlenose dolphins. All the potential effects considered within the assessment (underwater noise, vessel collision risk and disturbance, and changes to prey, which all concluded no AEoSI. Therefore, there is no AEoSI on the bottlenose dolphin feature of the Moray Firth SAC with respect to the Proposed Development (Offshore) alone.**

10.2.2.135 In-combination effects for Marine Mammals are presented in Section 10.3.2.

10.2.3 Offshore and Intertidal Ornithology

Assessment Criteria

10.2.3.1 This section presents an assessment of the adverse effects from the Proposed Development (Offshore) on sites designated for Offshore and Intertidal Ornithology features with an identified LSE within the Screening Report (Application Document 12). Consultation and screening advice received from various SNCBs has been received and considered. The full list of sites considered is presented in Table 10-1.

Worst Case Scenario

10.2.3.2 Table 10-9 below summarises the WCSs considered for Offshore and Intertidal Ornithology. The full project description is provided in Volume 1, Chapter 3: Proposed Development Description (Offshore) for full reference.

Table 10-9: Worst Case Scenario for Offshore and Intertidal Ornithology for the Proposed Development (Offshore).

Potential Impact	Assessment Parameter	Explanation
Construction		
Distributional Responses: Caledonia OWF	**Construction/installation:** Proposed Development (Offshore) area of 423km^2, with potential displacement occurring out to a 2km buffer = 637km^2. **Vessel Activity:** ▪ Foundation piling; 280 vessel movements ▪ Substructure; 560 vessel movements ▪ WTG installation; 397 vessel movements ▪ WTG commissioning; 793 vessel movements ▪ Array Area cables installation and hook up; 1,450 vessel movements ▪ Export Cables: 116 vessel movements **Total vessel movements = 3,992**	▪ The maximum estimated number of vessels associated with the construction of the Caledonia OWF.
Distributional Responses: Caledonia OECC	**Vessel Activity:** ▪ 116 vessel movements over the construction phase.	▪ The maximum estimated number of vessels associated with the construction of the Caledonia OECC.
Distributional Responses: Vessel Transit (Moray Firth SPA)	**Vessel Activity:** ▪ Up to 3,876 vessel movements over the construction phase that pass through the Moray Firth SPA.	▪ The maximum estimated number of vessels to transit through the Moray Firth SPA. At the point of assessment, construction ports are not confirmed.

Potential Impact	Assessment Parameter	Explanation
Indirect Effects: Habitat Loss/Displacement of Prey Species	See Worst Case Assessment Scenario for the Benthic and Intertidal Ecology assessment (Volume 2, Chapter 4: Benthic Subtidal and Intertidal Ecology, Impact 1-3) and for the Fish and Shellfish Ecology assessment (Volume 2, Chapter 5: Fish and Shellfish Ecology, impacts 1-5).	▪ Indirect effects on birds could occur through changes to any of the species and habitats considered within the Benthic Subtidal and Intertidal Ecology or Fish and Shellfish Ecology assessments.
Operation and Maintenance		
Distributional Responses: Caledonia OWF	▪ Proposed Development (Offshore) area of 423km^2, with potential displacement effects assessed for this area plus a 2km buffer = 637km^2. **WTGs**: ▪ 140 WTGs **Vessel activity**: Vessels used during routine inspections, repairs and replacement of equipment, major component replacement, painting or other coatings, removal of marine growth, replacement of access ladders, and geophysical surveys.	▪ As per the NatureScot Guidance Note 8 (NatureScot, 2023), species should be assessed within a wider zone which includes the impacts outside of the development footprint. For the key species of concern assessed for the Proposed Development (Offshore) this would be within 2km, with the exception of red-throated diver and sea ducks.
Distributional Responses: Vessel Transit (Moray Firth SPA)	**Vessel Activity:** Up to 938 vessel movements per year over the operation phase that pass through the Moray Firth SPA dependant on the O&M strategy.	▪ The maximum estimated number of vessels to transit through the Moray Firth SPA. At the point of assessment, O&M strategy and ports are not confirmed.
Indirect Effects: Habitat Loss/Displacement of Prey Species	See Worst Case Assessment Scenario for the Benthic and Intertidal Ecology assessment (Volume 2, Chapter 4: Benthic Subtidal and Intertidal Ecology, Impacts 4-10) and for the Fish and Shellfish Ecology assessment (Volume 2, Chapter 5: Fish and Shellfish Ecology, Impacts 6-11).	▪ Indirect effects on birds could occur through changes to any of the species and habitats considered within the Benthic Subtidal and Intertidal Ecology or Fish and Shellfish Ecology assessments.

Potential Impact	Assessment Parameter	Explanation
Collision Risk	**Caledonia OWF:** Based on WTG deployment across the full Caledonia OWF (423km^2).	▪ This represents the greatest total swept area to be considered for collision risk. CRM shows that WTG scenario 1 has the largest theoretical collision impact risk for all species (see Volume 7B, Appendix 6-3: Offshore Ornithology Collision Risk Modelling Technical Report).
Decommissioning		
Distributional Responses: Caledonia OWF	▪ To be determined, but assumed to include the reverse of construction activities, removing all offshore infrastructure. ▪ Vessels assumed to be similar to vessel activity described for construction phase, see the construction parameters.	▪ The maximum estimated number of vessels associated with the decommissioning of the Caledonia OWF.
Distributional Responses: Caledonia OECC		▪ The maximum estimated number of vessels associated with the decommissioning of the Caledonia OECC.
Distributional Responses: Vessel Transit (Moray Firth SPA)		▪ The maximum estimated number of vessels to transit through the Moray Firth SPA.
Indirect Effects: Habitat Loss/Displacement of Prey Species	See Worst Case Assessment Scenario for the Benthic and Intertidal Ecology assessment (Volume 2, Chapter 4: Benthic Subtidal and Intertidal Ecology, Impacts 11-14) and for the Fish and Shellfish Ecology assessment (Volume 2, Chapter 5: Fish and Shellfish Ecology, Impacts 12-15).	▪ Indirect effects on birds could occur through changes to any of the species and habitats considered within the Benthic Subtidal and Intertidal Ecology or Fish and Shellfish Ecology assessments.

East Caithness Cliffs SPA

10.2.3.3 The centroid of the East Caithness Cliffs SPA is 51.4km (at sea distance) from the centre of the Caledonia OWF, within the MMFR +1SD of kittiwake (156.1±144.5km), great black-backed gull (73km), herring gull (58.8±26.8km), guillemot (73.2±80.5km) and razorbill (88.7±75.9m) (Woodward *et al.*, 2019[78]). As such, potential for LSE alone has been identified for the following features of East Caithness Cliffs SPA:

- Kittiwake
  - Collision (O&M)
  - Distributional responses (O&M)
  - Dist
  - ibutional responses (C&D, Section 7.3.1)
- Great black-backed gull
  - Collision (O&M)
- Herring gull
  - Collision (O&M)
- Guillemot
  - Distributional responses (O&M)
  - Distributional responses (C&D, Section 7.3.1)
- Razorbill
  - Distributional responses (O&M)
  - Distributional responses (C&D, Section 7.3.1)

Conservation Objectives

10.2.3.4 The overarching conservation objectives for the qualifying features of the SPA is to ensure the conservation status of the qualifying features is 'favourable condition'. With respect to East Caithness Cliffs SPA, a species 'favourable' condition can be assessed against the following objectives:

- To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and
- To ensure for the qualifying species that the following are maintained in the long term:
  - Population of the species as a viable component of the site;
  - Distribution of the species within site;
  - Distribution and extent of habitats supporting the species;

- Structure, function and supporting processes of habitats supporting the species; and
- No significant disturbance of the species.

Kittiwake

10.2.3.5 Kittiwake have been screened into the assessment for collision risk as they are susceptible to collision due to their flight height distribution and behaviours (Furness and Wade, 2012[79]; Furness *et al*., 2013[80]; Bradbury *et al*., 2014[81]; NatureScot, 2023[82]; JNCC, 2024[83]).

10.2.3.6 Kittiwake have also been assessed for distributional responses as requested by NatureScot within consultation; however, the Applicant remains of the position that kittiwake do not require assessment for distributional responses due to the evidence base detailed within Volume 7B, Appendix 6-2, Annex 4: Review of Relevant Evidence suggesting kittiwake show limited behavioural response to OWFs. Distributional responses are assessed based on the birds within the Proposed Development (Offshore) Site and 2km buffer. A Guidance approach only is presented for kittiwake based on a displacement rate of 30% and a 1-3% mortality rate for O&M phase distributional response impacts.

10.2.3.7 The level of predicted abundance and collision risk apportioned to the kittiwake feature of the East Caithness Cliffs SPA to inform assessments is presented in Table 10-10 (detailed methods are presented within Application Document 13, Appendix 13-1: Caledonia North Apportioning Technical Note and Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note).

Table 10-10: Kittiwake level of abundance and collision risk apportioned to East Caithness Cliffs SPA seasonally.

Defined Season (Months)	Level of Apportionment (%)	Apportioned Abundance (Breeding Adults)	Apportioned collision risk (breeding adults)
Breeding season (Mid-April to August)	24.47	498.93	13.53
Non-breeding season (September to early-April)	5.84 (Autumn %) 7.72 (Spring %)	28.22	0.77
Note, two weightings for apportioning non-breeding season kittiwake are provided for autumn migration (September to December), and spring migration (January to Early-April). The autumn weighting has been used to apportion the potential numbers of non-breeding kittiwake distributional response as the mean peak of this species was recorded during the autumn migration season. While both the Spring and Autumn weightings have been used to apportion collision mortalities during the non-breeding season.			

Status

10.2.3.8 The SPA population of kittiwake was cited as 65,000 breeding adults in 1985-1987. The most recently published count (2015) is 48,920 breeding adults (Swann, 2016[84]).

10.2.3.9 When considering a breeding adult baseline mortality rate of 0.146 (1- 0.854, Horswill and Robinson 2015[85]), 9,490 (9,490.00) and 7,142 (7,142.32) breeding adults from the SPA population would be subject to natural mortality per annum, in relation to the citation count and most recently published count (2015), respectively. In terms of colony trends, significant declines of the kittiwake feature at East Caithness Cliffs have been noted Burnell *et al.*, (2023[86]) between 1998-2002 and 2015-2021.

Seasonal Apportionment of Potential Impacts

10.2.3.10 In line with NatureScot guidance, the assessment is carried out on a seasonal basis as the potential impacts on the SPA features varies by season. Kittiwake have been assessed during the breeding season of mid-April to August and non-breeding season of September to early April in relation to East Caithness Cliffs SPA (see Section 7.3.3).

Appropriate Assessment

O&M Phase Potential Distributional Response Effects on the Qualifying Feature in Isolation

10.2.3.11 During the O&M phase, the potential level of impact apportioned to the SPA seasonally is summarised in Table 10-11 for the Guidance approach.

10.2.3.12 A displacement matrix is also presented for the annual apportioned abundance for the Proposed Development (Offshore) plus 2km buffer to East Caithness Cliffs SPA in Table 10-12.

Table 10-11: Kittiwake predicted distributional responses mortalities during the O&M phase attributed to East Caithness Cliffs SPA and resultant change in survival rate percentage point change compared to citation and most recent population counts (guidance approach).

Population Size (Breeding Adults)	Defined Season (Months)	Guidance Approach	
		30% displacement, 1-3% mortality	Change in Average Survival Rate (% Point Change)
Citation (65,000)	Breeding season (Mid-April to August)	1.50 - 4.49	0.002 – 0.007
	Non-breeding season (September to early-April)	0.08 - 0.25	<0.001
	Annual	1.58 - 4.74	0.002 – 0.007
Latest count (48,920)	Breeding season (Mid-April to August)	1.50 - 4.49	0.003 – 0.009
	Non-breeding season (September to early-April)	0.08 - 0.25	<0.001 – 0.001
	Annual	1.58 - 4.74	0.003 – 0.010

Breeding Season

10.2.3.13 The estimated kittiwake mean peak abundance during the breeding season is 2,039 (2,038.69) individuals, with an estimated 51.31% of all individuals during the breeding season deriving from East Caithness Cliffs SPA (Application Document 13, Appendix 13-1: Caledonia North Apportioning Technical Note and Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note). Assuming that 53% of the kittiwake population are adults (Furness, 2015[87]) and using an adult sabbatical rate of 10%, the total proportion of breeding adults from East Caithness Cliffs SPA potentially impacted by distributional responses are 499 (498.93) per annum during the breeding season (Table 10-11).

10.2.3.14 When applying a displacement rate of 30% and a mortality rate of 1-3%, the consequent potential mortality is estimated to two - four (1.50 - 4.49) breeding adults per annum.

10.2.3.15 Using the citation colony count of 65,000 breeding adults and an annual background mortality of 9,490 breeding adults, the addition of two - four (1.50 - 4.49) predicted breeding adult mortalities would result in a 0.002 – 0.007 survival rate percentage point change during the breeding season per annum. When considering the most up to date counts of 48,920 breeding adults and an annual background mortality of 7,142 breeding adults, this results in a 0.003 – 0.009 survival rate percentage point change during the breeding season per annum (Table 10-11).

Non-breeding Season

10.2.3.16 The estimated kittiwake mean peak abundance during the non-breeding season is 483 (483.00) individuals. Based on the Furness (2015)[87] non-breeding season BDMPS region SPA proportional split corresponding to the mean peak abundance recorded, 5.84% of predicted mortalities during the non-breeding season are estimated to derive from East Caithness Cliffs SPA (Application Document 13, Appendix 13-1: Caledonia North Apportioning Technical Note and Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note). Therefore, the total mean peak abundance of breeding adults from the SPA potentially impacted by distributional responses are 28 (28.22) per annum during the non-breeding season (Table 10-11).

10.2.3.17 When applying a displacement rate of 30% and a mortality rate of 1-3%, the consequent predicted distributional response mortality of breeding adult kittiwake from East Caithness Cliffs SPA during the non-breeding season is predicted at significantly less than one (0.08 - 0.25) per annum.

10.2.3.18 Based on the 1985-1987 citation colony count of 65,000 breeding adults and using an annual background mortality of 9,490 breeding adults, the addition of significantly less than one (0.08 - 0.25) predicted breeding adult mortality would result in a <0.001 survival rate percentage point change during the non-breeding season per annum. When considering the most up to date counts of 48,920 breeding adults and an annual background mortality of 7,142 breeding adults, this results in a <0.001 – 0.001 survival rate percentage point change during the non-breeding season per annum (Table 10-11).

Annual Total

10.2.3.19 The predicted resultant mortality across all defined seasons from The Proposed Development (Offshore), attributed to East Caithness Cliffs SPA, is two - five (1.58 - 4.74) breeding adult kittiwake per annum. This is predicted to result in a survival rate percentage point change against the citation and most recently published counts of 0.002 – 0.007 and 0.003 – 0.010 respectively (see Table 10-11).

10.2.3.20 For both citation and most recently published count, predicted additional breeding adult mortalities per annum equates to an <0.02 survival rate percentage point change. As this would be under the threshold considered for further investigation into population level effects it is also considered to be indistinguishable from natural fluctuations in the population. **As such, there is no potential for an AEoSI to the conservation objectives of kittiwake at East Caithness Cliffs SPA in relation to potential distributional response effects from the Proposed Development (Offshore) alone during the O&M phase. Therefore, subject to natural change, kittiwake will be maintained as a feature in the long term.**

Table 10-12: Kittiwake O&M phase disturbance annual displacement matrix for impacts apportioned to East Caithness Cliffs SPA (Guidance approach).

Annual Total	Mortality Rate (%)													
Displacement Rate (%)	1	2	3	5	10	20	30	40	50	60	70	80	90	100
10	1	1	2	3	5	11	16	21	26	32	37	42	47	53
20	1	2	3	5	11	21	32	42	53	63	74	84	95	105
30	2	3	5	8	16	32	47	63	79	95	111	127	142	158
40	2	4	6	11	21	42	63	84	105	127	148	169	190	211
50	3	5	8	13	26	53	79	105	132	158	185	211	237	264
60	3	6	9	16	32	63	95	127	158	190	221	253	285	316
70	4	7	11	18	37	74	111	148	185	221	258	295	332	369
80	4	8	13	21	42	84	127	169	211	253	295	337	380	422
90	5	9	14	24	47	95	142	190	237	285	332	380	427	474
100	5	11	16	26	53	105	158	211	264	316	369	422	474	527
Note, outputs highlighted in dark blue represent the predicted annual mortality estimates as per the Guidance Approach. For further information regarding the Guidance and Applicant Approach see Section 2.5 of Volume 7B, Appendix 6-2: Offshore Ornithology Distributional Responses Technical Report and Volume 7B, Appendix 6-2, Annex 4: Review of Relevant Evidence.														

O&M Phase Potential Collision Risk Impacts on the Qualifying Feature in Isolation

10.2.3.21 During the O&M phase, the potential level of impact from collision risk apportioned to the East Caithness Cliffs SPA and subsequent survival rate percentage point change is summarised in Table 10-13.

Table 10-13: Kittiwake predicted collision risk impacts during the O&M phase attributed to East Caithness Cliffs SPA and resultant change in survival rate percentage point change compared to citation and most recent population counts.

Population Size (Breeding Adults)	Defined Season (Months)	Collision risk impact	
		Breeding adults per annum	Change in Average Survival Rate (% Point Change)
Citation (65,000)	Breeding season (Mid-April to August)	13.53	0.021
	Non-breeding season (September to early-April)	0.77	0.001
	Annual	14.30	0.022
Latest count (48,920)	Breeding season (Mid-April to August)	13.53	0.028
	Non-breeding season (September to early-April)	0.77	0.002
	Annual	14.30	0.029

Breeding Season

10.2.3.22 The predicted kittiwake collision mortality during the breeding season is 55 (55.27) individuals per annum, with an estimated 51.31% of all individuals during the breeding season deriving from East Caithness Cliffs SPA (Application Document 13, Appendix 13-1: Caledonia North Apportioning Technical Note and Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note). Assuming that 53% of the population are adults (Furness, 2015[87]) and using an adult sabbatical rate of 10%, the total proportion of breeding adults from East Caithness Cliffs SPA potentially subject to collision consequent mortality is under 14 (13.53) per annum during the breeding season.

10.2.3.23 Using the citation colony count of 65,000 breeding adults and an annual background mortality of 9,490 breeding adults, the addition of 14 predicted breeding adult mortalities per annum would result in a 0.021 survival rate percentage point change during the breeding season. When considering the most up to date counts of 48,920 breeding adults and an annual background mortality of 7,142 breeding adults, this results in a 0.028 survival rate percentage point change during the breeding season per annum (see Table 10-13

Non-breeding Season

10.2.3.24 The predicted kittiwake collision mortality during the non-breeding season is 12 (11.74) individuals. Based on the Furness (2015[87]) spring and autumn season BDMPS region SPA proportional split, 5.84% and 7.72% of predicted mortalities during the non-breeding season are estimated to derive from East Caithness Cliffs SPA (Application Document 13, Appendix 13-1: Caledonia North Apportioning Technical Note and Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note), the consequent predicted collision mortality of breeding adult kittiwake during the non-breeding season is predicted at less than one (0.77) per annum.

10.2.3.25 Based on the 1985-1987 citation colony count of 65,000 breeding adults and using an annual background mortality of 9,490 breeding adults, the addition of less than one (0.77) predicted breeding adult mortality per annum would result in a 0.001 survival rate percentage point change during the non-breeding season. When considering the most up to date counts of 48,920 breeding adults and an annual background mortality of 7,142 breeding adults, this results in a change in survival rate percentage point change of 0.002 during the non-breeding season per annum (see Table 10-13).

Annual Total

10.2.3.26 The predicted resultant mortality across all defined seasons from The Proposed Development (Offshore), attributed to East Caithness Cliffs SPA, is 14 (14.30) breeding adults per annum. This is predicted to result in a 0.022 and 0.029 survival rate percentage point change when considering the citation count and most recently published count, respectively (see Table 10-13).

10.2.3.27 As such, as the predicted impacts exceed a 0.02 survival rate percentage point change threshold, PVA has been undertaken to further assess the level of potential effect predicted.

Population Viability Analysis

10.2.3.28 The potential for collision alone has been assessed against the latest 2015 colony count population size of 48,920 breeding adults according to Swann (2016). An impact value of 14 breeding adult additional mortalities per annum was modelled, as set out in Table 10-108 of Section 10.3.3. Even when considering this impact, the annual reduction in the growth rate is predicted to be at most 0.035% against the latest colony count (PVA outputs against the citation count are presented in Application Document 13, Appendix 13-2: Caledonia North Habitats Regulations Appraisal Population Viability Analysis Technical Report and Application Document 14, Appendix 14-2: Caledonia South Habitats Regulations Appraisal Population Viability Analysis Technical Report as additional information), which would mean that the colony would likely remain in favourable condition.

10.2.3.29 Therefore, as the population is considered to be in a favourable condition and is being maintained, such a level of impact would have a limited effect on the overall trend or natural fluctuations in the population, which are more heavily influenced by other factors. **As such, considering the limited contribution to what are likely to be much greater factors at this colony there is no potential for an AEoSI to the conservation objectives of the kittiwake feature of East Caithness Cliffs SPA in relation to distributional response effects in the O&M phase from the Proposed Development (Offshore) alone. Therefore, subject to natural change and stability of the population at this site, kittiwake will be maintained as a feature in the long term.**

O&M Phase Potential Combined Distributional Response and Collision Risk Impacts on the Qualifying Feature in Isolation

10.2.3.30 During the O&M phase, the potential level of combined impact from collision risk and distributional responses apportioned to the East Caithness Cliffs SPA and subsequent survival rate percentage point change is summarised in Table 10-14.

Table 10-14: Kittiwake predicted distributional response and collision risk impacts during the O&M phase attributed to East Caithness Cliffs SPA and resultant change in survival rate percentage point change compared to citation and most recent population counts.

Population Size (Breeding Adults)	Defined Season (Months)	Guidance Approach 30% displacement; 1-3% mortality	
		Estimated number of mortalities from combined CRM and Distributional responses per annum	Change in Average Survival Rate (% Point Change)
Citation (65,000)	Breeding season (Mid-March to September)	15.02 - 18.02	0.023 – 0.028
	Non-breeding season (October to Early-March)	0.86 - 1.03	0.001 – 0.002
	Annual	15.88 - 19.05	0.024 – 0.029
Latest count (48,920)	Breeding season (Mid-March to September)	15.02 - 18.02	0.031 – 0.037
	Non-breeding season (October to Early-March)	0.86 - 1.03	0.002
	Annual	15.88 - 19.05	0.032 – 0.039

Breeding Season

10.2.3.31 As presented within (Table 10-14) the combined distributional response and collision risk impacts apportioned to the kittiwake feature of East Caithness Cliffs SPA, equates to approximately 15 to 18 (15.02 - 18.02) additional breeding adult mortalities during the breeding season per annum (when considering a displacement rate of 30% and a mortality rate of 1-3%). Using the citation colony count of 65,000 breeding adults and an annual background mortality of 9,490 breeding adults, the addition of 15 to 18 predicted breeding adult mortalities would result in a 0.023 – 0.028 survival rate percentage point change during the breeding season per annum. When considering the most up to date count of 48,920 breeding adults and an annual background mortality of 7,148 breeding adults, this results in a 0.031 – 0.037 survival rate percentage point change during the breeding season per annum (see Table 10-14).

Non-breeding Season

10.2.3.32 As presented within Table 10-14 the combined distributional response and collision risk impacts apportioned to the kittiwake feature of East Caithness Cliffs SPA, equates to approximately one (0.86 - 1.03) additional adult mortality during the non-breeding season per annum (when considering a displacement rate of 30% and a mortality rate of 1-3%). Using the citation colony count of 65,000 breeding adults and an annual background mortality of 9,490 breeding adults, the addition of one predicted breeding adult mortality would result in a 0.001 – 0.002 survival rate percentage point change during the breeding season per annum. When considering the most up to date counts of 48,920 and an annual background mortality of 7,148 breeding adults, this results in a 0.002 survival rate percentage point change during the non-breeding season per annum (see Table 10-14).

Annual Total

10.2.3.33 The predicted resultant mortality across all defined seasons from The Proposed Development (Offshore), attributed to East Caithness Cliffs, is 16 to 19 (15.88 - 19.05) kittiwake per annum. This is predicted to result in a survival rate percentage point change against the citation and most recently published counts of 0.024 – 0.029 and 0.032 – 0.039, respectively (see Table 10-14).

10.2.3.34 As such predicted impacts exceed a 0.02 survival rate percentage point change threshold, PVA has been undertaken to further assess the level of potential effect predicted.

Population Viability Analysis

10.2.3.35 The potential for distributional responses and collision alone has been assessed against the latest 2015 colony count population size of 48,920 breeding adults according to Swann (2016[84]). A range of impact values from 16 to 19 breeding adult additional mortalities per annum were modelled, which allows for consideration of the predicted impact levels, as set out in

Table 10-108of Section 10.3.3. Even when considering the maximum predicted impact of 19 breeding adult mortalities, the annual reduction in the growth rate is predicted to be at most 0.047% against the latest colony count (PVA outputs against the citation count are presented in Application Document 13, Appendix 13-2: Caledonia North Habitats Regulations Appraisal Population Viability Analysis Technical Report and Application Document 14, Appendix 14-2: Caledonia South Habitats Regulations Appraisal Population Viability Analysis Technical Report as additional information), which would mean the colony would remain in favourable condition and maintained.

10.2.3.36 9.3.3.78 This colony has experienced fluctuations of many thousands of breeding pairs over the course of the last 30 years, so it is highly unlikely that such a level of impact amounting to the loss of 19 breeding adults would effect on the overall trend or natural fluctuations in the population, which are more heavily influenced by other factors. **As such, although it is recognised that the colony has been subject to large fluctuations over 30 years the development of the Proposed Project (Offshore) would have limited additional effects. Therefore, it is considered that there is no potential for an AEoSI to the conservation objectives of the kittiwake feature of East Caithness Cliffs SPA in relation to the combined distributional response and collision risk effects in the O&M phase from the Proposed Development (Offshore) alone. Subject to natural change and stability of the population at this site, kittiwake will be maintained as a feature in the long term.**

Great Black-Backed Gull

10.2.3.37 Great black-backed gull has been screened into the assessment for O&M phase collision risk only. Due to potential connectivity being limited to the non-breeding season only for great black-backed gull for all SPAs, a combined assessment for all SPAs is provided in Section 10.2.3, beginning in paragraph 10.2.3.577. As presented in paragraph 10.2.3.577, **the potential for an AEoSI to the conservation objectives of great black-blacked gull at East Caithness Cliffs SPA in relation to collision impacts from the Proposed Development (Offshore) alone during the O&M phase can confidently be ruled out. Therefore, subject to natural change, great black-backed gull will be maintained as a feature in the long term.**

Herring Gull

10.2.3.38 Herring gull have been screened into the assessment for O&M phase collision risk only. Due to potential connectivity being limited to the non-breeding season only for herring gull for all SPAs, a combined assessment for all SPAs is provided in Section 10.2.3, beginning in paragraph 10.2.3.581. As presented in paragraph 10.2.3.581, **the potential for an AEoSI to the conservation objectives of herring gull at East Caithness Cliffs SPA in relation to collision impacts from the Proposed Development (Offshore) alone during the O&M phase can confidently be ruled out.**

Therefore, subject to natural change, herring gull will be maintained as a feature in the long term.

Guillemot

10.2.3.39 Guillemot have been screened into the assessment for distributional responses as they are susceptible to displacement due to their distribution and behaviours (Furness and Wade, 2012[79]; Furness *et al*., 2013[80]; Bradbury *et al*., 2014[81]; NatureScot, 2023[82]).

Status

10.2.3.40 The SPA population of guillemot was cited as 106,700 breeding adults in 1985-1987. The most recently published count (2015) is 199,992 breeding adults (Swann, 2016[84]).

10.2.3.41 When considering a breeding adult baseline mortality rate of 0.061 (1- 0.939, Horswill and Robinson 2015[85]), 6,509 (6,508.70) and 12,200 (12,199.51) breeding adults from the SPA population would be subject to natural mortality per annum, in relation to the citation count and most recently published count (2015), respectively. As of June 2015, the guillemot feature at East Caithness Cliffs SPA is considered to be 'Favourable' and 'Maintained'.

Seasonal Apportionment of Potential Impacts

10.2.3.42 In line with NatureScot guidance, the assessment is carried out on a seasonal basis as the potential impacts on the SPA features varies by season. Guillemot have been assessed during the breeding season of April to mid-August and non-breeding season of mid-August to March in relation to East Caithness Cliffs SPA (see Section 7.3.3).

Appropriate Assessment

10.2.3.43 As outlined above, guillemot have been screened into the assessment for distributional responses. The level of abundance apportioned is presented in Table 10-15 (detailed methods are presented within Application Document 13, Appendix 13-1: Caledonia North Apportioning Technical Note and Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note).

10.2.3.44 For guillemot, distributional responses are assessed based on the birds within the Proposed Development (Offshore) Site and 2km buffer. The main focus of the assessment is based on the Applicant Approach of a displacement rate of 50% and a 1% mortality rate for O&M phase distributional response impacts. Presentation of distributional response impacts using the Guidance Approach recommended rates are also provided. Further details regarding the differences between the Guidance and Applicant Approach for distributional response assessment is provided within Volume 7B, Appendix 6-2, Annex 4: Review of Relevant Evidence.

Table 10-15: Guillemot level of predicted abundance apportioned to the guillemot feature of the East Caithness Cliffs SPA seasonally.

Defined Season (Months)	Level of Apportionment (%)	Apportioned Abundance (Breeding Adults)
Breeding season (April to Mid-August)	38.94	6,266.67
Non-breeding season (Mid-August to March)	28.28	1,897.61

O&M Phase Potential Distributional Response Effects on the Qualifying Feature in Isolation

10.2.3.45 During the O&M phase, the potential level of impact apportioned to the SPA seasonally is summarised in Table 10-16 for both the Applicant and Guidance approach.

10.2.3.46 A displacement matrix is also presented for the annual apportioned abundance for the Proposed Development (Offshore) plus 2km buffer to East Caithness Cliffs SPA in Table 10-17.

Table 10-16: Guillemot predicted distributional responses mortalities during the O&M phase attributed to East Caithness Cliffs SPA and resultant change in survival rate percentage point change compared to citation and most recent population counts.

Population Size (Breeding Adults)	Defined Season (Months)	Applicant Approach		Guidance Approach	
		50% displacement, 1% mortality	Change in Average Survival Rate (% Point Change)	60% displacement, 1-3% mortality (non-breeding); 3-5% mortality (breeding)	Change in Average Survival Rate (% Point Change)
Citation (106,700)	Breeding season (April to Mid-August)	31.33	0.029	112.80 - 188.00	0.106 – 0.176
	Non-breeding season (Mid-August to March)	9.49	0.009	11.39 - 34.16	0.011 – 0.032
	Annual	40.82	0.038	124.19 - 222.16	0.116 – 0.208
Latest count (199,992)	Breeding season (April to Mid-August)	31.33	0.016	112.80 - 188.00	0.056 – 0.094
	Non-breeding season (Mid-August to March)	9.49	0.005	11.39 - 34.16	0.006 – 0.017
	Annual	40.82	0.020	124.19 - 222.16	0.062 – 0.111

Breeding Season

10.2.3.47 The estimated guillemot mean peak abundance during the breeding season is 16,092 (16,091.78) individuals, with an estimated 73.46% of guillemot during the breeding season deriving from East Caithness Cliffs SPA (Application Document 13, Appendix 13-1: Caledonia North Apportioning Technical Note and Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note). Assuming that 57% of the guillemot population are adults (Furness, 2015)[87] and using an adult sabbatical rate of 7%, the total proportion of breeding adults from East Caithness Cliffs SPA potentially impacted by distributional responses are 6,266 (6,266.67) per annum during the breeding season (Table 10-16).

10.2.3.48 When applying a displacement rate of 50% and a mortality rate of 1%, the consequent potential mortality is estimated to 31 (31.33) breeding adults per annum.

10.2.3.49 Using the citation colony count of 106,700 breeding adults and an annual background mortality of 6,509 breeding adults, the addition of 31 predicted breeding adult mortalities per annum would result in a 0.029 survival rate percentage point change during the breeding season. When considering the most up to date counts of 199,992 breeding adults and an annual background mortality of 12,200 breeding adults, this results in a 0.016 survival rate percentage point change during the breeding season per annum (Table 10-16).

Non-breeding Season

10.2.3.50 The estimated guillemot mean peak abundance during the non-breeding season is 6,710 (6,709.90) individuals. For guillemot, apportioning for the non-breeding season was based on the breeding population found within the MMFR + 1SD of the Caledonia OWF. This is in line with the approach outlined in the NatureScot Guidance Note 3 (NatureScot, 2023[82]), based on recent geolocator studies presented in Buckingham *et al.* (2022[88]). Based on the resultant SPA proportional split during the non-breeding season, 28.28% of predicted mortalities are estimated to derive from East Caithness Cliffs SPA (Application Document 13, Appendix 13-1: Caledonia North Apportioning Technical Note and Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note). Therefore, the total mean peak abundance of breeding adults from the SPA potentially impacted by distributional responses are 1,898 (1,897.61) per annum during the non-breeding season (Table 10-16).

10.2.3.51 When applying a displacement rate of 50% and a mortality rate of 1%, the consequent predicted distributional response mortality of breeding adult guillemots from East Caithness Cliffs SPA during the non-breeding season is predicted at 10 (9.49) per annum.

10.2.3.52 Based on the 1985 - 1987 citation colony count of 106,700 breeding adults and using an annual background mortality of 6,509 breeding adults, the addition of 10 predicted breeding adult mortalities per annum would result in a 0.009 survival rate percentage point change during the non-breeding season. When considering the most up to date counts of 199,992 breeding adults and an annual background mortality of 12,200 breeding adults, this results in a 0.005 survival rate percentage point change during the non-breeding season per annum (Table 10-16).

Annual Total

10.2.3.53 The predicted resultant mortality across all defined seasons from The Proposed Development (Offshore), attributed to East Caithness Cliffs SPA, is 41 (40.82) breeding adult guillemots per annum. This is predicted to result in a survival rate percentage point change against the citation and most recently published counts of 0.038 and 0.020, respectively (Table 10-16).

10.2.3.54 When considering the Guidance approach, a total of 124 - 222 (124.19 - 222.16) breeding adult mortalities are predicted due to potential distributional response effects per annum. This results in a survival rate percentage point change of 0.116 – 0.208 against the citation and 0.062 – 0.111 against the most recently published count (Table 10-16).

10.2.3.55 As impacts exceeds a 0.02 survival rate percentage point change threshold when considering both the Applicant and Guidance Approach, PVA has been undertaken to further assess the level of potential effect predicted.

Population Viability Analysis

10.2.3.56 As the most recent count in 2015, 199,992 breeding adults (Swann, 2016), is significantly higher than the older citation count, impacts are assessed against this count, reflecting the current status of this SPA feature as being in favourable condition.

10.2.3.57 A range of impact values from 41 to 222 breeding adult additional mortalities per annum were modelled, which allows for consideration of both the Applicant and Guidance approach predicted impact levels, as set out in Table 10-112 of Section 10.3.3. When considering the maximum predicted impact of 222, the annual reduction in the growth rate is predicted to be at most 0.125% following the Guidance approach. When considering the Applicant Approach it is 0.023% (PVA outputs against the citation count are presented in Application Document 13, Appendix 13-2: Caledonia North Habitats Regulations Appraisal Population Viability Analysis Technical Report and Application Document 14, Appendix 14-2: Caledonia South Habitats Regulations Appraisal Population Viability Analysis Technical Report as additional information) which would mean the colony would likely continue to grow in the long term subject to natural change and other factors.

10.2.3.58 When considering the known colony growth trend of 2.19% (i.e. the Colony Annual Compound Growth Rate), the colony growth rate would still remain positive under all impact scenarios considered when assessed against the long-term growth trend for the colony. **There is, therefore, no potential for an AEoSI to the conservation objectives of the guillemot feature of East Caithness Cliffs SPA in relation to distributional response effects in the O&M phase from the Proposed Development (Offshore) alone. Subject to natural change, guillemot will be maintained as a feature in the long term.**

Table 10-17: Guillemot O&M phase disturbance annual displacement matrix for impacts apportioned to East Caithness Cliffs SPA.

Annual Total	Mortality Rate (%)													
Displacement Rate (%)	1	2	3	5	10	20	30	40	50	60	70	80	90	100
10	8	16	24	41	82	163	245	327	408	490	571	653	735	816
20	16	33	49	82	163	327	490	653	816	980	1,143	1,306	1,470	1,633
30	24	49	73	122	245	490	735	980	1,225	1,470	1,714	1,959	2,204	2,449
40	33	65	98	163	327	653	980	1,306	1,633	1,959	2,286	2,613	2,939	3,266
50	41	82	122	204	408	816	1,225	1,633	2,041	2,449	2,857	3,266	3,674	4,082
60	49	98	147	245	490	980	1,470	1,959	2,449	2,939	3,429	3,919	4,409	4,899
70	57	114	171	286	571	1,143	1,714	2,286	2,857	3,429	4,000	4,572	5,143	5,715
80	65	131	196	327	653	1,306	1,959	2,613	3,266	3,919	4,572	5,225	5,878	6,531
90	73	147	220	367	735	1,470	2,204	2,939	3,674	4,409	5,143	5,878	6,613	7,348
100	82	163	245	408	816	1,633	2,449	3,266	4,082	4,899	5,715	6,531	7,348	8,164
Note, outputs highlighted in dark blue represent the predicted annual mortality estimates as per the Guidance Approach and those highlighted in yellow represent the predicted annual mortality estimates as per Applicant Approach. For further information regarding the Guidance and Applicant Approach see Section 2.5 of Volume 7B, Appendix 6-2: Offshore Ornithology Distributional Responses Technical Report and Volume 7B, Appendix 6-2, Annex 4: Review of Relevant Evidence.														

Razorbill

10.2.3.59 Razorbill have been screened into the assessment for distributional responses as they are susceptible to displacement due to their distribution and behaviours (Furness and Wade, 2012[79]; Furness *et al*., 2013[80]; Bradbury *et al*., 2014[81]; NatureScot, 2023[82]).

Status

10.2.3.60 The SPA population of razorbill was cited as 15,800 breeding adults in 1985-1987. The most recently published count (2015) is 40,256 breeding adults (Swann, 2016[84]).

10.2.3.61 When considering a breeding adult baseline mortality rate of 0.105 (1-0.895, Horswill and Robinson 2015[85]), 1,659 (1,659.00) and 4,227 (4,226.88) breeding adults from the SPA population would be subject to natural mortality per annum, in relation to the citation count and most recently published count (2015) respectively. As of June 2015, the razorbill feature at East Caithness Cliffs SPA is considered to be 'Favourable' and 'Maintained'.

Seasonal Apportionment of Potential Impacts

10.2.3.62 In line with NatureScot guidance, the assessment is carried out on a seasonal basis as the potential impacts on the SPA features varies by season. Razorbill have been assessed during the breeding season of April to Mid-August and non-breeding season of Mid-August to March in relation to East Caithness Cliffs SPA (see Section 7.3.3).

Appropriate Assessment

10.2.3.63 As outlined above, razorbill have been screened into the assessment for distributional responses. The level of abundance apportioned is presented in Table 10-18 (detailed methods are presented within Application Document 13, Appendix 13-1: Caledonia North Apportioning Technical Note and Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note).

10.2.3.64 For razorbill, distributional responses are assessed based on the birds within the Proposed Development (Offshore) Site and 2km buffer. The main focus of the assessment is based on the Applicant Approach of a displacement rate of 50% and a 1% mortality rate for O&M phase distributional response impacts. Presentation of distributional response impacts using the Guidance Approach recommended rates are also provided. Further details regarding the differences between the Guidance and Applicant Approach for distributional response assessment is provided within Volume 7B, Appendix 6-2, Annex 4: Review of Relevant Evidence.

Table 10-18: Razorbill level of abundance apportioned to East Caithness Cliffs SPA seasonally.

Defined Season (Months)	Level of Apportionment (%)	Apportioned Abundance (Breeding Adults)
Breeding season (April to Mid-August)	36.31	639.75
Non-breeding season (Mid-August to March)	4.22	81.52

O&M Phase Potential Distributional Response Effects on the Qualifying Feature in Isolation

10.2.3.65 During the O&M phase, the potential level of impact apportioned to the SPA seasonally is summarised in Table 10-19 for both the Applicant and Guidance approach.

10.2.3.66 A displacement matrix is also presented for the annual apportioned abundance for the Proposed Development (Offshore) plus 2km buffer to East Caithness Cliffs SPA in Table 10-20.

Table 10-19: Razorbill predicted distributional responses mortalities during the O&M phase attributed to East Caithness Cliffs SPA and resultant change in survival rate percentage point change compared to citation and most recent population counts.

Population Size (Breeding Adults)	Defined Season (Months)	Applicant Approach		Guidance Approach	
		50% displacement, 1% mortality	Change in Average Survival Rate (% Point Change)	60% displacement, 1-3% mortality (non-breeding); 3-5% mortality (breeding)	Change in Average Survival Rate (% Point Change)
Citation (15,800)	Breeding season (April to Mid-August)	3.20	0.020	11.52 - 19.19	0.073 – 0.121
	Non-breeding season (Mid-August to March)	0.41	0.003	0.49 - 1.47	0.003 – 0.009
	Annual	3.61	0.023	12.00 - 20.66	0.076 – 0.131
Latest count (40,256)	Breeding season (April to Mid-August)	3.20	0.008	0.05 - 0.08	0.029 – 0.048
	Non-breeding season (Mid-August to March)	0.41	0.001	0.49 - 1.47	0.001 – 0.004
	Annual	3.61	0.009	12.00 - 20.66	0.030 – 0.051

Breeding Season

10.2.3.67 The estimated razorbill mean peak abundance during the breeding season is 1,762 (1,761.87) individuals, with an estimated 68.50% of razorbill during the breeding season deriving from East Caithness Cliffs SPA (Application Document 13, Appendix 13-1: Caledonia North Apportioning Technical Note and Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note). Assuming that 57% of the razorbill population are adults (Furness, 2015[87]) and using an adult sabbatical rate of 7%, the total proportion of breeding adults from East Caithness Cliffs SPA potentially impacted by distributional responses are 640 (639.75) per annum during the breeding season (Table 10-19).

10.2.3.68 When applying a displacement rate of 50% and a mortality rate of 1%, the consequent potential mortality for breeding adult razorbill from East Caithness Cliffs SPA is estimated at three (3.20) breeding adults per annum.

10.2.3.69 Using the citation colony count of 15,800 breeding adults and an annual background mortality of 1,659 breeding adults, the addition of three predicted breeding adult mortalities per annum would result in a 0.020 survival rate percentage point change during the breeding season. When considering the most up to date counts of 40,256 breeding adults and an annual background mortality of 4,227 breeding adults, this results in a 0.008 survival rate percentage point change during the breeding season per annum (see Table 10-19).

Non-breeding Season

10.2.3.70 The estimated razorbill mean peak abundance during the non-breeding season is 1,930 (1,930.00) individuals. Based on the Furness (2015[87]) non-breeding season BDMPS region SPA proportional split corresponding to the mean peak abundance recorded, 4.22% of predicted mortalities during the non-breeding season are estimated to derive from East Caithness Cliffs SPA Application Document 13, Appendix 13-1: Caledonia North Apportioning Technical Note and Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note). Therefore, the total mean peak abundance of breeding adults from the SPA potentially impacted by distributional responses are 82 (81.52) breeding adults per annum during the non-breeding season (Table 10-19).

10.2.3.71 When applying a displacement rate of 50% and a mortality rate of 1%, the consequent predicted distributional response mortality of breeding adult razorbill from East Caithness Cliffs SPA during the non-breeding season is predicted at less than one (0.41) per annum.

10.2.3.72 Based on the citation colony count of 15,800 breeding adults and using an annual background mortality of 1,659 breeding adults, the addition of less than one predicted breeding adult mortality per annum would result in a 0.003 survival rate percentage point change during the non-breeding season. When considering the most up to date counts of 40,256 breeding adults and an annual background mortality of 4,227 breeding adult adults, this results in a 0.001 survival rate percentage point change during the non-breeding season (Table 10-19)

Annual Total

10.2.3.73 The predicted resultant mortality across all defined seasons from The Proposed Development (Offshore), attributed to East Caithness Cliffs SPA, is four (3.61) predicted breeding adult mortalities per annum would. The is predicted to result in a survival rate percentage point change against the citation and most recently published counts of 0.023 and 0.009 respectively (see Table 10-19).

10.2.3.74 When considering the Guidance approach, a total of 12 - 21 (12.00 - 20.66) breeding adult mortalities are predicted due to potential distributional response effects per annum. This results in a survival rate percentage point change of 0.076 – 0.131 against the citation and 0.030 – 0.051 against the most recently published count (Table 10-19).

10.2.3.75 As impacts exceed a 0.02 survival rate percentage point change threshold when considering both the Applicant (when considering the citation count) and Guidance Approach (when considering the citation count and the most recently published count), PVA has been undertaken to further assess the level of potential effect predicted.

Population Viability Analysis

10.2.3.76 As the most recently published count of 40,256 breeding adults (Swan, 2016), is significantly higher than the older citation count, impacts are assessed against this count, reflecting the current status of this SPA feature as being in favourable condition.

10.2.3.77 A range of impact values from 12 to 21 breeding adult additional mortalities per annum were modelled, which allows for consideration of the Guidance approach predicted impact levels, as set out in Table 10-117 of Section 10.3.3. When considering the maximum predicted impact of 21, the annual reduction in the growth rate is predicted to be at most 0.060% following the Guidance approach (PVA outputs against the citation count are presented for both the Applicant and Guidance Approach in Application Document 13, Appendix 13-2: Caledonia North Habitats Regulations Appraisal Population Viability Analysis Technical Report and Application Document 14, Appendix 14-2: Caledonia South Habitats Regulations Appraisal Population Viability Analysis Technical Report as additional information) which would mean the colony would continue to grow in the long term.

10.2.3.78 Regardless of the colony’s population trend, such a level of effect would almost certainly be indistinguishable from natural fluctuations in the population. **There is, therefore, no potential for an AEoSI to the conservation objectives of the razorbill feature of East Caithness Cliffs SPA in relation to distributional response effects in the O&M phase from the Proposed Development (Offshore) alone. Subject to natural change, razorbill will be maintained as a feature in the long term.**

Table 10-20: Razorbill O&M phase disturbance annual displacement matrix for impacts apportioned to East Caithness Cliffs SPA.

Annual Total	Mortality Rate (%)													
Displacement Rate (%)	1	2	3	5	10	20	30	40	50	60	70	80	90	100
10	1	1	2	4	7	14	22	29	36	43	50	58	65	72
20	1	3	4	7	14	29	43	58	72	87	101	115	130	144
30	2	4	6	11	22	43	65	87	108	130	151	173	195	216
40	3	6	9	14	29	58	87	115	144	173	202	231	260	289
50	4	7	11	18	36	72	108	144	180	216	252	289	325	361
60	4	9	13	22	43	87	130	173	216	260	303	346	389	433
70	5	10	15	25	50	101	151	202	252	303	353	404	454	505
80	6	12	17	29	58	115	173	231	289	346	404	462	519	577
90	6	13	19	32	65	130	195	260	325	389	454	519	584	649
100	7	14	22	36	72	144	216	289	361	433	505	577	649	721

Note, outputs highlighted in dark blue represent the predicted annual mortality estimates as per the Guidance Approach and those highlighted in yellow represent the predicted annual mortality estimates as per Applicant Approach. For further information regarding the Guidance and Applicant Approach see Section 2.5 of Volume 7B, Appendix 6-2: Offshore Ornithology Distributional Responses Technical Report and Volume 7B, Appendix 6-2, Annex 4: Review of Relevant Evidence.

North Caithness Cliffs SPA

10.2.3.79 The centroid of the North Caithness Cliff SPA is 89.4km (around land) from the centre of the Caledonia OWF, within the MMFR +1SD of guillemot (73.2±80.5km), razorbill (88.7±75.9km), puffin (137.1±128.3km), and kittiwake (156.1±144.5km) (Woodward *et al*., 2019[78]). As such, potential for LSE alone has been identified for the following features of North Caithness Cliffs SPA:

- Kittiwake
  - Collision (O&M)
  - Distributional responses (O&M)
  - Distributional responses (C&D, Section 7.3.1)
- Guillemot
  - Distributional responses (O&M)
  - Distributional responses (C&D, Section 7.3.1)
- Razorbill
  - Distributional responses (O&M)
  - Distributional responses (C&D, Section 7.3.1)
- Puffin
  - Distributional responses (O&M)
  - Distributional responses (C&D, Section 7.3.1)

Conservation objectives

10.2.3.80 The overarching conservation objectives for the qualifying features of the SPA is to ensure the conservation status of the qualifying features is 'favourable condition'. With respect to North Caithness Cliff SPA, a species 'favourable' condition can be assessed against the following objectives:

- To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and
- To ensure for the qualifying species that the following are maintained in the long term:
  - Population of the species as a viable component of the site;
  - Distribution of the species within site;
  - Distribution and extent of habitats supporting the species;
  - Structure, function and supporting processes of habitats supporting the species; and
  - No significant disturbance of the species.

Kittiwake

10.2.3.81 Kittiwake have been screened into the assessment for collision risk as they are susceptible to collision due to their flight height distribution and behaviours (Furness and Wade, 2012[79]; Furness *et al.*, 2013[80]; Bradbury *et al.*, 2014[81]; NatureScot, 2023[82]).

10.2.3.82 Kittiwake have also been assessed for distributional responses as requested by NatureScot within consultation; however, the Applicant remains of the position that kittiwake do not require assessment for distributional responses due to the evidence base detailed within Volume 7B, Appendix 6-2, Annex 4: Review of Relevant Evidence suggesting kittiwake show limited behavioural response to OWFs. Distributional responses are assessed based on the birds within the Proposed Development (Offshore) And 2km buffer. A Guidance approach only is presented for kittiwake based on a displacement rate of 30% and a 1-3% mortality rate for O&M phase distributional response impacts.

10.2.3.83 The level of predicted abundance and collision risk apportioned to the kittiwake feature of the North Caithness Cliffs SPA to inform assessments is presented in Table 10-21 (detailed methods are presented within Application Document 13, Appendix 13-1: Caledonia North Apportioning Technical Note and Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note).

Table 10-21: Kittiwake level of abundance and collision risk apportioned to North Caithness Cliffs SPA seasonally.

Defined Season (Months)	Level of Apportionment (%)	Apportioned Abundance (Breeding Adults)	Apportioned collision risk (breeding adults)
Breeding season (Mid-April to August)	2.74	55.95	1.52
Non-breeding season (September to early-April)	1.47 (Autumn %) 1.94 (Spring %)	7.09	0.19
Note two weightings for apportioning non-breeding season kittiwake are provided for autumn migration (September to December), and spring migration (January to Early-April). The autumn weighting has been used to apportion the potential numbers of non-breeding kittiwake distributional response as the mean peak of this species was recorded during the autumn migration season. While both the Spring and Autumn weightings have been used to apportion collision mortalities during the non-breeding season.			

Status

10.2.3.84 The SPA population of kittiwake was cited as 26,200 breeding adults in 1986-1987. The most recently published count (2015-2023) is 16,424 breeding adults (Seabird Monitoring Programme (SMP), 2024[89]).

10.2.3.85 When considering a breeding adult baseline mortality rate of 0.146 (1- 0.854, Horswill and Robinson 2015[85]), 3,825 (3,825.20) and 2,398 (2,397.90) breeding adults from the SPA population would be subject to natural mortality per annum, in relation to the citation count and most recently published count (2015-2018) respectively. As of June 2023, the kittiwake feature at North Caithness Cliffs is considered to be 'Unfavourable' and with 'No change'.

Seasonal Apportionment of Potential Impacts

10.2.3.86 In line with NatureScot guidance, the assessment is carried out on a seasonal basis as the potential impacts on the SPA features varies by season. Kittiwake have been assessed during the breeding season of Mid-April to August and non-breeding season of September to Early April in relation to North Caithness Cliffs SPA (see Section 7.3.3).

Appropriate Assessment

O&M Phase Potential Distributional Response Effects on the Qualifying Feature in Isolation

10.2.3.87 During the O&M phase, the potential level of impact apportioned to the SPA seasonally is summarised in Table 10-22 for the Guidance approach.

10.2.3.88 A displacement matrix is also presented for the annual apportioned abundance for the Proposed Development (Offshore) plus 2km buffer to North Caithness Cliffs SPA in Table 10-23.

Table 10-22: Kittiwake predicted distributional responses mortalities during the O&M phase attributed to North Caithness Cliffs SPA and resultant change in survival rate percentage point change compared to citation and most recent population counts (guidance approach).

Population Size (Breeding Adults)	Defined Season (Months)	Guidance Approach	
		30% displacement, 1-3% mortality	Change in Average Survival Rate (% Point Change)
Citation (26,200)	Breeding season (Mid-April to August)	0.17 - 0.50	0.001 - 0.002
	Non-breeding season (September to early-April)	0.02 - 0.06	<0.001
	Annual	0.19 - 0.57	0.001 - 0.002
Latest count (16,424)	Breeding season (Mid-April to August)	0.17 - 0.50	0.001 – 0.003
	Non-breeding season (September to early-April)	0.02 - 0.06	<0.001
	Annual	0.19 - 0.57	0.001 – 0.003

Breeding Season

10.2.3.89 The estimated kittiwake mean peak abundance during the breeding season is 2,039 (2,038.69) individuals, with an estimated 5.75% of all individuals during the breeding season deriving from North Caithness Cliffs SPA (Application Document 13, Appendix 13-1: Caledonia North Apportioning Technical Note and Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note). Assuming that 53% of the kittiwake population are adults (Furness, 2015)[87] and using an adult sabbatical rate of 10%, the total proportion of breeding adults from North Caithness Cliffs SPA potentially impacted by distributional responses are 56 (55.95) per annum during the breeding season (Table 10-22).

10.2.3.90 When applying a displacement rate of 30% and a mortality rate of 1-3%, the consequent potential mortality is estimated to be less than one (0.17 – 0.50) breeding adult per annum.

10.2.3.91 Using the citation colony count of 26,200 breeding adults and an annual background mortality of 3,825 breeding adults, the addition of less than one predicted breeding adult mortality would result in a 0.001 - 0.002 survival rate percentage point change during the breeding season per annum. When considering the most up to date counts of 16,424 breeding adults and an annual background mortality of 2,398 breeding adults, this results in a 0.001 – 0.003 survival rate percentage point change during the breeding season per annum (Table 10-22).

Non-breeding Season

10.2.3.92 The estimated kittiwake mean peak abundance during the non-breeding season is 483 (483.00) individuals. Based on the Furness (2015)[87] non-breeding season BDMPS region SPA proportional split corresponding to the mean peak abundance recorded, 1.47% of predicted mortalities during the non-breeding season are estimated to derive from North Caithness Cliffs SPA (Application Document 13, Appendix 13-1: Caledonia North Apportioning Technical Note and Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note). Therefore, the total mean peak abundance of breeding adults from the SPA potentially impacted by distributional responses are seven (7.09) per annum during the non-breeding season (Table 10-22).

10.2.3.93 When applying a displacement rate of 30% and a mortality rate of 1-3%, the consequent predicted distributional response mortality of breeding adult kittiwake from North Caithness Cliffs SPA during the non-breeding season is predicted at significantly less than one (0.02 - 0.06) per annum.

10.2.3.94 Based on the 1986-1987 citation colony count of 26,200 breeding adults and using an annual background mortality of 3,825 breeding adults, the addition of significantly less than one (0.02 - 0.06) predicted breeding adult mortality would result in a <0.001 survival rate percentage point change during the non-breeding season per annum. When considering the most up to date counts of 16,424 breeding adults and an annual background mortality of

2,398 breeding adults, this results in a <0.001 survival rate percentage point change during the non-breeding season per annum (Table 10-22).

Annual Total

10.2.3.95 The predicted resultant mortality across all defined seasons from The Proposed Development (Offshore), attributed to North Caithness Cliffs SPA, is less than one (0.19 - 0.57) breeding adult kittiwake per annum. This is predicted to result in a survival rate percentage point change against the citation and most recently published counts of 0.001 - 0.002 and 0.001 – 0.003 respectively (see Table 10-22).

10.2.3.96 For both the citation and most recently published counts, predicted additional breeding adult mortalities per annum equate to an <0.02 survival rate percentage point change. As this would be under the threshold considered for further investigation into population level effects it is also considered to be indistinguishable from natural fluctuations in the population. **As such, there is no potential for an AEoSI to the conservation objectives of kittiwake at North Caithness Cliffs SPA in relation to potential distributional response effects from The Proposed Development (Offshore) alone during the O&M phase. Therefore, subject to natural change, kittiwake will be maintained as a feature in the long term.**

Table 10-23: Kittiwake O&M phase disturbance annual displacement matrix for impacts apportioned to North Caithness Cliffs SPA.

Annual Total	Mortality Rate (%)													
Displacement Rate (%)	1	2	3	5	10	20	30	40	50	60	70	80	90	100
10	0	0	0	0	1	1	2	3	3	4	4	5	6	6
20	0	0	0	1	1	3	4	5	6	8	9	10	11	13
30	0	0	1	1	2	4	6	8	9	11	13	15	17	19
40	0	1	1	1	3	5	8	10	13	15	18	20	23	25
50	0	1	1	2	3	6	9	13	16	19	22	25	28	32
60	0	1	1	2	4	8	11	15	19	23	26	30	34	38
70	0	1	1	2	4	9	13	18	22	26	31	35	40	44
80	1	1	2	3	5	10	15	20	25	30	35	40	45	50
90	1	1	2	3	6	11	17	23	28	34	40	45	51	57
100	1	1	2	3	6	13	19	25	32	38	44	50	57	63

Note, outputs highlighted in dark blue represent the predicted annual mortality estimates as per the Guidance Approach. For further information regarding the Guidance and Applicant Approach see Section 2.5 of Volume 7B, Appendix 6-2: Offshore Ornithology Distributional Responses Technical Report and Volume 7B, Appendix 6-2, Annex 4: Review of Relevant Evidence.

O&M Phase Potential Collision Risk Impacts on the Qualifying Feature in Isolation

10.2.3.97 During the O&M phase, the potential level of impact from collision risk apportioned to the North Caithness Cliffs SPA and subsequent survival rate percentage point change is summarised in Table 10-24.

Table 10-24: Kittiwake predicted collision risk impacts during the O&M phase attributed to North Caithness Cliffs SPA and resultant change in survival rate percentage point change compared to citation and most recent population counts.

Population Size (Breeding Adults)	Defined Season (Months)	Collision risk impact	
		Breeding adults per annum	Change in Average Survival Rate (% Point Change)
Citation (26,200)	Breeding season (Mid-April to August)	1.52	0.006
	Non-breeding season (September to early-April)	0.19	0.001
	Annual	1.71	0.007
Latest count (16,424)	Breeding season (Mid-April to August)	1.52	0.009
	Non-breeding season (September to early-April)	0.19	0.001
	Annual	1.71	0.010

Breeding Season

10.2.3.98 The predicted kittiwake collision mortality during the breeding season is 55 (55.27) individuals per annum, with an estimated 5.75% of all individuals during the breeding season deriving from North Caithness Cliffs SPA (Application Document 13, Appendix 13-1: Caledonia North Apportioning Technical Note and Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note). Assuming that 53% of the population are adults (Furness, 2015[87]) and using an adult sabbatical rate of 10%, the total proportion of breeding adults from North Caithness Cliffs SPA potentially subject to collision consequent mortality is two (1.52) per annum during the breeding season.

10.2.3.99 Using the citation colony count of 26,200 breeding adults and an annual background mortality of 3,825 breeding adults, the addition of two predicted breeding adult mortalities per annum would result in a 0.006 survival rate percentage point change during the breeding season. When considering the most up to date counts of 16,424 breeding adults and an annual background mortality of 2,398 breeding adults, this results in a 0.009 survival rate percentage point change during the breeding season per annum (see Table 10-24).

Non-breeding Season

10.2.3.100 The predicted kittiwake collision mortality during the non-breeding season is 12 (11.74) individuals. Based on the Furness (2015[87]) spring and autumn season BDMPS region SPA proportional split, 1.47% and 1.94% of predicted mortalities during the non-breeding season are estimated to derive from North Caithness Cliffs SPA (Application Document 13, Appendix 13-1: Caledonia North Apportioning Technical Note and Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note), the consequent predicted collision mortality of adult kittiwake during the non-breeding season is predicted at less than one (0.19) per annum (see Table 10-24).

10.2.3.101 Based on the 1985-1987 citation colony count of 26,200 breeding adults and using an annual background mortality of 3,825 breeding adults, the addition of less than one (0.19) predicted breeding adult mortalities per annum would result in a 0.001 survival rate percentage point change during the non-breeding season. When considering the most up to date counts of 16,424 breeding adults and an annual background mortality of 2,398 breeding adults, this results in a change in survival rate percentage point change of 0.001 during the non-breeding season per annum (see Table 10-24).

Annual Total

10.2.3.102 The predicted resultant mortality across all defined seasons from The Proposed Development (Offshore), attributed to North Caithness Cliffs SPA, is two (1.71) breeding adults per annum. This is predicted to result in a 0.007 and 0.010 survival rate percentage point change when considering the citation count and most recently published count, respectively (see Table 10-24).

10.2.3.103 For both the citation and most recently published counts, predicted additional breeding adult mortalities per annum equate to an <0.02 survival rate percentage point change. As this would be under the threshold considered for further investigation into population level effects it is also considered to be indistinguishable from natural fluctuations in the population**. As such, there is no potential for an AEoSI to the conservation objectives of kittiwake at North Caithness Cliffs SPA in relation to potential collision risk effects from the Proposed Development (Offshore) alone during the O&M phase. Therefore, subject to natural change, kittiwake will be maintained as a feature in the long term.**

O&M Phase Potential Combined Distributional Response and Collision Risk Impacts on the Qualifying Feature in Isolation

10.2.3.104 During the O&M phase, the potential level of combined impact from collision risk and distributional responses apportioned to the North Caithness Cliffs SPA and subsequent survival rate percentage point change is summarised in Table 10-25.

Table 10-25: Kittiwake predicted distributional response and collision risk impacts during the O&M phase attributed to North Caithness Cliffs SPA and resultant change in survival rate percentage point change compared to citation and most recent population counts.

Population Size (Breeding Adults)	Defined Season (Months)	Guidance Approach 30% displacement; 1-3% mortality	
		Estimated number of mortalities from combined CRM and Distributional responses per annum	Change in Average Survival Rate (% Point Change)
Citation (26,200)	Breeding season (Mid-March to September)	1.68 - 2.02	0.006 – 0.008
	Non-breeding season (October to Early-March)	0.22 - 0.26	0.001
	Annual	1.90 - 2.28	0.007 – 0.009
Latest count (16,424)	Breeding season (Mid-March to September)	1.68 - 2.02	0.010 – 0.012
	Non-breeding season (October to Early-March)	0.22 - 0.26	0.001 – 0.002
	Annual	1.90 - 2.28	0.012 – 0.014

Breeding Season

10.2.3.105 As presented within (Table 10-25) the combined distributional response and collision risk impacts apportioned to the kittiwake feature of North Caithness Cliffs SPA, equates to approximately two (1.68 - 2.02) additional breeding adult mortalities during the breeding season per annum (when considering a displacement rate of 30% and a mortality rate of 1-3%). Using the citation colony count of 26,200 breeding adults and an annual background mortality of 3,825 breeding adults, the addition of two predicted breeding adult mortalities would result in a 0.006 – 0.008 survival rate percentage point change during the breeding season per annum. When considering the most up to date count of 16,424 breeding adults and an annual background mortality of 2,398 breeding adults, this results in a 0.010 – 0.012 survival rate percentage point change during the breeding season per annum (see Table 10-25).

Non-breeding Season

10.2.3.106 As presented within Table 10-25 the combined distributional response and collision risk impacts apportioned to the kittiwake feature of North Caithness Cliffs SPA, equates to approximately less than one (0.22 - 0.26) additional adult mortality during the non-breeding season per annum (when considering a displacement rate of 30% and a mortality rate of 1-3%). Using the citation colony count of 26,200 breeding adults and an annual background mortality of 3,825 breeding adults, the addition of one predicted breeding adult mortality would result in a 0.001 survival rate percentage point change during the breeding season per annum. When considering the most up to date counts of 16,424 and an annual background mortality of 2,398 breeding adults, this results in a 0.001 – 0.002 survival rate percentage point change during the non-breeding season per annum (see Table 10-25).

Annual Total

10.2.3.107 The predicted resultant mortality across all defined seasons from The Proposed Development (Offshore), attributed to North Caithness Cliffs, is approximately two (1.90 - 2.28) breeding adult kittiwake per annum. This is predicted to result in survival rate percentage point change against the citation and most recently published counts of 0.007 – 0.009 and 0.012 – 0.014 respectively (see Table 10-25).

10.2.3.108 For both the citation and most recently published counts, predicted additional breeding adult mortalities per annum equate to an <0.02 survival rate percentage point change. As this would be under the threshold considered for further investigation into population level effects it is also considered to be indistinguishable from natural fluctuations in the population. **As such, there is no potential for an AEoSI to the conservation objectives of kittiwake at North Caithness Cliffs SPA in relation to potential combined distributional response and collision risk effects from the Proposed Development (Offshore) alone during the O&M phase. Therefore, subject to natural change, kittiwake will be maintained as a feature in the long term.**

Guillemot

10.2.3.109 Guillemot have been screened into the assessment for distributional responses as they are susceptible to displacement due to their distribution and behaviours (Furness and Wade, 2012[79]; Furness *et al*., 2013[80]; Bradbury *et al*., 2014[81]; NatureScot, 2023[82]).

Status

10.2.3.110 The SPA population of guillemot was cited as 38,300 breeding adults in 1985-1987. The most recently published count (2015-2023) is 62,599 breeding adults (SMP, 2024).

10.2.3.111 When considering a breeding adult baseline mortality rate of 0.061 (1- 0.939, Horswill and Robinson 2015[85]), 2,336 (2,336.30) and 3,819 (3,818.54) breeding adults from the SPA population would be subject to natural mortality per annum, in relation to the citation count and most recently published count (2015-2018) respectively. As of June 2023, the guillemot feature at North Caithness Cliffs SPA is considered to be 'Favourable' and 'Maintained'.

Seasonal Apportionment of Potential Impacts

10.2.3.112 In line with NatureScot guidance, the assessment is carried out on a seasonal basis as the potential impacts on the SPA features varies by season. Guillemot have been assessed during the breeding season of April to Mid-August and non-breeding season of Mid-August to March in relation to North Caithness Cliffs SPA (see Section 7.3.3).

Appropriate Assessment

10.2.3.113 As outlined above, guillemot have been screened into the assessment for distributional responses. The level of abundance apportioned is presented in Table 10-26 (detailed methods are presented within Application Document 13, Appendix 13-1: Caledonia North Apportioning Technical Note and Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note).

10.2.3.114 For guillemot, distributional responses are assessed based on the birds within the Proposed Development (Offshore) Site and 2km buffer. The main focus of the assessment is based on the Applicant Approach of a displacement rate of 50% and a 1% mortality rate for O&M phase distributional response impacts. Presentation of distributional response impacts using the Guidance Approach recommended rates are also provided. Further details regarding the differences between the Guidance and Applicant Approach for distributional response assessment is provided within Volume 7B, Appendix 6-2, Annex 4: Review of Relevant Evidence.

Table 10-26: Guillemot level of predicted abundance apportioned to the guillemot feature of the North Caithness Cliffs SPA seasonally.

Defined Season (Months)	Level of Apportionment (%)	Apportioned Abundance (Breeding Adults)
Breeding season (April to Mid-August)	4.34	698.18
Non-breeding season (Mid-August to March)	8.85	593.97

O&M Phase Potential Distributional Response Effects on the Qualifying Feature in Isolation

10.2.3.115 During the O&M phase, the potential level of impact apportioned to the SPA seasonally is summarised in Table 10-27 for both the Applicant and Guidance approach.

10.2.3.116 A displacement matrix is also presented for the annual apportioned abundance for the Proposed Development (Offshore) plus 2km buffer to North Caithness Cliffs SPA in Table 10-28.

Table 10-27: Guillemot predicted distributional responses mortalities during the O&M phase attributed to North Caithness Cliffs SPA and resultant change in survival rate percentage point change compared to citation and most recent population counts.

Population Size (Breeding Adults)	Defined Season (Months)	Applicant Approach		Guidance Approach	
		50% displacement, 1% mortality	Change in Average Survival Rate (% Point Change)	60% displacement, 1-3% mortality (non-breeding); 3-5% mortality (breeding)	Change in Average Survival Rate (% Point Change)
Citation (38,300)	Breeding season (April to Mid-August)	3.49	0.009	12.57 - 20.95	0.033 – 0.055
	Non-breeding season (Mid-August to March)	2.97	0.008	3.56 - 10.69	0.009 – 0.028
	Annual	6.46	0.017	16.13 - 31.64	0.042 – 0.083
Latest count (62,599)	Breeding season (April to Mid-August)	3.49	0.006	12.57 - 20.95	0.020 – 0.033
	Non-breeding season (Mid-August to March)	2.97	0.005	3.56 - 10.69	0.006 – 0.017
	Annual	6.46	0.010	16.13 - 31.64	0.026 – 0.051

Breeding Season

10.2.3.117 The estimated guillemot mean peak abundance in the Proposed Development (Offshore) during the breeding season was 16,092 (16,091.78) individuals. The total mean peak of breeding adults from North Caithness Cliffs SPA potentially impacted by distributional responses are 698 (698.18) per annum during the breeding season (Table 10-27).

10.2.3.118 The consequent potential mortality is estimated to three (3.49) breeding adults per annum, based on the Applicant Approach.

10.2.3.119 Using the citation colony count of 38,300 breeding adults and an annual background mortality of 2,336 breeding adults, the addition of a maximum of three predicted breeding adult mortalities per annum would result in a 0.009 survival rate percentage point change during the breeding season. When considering the most up to date counts of 62,599 breeding adults and an annual background mortality of 3,819 breeding adults, this results in a 0.006 survival rate percentage point change during the breeding season per annum (Table 10-27).

Non-breeding Season

10.2.3.120 The estimated guillemot mean peak abundance during the non-breeding season is 6,710 (6,709.90) individuals. For guillemot, apportioning for the non-breeding season was based on the breeding population found within the MMFR + 1SD of the Caledonia OWF. This is in line with the approach outlined in the NatureScot Guidance Note 3 (NatureScot, 2023[82]), based on recent geolocator studies presented in Buckingham *et al.* (2022[88]). Based on the resultant SPA proportional split during the non-breeding season, 8.85% of predicted mortalities are estimated to derive from North Caithness Cliffs SPA Application Document 13, Appendix 13-1: Caledonia North Apportioning Technical Note and Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note). Therefore, the total mean peak abundance of breeding adults from the SPA potentially impacted by distributional responses are 698 (698.18) per annum during the non-breeding season (Table 10-27).

10.2.3.121 When applying a displacement rate of 50% and a mortality rate of 1%, the consequent predicted distributional response mortality of breeding adult guillemot from North Caithness Cliffs SPA during the non-breeding season is predicted at three (2.97) per annum.

10.2.3.122 Based on the 1985 - 1987 citation colony count of 38,300 breeding adults and using an annual background mortality of 2,336 breeding adults, the addition of three predicted breeding adult mortalities per annum would result in a 0.008 survival rate percentage point change during the non-breeding season. When considering the most up to date counts of 62,599 breeding adults and an annual background mortality of 3,819 breeding adults, this results in a 0.005 survival rate percentage point change during the non-breeding season per annum (Table 10-27).

Annual Total

10.2.3.123 The predicted resultant mortality across all defined seasons from The Proposed Development (Offshore), attributed to North Caithness Cliffs SPA, is six (6.46) breeding adult guillemot per annum. This is predicted to result in a survival rate percentage point change against the citation and most recently published counts of 0.017 and 0.010 respectively (Table 10-27).

10.2.3.124 When considering the Guidance approach, a total of 16 - 32 (16.13 - 31.64) breeding adult mortalities are predicted due to potential distributional response effects per annum. This results in a survival rate percentage point change of 0.042 – 0.083 against the citation and 0.026 – 0.051 against the most recently published count (Table 10-27).

10.2.3.125 As impacts exceeds a 0.02 survival rate percentage point change threshold when considering the Guidance approach, PVA has been undertaken to further assess the level of potential effect predicted.

Population Viability Analysis

10.2.3.126 The potential for distributional responses alone has been assessed against the latest 2015-2023 colony count population size of 62,599 breeding adults according to the Seabird Monitoring Programme (2020) database. A range of impact values from 16 to 32 breeding adult additional mortalities per annum were modelled, which allows for consideration of the Guidance approach predicted impact levels, as set out in Table 10-121 of Section 10.3.3. Even when considering a maximum predicted impact of 32, the annual reduction in the growth rate is predicted to be at most 0.124% against the latest colony count (PVA outputs against the citation count are presented in Application Document 13, Appendix 13-2: Caledonia North Habitats Regulations Appraisal Population Viability Analysis Technical Report and Application Document 14, Appendix 14-2: Caledonia South Habitats Regulations Appraisal Population Viability Analysis Technical Report as additional information), which would mean the colony would continue to grow in the long term.

10.2.3.127 When considering the known colony growth trend of 5.86% (i.e. the Colony Annual Compound Growth Rate), the colony growth rate would still remain positive under all impact scenarios considered when assessed against the long-term growth trend for the colony. **There is, therefore, no potential for an AEoSI to the conservation objectives of the guillemot feature of North Caithness Cliffs SPA in relation to distributional response effects in the O&M phase from the Proposed Development (Offshore) alone. Subject to natural change, guillemot will be maintained as a feature in the long term.**

Table 10-28: Guillemot O&M phase disturbance annual displacement matrix for impacts apportioned to North Caithness Cliffs SPA.

Annual Total	Mortality Rate (%)													
Displacement Rate (%)	1	2	3	5	10	20	30	40	50	60	70	80	90	100
10	1	3	4	6	13	26	39	52	65	78	90	103	116	129
20	3	5	8	13	26	52	78	103	129	155	181	207	233	258
30	4	8	12	19	39	78	116	155	194	233	271	310	349	388
40	5	10	16	26	52	103	155	207	258	310	362	413	465	517
50	6	13	19	32	65	129	194	258	323	388	452	517	581	646
60	8	16	23	39	78	155	233	310	388	465	543	620	698	775
70	9	18	27	45	90	181	271	362	452	543	633	724	814	905
80	10	21	31	52	103	207	310	413	517	620	724	827	930	1,034
90	12	23	35	58	116	233	349	465	581	698	814	930	1,047	1,163
100	13	26	39	65	129	258	388	517	646	775	905	1,034	1,163	1,292

Note, outputs highlighted in dark blue represent the predicted annual mortality estimates as per the Guidance Approach and those highlighted in yellow represent the predicted annual mortality estimates as per Applicant Approach. For further information regarding the Guidance and Applicant Approach see Section 2.5 of Volume 7B, Appendix 6-2: Offshore Ornithology Distributional Responses Technical Report and Volume 7B, Appendix 6-2, Annex 4: Review of Relevant Evidence.

Razorbill

10.2.3.128 Razorbill have been screened into the assessment for distributional responses as they are susceptible to displacement due to their distribution and behaviours (Furness and Wade, 2012[79]; Furness *et al.*, 2013[80]; Bradbury *et al.*, 2014[81]; NatureScot, 2023[82]).

Status

10.2.3.129 The SPA population of razorbill was cited as 4,000 breeding adults in 1985-1987. The most recently published count (2015-2018) is 13,384 breeding adults (SMP, 2024[152]).

10.2.3.130 Based on a breeding adult baseline mortality rate of 0.105 (1-0.895, Horswill and Robinson 2015[85]), 420 (420.00) and 1,405 (1,405.32) breeding adults from the SPA population would be subject to natural mortality per annum, in relation to the citation count and most recently published count (2015-2018) respectively. As of June 2023, the razorbill feature at North Caithness Cliffs SPA is considered to be 'Favourable' and 'Maintained'.

Seasonal Apportionment of Potential Impacts

10.2.3.131 Razorbill have been assessed during the breeding season of April to Mid-August and non-breeding season of Mid-August to March in relation to North Caithness Cliffs SPA (see Section 7.3.3).

Appropriate Assessment

10.2.3.132 As outlined above, razorbill have been screened into the assessment for distributional responses. The level of abundance apportioned is presented in Table 10-29 (detailed methods are presented within Application Document 13, Appendix 13-1: Caledonia North Apportioning Technical Note and Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note).

10.2.3.133 Distributional responses are assessed based on the birds within the Proposed Development (Offshore) Site and 2km buffer. The main focus of the assessment is the Applicant Approach of a displacement rate of 50% and a 1% mortality rate, though it is considered that the observed displacement rate could be substantially lower than 50%, so this is regarded as a maximum value. Presentation of distributional response impacts using the Guidance Approach displacement and mortality rates are also provided.

10.2.3.134 Further details regarding the differences between the Guidance and Applicant Approach for distributional response assessment is provided within Volume 7B, Appendix 6-2, Annex 4: Review of Relevant Evidence.

Table 10-29: Razorbill level of abundance apportioned to North Caithness Cliffs SPA seasonally.

Defined Season (Months)	Level of Apportionment (%)	Apportioned Abundance (Breeding Adults)
Breeding season (April to Mid-August)	5.59	98.50
Non-breeding season (Mid-August to March)	0.55	10.53

O&M Phase Potential Distributional Response Effects on the Qualifying Feature in Isolation

10.2.3.135 During the O&M phase, the potential level of impact apportioned to the SPA seasonally is summarised in Table 10-30 for both the Applicant and Guidance approach.

10.2.3.136 A displacement matrix is also presented for the annual apportioned abundance for the Proposed Development (Offshore) plus 2km buffer to North Caithness Cliffs SPA is presented in Table 10-31.

Table 10-30: Razorbill predicted distributional responses mortalities during the O&M phase attributed to North Caithness Cliffs SPA and resultant change in survival rate percentage point change compared to citation and most recent population counts.

Population Size (Breeding Adults)	Defined Season (Months)	Applicant Approach		Guidance Approach	
		50% displacement, 1% mortality	Change in Average Survival Rate (% Point Change)	60% displacement, 1-3% mortality (non-breeding); 3-5% mortality (breeding)	Change in Average Survival Rate (% Point Change)
Citation (4,000)	Breeding season (April to Mid-August)	0.49	0.012	1.77 - 2.95	0.044 – 0.074
	Non-breeding season (Mid-August to March)	0.05	0.001	0.06 - 0.19	0.002 – 0.005
	Annual	0.55	0.014	1.84 - 3.14	0.046 – 0.079
Latest count (13,384)	Breeding season (April to Mid-August)	0.49	0.004	1.77 - 2.95	0.013 – 0.022
	Non-breeding season (Mid-August to March)	0.05	<0.001	0.06 - 0.19	<0.001 – 0.001
	Annual	0.55	0.004	1.84 - 3.14	0.014 – 0.023

Breeding Season

10.2.3.137 The estimated razorbill mean peak abundance at the Proposed Development (Offshore) during the breeding season was 1,762 (1,761.87) individuals.The total mean peak of breeding adults from North Caithness Cliffs SPA potentially impacted by distributional responses are 99 (98.50) per annum during the breeding season (Table 10-30).

10.2.3.138 The consequent potential mortality for breeding adult razorbill from North Caithness Cliffs SPA is estimated at less than one (0.49) breeding adults per annum, based on the Applicant Approach.

10.2.3.139 Using the citation colony count of 4,000 breeding adults and an annual background mortality of 420 breeding adults, the addition of less than one predicted breeding adult mortality per annum would result in a 0.012 survival rate percentage point change during the breeding season. When considering the most up to date counts of 13,384 breeding adults and an annual background mortality of 1,405 breeding adults, this results in a 0.004 survival rate percentage point change during the breeding season per annum (see Table 10-30).

Non-breeding Season

10.2.3.140 The estimated razorbill mean peak abundance at the Proposed Development (Offshore) Site (plus 2km buffer) during the non-breeding season is 1,930 (1,930.00) individuals. Based on the Furness (2015)[87] non-breeding season BDMPS region SPA proportional split corresponding to the mean peak abundance recorded, 0.55% of predicted mortalities during the non-breeding season are estimated to derive from North Caithness Cliffs SPA (Application Document 13, Appendix 13-1: Caledonia North Apportioning Technical Note and Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note).

10.2.3.141 The consequent predicted distributional response mortality of adult razorbill from North Caithness Cliffs SPA during the non-breeding season is predicted at significantly less than one (0.05) per annum.

10.2.3.142 Based on the citation colony count of 4,000 breeding adults and using an annual background mortality of 420 breeding adults, the addition of less than one predicted breeding adult mortality per annum would result in a 0.001 survival rate percentage point change during the non-breeding season. When considering the most up to date counts of 13,384 breeding adults and an annual background mortality of 1,405 breeding adult adults, this results in a <0.001 survival rate percentage point change during the non-breeding season (Table 10-30).

Annual Total

10.2.3.143 The predicted resultant mortality across all defined seasons from The Proposed Development (Offshore), attributed to North Caithness Cliffs SPA, is less than one (0.55) predicted breeding adult mortality per annum. This is predicted to result in a survival rate percentage point change against the citation and most recently published counts of 0.014 and 0.004 respectively (see Table 10-30).

10.2.3.144 When considering the Guidance approach, a total of two - three (1.84 - 3.14) breeding adult mortalities are predicted due to potential distributional response effects per annum. This results in a survival rate percentage point change of 0.046 – 0.079 against the citation and 0.014 – 0.023 against the most recently published count (Table 10-30).

10.2.3.145 As impacts exceeds a 0.02 survival rate percentage point change threshold when considering the Guidance approach, PVA has been undertaken to further assess the level of potential effect predicted.

Population Viability Analysis

10.2.3.146 The potential for distributional responses alone has been assessed against the latest 2015-2023 colony count population size of 13,384 breeding adults according to the Seabird Monitoring Programme (2020) database. A range of impact values from two to three breeding adult additional mortalities per annum were modelled, which allows for consideration of the Guidance approach predicted impact levels, as set out in Table 10-125 of Section 10.3.3. Even when considering a maximum predicted impact of three, the annual reduction in the growth rate is predicted to be at most 0.025% against the latest colony count (PVA outputs against the citation count are presented in Application Document 13, Appendix 13-2: Caledonia North Habitats Regulations Appraisal Population Viability Analysis Technical Report and Application Document 14, Appendix 14-2: Caledonia South Habitats Regulations Appraisal Population Viability Analysis Technical Report as additional information) which would mean the colony would continue to grow in the long term.

10.2.3.147 Regardless of the colony's population trend, such a level of effect would almost certainly be indistinguishable from natural fluctuations in the population. **As such, no potential for an AEoSI to the conservation objectives of the razorbill feature of North Caithness Cliffs SPA in relation to distributional response effects in the O&M phase from the Proposed Development (Offshore) alone. Subject to natural change, razorbill will be maintained as a feature in the long term.**

Table 10-31: Razorbill O&M phase disturbance annual displacement matrix for impacts apportioned to North Caithness Cliffs SPA.

Annual Total	Mortality Rate (%)													
Displacement Rate (%)	1	2	3	5	10	20	30	40	50	60	70	80	90	100
10	0	0	0	1	1	2	3	4	5	7	8	9	10	11
20	0	0	1	1	2	4	7	9	11	13	15	17	20	22
30	0	1	1	2	3	7	10	13	16	20	23	26	29	33
40	0	1	1	2	4	9	13	17	22	26	31	35	39	44
50	1	1	2	3	5	11	16	22	27	33	38	44	49	55
60	1	1	2	3	7	13	20	26	33	39	46	52	59	65
70	1	2	2	4	8	15	23	31	38	46	53	61	69	76
80	1	2	3	4	9	17	26	35	44	52	61	70	79	87
90	1	2	3	5	10	20	29	39	49	59	69	79	88	98
100	1	2	3	5	11	22	33	44	55	65	76	87	98	109
Note, outputs highlighted in dark blue represent the predicted annual mortality estimates as per the Guidance Approach and those highlighted in yellow represent the predicted annual mortality estimates as per Applicant Approach. For further information regarding the Guidance and Applicant Approach see Section 2.5 of Volume 7B, Appendix 6-2: Offshore Ornithology Distributional Responses Technical Report and Volume 7B, Appendix 6-2, Annex 4: Review of Relevant Evidence.														

Puffin

10.2.3.148 Puffin have been screened into the assessment for distributional responses as they are susceptible to displacement due to their distribution and behaviours (Furness and Wade, 2012[79]; Furness *et al*., 2013[80]; Bradbury *et al*., 2014[81]; NatureScot, 2023[82]).

Status

10.2.3.149 The SPA population of puffin was cited as 4,160 breeding adults in 1985-1987. The most recently published count (2015-2023) is 3,011 breeding adults (SMP, 2024[152]).

10.2.3.150 When considering a breeding adult baseline mortality rate of 0.094 (1-0.906, Horswill and Robinson, 2015[85]), 391 (391.04) and 283 (283.03) breeding adults from the SPA population would be subject to natural mortality per annum, in relation to the citation count and most recently published count (2015-2023) respectively. As of June 2023, the puffin feature at North Caithness Cliffs SPA is considered to be 'Unfavourable' and 'Declining'.

Seasonal Apportionment of Potential Impacts

10.2.3.151 In line with NatureScot guidance, the assessment is carried out on a seasonal basis as the potential impacts on the SPA features varies by season. Puffin have been assessed during the breeding season of April to mid-August and non-breeding season of mid-August to March in relation to North Caithness Cliffs SPA (see Section 7.3.3).

Appropriate Assessment

10.2.3.152 As outlined above, puffin have been screened into the assessment for distributional responses. The level of abundance apportioned is presented in Table 10-32 (detailed methods are presented within Application Document 13, Appendix 13-1: Caledonia North Apportioning Technical Note and Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note).

10.2.3.153 For puffin, distributional responses are assessed based on the birds within the Proposed Development (Offshore) And 2km buffer. The main focus of the assessment is based on the Applicant Approach of a displacement rate of 50% and a 1% mortality rate for O&M phase distributional response impacts. Presentation of distributional response impacts using the Guidance Approach recommended rates are also provided. Further details regarding the differences between the Guidance and Applicant Approach for distributional response assessment is provided within Volume 7B, Appendix 6-2, Annex 4: Review of Relevant Evidence.

Table 10-32: Puffin level of abundance apportioned to North Caithness Cliffs SPA seasonally.

Defined Season (Months)	Level of Apportionment (%)	Apportioned Abundance (Breeding Adults)
Breeding season (April to Mid-August)	2.63	18.38* / 54.27**
Non-breeding season (Mid-August to March)	0.13	3.80* / 1.69**
* It should be noted the Applicant has decided to include the Year 1 August count in the non-breeding season rather than during the breeding season. This is due to the Year 1 August abundance being considered to reflect migration rather than individuals present in the breeding season. ** The mean seasonal peaks for puffin have also been presented with the August count included in the breeding season as per the Guidance Approach. Note, apportioned abundance is presented for the Applicant Approach and the Guidance Approach, respectively.		

O&M Phase Potential Distributional Response Effects on the Qualifying Feature in Isolation

10.2.3.154 During the O&M phase, the potential level of impact apportioned to the SPA seasonally is summarised in Table 10-33 for both the Applicant and Guidance approach.

10.2.3.155 Displacement matrices are also presented for the annual apportioned abundance for the Proposed Development (Offshore) plus 2km buffer to North Caithness Cliffs SPA in Table 10-34 and Table 10-35 as per the Applicant and Guidance Approach, respectively.

Table 10-33: Puffin predicted distributional responses mortalities during the O&M phase attributed to North Caithness Cliffs SPA and resultant change in survival rate percentage point change compared to citation and most recent population counts.

Population Size (Breeding Adults)	Defined Season (Months)	Applicant Approach		Guidance Approach	
		50% displacement, 1% mortality	Change in Average Survival Rate (% Point Change)	60% displacement, 1-3% mortality (non-breeding); 3-5% mortality (breeding)	Change in Average Survival Rate (% Point Change)
Citation (4,160)	Breeding season (April to Mid-August)	0.09	0.002	0.98 - 1.63	0.023 – 0.039
	Non-breeding season (Mid-August to March)	0.02	<0.001	0.01 - 0.03	<0.001 – 0.001
	Annual	0.11	0.003	0.99 - 1.66	0.024 – 0.040
Latest count (3,011)	Breeding season (April to Mid-August)	0.09	0.003	0.98 - 1.63	0.032 – 0.054
	Non-breeding season (Mid-August to March)	0.02	0.001	0.01 - 0.03	<0.001 – 0.001
	Annual	0.11	0.004	0.99 - 1.66	0.033 – 0.055

Breeding Season

10.2.3.156 The estimated puffin mean peak abundance during the breeding season is 698 (698.06) individuals, with an estimated 5.15% of puffin during the breeding season deriving from North Caithness Cliffs SPA (Application Document 13, Appendix 13-1: Caledonia North Apportioning Technical Note and Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note). Assuming that 57% of the puffin population are adults (Furness, 2015[87]) and using an adult sabbatical rate of 7%, the total proportion of breeding adults from North Caithness Cliffs SPA potentially impacted by distributional responses are 55 (54.27) per annum during the breeding season (Table 10-33

10.2.3.157 When applying a displacement rate of 50% and a mortality rate of 1%, the consequent potential mortality is estimated to be significantly less than one (0.09) breeding adult per annum.

10.2.3.158 Using the citation colony count of 4,160 breeding adults and an annual background mortality of 391 breeding adults, the addition of less than one predicted breeding adult mortality per annum would result in a 0.002 survival rate percentage point change during the breeding season. When considering the most up to date counts of 3,011 breeding adults and an annual background mortality of 283 breeding adults, this results in a 0.003 survival rate percentage point change during the breeding season per annum (Table 10-33).

Non-breeding Season

10.2.3.159 The estimated puffin mean peak abundance during the non-breeding season is 3,004 (3,004.50) individuals. Based on the Furness (2015)[87] BDMPS region SPA proportional split during the non-breeding season, 0.13% of predicted mortalities are estimated to derive from North Caithness Cliffs SPA Application Document 13, Appendix 13-1: Caledonia North Apportioning Technical Note and Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note). Therefore, the total mean peak abundance of breeding adults from the SPA potentially impacted by distributional responses are four (3.80) per annum during the non-breeding season (Table 10-33).

10.2.3.160 When applying a displacement rate of 50% and a mortality rate of 1%, the consequent predicted distributional response mortality of breeding adult puffin from North Caithness Cliffs SPA during the non-breeding season is predicted at less than one (0.02) per annum.

10.2.3.161 Based on the 1985 - 1987 citation colony count of 4,160 breeding adults and using an annual background mortality of 391 breeding adults, the addition of less than one predicted breeding adult mortality per annum would result in a <0.001 survival rate percentage point change during the non-breeding season. When considering the most up to date counts of 3,011 breeding adults and an annual background mortality of 283 breeding adults, this results in a 0.001 survival rate percentage point change during the non-breeding season per annum (Table 10-33).

Annual Total

10.2.3.162 The predicted resultant mortality across all defined seasons from The Proposed Development (Offshore), attributed to North Caithness Cliffs SPA, is significantly less than one (0.11) breeding adult puffin per annum. This is predicted to result in a survival rate percentage point change against the citation and most recently published counts of 0.003 and 0.004 respectively (see Table 10-33).

10.2.3.163 When considering the Guidance approach, a total of one - two (0.99 - 1.66) breeding adult mortalities are predicted due to potential distributional response effects per annum. This results in a survival rate percentage point change of 0.024 – 0.040 against the citation and 0.033 – 0.055 against the most recently published count (Table 10-33).

10.2.3.164 As impacts exceeds a 0.02 survival rate percentage point change threshold when considering the Guidance approach, PVA has been undertaken to further assess the level of potential effect predicted.

Population Viability Analysis

10.2.3.165 The potential for distributional responses alone has been assessed against the latest 2016-2023 colony count population size of 3,011 breeding adults according to the Seabird Monitoring Programme (2020) database. A range of impact values from one to two breeding adult additional mortalities per annum were modelled, which allows for consideration of the Guidance approach predicted impact levels, as set out in Table 10-129 of Section 10.3.3. Even when considering a maximum predicted impact of two, the annual reduction in the growth rate is predicted to be at most 0.067% against the latest colony count (PVA outputs against the citation count are presented in Application Document 13, Appendix 13-2: Caledonia North Habitats Regulations Appraisal Population Viability Analysis Technical Report and Application Document 14, Appendix 14-2: Caledonia South Habitats Regulations Appraisal Population Viability Analysis Technical Report as additional information).

10.2.3.166 Although the colony has recently declined in population and is considered to be in an unfavourable condition the minimal impacts assessed under all scenarios would almost certainly be indistinguishable from natural fluctuations in the population. **There is, therefore, no potential for an AEoSI to the conservation objectives of the puffin feature of North Caithness Cliffs SPA in relation to distributional response effects in the O&M phase from the Proposed Development (Offshore) alone. Subject to natural change, puffin will be maintained as a feature in the long term.**

Table 10-34: Puffin O&M phase disturbance annual displacement matrix for impacts apportioned to North Caithness Cliffs SPA. Note, this table presents the Applicant Approach for puffin, whereby the Year 1 August abundance has been incorporated as part of the non-breeding season.

Annual Total	Mortality Rate (%)													
Displacement Rate (%)	1	2	3	5	10	20	30	40	50	60	70	80	90	100
10	0	0	0	0	0	0	1	1	1	1	2	2	2	2
20	0	0	0	0	0	1	1	2	2	3	3	4	4	4
30	0	0	0	0	1	1	2	3	3	4	5	5	6	7
40	0	0	0	0	1	2	3	4	4	5	6	7	8	9
50	0	0	0	1	1	2	3	4	6	7	8	9	10	11
60	0	0	0	1	1	3	4	5	7	8	9	11	12	13
70	0	0	0	1	2	3	5	6	8	9	11	12	14	16
80	0	0	1	1	2	4	5	7	9	11	12	14	16	18
90	0	0	1	1	2	4	6	8	10	12	14	16	18	20
100	0	0	1	1	2	4	7	9	11	13	16	18	20	22

Note, outputs highlighted in dark blue represent the predicted annual mortality estimates as per the Guidance Approach and those highlighted in yellow represent the predicted annual mortality estimates as per Applicant Approach. For further information regarding the Guidance and Applicant Approach see Section 2.5 of Volume 7B, Appendix 6-2: Offshore Ornithology Distributional Responses Technical Report and Volume 7B, Appendix 6-2, Annex 4: Review of Relevant Evidence.

Table 10-35: Puffin O&M phase disturbance annual displacement matrix for impacts apportioned to North Caithness Cliffs SPA. Note, this table presents the Guidance Approach for puffin, whereby the Year 1 August abundance has been incorporated as part of the breeding season.

Annual Total	Mortality Rate (%)												
Displacement Rate (%)	1	2	3	5	10	20	30	40	50	60	70	80	90	100
10	0	0	0	0	1	1	2	2	3	3	4	4	5	6
20	0	0	0	1	1	2	3	4	6	7	8	9	10	11
30	0	0	1	1	2	3	5	7	8	10	12	13	15	17
40	0	0	1	1	2	4	7	9	11	13	16	18	20	22
50	0	1	1	1	3	6	8	11	14	17	20	22	25	28
60	0	1	1	2	3	7	10	13	17	20	24	27	30	34
70	0	1	1	2	4	8	12	16	20	24	27	31	35	39
80	0	1	1	2	4	9	13	18	22	27	31	36	40	45
90	1	1	2	3	5	10	15	20	25	30	35	40	45	50
100	1	1	2	3	6	11	17	22	28	34	39	45	50	56

Note, outputs highlighted in dark blue represent the predicted annual mortality estimates as per the Guidance Approach and those highlighted in yellow represent the predicted annual mortality estimates as per Applicant Approach. For further information regarding the Guidance and Applicant Approach see Section 2.5 of Volume 7B, Appendix 6-2: Offshore Ornithology Distributional Responses Technical Report and Volume 7B, Appendix 6-2, Annex 4: Review of Relevant Evidence.

Troup, Pennan and Lion's Heads SPA

10.2.3.167 The centroid of the Troup, Pennan and Lion's Heads SPA is 59.8km (around land) from the centre of the Caledonia OWF, within the MMFR +1SD of guillemot (73.2±80.5km), razorbill (88.7±75.9km), herring gull (58.8±26.8km), and kittiwake (156.1±144.5km), (Woodward *et al*., 2019[78]). As such, potential for LSE alone has been identified for the following features of Troup, Pennan and Lion's Heads SPA:

- Kittiwake
  - Collision (O&M)
  - Distributional response (O&M)
  - Distributional response (C&D, Section 7.3.1)
- Herring gull
  - Collision (O&M)
- Guillemot
  - Distributional response (O&M)
  - Distributional response (C&D, Section 7.3.1)
- Razorbill
  - Distributional response (O&M)
  - Distributional response (C&D, Section 7.3.1)

Conservation Objectives

- To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and
- To ensure for the qualifying species that the following are maintained in the long term:
  - Population of the species as a viable component of the site;
  - Distribution of the species within site;
  - Distribution and extent of habitats supporting the species;
  - Structure, function and supporting processes of habitats supporting the species; and
  - No significant disturbance of the species.

Kittiwake

10.2.3.168 Kittiwake have been screened into the assessment for collision risk as they are susceptible to collision due to their flight height distribution and behaviours (Furness and Wade, 2012[79]; Furness *et al*., 2013[80]; Bradbury *et al*., 2014[81]; NatureScot, 2023[82]).

10.2.3.169 Kittiwake have also been assessed for distributional responses as requested by NatureScot within consultation; however, the Applicant remains of the position that kittiwake do not require assessment for distributional responses due to the evidence base detailed within Volume 7B, Appendix 6-2, Annex 4: Review of Relevant Evidence suggesting kittiwake show limited behavioural response to OWFs. Distributional responses are assessed based on the birds within the Proposed Development (Offshore) And 2km buffer. A Guidance approach only is presented for kittiwake based on a displacement rate of 30% and a 1-3% mortality rate for O&M phase distributional response impacts.

10.2.3.170 The level of predicted abundance and collision risk apportioned to the kittiwake feature of the Troup, Pennan and Lion's Heads SPA to inform assessments is presented in Table 10-36 (detailed methods are presented within Application Document 13, Appendix 13-1: Caledonia North Apportioning Technical Note and Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note).

Table 10-36: Kittiwake level of abundance and collision risk apportioned to Troup, Pennan and Lion's Heads SPA seasonally.

Defined Season (Months)	Level of Apportionment (%)	Apportioned Abundance (Breeding Adults)	Apportioned collision risk (breeding adults)
Breeding season (Mid-April to August)	10.04	204.63	5.55
Non-breeding season (September to early-April)	2.15 (Autumn %) 2.85 (Spring %)	10.40	0.29
Note, two weightings for apportioning non-breeding season kittiwake are provided for autumn migration (September to December), and spring migration (January to Early-April). The autumn weighting has been used to apportion the potential numbers of non-breeding kittiwake distributional response as the mean peak of this species was recorded during the autumn migration season. While both the Spring and Autumn weightings have been used to apportion collision mortalities during the non-breeding season.			

Status

10.2.3.171 The SPA population of kittiwake was cited as 63,200 breeding adults in 1995. The most recently published count (2017 - 2023) is 27,344 breeding adults (SMP, 2024[152]).

10.2.3.172 When considering a breeding adult baseline mortality rate of 0.146 (1- 0.854, Horswill and Robinson 2015)[85], 9,227 (9,227.20) and 3,992 (3,992.22) breeding adults from the SPA population would be subject to natural mortality per annum, in relation to the citation count and most recently published count (2017 - 2023) respectively. As of June 2023, the kittiwake feature at Troup, Pennan and Lion's Heads SPA is considered to be 'Unfavourable' and 'Declining'.

Seasonal Apportionment of Potential Impacts

10.2.3.173 In line with NatureScot guidance, the assessment is carried out on a seasonal basis as the potential impacts on the SPA features varies by season. Kittiwake have been assessed during the breeding season of mid-April to August and non-breeding season of September to early April in relation to Troup, Pennan and Lion's Heads SPA (see Section 7.3.3).

Appropriate Assessment

O&M Phase Potential Distributional Response Effects on the Qualifying Feature in Isolation

10.2.3.174 During the O&M phase, the potential level of impact apportioned to the SPA seasonally is summarised in Table 10-37 for the Guidance approach.

10.2.3.175 A displacement matrix is also presented for the annual apportioned abundance for the Proposed Development (Offshore) plus 2km buffer to Troup, Pennan and Lion's Heads SPA in Table 10-38.

Table 10-37: Kittiwake predicted distributional responses mortalities during the O&M phase attributed to Troup, Pennan and Lion's Heads SPA and resultant change in survival rate percentage point change compared to citation and most recent population counts (guidance approach).

Population Size (Breeding Adults)	Defined Season (Months)	Guidance Approach	
		30% displacement, 1-3% mortality	Change in Average Survival Rate (% Point Change)
Citation (63,200)	Breeding season (Mid-April to August)	0.61 - 1.84	0.001 – 0.003
	Non-breeding season (September to early-April)	0.03 - 0.09	<0.001
	Annual	0.65 - 1.94	0.001 – 0.003
Latest count (27,344)	Breeding season (Mid-April to August)	0.61 - 1.84	0.002 – 0.007
	Non-breeding season (September to early-April)	0.03 - 0.09	<0.001
	Annual	0.65 - 1.94	0.002 – 0.007

Breeding Season

10.2.3.176 The estimated kittiwake mean peak abundance during the breeding season is 2,038 (2,038.69) individuals, with an estimated 21.04% of all individuals during the breeding season deriving from Troup, Pennan and Lion's Heads SPA (Application Document 13, Appendix 13-1: Caledonia North Apportioning Technical Note and Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note). Assuming that 53% of the kittiwake population are adults (Furness, 2015)[87] and using an adult sabbatical rate of 10%, the total proportion of breeding adults from Troup, Pennan and Lion's Heads SPA potentially impacted by distributional responses are 205 (204.63) per annum during the breeding season (Table 10-37).

10.2.3.177 When applying a displacement rate of 30% and a mortality rate of 1-3%, the consequent potential mortality is estimated at less than one - two (0.61 - 1.84) breeding adults per annum.

10.2.3.178 Using the citation colony count of 63,200 breeding adults and an annual background mortality of 9,227 breeding adults, the addition of less than one - two predicted breeding adult mortalities would result in a 0.001 – 0.003 survival rate percentage point change during the breeding season per annum. When considering the most up to date counts of 27,344 breeding adults and an annual background mortality of 3,992 breeding adults, this results in a 0.002 – 0.007 survival rate percentage point change during the breeding season per annum (Table 10-37).

Non-breeding Season

10.2.3.179 The estimated kittiwake mean peak abundance during the non-breeding season is 483 (483.00) individuals. Based on the Furness (2015)[87] non-breeding season BDMPS region SPA proportional split corresponding to the mean peak abundance recorded, 2.15% of predicted mortalities during the non-breeding season are estimated to derive from Troup, Pennan and Lion's Heads SPA (Application Document 13, Appendix 13-1: Caledonia North Apportioning Technical Note and Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note). Therefore, the total mean peak abundance of breeding adults from the SPA potentially impacted by distributional responses are 10 (10.40) per annum during the non-breeding season (Table 10-37).

10.2.3.180 When applying a displacement rate of 30% and a mortality rate of 1-3%, the consequent predicted distributional response mortality of breeding adult kittiwake from Troup, Pennan and Lion's Heads SPA during the non-breeding season is predicted at significantly less than one (0.03 - 0.09) per annum.

10.2.3.181 Based on the 1995 citation colony count of 63,200 breeding adults and using an annual background mortality of 9,227 breeding adults, the addition of significantly less than one predicted breeding adult mortality would result in a <0.001 survival rate percentage point change during the non-breeding season per annum. When considering the most up to date counts of 27,344 breeding adults and an annual background mortality of 3,992 breeding adults, this results in a <0.001 survival rate percentage point change during the non-breeding season per annum (Table 10-37).

Annual Total

10.2.3.182 The predicted resultant mortality across all defined seasons from The Proposed Development (Offshore), attributed to Troup, Pennan and Lion's Heads SPA, is less than one - two (0.65 - 1.94) breeding adult kittiwakes per annum. This is predicted to result in a survival rate percentage point change against the citation and most recently published counts of 0.001 – 0.003 and 0.002 – 0.007, respectively (Table 10-37).

10.2.3.183 For both the citation and most recently published counts, predicted additional breeding adult mortalities per annum equate to an <0.02 survival rate percentage point change. As this would be under the threshold considered for further investigation into population level effects it is also considered to be indistinguishable from natural fluctuations in the population. **As such, there is no potential for an AEoSI to the conservation objectives of kittiwake at Troup, Pennan and Lion's Heads SPA in relation to potential distributional response effects from the Proposed Development (Offshore) alone during the O&M phase. Therefore, subject to natural change, kittiwake will be maintained as a feature in the long term.**

Table 10-38: Kittiwake O&M phase disturbance annual displacement matrix for impacts apportioned to Troup, Pennan and Lion's Heads SPA (Guidance approach).

Annual Total Displacement Rate (%)	Mortality Rate (%)													
	1	2	3	5	10	20	30	40	50	60	70	80	90	100
10	0	0	1	1	2	4	6	9	11	13	15	17	19	22
20	0	1	1	2	4	9	13	17	22	26	30	34	39	43
30	1	1	2	3	6	13	19	26	32	39	45	52	58	65
40	1	2	3	4	9	17	26	34	43	52	60	69	77	86
50	1	2	3	5	11	22	32	43	54	65	75	86	97	108
60	1	3	4	6	13	26	39	52	65	77	90	103	116	129
70	2	3	5	8	15	30	45	60	75	90	105	120	135	151
80	2	3	5	9	17	34	52	69	86	103	120	138	155	172
90	2	4	6	10	19	39	58	77	97	116	135	155	174	194
100	2	4	6	11	22	43	65	86	108	129	151	172	194	215
Note, outputs highlighted in dark blue represent the predicted annual mortality estimates as per the Guidance Approach. For further information regarding the Guidance and Applicant Approach see Section 2.5 of Volume 7B, Appendix 6-2: Offshore Ornithology Distributional Responses Technical Report and Volume 7B, Appendix 6-2, Annex 4: Review of Relevant Evidence.														

O&M Phase Potential Collision Risk Impacts on the Qualifying Feature in Isolation

10.2.3.184 During the O&M phase, the potential level of impact from collision risk apportioned to the Troup, Pennan and Lion's Heads SPA and subsequent survival rate percentage point change is summarised in Table 10-39.

Table 10-39: Kittiwake predicted collision risk impacts during the O&M phase attributed to Troup, Pennan and Lion's Heads SPA and resultant change in survival rate percentage point change compared to citation and most recent population counts.

Population Size (Breeding Adults)	Defined Season (Months)	Collision risk impact	
		Breeding adults per annum	Change in Average Survival Rate (% Point Change)
Citation (63,200)	Breeding season (Mid-April to August)	5.55	0.009
	Non-breeding season (September to early-April)	0.29	<0.001
	Annual	5.83	0.009
Latest count (27,344)	Breeding season (Mid-April to August)	5.55	0.020
	Non-breeding season (September to early-April)	0.29	0.001
	Annual	5.83	0.021

Breeding Season

10.2.3.185 The predicted kittiwake collision mortality during the breeding season is 55 (55.27) individuals per annum, with an estimated 21.04% of all individuals during the breeding season deriving from Troup, Pennan and Lion's Heads SPA (Application Document 13, Appendix 13-1: Caledonia North Apportioning Technical Note and Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note). Assuming that 53% of the population are adults (Furness, 2015)[87] and using an adult sabbatical rate of 10%, the total proportion of breeding adults from Troup, Pennan and Lion's Heads SPA potentially subject to collision consequent mortality is six (5.55) per annum during the breeding season.

10.2.3.186 Using the citation colony count of 63,200 breeding adults and an annual background mortality of 9,227 breeding adults, the addition of six predicted breeding adult mortalities per annum would result in a 0.009 survival rate percentage point change during the breeding season. When considering the most up to date counts of 27,344 breeding adults and an annual background mortality of 3,992 breeding adults, this results in a 0.020 survival rate percentage point change during the breeding season per annum (see Table 10-39).

Non-breeding Season

10.2.3.187 The predicted kittiwake collision mortality during the non-breeding season is 12 (11.74) individuals. Based on the Furness (2015)[87] spring and autumn season BDMPS region SPA proportional split, 2.15% and 2.85% of predicted mortalities during the non-breeding season are estimated to derive from Troup, Pennan and Lion's Heads SPA (Application Document 13, Appendix 13-1: Caledonia North Apportioning Technical Note and Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note), the consequent predicted collision mortality of adult kittiwake during the non-breeding season is predicted at less than one (0.29) per annum

10.2.3.188 Based on the 1995 citation colony count of 63,200 breeding adults and using an annual background mortality of 9,227 breeding adults, the addition of less than one predicted breeding adult mortalities per annum would result in a <0.001 survival rate percentage point change during the non-breeding season. When considering the most up to date counts of 27,344 breeding adults and an annual background mortality of 3,992 breeding adults, this results in a change in survival rate percentage point change of 0.001 during the non-breeding season per annum (see Table 10-39).

Annual Total

10.2.3.189 The predicted resultant mortality across all defined seasons from The Proposed Development (Offshore), attributed to Troup, Pennan and Lion's Heads SPA, is six (5.83) breeding adults per annum. This is predicted to result in a 0.009 and 0.021 survival rate percentage point change when considering the citation count and most recently published count, respectively (see Table 10-39).

10.2.3.190 As predicted impacts exceed a 0.02 survival rate percentage point change threshold for the Guidance Approach, PVA has been undertaken to further assess the level of potential effect predicted.

Population Viability Analysis

10.2.3.191 The potential for collision alone has been assessed against the latest 2017-2023 colony count population size of 27,344 breeding adults according to the Seabird Monitoring Programme (2020) database. An impact value of six breeding adult additional mortalities per annum were modelled, as set out in Table 10-139 of Section 10.3.3. Even when considering the maximum predicted impact of six breeding adult mortalities, the annual reduction in the growth rate is predicted to be at most 0.023% against the latest colony count.

10.2.3.192 Regardless of the colony's population trend and despite the colony being in decline and in unfavourable status, such a level of effect would almost certainly be indistinguishable from natural fluctuations in the population. **Therefore, no potential for an AEoSI to the conservation objectives of**

the kittiwake feature of Troup, Pennan and Lion's Heads SPA in relation to distributional response effects in the O&M phase from the Proposed Development (Offshore) alone can be concluded. Therefore, subject to natural change, kittiwake will be maintained as a feature in the long term.

O&M Phase Potential Combined Distributional Response and Collision Risk Impacts on the Qualifying Feature in Isolation

10.2.3.193 During the O&M phase, the potential level of combined impact from collision risk and distributional responses apportioned to the Troup, Pennan and Lion's Heads SPA and subsequent survival rate percentage point change is summarised in Table 10-40.

Table 10-40: Kittiwake predicted distributional response and collision risk impacts during the O&M phase attributed to Troup, Pennan and Lion's Heads SPA and resultant change in survival rate percentage point change compared to citation and most recent population counts.

Population Size (Breeding Adults)	Defined Season (Months)	Guidance Approach 30% displacement; 1-3% mortality	
		Estimated number of mortalities from combined CRM and Distributional responses per annum	Change in Average Survival Rate (% Point Change)
Citation (63,200)	Breeding season (Mid-March to September)	6.16 - 7.39	0.010- 0.012
	Non-breeding season (October to Early-March)	0.32 - 0.38	0.001
	Annual	6.48 - 7.77	0.010 – 0.012
Latest count (27,344)	Breeding season (Mid-March to September)	6.16 - 7.39	0.023 – 0.027
	Non-breeding season (October to Early-March)	0.32 - 0.38	0.001
	Annual	6.48 - 7.77	0.024 – 0.028

Breeding Season

10.2.3.194 As presented within (Table 10-40) the combined distributional response and collision risk impacts apportioned to the kittiwake feature of Troup, Pennan and Lion's Heads SPA, equates to approximately six - seven (6.16 - 7.39) additional breeding adult mortalities during the breeding season per annum (when considering a displacement rate of 30% and a mortality rate of 1-3%). Using the citation colony count of 63,200 breeding adults and an annual background mortality of 9,227 breeding adults, the addition of six - seven predicted breeding adult mortalities would result in a 0.010- 0.012 survival rate percentage point change during the breeding season per annum. When considering the most up to date count of 27,344 breeding adults and an annual background mortality of 3,992 breeding adults, this results in a 0.023 – 0.027 survival rate percentage point change during the breeding season per annum (see Table 10-40).Table 10-40: Kittiwake predicted distributional response and collision risk impacts during the O&M phase attributed to Troup, Pennan and Lion's Heads SPA and resultant change in survival rate percentage point change compared to citation and most recent population counts.

Non-breeding Season

10.2.3.195 As presented within Table 10-40 the combined distributional response and collision risk impacts apportioned to the kittiwake feature of Troup, Pennan and Lion's Heads SPA, equates to approximately less than one (0.32 - 0.38) additional adult mortality during the non-breeding season per annum (when considering a displacement rate of 30% and a mortality rate of 1-3%). Using the citation colony count of 63,200 breeding adults and an annual background mortality of 9,227 breeding adults, the addition of less than one predicted breeding adult mortality would result in a 0.001 survival rate percentage point change during the breeding season per annum. When considering the most up to date counts of 27,344 and an annual background mortality of 3,992 breeding adults, this results in a 0.001 survival rate percentage point change during the non-breeding season per annum (Table 10-40).

Annual Total

10.2.3.196 The predicted resultant mortality across all defined seasons from The Proposed Development (Offshore), attributed to Troup, Pennan and Lion's Heads, is six - eight (6.48 - 7.77) kittiwake per annum. This is predicted to result in survival rate percentage point change against the citation and most recently published counts of 0.010 – 0.012 and 0.024 – 0.028 respectively (see Table 10-40).

10.2.3.197 As impacts exceeds a 0.02 survival rate percentage point change threshold for the Guidance Approach, PVA has been undertaken to further assess the level of potential effect predicted.

Population Viability Analysis

10.2.3.198 The potential for distributional responses and collision alone has been assessed against the latest 2017-2023 colony count population size of 27,344 breeding adults according to the Seabird Monitoring Programme (2020) database. A range of impact values from six to eight breeding adult additional mortalities per annum were modelled, which allows for consideration of the Guidance approach predicted impact levels, as set out in Table 10-139 of Section 10.3.3. When considering the maximum predicted impact of eight breeding adult mortalities, the annual reduction in the growth rate is predicted to be at most 0.035% against the latest colony count.

10.2.3.199 Regardless of the colony's declining population trend and unfavourable status, such a level of effect would almost certainly be indistinguishable from natural fluctuations in the population. **As such, no potential for an AEoSI to the conservation objectives of the kittiwake feature of Troup, Pennan and Lion's Heads SPA in relation to distributional response effects in the O&M phase from the Proposed Development (Offshore) alone can be concluded. Therefore, subject to natural change, kittiwake will be maintained as a feature in the long term.**

Herring gull

10.2.3.200 Herring gull have been screened into the assessment for O&M phase collision risk only. Due to potential connectivity being limited to the non-breeding season only for herring gull for all SPAs, a combined assessment for all SPAs is provided in Section 10.2.3, beginning in paragraph 10.2.3.581. As presented in paragraph 10.2.3.581, **the potential for an AEoSI to the conservation objectives of herring gull at Troup, Pennan and Lion's Heads SPA in relation to collision impacts from the Proposed Development (Offshore) alone during the O&M phase can confidently be ruled out. Therefore, subject to natural change, herring gull will be maintained as a feature in the long term.**

Guillemot

10.2.3.201 Guillemot have been screened into the assessment for distributional responses as they are susceptible to displacement due to their distribution and behaviours (Furness and Wade, 2012[79]; Furness *et al*., 2013[80]; Bradbury *et al*., 2014[81]; NatureScot, 2023[82]).

Status

10.2.3.202 The SPA population of guillemot was cited as 44,600 breeding adults in 1995. The most recently published count (2017 - 2023) is 47,719 breeding adults (SMP, 2024[152]).

10.2.3.203 When considering a breeding adult baseline mortality rate of 0.061 (1- 0.939, Horswill and Robinson 2015[85]), 2,721 (2,720.60) and 2,911 (2,910.86) breeding adults from the SPA population would be subject to natural mortality per annum, in relation to the citation count and most recently published count (2017 - 2023) respectively. As of June 2023, the guillemot feature at Troup, Pennan and Lion's Heads SPA is considered to be 'Unfavourable' and 'Recovering'.

Seasonal Apportionment of Potential Impacts

10.2.3.204 In line with NatureScot guidance, the assessment is carried out on a seasonal basis as the potential impacts on the SPA features varies by season. Guillemot have been assessed during the breeding season of April to mid-August and non-breeding season of mid-August to March in relation to Troup, Pennan and Lion's Heads SPA (see Section 7.3.3).

Appropriate Assessment

10.2.3.205 As outlined above, guillemot have been screened into the assessment for distributional responses. The level of abundance apportioned is presented in Table 10-41 (detailed methods are presented within Application Document 13, Appendix 13-1: Caledonia North Apportioning Technical Note and Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note).

10.2.3.206 For guillemot, distributional response is assessed based on the birds within the Proposed Development (Offshore) And 2km buffer. The main focus of the assessment is based on the Applicant Approach of a displacement rate of 50% and a 1% mortality rate for O&M phase distributional response impacts. Presentation of distributional response impacts using the Guidance approach recommended rates are also provided. Further details regarding the differences between the Guidance and Applicant Approach for distributional response assessment is provided within Volume 7B, Appendix 6-2, Annex 4: Review of Relevant Evidence.

Table 10-41: Guillemot level of predicted abundance apportioned to the guillemot feature of the Troup, Pennan and Lion's Heads SPA seasonally.

Defined Season (Months)	Level of Apportionment (%)	Apportioned Abundance (Breeding Adults)
Breeding season (April to Mid-August)	5.43	874.00
Non-breeding season (Mid-August to March)	6.75	452.78

O&M Phase Potential Distributional Response Effects on the Qualifying Feature in Isolation

10.2.3.207 During the O&M phase, the potential level of impact apportioned to the SPA seasonally is summarised in Table 10-42 for both the Applicant and Guidance Approach.

10.2.3.208 A displacement matrix is also presented for the annual apportioned abundance for the Proposed Development (Offshore) plus 2km buffer to Troup, Pennan and Lion's Heads SPA in Table 10-43.

Table 10-42: Guillemot predicted distributional responses mortalities during the O&M phase attributed to Troup, Pennan and Lion's Heads SPA and resultant change in survival rate percentage point change compared to citation and most recent population count

Population Size (Breeding Adults)	Defined Season (Months)	Applicant Approach		Guidance Approach	
		50% displacement, 1% mortality	Change in Average Survival Rate (% Point Change)	60% displacement, 1-3% mortality (non-breeding); 3-5% mortality (breeding)	Change in Average Survival Rate (% Point Change)
Citation (44,600)	Breeding season (April to Mid-August)	4.37	0.010	15.73 - 26.22	0.035 – 0.059
	Non-breeding season (Mid-August to March)	2.26	0.005	2.72 - 8.15	0.006 – 0.018
	Annual	6.63	0.015	18.45 - 34.37	0.041 – 0.077
Latest count (47,719)	Breeding season (April to Mid-August)	4.37	0.009	15.73 - 26.22	0.033 - 0.055
	Non-breeding season (Mid-August to March)	2.26	0.005	2.72 - 8.15	0.006 – 0.017
	Annual	6.63	0.014	18.45 - 34.37	0.039 – 0.072

Breeding season

10.2.3.209 The estimated guillemot mean peak abundance during the breeding season is 16,092 (16,091.78) individuals, with an estimated 10.25% of guillemot during the breeding season deriving from Troup, Pennan and Lion's Heads SPA (Application Document 13, Appendix 13-1: Caledonia North Apportioning Technical Note and Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note). Assuming that 57% of the guillemot population are adults (Furness, 2015)[87] and using an adult sabbatical rate of 7%, the total proportion of breeding adults from Troup, Pennan and Lion's Heads SPA potentially impacted by distributional responses are 874 (874.00) per annum during the breeding season (Table 10-42).

10.2.3.210 When applying a displacement rate of 50% and a mortality rate of 1%, the consequent potential mortality is estimated to four (4.37) breeding adults per annum.

10.2.3.211 Using the citation colony count of 44,600 breeding adults and an annual background mortality of 2,721 breeding adults, the addition of four predicted breeding adult mortalities per annum would result in a 0.010 survival rate percentage point change during the breeding season. When considering the most up to date counts of 47,719 breeding adults and an annual background mortality of 2,911 breeding adults, this results in a 0.009 survival rate percentage point change during the breeding season per annum (Table 10-42).

Non-breeding season

10.2.3.212 The estimated guillemot mean peak abundance during the non-breeding season is 6,710 (6,709.90) individuals. For guillemot, apportioning for the non-breeding season was based on the breeding population found within the MMFR + 1SD of the Caledonia OWF. This is in line with the approach outlined in the NatureScot Guidance Note 3 (NatureScot, 2023[82]), based on recent geolocator studies presented in Buckingham *et al.* (2022[88]). Based on the resultant SPA proportional split during the non-breeding season, 6.75% of predicted mortalities are estimated to derive from Troup, Pennan and Lion's Heads Cliffs SPA (Application Document 13, Appendix 13-1: Caledonia North Apportioning Technical Note and Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note). Therefore, the total mean peak abundance of breeding adults from the SPA potentially impacted by distributional responses are 453 (452.78) per annum during the non-breeding season (Table 10-42).

10.2.3.213 When applying a displacement rate of 50% and a mortality rate of 1%, the consequent predicted distributional response mortality of breeding adult guillemot from Troup, Pennan and Lion's Heads SPA during the non-breeding season is predicted at two (2.26) per annum.

10.2.3.214 Based on the 1995 citation colony count of 44,600 breeding adults and using an annual background mortality of 2,721 breeding adults, the addition of two predicted breeding adult mortalities per annum would result in a 0.005 survival rate percentage point change during the non-breeding season. When considering the most up to date counts of 47,719 breeding adults and an annual background mortality of 2,911 breeding adults, this results in a 0.005 survival rate percentage point change during the non-breeding season per annum (see Table 10-42).

Annual total

10.2.3.215 The predicted resultant mortality across all defined seasons from The Proposed Development (Offshore), attributed to Troup, Pennan and Lion's Heads SPA, is under seven (6.63) breeding adult guillemots per annum. This is predicted to result in a survival rate percentage point change against the citation and most recently published counts of 0.015 and 0.014 respectively (Table 10-42).

10.2.3.216 When considering the Guidance approach, a total of 18 to 34 (18.45 - 34.37) breeding adult mortalities are predicted due to potential distributional response effects per annum. This results in a survival rate percentage point change of 0.041 – 0.077 against the citation count and 0.039 – 0.072 against the most recently published count (Table 10-42).

10.2.3.217 The impacts do not exceed a 0.02 survival rate percentage point change threshold when considering the Applicant Approach, but do for the Guidance approach, so PVA has been undertaken to further assess the level of potential effect predicted.

Population Viability Analysis

10.2.3.218 The potential for distributional responses alone has been assessed against the latest 2017-2023 colony count population size of 47,719 breeding adults according to the Seabird Monitoring Programme (2020) database. A range of impact values from 18 to 34 breeding adult additional mortalities per annum were modelled, which allows for consideration of the Guidance approach predicted impact levels, as set out in Table 10-142 of Section 10.3.3. When considering the maximum predicted impact of 34 breeding adult mortalities, the annual reduction in the growth rate is predicted to be at most 0.081% against the latest colony count (PVA outputs against the citation count are presented in Application Document 13, Appendix 13-2: Caledonia North Habitats Regulations Appraisal Population Viability Analysis Technical Report and Application Document 14, Appendix 14-2: Caledonia South Habitats Regulations Appraisal Population Viability Analysis Technical Report as additional information).

10.2.3.219 Whilst recognising the population at this site has fluctuated through declines and increases since the citation count in 1995 it is considered to be in unfavourable, but recovering condition, with the latest count in 2019 being higher than the citation colony count. The reasons for the fluctuations are unclear, but not considered to be linked to the development of offshore wind farms within the Moray Firth, which have only been in operation for a short period. It is also worth noting that distributional responses are not considered likely to be at the upper end of the Guidance approach, particularly when considering monitoring studies from the operational Beatrice offshore wind farm within the Moray Firth. Therefore, when considering the Applicant Approach, it is clear that the loss of under seven birds per annum would likely be intangible from the natural baseline mortality per annum. However, whether considering the Applicant Approach or Guidance approach the impacts from Caledonia in-combination with all other projects would have a limited effect on the overall status or trajectory of the population, as the resulting reduction in growth rate of 0.081% as a consequence of the loss of a maximum 34 breeding adults per annum would not tip the long term colony growth rate of 0.28% into decline.

10.2.3.220 Therefore, when considering the long-term growth rate, regardless of the colony's population fluctuating trends, such a level of effect would likely be indistinguishable from natural fluctuations in the population. **As such, no potential for an AEoSI to the conservation objectives of the guillemot feature of Troup, Pennan and Lion's Heads SPA in relation to distributional response effects in the O&M phase from the Proposed Development (Offshore) alone can be concluded. Therefore, subject to natural change, guillemot will be maintained as a feature in the long term.**

Table 10-43: Guillemot O&M phase disturbance annual displacement matrix for impacts apportioned to Troup, Pennan and Lion's Heads SPA.

Annual Total	Mortality Rate (%)													
Displacement Rate (%)	1	2	3	5	10	20	30	40	50	60	70	80	90	100
10	1	3	4	7	13	27	40	53	66	80	93	106	119	133
20	3	5	8	13	27	53	80	106	133	159	186	212	239	265
30	4	8	12	20	40	80	119	159	199	239	279	318	358	398
40	5	11	16	27	53	106	159	212	265	318	371	425	478	531
50	7	13	20	33	66	133	199	265	332	398	464	531	597	663
60	8	16	24	40	80	159	239	318	398	478	557	637	716	796
70	9	19	28	46	93	186	279	371	464	557	650	743	836	929
80	11	21	32	53	106	212	318	425	531	637	743	849	955	1,061
90	12	24	36	60	119	239	358	478	597	716	836	955	1,075	1,194
100	13	27	40	66	133	265	398	531	663	796	929	1,061	1,194	1,327
Note, outputs highlighted in dark blue represent the predicted annual mortality estimates as per the Guidance Approach and those highlighted in yellow represent the predicted annual mortality estimates as per Applicant Approach. For further information regarding the Guidance and Applicant Approach see Section 2.5 of Volume 7B, Appendix 6-2: Offshore Ornithology Distributional Responses Technical Report and Volume 7B, Appendix 6-2, Annex 4: Review of Relevant Evidence														

Razorbill

10.2.3.221 Razorbill have been screened into the assessment for distributional responses as they are susceptible to displacement due to their distribution and behaviours (Furness and Wade, 2012[79]; Furness *et al.*, 2013[80]; Bradbury *et al.*, 2014[81]; NatureScot, 2023[82]).

Status

10.2.3.222 The SPA population of razorbill was cited as 4,800 breeding adults in 1995. The most recently published count (2017-2023) is 8,801 breeding adults (SMP, 2024[152]).

10.2.3.223 When considering a breeding adult baseline mortality rate of 0.105 (1-0.895, Horswill and Robinson, 2015[85]), 504 (504.00) and 924 (924.11) breeding adults from the SPA population would be subject to natural mortality per annum, in relation to the citation count and most recently published count (2017-2023) respectively. As of June 2023, the razorbill feature at Troup, Pennan and Lion's Heads SPA is considered to be 'Favourable' and 'Recovered'.

Seasonal Apportionment of Potential Impacts

10.2.3.224 In line with NatureScot guidance, the assessment is carried out on a seasonal basis as the potential impacts on the SPA features varies by season. Razorbill have been assessed during the breeding season of April to Mid-August and non-breeding season of Mid-August to March in relation to Troup, Pennan and Lion's Heads SPA (see Section 7.3.3).

Appropriate Assessment

10.2.3.225 As outlined above, razorbill have been screened into the assessment for distributional responses. The level of abundance apportioned is presented in Table 10-44 (detailed methods are presented within Application Document 13, Appendix 13-1: Caledonia North Apportioning Technical Note and Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note).

10.2.3.226 For razorbill, distributional responses are assessed based on the birds within the Proposed Development (Offshore) And 2km buffer. The main focus of the assessment is based on the Applicant Approach of a displacement rate of 50% and a 1% mortality rate for O&M phase distributional response impacts. Presentation of distributional response impacts using the Guidance Approach recommended rates are also provided. Further details regarding the differences between the Guidance and Applicant Approach for distributional response assessment is provided within Volume 7B, Appendix 6-2, Annex 4: Review of Relevant Evidence.

Table 10-44: Razorbill level of abundance apportioned to Troup, Pennan and Lion's Heads SPA seasonally.

Defined Season (Months)	Level of Apportionment (%)	Apportioned Abundance (Breeding Adults)
Breeding season (April to Mid-August)	5.93	104.41
Non-breeding season (Mid-August to March)	0.59	11.37

O&M Phase Potential Distributional Response Effects on the Qualifying Feature in Isolation

10.2.3.227 During the O&M phase, the potential level of impact apportioned to the SPA seasonally is summarised in Table 10-45 for both the Applicant and Guidance approach.

10.2.3.228 A displacement matrix is also presented for the annual apportioned abundance for the Proposed Development (Offshore) plus 2km buffer to Troup, Pennan and Lion's Heads SPA is presented in Table 10-46.

Table 10-45: Razorbill predicted distributional responses mortalities during the O&M phase attributed to Troup, Pennan and Lion's Heads SPA and resultant change in survival rate percentage point change compared to citation and most recent population counts.

Population Size (Breeding Adults)	Defined Season (Months)	Applicant Approach		Guidance Approach	
		50% displacement, 1% mortality	Change in Average Survival Rate (% Point Change)	60% displacement, 1-3% mortality (non-breeding); 3-5% mortality (breeding)	Change in Average Survival Rate (% Point Change)
Citation (4,800)	Breeding season (April to Mid-August)	0.52	0.011	1.88 – 3.13	0.039 – 0.065
	Non-breeding season (Mid-August to March)	0.06	0.001	0.07 – 0.20	0.001 – 0.004
	Annual	0.58	0.012	1.95 – 3.34	0.041 – 0.070
Latest count (8,801)	Breeding season (April to Mid-August)	0.52	0.006	1.88 – 3.13	0.021 – 0.036
	Non-breeding season (Mid-August to March)	0.06	0.001	0.07 – 0.20	0.001 – 0.002
	Annual	0.58	0.007	1.95 – 3.34	0.022 – 0.038

Breeding Season

10.2.3.229 The estimated razorbill mean peak abundance during the breeding season is 1,762 (1,761.87) individuals, with an estimated 11.18% of razorbill during the breeding season deriving from Troup, Pennan and Lion's Heads SPA (Application Document 13, Appendix 13-1: Caledonia North Apportioning Technical Note and Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note). Assuming that 57% of the razorbill population are adults (Furness, 2015)[87] and using an adult sabbatical rate of 7%, the total proportion of breeding adults from Troup, Pennan and Lion's Heads SPA potentially impacted by distributional responses are 104 (104.41) per annum during the breeding season (Table 10-45).

10.2.3.230 When applying a displacement rate of 50% and a mortality rate of 1%, the consequent potential mortality for breeding adult razorbill from Troup, Pennan and Lion's Heads SPA is estimated at less than one (0.52) breeding adult per annum.

10.2.3.231 Using the citation colony count of 4,800 breeding adults and an annual background mortality of 504 breeding adults, the addition of less than one predicted breeding adult mortality per annum would result in a 0.011 survival rate percentage point change during the breeding season. When considering the most up to date counts of 8,801 breeding adults and an annual background mortality of 924 breeding adults, this results in a 0.006 survival rate percentage point change during the breeding season per annum (see Table 10-45).

Non-breeding Season

10.2.3.232 The estimated razorbill mean peak abundance during the non-breeding season is 1,930 (1,930.00) individuals. Based on the Furness (2015)[87] non-breeding season BDMPS region SPA proportional split corresponding to the mean peak abundance recorded, 0.59% of predicted mortalities during the non-breeding season are estimated to derive from Troup, Pennan and Lion's Heads SPA (Application Document 13, Appendix 13-1: Caledonia North Apportioning Technical Note and Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note). Therefore, the total mean peak abundance of breeding adults from the SPA potentially impacted by distributional responses are 11 (11.37) per annum during the non-breeding season (Table 10-45).

10.2.3.233 When applying a displacement rate of 50% and a mortality rate of 1%, the consequent predicted distributional response mortality of breeding adult razorbill from Troup, Pennan and Lion's Heads SPA during the non-breeding season is predicted at significantly less than one (11.37) per annum.

10.2.3.234 Based on the citation colony count of 4,800 breeding adults and using an annual background mortality of 504 breeding adults, the addition of less than one predicted breeding adult mortality per annum would result in a 0.001 survival rate percentage point change during the non-breeding season. When considering the most up to date counts of 8,801 breeding adults and an annual background mortality of 924 breeding adult adults, this results in a 0.001 survival rate percentage point change during the non-breeding season (Table 10-45).

Annual Total

10.2.3.235 The predicted resultant mortality across all defined seasons from The Proposed Development (Offshore), attributed to Troup, Pennan and Lion's Heads SPA, is one (0.58) predicted breeding adult mortalities per annum would. The predicted resultant mortality across all defined seasons from The Proposed Development (Offshore), attributed to Troup, Pennan and Lion's Heads SPA, is less than one (0.58) predicted breeding adult mortalities per annum would. The is predicted to result in a survival rate percentage point change against the citation and most recently published counts of 0.012 and 0.007 respectively (see Table 10-45).

10.2.3.236 When considering the Guidance approach, a total of two - three (1.95 – 3.34) breeding adult mortalities are predicted due to potential distributional response effects per annum. This results in a survival rate percentage point change of 0.041 – 0.070 against the citation and 0.022 – 0.038 against the most recently published count (Table 10-45).

10.2.3.237 As impacts exceeds a 0.02 survival rate percentage point change threshold when considering the Guidance approach, PVA has been undertaken to further assess the level of potential effect predicted.

Population Viability Analysis

10.2.3.238 The potential for distributional responses alone has been assessed against the latest 2017-2023 colony count population size of 8,801 breeding adults according to the Seabird Monitoring Programme (2020) database. A range of impact values from two to three breeding adult additional mortalities per annum were modelled, which allows for consideration of the Guidance approach predicted impact levels, as set out in Table 10-146 of Section 10.3.3. Even when considering a predicted impact of three breeding adult mortalities (based on 60% displacement and 3-5% mortality rate), the annual reduction in the growth rate is predicted to be at most 0.054% against the latest colony count (PVA outputs against the citation count are presented in Application Document 13, Appendix 13-2: Caledonia North Habitats Regulations Appraisal Population Viability Analysis Technical Report and Application Document 14, Appendix 14-2: Caledonia South Habitats Regulations Appraisal Population Viability Analysis Technical Report as additional information).

10.2.3.239 Regardless of the colony's population trend, such a level of effect would almost certainly be indistinguishable from natural fluctuations in the population. **As such, no potential for an AEoSI to the conservation objectives of the razorbill feature of Troup, Pennan and Lion's Heads SPA in relation to distributional response effects in the O&M phase from the Proposed Development (Offshore) alone can be concluded. Therefore, subject to natural change, razorbill will be maintained as a feature in the long term.**

Table 10-46: Razorbill O&M phase disturbance annual displacement matrix for impacts apportioned to Troup, Pennan and Lion's SPA.

Annual Total	Mortality Rate (%)													
Displacement Rate (%)	1	2	3	5	10	20	30	40	50	60	70	80	90	100
10	0	0	0	1	1	2	3	5	6	7	8	9	10	12
20	0	0	1	1	2	5	7	9	12	14	16	19	21	23
30	0	1	1	2	3	7	10	14	17	21	24	28	31	35
40	0	1	1	2	5	9	14	19	23	28	32	37	42	46
50	1	1	2	3	6	12	17	23	29	35	41	46	52	58
60	1	1	2	3	7	14	21	28	35	42	49	56	63	69
70	1	2	2	4	8	16	24	32	41	49	57	65	73	81
80	1	2	3	5	9	19	28	37	46	56	65	74	83	93
90	1	2	3	5	10	21	31	42	52	63	73	83	94	104
100	1	2	3	6	12	23	35	46	58	69	81	93	104	116

Note, outputs highlighted in dark blue represent the predicted annual mortality estimates as per the Guidance Approach and those highlighted in yellow represent the predicted annual mortality estimates as per Applicant Approach. For further information regarding the Guidance and Applicant Approach see Section 2.5 of Volume 7B, Appendix 6-2: Offshore Ornithology Distributional Responses Technical Report and Volume 7B, Appendix 6-2, Annex 4: Review of Relevant Evidence.

Pentland Firth Islands SPA

10.2.3.240 The centroid of the Pentland Firth Islands SPA is 65.2km from The Proposed Development (Offshore), within the MMFR +1SD of Artic tern (25.7±14.8km) (Woodward *et al*., 2019[78]).

10.2.3.241 As such, potential for LSE alone has been identified for the following features of Pentland Firth Islands SPA:

- Arctic tern
  - Migratory collision (O&M)

Conservation Objectives

- To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and
- To ensure for the qualifying species that the following are maintained in the long term:
  - Population of the species as a viable component of the site;
  - Distribution of the species within site;
  - Distribution and extent of habitats supporting the species;
  - Structure, function and supporting processes of habitats supporting the species; and
  - No significant disturbance of the species.

Appropriate Assessment

Potential Migratory Collision Risk Effects in Isolation

10.2.3.242 Consideration of the potential migratory collision risk on qualifying features of SPAs screened in for assessment is provided in Section 7.3.10. **As concluded within Section 7.3.10, the potential for an AEoSI to the conservation objectives of the Arctic tern qualifying feature of Pentland Firth Islands SPA in relation to collision risk from the Proposed Development (Offshore) can be ruled out. Therefore, subject to natural change, Arctic tern will be maintained as a feature in the long term.**

Moray and Nairn Coast SPA and Ramsar Site

10.2.3.243 The centroid of the Moray and Nairn Coast SPA and Ramsar Site is 59.0km from the centre of the Caledonia OWF. As such, potential for LSE alone has been identified for the following features of Moray and Nairn Coast SPA and Ramsar Site:

- Bar-tailed godwit
  - Migratory collision (O&M)
- Pink footed goose

    - Migratory collision (O&M)
- Redshank
    - Migratory collision (O&M)
- Dunlin
    - Migratory collision (O&M)
- Oystercatcher
    - Migratory collision (O&M)
- Red-breasted merganser
    - Migratory collision (O&M)
- Greylag goose
    - Migratory collision (O&M)
- Wigeon
    - Migratory collision (O&M)

Conservation objectives

- To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and
- To ensure for the qualifying species that the following are maintained in the long term:
    - Population of the species as a viable component of the site;
    - Distribution of the species within site;
    - Distribution and extent of habitats supporting the species;
    - Structure, function and supporting processes of habitats supporting the species; and
    - No significant disturbance of the species.

Appropriate Assessment

Potential Migratory Collision Risk Effects in Isolation

10.2.3.244 Consideration of the potential migratory collision risk on qualifying features of SPAs screened in for assessment is provided in Section 7.3.10. **As concluded within Section 7.3.10, the potential for an AEoSI to the conservation objectives of the qualifying features of Moray and Nairn Coast SPA and Ramsar Site in relation to collision risk from the Proposed Development (Offshore) can be ruled out. Therefore, subject to natural change, all qualifying features assessed will be maintained as a feature in the long term.**

Copinsay SPA

10.2.3.245 The centroid of the Copinsay SPA is 80.9km (around land) from the centre of the Caledonia OWF, within the MMFR +1SD of kittiwake (156.1±144.5km) and guillemot (73.2±80.5km) (Woodward *et al.*, 2019[78]). As such, Potential for LSE alone has been identified for the following features of Copinsay SPA:

- Kittiwake
  - Collision (O&M)
  - Distributional response (O&M)
  - Distributional response (C&D, Section 7.3.1)
- Guillemot
  - Distributional response (O&M)
  - Distributional response (C&D, Section 7.3.1)

Conservation Objectives

- To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and
- To ensure for the qualifying species that the following are maintained in the long term:
  - Population of the species as a viable component of the site;
  - Distribution of the species within site;
  - Distribution and extent of habitats supporting the species;
  - Structure, function and supporting processes of habitats supporting the species; and
  - No significant disturbance of the species.

Kittiwake

10.2.3.246 Kittiwake have been screened into the assessment for O&M phase for distributional responses and collision risk. Due to potential connectivity being limited based on overall proportional weighting to Copinsay SPA, a combined assessment with other SPAs is provided in Section 10.2.3, beginning in paragraph 10.2.3.562. As presented in paragraph 10.2.3.562, **the potential for an AEoSI to the conservation objectives of kittiwake at Copinsay SPA in relation to both distributional responses and collision impacts from the Proposed Development (Offshore) alone during the O&M phase can confidently be ruled out. Therefore, subject to natural change, kittiwake will be maintained as a feature in the long term.**

Guillemot

10.2.3.247 Guillemot have been screened into the assessment for distributional responses as they are susceptible to displacement due to their distribution and behaviours ((Furness and Wade, 2012[79]; Furness *et al*., 2013[80]; Bradbury *et al*., 2014[81]; NatureScot, 2023[82]).

Status

10.2.3.248 The SPA population of guillemot was cited as 29,450 breeding adults in 1994 The most recently published count (2015 - 2023) is 10,967 breeding adults (SMP, 2024[152]).

10.2.3.249 When considering a breeding adult baseline mortality rate of 0.061 (1- 0.939, Horswill and Robinson 2015)[85], 1,797 (1,796.45) and 669 (668.99) breeding adults from the SPA population would be subject to natural mortality per annum, in relation to the citation count and most recently published count (2015 - 2023) respectively. As of June 2023, the guillemot feature at Copinsay SPA is considered to be 'Unfavourable' and 'Declining'.

Seasonal Apportionment of Potential Impacts

10.2.3.250 In line with NatureScot guidance, the assessment is carried out on a seasonal basis as the potential impacts on the SPA features varies by season. Guillemot have been assessed during the breeding season of April to mid-August and non-breeding season of mid-August to March in relation to Copinsay SPA (see Section 7.3.3).

Appropriate Assessment

10.2.3.251 As outlined above, guillemot have been screened into the assessment for distributional responses. The level of abundance apportioned is presented in Table 10-47 (detailed methods are presented within Application Document 13, Appendix 13-1: Caledonia North Apportioning Technical Note and Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note).

10.2.3.252 For guillemot, distributional response is assessed based on the birds within the Proposed Development (Offshore) And 2km buffer. The main focus of the assessment is based on the Applicant Approach of a displacement rate of 50% and a 1% mortality rate for O&M phase distributional response impacts. Presentation of distributional response impacts using the Guidance approach recommended rates are also provided. Further details regarding the differences between the Guidance and Applicant Approach for distributional response assessment is provided within Volume 7B, Appendix 6-2, Annex 4: Review of Relevant Evidence.

Table 10-47: Guillemot level of predicted abundance apportioned to the guillemot feature of the Copinsay SPA seasonally.

Defined Season (Months)	Level of Apportionment (%)	Apportioned Abundance (Breeding Adults)
Breeding season (April to Mid-August)	0.51	82.19
Non-breeding season (Mid-August to March)	1.55	104.06

O&M Phase Potential Distributional Response Effects on the Qualifying Feature in Isolation

10.2.3.253 During the O&M phase, the potential level of impact apportioned to the SPA seasonally is summarised in Table 10-48 for both the Applicant and Guidance Approach.

10.2.3.254 A displacement matrix is also presented for the annual apportioned abundance for the Proposed Development (Offshore) plus 2km buffer to Copinsay SPA in Table 10-49.

Table 10-48: Guillemot predicted distributional responses mortalities during the O&M phase attributed to Copinsay SPA and resultant change in survival rate percentage point change compared to citation and most recent population counts.

Population Size (Breeding Adults)	Defined Season (Months)	Applicant Approach		Guidance Approach	
		50% displacement, 1% mortality	Change in Average Survival Rate (% Point Change)	60% displacement, 1-3% mortality (non-breeding); 3-5% mortality (breeding)	Change in Average Survival Rate (% Point Change)
Citation (29,450)	Breeding season (April to Mid-August)	0.41	0.001	1.48 - 2.47	0.005 – 0.008
	Non-breeding season (Mid-August to March)	0.52	0.002	0.62 - 1.87	0.002 – 0.006
	Annual	0.93	0.003	2.10 - 4.34	0.007 – 0.015
Latest count (10,967)	Breeding season (April to Mid-August)	0.41	0.004	1.48 - 2.47	0.013 – 0.022
	Non-breeding season (Mid-August to March)	0.52	0.005	0.62 - 1.87	0.006 – 0.017
	Annual	0.93	0.008	2.10 - 4.34	0.019 – 0.040

Breeding Season

10.2.3.255 The estimated guillemot mean peak abundance during the breeding season is 16,092 (16,091.78) individuals, with an estimated 0.96% of guillemot during the breeding season deriving from Copinsay SPA (Application Document 13, Appendix 13-1: Caledonia North Apportioning Technical Note and Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note). Assuming that 57% of the guillemot population are adults (Furness, 2015)[87] and using an adult sabbatical rate of 7%, the total proportion of breeding adults from Copinsay SPA potentially impacted by distributional responses are 82 (82.19) per annum during the breeding season (Table 10-48).

10.2.3.256 When applying a displacement rate of 50% and a mortality rate of 1%, the consequent potential mortality is estimated at less than one (0.41) breeding adult per annum.

10.2.3.257 Using the citation colony count of 29,450 breeding adults and an annual background mortality of 1,797 breeding adults, the addition of less than one predicted breeding adult mortality per annum would result in a 0.001 survival rate percentage point change during the breeding season. When considering the most up to date counts of 10,967 breeding adults and an annual background mortality of 669 breeding adults, this results in a 0.004 survival rate percentage point change during the breeding season per annum (Table 10-48).

Non-breeding Season

10.2.3.258 The estimated guillemot mean peak abundance during the non-breeding season is 6,710 (6,709.90) individuals. For guillemot, apportioning for the non-breeding season was based on the breeding population found within the MMFR + 1SD of the Caledonia OWF. This is in line with the approach outlined in the NatureScot Guidance Note 3 (NatureScot, 2023[82]), based on recent geolocator studies presented in Buckingham *et al.* (2022[88]). Based on the resultant SPA proportional split during the non-breeding season, 1.55% of predicted mortalities are estimated to derive from Copinsay SPA (Application Document 13, Appendix 13-1: Caledonia North Apportioning Technical Note and Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note). Therefore, the total mean peak abundance of breeding adults from the SPA potentially impacted by distributional responses are 104 (104.06) per annum during the non-breeding season (Table 10-48).

10.2.3.259 When applying a displacement rate of 50% and a mortality rate of 1%, the consequent predicted distributional response mortality of breeding adult guillemot from Copinsay SPA during the non-breeding season is predicted at less than one (0.52) per annum.

10.2.3.260 Based on the 1994 citation colony count of 29,450 breeding adults and using an annual background mortality of 1,797 breeding adults, the addition of less than one predicted breeding adult mortality per annum would result in a 0.002 survival rate percentage point change during the non-breeding season. When considering the most up to date counts of 10,967 breeding adults and an annual background mortality of 669 breeding adults, this results in a 0.005 survival rate percentage point change during the non-breeding season per annum (Table 10-48).

Annual Total

10.2.3.261 The predicted resultant mortality across all defined seasons from The Proposed Development (Offshore), attributed to Copinsay SPA, is under one (0.93) breeding adult guillemot per annum. This is predicted to result in a survival rate percentage point change against the citation and most recently published counts of 0.003 and 0.008 respectively (Table 10-48).

10.2.3.262 When considering the Guidance approach, a total of two to four (2.10 - 4.34) breeding adult mortalities are predicted due to potential distributional response effects per annum. This results in a survival rate percentage point change of 0.007 – 0.015 against the citation count and 0.019 – 0.040 against the most recently published count (Table 10-48).

10.2.3.263 The impacts do not exceed a 0.02 survival rate percentage point change threshold when considering the Applicant Approach or the lower end of the Guidance approach. However, as the upper end of the Guidance approach tipped the threshold PVA has been undertaken to further assess the level of potential effect predicted.

Population Viability Analysis

10.2.3.264 The potential for distributional responses alone has been assessed against the latest 2015-2023 colony count population size of 10,967 breeding adults according to the Seabird Monitoring Programme (2020) database. A range of impact values from two to four breeding adult additional mortalities per annum were modelled, which allows for consideration of the Guidance approach predicted impact levels, as set out in Table 10-150 of Section 10.3.3. Even when considering a predicted impact of four breeding adult mortalities (based on 60% displacement and 3-5% mortality rate), the annual reduction in the growth rate is predicted to be at most 0.044% against the latest colony count.

10.2.3.265 Regardless of the colony's population trend, such a level of effect would almost certainly be indistinguishable from natural fluctuations in the population. **As such, no potential for an AEoSI to the conservation objectives of the guillemot feature of Copinsay SPA in relation to distributional response effects in the O&M phase from the Proposed Development (Offshore) alone can be concluded. Therefore, subject to natural change, guillemot will be maintained as a feature in the long term.**

Table 10-49: Guillemot O&M phase disturbance annual displacement matrix for impacts apportioned to Copinsay SPA.

Annual Total	Mortality Rate (%)												
Displacement Rate (%)	1	2	3	5	10	20	30	40	50	60	70	80	90	100
10	0	0	1	1	2	4	6	7	9	11	13	15	17	19
20	0	1	1	2	4	7	11	15	19	22	26	30	34	37
30	1	1	2	3	6	11	17	22	28	34	39	45	50	56
40	1	1	2	4	7	15	22	30	37	45	52	60	67	75
50	1	2	3	5	9	19	28	37	47	56	65	74	84	93
60	1	2	3	6	11	22	34	45	56	67	78	89	101	112
70	1	3	4	7	13	26	39	52	65	78	91	104	117	130
80	1	3	4	7	15	30	45	60	75	89	104	119	134	149
90	2	3	5	8	17	34	50	67	84	101	117	134	151	168
100	2	4	6	9	19	37	56	75	93	112	130	149	168	186

Note, outputs highlighted in dark blue represent the predicted annual mortality estimates as per the Guidance Approach and those highlighted in yellow represent the predicted annual mortality estimates as per Applicant Approach. For further information regarding the Guidance and Applicant Approach see Section 2.5 of Volume 7B, Appendix 6-2: Offshore Ornithology Distributional Responses Technical Report and Volume 7B, Appendix 6-2, Annex 4: Review of Relevant Evidence.

Hoy SPA

10.2.3.266 The centroid of the Hoy SPA is 94.1km (around land) from the centre of the Caledonia OWF array are, within the MMFR +1SD of great skua (443.3±487.9km), artic skua (2±0.7km, mean foraging range), guillemot (73.2±80.5km), puffin (137.1±128.3km), and kittiwake (156.1±144.5km) (Woodward *et al.*, 2019[78]). The great black-backed gull feature of Hoy SPA has also been screened into assessment though only for the non-breeding season, due to the Proposed Development (Offshore) being outside of MMFR + 1SD. Potential for LSE alone has been identified for the following features of Hoy SPA:

- Kittiwake
  - Collision (O&M)
  - Distributional response (O&M)
  - Distributional response (C&D, Section 7.3.1)
- Great black-backed gull
  - Collision (O&M)
- Great skua
  - Collision (O&M)
- Guillemot
  - Distributional response (O&M)
  - Distributional response (C&D, Section 7.3.1)
- Puffin
  - Distributional response (O&M)
  - Distributional response (C&D, Section 7.3.1)

Conservation Objectives

- To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and
- To ensure for the qualifying species that the following are maintained in the long term:
  - Population of the species as a viable component of the site;
  - Distribution of the species within site;
  - Distribution and extent of habitats supporting the species;
  - Structure, function and supporting processes of habitats supporting the species; and
  - No significant disturbance of the species.

Kittiwake

10.2.3.267 Kittiwake have been screened into the assessment for O&M phase for distributional responses and collision risk. Due to potential connectivity being limited based on overall proportional weighting to Hoy SPA, a combined assessment with other SPAs is provided in Section 10.2.3, beginning in paragraph 10.2.3.562. As presented in paragraph 10.2.3.562, **the potential for an AEoSI to the conservation objectives of kittiwake at Hoy SPA in relation to both distributional responses and collision impacts from the Proposed Development (Offshore) alone during the O&M phase can confidently be ruled out. Therefore, subject to natural change, kittiwake will be maintained as a feature in the long term.**

Great Black-Backed Gull

10.2.3.268 Great black-backed gull has been screened into the assessment for O&M phase collision risk only. Due to potential connectivity being limited to the non-breeding season only for great black-backed gull for all SPAs, a combined assessment for all SPAs is provided in Section 10.2.3, beginning in paragraph 10.2.3.577. As presented in paragraph 10.2.3.577, **the potential for an AEoSI to the conservation objectives of great black-blacked gull at Hoy SPA in relation to collision impacts from the Proposed Development (Offshore) alone during the O&M phase can confidently be ruled out. Therefore, subject to natural change, great black-backed gull will be maintained as a feature in the long term.**

Great skua

10.2.3.269 Great skua have been screened into the assessment for O&M phase collision risk only. Due to potential connectivity being limited to the breeding season only for great skua for all SPAs, a combined assessment for all SPAs is provided in Section 10.2.3, beginning in paragraph 10.2.3.585. As presented in paragraph 10.2.3.585, **the potential for an AEoSI to the conservation objectives of great skua at Hoy SPA in relation to collision impacts from the Proposed Development (Offshore) alone during the O&M phase can confidently be ruled out. Therefore, subject to natural change, great skua will be maintained as a feature in the long term.**

Guillemot

10.2.3.270 Guillemot have been screened into the assessment for distributional responses as they are susceptible to displacement due to their distribution and behaviours ((Furness and Wade, 2012[79]; Furness *et al*., 2013[80]; Bradbury *et al*., 2014[81]; NatureScot, 2023[82]).

Status

10.2.3.271 The SPA population of guillemot was cited as 26,800 breeding adults in 2000. The most recently published count (2016 - 2017) is 16,345 breeding adults (SMP, 2024[152]).

10.2.3.272 When considering a breeding adult baseline mortality rate of 0.061 (1- 0.939, Horswill and Robinson 2015[85]), 1,635 (1,634.80) and 997 (997.05) breeding adults from the SPA population would be subject to natural mortality per annum, in relation to the citation count and most recently published count (2016 - 2017) respectively. As of June 2017, the guillemot feature at Hoy SPA is considered to be 'Unfavourable' with 'No change'.

Seasonal Apportionment of Potential Impacts

10.2.3.273 In line with NatureScot guidance, the assessment is carried out on a seasonal basis as the potential impacts on the SPA features varies by season. Guillemot have been assessed during the breeding season of April to mid-August and non-breeding season of mid-August to March in relation to Hoy SPA (see Section 7.3.3).

Appropriate Assessment

10.2.3.274 As outlined above, guillemot have been screened into the assessment for distributional responses. The level of abundance apportioned is presented in Table 10-50 (detailed methods are presented within Application Document 13, Appendix 13-1: Caledonia North Apportioning Technical Note and Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note).

10.2.3.275 For guillemot, distributional response is assessed based on the birds within the Proposed Development (Offshore) And 2km buffer. The main focus of the assessment is based on the Applicant Approach of a displacement rate of 50% and a 1% mortality rate for O&M phase distributional response impacts. Presentation of distributional response impacts using the Guidance approach recommended rates are also provided. Further details regarding the differences between the Guidance and Applicant Approach for distributional response assessment is provided within Volume 7B, Appendix 6-2, Annex 4: Review of Relevant Evidence.

Table 10-50: Guillemot level of predicted abundance apportioned to the guillemot feature of the Hoy SPA seasonally.

Defined Season (Months)	Level of Apportionment (%)	Apportioned Abundance (Breeding Adults)
Breeding season (April to Mid-August)	0.67	108.16
Non-breeding season (Mid-August to March)	2.31	155.09

O&M Phase Potential Distributional Response Effects on the Qualifying Feature in Isolation

10.2.3.276 During the O&M phase, the potential level of impact apportioned to the SPA seasonally is summarised in Table 10-51 for both the Applicant and Guidance Approach.

10.2.3.277 A displacement matrix is also presented for the annual apportioned abundance for the Proposed Development (Offshore) plus 2km buffer to Hoy SPA in Table 10-52.

Table 10-51: Guillemot predicted distributional responses mortalities during the O&M phase attributed to Hoy SPA and resultant change in survival rate percentage point change compared to citation and most recent population counts.

Population Size (Breeding Adults)	Defined Season (Months)	Applicant Approach		Guidance Approach	
		50% displacement, 1% mortality	Change in Average Survival Rate (% Point Change)	60% displacement, 1-3% mortality (non-breeding); 3-5% mortality (breeding)	Change in Average Survival Rate (% Point Change)
Citation (26,800)	Breeding season (April to Mid-August)	0.54	0.002	1.94 - 3.24	0.007 – 0.012
	Non-breeding season (Mid-August to March)	0.78	0.003	0.93 – 2.79	0.003 – 0.010
	Annual	1.32	0.005	2.88 - 6.04	0.011 – 0.023
Latest count (16,345)	Breeding season (April to Mid-August)	0.54	0.003	1.94 - 3.24	0.012 – 0.020
	Non-breeding season (Mid-August to March)	0.78	0.005	0.62 - 1.87	0.006 – 0.017
	Annual	1.32	0.008	2.88 - 6.04	0.018 – 0.037

Breeding Season

10.2.3.278 The estimated guillemot mean peak abundance during the breeding season is 16,092 (16,091.78) individuals, with an estimated 1.27% of guillemot during the breeding season deriving from Hoy SPA (Application Document 13, Appendix 13-1: Caledonia North Apportioning Technical Note and Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note). Assuming that 57% of the guillemot population are adults (Furness, 2015)[87] and using an adult sabbatical rate of 7%, the total proportion of breeding adults from Hoy SPA potentially impacted by distributional responses are 108 (108.16) per annum during the breeding season (Table 10-51).

10.2.3.279 When applying a displacement rate of 50% and a mortality rate of 1%, the consequent potential mortality is estimated at less than one (0.54) breeding adult per annum.

10.2.3.280 Using the citation colony count of 26,800 breeding adults and an annual background mortality of 1,635 breeding adults, the addition of less than one predicted breeding adult mortality per annum would result in a 0.002 survival rate percentage point change during the breeding season. When considering the most up to date counts of 16,345 breeding adults and an annual background mortality of 997 breeding adults, this results in a 0.003 survival rate percentage point change during the breeding season per annum (Table 10-51).

Non-breeding Season

10.2.3.281 The estimated guillemot mean peak abundance during the non-breeding season is 6,710 (6,709.90) individuals. For guillemot, apportioning for the non-breeding season was based on the breeding population found within the MMFR + 1SD of the Caledonia OWF. This is in line with the approach outlined in the NatureScot Guidance Note 3 (NatureScot, 2023[82]), based on recent geolocator studies presented in Buckingham *et al.* (2022[88]). Based on the resultant SPA proportional split during the non-breeding season, 2.31% of predicted mortalities are estimated to derive from Hoy Cliffs SPA (Application Document 13, Appendix 13-1: Caledonia North Apportioning Technical Note and Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note). Therefore, the total mean peak abundance of breeding adults from the SPA potentially impacted by distributional responses are 155 (155.09) per annum during the non-breeding season (Table 10-51).

10.2.3.282 When applying a displacement rate of 50% and a mortality rate of 1%, the consequent predicted distributional response mortality of breeding adult guillemot from Hoy SPA during the non-breeding season is predicted at less than one (0.78) per annum.

10.2.3.283 Based on the 2000 citation colony count of 26,800 breeding adults and using an annual background mortality of 1,635 breeding adults, the addition of less than one (0.78) predicted breeding adult mortality per annum would result in a 0.003 survival rate percentage point change during the non-breeding season. When considering the most up to date counts of 16,345 breeding adults and an annual background mortality of 997 breeding adults, this results in a 0.005 survival rate percentage point change during the non-breeding season per annum (Table 10-51).

Annual Total

10.2.3.284 The predicted resultant mortality across all defined seasons from The Proposed Development (Offshore), attributed to Hoy SPA, is one (1.32) breeding adult guillemot per annum. This is predicted to result in a survival rate percentage point change against the citation and most recently published counts of 0.005 and 0.008 respectively (Table 10-51).

10.2.3.285 When considering the Guidance approach, a total of three to six (2.88 - 6.04) breeding adult mortalities are predicted due to potential distributional response effects per annum. This results in a survival rate percentage point change of 0.011 – 0.023 against the citation and 0.018 – 0.037 against the most recently published count (Table 10-51).

10.2.3.286 The impacts do not exceed a 0.02 survival rate percentage point change threshold when considering the Applicant Approach or lower end of the Guidance approach. However, as the threshold is tipped for the upper end of the Guidance approach PVA has been undertaken to further assess the level of potential effect predicted.

Population Viability Analysis

The potential for distributional responses alone has been assessed against the latest 2016-2017 colony count population size of 16,345 breeding adults according to the Seabird Monitoring Programme (2020) database. A range of impact values from three to six breeding adult additional mortalities per annum were modelled, which allows for consideration of the Guidance approach predicted impact levels, as set out in Table 10-154 of Section 10.3.3. Even when considering a predicted impact of six breeding adult mortalities (based on 60% displacement and 3-5% mortality rate), the annual reduction in the growth rate is predicted to be at most 0.041% against the latest colony count, which is a level of effect considered too low to be of consequence to the overall population status or trend (PVA outputs against the citation count are presented in Application Document 13, Appendix 13-2: Caledonia North Habitats Regulations Appraisal Population Viability Analysis Technical Report and Application Document 14, Appendix 14-2: Caledonia South Habitats Regulations Appraisal Population Viability Analysis Technical Report as additional information).

10.2.3.287 As the maximum level of effect is considered to be of limited consequence to the colony's population trend, such a level of effect would almost certainly be indistinguishable from natural fluctuations in the population. **As such, no potential for an AEoSI to the conservation objectives of the guillemot feature of Hoy SPA in relation to distributional response effects in the O&M phase from the Proposed Development (Offshore) alone can be concluded. Therefore, subject to natural change, guillemot will be maintained as a feature in the long term.**

Table 10-52: Guillemot O&M phase disturbance annual displacement matrix for impacts apportioned to Hoy SPA.

Annual Total	Mortality Rate (%)													
Displacement Rate (%)	1	2	3	5	10	20	30	40	50	60	70	80	90	100
10	0	1	1	1	3	5	8	11	13	16	18	21	24	26
20	1	1	2	3	5	11	16	21	26	32	37	42	47	53
30	1	2	2	4	8	16	24	32	39	47	55	63	71	79
40	1	2	3	5	11	21	32	42	53	63	74	84	95	105
50	1	3	4	7	13	26	39	53	66	79	92	105	118	132
60	2	3	5	8	16	32	47	63	79	95	111	126	142	158
70	2	4	6	9	18	37	55	74	92	111	129	147	166	184
80	2	4	6	11	21	42	63	84	105	126	147	168	190	211
90	2	5	7	12	24	47	71	95	118	142	166	190	213	237
100	3	5	8	13	26	53	79	105	132	158	184	211	237	263
Note, outputs highlighted in dark blue represent the predicted annual mortality estimates as per the Guidance Approach and those highlighted in yellow represent the predicted annual mortality estimates as per Applicant Approach. For further information regarding the Guidance and Applicant Approach see Section 2.5 of Volume 7B, Appendix 6-2: Offshore Ornithology Distributional Responses Technical Report and Volume 7B, Appendix 6-2, Annex 4: Review of Relevant Evidence.														

Puffin

10.2.3.288 Puffin have been screened into the assessment for O&M phase for distributional responses. Due to potential connectivity being limited based on overall proportional weighting to Hoy SPA, a combined assessment with other SPAs is provided in Section 10.2.3, beginning in paragraph 10.2.3.573. As presented in paragraph 10.2.3.573, **the potential for an AEoSI to the conservation objectives of puffin at Hoy SPA in relation to distributional responses from the Proposed Development (Offshore) alone during the O&M phase can confidently be ruled out. Therefore, subject to natural change, puffin will be maintained as a feature in the long term.**

Buchan Ness to Collieston Coast SPA

10.2.3.289 The centroid of the Buchan Ness to Collieston Coast SPA is 102.4km (around land) from the centre of the Caledonia OWF, within the MMFR +1SD of kittiwake (156.1±144.5km) (Woodward *et al*., 2019[78]). As such, potential for LSE alone has been identified for the following features of Buchan Ness to Collieston Coast SPA:

- Kittiwake
  - Collision (O&M)
  - Distributional response (O&M)
  - Distributional response (C&D, Section 7.3.1)

Conservation Objectives

- To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and
- To ensure for the qualifying species that the following are maintained in the long term:
  - Population of the species as a viable component of the site;
  - Distribution of the species within site;
  - Distribution and extent of habitats supporting the species;
  - Structure, function and supporting processes of habitats supporting the species; and
  - No significant disturbance of the species.

Kittiwake

10.2.3.290 Kittiwake have been screened into the assessment for collision risk as they are susceptible to collision due to their flight height distribution and behaviours (Furness and Wade, 2012; Furness *et al*., 2013; Bradbury *et al*., 2014; NatureScot, 2023; JNCC, 2024)[79] [80] [81] [82] [83].

10.2.3.291 Kittiwake have also been assessed for distributional responses as requested by NatureScot within consultation; however, the Applicant remains of the position that kittiwake do not require assessment for distributional responses due to the evidence base detailed within Volume 7B, Appendix 6-2, Annex 4: Review of Relevant Evidence suggesting kittiwake show limited behavioural response to OWFs. Distributional responses are assessed based on the birds within the Proposed Development (Offshore) And 2km buffer. A Guidance approach only is presented for kittiwake based on a displacement rate of 30% and a 1-3% mortality rate for O&M phase distributional response impacts.

10.2.3.292 The level of predicted abundance and collision risk apportioned to the kittiwake feature of the Buchan Ness to Collieston Coast SPA to inform assessments is presented in Table 10-53 (detailed methods are presented within Application Document 13, Appendix 13-1: Caledonia North Apportioning Technical Note and Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note).

Table 10-53: Kittiwake level of abundance and collision risk apportioned to Buchan Ness to Collieston Coast SPA seasonally.

Defined Season (Months)	Level of Apportionment (%)	Apportioned Abundance (Breeding Adults)	Apportioned collision risk (breeding adults)
Breeding season (Mid-April to August)	3.33	67.93	1.84
Non-breeding season (September to early-April)	1.81 (Autumn %) 2.40 (Spring %)	8.76	0.24
Note, two weightings for apportioning non-breeding season kittiwake are provided for autumn migration (September to December), and spring migration (January to Early-April). The autumn weighting has been used to apportion the potential numbers of non-breeding kittiwake distributional response as the mean peak of this species was recorded during the autumn migration season. While both the Spring and Autumn weightings have been used to apportion collision mortalities during the non-breeding season.			

Status

10.2.3.293 The SPA population of kittiwake was cited as 60,904 breeding adults in 1998. The most recently published count (2023) is 27,094 breeding adults (SMP, 2024[152]).

10.2.3.294 When considering a breeding adult baseline mortality rate of 0.146 (1- 0.854, Horswill and Robinson 2015[85]), 8,892 (8,891.98) and 3,956 (3,955.72) breeding adults from the SPA population would be subject to natural mortality per annum, in relation to the citation count and most recently published count (2019) respectively. As of June 2019, the kittiwake feature at Buchan Ness to Collieston Coast SPA is considered to be 'Unfavourable' with 'No change'.

Seasonal Apportionment of Potential Impacts

10.2.3.295 In line with NatureScot guidance, the assessment is carried out on a seasonal basis as the potential impacts on the SPA features varies by season. Kittiwake have been assessed during the breeding season of Mid-April to August and non-breeding season of September to Early April in relation to Buchan Ness to Collieston Coast SPA (see Section 7.3.3).

Appropriate Assessment

O&M Phase Potential Distributional Response Effects on the Qualifying Feature in Isolation

10.2.3.296 During the O&M phase, the potential level of impact apportioned to the SPA seasonally is summarised in Table 10-54 for the Guidance approach.

10.2.3.297 A displacement matrix is also presented for the annual apportioned abundance for the Proposed Development (Offshore) plus 2km buffer to Buchan Ness to Collieston Coast SPA in Table 10-55.

Table 10-54: Kittiwake predicted distributional responses mortalities during the O&M phase attributed to Buchan Ness to Collieston Coast SPA and resultant change in survival rate percentage point change compared to citation and most recent population counts (guidance approach).

Population Size (Breeding Adults)	Defined Season (Months)	Guidance Approach	
		30% displacement, 1-3% mortality	Change in Average Survival Rate (% Point Change)
Citation (60,904)	Breeding season (Mid-April to August)	0.20 - 0.61	<0.001 – 0.001
	Non-breeding season (September to early-April)	0.03 - 0.08	<0.001
	Annual	0.23 - 0.69	<0.001 – 0.001
Latest count (27,094)	Breeding season (Mid-April to August)	0.20 - 0.61	0.001 – 0.002
	Non-breeding season (September to early-April)	0.03 - 0.08	<0.001
	Annual	0.23 - 0.69	0.001 – 0.003

Breeding Season

10.2.3.298 The estimated kittiwake mean peak abundance during the breeding season is 2,039 (2,038.69) individuals, with an estimated 6.99% of all individuals during the breeding season deriving from Buchan Ness to Collieston Coast SPA (Application Document 13, Appendix 13-1: Caledonia North Apportioning Technical Note and Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note). Assuming that 53% of the kittiwake population are adults (Furness, 2015)[87] and using an adult sabbatical rate of 10%, the total proportion of breeding adults from Buchan Ness to Collieston Coast SPA potentially impacted by distributional responses are 68 (67.93) per annum during the breeding season (Table 10-54).

10.2.3.299 When applying a displacement rate of 30% and a mortality rate of 1-3%, the consequent potential mortality is estimated to approximately less than one (0.20 - 0.61) breeding adult per annum.

10.2.3.300 Using the citation colony count of 60,904 breeding adults and an annual background mortality of 8,892 breeding adults, the addition of less than one predicted breeding adult mortality would result in a <0.001 – 0.001 survival rate percentage point change during the breeding season per annum. When considering the most up to date counts of 27,094 breeding adults and an annual background mortality of 3,956 breeding adults, this results in a 0.001 – 0.002 survival rate percentage point change during the breeding season per annum (Table 10-54).

Non-breeding Season

10.2.3.301 The estimated kittiwake mean peak abundance during the non-breeding season is 483 (483.00) individuals. Based on the Furness (2015)[87] non-breeding season BDMPS region SPA proportional split corresponding to the mean peak abundance recorded, 1.81% of predicted mortalities during the non-breeding season are estimated to derive from Buchan Ness to Collieston Coast SPA (Application Document 13, Appendix 13-1: Caledonia North Apportioning Technical Note and Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note). Therefore, the total mean peak abundance of breeding adults from the SPA potentially impacted by distributional responses are nine (8.76) per annum during the non-breeding season (Table 10-54).

10.2.3.302 When applying a displacement rate of 30% and a mortality rate of 1-3%, the consequent predicted distributional response mortality of breeding adult kittiwake from Troup, Pennan and Lion's Heads SPA during the non-breeding season is predicted at significantly less one (0.03 - 0.08) per annum.

10.2.3.303 Based on the 1998 citation colony count of 60,904 breeding adults and using an annual background mortality of 8,892 breeding adults, the addition of y less than one predicted breeding adult mortality would result in a <0.001 survival rate percentage point change during the non-breeding season per annum. When considering the most up to date counts of 27,094 breeding adults and an annual background mortality of 3,956 breeding adults, this results in a <0.001 survival rate percentage point change during the non-breeding season per annum (Table 10-54).

Annual Total

10.2.3.304 The predicted resultant mortality across all defined seasons from The Proposed Development (Offshore), attributed to Buchan Ness to Collieston Coast SPA, is significantly less than one (0.23 - 0.69) breeding adult kittiwake per annum. This is predicted to result in a survival rate percentage point change against the citation and most recently published counts of <0.001 – 0.001 and 0.001 – 0.003 respectively (Table 10-54).

10.2.3.305 For both the citation and most recently published count, the Guidance approach predicted additional breeding adult mortalities per annum equates to a <0.02 survival rate percentage point change and would, therefore, be indistinguishable from natural fluctuations in the population. **There is, therefore, no potential for an AEoSI to the conservation objectives of kittiwake at Buchan Ness to Collieston Coast SPA in relation to potential distributional response effects from the Proposed Development (Offshore) alone during the O&M phase. Therefore, subject to natural change, kittiwake will be maintained as a feature in the long term.**

Table 10-55: Kittiwake O&M phase disturbance annual displacement matrix for impacts apportioned to Buchan Ness to Collieston Coast SPA (Guidance approach).

Annual Total Displacement Rate (%)	Mortality Rate (%)													
	1	2	3	5	10	20	30	40	50	60	70	80	90	100
10	0	0	0	0	1	2	2	3	4	5	5	6	7	8
20	0	0	0	1	2	3	5	6	8	9	11	12	14	15
30	0	0	1	1	2	5	7	9	12	14	16	18	21	23
40	0	1	1	2	3	6	9	12	15	18	21	25	28	31
50	0	1	1	2	4	8	12	15	19	23	27	31	35	38
60	0	1	1	2	5	9	14	18	23	28	32	37	41	46
70	1	1	2	3	5	11	16	21	27	32	38	43	48	54
80	1	1	2	3	6	12	18	25	31	37	43	49	55	61
90	1	1	2	3	7	14	21	28	35	41	48	55	62	69
100	1	2	2	4	8	15	23	31	38	46	54	61	69	77

Note, outputs highlighted in dark blue represent the predicted annual mortality estimates as per the Guidance Approach. For further information regarding the Guidance and Applicant Approach see Section 2.5 of Volume 7B, Appendix 6-2: Offshore Ornithology Distributional Responses Technical Report and Volume 7B, Appendix 6-2, Annex 4: Review of Relevant Evidence.

O&M Phase Potential Collision Risk Impacts on the Qualifying Feature in Isolation

10.2.3.306 During the O&M phase, the potential level of impact from collision risk apportioned to the Buchan Ness to Collieston Coast SPA and subsequent survival rate percentage point change is summarised in Table 10-56.

Table 10-56: Kittiwake predicted collision risk impacts during the O&M phase attributed to Buchan Ness to Collieston Coast SPA and resultant change in survival rate percentage point change compared to citation and most recent population counts.

Population Size (Breeding Adults)	Defined Season (Months)	Collision risk impact	
		Breeding adults per annum	Change in Average Survival Rate (% Point Change)
Citation (60,904)	Breeding season (Mid-April to August)	1.84	0.003
	Non-breeding season (September to early-April)	0.24	<0.001
	Annual	2.08	0.003
Latest count (27,094)	Breeding season (Mid-April to August)	1.84	0.007
	Non-breeding season (September to early-April)	0.24	0.001
	Annual	2.08	0.008

Breeding Season

10.2.3.307 The predicted kittiwake collision mortality during the breeding season is 55 (55.27) individuals per annum, with an estimated 6.99% of all individuals during the breeding season deriving from Buchan Ness to Collieston Coast SPA (Application Document 13, Appendix 13-1: Caledonia North Apportioning Technical Note and Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note). Assuming that 53% of the population are adults (Furness, 2015)[87] and using an adult sabbatical rate of 10%, the total proportion of breeding adults from Buchan Ness to Collieston Coast SPA potentially subject to collision consequent mortality is two (1.84) per annum during the breeding season.

10.2.3.308 Using the citation colony count of 60,904 breeding adults and an annual background mortality of 8,892 breeding adults, the addition of two predicted breeding adult mortalities per annum would result in a 0.003 survival rate percentage point change during the breeding season. When considering the most up to date counts of 27,094 breeding adults and an annual background mortality of 3,956 breeding adults, this results in a 0.007 survival rate percentage point change during the breeding season per annum (see Table 10-56).

Non-breeding Season

10.2.3.309 The predicted kittiwake collision mortality during the non-breeding season is 12 (11.74) individuals. Based on the Furness (2015)[87] spring and autumn season BDMPS region SPA proportional split, 1.81% and 2.40% of predicted mortalities during the non-breeding season are estimated to derive from Buchan Ness to Collieston Coast SPA (Application Document 13, Appendix 13-1: Caledonia North Apportioning Technical Note and Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note), the consequent predicted collision mortality of adult kittiwake during the non-breeding season is predicted at significantly less than one (0.24) per annum (see Table 10-56).

10.2.3.310 Based on the 1998 citation colony count of 60,904 breeding adults and using an annual background mortality of 8,892 breeding adults, the addition of less than one predicted breeding adult mortality per annum would result in a <0.001 survival rate percentage point change during the non-breeding season. When considering the most up to date counts of 27,094 breeding adults and an annual background mortality of 3,956 breeding adults, this results in a change in survival rate percentage point change of 0.001 during the non-breeding season per annum (see Table 10-56).

Annual Total

10.2.3.311 The predicted resultant mortality across all defined seasons from The Proposed Development (Offshore), attributed to Buchan Ness to Collieston Coast SPA, is two (2.08) breeding adults per annum. This is predicted to result in a 0.003 and 0.008 survival rate percentage point change when considering the citation count and most recently published count, respectively (see Table 10-56).

10.2.3.312 For both the citation and most recently published counts, the Guidance approach predicted additional breeding adult mortalities per annum equates to a <0.02 survival rate percentage point change and would, therefore, be indistinguishable from natural fluctuations in the population. **There is, therefore, no potential for an AEoSI to the conservation objectives of kittiwake at Buchan Ness to Collieston Coast SPA in relation to potential collision risk effects from the Proposed Development (Offshore) alone during the O&M phase. Therefore, subject to natural change, kittiwake will be maintained as a feature in the long term.**

O&M Phase Potential Combined Distributional Response and Collision Risk Impacts on the Qualifying Feature in Isolation

10.2.3.313 During the O&M phase, the potential level of combined impact from collision risk and distributional responses apportioned to the Buchan Ness to Collieston Coast SPA and subsequent survival rate percentage point change is summarised in Table 10-57).

Table 10-57: Kittiwake predicted distributional response and collision risk impacts during the O&M phase attributed to Buchan Ness to Collieston Coast SPA and resultant change in survival rate percentage point change compared to citation and most recent population counts.

Population Size (Breeding Adults)	Defined Season (Months)	Guidance Approach 30% displacement; 1-3% mortality	
		Estimated number of mortalities from combined CRM and Distributional responses per annum	Change in Average Survival Rate (% Point Change)
Citation (60,904)	Breeding season (Mid-March to September)	2.05 - 2.45	0.003 – 0.004
	Non-breeding season (October to Early-March)	0.27 - 0.32	<0.001 – 0.001
	Annual	2.31 - 2.77	0.004 – 0.005
Latest count (27,094)	Breeding season (Mid-March to September)	2.05 - 2.45	0.008 – 0.009
	Non-breeding season (October to Early-March)	0.27 - 0.32	0.001
	Annual	2.31 - 2.77	0.009 – 0.010

Breeding Season

10.2.3.314 As presented within (Table 10-57) the combined distributional response and collision risk impacts apportioned to the kittiwake feature of Buchan Ness to Collieston Coast SPA, equates to approximately two - three (2.05 - 2.45) additional breeding adult mortalities during the breeding season per annum (when considering a displacement rate of 30% and a mortality rate of 1-3%). Using the citation colony count of 60,904 breeding adults and an annual background mortality of 8,892 breeding adults, the addition of two - three predicted breeding adult mortalities would result in a 0.003 – 0.004 survival rate percentage point change during the breeding season per annum. When considering the most up to date count of 27,094 breeding adults and an annual background mortality of 3,956 breeding adults, this results in a 0.009 – 0.010 survival rate percentage point change during the breeding season per annum (see Table 10-57).

Non-breeding Season

10.2.3.315 As presented within Table 10-57 the combined distributional response and collision risk impacts apportioned to the kittiwake feature of Buchan Ness to Collieston Coast SPA, equates to significantly less than one (0.27 - 0.32) additional adult mortality during the non-breeding season per annum (when considering a displacement rate of 30% and a mortality rate of 1-3%). Using the citation colony count of 60,904 breeding adults and an annual background mortality of 8,892 breeding adults, the addition of less than one predicted breeding adult mortality would result in a <0.001 – 0.001 survival rate percentage point change during the breeding season per annum. When considering the most up to date counts of 27,094 and an annual background mortality of 3,956 breeding adults, this results in a 0.001 survival rate percentage point change during the non-breeding season per annum (see Table 10-57).

Annual Total

10.2.3.316 The predicted resultant mortality across all defined seasons from The Proposed Development (Offshore), attributed to Buchan Ness to Collieston Coast, is two to three (2.31 - 2.77) kittiwake per annum. This is predicted to result in survival rate percentage point change against the citation and most recently published counts of 0.004 – 0.005 and 0.009 – 0.010, respectively (see Table 10-57).

10.2.3.317 For both the citation and most recently published counts, the Guidance approach predicted additional breeding adult mortalities per annum equates to a <0.02 survival rate percentage point change and would therefore be indistinguishable from natural fluctuations in the population. **There is, therefore, no potential for an AEoSI to the conservation objectives of kittiwake at Buchan Ness to Collieston Coast SPA in relation to potential distributional response and collision risk effects from the Proposed Development (Offshore) alone during the O&M phase. Therefore, subject to natural change, kittiwake will be maintained as a feature in the long term.**

Auskerry SPA

10.2.3.318 The centroid of the Auskerry SPA is 94.3km (around land) from the centre of the Caledonia OWF, within the MMFR of storm petrel (336.0km) (Woodward *et al*., 2019[78]). As such, potential for LSE alone has been identified for the following features of Buchan Ness to Auskerry SPA:

- Storm petrel
  - Distributional response (O&M)
  - Distributional response (C&D)

Conservation Objectives

- To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and
- To ensure for the qualifying species that the following are maintained in the long term:
  - Population of the species as a viable component of the site;
  - Distribution of the species within site;
  - Distribution and extent of habitats supporting the species;
  - Structure, function and supporting processes of habitats supporting the species; and
  - No significant disturbance of the species.

Storm petrel

10.2.3.319 A proportionate approach has been undertaken for assessment of potential impacts to features of SPAs screened in for assessment. For species such as storm petrel, where no individuals were recorded within site-specific DAS and the potential impact prior to apportionment can be considered negligible, qualitative assessments have been undertaken for all European sites together for this receptor (see the Consideration of storm petrel species for HRA assessment Section within Section 7.3.4).

Dornoch Firth and Loch Fleet SPA and Ramsar Site

10.2.3.320 The centroid of the Dornoch Firth and Loch Fleet SPA and Ramsar Site is 77.0km (around land) from the centre of the Caledonia OWF. As such, potential for LSE alone has been identified for the following features of Dornoch Firth and Loch Fleet SPA and Ramsar Site:

- Bar-tailed godwit
  - Migratory collision (O&M)
- Greylag goose
  - Migratory collision (O&M)

- Osprey
  - Migratory collision (O&M)
- Wigeon
  - Migratory collision (O&M)

Conservation Objectives

- To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and
- To ensure for the qualifying species that the following are maintained in the long term:
  - Population of the species as a viable component of the site;
  - Distribution of the species within site;
  - Distribution and extent of habitats supporting the species;
  - Structure, function and supporting processes of habitats supporting the species; and
  - No significant disturbance of the species.

Appropriate Assessment

Potential Migratory Collision Risk Effects in Isolation

10.2.3.321 Consideration of the potential migratory collision risk on qualifying features of SPAs screened in for assessment is provided in Section 7.3.10. **As concluded within Section 7.3.10, the potential for an AEoSI to the conservation objectives of the qualifying features of Dornoch Firth and Loch Fleet SPA and Ramsar Site in relation to collision risk from the Proposed Development (Offshore) can be ruled out. Therefore, subject to natural change, all qualifying features assessed will be maintained as a feature in the long term.**

Rousay SPA

10.2.3.322 The centroid of the Rousay SPA is 123km (around land) from the centre of the Caledonia OWF, within the MMFR +1SD of guillemot (73.2±80.5km), and kittiwake (156.1±144.5km) (Woodward *et al.*, 2019[78]). As such, potential for LSE alone has been identified for the following features of Rousay SPA:

- Kittiwake
  - Collision (O&M)
  - Distributional response (O&M)
  - Distributional response (C&D, Section 7.3.1)
- Guillemot
  - Distributional response (O&M)

- Distributional response (C&D, Section 7.3.1)

Conservation Objectives

- To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and
- To ensure for the qualifying species that the following are maintained in the long term:
  - Population of the species as a viable component of the site;
  - Distribution of the species within site;
  - Distribution and extent of habitats supporting the species;
  - Structure, function and supporting processes of habitats supporting the species; and
  - No significant disturbance of the species

Kittiwake

10.2.3.323 Kittiwake have been screened into the assessment for O&M phase for distributional responses and collision risk. Due to potential connectivity being limited based on overall proportional weighting to Rousay SPA, a combined assessment with other SPAs is provided in Section 10.2.3, beginning in paragraph 10.2.3.562. As presented in paragraph 10.2.3.562, **the potential for an AEoSI to the conservation objectives of kittiwake at Rousay SPA in relation to both distributional responses and collision impacts from the Proposed Development (Offshore) alone during the O&M phase can confidently be ruled out. Therefore, subject to natural change, kittiwake will be maintained as a feature in the long term.**

Guillemot

10.2.3.324 Guillemot have been screened into the assessment for distributional responses as they are susceptible to displacement due to their distribution and behaviours (Furness and Wade, 2012[79]; Furness *et al*., 2013[80]; Bradbury *et al*., 2014[81]; NatureScot, 2023[82]).

Status

10.2.3.325 The SPA population of guillemot was cited as 9,800 breeding adults in 2000. The most recently published count (2016 - 2018) is 7,921 breeding adults (SMP, 2024[152]).

10.2.3.326 When considering a breeding adult baseline mortality rate of 0.061 (1- 0.939, Horswill and Robinson 2015)[85], 598 (597.80) and 483 (483.18) breeding adults from the SPA population would be subject to natural mortality per annum, in relation to the citation count and most recently published count (2016 - 2018) respectively. As of June 2021, the guillemot feature at Rousay SPA is considered to be ‘Unfavourable’ with ‘No change’.

Seasonal Apportionment of Potential Impacts

10.2.3.327 In line with NatureScot guidance, the assessment is carried out on a seasonal basis as the potential impacts on the SPA features varies by season. Guillemot have been assessed during the breeding season of April to mid-August and non-breeding season of mid-August to March in relation to Rousay SPA (see Section 7.3.3).

Appropriate Assessment

10.2.3.328 As outlined above, guillemot have been screened into the assessment for distributional responses. The level of abundance apportioned is presented in Table 10-58 (detailed methods are presented within Application Document 13, Appendix 13-1: Caledonia North Apportioning Technical Note and Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note).

10.2.3.329 For guillemot, distributional responses are assessed based on the birds within the Proposed Development (Offshore) And 2km buffer. The main focus of the assessment is based on the Applicant Approach of a displacement rate of 50% and a 1% mortality rate for O&M phase distributional response impacts. Presentation of distributional response impacts using the Guidance approach recommended rates are also provided. Further details regarding the differences between the Guidance and Applicant Approach for distributional response assessment is provided within Volume 7B, Appendix 6-2, Annex 4: Review of Relevant Evidence.

Table 10-58: Guillemot level of predicted abundance apportioned to the guillemot feature of the Rousay SPA seasonally.

Defined Season (Months)	Level of Apportionment (%)	Apportioned Abundance (Breeding Adults)
Breeding season (April to Mid-August)	0.15	24.18
Non-breeding season (Mid-August to March)	1.12	75.16

O&M Phase Potential Distributional Response Effects on the Qualifying Feature in Isolation

10.2.3.330 During the O&M phase, the potential level of impact apportioned to the SPA seasonally is summarised in Table 10-59 for both the Applicant and Guidance Approach.

10.2.3.331 A displacement matrix is also presented for the annual apportioned abundance for the Proposed Development (Offshore) plus 2km buffer to Rousay SPA in Table 10-59.

Table 10-59: Guillemot predicted distributional responses mortalities during the O&M phase attributed to Rousay SPA and resultant change in survival rate percentage point change compared to citation and most recent population counts.

Population Size (Breeding Adults)	Defined Season (Months)	Applicant Approach		Guidance Approach	
		50% displacement, 1% mortality	Change in Average Survival Rate (% Point Change)	60% displacement, 1-3% mortality (non-breeding); 3-5% mortality (breeding)	Change in Average Survival Rate (% Point Change)
Citation (9,800)	Breeding season (April to Mid-August)	0.12	0.001	0.44 - 0.73	0.004 – 0.007
	Non-breeding season (Mid-August to March)	0.38	0.004	0.45 - 1.35	0.005 – 0.014
	Annual	0.50	0.005	0.89 - 2.08	0.009 – 0.021
Latest count (7,921)	Breeding season (April to Mid-August)	0.12	0.002	0.44 - 0.73	0.005 – 0.009
	Non-breeding season (Mid-August to March)	0.38	0.005	0.45 - 1.35	0.006 – 0.017
	Annual	0.50	0.006	0.89 - 2.08	0.011 – 0.026

Breeding Season

10.2.3.332 The estimated guillemot mean peak abundance during the breeding season is 16,092 (16,091.78) individuals, with an estimated 0.28% of guillemot during the breeding season deriving from Rousay SPA (Application Document 13, Appendix 13-1: Caledonia North Apportioning Technical Note and Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note). Assuming that 57% of the guillemot population are adults (Furness, 2015)[87] and using an adult sabbatical rate of 7%, the total proportion of breeding adults from Rousay SPA potentially impacted by distributional responses are 24 (24.18) per annum during the breeding season (Table 10-59).

10.2.3.333 When applying a displacement rate of 50% and a mortality rate of 1%, the consequent potential mortality is estimated at significantly less than one (0.12) breeding adult per annum.

10.2.3.334 Using the citation colony count of 9,800 breeding adults and an annual background mortality of 598 breeding adults, the addition of less than one (0.12) predicted breeding adult mortalities per annum would result in a 0.001 survival rate percentage point change during the breeding season. When considering the most up to date counts of 7,921 breeding adults and an annual background mortality of 483 breeding adults, this results in a 0.002 survival rate percentage point change during the breeding season per annum (Table 10-59).

Non-breeding Season

10.2.3.335 The estimated guillemot mean peak abundance during the non-breeding season is 6,710 (6,709.90) individuals. For guillemot, apportioning for the non-breeding season was based on the breeding population found within the MMFR + 1SD of the Caledonia OWF. This is in line with the approach outlined in the NatureScot Guidance Note 3 (NatureScot, 2023), based on recent geolocator studies presented in Buckingham *et al.* (2022[88]). Based on the resultant SPA proportional split during the non-breeding season, 1.12% of predicted mortalities are estimated to derive from Rousay SPA (Application Document 13, Appendix 13-1: Caledonia North Apportioning Technical Note and Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note). Therefore, the total mean peak abundance of breeding adults from the SPA potentially impacted by distributional responses are 75 (75.16) per annum during the non-breeding season (Table 10-59).

10.2.3.336 When applying a displacement rate of 50% and a mortality rate of 1%, the consequent predicted distributional response mortality of breeding adult guillemot from Rousay SPA during the non-breeding season is predicted at less than one (0.38) per annum.

10.2.3.337 Based on the 2000 citation colony count of 9,800 breeding adults and using an annual background mortality of 598 breeding adults, the addition of less than one predicted breeding adult mortality per annum would result in a 0.004 survival rate percentage point change during the non-breeding season. When considering the most up to date counts of 7,921 breeding adults and an annual background mortality of 483 breeding adults, this results in a 0.005 survival rate percentage point change during the non-breeding season per annum (Table 10-59).

Annual Total

10.2.3.338 The predicted resultant mortality across all defined seasons from The Proposed Development (Offshore), attributed to Rousay SPA, is less than one (0.50) breeding adult guillemot per annum. This is predicted to result in a survival rate percentage point change against the citation and most recently published counts of 0.005 and 0.006 respectively (Table 10-59).

10.2.3.339 When considering the Guidance approach, a total of less than one - two (0.89 - 2.08) breeding adult mortalities are predicted due to potential distributional response effects per annum. This results in a survival rate percentage point change of 0.009 – 0.021 against the citation and 0.011 – 0.026 against the most recently published count (Table 10-59).

10.2.3.340 The impacts do not exceed a 0.02 survival rate percentage point change threshold when considering the Applicant Approach or lower end of the Guidance approach. However, as the threshold is tipped for the upper end of the Guidance approach PVA has been undertaken to further assess the level of potential effect predicted.

Population Viability Analysis

10.2.3.341 The potential for distributional responses alone has been assessed against the latest 2016-2018 colony count population size of 7,921 breeding adults according to the Seabird Monitoring Programme (2020) database. A range of impact values from less than one to two breeding adult additional mortalities per annum were modelled, which allows for consideration of the Guidance approach predicted impact levels, as set out in Table 10-101 of Section 10.3.3. Even when considering a maximum predicted impact of two breeding adult mortalities (based on 60% displacement and 3-5% mortality rate), the annual reduction in the growth rate is predicted to be at most 0.027% against the latest colony count.

10.2.3.342 Regardless of the colony's population trend, such a level of effect would almost certainly be indistinguishable from natural fluctuations in the population. **As such, no potential for an AEoSI to the conservation objectives of the guillemot feature of Rousay SPA in relation to distributional response effects in the O&M phase from the Proposed Development (Offshore) alone can be concluded. Therefore, subject to natural change, guillemot will be maintained as a feature in the long term.**

Table 10-60: Guillemot O&M phase disturbance annual displacement matrix for impacts apportioned to Rousay SPA.

Annual Total	Mortality Rate (%)													
Displacement Rate (%)	1	2	3	5	10	20	30	40	50	60	70	80	90	100
10	0	0	0	0	1	2	3	4	5	6	7	8	9	10
20	0	0	1	1	2	4	6	8	10	12	14	16	18	20
30	0	1	1	1	3	6	9	12	15	18	21	24	27	30
40	0	1	1	2	4	8	12	16	20	24	28	32	36	40
50	0	1	1	2	5	10	15	20	25	30	35	40	45	50
60	1	1	2	3	6	12	18	24	30	36	42	48	54	60
70	1	1	2	3	7	14	21	28	35	42	49	56	63	70
80	1	2	2	4	8	16	24	32	40	48	56	64	72	79
90	1	2	3	4	9	18	27	36	45	54	63	72	80	89
100	1	2	3	5	10	20	30	40	50	60	70	79	89	99
Note, outputs highlighted in dark blue represent the predicted annual mortality estimates as per the Guidance Approach and those highlighted in yellow the predicted annual mortality estimates as per Applicant Approach. For further information regarding the Guidance and Applicant Approach see Section 2.5 of Volume 7B, Appendix 6-2: Offshore Ornithology Distributional Responses Technical Report and Volume 7B, Appendix 6-2, Annex 4: Review of Relevant Evidence.														

Marwick Head SPA

10.2.3.343 The centroid of the Marwick head SPA is 117.3km (around land) from the centre of the Caledonia OWF, within the MMFR +1SD of guillemot (73.2±80.5km), and kittiwake (156.1±144.5km) (Woodward *et al*., 2019[78]). As such, potential for LSE alone has been identified for the following features of Marwick head SPA:

- Kittiwake
  - Collision (O&M)
  - Distributional response (O&M)
  - Distributional response (C&D, Section 7.3.1)
- Guillemot
  - Distributional response (O&M)
  - Distributional response (C&D, Section 7.3.1)

Conservation objectives

- To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and
- To ensure for the qualifying species that the following are maintained in the long term:
  - Population of the species as a viable component of the site;
  - Distribution of the species within site;
  - Distribution and extent of habitats supporting the species;
  - Structure, function and supporting processes of habitats supporting the species; and
  - No significant disturbance of the species.

Kittiwake

10.2.3.344 Kittiwake have been screened into the assessment for O&M phase for distributional responses and collision risk. Due to potential connectivity being limited based on overall proportional weighting to Marwick head SPA, a combined assessment with other SPAs is provided in Section 10.2.3, beginning in paragraph 10.2.3.562. As presented in paragraph 10.2.3.562, **the potential for an AEoSI to the conservation objectives of kittiwake at Marwick head SPA in relation to both distributional responses and collision impacts from the Proposed Development (Offshore) alone during the O&M phase can confidently be ruled out. Therefore, subject to natural change, kittiwake will be maintained as a feature in the long term.**

Guillemot

10.2.3.345 Guillemot have been screened into the assessment for distributional responses as they are susceptible to displacement due to their distribution and behaviours (Furness and Wade, 2012[79]; Furness *et al*., 2013[80]; Bradbury *et al*., 2014[81]; NatureScot, 2023[82]).

Status

10.2.3.346 The SPA population of guillemot was cited as 37,700 breeding adults in 1998. The most recently published count (2023) is 12,800 breeding adults (SMP, 2024[89]).

10.2.3.347 When considering a breeding adult baseline mortality rate of 0.061 (1- 0.939, Horswill and Robinson 2015[85]), 2,300 (2,299.70) and 781 (780.80) breeding adults from the SPA population would be subject to natural mortality per annum, in relation to the citation count and most recently published count (2023) respectively. As of June 2023, the guillemot feature at Marwick Head SPA is considered to be 'Unfavourable' with 'No change'.

Seasonal Apportionment of Potential Impacts

10.2.3.348 In line with NatureScot guidance, the assessment is carried out on a seasonal basis as the potential impacts on the SPA features varies by season. Guillemot have been assessed during the breeding season of April to mid-August and non-breeding season of mid-August to March in relation to Marwick Head SPA (see Section 7.3.3).

Appropriate Assessment

10.2.3.349 As outlined above, guillemot have been screened into the assessment for distributional responses. The level of abundance apportioned is presented in Table 10-61 (detailed methods are presented within Application Document 13, Appendix 13-1: Caledonia North Apportioning Technical Note and Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note).

10.2.3.350 For guillemot, distributional response is assessed based on the birds within the Proposed Development (Offshore) And 2km buffer. The main focus of the assessment is based on the Applicant Approach of a displacement rate of 50% and a 1% mortality rate for O&M phase distributional response impacts. Presentation of distributional response impacts using the Guidance approach recommended rates are also provided. Further details regarding the differences between the Guidance and Applicant Approach for distributional response assessment is provided within Volume 7B, Appendix 6-2, Annex 4: Review of Relevant Evidence.

Table 10-61: Guillemot level of predicted abundance apportioned to the guillemot feature of the Marwick Head SPA seasonally.

Defined Season (Months)	Level of Apportionment (%)	Apportioned Abundance (Breeding Adults)
Breeding season (April to Mid-August)	0.28	45.47
Non-breeding season (Mid-August to March)	1.81	121.45

O&M Phase Potential Distributional Response Effects on the Qualifying Feature in Isolation

10.2.3.351 During the O&M phase, the potential level of impact apportioned to the SPA seasonally is summarised in Table 10-62 for both the Applicant and Guidance approach.

10.2.3.352 A displacement matrix is also presented for the annual apportioned abundance for the Proposed Development (Offshore) plus 2km buffer to Marwick Head SPA in Table 10-63.

Table 10-62: Guillemot predicted distributional responses mortalities during the O&M phase attributed to Marwick Head SPA and resultant change in survival rate percentage point change compared to citation and most recent population counts.

Population Size (Breeding Adults)	Defined Season (Months)	Applicant Approach		Guidance Approach	
		50% displacement, 1% mortality	Change in Average Survival Rate (% Point Change)	60% displacement, 1-3% mortality (non-breeding); 3-5% mortality (breeding)	Change in Average Survival Rate (% Point Change)
Citation (37,700)	Breeding season (April to Mid-August)	0.23	0.001	0.82 - 1.36	0.002 – 0.004
	Non-breeding season (Mid-August to March)	0.61	0.002	0.73 - 2.19	0.002 – 0.006
	Annual	0.83	0.002	1.55 - 3.55	0.004 – 0.009
Latest count (12,800)	Breeding season (April to Mid-August)	0.23	0.002	0.82 - 1.36	0.006 – 0.011
	Non-breeding season (Mid-August to March)	0.61	0.005	0.73 - 2.19	0.006 – 0.017
	Annual	0.83	0.007	1.55 - 3.55	0.012 – 0.028

Breeding Season

10.2.3.353 The estimated guillemot mean peak abundance during the breeding season is 16,092 (16,091.78) individuals, with an estimated 0.53% of guillemot during the breeding season deriving from Marwick Head SPA (Application Document 13, Appendix 13-1: Caledonia North Apportioning Technical Note and Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note). Assuming that 57% of the guillemot population are adults (Furness, 2015)[87] and using an adult sabbatical rate of 7%, the total proportion of breeding adults from Marwick Head SPA potentially impacted by distributional responses are 45 (45.47) per annum during the breeding season (Table 10-62).

10.2.3.354 When applying a displacement rate of 50% and a mortality rate of 1%, the consequent potential mortality is estimated at significantly less than a single (0.23) breeding adult per annum.

10.2.3.355 Using the citation colony count of 37,700 breeding adults and an annual background mortality of 2,300 breeding adults, the addition of less than one predicted breeding adult mortality per annum would result in a 0.001 survival rate percentage point change during the breeding season. When considering the most up to date counts of 12,800 breeding adults and an annual background mortality of 781 breeding adults, this results in a 0.002 survival rate percentage point change during the breeding season per annum (Table 10-62).

Non-breeding Season

10.2.3.356 The estimated guillemot mean peak abundance during the non-breeding season is 6,710 (6,709.90) individuals. For guillemot, apportioning for the non-breeding season was based on the breeding population found within the MMFR + 1SD of the Caledonia OWF. This is in line with the approach outlined in the NatureScot Guidance Note 3 (NatureScot, 2023), based on recent geolocator studies presented in Buckingham *et al.* (2022)[88]. Based on the resultant SPA proportional split during the non-breeding season, 1.81% of predicted mortalities are estimated to derive from Marwick Head SPA (Application Document 13, Appendix 13-1: Caledonia North Apportioning Technical Note and Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note). Therefore, the total mean peak abundance of breeding adults from the SPA potentially impacted by distributional responses are 121 (121.45) per annum during the non-breeding season (Table 10-62).

10.2.3.357 When applying a displacement rate of 50% and a mortality rate of 1%, the consequent predicted distributional response mortality of breeding adult guillemot from Marwick Head SPA during the non-breeding season is predicted at less than one (0.61) per annum.

10.2.3.358 Based on the 1998 citation colony count of 37,700 breeding adults and using an annual background mortality of 2,300 breeding adults, the addition of less than one predicted breeding adult mortality per annum would result in a 0.002 survival rate percentage point change during the non-breeding season. When considering the most up to date counts of 12,800 breeding adults and an annual background mortality of 781 breeding adults, this results in a 0.005 survival rate percentage point change during the non-breeding season per annum (Table 10-62).

Annual Total

10.2.3.359 The predicted resultant mortality across all defined seasons from The Proposed Development (Offshore), attributed to Marwick Head SPA, is less than one (0.83) breeding adult guillemot per annum. This is predicted to result in a survival rate percentage point change against the citation and most recently published counts of 0.002 and 0.007 respectively (Table 10-62).

10.2.3.360 When considering the Guidance approach, a total of two to four (1.55 - 3.55) breeding adult mortalities are predicted due to potential distributional response effects per annum. This results in a survival rate percentage point change of 0.004 – 0.009 against the citation and 0.012 – 0.028 against the most recently published count (Table 10-62).

10.2.3.361 The impacts do not exceed a 0.02 survival rate percentage point change threshold when considering the Applicant Approach or lower end of the Guidance approach. However, as the upper end of the Guidance approach tipped the threshold PVA has been undertaken to further assess the level of potential effect predicted.

Population Viability Analysis

10.2.3.362 The potential for distributional responses alone has been assessed against the latest 2023 colony count population size of 12,800 breeding adults according to the Seabird Monitoring Programme (2020) database. A range of impact values from two to four breeding adult additional mortalities per annum were modelled, which allows for consideration of the Guidance approach predicted impact levels, as set out in Table 10-165 of Section 10.3.3. Even when considering a maximum predicted impact of four breeding adult mortalities (based on 60% displacement and 3-5% mortality rate), the annual reduction in the growth rate is predicted to be at most 0.031% against the latest colony count.

10.2.3.363 Regardless of the colony's population trend, such a level of effect would almost certainly be indistinguishable from natural fluctuations in the population. **As such, no potential for an AEoSI to the conservation objectives of the guillemot feature of Marwick Head SPA in relation to distributional response effects in the O&M phase from the Proposed Development (Offshore) alone can be concluded. Therefore, subject to natural change, guillemot will be maintained as a feature in the long term.**

Table 10-63: Guillemot O&M phase disturbance annual displacement matrix for impacts apportioned to Marwick Head SPA.

Annual Total	Mortality Rate (%)													
Displacement Rate (%)	1	2	3	5	10	20	30	40	50	60	70	80	90	100
10	0	0	1	1	2	3	5	7	8	10	12	13	15	17
20	0	1	1	2	3	7	10	13	17	20	23	27	30	33
30	1	1	2	3	5	10	15	20	25	30	35	40	45	50
40	1	1	2	3	7	13	20	27	33	40	47	53	60	67
50	1	2	3	4	8	17	25	33	42	50	58	67	75	83
60	1	2	3	5	10	20	30	40	50	60	70	80	90	100
70	1	2	4	6	12	23	35	47	58	70	82	93	105	117
80	1	3	4	7	13	27	40	53	67	80	93	107	120	134
90	2	3	5	8	15	30	45	60	75	90	105	120	135	150
100	2	3	5	8	17	33	50	67	83	100	117	134	150	167
Note, outputs highlighted in dark blue represent the predicted annual mortality estimates as per the Guidance Approach and those highlighted in yellow represent the predicted annual mortality estimates as per Applicant Approach. For further information regarding the Guidance and Applicant Approach see Section 2.5 of Volume 7B, Appendix 6-2: Offshore Ornithology Distributional Responses Technical Report and Volume 7B, Appendix 6-2, Annex 4: Review of Relevant Evidence.														

Calf of Eday SPA

10.2.3.364 The centroid of the Calf of Eday SPA is 119.9km (around land) from the centre of the Caledonia OWF, within the MMFR +1SD of guillemot (73.2±80.5km), and kittiwake (156.1±144.5km) (Woodward *et al*., 2019[78]). As such, potential for LSE alone has been identified for the following features of Calf of Eday SPA:

- Kittiwake
  - Collision (O&M)
  - Distributional response (O&M)
  - Distributional response (C&D, Section 7.3.1)
- Guillemot
  - Distributional response (O&M)
  - Distributional response (C&D, Section 7.3.1)

Conservation Objectives

- To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and
- To ensure for the qualifying species that the following are maintained in the long term:
  - Population of the species as a viable component of the site;
  - Distribution of the species within site;
  - Distribution and extent of habitats supporting the species;
  - Structure, function and supporting processes of habitats supporting the species; and
  - No significant disturbance of the species.

Kittiwake

10.2.3.365 Kittiwake have been screened into the assessment for O&M phase for distributional responses and collision risk. Due to potential connectivity being limited based on overall proportional weighting to Calf of Eday SPA, a combined assessment with other SPAs is provided in Section 10.2.3, beginning in paragraph 10.2.3.562. As presented in paragraph 10.2.3.562, **the potential for an AEoSI to the conservation objectives of kittiwake at Calf of Eday SPA in relation to both distributional responses and collision impacts from the Proposed Development (Offshore) alone during the O&M phase can confidently be ruled out. Therefore, subject to natural change, kittiwake will be maintained as a feature in the long term.**

Guillemot

10.2.3.366 Guillemot have been screened into the assessment for distributional responses as they are susceptible to displacement due to their distribution and behaviours (Furness and Wade, 2012[79]; Furness *et al*., 2013[80]; Bradbury *et al*., 2014[81]; NatureScot, 2023[82]).

Status

10.2.3.367 The SPA population of guillemot was cited as 12,645 breeding adults in 1998. The most recently published count (2018) is 7,402 breeding adults (SMP, 2024[89]).

10.2.3.368 When considering a breeding adult baseline mortality rate of 0.061 (1- 0.939, Horswill and Robinson 2015[85]), 771 (771.35) and 452 (451.52) breeding adults from the SPA population would be subject to natural mortality per annum, in relation to the citation count and most recently published count (2018) respectively. As of May 2022, the guillemot feature at Calf of Eday SPA is considered to be 'Unfavourable' with 'No change'.

Seasonal Apportionment of Potential Impacts

10.2.3.369 In line with NatureScot guidance, the assessment is carried out on a seasonal basis as the potential impacts on the SPA features varies by season. Guillemot have been assessed during the breeding season of April to mid-August and non-breeding season of mid-August to March in relation to Calf of Eday SPA (see Section 7.3.3).

Appropriate Assessment

10.2.3.370 As outlined above, guillemot have been screened into the assessment for distributional responses. The level of abundance apportioned is presented in Table 10-64 (detailed methods are presented within Application Document 13, Appendix 13-1: Caledonia North Apportioning Technical Note and Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note).

10.2.3.371 For guillemot, distributional response is assessed based on the birds within the Proposed Development (Offshore) Site and 2km buffer. The main focus of the assessment is based on the Applicant Approach of a displacement rate of 50% and a 1% mortality rate for O&M phase distributional response impacts. Presentation of distributional response impacts using the Guidance approach recommended rates are also provided. Further details regarding the differences between the Guidance and Applicant Approach for distributional response assessment is provided within Volume 7B, Appendix 6-2, Annex 4: Review of Relevant Evidence.

Table 10-64: Guillemot level of predicted abundance apportioned to the guillemot feature of the Calf of Eday SPA seasonally.

Defined Season (Months)	Level of Apportionment (%)	Apportioned Abundance (Breeding Adults)
Breeding season (April to Mid-August)	0.15	23.90
Non-breeding season (Mid-August to March)	1.05	70.23

O&M Phase Potential Distributional Response Effects on the Qualifying Feature in Isolation

10.2.3.372 During the O&M phase, the potential level of impact apportioned to the SPA seasonally is summarised in Table 10-65 for both the Applicant and Guidance Approach.

10.2.3.373 A displacement matrix is also presented for the annual apportioned abundance for the Proposed Development (Offshore) plus 2km buffer to Calf of Eday SPA in Table 10-66.

Table 10-65: Guillemot predicted distributional responses mortalities during the O&M phase attributed to Calf of Eday SPA and resultant change in survival rate percentage point change compared to citation and most recent population counts.

Population Size (Breeding Adults)	Defined Season (Months)	Applicant Approach		Guidance Approach	
		50% displacement, 1% mortality	Change in Average Survival Rate (% Point Change)	60% displacement, 1-3% mortality (non-breeding); 3-5% mortality (breeding)	Change in Average Survival Rate (% Point Change)
Citation (12,645)	Breeding season (April to Mid-August)	0.12	0.001	0.43 - 0.72	0.003 – 0.006
	Non-breeding season (Mid-August to March)	0.35	0.003	0.42 - 1.26	0.003 – 0.010
	Annual	0.47	0.004	0.85 - 1.98	0.007 – 0.016
Latest count (7,402)	Breeding season (April to Mid-August)	0.12	0.002	0.43 - 0.72	0.006 – 0.010
	Non-breeding season (Mid-August to March)	0.35	0.005	0.42 - 1.26	0.006 – 0.017
	Annual	0.47	0.006	0.85 - 1.98	0.012 – 0.027

Breeding Season

10.2.3.374 The estimated guillemot mean peak abundance during the breeding season is 16,092 (16,091.78) individuals, with an estimated 0.28% of guillemot during the breeding season deriving from Calf of Eday SPA (Application Document 13, Appendix 13-1: Caledonia North Apportioning Technical Note and Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note). Assuming that 57% of the guillemot population are adults (Furness, 2015)[87] and using an adult sabbatical rate of 7%, the total proportion of breeding adults from Calf of Eday SPA potentially impacted by distributional responses are 24 (23.90) per annum during the breeding season (Table 10-65)

10.2.3.375 When applying a displacement rate of 50% and a mortality rate of 1%, the consequent potential mortality is estimated at significantly less than one (0.12) breeding adult per annum.

10.2.3.376 Using the citation colony count of 12,645 breeding adults and an annual background mortality of 771 breeding adults, the addition of less than one predicted breeding adult mortality per annum would result in a 0.001 survival rate percentage point change during the breeding season. When considering the most up to date counts of 7,402 breeding adults and an annual background mortality of 452 breeding adults, this results in a 0.002 survival rate percentage point change during the breeding season per annum (Table 10-65).

Non-breeding Season

10.2.3.377 The estimated guillemot mean peak abundance during the non-breeding season is 6,710 (6,709.90) individuals. For guillemot, apportioning for the non-breeding season was based on the breeding population found within the MMFR + 1SD of the Caledonia OWF. This is in line with the approach outlined in the NatureScot Guidance Note 3 (NatureScot, 2023), based on recent geolocator studies presented in Buckingham *et al.* (2022)[88]. Based on the resultant SPA proportional split during the non-breeding season, 1.05% of predicted mortalities are estimated to derive from Calf of Eday SPA (Application Document 13, Appendix 13-1: Caledonia North Apportioning Technical Note and Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note). Therefore, the total mean peak abundance of breeding adults from the SPA potentially impacted by distributional responses are 70 (70.23) per annum during the non-breeding season (Table 10-65).

10.2.3.378 When applying a displacement rate of 50% and a mortality rate of 1%, the consequent predicted distributional response mortality of breeding adult guillemot from Calf of Eday SPA during the non-breeding season is predicted at less than one (0.38) per annum.

10.2.3.379 Based on the 1998 citation colony count of 12,645 breeding adults and using an annual background mortality of 771 breeding adults, the addition of less than one predicted breeding adult mortality per annum would result in a 0.003 survival rate percentage point change during the non-breeding season. When considering the most up to date counts of 7,402 breeding adults and an annual background mortality of 452 breeding adults, this results in a 0.005 survival rate percentage point change during the non-breeding season per annum (Table 10-65).

Annual Total

10.2.3.380 The predicted resultant mortality across all defined seasons from The Proposed Development (Offshore), attributed to Calf of Eday SPA, is less than one (0.47) breeding adult guillemot per annum. This is predicted to result in a survival rate percentage point change against the citation and most recently published counts of 0.004 and 0.006 respectively (Table 10-65).

10.2.3.381 When considering the Guidance approach, a total of less than one to two (0.85 - 1.98) breeding adult mortalities are predicted due to potential distributional response effects per annum. This results in a survival rate percentage point change of 0.007 – 0.016 against the citation count and 0.012 – 0.027 against the most recently published count (Table 10-65).

10.2.3.382 The impacts do not exceed a 0.02 survival rate percentage point change threshold when considering the Applicant Approach of lower levels of the Guidance approach. As the threshold is tipped for the upper end of the Guidance approach PVA has been undertaken to further assess the level of potential effect predicted.

Population Viability Analysis

10.2.3.383 The potential for distributional responses alone has been assessed against the latest 2018 colony count population size of 7,402 breeding adults according to the Seabird Monitoring Programme (2020) database. A range of impact values from less than one to two breeding adult additional mortalities per annum were modelled, which allows for consideration of the Guidance approach predicted impact levels, as set out in Table 10-101 of Section 10.3.3. Even when considering a predicted impact of two breeding adult mortalities (based on 60% displacement and 3-5% mortality rate), the annual reduction in the growth rate is predicted to be at most 0.030% against the latest colony count.

10.2.3.384 Regardless of the colony's population trend such a level of effect, even considering the loss of two adults per annum, would almost certainly be indistinguishable from natural fluctuations in the population. **As such, no potential for an AEoSI to the conservation objectives of the guillemot feature of Calf of Eday SPA in relation to distributional response effects in the O&M phase from the Proposed Development (Offshore) alone can be concluded. Therefore, subject to natural change, guillemot will be maintained as a feature in the long term.**

Table 10-66: Guillemot O&M phase disturbance annual displacement matrix for impacts apportioned to Calf of Eday SPA.

Annual Total	Mortality Rate (%)													
Displacement Rate (%)	1	2	3	5	10	20	30	40	50	60	70	80	90	100
10	0	0	0	0	1	2	3	4	5	6	7	8	8	9
20	0	0	1	1	2	4	6	8	9	11	13	15	17	19
30	0	1	1	1	3	6	8	11	14	17	20	23	25	28
40	0	1	1	2	4	8	11	15	19	23	26	30	34	38
50	0	1	1	2	5	9	14	19	24	28	33	38	42	47
60	1	1	2	3	6	11	17	23	28	34	40	45	51	56
70	1	1	2	3	7	13	20	26	33	40	46	53	59	66
80	1	2	2	4	8	15	23	30	38	45	53	60	68	75
90	1	2	3	4	8	17	25	34	42	51	59	68	76	85
100	1	2	3	5	9	19	28	38	47	56	66	75	85	94
Note, outputs highlighted in dark blue represent the predicted annual mortality estimates as per the Guidance Approach and those highlighted in yellow represent the predicted annual mortality estimates as per Applicant Approach. For further information regarding the Guidance and Applicant Approach see Section 2.5 of Volume 7B, Appendix 6-2: Offshore Ornithology Distributional Responses Technical Report and Volume 7B, Appendix 6-2, Annex 4: Review of Relevant Evidence.														

Cromarty Firth SPA and Ramsar Site

10.2.3.385 The centroid of the Cromarty Firth SPA and Ramsar Site is 122.0km (around land) from the centre of the Caledonia OWF. As such, potential for LSE alone has been identified for the following features of Cromarty Firth SPA and Ramsar Site:

- Bar-tailed godwit
  - Migratory collision (O&M)
- Greylag goose
  - Migratory collision (O&M)
- Osprey
  - Migratory collision (O&M)
- Whooper swan
  - Migratory collision (O&M)
- Common tern
  - Migratory Collision (O&M)
- Dunlin
  - Migratory collision (O&M)
- Knot
  - Migratory collision (O&M)
- Oystercatcher
  - Migratory collision (O&M)
- Red-breasted merganser
  - Migratory collision (O&M)
- Redshank
  - Migratory collision (O&M)
- Scaup
  - Migratory collision (O&M)
- Wigeon
  - Migratory collision (O&M)

Conservation Objectives

- To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and
- To ensure for the qualifying species that the following are maintained in the long term:

- Population of the species as a viable component of the site;
- Distribution of the species within site;
- Distribution and extent of habitats supporting the species;
- Structure, function and supporting processes of habitats supporting the species; and
- No significant disturbance of the species.

Appropriate Assessment

Potential Migratory Collision Risk Effects in Isolation

10.2.3.386 Consideration of the potential migratory collision risk on qualifying features of SPAs screened in for assessment is provided in Section 7.3.10. **As concluded within Section 7.3.10, the potential for an AEoSI to the conservation objectives of the qualifying features of Cromarty Firth SPA and Ramsar Site in relation to collision risk from the Proposed Development can be ruled out. Therefore, subject to natural change, all qualifying features assessed will be maintained as a feature in the long term.**

West Westray SPA

10.2.3.387 The centroid of the West Westray SPA is 131.7km (around land) from the centre of the Caledonia OWF, within the MMFR +1SD of guillemot (73.2±80.5km), razorbill (88.7±75.9km), and kittiwake (156.1±144.5km) (Woodward *et al*., 2019[78]). As such, potential for LSE alone has been identified for the following features of West Westray SPA:

- Kittiwake
  - Collision (O&M)
  - Distributional response (O&M)
  - Distributional response (C&D, Section 7.3.1)
- Guillemot
  - Distributional response (O&M)
  - Distributional response (C&D, Section 7.3.1)
- Razorbill
  - Distributional response (O&M)
  - Distributional response (C&D, Section 7.3.1)

Conservation Objectives

- To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and

- To ensure for the qualifying species that the following are maintained in the long term:
  - Population of the species as a viable component of the site;
  - Distribution of the species within site;
  - Distribution and extent of habitats supporting the species;
  - Structure, function and supporting processes of habitats supporting the species; and
  - No significant disturbance of the species.

Kittiwake

10.2.3.388 Kittiwake have been screened into the assessment for O&M phase for distributional responses and collision risk. Due to potential connectivity being limited based on overall proportional weighting to West Westray SPA, a combined assessment with other SPAs is provided in Section 10.2.3, beginning in paragraph 10.2.3.562. As presented in paragraph 10.2.3.562, **the potential for an AEoSI to the conservation objectives of kittiwake at West Westray SPA in relation to both distributional responses and collision impacts from the Proposed Development (Offshore) alone during the O&M phase can confidently be ruled out. Therefore, subject to natural change, kittiwake will be maintained as a feature in the long term.**

Guillemot

10.2.3.389 Guillemot have been screened into the assessment for distributional responses as they are susceptible to displacement due to their distribution and behaviours (Furness and Wade, 2012[79]; Furness *et al*., 2013[80]; Bradbury *et al*., 2014[81]; NatureScot, 2023[82]).

Status

10.2.3.390 The SPA population of guillemot was cited as 42,150 breeding adults in 1996. The most recently published count (2017 - 2023) is 40,673 breeding adults (SMP, 2024[89]).

10.2.3.391 When considering a breeding adult baseline mortality rate of 0.061 (1- 0.939, Horswill and Robinson 2015[85]), 2,571 (2,571.15) and 2,481 (2,481.05) breeding adults from the SPA population would be subject to natural mortality per annum, in relation to the citation count and most recently published count (2017 - 2023) respectively. As of June 2023, the guillemot feature at West Westray SPA is considered to be 'Unfavourable' with 'No change'.

Seasonal Apportionment of Potential Impacts

10.2.3.392 In line with NatureScot guidance, the assessment is carried out on a seasonal basis as the potential impacts on the SPA features varies by season. Guillemot have been assessed during the breeding season of April to Mid-August and non-breeding season of Mid-August to March in relation to West Westray SPA (see Section 7.3.3).

Appropriate Assessment

10.2.3.393 As outlined above, guillemot have been screened into the assessment for distributional responses. The level of abundance apportioned is presented in Table 10-67 (detailed methods are presented within Application Document 13, Appendix 13-1: Caledonia North Apportioning Technical Note and Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note).

10.2.3.394 For guillemot, distributional response is assessed based on the birds within the Proposed Development (Offshore) And 2km buffer. The main focus of the assessment is based on the Applicant Approach of a displacement rate of 50% and a 1% mortality rate for O&M phase distributional response impacts. Presentation of distributional response impacts using the Guidance approach recommended rates are also provided. Further details regarding the differences between the Guidance and Applicant Approach for distributional response assessment is provided within Volume 7B, Appendix 6-2, Annex 4: Review of Relevant Evidence.

Table 10-67: Guillemot level of predicted abundance apportioned to the guillemot feature of the West Westray SPA seasonally.

Defined Season (Months)	Level of Apportionment (%)	Apportioned Abundance (Breeding Adults)
Breeding season (April to Mid-August)	0.67	107.59
Non-breeding season (Mid-August to March)	5.75	385.92

O&M Phase Potential Distributional Response Effects on the Qualifying Feature in Isolation

10.2.3.395 During the O&M phase, the potential level of impact apportioned to the SPA seasonally is summarised in Table 10-68 for both the Applicant and Guidance approach.

10.2.3.396 A displacement matrix is also presented for the annual apportioned abundance for the Proposed Development (Offshore) plus 2km buffer to West Westray SPA in Table 10-69.

Table 10-68: Guillemot predicted distributional responses mortalities during the O&M phase attributed to West Westray SPA and resultant change in survival rate percentage point change compared to citation and most recent population counts.

Population Size (Breeding Adults)	Defined Season (Months)	Applicant Approach		Guidance Approach	
		50% displacement, 1% mortality	Change in Average Survival Rate (% Point Change)	60% displacement, 1-3% mortality (non-breeding); 3-5% mortality (breeding)	Change in Average Survival Rate (% Point Change)
Citation (42,150)	Breeding season (April to Mid-August)	0.54	0.001	1.94 – 3.23	0.005 – 0.008
	Non-breeding season (Mid-August to March)	1.93	0.005	2.32 – 6.95	0.001 – 0.016
	Annual	2.47	0.006	4.25 – 10.17	0.010 - 0.024
Latest count (40,673)	Breeding season (April to Mid-August)	0.54	0.001	1.94 – 3.23	0.005 – 0.008
	Non-breeding season (Mid-August to March)	1.93	0.005	2.32 – 6.95	0.006 – 0.017
	Annual	2.47	0.006	4.25 – 10.17	0.010 - 0.025

Breeding Season

10.2.3.397 The estimated guillemot mean peak abundance during the breeding season is 16,092 (16,091.78) individuals, with an estimated 1.26% of guillemot during the breeding season deriving from West Westray SPA (Application Document 13, Appendix 13-1: Caledonia North Apportioning Technical Note and Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note). Assuming that 57% of the guillemot population are adults (Furness, 2015)[87] and using an adult sabbatical rate of 7%, the total proportion of breeding adults from West Westray SPA potentially impacted by distributional responses are 108 (107.59) per annum during the breeding season (Table 10-68).

10.2.3.398 When applying a displacement rate of 50% and a mortality rate of 1%, the consequent potential mortality is estimated to less than one (0.54) breeding adult per annum.

10.2.3.399 Using the citation colony count of 42,150 breeding adults and an annual background mortality of 2,571 breeding adults, the addition of less than one predicted breeding adult mortality per annum would result in a 0.001 survival rate percentage point change during the breeding season. When considering the most up to date counts of 40,673 breeding adults and an annual background mortality of 2,481 breeding adults, this results in a 0.001 survival rate percentage point change during the breeding season per annum (Table 10-68).

Non-breeding Season

10.2.3.400 The estimated guillemot mean peak abundance during the non-breeding season is 6,710 (6,709.90) individuals. For guillemot, apportioning for the non-breeding season was based on the breeding population found within the MMFR + 1SD of the Caledonia OWF. This is in line with the approach outlined in the NatureScot Guidance Note 3 (NatureScot, 2023), based on recent geolocator studies presented in Buckingham *et al.* (2022[88]). Based on the resultant SPA proportional split during the non-breeding season, 5.75% of predicted mortalities are estimated to derive from West Westray SPA (Application Document 13, Appendix 13-1: Caledonia North Apportioning Technical Note and Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note). Therefore, the total mean peak abundance of breeding adults from the SPA potentially impacted by distributional responses are 386 (385.92) per annum during the non-breeding season (Table 10-68).

10.2.3.401 When applying a displacement rate of 50% and a mortality rate of 1%, the consequent predicted distributional response mortality of breeding adult guillemot from West Westray SPA during the non-breeding season is predicted at two (1.93) per annum.

10.2.3.402 Based on the 1996 citation colony count of 42,150 breeding adults and using an annual background mortality of 2,571 breeding adults, the addition of two predicted breeding adult mortalities per annum would result in a 0.005 survival rate percentage point change during the non-breeding season. When considering the most up to date counts of 40,673 breeding adults and an annual background mortality of 2,481 breeding adults, this results in a 0.005 survival rate percentage point change during the non-breeding season per annum (Table 10-68).

Annual Total

10.2.3.403 The predicted resultant mortality across all defined seasons from The Proposed Development (Offshore), attributed to West Westray SPA, is two (2.47) breeding adult guillemot per annum. This is predicted to result in a survival rate percentage point change against the citation and most recently published counts of 0.006 and 0.006 respectively (Table 10-68).

10.2.3.404 When considering the Guidance approach, a total of four to 10 (4.25 – 10.17) breeding adult mortalities are predicted due to potential distributional response effects per annum. This results in a survival rate percentage point change of 0.010 - 0.024 against the citation and 0.010 - 0.025 against the most recently published count (Table 10-68).

10.2.3.405 The impacts do not exceed a 0.02 survival rate percentage point change threshold when considering the Applicant Approach or the lower levels of the Guidance approach. However, as the threshold is tipped from the upper end of the Guidance approach PVA has been undertaken to further assess the level of potential effect predicted.

Population Viability Analysis

10.2.3.406 The potential for distributional responses alone has been assessed against the latest 2017-2023 colony count population size of 40,673 breeding adults according to the Seabird Monitoring Programme (2020) database. A range of impact values from four to 10 breeding adult additional mortalities per annum were modelled, which allows for consideration of the Guidance approach predicted impact levels, as set out in Table 10-169 of Section 10.3.3. Even when considering a maximum predicted impact of 10 breeding adult mortalities (based on 60% displacement and 3-5% mortality rate), the annual reduction in the growth rate is predicted to be at most 0.028% against the latest colony count (PVA outputs against the citation count are presented in Application Document 13, Appendix 13-2: Caledonia North Habitats Regulations Appraisal Population Viability Analysis Technical Report and Application Document 14, Appendix 14-2: Caledonia South Habitats Regulations Appraisal Population Viability Analysis Technical Report as additional information).

10.2.3.407 Regardless of the colony’s population trend, such a level of effect would almost certainly be indistinguishable from natural fluctuations in the population. **As such, no potential for an AEoSI to the conservation objectives of the guillemot feature of West Westray SPA in relation to distributional response effects in the O&M phase from the Proposed Development (Offshore) alone can be concluded. Therefore, subject to natural change, guillemot will be maintained as a feature in the long term**

Table 10-69: Guillemot O&M phase disturbance annual displacement matrix for impacts apportioned to West Westray SPA.

Annual Total	Mortality Rate (%)													
Displacement Rate (%)	1	2	3	5	10	20	30	40	50	60	70	80	90	100
10	0	1	1	2	5	10	15	20	25	30	35	39	44	49
20	1	2	3	5	10	20	30	39	49	59	69	79	89	99
30	1	3	4	7	15	30	44	59	74	89	104	118	133	148
40	2	4	6	10	20	39	59	79	99	118	138	158	178	197
50	2	5	7	12	25	49	74	99	123	148	173	197	222	247
60	3	6	9	15	30	59	89	118	148	178	207	237	266	296
70	3	7	10	17	35	69	104	138	173	207	242	276	311	345
80	4	8	12	20	39	79	118	158	197	237	276	316	355	395
90	4	9	13	22	44	89	133	178	222	266	311	355	400	444
100	5	10	15	25	49	99	148	197	247	296	345	395	444	494

Note, outputs highlighted in dark blue represent the predicted annual mortality estimates as per the Guidance Approach and those highlighted in yellow represent the predicted annual mortality estimates as per Applicant Approach. For further information regarding the Guidance and Applicant Approach see Section 2.5 of Volume 7B, Appendix 6-2: Offshore Ornithology Distributional Responses Technical Report and Volume 7B, Appendix 6-2, Annex 4: Review of Relevant Evidence.

Razorbill

10.2.3.408 Razorbill have been screened into the assessment for O&M phase for distributional responses. Due to potential connectivity being limited based on overall proportional weighting to West Westray SPA, a combined assessment with other SPAs is provided in Section 10.2.3, beginning in paragraph 10.2.3.569. As presented in paragraph 10.2.3.569, **the potential for an AEoSI to the conservation objectives of razorbill at West Westray SPA in relation to distributional response impacts from the Proposed Development (Offshore) alone during the O&M phase can confidently be ruled out. Therefore, subject to natural change, razorbill will be maintained as a feature in the long term.**

Inner Moray Firth SPA and Ramsar Site

10.2.3.409 The centroid of the Inner Moray Firth SPA and Ramsar Site is 127.4km (around land) from the centre of the Caledonia OWF. As such, potential for LSE alone has been identified for the following features of Inner Moray Firth SPA and Ramsar Site:

- Bar-tailed godwit
  - Migratory collision (O&M)
- Greylag goose
  - Migratory collision (O&M)
- Red-breasted merganser
  - Migratory collision (O&M)
- Redshank
  - Migratory collision (O&M)
- Curlew
  - Migratory collision (O&M)
- Goldeneye
  - Migratory collision (O&M)
- Oystercatcher
  - Migratory collision (O&M)
- Scaup
  - Migratory collision (O&M)
- Teal
  - Migratory collision (O&M)
- Wigeon
  - Migratory collision (O&M)

Conservation Objectives

- To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and
- To ensure for the qualifying species that the following are maintained in the long term:
  - Population of the species as a viable component of the site;
  - Distribution of the species within site;
  - Distribution and extent of habitats supporting the species;
  - Structure, function and supporting processes of habitats supporting the species; and
  - No significant disturbance of the species.

Appropriate Assessment

Potential Migratory Collision Risk Effects in Isolation

10.2.3.410 Consideration of the potential migratory collision risk on qualifying features of SPAs screened in for assessment is provided in Section 7.3.10. **As concluded within Section 7.3.10, the potential for an AEoSI to the conservation objectives of the qualifying features of Inner Moray Firth SPA and Ramsar Site in relation to collision risk from the Proposed Development (Offshore) can be ruled out. Therefore, subject to natural change, all qualifying features assessed will be maintained as a feature in the long term.**

Fowlsheugh SPA

10.2.3.411 The centroid of the Fowlsheugh SPA is 161.3km (around land) from the centre of the Caledonia OWF, within the MMFR +1SD of kittiwake (156.1±144.5km) (Woodward *et al.,* 2019[78]). The razorbill feature of Fowlsheugh SPA has also been screened into assessment though only for the non-breeding season, due to the Proposed Development (Offshore) being outside of MMFR + 1SD. As such, potential for LSE alone has been identified for the following features of Fowlsheugh SPA:

- Kittiwake
  - Collision (O&M)
  - Distributional response (O&M)
  - Distributional response (C&D, Section 7.3.1)
- Razorbill
  - Distributional response (O&M)
  - Distributional response (C&D, Section 7.3.1)

Conservation Objectives

- To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and
- To ensure for the qualifying species that the following are maintained in the long term:
  - Population of the species as a viable component of the site;
  - Distribution of the species within site;
  - Distribution and extent of habitats supporting the species;
  - Structure, function and supporting processes of habitats supporting the species; and
  - No significant disturbance of the species.

Kittiwake

10.2.3.412 Kittiwake have been screened into the assessment for collision risk as they are susceptible to collision due to their flight height distribution and behaviours (Furness and Wade, 2012[79]; Furness *et al*., 2013[80]; Bradbury *et al*., 2014[81]; NatureScot, 2023[82]; JNCC, 2024[83]).

10.2.3.413 Kittiwake have also been assessed for distributional responses as requested by NatureScot within consultation; however, the Applicant remains of the position that kittiwake do not require assessment for distributional responses due to the evidence base detailed within Volume 7B, Appendix 6-2, Annex 4: Review of Relevant Evidence suggesting kittiwake show limited behavioural response to OWFs. Distributional responses are assessed based on the birds within the Proposed Development (Offshore) And 2km buffer. A Guidance approach only is presented for kittiwake based on a displacement rate of 30% and a 1-3% mortality rate for O&M phase distributional response impacts.

10.2.3.414 The level of predicted abundance and collision risk apportioned to the kittiwake feature of the Fowlsheugh SPA to inform assessments is presented in Table 10-70 (detailed methods are presented within Application Document 13, Appendix 13-1: Caledonia North Apportioning Technical Note and Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note).

Table 10-70: Kittiwake level of abundance and collision risk apportioned to Fowlsheugh SPA seasonally.

Defined Season (Months)	Level of Apportionment (%)	Apportioned Abundance (Breeding Adults)	Apportioned collision risk (breeding adults)
Breeding season (Mid-April to August)	2.45	49.95	1.35
Non-breeding season (September to early-April)	1.35 (Autumn %) 1.78 (Spring %)	6.52	0.18
Note two weightings for apportioning non-breeding season kittiwake are provided for autumn migration (September to December), and spring migration (January to Early-April). The autumn weighting has been used to apportion the potential numbers of non-breeding kittiwake distributional response as the mean peak of this species was recorded during the autumn migration season. While both the Spring and Autumn weightings have been used to apportion collision mortalities during the non-breeding season.			

Status

10.2.3.415 The SPA population of kittiwake was cited as 73,300 breeding adults in 1992. The most recently published count (2018 - 2023) is 40,156 breeding adults (SMP, 2024[89]).

10.2.3.416 When considering a breeding adult baseline mortality rate of 0.146 (1- 0.854, Horswill and Robinson 2015)[85], 10,702 (10,701.80) and 5,863 (5,862.78) breeding adults from the SPA population would be subject to natural mortality per annum, in relation to the citation count and most recently published count (2018 - 2023) respectively. As of June 2018, the kittiwake feature at to Fowlsheugh SPA is considered to be 'Unfavourable' and 'Declining'.

Seasonal Apportionment of Potential Impacts

10.2.3.417 In line with NatureScot guidance, the assessment is carried out on a seasonal basis as the potential impacts on the SPA features varies by season. Kittiwake have been assessed during the breeding season of Mid-April to August and non-breeding season of September to Early April in relation to Fowlsheugh SPA (see Section 7.3.3).

Appropriate Assessment

O&M Phase Potential Distributional Response Effects on the Qualifying Feature in Isolation

10.2.3.418 During the O&M phase, the potential level of impact apportioned to the SPA seasonally is summarised in Table 10-71 for the Guidance approach.

10.2.3.419 A displacement matrix is also presented for the annual apportioned abundance for the Proposed Development (Offshore) plus 2km buffer to Fowlsheugh SPA in Table 10-72.

Table 10-71: Kittiwake predicted distributional responses mortalities during the O&M phase attributed to Fowlsheugh SPA and resultant change in survival rate percentage point change compared to citation and most recent population counts (guidance approach).

Population Size (Breeding Adults)	Defined Season (Months)	Guidance Approach	
		30% displacement, 1-3% mortality	Change in Average Survival Rate (% Point Change)
Citation (73,300)	Breeding season (Mid-April to August)	0.15 – 0.45	<0.001 – 0.001
	Non-breeding season (September to early-April)	0.02 – 0.06	<0.001
	Annual	0.17 – 0.51	<0.001 – 0.001
Latest count (40,156)	Breeding season (Mid-April to August)	0.15 – 0.45	<0.001 – 0.001
	Non-breeding season (September to early-April)	0.02 – 0.06	<0.001
	Annual	0.17 – 0.51	<0.001 – 0.001

Breeding Season

10.2.3.420 The estimated kittiwake mean peak abundance during the breeding season is 2,039 (2,038.69) individuals, with an estimated 5.14% of all individuals during the breeding season deriving from Fowlsheugh SPA (Application Document 13, Appendix 13-1: Caledonia North Apportioning Technical Note and Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note). Assuming that 53% of the kittiwake population are adults (Furness, 2015[87]) and using an adult sabbatical rate of 10%, the total proportion of breeding adults from Fowlsheugh SPA potentially impacted by distributional responses are 50 (49.95) per annum during the breeding season (Table 10-71).

10.2.3.421 When applying a displacement rate of 30% and a mortality rate of 1-3%, the consequent potential mortality is estimated at less than one (0.15 – 0.45) breeding adult per annum.

10.2.3.422 Using the citation colony count of 73,300 breeding adults and an annual background mortality of 10,702 breeding adults, the addition of less than one predicted breeding adult mortality would result in a <0.001 – 0.001 survival rate percentage point change during the breeding season per annum. When considering the most up to date counts of 40,156 breeding adults and an annual background mortality of 5,863 breeding adults, this results in a <0.001 – 0.001 survival rate percentage point change during the breeding season per annum (Table 10-71).

Non-breeding Season

10.2.3.423 The estimated kittiwake mean peak abundance during the non-breeding season is 483 (483.00) individuals. Based on the Furness (2015)[87] non-breeding season BDMPS region SPA proportional split corresponding to the mean peak abundance recorded, 1.35% of predicted mortalities during the non-breeding season are estimated to derive from Fowlsheugh SPA (Application Document 13, Appendix 13-1: Caledonia North Apportioning Technical Note and Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note). Therefore, the total mean peak abundance of breeding adults from the SPA potentially impacted by distributional responses are seven (6.52) per annum during the non-breeding season (Table 10-71).

10.2.3.424 When applying a displacement rate of 30% and a mortality rate of 1-3%, the consequent predicted distributional response mortality of breeding adult kittiwake from Fowlsheugh SPA during the non-breeding season is predicted at significantly less than one (0.02 – 0.06) per annum.

10.2.3.425 Based on the 1992 citation colony count of 73,300 breeding adults and using an annual background mortality of 10,702 breeding adults, the addition of less than one predicted breeding adult mortality would result in a <0.001 survival rate percentage point change during the non-breeding season per annum. When considering the most up to date counts of 40,156 breeding adults and an annual background mortality of 5,863 breeding adults, this results in a <0.001 survival rate percentage point change during the non-breeding season per annum (Table 10-71).

Annual Total

10.2.3.426 The predicted resultant mortality across all defined seasons from The Proposed Development (Offshore), attributed to Fowlsheugh SPA, is less than one (0.17 – 0.51) breeding adult kittiwake per annum. This is predicted to result in a survival rate percentage point change against the citation and most recently published counts of <0.001 – 0.001 and <0.001 – 0.001 respectively (Table 10-71).

10.2.3.427 For both citation and most recently published count, the Guidance Approach predicted additional breeding adult mortalities per annum equates to a <0.02 survival rate percentage point change and would therefore be indistinguishable from natural fluctuations in the population. **There is, therefore, no potential for an AEoSI to the conservation objectives of kittiwake at Fowlsheugh SPA in relation to potential distributional response effects from the Proposed Development (Offshore) alone during the O&M phase. Therefore, subject to natural change, kittiwake will be maintained as a feature in the long term**

Table 10-72: Kittiwake O&M phase disturbance annual displacement matrix for impacts apportioned to Fowlsheugh SPA (Guidance approach).

Annual Total	Mortality Rate (%)													
Displacement Rate (%)	1	2	3	5	10	20	30	40	50	60	70	80	90	100
10	0	0	0	0	1	1	2	2	3	3	4	5	5	6
20	0	0	0	1	1	2	3	5	6	7	8	9	10	11
30	0	0	1	1	2	3	5	7	8	10	12	14	15	17
40	0	0	1	1	2	5	7	9	11	14	16	18	20	23
50	0	1	1	1	3	6	8	11	14	17	20	23	25	28
60	0	1	1	2	3	7	10	14	17	20	24	27	30	34
70	0	1	1	2	4	8	12	16	20	24	28	32	36	40
80	0	1	1	2	5	9	14	18	23	27	32	36	41	45
90	1	1	2	3	5	10	15	20	25	30	36	41	46	51
100	1	1	2	3	6	11	17	23	28	34	40	45	51	56
Note, outputs highlighted in dark blue represent the predicted annual mortality estimates as per the Guidance Approach. For further information regarding the Guidance and Applicant Approach see Section 2.5 of Volume 7B, Appendix 6-2: Offshore Ornithology Distributional Responses Technical Report and Volume 7B, Appendix 6-2, Annex 4: Review of Relevant Evidence.														

O&M Phase Potential Collision Risk Impacts on the Qualifying Feature in Isolation

10.2.3.428 During the O&M phase, the potential level of impact from collision risk apportioned to the Fowlsheugh SPA and subsequent survival rate percentage point change is summarised in Table 10-73.

Table 10-73: Kittiwake predicted collision risk impacts during the O&M phase attributed to Fowlsheugh SPA and resultant change in survival rate percentage point change compared to citation and most recent population counts.

Population Size (Breeding Adults)	Defined Season (Months)	Collision risk impact	
		Breeding adults per annum	Change in Average Survival Rate (% Point Change)
Citation (73,300)	Breeding season (Mid-April to August)	1.35	0.002
	Non-breeding season (September to early-April)	0.18	<0.001
	Annual	1.53	0.002
Latest count (40,156)	Breeding season (Mid-April to August)	1.35	0.003
	Non-breeding season (September to early-April)	0.18	<0.001
	Annual	1.53	0.004

Breeding Season

10.2.3.429 The predicted kittiwake collision mortality during the breeding season is 55 (55.27) individuals per annum, with an estimated 5.14% of all individuals during the breeding season deriving from Fowlsheugh SPA (Application Document 13, Appendix 13-1: Caledonia North Apportioning Technical Note and Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note). Assuming that 53% of the population are adults (Furness, 2015[87]) and using an adult sabbatical rate of 10%, the total proportion of breeding adults from Fowlsheugh SPA potentially subject to collision consequent mortality is one (1.35) per annum during the breeding season.

10.2.3.430 Using the citation colony count of 73,300 breeding adults and an annual background mortality of 10,702 breeding adults, the addition of one predicted breeding adult mortality per annum would result in a 0.002 survival rate percentage point change during the breeding season. When considering the most up to date counts of 40,156 breeding adults and an annual background mortality of 5,863 breeding adults, this results in a 0.003 survival rate percentage point change during the breeding season per annum (see Table 10-73).

Non-breeding Season

10.2.3.431 The predicted kittiwake collision mortality during the non-breeding season is 12 (11.74) individuals. Based on the Furness (2015)[87] spring and autumn season BDMPS region SPA proportional split, 1.78% and 1.35% of predicted mortalities during the non-breeding season are estimated to derive from Fowlsheugh SPA (Application Document 13, Appendix 13-1: Caledonia North Apportioning Technical Note and Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note), the consequent predicted collision mortality of adult kittiwake during the non-breeding season is predicted at significantly less than one (0.18) per annum (see Table 10-73)

10.2.3.432 Based on the 1992 citation colony count of 73,300 breeding adults and using an annual background mortality of 10,702 breeding adults, the addition of less than one predicted breeding adult mortalities per annum would result in a <0.001 survival rate percentage point change during the non-breeding season. When considering the most up to date counts of 40,156 breeding adults and an annual background mortality of 5,863 breeding adults, this results in a change in survival rate percentage point change of <0.001 during the non-breeding season per annum (see Table 10-73).

Annual Total

10.2.3.433 The predicted resultant mortality across all defined seasons from The Proposed Development (Offshore), attributed to Fowlsheugh SPA, is two (1.53) breeding adults per annum. This is predicted to result in a 0.002 and 0.004 survival rate percentage point change when considering the citation count and most recently published count, respectively (see Table 10-73).

10.2.3.434 For both citation and most recently published count, the Guidance Approach predicted additional breeding adult mortalities per annum equates to a <0.02 survival rate percentage point change and would therefore be indistinguishable from natural fluctuations in the population. **There is, therefore, no potential for an AEoSI to the conservation objectives of kittiwake at Fowlsheugh SPA in relation to potential distributional response effects from the Proposed Development (Offshore) alone during the O&M phase. Therefore, subject to natural change, kittiwake will be maintained as a feature in the long term.**

O&M Phase Potential Combined Distributional Response and Collision Risk Impacts on the Qualifying Feature in Isolation

10.2.3.435 During the O&M phase, the potential level of combined impact from collision risk and distributional responses apportioned to the Fowlsheugh SPA and subsequent survival rate percentage point change is summarised in Table 10-74.

Table 10-74: Kittiwake predicted distributional response and collision risk impacts during the O&M phase attributed to Fowlsheugh SPA and resultant change in survival rate percentage point change compared to citation and most recent population counts.

Population Size (Breeding Adults)	Defined Season (Months)	Guidance Approach 30% displacement; 1-3% mortality	
		Estimated number of mortalities from combined CRM and Distributional responses per annum	Change in Average Survival Rate (% Point Change)
Citation (73,300)	Breeding season (Mid-March to September)	1.50 – 1.80	0.002
	Non-breeding season (October to Early-March)	0.20 – 0.24	<0.001
	Annual	1.70 – 2.04	0.002 – 0.003
Latest count (40,156)	Breeding season (Mid-March to September)	1.50 – 1.80	0.004
	Non-breeding season (October to Early-March)	0.20 – 0.24	<0.001 – 0.001
	Annual	1.70 – 2.04	0.004 – 0.005

Breeding Season

10.2.3.436 As presented within (Table 10-74) the combined distributional response and collision risk impacts apportioned to the kittiwake feature of Fowlsheugh SPA, equates to approximately two (1.50 – 1.80) additional breeding adult mortalities during the breeding season per annum (when considering a displacement rate of 30% and a mortality rate of 1-3%). Using the citation colony count of 73,300 breeding adults and an annual background mortality of 10,702 breeding adults, the addition of two predicted breeding adult mortalities would result in a 0.002 survival rate percentage point change during the breeding season per annum. When considering the most up to date count of 40,156 breeding adults and an annual background mortality of 5,863 breeding adults, this results in a 0.004 survival rate percentage point change during the breeding season per annum (see Table 10-74).

Non-breeding Season

10.2.3.437 As presented within Table 10-74 the combined distributional response and collision risk impacts apportioned to the kittiwake feature of Fowlsheugh SPA, equates to approximately less than one additional adult mortality during the non-breeding season per annum (when considering a displacement rate of 30% and a mortality rate of 1-3%). Using the citation colony count of 73,300 breeding adults and an annual background mortality of 10,702 breeding adults, the addition of one predicted breeding adult mortality would result in a <0.001 survival rate percentage point change during the breeding season per annum. When considering the most up to date counts of 40,156 breeding adults and an annual background mortality of 5,863 breeding adults, this results in a <0.001 – 0.001 survival rate percentage point change during the non-breeding season per annum (see Table 10-74).

Annual Total

10.2.3.438 The predicted resultant mortality across all defined seasons from The Proposed Development (Offshore), attributed to Fowlsheugh, is two (1.70 – 2.04) kittiwake per annum. This is predicted to result in survival rate percentage point change against the citation and most recently published counts of 0.002 – 0.003 and 0.004 – 0.005 respectively (see Table 10-74).

10.2.3.439 For both citation and most recently published count, the Guidance Approach predicted additional breeding adult mortalities per annum equates to a <0.02 survival rate percentage point change and would therefore be indistinguishable from natural fluctuations in the population. **There is, therefore, no potential for an AEoSI to the conservation objectives of kittiwake at Fowlsheugh SPA in relation to potential distributional response effects from the Proposed Development (Offshore) alone during the O&M phase. Therefore, subject to natural change, kittiwake will be maintained as a feature in the long term.**

Razorbill

10.2.3.440 Razorbill have been screened into the assessment for O&M phase for distributional responses. Due to potential connectivity being limited based on overall proportional weighting to Fowlsheugh SPA, a combined assessment with other SPAs is provided in Section 10.2.3, beginning in paragraph 10.2.3.569. As presented in paragraph 10.2.3.569, **the potential for an AEoSI to the conservation objectives of razorbill at Fowlsheugh SPA in relation to distributional response impacts from the Proposed Development (Offshore) alone during the O&M phase can confidently be ruled out. Therefore, subject to natural change, razorbill will be maintained as a feature in the long term.**

Cape Wrath SPA

10.2.3.441 The centroid of the Cape Warth SPA is 175.3km (around land) from The Caledonia OWF, within the MMFR +1SD of puffin (137.1±128.3km), and kittiwake (156.1±144.5km) (Woodward *et al*., 2019[78]). As such, potential for LSE alone has been identified for the following features of Cape Wrath SPA:

- Kittiwake
  - Collision (O&M)
  - Distributional response (O&M)
  - Distributional response (C&D, Section 7.3.1)
- Puffin
  - Distributional response (O&M)
  - Distributional response (C&D, Section 7.3.1)

Conservation Objectives

- To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and
- To ensure for the qualifying species that the following are maintained in the long term:
  - Population of the species as a viable component of the site;
  - Distribution of the species within site;
  - Distribution and extent of habitats supporting the species;
  - Structure, function and supporting processes of habitats supporting the species; and
  - No significant disturbance of the species.

Kittiwake

10.2.3.442 Kittiwake have been screened into the assessment for O&M phase for distributional responses and collision risk. Due to potential connectivity being limited based on overall proportional weighting to Cape Wrath SPA, a combined assessment with other SPAs is provided in Section 10.2.3, beginning in paragraph 10.2.3.562. As presented in paragraph 10.2.3.562, **the potential for an AEoSI to the conservation objectives of kittiwake at Cape Wrath SPA in relation to both distributional responses and collision impacts from the Proposed Development (Offshore) alone during the O&M phase can confidently be ruled out. Therefore, subject to natural change, kittiwake will be maintained as a feature in the long term.**

Puffin

10.2.3.443 Puffin have been screened into the assessment for O&M phase for distributional responses. Due to potential connectivity being limited based on overall proportional weighting to Cape Wrath SPA, a combined assessment with other SPAs is provided in Section 10.2.3, beginning in paragraph 10.2.3.573. As presented in paragraph 10.2.3.573, **the potential for an AEoSI to the conservation objectives of puffin at Cape Wrath SPA in relation to distributional response impacts from the Proposed Development (Offshore) alone during the O&M phase can confidently be ruled out. Therefore, subject to natural change, puffin will be maintained as a feature in the long term.**

Sule Skerry and Sule Stack SPA

10.2.3.444 The centroid of the Sule Skerry and Sule Stack SPA is 154.8km (around land) from the centre of the Caledonia OWF, within the MMFR +1SD of gannet (315.2±194.2km), puffin (137.1±128.3km), and storm petrel (336.0km) (Woodward *et al*., 2019[78]). As such, potential for LSE alone has been identified for the following features of Sule Skerry and Sule Stack SPA:

- Puffin
  - Distributional response (O&M)
  - Distributional response (C&D, Section 7.3.1)
- Storm petrel
  - Distributional response (O&M)
  - Distributional response (C&D)
- Gannet
  - Collision (O&M)
  - Distributional response (O&M)
  - Distributional response (C&D, Section 7.3.1)

Conservation Objectives

- To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and
- To ensure for the qualifying species that the following are maintained in the long term:
  - Population of the species as a viable component of the site;
  - Distribution of the species within site;
  - Distribution and extent of habitats supporting the species;
  - Structure, function and supporting processes of habitats supporting the species; and

- No significant disturbance of the species.

Puffin

10.2.3.445 Puffin have been screened into the assessment for distributional responses as they are susceptible to displacement due to their distribution and behaviours (Furness and Wade, 2012[79]; Furness *et al*., 2013[80]; Bradbury *et al*., 2014[81]; NatureScot, 2023[82]).

Status

10.2.3.446 The SPA population of puffin was cited as 93,800 breeding adults in 1994. The most recently published count (2018) is 95,484 breeding adults (SMP, 2024[89]).

10.2.3.447 When considering a breeding adult baseline mortality rate of 0.094 (1-0.906, Horswill and Robinson 2015[85]), 8,817 (8,817.20) and 8,976 (8,975.50) breeding adults from the SPA population would be subject to natural mortality per annum, in relation to the citation count and most recently published count (2018) respectively. As of June 2018, the puffin feature at Sule Skerry and Sule Stack SPA is considered to be 'Favourable' and 'Maintained'.

Seasonal Apportionment of Potential Impacts

10.2.3.448 In line with NatureScot guidance, the assessment is carried out on a seasonal basis as the potential impacts on the SPA features varies by season. Puffin have been assessed during the breeding season of April to Mid-August and non-breeding season of Mid-August to March in relation to Sule Skerry and Sule Stack SPA (see Section 7.3.3).

Appropriate Assessment

10.2.3.449 As outlined above, puffin have been screened into the assessment for distributional responses. The level of abundance apportioned is presented in Table 10-75 (detailed methods are presented within Application Document 13, Appendix 13-1: Caledonia North Apportioning Technical Note and Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note).

10.2.3.450 For puffin, distributional responses are assessed based on the birds within the Proposed Development (Offshore) And 2km buffer. The main focus of the assessment is based on the Applicant Approach of a displacement rate of 50% and a 1% mortality rate for O&M phase distributional response impacts. Presentation of distributional response impacts using the Guidance Approach recommended rates are also provided. Further details regarding the differences between the Guidance and Applicant Approach for distributional response assessment is provided within Volume 7B, Appendix 6-2, Annex 4: Review of Relevant Evidence.

Table 10-75: Puffin level of abundance apportioned to Sule Skerry and Sule Stack SPA seasonally.

Defined Season (Months)	Level of Apportionment (%)	Apportioned Abundance (Breeding Adults)
Breeding season (April to Mid-August)	29.72	207.44* / 612.38**
Non-breeding season (Mid-August to March)	0.05	1.54* / 0.69**
* It should be noted the Applicant has decided to include the Year 1 August count in the non-breeding season rather than during the breeding season. This is due to the Year 1 August abundance being considered to reflect migration rather than individuals present in the breeding season. ** The mean seasonal peaks for puffin have also been presented with the August count included in the breeding season as per the Guidance Approach. Note apportioned abundance is presented for the Applicant Approach and the Guidance Approach, respectively.		

O&M Phase Potential Distributional Response Effects on the Qualifying Feature in Isolation

10.2.3.451 During the O&M phase, the potential level of impact apportioned to the SPA seasonally is summarised in Table 10-76 for both the Applicant and Guidance approach.

10.2.3.452 Displacement matrices are also presented for the annual apportioned abundance for the Proposed Development (Offshore) plus 2km buffer to Sule Skerry and Sule Stack SPA in Table 10-77 and Table 10-78as per the Applicant and Guidance Approach, respectively.

Table 10-76: Puffin predicted distributional responses mortalities during the O&M phase attributed to Sule Skerry and Sule Stack SPA and resultant change in survival rate percentage point change compared to citation and most recent population counts.

Population Size (Breeding Adults)	Defined Season (Months)	Applicant Approach		Guidance Approach	
		50% displacement, 1% mortality	Change in Average Survival Rate (% Point Change)	60% displacement, 1-3% mortality (non-breeding); 3-5% mortality (breeding)	Change in Average Survival Rate (% Point Change)
Citation (93,800)	Breeding season (April to Mid-August)	1.04	0.001	11.02 – 18.37	0.012 – 0.020
	Non-breeding season (Mid-August to March)	0.01	<0.001	<0.01 – 0.01	<0.001
	Annual	1.04	0.001	11.03 – 18.38	0.012 – 0.020
Latest count (95,484)	Breeding season (April to Mid-August)	1.04	0.001	11.02 – 18.37	0.012 – 0.019
	Non-breeding season (Mid-August to March)	0.01	<0.001	<0.01 – 0.01	<0.001
	Annual	1.04	0.001	11.03 – 18.38	0.012 – 0.019

Breeding Season

10.2.3.453 The estimated puffin mean peak abundance during the breeding season is 698 (698.06) individuals, with an estimated 58.10% of puffin during the breeding season deriving from Sule Skerry and Sule Stack SPA (Application Document 13, Appendix 13-1: Caledonia North Apportioning Technical Note and Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note). Assuming that 57% of the puffin population are adults (Furness, 2015[87]). and using an adult sabbatical rate of 7%, the total proportion of breeding adults from Sule Skerry and Sule Stack SPA potentially impacted by distributional responses are 207 (207.44) per annum during the breeding season (Table 10-76)

10.2.3.454 When applying a displacement rate of 50% and a mortality rate of 1%, the consequent potential mortality is estimated at one (1.04) breeding adult per annum.

10.2.3.455 Using the citation colony count of 93,800 breeding adults and an annual background mortality of 8,817 breeding adults, the addition of one predicted breeding adult mortality per annum would result in a 0.001 survival rate percentage point change during the breeding season. When considering the most up to date counts of 95,484 breeding adults and an annual background mortality of 8,976 breeding adults, this results in a 0.001 survival rate percentage point change during the breeding season per annum (Table 10-76).

Non-breeding Season

10.2.3.456 The estimated puffin mean peak abundance during the non-breeding season is 3,005 (3,004.50) individuals. Based on the Furness (2015)[87] BDMPS region SPA proportional split during the non-breeding season, 0.05% of predicted mortalities are estimated to derive from Sule Skerry and Sule Stack SPA (Application Document 13, Appendix 13-1: Caledonia North Apportioning Technical Note and Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note). Therefore, the total mean peak abundance of breeding adults from the SPA potentially impacted by distributional responses are two (1.54) per annum during the non-breeding season (Table 10-76)

10.2.3.457 When applying a displacement rate of 50% and a mortality rate of 1%, the consequent predicted distributional response mortality of breeding adult puffin from Sule Skerry and Sule Stack SPA during the non-breeding season is predicted at significantly less than one (0.01) per annum.

10.2.3.458 Based on the 1994 citation colony count of 93,800 breeding adults and using an annual background mortality of 8,817 breeding adults, the addition of less than one predicted breeding adult mortalities per annum would result in a <0.001 survival rate percentage point change during the non-breeding season. When considering the most up to date counts of 95,484 breeding adults and an annual background mortality of 8,976 breeding adults, this results in a <0.001 survival rate percentage point change during the non-breeding season per annum (Table 10-76)

Annual Total

10.2.3.459 The predicted resultant mortality across all defined seasons from The Proposed Development (Offshore), attributed to Sule Skerry and Sule Stack SPA, is one (1.04) breeding adult puffin per annum. This is predicted to result in a survival rate percentage point change against the citation and most recently published counts of 0.001 and 0.001 respectively (Table 10-76)

10.2.3.460 When considering the Guidance approach, a total of 11 – 18 (11.03 – 18.38) breeding adult mortalities are predicted due to potential distributional response effects per annum. This results in a survival rate percentage point change of 0.012 – 0.020 (0.0118 – 0.0196) against the citation and 0.012 – 0.019 against the most recently published count (Table 10-76).

10.2.3.461 For both citation and most recently published count, the Applicant and Guidance Approach predicted additional breeding adult mortalities per annum equates to a <0.02 survival rate percentage point change and would therefore be indistinguishable from natural fluctuations in the population. **There is, therefore, no potential for an AEoSI to the conservation objectives of puffin at Sule Skerry and Sule Stack SPA in relation to potential distributional response effects from The Proposed Development (Offshore) alone during the O&M phase. Therefore, subject to natural change, puffin will be maintained as a feature in the long term.**

.

Table 10-77: Puffin O&M phase disturbance annual displacement matrix for impacts apportioned to Sule Skerry and Sule Stack SPA. Note, this table presents the Applicant Approach for puffin, whereby the Year 1 August abundance has been incorporated as part of the non-breeding season.

Annual Total	Mortality Rate (%)													
Displacement Rate (%)	1	2	3	5	10	20	30	40	50	60	70	80	90	100
10	0	0	1	1	2	4	6	8	10	13	15	17	19	21
20	0	1	1	2	4	8	13	17	21	25	29	33	38	42
30	1	1	2	3	6	13	19	25	31	38	44	50	56	63
40	1	2	3	4	8	17	25	33	42	50	59	67	75	84
50	1	2	3	5	10	21	31	42	52	63	73	84	94	104
60	1	3	4	6	13	25	38	50	63	75	88	100	113	125
70	1	3	4	7	15	29	44	59	73	88	102	117	132	146
80	2	3	5	8	17	33	50	67	84	100	117	134	150	167
90	2	4	6	9	19	38	56	75	94	113	132	150	169	188
100	2	4	6	10	21	42	63	84	104	125	146	167	188	209
Note, outputs highlighted in dark blue represent the predicted annual mortality estimates as per the Guidance Approach and those highlighted in yellow represent the predicted annual mortality estimates as per Applicant Approach. For further information regarding the Guidance and Applicant Approach see Section 2.5 of Volume 7B, Appendix 6-2: Offshore Ornithology Distributional Responses Technical Report and Volume 7B, Appendix 6-2, Annex 4: Review of Relevant Evidence.														

Table 10-78: Puffin O&M phase disturbance annual displacement matrix for impacts apportioned to Sule Skerry and Sule Stack SPA.

Annual Total	Mortality Rate (%)													
Displacement Rate (%)	1	2	3	5	10	20	30	40	50	60	70	80	90	100
10	1	1	2	3	6	12	18	25	31	37	43	49	55	61
20	1	2	4	6	12	25	37	49	61	74	86	98	110	123
30	2	4	6	9	18	37	55	74	92	110	129	147	166	184
40	2	5	7	12	25	49	74	98	123	147	172	196	221	245
50	3	6	9	15	31	61	92	123	153	184	215	245	276	307
60	4	7	11	18	37	74	110	147	184	221	257	294	331	368
70	4	9	13	21	43	86	129	172	215	257	300	343	386	429
80	5	10	15	25	49	98	147	196	245	294	343	392	441	490
90	6	11	17	28	55	110	166	221	276	331	386	441	497	552
100	6	12	18	31	61	123	184	245	307	368	429	490	552	613

Note, outputs highlighted in dark blue represent the predicted annual mortality estimates as per the Guidance Approach and those highlighted in yellow represent the predicted annual mortality estimates as per Applicant Approach. For further information regarding the Guidance and Applicant Approach see Section 2.5 of Volume 7B, Appendix 6-2: Offshore Ornithology Distributional Responses Technical Report and Volume 7B, Appendix 6-2, Annex 4: Review of Relevant Evidence.

Gannet

10.2.3.462 Gannet have been screened into the assessment for O&M phase for distributional responses and collision risk. Due to potential connectivity being limited based on overall proportional weighting to Sule Skerry SPA, a combined assessment with other SPAs is provided in paragraph 10.2.3.589. As presented in paragraph 10.2.3.589, **the potential for an AEoSI to the conservation objectives of gannet at Sule Skerry and Sule Stack SPA in relation to both distributional responses and collision impacts from the Proposed Development (Offshore) alone during the O&M phase can confidently be ruled out. Therefore, subject to natural change, gannet will be maintained as a feature in the long term.**

Storm Petrel

10.2.3.463 A proportionate approach has been undertaken for assessment of potential impacts to features of SPAs screened in for assessment. For species such as storm petrel, where no individuals were recorded within site-specific DAS and the potential impact prior to apportionment can be considered negligible, qualitative assessments have been undertaken for all European sites together for this receptor (see the Consideration of storm petrel species for HRA assessment Section within Section 7.3.4).

Fair Isle SPA

10.2.3.464 The centroid of the Fair Isle SPA is 160.6km (around land) from the centre of the Caledonia OWF, within the MMFR +1SD of gannet (315.2±194.2km), razorbill (88.7±75.9km), puffin (137.1±128.3km), great skua (443.3±487.9km) and kittiwake (156.1±144.5km) (Woodward *et al.*, 2019[78]). As such, potential for LSE alone has been identified for the following features of Fair Isle SPA:

- Kittiwake
  - Collision (O&M)
  - Distributional response (O&M)
  - Distributional response (C&D, Section 7.3.1)
- Great skua
  - Collision (O&M)
- Razorbill
  - Distributional response (O&M)
  - Distributional response (C&D, Section 7.3.1)
- Puffin
  - Distributional response (O&M)
  - Distributional response (C&D, Section 7.3.1)
- Gannet

- Collision (O&M)
- Distributional response (O&M)
- Distributional response (C&D, Section 7.3.1)

Conservation Objectives

- To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and
- To ensure for the qualifying species that the following are maintained in the long term:
  - Population of the species as a viable component of the site;
  - Distribution of the species within site;
  - Distribution and extent of habitats supporting the species;
  - Structure, function and supporting processes of habitats supporting the species; and
  - No significant disturbance of the species.

Kittiwake

10.2.3.465 Kittiwake have been screened into the assessment for O&M phase for distributional responses and collision risk. Due to potential connectivity being limited based on overall proportional weighting to Fair Isles SPA, a combined assessment with other SPAs is provided in Section 10.2.3, beginning in paragraph10.2.3.562 As presented in paragraph 10.2.3.562, **the potential for an AEoSI to the conservation objectives of kittiwake at Fair Isles SPA in relation to both distributional responses and collision impacts from the Proposed Development (Offshore) alone during the O&M phase can confidently be ruled out. Therefore, subject to natural change, kittiwake will be maintained as a feature in the long term.**

Great Skua

10.2.3.466 Great skua have been screened into the assessment for O&M phase collision risk only. Due to potential connectivity being limited to the breeding season only for great skua for all SPAs, a combined assessment for all SPAs is provided in Section 10.2.3, beginning in paragraph 10.2.3.585. As presented in paragraph 10.2.3.585, **the potential for an AEoSI to the conservation objectives of great skua at Fair Isles SPA in relation to collision impacts from the Proposed Development (Offshore) alone during the O&M phase can confidently be ruled out. Therefore, subject to natural change, great skua will be maintained as a feature in the long term.**

Razorbill

10.2.3.467 Razorbill have been screened into the assessment for O&M phase for distributional responses. Due to potential connectivity being limited based on overall proportional weighting to Fair Isles SPA, a combined assessment with other SPAs is provided in Section 10.2.3, beginning in paragraph 10.2.3.569. As presented in paragraph 10.2.3.569, **the potential for an AEoSI to the conservation objectives of razorbill at Fair Isles SPA in relation to distributional response impacts from the Proposed Development (Offshore) alone during the O&M phase can confidently be ruled out. Therefore, subject to natural change, razorbill will be maintained as a feature in the long term.**

Puffin

10.2.3.468 Puffin have been screened into the assessment for distributional responses as they are susceptible to displacement due to their distribution and behaviours (Furness and Wade, 2012; Furness *et al*., 2013; Bradbury *et al*., 2014; NatureScot, 2023)[79 80 81 82].

Status

10.2.3.469 The SPA population of puffin was cited as 23,000 breeding adults in 1994. The most recently published count (2015) is 6,666 breeding adults (SMP, 2024[89]).

10.2.3.470 When considering a breeding adult baseline mortality rate of 0.094 (1-0.906, Horswill and Robinson 2015)[85], 2,162 (2,162.00) and 627 (626.60) breeding adults from the SPA population would be subject to natural mortality per annum, in relation to the citation count and most recently published count (2015) respectively. As of April 2015, the puffin feature at Fair Isle SPA is considered to be 'Unfavourable' and 'Declining'.

Seasonal Apportionment of Potential Impacts

10.2.3.471 In line with NatureScot guidance, the assessment is carried out on a seasonal basis as the potential impacts on the SPA features varies by season. Puffin have been assessed during the breeding season of April to Mid-August and non-breeding season of Mid-August to March in relation to Fair Isle SPA (see Section 7.3.3).

Appropriate Assessment

10.2.3.472 As outlined above, puffin have been screened into the assessment for distributional responses. The level of abundance apportioned is presented in Table 10-79 (detailed methods are presented within Application Document 13, Appendix 13-1: Caledonia North Apportioning Technical Note and Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note).

10.2.3.473 For puffin, distributional responses are assessed based on the birds within the Proposed Development (Offshore) And 2km buffer. The main focus of the assessment is based on the Applicant Approach of a displacement rate of 50% and a 1% mortality rate for O&M phase distributional response impacts. Presentation of distributional response impacts using the Guidance Approach recommended rates are also provided. Further details regarding the differences between the Guidance and Applicant Approach for distributional response assessment is provided within Volume 7B, Appendix 6-2, Annex 4: Review of Relevant Evidence.

Table 10-79: Puffin level of abundance apportioned to Fair Isle SPA seasonally.

Defined Season (Months)	Level of Apportionment (%)	Apportioned Abundance (Breeding Adults)
Breeding season (April to Mid-August)	1.69	11.80* / 34.84**
Non-breeding season (Mid-August to March)	1.38	41.60* / 18.50**
* It should be noted the Applicant has decided to include the Year 1 August count in the non-breeding season rather than during the breeding season. This is due to the Year 1 August abundance being considered to reflect migration rather than individuals present in the breeding season. ** The mean seasonal peaks for puffin have also been presented with the August count included in the breeding season as per the Guidance Approach. Note apportioned abundance is presented for the Applicant Approach and the Guidance Approach, respectively.		

O&M Phase Potential Distributional Response Effects on the Qualifying Feature in Isolation

10.2.3.474 During the O&M phase, the potential level of impact apportioned to the SPA seasonally is summarised in Table 10-80 for both the Applicant and Guidance approach.

10.2.3.475 Displacement matrices are also presented for the annual apportioned abundance for the Proposed Development (Offshore) plus 2km buffer to Fair Isle SPA in Table 10-81 and Table 10-82 as per the Applicant and Guidance Approach, respectively.

Table 10-80: Puffin predicted distributional responses mortalities during the O&M phase attributed to Fair Isle SPA and resultant change in survival rate percentage point change compared to citation and most recent population counts.

Population Size (Breeding Adults)	Defined Season (Months)	Applicant Approach		Guidance Approach	
		50% displacement, 1% mortality	Change in Average Survival Rate (% Point Change)	60% displacement, 1-3% mortality (non-breeding); 3-5% mortality (breeding)	Change in Average Survival Rate (% Point Change)
Citation (23,000)	Breeding season (April to Mid-August)	0.06	<0.001	0.63 – 1.05	0.003 – 0.005
	Non-breeding season (Mid-August to March)	0.21	0.001	0.11 – 0.33	<0.001 - 0.001
	Annual	0.27	0.001	0.74 – 1.38	0.003 – 0.006
Latest count (6,666)	Breeding season (April to Mid-August)	0.06	0.001	0.63 – 1.05	0.009 – 0.016
	Non-breeding season (Mid-August to March)	0.21	0.003	0.11 – 0.33	0.002 - 0 0.005
	Annual	0.27	0.004	0.74 – 1.38	0.011 – 0.021

Breeding Season

10.2.3.476 The estimated puffin mean peak abundance during the breeding season is 698 (698.06) individuals, with an estimated 3.31% of puffin during the breeding season deriving from Fair Isle SPA (Application Document 13, Appendix 13-1: Caledonia North Apportioning Technical Note and Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note). Assuming that 57% of the puffin population are adults (Furness, 2015)[87]. and using an adult sabbatical rate of 7%, the total proportion of breeding adults from Fair Isle SPA potentially impacted by distributional responses are 12 (11.80) per annum during the breeding season (Table 10-80).

10.2.3.477 When applying a displacement rate of 50% and a mortality rate of 1%, the consequent potential mortality is estimated at significantly less than one (0.06) breeding adult per annum.

10.2.3.478 Using the citation colony count of 23,000 breeding adults and an annual background mortality of 2,162 breeding adults, the addition of less than one predicted breeding adult mortality per annum would result in a <0.001 survival rate percentage point change during the breeding season. When considering the most up to date counts of 6,666 breeding adults and an annual background mortality of 627 breeding adults, this results in a 0.001 survival rate percentage point change during the breeding season per annum (Table 10-80).

Non-breeding Season

10.2.3.479 The estimated puffin mean peak abundance during the non-breeding season is 3,005 (3,004.50) individuals. Based on the Furness (2015[87]) BDMPS region SPA proportional split during the non-breeding season, 1.38% of predicted mortalities are estimated to derive from Fair Isle SPA (Application Document 13, Appendix 13-1: Caledonia North Apportioning Technical Note and Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note). Therefore, the total mean peak abundance of breeding adults from the SPA potentially impacted by distributional responses are 42 (41.60) per annum during the non-breeding season (Table 10-80).

10.2.3.480 When applying a displacement rate of 50% and a mortality rate of 1%, the consequent predicted distributional response mortality of breeding adult puffin from Fair Isle SPA during the non-breeding season is predicted at significantly less than one (0.21) per annum.

10.2.3.481 Based on the 1994 citation colony count of 23,000 breeding adults and using an annual background mortality of 2,162 breeding adults, the addition of less than one predicted breeding adult mortality per annum would result in a 0.001 survival rate percentage point change during the non-breeding season. When considering the most up to date counts of 6,666 breeding adults and an annual background mortality of 627 breeding adults, this results in a 0.003 survival rate percentage point change during the non-breeding season per annum (Table 10-80).

Annual Total

10.2.3.482 The predicted resultant mortality across all defined seasons from The Proposed Development (Offshore), attributed to Fair Isle SPA, is less than one (0.27) breeding adult puffin per annum. This is predicted to result in a survival rate percentage point change against the citation and most recently published counts of 0.001 and 0.004 respectively (Table 10-80).

10.2.3.483 When considering the Guidance approach, a total of less than one - two (0.74 – 1.38) breeding adult mortalities are predicted due to potential distributional response effects per annum. This results in a survival rate percentage point change of 0.003 – 0.006 against the citation and 0.011 – 0.021 against the most recently published count (Table 10-80).

10.2.3.484 As impacts exceeds a 0.02 survival rate percentage point change threshold when considering the Guidance approach, PVA has been undertaken to further assess the level of potential effect predicted.

Population Viability Analysis

10.2.3.485 The potential for distributional responses alone has been assessed against the latest 2015 colony count population size of 6,666 breeding adults according to the Seabird Monitoring Programme (2020) database. A range of impact values from less than one to two breeding adult additional mortalities per annum were modelled, which allows for consideration of the Guidance approach predicted impact levels, as set out in Table 10-180 of Section 10.3.3. Even when considering a predicted impact of two breeding adult mortalities (based on 60% displacement and 3-5% mortality rate), the annual reduction in the growth rate is predicted to be at most 0.026% against the latest colony count.

10.2.3.486 Regardless of the colony's population trend, such a level of effect would almost certainly be indistinguishable from natural fluctuations in the population. **As such, no potential for an AEoSI to the conservation objectives of the puffin feature of Fair Isle SPA in relation to distributional response effects in the O&M phase from the Proposed Development (Offshore) alone can be concluded. Therefore, subject to natural change, puffin will be maintained as a feature in the long term.**

Table 10-81: Puffin O&M phase disturbance annual displacement matrix for impacts apportioned to Fair Isle. Note, this table presents the Applicant Approach for puffin, whereby the Year 1 August abundance has been incorporated as part of the non-breeding season.

Annual Total	Mortality Rate (%)												
Displacement Rate (%)	1	2	3	5	10	20	30	40	50	60	70	80	90	100
10	0	0	0	0	1	1	2	2	3	3	4	4	5	5
20	0	0	0	1	1	2	3	4	5	6	7	9	10	11
30	0	0	0	1	2	3	5	6	8	10	11	13	14	16
40	0	0	1	1	2	4	6	9	11	13	15	17	19	21
50	0	1	1	1	3	5	8	11	13	16	19	21	24	27
60	0	1	1	2	3	6	10	13	16	19	22	26	29	32
70	0	1	1	2	4	7	11	15	19	22	26	30	34	37
80	0	1	1	2	4	9	13	17	21	26	30	34	38	43
90	0	1	1	2	5	10	14	19	24	29	34	38	43	48
100	1	1	2	3	5	11	16	21	27	32	37	43	48	53
Note, outputs highlighted in dark blue represent the predicted annual mortality estimates as per the Guidance Approach and those highlighted in yellow represent the predicted annual mortality estimates as per Applicant Approach. For further information regarding the Guidance and Applicant Approach see Section 2.5 of Volume 7B, Appendix 6-2: Offshore Ornithology Distributional Responses Technical Report and Volume 7B, Appendix 6-2, Annex 4: Review of Relevant Evidence.													

Table 10-82: Puffin O&M phase disturbance annual displacement matrix for impacts apportioned to Fair Isle. Note, this table presents the Guidacne Approach for puffin, whereby the Year 1 August abundance has been incorporated as part of the breeding season.

Annual Total	Mortality Rate (%)													
Displacement Rate (%)	1	2	3	5	10	20	30	40	50	60	70	80	90	100
10	0	0	0	0	1	1	2	2	3	3	4	4	5	5
20	0	0	0	1	1	2	3	4	5	6	7	9	10	11
30	0	0	0	1	2	3	5	6	8	10	11	13	14	16
40	0	0	1	1	2	4	6	9	11	13	15	17	19	21
50	0	1	1	1	3	5	8	11	13	16	19	21	24	27
60	0	1	1	2	3	6	10	13	16	19	22	26	29	32
70	0	1	1	2	4	7	11	15	19	22	26	30	34	37
80	0	1	1	2	4	9	13	17	21	26	30	34	38	43
90	0	1	1	2	5	10	14	19	24	29	34	38	43	48
100	1	1	2	3	5	11	16	21	27	32	37	43	48	53

Note, outputs highlighted in dark blue represent the predicted annual mortality estimates as per the Guidance Approach and those highlighted in yellow represent the predicted annual mortality estimates as per Applicant Approach. For further information regarding the Guidance and Applicant Approach see Section 2.5 of Volume 7B, Appendix 6-2: Offshore Ornithology Distributional Responses Technical Report and Volume 7B, Appendix 6-2, Annex 4: Review of Relevant Evidence.

Gannet

10.2.3.487 Gannet have been screened into the assessment for O&M phase for distributional responses and collision risk. Due to potential connectivity being limited based on overall proportional weighting to Fair Isle SPA, a combined assessment with other SPAs is provided in paragraph 10.2.3.589. As presented in paragraph 10.2.3.589, **the potential for an AEoSI to the conservation objectives of gannet at Fair Isle SPA in relation to both distributional responses and collision impacts from the Proposed Development (Offshore) alone during the O&M phase can confidently be ruled out. Therefore, subject to natural change, gannet will be maintained as a feature in the long term.**

Sumburgh Head SPA

10.2.3.488 The centroid of the Sumburgh Head SPA is 202.4km (around land) from the centre of the Caledonia OWF, within the MMFR +1SD of kittiwake (156.1±144.5km) (Woodward *et al.,* 2019[78]). As such, potential for LSE alone has been identified for the following features of Sumburgh Head SPA:

- Kittiwake
  - Collision (O&M)
  - Distributional response (O&M)
  - Distributional response (C&D, Section 7.3.1)

Conservation Objectives

- To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and
- To ensure for the qualifying species that the following are maintained in the long term:
  - Population of the species as a viable component of the site;
  - Distribution of the species within site;
  - Distribution and extent of habitats supporting the species;
  - Structure, function and supporting processes of habitats supporting the species; and
  - No significant disturbance of the species.

Kittiwake

10.2.3.489 Kittiwake have been screened into the assessment for O&M phase for distributional responses and collision risk. Due to potential connectivity being limited based on overall proportional weighting to Sumburgh Head SPA, a combined assessment with other SPAs is provided in Section 10.2.3, beginning in paragraph 10.2.3.562. As presented in paragraph 10.2.3.562, **the potential for an AEoSI to the conservation objectives of kittiwake**

at Sumburgh Head SPA in relation to both distributional responses and collision impacts from the Proposed Development (Offshore) alone during the O&M phase can confidently be ruled out. Therefore, subject to natural change, kittiwake will be maintained as a feature in the long term.

Foula SPA

10.2.3.490 The centroid of the Foula SPA is 222.5km (around land) from the centre of the Caledonia OWF, within the MMFR +1SD of great skua (443.3±487.9km), kittiwake (156.1±144.5km), and puffin (137.1±128.3km) (Woodward *et al.*, 2019[78]). As such, potential for LSE alone has been identified for the following features of Foula SPA:

- Kittiwake
  - Collision (O&M)
  - Distributional response (O&M)
  - Distributional response (C&D, Section 7.3.1)
- Great skua
  - Collision (O&M)
- Puffin
  - Distributional response (O&M)
  - Distributional response (C&D, Section 7.3.1)

Conservation Objectives

- To ensure that the qualifying features of Foula SPA and the Seas off Foula SPA are in favourable condition and make an appropriate contribution to achieving Favourable Conservation Status.
- To ensure that the integrity of Foula SPA and the Seas off Foula SPA is restored in the context of environmental changes by meeting objectives 2a, 2b and 2c for each qualifying feature:
  - 2a. The populations of the qualifying features are viable components of Foula SPA and Seas off Foula SPA;
  - 2b. The distributions of the qualifying features throughout Foula SPA and Seas off Foula SPA are maintained by avoiding significant disturbance of the species; and
  - 2c. The supporting habitats and processes relevant to qualifying features and their prey/food resources are maintained, or where appropriate restored, at Foula SPA and Seas off Foula SPA.

Kittiwake

10.2.3.491 Kittiwake have been screened into the assessment for O&M phase for distributional responses and collision risk. Due to potential connectivity being limited based on overall proportional weighting to Foula SPA, a combined assessment with other SPAs is provided in Section 10.2.3, beginning in paragraph 10.2.3.562. As presented in paragraph 10.2.3.562, **the potential for an AEoSI to the conservation objectives of kittiwake at Foula SPA in relation to both distributional responses and collision impacts from the Proposed Development (Offshore) alone during the O&M phase can confidently be ruled out. Therefore, subject to natural change, kittiwake will be maintained as a feature in the long term.**

Great skua

10.2.3.492 Great skua have been screened into the assessment for O&M phase collision risk only. Due to potential connectivity being limited to the breeding season only for great skua for all SPAs, a combined assessment for all SPAs is provided in Section 10.2.3, beginning in paragraph 10.2.3.585. As presented in paragraph 10.2.3.585, **the potential for an AEoSI to the conservation objectives of great skua at Foula SPA in relation to collision impacts from the Proposed Development (Offshore) alone during the O&M phase can confidently be ruled out. Therefore, subject to natural change, great skua will be maintained as a feature in the long term.**

Puffin

10.2.3.493 Puffin have been screened into the assessment for O&M phase for distributional responses. Due to potential connectivity being limited based on overall proportional weighting to Foula SPA, a combined assessment with other SPAs is provided in Section 10.2.3, beginning in paragraph 10.2.3.573. As presented in paragraph 10.2.3.573, **the potential for an AEoSI to the conservation objectives of puffin at Foula SPA in relation to distributional response impacts from the Proposed Development (Offshore) alone during the O&M phase can confidently be ruled out. Therefore, subject to natural change, puffin will be maintained as a feature in the long term.**

North Rona and Sula Sgeir SPA

10.2.3.494 The centroid of the North Rona and Sula Sgeir SPA is 242.6km (around land) from the centre of Caledonia OWF, within the MMFR +1SD of gannet (315.2±194.2km), storm petrel (336.0km), kittiwake (156.1±144.5km), and puffin (137.1±128.3km) (Woodward *et al.,* 2019[78]). As such, potential for LSE alone has been identified for the following features of North Rona and Sula Sgeir SPA:

- Kittiwake
  - Collision (O&M)
  - Distributional response (O&M)
  - Distributional response (C&D, Section 7.3.1)
- Puffin

  - Distributional response (O&M)
  - Distributional response (C&D, Section 7.3.1)
- Storm petrel
  - Distributional response (O&M)
  - Distributional response (C&D)
- Gannet
  - Collision (O&M)
  - Distributional response (O&M)
  - Distributional response (C&D, Section 7.3.1)

Conservation Objectives

- To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and
- To ensure for the qualifying species that the following are maintained in the long term:
  - Population of the species as a viable component of the site;
  - Distribution of the species within site;
  - Distribution and extent of habitats supporting the species;
  - Structure, function and supporting processes of habitats supporting the species; and
  - No significant disturbance of the species.

Kittiwake

10.2.3.495 Kittiwake have been screened into the assessment for O&M phase for distributional responses and collision risk. Due to potential connectivity being limited based on overall proportional weighting to North Rona and Sula Sgeir SPA, a combined assessment with other SPAs is provided in Section 10.2.3, beginning in paragraph 10.2.3.562. As presented in paragraph 10.2.3.562, **the potential for an AEoSI to the conservation objectives of kittiwake at North Rona and Sula Sgeir SPA in relation to both distributional responses and collision impacts from the Proposed Development (Offshore) alone during the O&M phase can confidently be ruled out. Therefore, subject to natural change, kittiwake will be maintained as a feature in the long term.**

Puffin

10.2.3.496 Puffin have been screened into the assessment for O&M phase for distributional responses. Due to potential connectivity being limited based on overall proportional weighting to North Rona and Sula Sgeir SPA, a combined assessment with other SPAs is provided in Section 10.2.3, beginning in paragraph 10.2.3.573. As presented in paragraph 10.2.3.573 **the potential**

for an AEoSI to the conservation objectives of puffin at North Rona and Sula Sgeir SPA in relation to distributional response impacts from the Proposed Development (Offshore) alone during the O&M phase can confidently be ruled out. Therefore, subject to natural change, puffin will be maintained as a feature in the long term.

Storm Petrel

10.2.3.497 A proportionate approach has been undertaken for assessment of potential impacts to features of SPAs screened in for assessment. For species such as storm petrel, where no individuals were recorded within site-specific DAS and the potential impact prior to apportionment can be considered negligible, qualitative assessments have been undertaken for all European sites together for this receptor (see the Consideration of storm petrel species for HRA assessment Section within Section 7.3.4).

Gannet

10.2.3.498 Gannet have been screened into the assessment for O&M phase for distributional responses and collision risk. Due to potential connectivity being limited based on overall proportional weighting to North Rona and Sula Sgeir SPA, a combined assessment with other SPAs is provided in paragraph 10.2.3.589. As presented in paragraph 10.2.3.589, **the potential for an AEoSI to the conservation objectives of gannet at North Rona and Sula Sgeir SPA in relation to both distributional responses and collision impacts from the Proposed Development (Offshore) alone during the O&M phase can confidently be ruled out. Therefore, subject to natural change, gannet will be maintained as a feature in the long term.**

Storm Petrel

10.2.3.499 A proportionate approach has been undertaken for assessment of potential impacts to features of SPAs screened in for assessment. For species such as storm petrel, where no individuals were recorded within site-specific DAS and the potential impact prior to apportionment can be considered negligible, qualitative assessments have been undertaken for all European sites together for this receptor (see the Consideration of storm petrel species for HRA assessment Section within Section 7.3.4).

Mousa SPA

10.2.3.500 The centroid of the Mousa SPA is 220.1km (around land) from the centre of the Caledonia OWF, within the MMFR +1SD of storm petrel (336.0km) (Woodward *et al*., 2019[78]). As such, potential for LSE alone has been identified for the following features of Mousa SPA:

- Storm petrel
  - Distributional response (O&M)
  - Distributional response (C&D)

Conservation Objectives

- To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and
- To ensure for the qualifying species that the following are maintained in the long term:
  - Population of the species as a viable component of the site;
  - Distribution of the species within site;
  - Distribution and extent of habitats supporting the species;
  - Structure, function and supporting processes of habitats supporting the species; and
  - No significant disturbance of the species.

Storm Petrel

10.2.3.501 A proportionate approach has been undertaken for assessment of potential impacts to features of SPAs screened in for assessment. For species such as storm petrel, where no individuals were recorded within site-specific DAS and the potential impact prior to apportionment can be considered negligible, qualitative assessments have been undertaken for all European sites together for this receptor (see the Consideration of storm petrel species for HRA assessment Section within Section 7.3.4).

Forth Islands SPA

10.2.3.502 The centroid of the Forth Islands SPA is 268.7km (around land) from the centre of the Caledonia OWF, within the MMFR +1SD of gannet (315.2±194.2km), and kittiwake (156.1±144.5km) (Woodward *et al.*, 2019[78]). The razorbill feature of Forth Islands SPA has also been screened into assessment though only for the non-breeding season, due to the Proposed Development (Offshore) being outside of MMFR +1SD. As such, potential for LSE alone has been identified for the following features of Forth Islands SPA:

- Kittiwake
  - Collision (O&M)
  - Distributional response (O&M)
  - Distributional response (C&D, Section 7.3.1)
- Gannet
  - Collision (O&M)
  - Distributional response (O&M)
  - Distributional response (C&D, Section 7.3.1)
- Razorbill

- Distributional response (O&M)
- Distributional response (C&D, Section 7.3.1)

Conservation Objectives

- To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and
- To ensure for the qualifying species that the following are maintained in the long term:
  - Population of the species as a viable component of the site;
  - Distribution of the species within site;
  - Distribution and extent of habitats supporting the species;
  - Structure, function and supporting processes of habitats supporting the species; and
  - No significant disturbance of the species.

Kittiwake

10.2.3.503 Kittiwake have been screened into the assessment for O&M phase for distributional responses and collision risk. Due to potential connectivity being limited based on overall proportional weighting to Forth Islands SPA, a combined assessment with other SPAs is provided in Section 10.2.3, beginning in paragraph 10.2.3.562. As presented in paragraph 10.2.3.562, **the potential for an AEoSI to the conservation objectives of kittiwake at Forth Islands SPA in relation to both distributional responses and collision impacts from the Proposed Development (Offshore) alone during the O&M phase can confidently be ruled out. Therefore, subject to natural change, kittiwake will be maintained as a feature in the long term.**

Gannet

10.2.3.504 Gannet have been screened into the assessment for collision risk as they are susceptible to collision due to their flight height distribution and behaviours (Furness and Wade, 2012[79]; Furness *et al*., 2013[80]; Bradbury *et al*., 2014[81]; JNCC, 2024[83]). Gannet have also been assessed for distributional responses due to their sensitivity to displacement (Furness and Wade, 2012[79]; Furness *et al*., 2013[80]; Bradbury *et al*., 2014[81]; NatureScot, 2023[82]).

10.2.3.505 As agreed in consultation, a macro-avoidance rate of 70% has been applied to gannet densities during the non-breeding season (October – early-March). During the breeding season (mid-March – September), the monthly in-flight densities have not been adjusted for macro-avoidance (see Volume 2, Chapter 6: Offshore Ornithology for further information regarding approaches). This approach has been presented as the Guidance Approach (Table 10-86). The Applicant Approach has also been presented, with the macro-avoidance rate applied to the predicted mortalities in all months (Table 10-86).

10.2.3.506 Gannet have also been assessed for distributional responses based on the birds within the Proposed Development (Offshore) And 2km buffer. The main focus of the assessment is based on the Applicant Approach of a displacement rate of 70% and a 1% mortality rate for O&M phase distributional response impacts (Table 10-84). Presentation of distributional response impacts following NatureScot Guidance Approach are also provided in Table 10-84. For further details regarding the differences between the Guidance Approach and the Applicant Approach for the distributional responses assessment see Volume 7B, Appendix 6-2, Annex 4: Review of Relevant Evidence.

10.2.3.507 The level of predicted abundance and collision risk apportioned to the gannet feature of the Forth Islands SPA to inform assessments is presented in Table 10-83 (detailed methods are presented within Application Document 13, Appendix 13-1: Caledonia North Apportioning Technical Note and Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note). For the Forth Islands SPA, two assessments are presented for gannet. One using the latest SMP count and one using an updated Forth Islands SPA count. The Forth Islands SPA updated count takes into account the 2021 estimated Bass Rock drone count of 81,000 AOS (Harris *et al*. 2023[90]; Wanless *et al*. 2023[91]). Further information regarding the level of apportionment used when considering the Forth Islands SPA updated count is presented within Application Document 13, Appendix 13-1: Caledonia North Apportioning Technical Note and Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note.

Table 10-83: Gannet level of abundance and collision risk apportioned to Forth Islands SPA seasonally.

Defined Season (Months)	Level of Apportionment (%)	Apportioned Abundance (Breeding Adults)	Apportioned collision risk (breeding adults)
Breeding season (Mid-March to September)	20.18	183.30	0.75* / 2.49**
Non-breeding season (October to Early-March)	24.32 (Autumn %) 31.27 (Spring %)	76.60	0.17* / 0.17**
Note two weightings for apportioning non-breeding season gannet are provided for autumn migration (October to November), and spring migration (December to Mid-March). The autumn weighting has been used to apportion the potential numbers of non-breeding gannet distributional response as the mean peak of this species was recorded during the autumn migration season. While both the Spring and Autumn weightings have been used to apportion collision mortalities during the non-breeding season. * The Applicant Approach has also been presented, with the macro-avoidance rate applied to the predicted mortalities in all months. ** It should be noted that as agreed in consultation a macro-avoidance rate of 70% has been applied to gannet densities during the non-breeding season. During the breeding season, the monthly in-flight densities have not been adjusted for macro-avoidance. This approach has been presented as the Guidance Approach.			

Status

10.2.3.508 The SPA population of gannet was cited as 43,200 breeding adults in 1990. The most recent SMP count (2014) is 150,518 breeding adults (SMP, 2024[89]). An updated 2021 Forth Islands SPA count of 162,000 breeding adults has also been taken into account (Harris *et al*. 2023[90]; Wanless *et al*. 2023[91]), which is based on extrapolation of the 2014 count.

10.2.3.509 When considering a breeding adult baseline mortality rate of 0.081 (1- 919, Horswill and Robinson 2015[85]), 3,499 (3,499.20), 12,192 (12,191.96) and 13,122 (13,122) breeding adults from the SPA population would be subject to natural mortality per annum, in relation to the citation count, the most recent SMP count (2014) and the Forth Islands SPA updated count (2021) respectively. As of June 2014, the gannet feature at Forth Islands SPA is considered to be 'Favourable' and 'Maintained'.

Seasonal Apportionment of Potential Impacts

10.2.3.510 In line with the NatureScot guidance, the assessment is carried out on a seasonal basis as the potential impacts on the SPA features varies by season. Gannet have been assessed during the breeding season of Mid-April to August and non-breeding season of September to Early April in relation Forth Islands SPA (see Section 7.3.3).

Appropriate Assessment

O&M Phase Potential Distributional Response Effects on the Qualifying Feature in Isolation

10.2.3.511 During the O&M phase, the potential level of impact apportioned to the SPA seasonally is summarised in Table 10-84 for the Applicant and Guidance approach.

10.2.3.512 A displacement matrix is also presented for the annual apportioned abundance for the Proposed Development (Offshore) plus 2km buffer to Forth Islands SPA in Table 10-85.

Table 10-84: Gannet predicted distributional responses mortalities during the O&M phase attributed to Forth Islands SPA and resultant change in survival rate percentage point change compared to citation and most recent population counts.

Population Size (Breeding Adults)	Defined Season (Months)	Applicant Approach		Guidance Approach	
		70% displacement, 1% mortality	Change in Average Survival Rate (% Point Change)	70% displacement, 1-3% mortality	Change in Average Survival Rate (% Point Change)
Citation (43,200)	Breeding season (Mid-April to August)	1.28	0.003	1.28 – 3.85	0.003 – 0.009
	Non-breeding season (September to early-April)	0.54	0.001	0.54 – 1.61	0.001 – 0.004
	Annual	1.82	0.004	1.82 – 5.46	0.004 – 0.013
Latest count (150,518)	Breeding season (Mid-April to August)	1.28	0.001	1.28 – 3.85	0.001 – 0.003
	Non-breeding season (September to early-April)	0.54	<0.001	0.54 – 1.61	<0.001 – 0.001
	Annual	1.82	0.001	1.82 – 5.46	0.001 – 0.004
Forth Islands SPA updated count (162,000)*	Breeding season (Mid-April to August)	0.76	<0.001	0.76 – 2.29	<0.001 – 0.001
	Non-breeding season	1.24	0.001	1.24 – 3.72	0.001 – 0.002

Population Size (Breeding Adults)	Defined Season (Months)	Applicant Approach		Guidance Approach	
		70% displacement, 1% mortality	Change in Average Survival Rate (% Point Change)	70% displacement, 1-3% mortality	Change in Average Survival Rate (% Point Change)
	(September to early-April)				
	Annual	2.00	0.001	2.00 – 6.01	0.001 – 0.004

* The Forth Islands SPA updated count takes into account the 2021 estimated Bass Rock drone count of 81,000 AOS (Harris *et al*., 2023[90]; Wanless *et al*., 2023[91]). Further information regarding this approach is outlined within Section 7.3.11 and apportionment is presented within Application Document 13, Appendix 13-1: Caledonia North Apportioning Technical Note and Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note.

Breeding Season

10.2.3.513 The estimated gannet mean peak abundance during the breeding season is 909 (908.5) individuals, with an estimated 20.18% of all individuals during the breeding season deriving from Forth Islands SPA (Application Document 13, Appendix 13-1: Caledonia North Apportioning Technical Note and Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note). Assuming that 55% of the gannet population are adults (Furness, 2015[87]) and using an adult sabbatical rate of 10%, the total proportion of breeding adults from Forth Islands SPA potentially impacted by distributional responses are 183 (183.30) per annum during the breeding season (Table 10-84).

10.2.3.514 When applying a displacement rate of 70% and a mortality rate of 1%, the consequent potential mortality is estimated to one (1.28) breeding adult per annum and one (0.76) breeding adult when considering the Forth Islands updated count. Table 10-84 presents a range of potential distributional response mortalities as per SNCB guidance (70% displacement, 1 and 3% mortality).

10.2.3.515 Using the citation colony count of 43,200 breeding adults and using an annual background mortality of 3,499 breeding adults, the addition of one predicted breeding adult mortality would result in a 0.003 survival rate percentage point change during the breeding season per annum. When considering the most up to date SMP counts of 150,518 breeding adults and an annual background mortality of 12,192 breeding adults, this results in a 0.001 survival rate percentage point change during the breeding season per annum (Table 10-84).When considering the Forth Islands SPA updated counts of 162,000 breeding adults and an annual background mortality of 13,122 breeding adults, this results in a <0.001 survival rate percentage point change during the breeding season per annum (Table 10-84).

Non-breeding Season

10.2.3.516 The estimated gannet mean peak abundance during the non-breeding season is 315 (135.00) individuals. Based on the Furness (2015)[87] non-breeding season BDMPS region SPA proportional split corresponding to the mean peak abundance recorded, 24.32% of predicted mortalities during the non-breeding season are estimated to derive from Forth Islands SPA (Application Document 13, Appendix 13-1: Caledonia North Apportioning Technical Note and Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note). Therefore, the total mean peak abundance of breeding adults from the SPA potentially impacted by distributional responses are 77 (76.60) per annum during the non-breeding season (Table 10-84).

10.2.3.517 When applying a displacement rate of 70% and a mortality rate of 1%, the consequent predicted distributional response mortality of breeding adult gannet from Forth Islands SPA during the non-breeding season is predicted at significantly less than one (0.54) per annum and one (1.24) breeding adult when considering the Forth Islands updated count.

10.2.3.518 Based on the 1990 citation colony count of 43,200 breeding adults and using an annual background mortality of 3,499 breeding adults, the addition of significantly less than one - one predicted breeding adult mortality would result in a 0.001 survival rate percentage point change during the non-breeding season per annum. When considering the most up to date SMP counts of 150,518 breeding adults and an annual background mortality of 12,192 breeding adults, this results in a <0.001 survival rate percentage point change during the non-breeding season per annum (Table 10-84). When considering the Forth Islands SPA updated counts of 162,000 breeding adults and an annual background mortality of 13,122 breeding adults, this results in a 0.001 survival rate percentage point change during the non-breeding season per annum (Table 10-84).

Annual Total

10.2.3.519 The predicted resultant mortality across all defined seasons from The Proposed Development (Offshore), attributed to Forth Islands SPA, is two (1.82) breeding adult gannet per annum and two (2.00) breeding adults per annum when considering the Forth Islands updated count. This is predicted to result in a survival rate percentage point change against the citation, most recent SMP counts and the Forth Islands SPA updated counts of 0.004, 0.001, and 0.001 respectively (see Table 10-84).

10.2.3.520 When considering the Guidance approach, a total of two - five (1.82 – 5.46) breeding adult mortalities are predicted due to potential distributional response effects per annum and two – six (2.00 – 6.01) breeding adult mortalities when considering the Forth Islands updated count. This results in a survival rate percentage point change of 0.004 - 0.013 against the citation and 0.001 - 0.004 against the most recent SMP count and the Forth Islands SPA updated count (Table 10-84).

10.2.3.521 For both citation, the most recently published count and the Forth Islands SPA updated count, predicted additional breeding adult mortalities per annum equates to a <0.02 survival rate percentage point change and would therefore be indistinguishable from natural fluctuations in the population. **There is, therefore, no potential for an AEoSI to the conservation objectives of gannet at Forth Islands SPA in relation to potential distributional response effects from the Proposed Development (Offshore) alone during the O&M phase. Therefore, subject to natural change, gannet will be maintained as a feature in the long term.**

Table 10-85: Gannet O&M phase disturbance annual displacement matrix for impacts apportioned to Forth Islands SPA.

Annual Total	Mortality Rate (%)													
Displacement Rate (%)	1	2	3	5	10	20	30	40	50	60	70	80	90	100
10	0	1	1	1	3	5	8	10	13	16	18	21	23	26
20	1	1	2	3	5	10	16	21	26	31	36	42	47	52
30	1	2	2	4	8	16	23	31	39	47	55	62	70	78
40	1	2	3	5	10	21	31	42	52	62	73	83	94	104
50	1	3	4	6	13	26	39	52	65	78	91	104	117	130
60	2	3	5	8	16	31	47	62	78	94	109	125	140	156
70	2	4	5	9	18	36	55	73	91	109	127	146	164	182
80	2	4	6	10	21	42	62	83	104	125	146	166	187	208
90	2	5	7	12	23	47	70	94	117	140	164	187	211	234
100	3	5	8	13	26	52	78	104	130	156	182	208	234	260

Note, outputs highlighted in dark blue represent the predicted annual mortality estimates as per the Guidance Approach and those highlighted in light blue represent the overlapping predicted annual mortality estimates from both the Guidance Approach and Applicant Approach. For further information regarding the Guidance and Applicant Approach see Section 2.5 of Volume 7B, Appendix 6-2: Offshore Ornithology Distributional Responses Technical Report and Volume 7B, Appendix 6-2, Annex 4: Review of Relevant Evidence.

O&M Phase Potential Collision Risk Impacts on the Qualifying Feature in Isolation

10.2.3.522 During the O&M phase, the potential level of impact from collision risk apportioned to the Forth Islands SPA and subsequent survival rate percentage point change is summarised in Table 10-86.

Table 10-86: Gannet predicted collision risk impacts during the O&M phase attributed to Forth Islands SPA and resultant change in survival rate percentage point change compared to citation and most recent population counts.

Population Size (Breeding Adults)	Defined Season (Months)	Collision risk impact Applicant Approach		Collision risk impact Guidance Approach	
		Breeding adults per annum	Change in Average Survival Rate (% Point Change)	Breeding adults per annum	Change in Average Survival Rate (% Point Change)
Citation (43,200)	Breeding season (Mid-March to September)	0.75	0.002	2.49	0.006
	Non-breeding season (October to Early-March)	0.17	<0.001	0.17	<0.001
	Annual	0.92	0.002	2.66	0.006
Latest count (150,518)	Breeding season (Mid-March to September)	0.75	<0.001	2.49	0.002
	Non-breeding season (October to Early-March)	0.17	<0.001	0.17	<0.001
	Annual	0.92	0.001	2.66	0.002
Forth Islands SPA updated count (162,000)*	Breeding season (Mid-April to August)	0.78	<0.001	2.59	0.002
	Non-breeding season (September to early-April)	0.21	<0.001	0.22	<0.001
	Annual	0.99	0.001	2.81	0.002

* The Forth Islands SPA updated count takes into account the 2021 estimated Bass Rock drone count of 81,000 AOS (Harris *et al*. 2023[90]; Wanless *et al*. 2023; Wanless *et al*. 2023[91]). Further information regarding this approach is outlined within Section 7.3.11 and apportionment is presented within Application Document 13, Appendix 13-1: Caledonia North Apportioning Technical Note and Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note.

Breeding Season

10.2.3.523 The predicted gannet collision mortality during the breeding season is four (3.70) individuals per annum, with an estimated 20.18% of all individuals during the breeding season deriving from Forth Islands SPA (Application Document 13, Appendix 13-1: Caledonia North Apportioning Technical Note and Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note). Assuming that 55% of the population are adults (Furness, 2015[87]) and using an adult sabbatical rate of 10%, the total proportion of breeding adults from Forth Islands SPA potentially subject to collision consequent mortality is less than one (0.75) per annum during the breeding season and less than one (0.78) breeding adult when considering the Forth Islands updated count.

10.2.3.524 Using the citation colony count of 43,200 breeding adults and using a background mortality of 3,499 breeding adults, the addition of less than one predicted breeding adult mortality per annum would result in a 0.002 survival rate percentage point change during the breeding season. When considering the most up to date SMP counts of 150,518 breeding adults and an annual background mortality of 12,192 breeding adults, this results in a <0.001 survival rate percentage point change during the breeding season per annum (Table 10-86). When considering the Forth Islands SPA updated counts of 162,000 breeding adults and an annual background mortality of 13,122 breeding adults, this results in a <0.001 survival rate percentage point change during the breeding season per annum (Table 10-86).

Non-breeding Season

10.2.3.525 The predicted gannet collision mortality during the non-breeding season is less than one (0.67) individual per annum. Based on the Furness (2015[87]) spring and autumn season BDMPS region SPA proportional split, 31.27% and 24.32% of predicted mortalities during the non-breeding season are estimated to derive from Forth Islands SPA (Application Document 13, Appendix 13-1: Caledonia North Apportioning Technical Note and Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note), the consequent predicted collision mortality of adult gannet during the non-breeding season is predicted at less than one (0.17) per annum and less than one (0.21) breeding adult when considering the Forth islands updated count.

10.2.3.526 Based on the 1990 citation colony count of 43,200 breeding adults and using a background mortality of 3,499 breeding adults, the addition of less than one predicted breeding adult mortality per annum would result in a <0.001 survival rate percentage point change during the non-breeding season. When considering the most up to date SMP counts of 150,518 breeding adults and an annual background mortality of 12,192 breeding adults, this results in a change in survival rate percentage point change of <0.001 during the non-breeding season per annum (see Table 10-86). When considering the Forth Islands SPA updated counts of 162,000 breeding adults and an annual background mortality of 13,122 breeding adults, this results in a <0.001 survival rate percentage point change during the non-breeding season per annum (Table 10-86).

Annual Total

10.2.3.527 The predicted resultant mortality across all defined seasons from The Proposed Development (Offshore), attributed to Forth Islands SPA, is approximately one (0.92) breeding adult per annum and approximately one (0.99) breeding adult per annum when considering the Forth Islands updated count. This is predicted to result in a 0.002, 0.001 and 0.001 survival rate percentage point change when considering the citation count, the most recent SMP count and the Forth Islands SPA updated count, respectively (see Table 10-86).

10.2.3.528 When considering the Guidance approach to macro-avoidance, a total of three (2.66) breeding adult mortalities are predicted due to potential collision risk impacts per annum and three (2.81) breeding adult mortalities when considering the Forth Islands updated count. This results in a survival rate percentage point change of 0.006 against the citation and 0.002 against the most recent SMP count and the Forth Islands SPA updated count (Table 10-86).

10.2.3.529 For both citation, the most recently published count and the Forth Islands SPA updated count, the Applicant and Guidance Approach to macro-avoidance predicted additional breeding adult mortalities per annum equates to a <0.02 survival rate percentage point change and would therefore be indistinguishable from natural fluctuations in the population. **There is, therefore, no potential for an AEoSI to the conservation objectives of gannet at Forth Islands SPA in relation to potential collision risk effects from the Proposed Development (Offshore) alone during the O&M phase. Therefore, subject to natural change, gannet will be maintained as a feature in the long term.**

O&M Phase Potential Combined Distributional Response and Collision Risk Impacts on the Qualifying Feature in Isolation

10.2.3.530 During the O&M phase, the potential level of combined impact from collision risk and distributional responses apportioned to the Forth Islands SPA and subsequent survival rate percentage point change is summarised in Table 10-87.

Table 10-87: Gannet predicted distributional response and collision risk impacts using the Applicant Approach to macro-avoidance during the O&M phase attributed to Forth Islands SPA and resultant change in survival rate percentage point change compared to citation and most recent population counts.

Population Size (Breeding Adults)	Defined Season (Months)	Applicant Approach 70% Displacement; 1% Mortality		Guidance Approach 70% Displacement; 1-3% Mortality	
		Estimated number of mortalities from combined CRM and Distributional responses per annum	Change in Average Survival Rate (% Point Change)	Estimated number of mortalities from combined CRM and Distributional responses per annum	Change in Average Survival Rate (% Point Change)
Citation (43,200)	Breeding season (Mid-March to September)	2.03	0.005	2.03 – 4.60	0.005 0.011
	Non-breeding season (October to Early-March)	0.71	0.002	0.71 – 1.78	0.002 – 0.004
	Annual	2.74	0.006	2.74 – 6.38	0.006 – 0.015
Latest count (150,518)	Breeding season (Mid-March to September)	2.03	0.001	2.03 – 4.60	0.001 – 0.003
	Non-breeding season (October to Early-March)	0.71	<0.001	0.71 – 1.78	<0.001 – 0.001
	Annual	2.74	0.002	2.74 – 6.38	0.002 – 0.004
Forth Islands SPA updated count (162,000)*	Breeding season (Mid-March to September)	1.54	0.001	1.54	0.001 – 0.002
	Non-breeding season (October to Early-March)	1.43	0.001	1.43	0.001 – 0.002
	Annual	2.99	0.002	2.99	0.002 – 0.004

Population Size (Breeding Adults)	Defined Season (Months)	Applicant Approach 70% Displacement; 1% Mortality		Guidance Approach 70% Displacement; 1-3% Mortality	
		Estimated number of mortalities from combined CRM and Distributional responses per annum	Change in Average Survival Rate (% Point Change)	Estimated number of mortalities from combined CRM and Distributional responses per annum	Change in Average Survival Rate (% Point Change)
* The Forth Islands SPA updated count takes into account the 2021 estimated Bass Rock drone count of 81,000 AOS (Harris *et al*., 2023[90]; Wanless *et al*., 2023[91]). Further information regarding this approach is outlined within Section 7.3.11 and apportionment is presented within Application Document 13, Appendix 13-1: Caledonia North Apportioning Technical Note and Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note.					

Table 10-88: Gannet predicted distributional response and collision risk impacts using the Guidance Approach to macro-avoidance during the O&M phase attributed to Forth Islands SPA and resultant change in survival rate percentage point change compared to citation and most recent population counts.

Population Size (Breeding Adults)	Defined Season (Months)	Applicant Approach 70% Displacement; 1% Mortality		Guidance Approach 70% Displacement; 1-3% Mortality	
		Estimated number of mortalities from combined CRM and Distributional responses per annum	Change in Average Survival Rate (% Point Change)	Estimated number of mortalities from combined CRM and Distributional responses per annum	Change in Average Survival Rate (% Point Change)
Citation (43,200)	Breeding season (Mid-March to September)	3.77	0.009	3.77 – 6.34	0.009 – 0.015
	Non-breeding season (October to Early-March)	0.71	0.002	0.71 – 1.78	0.002 – 0.004
	Annual	4.48	0.010	4.48 – 8.12	0.010 – 0.019
Latest count (150,518)	Breeding season (Mid-March to September)	3.77	0.003	3.77 – 6.34	0.003 – 0.004
	Non-breeding season (October to Early-March)	0.71	<0.001	0.71 – 1.78	<0.001 – 0.001
	Annual	4.48	0.003	4.48 – 8.12	0.003 – 0.005
Forth Islands SPA updated count (162,000)*	Breeding season (Mid-March to September)	3.35	0.002	3.35 – 4.88	0.002 – 0.003
	Non-breeding season (October to Early-March)	1.43	0.001	1.43 – 3.91	0.001 – 0.002
	Annual	4.81	0.003	4.81 – 8.82	0.003 – 0.005

* The Forth Islands SPA updated count takes into account the 2021 estimated Bass Rock drone count of 81,000 AOS (Harris *et al*. 2023[90]; Wanless *et al*. 2023[91]). Further information regarding this approach is outlined within Section 7.3.11 and apportionment is presented within Application Document 13, Appendix 13-1: Caledonia North Apportioning Technical Note and Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note.

Breeding Season

10.2.3.531 As presented within (Table 10-87) the combined distributional response and collision risk impacts apportioned to the gannet feature of Forth Islands SPA, equates to approximately two (2.03) additional breeding adult mortalities during the breeding season per annum and approximately two (1.54) breeding adult mortalities when considering the Forth Islands updated count (when considering the Applicant Approach to macro-avoidance and a displacement rate of 70% and a mortality rate of 1%). Using the citation colony count of 43,200 breeding adults and an annual background mortality of 3,499 breeding adults, the addition of two predicted breeding adult mortalities would result in a 0.005 survival rate percentage point change during the breeding season per annum. When considering the most up to date SMP count of 150,518 breeding adults and an annual background mortality of 12,192 breeding adults, this results in a 0.001 survival rate percentage point change during the breeding season per annum (see Table 10-87). When considering the Forth Islands SPA updated counts of 162,000 breeding adults and an annual background mortality of 13,122 breeding adults, this results in a 0.001 survival rate percentage point change during the breeding season per annum (Table 10-87).

10.2.3.532 Table 10-87 presents a range of potential combined distributional response and collision risk impacts apportioned to the gannet feature of Forth Islands SPA as per SNCB guidance regarding collision (macro-avoidance rate of 70% applied to gannet densities during the non-breeding season (October - early-March) as agreed in consultation). In addition, Table 10-87 and Table 10-88 present a range of potential combined distributional response and collision risk impacts as per SNCB guidance regarding displacement (70% displacement, 1 and 3% mortality).

Non-breeding Season

10.2.3.533 As presented within Table 10-87 the combined distributional response and collision risk impacts apportioned to the gannet feature of Forth Islands SPA, equates to approximately one (0.71) additional adult mortality during the non-breeding season per annum and one (1.43) breeding adult when considering the Forth Islands updated count (when considering the Applicant Approach to macro-avoidance and a displacement rate of 70% and a mortality rate of 1%). Using the citation colony count of 43,200 breeding adults and an annual background mortality of 3,499 breeding adults, the addition of one predicted breeding adult mortality would result in a 0.002 survival rate percentage point change during the breeding season per annum. When considering the most up to date SMP counts of 150,518 and an annual background mortality of 12,192 breeding adults, this results in a <0.001 survival rate percentage point change during the non-breeding season per annum (see Table 10-87). When considering the Forth Islands SPA updated counts of 162,000 breeding adults and an annual background mortality of

13,122 breeding adults, this results in a 0.001 survival rate percentage point change during the non-breeding season per annum (Table 10-87).

Annual Total

10.2.3.534 The predicted resultant mortality across all defined seasons from the Proposed Development (Offshore), attributed to Forth Islands, is three (2.74) gannet per annum and three (2.99) breeding adults when considering the Forth Islands updated count. This is predicted to result in survival rate percentage point change against the citation, the most recent SMP counts and the Forth Islands SPA updated counts of 0.006, 0.002 and 0.002 respectively (see Table 10-87).

10.2.3.535 When considering the Guidance approach to macro-avoidance, a total of four - eight (4.48 – 8.12) breeding adult mortalities are predicted due to potential collision risk impacts per annum and five to nine (4.81 – 8.82) breeding adult mortalities when considering the Forth Islands updated count. This results in a survival rate percentage point change of 0.010 – 0.019 against the citation and 0.003 – 0.005 against the most recent SMP count and the Forth Islands SPA updated count (Table 10-88).

10.2.3.536 For both citation, the most recently published count and the Forth Islands SPA updated count, the Applicant and Guidance Approach to macro-avoidance predicted additional breeding adult mortalities per annum equates to a <0.02 survival rate percentage point change and would therefore be indistinguishable from natural fluctuations in the population. **There is, therefore, no potential for an AEoSI to the conservation objectives of gannet at Forth Islands SPA in relation to potential distributional response and collision risk effects from the Proposed Development (Offshore) alone during the O&M phase. Therefore, subject to natural change, gannet will be maintained as a feature in the long term.**

Razorbill

10.2.3.537 Razorbill have been screened into the assessment for O&M phase for distributional responses. Due to potential connectivity being limited based on overall proportional weighting to Forth Islands SPA, a combined assessment with other SPAs is provided in Section 10.2.3, beginning in paragraph 10.2.3.569. As presented in paragraph 10.2.3.569, **the potential for an AEoSI to the conservation objectives of razorbill at Forth Islands SPA in relation to distributional response impacts from the Proposed Development (Offshore) alone during the O&M phase can confidently be ruled out. Therefore, subject to natural change, razorbill will be maintained as a feature in the long term.**

Noss SPA

10.2.3.538 The centroid of the Noss SPA is 237.6km (around land) from the centre of the Caledonia OWF, within the MMFR +1SD of gannet (315.2±194.2km), great skua (443.3±487.9km), kittiwake (156.1±144.5km), and puffin (137.1±128.3km) (Woodward *et al*., 2019[78]). As such, potential for LSE alone has been identified for the following features of Noss SPA:

- Kittiwake
  - Collision (O&M)
  - Distributional response (O&M)
  - Distributional response (C&D, Section 7.3.1)
- Great skua
  - Collision (O&M)
- Puffin
  - Distributional response (O&M)
  - Distributional response (C&D, Section 7.3.1)
- Gannet
  - Collision (O&M)
  - Distributional response (O&M)
  - Distributional response (C&D, Section 7.3.1)

Conservation Objectives

- To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and
- To ensure for the qualifying species that the following are maintained in the long term: ¾ Population of the species as a viable component of the site
  - Distribution of the species within site
  - Distribution and extent of habitats supporting the species
  - Structure, function and supporting processes of habitats supporting the species
  - No significant disturbance of the species

Kittiwake

10.2.3.539 Kittiwake have been screened into the assessment for O&M phase for distributional responses and collision risk. Due to potential connectivity being limited based on overall proportional weighting to Noss SPA, a combined assessment with other SPAs is provided in Section 10.2.3, beginning in paragraph 10.2.3.562. As presented in paragraph 10.2.3.562, **the potential for an AEoSI to the conservation objectives of kittiwake at Noss SPA**

in relation to both distributional responses and collision impacts from the Proposed Development (Offshore) alone during the O&M phase can confidently be ruled out. Therefore, subject to natural change, kittiwake will be maintained as a feature in the long term.

Great Skua

10.2.3.540 Great skua have been screened into the assessment for O&M phase collision risk only. Due to potential connectivity being limited to the breeding season only for great skua for all SPAs, a combined assessment for all SPAs is provided in Section 10.2.3, beginning in paragraph 10.2.3.585. As presented in paragraph 10.2.3.585, **the potential for an AEoSI to the conservation objectives of great skua at Noss SPA in relation to collision impacts from the Proposed Development (Offshore) alone during the O&M phase can confidently be ruled out. Therefore, subject to natural change, great skua will be maintained as a feature in the long term.**

Puffin

10.2.3.541 Puffin have been screened into the assessment for O&M phase for distributional responses. Due to potential connectivity being limited based on overall proportional weighting to Noss SPA, a combined assessment with other SPAs is provided in Section 10.2.3, beginning in paragraph 10.2.3.573. As presented in paragraph 10.2.3.573, **the potential for an AEoSI to the conservation objectives of puffin at Noss SPA in relation to distributional response impacts from the Proposed Development (Offshore) alone during the O&M phase can confidently be ruled out. Therefore, subject to natural change, puffin will be maintained as a feature in the long term.**

Gannet

10.2.3.542 Gannet have been screened into the assessment for O&M phase for distributional responses and collision risk. Due to potential connectivity being limited based on overall proportional weighting to Noss SPA, a combined assessment with other SPAs is provided in paragraph 10.2.2. As presented in paragraph 10.2.2, **the potential for an AEoSI to the conservation objectives of gannet at Noss SPA in relation to both distributional responses and collision impacts from the Proposed Development (Offshore) alone during the O&M phase can confidently be ruled out. Therefore, subject to natural change, gannet will be maintained as a feature in the long term.**

St Abb's Head to Fast Castle SPA

10.2.3.543 The centroid of the St Abb's Head to Fast Castle SPA is 272.2km (around land) from the centre of the Caledonia OWF, within the MMFR +1SD of kittiwake (156.1±144.5km) (Woodward *et al*., 2019[78]). As such, potential for LSE alone has been identified for the following features of St Abb's Head to Fast Castle SPA:

- Kittiwake
  - Collision (O&M)
  - Distributional response (O&M)
  - Distributional response (C&D, Section 7.3.1)

Conservation Objectives

- To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and
- To ensure for the qualifying species that the following are maintained in the long term:
  - Population of the species as a viable component of the site;
  - Distribution of the species within site;
  - Distribution and extent of habitats supporting the species;
  - Structure, function and supporting processes of habitats supporting the species; and
  - No significant disturbance of the species.

Kittiwake

10.2.3.544 Kittiwake have been screened into the assessment for O&M phase for distributional responses and collision risk. Due to potential connectivity being limited based on overall proportional weighting to St Abb's Head to Fast Castle SPA, a combined assessment with other SPAs is provided in Section 10.2.3, beginning in paragraph 10.2.3.562. As presented in paragraph 10.2.3.562, **the potential for an AEoSI to the conservation objectives of kittiwake at St Abb's Head to Fast Castle SPA in relation to both distributional responses and collision impacts from the Proposed Development (Offshore) alone during the O&M phase can confidently be ruled out. Therefore, subject to natural change, kittiwake will be maintained as a feature in the long term.**

Ronas–Hill – North Roe and Tingon SPA

10.2.3.545 The centroid of the Ronas–Hill – North Roe and Tingon SPA is 281.4km (around land) from the centre of the Caledonia OWF, within the MMFR +1SD of great skua (443.3±487.9km) (Woodward *et al*., 2019[78]). As such, potential for LSE alone has been identified for the following features of Ronas–Hill – North Roe and Tingon SPA:

- Great skua
  - Collision (O&M)

Conservation Objectives

- To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and
- To ensure for the qualifying species that the following are maintained in the long term:
  - Population of the species as a viable component of the site;
  - Distribution of the species within site;
  - Distribution and extent of habitats supporting the species;
  - Structure, function and supporting processes of habitats supporting the species; and
  - No significant disturbance of the species.

Great Skua

10.2.3.546 Great skua have been screened into the assessment for O&M phase collision risk only. Due to potential connectivity being limited to the breeding season only for great skua for all SPAs, a combined assessment for all SPAs is provided in Section 10.2.3, beginning in paragraph 10.2.3.585. As presented in paragraph 10.2.3.585, **the potential for an AEoSI to the conservation objectives of great skua at Ronas – Hill– North Roe and Tingon SPA in relation to collision impacts from the Proposed Development (Offshore) alone during the O&M phase can confidently be ruled out. Therefore, subject to natural change, great skua will be maintained as a feature in the long term.**

Fetlar SPA

10.2.3.547 The centroid of the Fetlar SPA is 290.5km (around land) from the centre of the Caledonia OWF, within the MMFR +1SD of great skua (443.3±487.9km) (Woodward *et al*., 2019[78]). As such, potential for LSE alone has been identified for the following features of Fetlar SPA:

- Great skua
  - Collision (O&M)

Conservation Objectives

- To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and
- To ensure for the qualifying species that the following are maintained in the long term:
  - Population of the species as a viable component of the site;
  - Distribution of the species within site;
  - Distribution and extent of habitats supporting the species;
  - Structure, function and supporting processes of habitats supporting the species; and
  - No significant disturbance of the species.

Great Skua

10.2.3.548 Great skua have been screened into the assessment for O&M phase collision risk only. Due to potential connectivity being limited to the breeding season only for great skua for all SPAs, a combined assessment for all SPAs is provided in Section 10.2.3, beginning in paragraph 10.2.3.585. As presented in paragraph 10.2.3.585, **the potential for an AEoSI to the conservation objectives of great skua at Feltlar SPA in relation to collision impacts from the Proposed Development (Offshore) alone during the O&M phase can confidently be ruled out. Therefore, subject to natural change, great skua will be maintained as a feature in the long term**.

Hermaness, Saxa Vord and Valla Field SPA

10.2.3.549 The centroid of the Hermaness, Saxa Vord and Valla Field SPA is 324.9km (around land) from the centre of the Caledonia OWF, within the MMFR +1SD of gannet (315.2±194.2km), and great skua (443.3±487.9km) (Woodward *et al*., 2019[78]). The kittiwake feature of Hermaness, Saxa Vord and Valla Field SPA has also been screened into assessment though only during the non-breeding season, due to the Proposed Development (Offshore) being outside of MMFR + 1SD. As such, potential for LSE alone has been identified for the following Hermaness, Saxa Vord and Valla Field SPA:

- Great skua

- Collision (O&M)
- Kittiwake
  - Collision (O&M)
  - Distributional response (O&M)
  - Distributional response (C&D, Section 7.3.1)
- Gannet
  - Collision (O&M)
  - Distributional response (O&M)
  - Distributional response (C&D, Section 7.3.1)

Conservation Objectives

- To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and
- To ensure for the qualifying species that the following are maintained in the long term:
  - Population of the species as a viable component of the site;
  - Distribution of the species within site;
  - Distribution and extent of habitats supporting the species;
  - Structure, function and supporting processes of habitats supporting the species; and
  - No significant disturbance of the species.

Great Skua

10.2.3.550 Great skua have been screened into the assessment for O&M phase collision risk only. Due to potential connectivity being limited to the breeding season only for great skua for all SPAs, a combined assessment for all SPAs is provided in Section 10.2.2, beginning in paragraph 10.2.3.585. As presented in paragraph 10.2.3.585, **the potential for an AEoSI to the conservation objectives of great skua at Hermaness, Saxa Vord and Valla Field SPA in relation to collision impacts from the Proposed Development (Offshore) alone during the O&M phase can confidently be ruled out. Therefore, subject to natural change, great skua will be maintained as a feature in the long term.**

Gannet

10.2.3.551 Gannet have been screened into the assessment for O&M phase for distributional responses and collision risk. Due to potential connectivity being limited based on overall proportional weighting to Hermaness, Saxa Vord and Valla Field SPA, a combined assessment with other SPAs is provided in Section 10.2.2, beginning in paragraph 10.2.3.589. As presented in paragraph 10.2.3.589, **the potential for an AEoSI to the conservation objectives of**

gannet at Hermaness, Saxa Vord and Valla Field SPA in relation to both distributional responses and collision impacts from the Proposed Development (Offshore) alone during the O&M phase can confidently be ruled out. Therefore, subject to natural change, gannet will be maintained as a feature in the long term.

Handa SPA

10.2.3.552 The centroid of the Handa SPA is 207.5km (around land) from the centre of the Caledonia OWF, within the MMFR +1SD of kittiwake (156.1±144.5km), and great skua (443.3±487.9km) (Woodward *et al*., 2019[78]). As such, potential for LSE alone has been identified for the following Handa SPA:

- Kittiwake
  - Distributional response (O&M)
  - Distributional response (C&D, Section 7.3.1)
- Great skua
  - Collision (O&M)

Conservation Objectives

- To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and
- To ensure for the qualifying species that the following are maintained in the long term:
  - Population of the species as a viable component of the site;
  - Distribution of the species within site;
  - Distribution and extent of habitats supporting the species;
  - Structure, function and supporting processes of habitats supporting the species; and
  - No significant disturbance of the species.

Kittiwake

10.2.3.553 Kittiwake have been screened into the assessment for O&M phase for distributional responses and collision risk. Due to potential connectivity being limited based on overall proportional weighting to Handa SPA, a combined assessment with other SPAs is provided in Section 10.2.2, beginning in paragraph 10.2.3.562. As presented in paragraph 10.2.3.562, **the potential for an AEoSI to the conservation objectives of kittiwake at Handa SPA in relation to both distributional responses and collision impacts from the Proposed Development (Offshore) alone during the O&M phase can confidently be ruled out. Therefore, subject to natural change, kittiwake will be maintained as a feature in the long term.**

Great Skua

10.2.3.554 Great skua have been screened into the assessment for O&M phase collision risk only. Due to potential connectivity being limited to the breeding season only for great skua for all SPAs, a combined assessment for all SPAs is provided in Section 10.2.2, beginning in paragraph 10.2.3.585. As presented in paragraph 10.2.3.585, **the potential for an AEoSI to the conservation objectives of great skua at Handa SPA in relation to collision impacts from the Proposed Development (Offshore) alone during the O&M phase can confidently be ruled out. Therefore, subject to natural change, great skua will be maintained as a feature in the long term.**

Shiant Isles SPA

10.2.3.555 The centroid of the Shiant Isles SPA is 293.5km (around land) from the centre of the Caledonia OWF, within the MMFR +1SD of kittiwake (156.1±144.5km) (Woodward *et al*., 2019[78]). As such, potential for LSE alone has been identified for the following Shiant Isles SPA:

- Kittiwake
  - Distributional response (O&M)
  - Distributional response (C&D, Section 7.3.1)

Conservation Objectives

- To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and
- To ensure for the qualifying species that the following are maintained in the long term:
  - Population of the species as a viable component of the site;
  - Distribution of the species within site;
  - Distribution and extent of habitats supporting the species;
  - Structure, function and supporting processes of habitats supporting the species; and
  - No significant disturbance of the species.

Kittiwake

10.2.3.556 Kittiwake have been screened into the assessment for O&M phase for distributional responses and collision risk. Due to potential connectivity being limited based on overall proportional weighting to Shiant Isles SPA, a combined assessment with other SPAs is provided in Section 10.2.2, beginning in paragraph 10.2.3.562. As presented in paragraph 10.2.3.562, **the potential for an AEoSI to the conservation objectives of kittiwake at Shiant Isles SPA in relation to both distributional responses and**

collision impacts from the Proposed Development (Offshore) alone during the O&M phase can confidently be ruled out. Therefore, subject to natural change, kittiwake will be maintained as a feature in the long term.

St Kilda SPA

10.2.3.557 The centroid of the St Kilda SPA is 408.8km (around land) from the centre of the Caledonia OWF, within the MMFR +1SD of great skua (443.3±487.9km) (Woodward *et al*., 2019[78]). As such, potential for LSE alone has been identified for the following St Kilda SPA:

- Great skua
  - Collision (O&M)

Conservation Objectives

- To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and
- To ensure for the qualifying species that the following are maintained in the long term:
  - Population of the species as a viable component of the site;
  - Distribution of the species within site;
  - Distribution and extent of habitats supporting the species;
  - Structure, function and supporting processes of habitats supporting the species; and
  - No significant disturbance of the species.

Great Skua

10.2.3.558 Great skua have been screened into the assessment for O&M phase collision risk only. Due to potential connectivity being limited to the breeding season only for great skua for all SPAs, a combined assessment for all SPAs is provided in Section 10.2.2, beginning in paragraph 10.2.3.585. As presented in 10.2.3.585, **the potential for an AEoSI to the conservation objectives of great skua at St Kilda SPA in relation to collision impacts from the Proposed Development (Offshore) alone during the O&M phase can confidently be ruled out. Therefore, subject to natural change, great skua will be maintained as a feature in the long term.**

UK SPAs

10.2.3.559 The following section provides assessments for a number of SPAs combined per species in order to provide a more concise review of more distant SPAs and/or species where potential connectivity is limited.

Conservation Objectives

10.2.3.560 Scottish SPAs have been assessed against the following conservation objectives:

- To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and
- To ensure for the qualifying species that the following are maintained in the long term:
  - Population of the species as a viable component of the site;
  - Distribution of the species within site;
  - Distribution and extent of habitats supporting the species;
  - Structure, function and supporting processes of habitats supporting the species; and
  - No significant disturbance of the species.

10.2.3.561 English SPAs have been assessed against the following conservation objectives based on the impact pathways and level of connectivity considered:

- Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring;
  - Distribution and extent of habitats of the qualifying features;
  - Structure and function of the habitats of the qualifying features; and
  - Supporting processes on which the habitats of the qualifying features rely;
  - The population of each of the qualifying features; and
  - Distribution of the qualifying features within the site.

Kittiwake

10.2.3.562 The kittiwake feature of a number of more distant UK SPAs from Caledonia OWF has been screened in for the assessment of distributional responses and collision risk for the O&M phase. The following sites have been assessed within this section together:

- Copinsay SPA (breeding and non-breeding season);
- Hoy SPA (breeding and non-breeding season);
- Marwick Head SPA (breeding and non-breeding season);
- Calf of Eday SPA (breeding and non-breeding season);
- Rousay SPA (breeding and non-breeding season);

- West Westray SPA (breeding and non-breeding season);
- Cape Wrath SPA (breeding and non-breeding season);
- Fair Isle SPA (breeding and non-breeding season);
- Sumburgh Head SPA (breeding and non-breeding season);
- Handa SPA (breeding and non-breeding season);
- Foula SPA (breeding and non-breeding season);
- North Rona and Sula Sgeir SPA (breeding and non-breeding season);
- Forth Islands SPA (breeding and non-breeding season);
- Noss SPA (breeding and non-breeding season);
- St Abbs Head to Fast Castle SPA (breeding and non-breeding season);
- Shiant Isles SPA (breeding and non-breeding season);
- Farne Islands SPA (non-breeding season only); and
- Hermanes, Saxa Vord and Valla Field SPA (non-breeding season only).

10.2.3.563 Assessments have been carried out for the breeding season of Mid-April to August and/ or the non-breeding season of September to Early April, in accordance with NatureScot seasonal guidance depending on the level of connectivity concluded during HRA Screening.

O&M Phase Potential Distributional Response Effects in Isolation

10.2.3.564 Table 10-89 below presents the predicted distributional response impacts during the O&M phase attributed to each SPA seasonally and subsequent survival rate percentage point change. Impact predictions presented are based on the Guidance approach only, as the Applicant remains of the position that kittiwake do not require assessment for distributional responses due to the evidence base detailed within Volume 7B, Appendix 6-2, Annex 4: Review of Relevant Evidence suggesting kittiwake show limited behavioural response to OWFs. Distributional responses are assessed based on the number of breeding adults within the Proposed Development (Offshore) And 2km buffer.

Table 10-89 Kittiwake predicted distributional response impacts during the O&M phase attributed to SPAs seasonally and resultant change in survival rate percentage point change compared to citation and most recent population counts.

SPA	Population Size (Breeding Adults)	Defined Season	Guidance Approach	
			30% Displacement; 1-3% Mortality	Change in Average Survival Rate (% Point Change)
Copinsay SPA	Citation (19,100)	Breeding	0.01 – 0.02	<0.001
		Non-breeding	<0.01	<0.001
		Annual	0.01 – 0.02	<0.001
	Latest count (592)	Breeding	0.01 – 0.02	0.001 – 0.003
		Non-breeding	<0.01	<0.001 - 0.001
		Annual	0.01 – 0.02	0.001 – 0.004
Hoy SPA	Citation (6,000)	Breeding	0.01 – 0.02	<0.001
		Non-breeding	<0.01	<0.001
		Annual	0.01 – 0.02	<0.001
	Latest count (608)	Breeding	0.01 – 0.02	0.001 – 0.003
		Non-breeding	<0.01	<0.001
		Annual	0.01 – 0.02	0.001 – 0.003
Marwick Head SPA	Citation (15,400)	Breeding	0.01 - 0.04	<0.001
		Non-breeding	<0.01	<0.001
		Annual	0.01 - 0.04	<0.001

SPA	Population Size (Breeding Adults)	Defined Season	Guidance Approach	
			30% Displacement; 1-3% Mortality	Change in Average Survival Rate (% Point Change)
	Latest count (2,878)	Breeding	0.01 - 0.04	<0.001 - 0.001
		Non-breeding	<0.01	<0.001
		Annual	0.01 - 0.04	<0.001 - 0.001
Calf of Eday SPA	Citation (3,434)	Breeding	<0.01	<0.001
		Non-breeding	<0.01	<0.001
		Annual	<0.01 – 0.01	<0.001
	Latest count (290)	Breeding	<0.01	<0.001 - 0.001
		Non-breeding	<0.01	0.001 - 0.002
		Annual	<0.01 – 0.01	0.001 - 0.003
Rousay SPA	Citation (9,800)	Breeding	<0.01 - 0.01	<0.001
		Non-breeding	<0.01 - 0.01	<0.001
		Annual	0.01 - 0.02	<0.001
	Latest count (962)	Breeding	<0.01 - 0.01	<0.001 - 0.001
		Non-breeding	<0.01 - 0.01	<0.001 - 0.001
		Annual	0.01 - 0.02	0.001 - 0.002
West Westray SPA	Citation count (47,800)	Breeding	0.02 – 0.05	<0.001

SPA	Population Size (Breeding Adults)	Defined Season	Guidance Approach	
			30% Displacement; 1-3% Mortality	Change in Average Survival Rate (% Point Change)
		Non-breeding	0.03 – 0.08	<0.001
		Annual	0.04 – 0.13	<0.001
	Latest count (4,838)	Breeding	0.02 – 0.05	<0.001 - 0.001
		Non-breeding	0.03 – 0.08	0.001 - 0.002
		Annual	0.04 – 0.13	0.001 - 0.003
Cape Wrath SPA	Citation count (19,400)	Breeding	0.02 – 0.05	<0.001
		Non-breeding	<0.01	<0.001
		Annual	0.02 – 0.05	<0.001
	Latest count (6,616)	Breeding	0.02 – 0.05	<0.001 - 0.001
		Non-breeding	<0.01	<0.001
		Annual	0.02 – 0.05	<0.001 - 0.001
Fair Isle SPA	Citation count (36,320)	Breeding	<0.01 – 0.01	<0.001
		Non-breeding	<0.01	<0.001
		Annual	<0.01 – 0.01	<0.001
	Latest count (896)	Breeding	<0.01 – 0.01	<0.001 - 0.001
		Non-breeding	<0.01	<0.001 - 0.001
		Annual	<0.01 – 0.01	<0.001 - 0.001
	Citation count (2,732)	Breeding	<0.01	<0.001

SPA	Population Size (Breeding Adults)	Defined Season	Guidance Approach	
			30% Displacement; 1-3% Mortality	Change in Average Survival Rate (% Point Change)
Sumburgh Head SPA		Non-breeding	<0.01	<0.001
		Annual	<0.01	<0.001
	Latest count (636)	Breeding	<0.01	<0.001
		Non-breeding	<0.01	<0.001
		Annual	<0.01	<0.001 - 0.001
Handa SPA	Citation count (21,464)	Breeding	0.02 – 0.05	<0.001
		Non-breeding	<0.01	<0.001
		Annual	0.02 – 0.05	<0.001
	Latest count (9,178)	Breeding	0.02 – 0.05	<0.001
		Non-breeding	<0.01	<0.001
		Annual	0.02 – 0.05	<0.001
Foula SPA	Citation count (7,680)	Breeding	<0.01	<0.001
		Non-breeding	<0.01	<0.001
		Annual	<0.01 - 0.01	<0.001
	Latest count (1,021)	Breeding	<0.01	<0.001
		Non-breeding	<0.01	<0.001

SPA	Population Size (Breeding Adults)	Defined Season	Guidance Approach	
			30% Displacement; 1-3% Mortality	Change in Average Survival Rate (% Point Change)
		Annual	<0.01 - 0.01	<0.001 - 0.001
North Rona and Sula Sgeir SPA	Citation count (10,000)	Breeding	<0.01	<0.001
		Non-breeding	<0.01	<0.001
		Annual	<0.01	<0.001
	Latest count (1,424)	Breeding	<0.01	<0.001
		Non-breeding	<0.01	<0.001
		Annual	<0.01	<0.001
Forth Islands SPA	Citation count (16,800)	Breeding	0.02 – 0.07	<0.001
		Non-breeding	0.01 – 0.02	<0.001
		Annual	0.03 – 0.09	<0.001 – 0.001
	Latest count (13,078)	Breeding	0.02 – 0.07	<0.001 – 0.001
		Non-breeding	0.01 – 0.02	<0.001
		Annual	0.03 – 0.09	<0.001 – 0.001
Noss SPA	Citation count (14,040)	Breeding	<0.01	<0.001
		Non-breeding	<0.01	<0.001
		Annual	<0.01	<0.001

SPA	Population Size (Breeding Adults)	Defined Season	Guidance Approach	
			30% Displacement; 1-3% Mortality	Change in Average Survival Rate (% Point Change)
	Latest count (172)	Breeding	<0.01	<0.001
		Non-breeding	<0.01	0.001 – 0.002
		Annual	<0.01	0.001 – 0.002
St Abbs Head to Fast Castle SPA	Citation count (42,340)	Breeding	0.01 – 0.04	<0.001
		Non-breeding	0.01 – 0.02	<0.001
		Annual	0.02 – 0.06	<0.001
	Latest count (9,158)	Breeding	0.01 – 0.04	<0.001
		Non-breeding	0.01 – 0.02	<0.001
		Annual	0.02 – 0.06	<0.001 – 0.001
Shaint Isles SPA	Citation count (3,600)	Breeding	<0.01 – 0.01	<0.001
		Non-breeding	<0.01	<0.001
		Annual	<0.01 – 0.01	<0.001
	Latest count (2,318)	Breeding	<0.01 – 0.01	<0.001
		Non-breeding	<0.01	<0.001
		Annual	<0.01 – 0.01	<0.001
Farne Islands SPA	Citation count (8,241)	Breeding	-	-

SPA	Population Size (Breeding Adults)	Defined Season	Guidance Approach	
			30% Displacement; 1-3% Mortality	Change in Average Survival Rate (% Point Change)
		Non-breeding	0.01 – 0.02	<0.001
		Annual	0.01 – 0.02	<0.001
	Latest count (7,166)	Breeding	-	-
		Non-breeding	0.01 – 0.02	<0.001
		Annual	0.01 – 0.02	<0.001
Hermannes, Saxa Vord and Valla Field SPA	Citation count (1,844)	Breeding	-	-
		Non-breeding	<0.01	<0.001
		Annual	<0.01	<0.001
	Latest count (154)	Breeding	-	-
		Non-breeding	<0.01	0.001 – 0.002
		Annual	<0.01	0.001 – 0.002

10.2.3.565 For all SPAs considered in Table 10-89, the level of predicted annual additional mortality due to Caledonia OWF alone distributional responses effects is at most significantly less than one (<0.01 – 0.13) breeding adult. Additionally, for all assessments the survival rate percentage point changes due to the predicted Caledonia OWF alone impacts for this impact pathway do not exceed an increase of 0.02% annually. **Therefore, for all SPAs it can be confidently concluded that there is no potential for an AEoSI in relation to potential distributional response effects from the Proposed Development (Offshore) alone during the O&M phase. Therefore, subject to natural change, kittiwake will be maintained as a feature in the long term for all SPAs.**

O&M Phase Potential Collision Risk Impacts in Isolation

10.2.3.566 Table 10-90 below presents predicted collision risk impacts during the O&M phase attributed to each SPA seasonally and subsequent survival rate percentage point change.

Table 10-90: Kittiwake predicted collision risk impacts during the O&M phase attributed to SPAs seasonally and resultant change in survival rate percentage point change compared to citation and most recent population counts.

SPA	Population Size (Breeding Adults)	Defined Season	Collision Risk Impact	
			Breeding Adults per Annum	Change in Average Survival Rate (% Point Change)
Copinsay SPA	Citation (19,100)	Breeding	0.05	<0.001
		Non-breeding	0.01	<0.001
		Annual	0.07	<0.001
	Latest count (592)	Breeding	0.05	0.009
		Non-breeding	0.01	0.002
		Annual	0.07	0.011
Hoy SPA	Citation (6,000)	Breeding	0.05	0.001
		Non-breeding	0.01	<0.001
		Annual	0.06	0.001
	Latest count (608)	Breeding	0.05	0.008
		Non-breeding	0.01	0.001
		Annual	0.06	0.009
Marwick Head SPA	Citation (15,400)	Breeding	0.12	0.001
		Non-breeding	0.01	<0.001

SPA	Population Size (Breeding Adults)	Defined Season	Collision Risk Impact	
			Breeding Adults per Annum	Change in Average Survival Rate (% Point Change)
		Annual	0.13	0.001
	Latest count (2,878)	Breeding	0.12	0.004
		Non-breeding	0.01	<0.001
		Annual	0.13	0.004
Calf of Eday SPA	Citation (3,434)	Breeding	0.01	<0.001
		Non-breeding	0.01	<0.001
		Annual	0.03	0.001
	Latest count (290)	Breeding	0.01	0.004
		Non-breeding	0.01	0.005
		Annual	0.03	0.009
Rousay SPA	Citation (9,800)	Breeding	0.04	<0.001
		Non-breeding	0.03	<0.001
		Annual	0.07	0.001
	Latest count (962)	Breeding	0.04	0.004
		Non-breeding	0.03	0.004

SPA	Population Size (Breeding Adults)	Defined Season	Collision Risk Impact	
			Breeding Adults per Annum	Change in Average Survival Rate (% Point Change)
		Annual	0.07	0.007
West Westray SPA	Citation count (47,800)	Breeding	0.15	<0.001
		Non-breeding	0.23	<0.001
		Annual	0.38	0.001
	Latest count (4,838)	Breeding	0.15	0.003
		Non-breeding	0.23	0.005
		Annual	0.38	0.008
Cape Wrath SPA	Citation count (19,400)	Breeding	0.14	0.001
		Non-breeding	<0.01	<0.001
		Annual	0.14	0.001
	Latest count (6,616)	Breeding	0.14	0.002
		Non-breeding	<0.01	<0.001
		Annual	0.14	0.002
Fair Isle SPA	Citation count (36,320)	Breeding	0.02	<0.001
		Non-breeding	0.01	<0.001

SPA	Population Size (Breeding Adults)	Defined Season	Collision Risk Impact	
			Breeding Adults per Annum	Change in Average Survival Rate (% Point Change)
		Annual	0.03	<0.001
	Latest count (896)	Breeding	0.02	0.002
		Non-breeding	0.01	0.002
		Annual	0.03	0.004
Sumburgh Head SPA	Citation count (2,732)	Breeding	0.01	<0.001
		Non-breeding	<0.01	<0.001
		Annual	0.01	<0.001
	Latest count (636)	Breeding	0.01	0.001
		Non-breeding	<0.01	0.001
		Annual	0.01	0.002
Handa SPA	Citation count (21,464)	Breeding	0.14	0.001
		Non-breeding	<0.01	<0.001
		Annual	0.14	0.001
	Latest count (9,178)	Breeding	0.14	0.001
		Non-breeding	<0.01	<0.001

SPA	Population Size (Breeding Adults)	Defined Season	Collision Risk Impact	
			Breeding Adults per Annum	Change in Average Survival Rate (% Point Change)
		Annual	0.14	0.001
Foula SPA	Citation count (7,680)	Breeding	0.01	<0.001
		Non-breeding	0.01	<0.001
		Annual	0.02	<0.001
	Latest count (1,021)	Breeding	0.01	0.001
		Non-breeding	0.01	0.001
		Annual	0.02	0.002
North Rona and Sula Sgeir SPA	Citation count (10,000)	Breeding	0.01	<0.001
		Non-breeding	<0.01	<0.001
		Annual	0.01	<0.001
	Latest count (1,424)	Breeding	0.01	0.001
		Non-breeding	<0.01	<0.001
		Annual	0.01	0.001
Forth Islands SPA	Citation count (16,800)	Breeding	0.21	0.001
		Non-breeding	0.06	<0.001

SPA	Population Size (Breeding Adults)	Defined Season	Collision Risk Impact	
			Breeding Adults per Annum	Change in Average Survival Rate (% Point Change)
		Annual	0.27	0.002
	Latest count (13,078)	Breeding	0.21	0.002
		Non-breeding	0.06	<0.001
		Annual	0.27	0.002
Noss SPA	Citation count (14,040)	Breeding	<0.01	<0.001
		Non-breeding	0.01	<0.001
		Annual	0.01	<0.001
	Latest count (172)	Breeding	<0.01	0.001
		Non-breeding	0.01	0.006
		Annual	0.01	0.007
St Abbs Head to Fast Castle SPA	Citation count (42,340)	Breeding	0.13	<0.001
		Non-breeding	0.07	<0.001
		Annual	0.19	<0.001
	Latest count (9,158)	Breeding	0.13	0.001
		Non-breeding	0.07	0.001

SPA	Population Size (Breeding Adults)	Defined Season	Collision Risk Impact	
			Breeding Adults per Annum	Change in Average Survival Rate (% Point Change)
		Annual	0.19	0.002
Shaint Isles SPA	Citation count (3,600)	Breeding	0.02	0.001
		Non-breeding	<0.01	<0.001
		Annual	0.02	0.001
	Latest count (2,318)	Breeding	0.02	0.001
		Non-breeding	<0.01	<0.001
		Annual	0.02	0.001
Farne Islands SPA	Citation count (8,241)	Breeding	-	-
		Non-breeding	0.07	0.001
		Annual	0.07	0.001
	Latest count (7,166)	Breeding	-	-
		Non-breeding	0.07	0.001
		Annual	0.07	0.001
Hermannes, Saxa Vord and Valla Field SPA	Citation count (1,844)	Breeding	-	-
		Non-breeding	0.01	<0.001

SPA	Population Size (Breeding Adults)	Defined Season	Collision Risk Impact	
			Breeding Adults per Annum	Change in Average Survival Rate (% Point Change)
		Annual	0.01	<0.001
	Latest count (154)	Breeding	-	-
		Non-breeding	0.01	0.005
		Annual	0.01	0.005

10.2.3.567 For all SPAs considered in Table 10-90, the level of predicted annual additional mortality due to Caledonia OWF alone collision risk impacts is less than one (<0.01 - 0.38) breeding adult per annum to any SPA. Additionally, for all assessments the survival rate percentage point changes due to the predicted Caledonia OWF alone impacts for this impact pathway do not exceed an increase of 0.02% annually. **Therefore, for all SPAs it can be confidently concluded that there is no potential for an AEoSI in relation to potential collision risk impacts from the Proposed Development (Offshore) alone during the O&M phase. Therefore, subject to natural change, kittiwake will be maintained as a feature in the long term for all SPAs.**

O&M Phase Combined Distributional Effects and Collision Risk Impacts

10.2.3.568 For all SPAs considered the level of predicted annual additional mortality due to combined Caledonia OWF alone distributional responses and collision risk is at most less than one (0.01 - 0.51) breeding adults per annum to any SPA. Additionally, the survival rate percentage point changes do not exceed an increase of 0.02% annually due to the combined predicted distributional responses and collision Caledonia OWF alone impacts. Such a level of impact can confidently be classified as intangible, regardless of the predicted survival rate percentage point change. Therefore, for all SPAs **it can be confidently concluded that there is no potential for an AEoSI in relation to potential combined distributional responses and collision risk impacts from the Proposed Development (Offshore) alone during the O&M phase. Therefore, subject to natural change, kittiwake will be maintained as a feature in the long term for all SPAs.**

Razorbill

10.2.3.569 The razorbill feature of a number of UK SPAs for Caledonia OWFhas been screened in for the assessment of distributional responses for the O&M phase. In order to provide a more concise review, the following sites have been assessed within this section together:

- West Westray SPA (breeding and non-breeding season);
- Fair Isle SPA (breeding and non-breeding season);
- Fowlsheugh SPA (non-breeding season only); and
- Forth Islands SPA (non-breeding season only).

10.2.3.570 Assessments have been carried out for the breeding season of April to Mid-August and/ or the non-breeding season of Mid-August to March, in accordance with NatureScot seasonal guidance depending on the level of connectivity concluded during HRA Screening.

O&M Phase Potential Distributional Response Effects in Isolation

10.2.3.571 Table 10-91 below presents the predicted distributional response impacts during the O&M phase attributed to each SPA seasonally and subsequent survival rate percentage point change. Impact predictions presented are based on both the Applicant and Guidance approach. Distributional response is assessed based on the number of breeding adults within the Proposed Development (Offshore) and 2km buffer.

Table 10-91: Razorbill predicted distributional response impacts during the O&M phase attributed to SPAs seasonally and resultant change in survival rate percentage point change compared to citation and most recent population counts.

SPA	Population Size (Breeding Adults)	Defined Season	Applicant Approach		Guidance Approach	
			70% Displacement; 1% Mortality	Change in Average Survival Rate (% Point Change)	70% Displacement; 1-3% Mortality	Change in Average Survival Rate (% Point Change)
West Westray SPA	Citation (1,946)	Breeding	0.02	0.001	0.09 – 0.14	0.004 – 0.007
		Non-breeding	0.02	0.001	0.02 – 0.06	0.001 – 0.003
		Annual	0.04	0.002	0.11 – 0.20	0.005 – 0.011
	Latest count (2,857)	Breeding	0.02	0.001	0.09 – 0.14	0.003 – 0.005
		Non-breeding	0.02	0.001	0.02 – 0.06	0.001 – 0.002
		Annual	0.04	0.001	0.11 – 0.20	0.004 – 0.007
Fair Isle SPA	Citation (3,400)	Breeding	0.01	<0.001	0.05 – 0.08	0.001 – 0.002
		Non-breeding	0.03	0.001	0.03 – 0.10	0.001 – 0.003
		Annual	0.04	0.001	0.08 – 0.18	0.002 – 0.005
	Latest count (2,580)	Breeding	0.01	0.001	0.05 – 0.08	0.002 – 0.003
		Non-breeding	0.03	0.001	0.03 – 0.10	0.001 – 0.004
		Annual	0.04	0.002	0.08 – 0.18	0.003 – 0.007

SPA	Population Size (Breeding Adults)	Defined Season	Applicant Approach		Guidance Approach	
			70% Displacement; 1% Mortality	Change in Average Survival Rate (% Point Change)	70% Displacement; 1-3% Mortality	Change in Average Survival Rate (% Point Change)
Fowlsheugh SPA	Citation (5,800)	Breeding	-	-	-	-
		Non-breeding	0.11	0.001	0.14 – 0.41	0.002 – 0.007
		Annual	0.11	0.001	0.14 – 0.41	0.002 – 0.007
	Latest count (17,770)	Breeding	-	-	-	-
		Non-breeding	0.11	0.001	0.14 – 0.41	0.001 – 0.002
		Annual	0.11	0.001	0.14 – 0.41	0.001 – 0.002
Forth Islands SPA	Citation (2,800)	Breeding	-	-	-	-
		Non-breeding	0.09	0.003	0.10 – 0.31	0.004 – 0.011
		Annual	0.09	0.003	0.10 – 0.31	0.004 – 0.011
	Latest count (8,186)	Breeding	-	-	-	-
		Non-breeding	0.09	0.001	0.10 – 0.31	0.001 – 0.004
		Annual	0.09	0.001	0.10 – 0.31	0.001 – 0.004

10.2.3.572 For all SPAs considered in Table 10-91, the level of predicted annual additional mortality due to Caledonia OWF alone distributional responses effects is less than one (0.04 – 0.11) breeding adult per annum to any SPA. Additionally, the survival rate percentage point changes due to the predicted Caledonia OWF alone impact pathway do not exceed an increase of 0.02% annually. **Therefore, for all SPAs it can be confidently concluded that there is no potential for an AEoSI in relation to potential distributional response effects from the Proposed Development (Offshore) alone during the O&M phase. Therefore, subject to natural change, razorbill will be maintained as a feature in the long term for all SPAs.**

Puffin

10.2.3.573 The puffin feature of a number of UK SPAs from Caledonia OWF has been screened in for the assessment of distributional responses for the O&M phase. In order to provide a more concise review, the following sites have been assessed within this section together:

- Hoy SPA (breeding and non-breeding season);
- Cape Wrath SPA (breeding and non-breeding season);
- Foula SPA (breeding and non-breeding season);
- North Rona and Sula Sgeir SPA (breeding and non-breeding season); and
- Noss SPA (breeding and non-breeding season).

10.2.3.574 Assessments have been carried out for the breeding season of April to Mid-August and the non-breeding season of Mid-August to March, in accordance with NatureScot seasonal guidance depending on the level of connectivity concluded during HRA Screening.

O&M Phase Potential Distributional Response Effects in Isolation

10.2.3.575 Table 10-92 below presents the predicted distributional response impacts during the O&M phase attributed to each SPA seasonally and subsequent survival rate percentage point change. Impact predictions presented are based on both the Applicant and Guidance approach. Distributional response is assessed based on the number of breeding adults within the Proposed Development (Offshore) And 2km buffer.

Table 10-92: Puffin predicted distributional response impacts during the O&M phase attributed to SPAs seasonally and resultant change in survival rate percentage point change compared to citation and most recent population counts.

SPA	Population Size (Breeding Adults)	Defined Season	Applicant Approach		Guidance Approach	
			70% Displacement; 1% Mortality	Change in Average Survival Rate (% Point Change)	70% Displacement; 1-3% Mortality	Change in Average Survival Rate (% Point Change)
Hoy SPA	Citation (7,000)	Breeding	0.12	0.005	0.13 – 0.21	0.002 – 0.003
		Non-breeding	0.03	0.001	0.04 – 0.11	0.001 – 0.002
		Annual	0.15	0.006	0.16 – 0.32	0.002 – 0.005
	Latest count (361)	Breeding	0.12	0.001	0.13 – 0.21	0.035 – 0.058
		Non-breeding	0.03	<0.001	0.04 – 0.11	0.010 – 0.030
		Annual	0.15	0.002	0.16 – 0.32	0.045 – 0.089
Cape Wrath SPA	Citation (11,800)	Breeding	0.10	<0.001	0.02 – 0.03	<0.001
		Non-breeding	0.19	0.001	<0.01 – 0.01	<0.001
		Annual	0.29	0.001	0.02 – 0.03	<0.001
	Latest count (214)	Breeding	0.10	<0.001	0.02 – 0.03	0.010 – 0.016
		Non-breeding	0.19	0.001	<0.01 – 0.01	<0.001
		Annual	0.29	0.001	0.02 – 0.03	0.010 – 0.016

SPA	Population Size (Breeding Adults)	Defined Season	Applicant Approach		Guidance Approach	
			70% Displacement; 1% Mortality	Change in Average Survival Rate (% Point Change)	70% Displacement; 1-3% Mortality	Change in Average Survival Rate (% Point Change)
Foula SPA	Citation (96,000)	Breeding	0.13	0.001	0.30 – 0.50	<0.001 - 0.001
		Non-breeding	0.08	0.001	0.23 – 0.70	<0.001 - 0.001
		Annual	0.21	0.002	0.53 – 1.20	0.001
	Latest count (6,351)	Breeding	0.13	0.001	0.30 – 0.50	0.005 - 0.008
		Non-breeding	0.08	<0.001	0.23 – 0.70	0.004 – 0.011
		Annual	0.21	0.001	0.53 – 1.20	0.008 - 0.019
North Rona and Sula Sgeir SPA	Citation (10,600)	Breeding	0.14	0.001	0.14 – 0.23	0.001 – 0.002
		Non-breeding	0.01	<0.001	<0.01	<0.001
		Annual	0.15	0.001	0.14 – 0.23	0.001 – 0.002
	Latest count (2,834)	Breeding	0.14	0.001	0.14 – 0.23	0.005 – 0.008
		Non-breeding	0.01	<0.001	<0.01	<0.001
		Annual	0.15	0.001	0.14 – 0.23	0.005 – 0.008
Noss SPA	Citation (2,348)	Breeding	0.24	0.002	0.02 – 0.04	0.001 – 0.002
		Non-breeding	<0.01	<0.001	0.01 – 0.02	<0.001 - 0.001

SPA	Population Size (Breeding Adults)	Defined Season	Applicant Approach		Guidance Approach	
			70% Displacement; 1% Mortality	Change in Average Survival Rate (% Point Change)	70% Displacement; 1-3% Mortality	Change in Average Survival Rate (% Point Change)
		Annual	0.25	0.002	0.03 – 0.06	0.001 – 0.003
	Latest count (545)	Breeding	0.24	0.001	0.02 – 0.04	0.004 – 0.007
		Non-breeding	<0.01	<0.001	0.01 – 0.02	0.002 – 0.005
		Annual	0.25	0.001	0.03 – 0.06	0.006 – 0.011

10.2.3.576 For all SPAs considered in Table 10-92, the level of predicted annual additional mortality due to Caledonia OWF alone distributional responses effects is less than one (0.15 - 0.29) breeding adult per annum to any SPA. Additionally, for all assessments, with the exception of Hoy SPA, the survival rate percentage point changes due to the predicted Caledonia OWF alone impacts for this impact pathway do not exceed an increase of 0.02% annually when considering both the Applicant and Guidance Approach. Such a level of impact can confidently be classified as intangible, regardless of the predicted survival rate percentage point change. However, in line with NatureScot Guidance, PVA has been undertaken for Hoy SPA and presented for further information within Application Document 13, Appendix 13-2: Caledonia North Habitats Regulations Appraisal Population Viability Analysis Technical Report and Application Document 14, Appendix 14-2: Caledonia South Habitats Regulations Appraisal Population Viability Analysis Technical Report. The PVA analysis concluded that the predicted level of effect attributed would result in an undetectable level of change at the colony. **Therefore, for all SPAs it can be confidently concluded that there is no potential for an AEoSI in relation to potential distributional response effects from the Proposed Development (Offshore) alone during the O&M phase. Therefore, subject to natural change, puffin will be maintained as a feature in the long term for all SPAs.**

Great Black-backed Gull

10.2.3.577 The great black-backed gull feature of a number of more distant UK SPAs from Caledonia OWF has been screened in for the assessment of collision risk for the O&M phase. In order to provide a more concise review, the following sites have been assessed within this section together:

- East Caithness Cliffs SPA (non-breeding season only);
- Copinsay SPA (non-breeding season only); and
- Hoy SPA (non-breeding season only).

10.2.3.578 Connectivity between the above SPAs and The Proposed Development (Offshore) is limited to the non-breeding season only (September to March), due to no great black-backed gulls being recorded within the 24 months of site-specific surveys during the breeding season.

O&M Phase Potential Collision Risk Impacts in Isolation

10.2.3.579 Table 10-93 below presents the apportioned predicted collision impacts to each designated site considered in the non-breeding season only, based on the apportionment process detailed in Application Document 13, Appendix 13-1: Caledonia North Apportioning Technica Note and Application Document 14, Appendix 14-1: Caledonia South Apportioning Technica Note.

Table 10-93: Great black-backed gull predicted collision risk impacts during the O&M phase attributed to SPAs during the non-breeding season and resultant change in survival rate percentage point change compared to citation and most recent population counts.

SPA	Population Size (Breeding Adults)	Collision risk impact	
		Breeding Adults per Annum	Change in Average Survival Rate (% Point Change)
East Caithness Cliffs SPA	Citation (1,600)	0.06	0.004
	Latest Count (532)		0.011
Copinsay SPA	Citation (980)	0.07	0.007
	Latest Count (98)		0.073
Hoy SPA	Citation (1,140)	0.02	0.002
	Latest Count (10)		0.197

10.2.3.580 For all SPAs considered in Table 10-93, the level of predicted annual additional mortality due to Caledonia OWF alone collision risk is significantly less than one (0.07) breeding adult per annum. Such a level of effect can almost certainly be concluded as intangible, regardless of the change in survival rate. **Therefore, for all SPAs it can be confidently concluded that there is no potential for an AEoSI in relation to potential collision risk impacts from The Proposed Development (Offshore) alone during the O&M phase. Therefore, subject to natural change, great black-backed gull will be maintained as a feature in the long term for all SPAs.**

Herring Gull

10.2.3.581 The Herring gull feature of a number of more distant UK SPAs from Caledonia OWF has been screened in for the assessment of collision risk for the O&M phase. In order to provide a more concise review, the following sites have been assessed within this section together:

- East Caithness Cliffs SPA (non-breeding season only); and
- Troup, Pennan and Lion’s Head SPA (non-breeding season only).

10.2.3.582 Connectivity between the above SPAs and The Proposed Development (Offshore) is limited to the non-breeding season only (September to March), due to no herring gulls being recorded within the 24 months of site-specific surveys during the breeding season.

O&M Phase Potential Collision Risk Impacts in Isolation

10.2.3.583 Table 10-94 below presents the apportioned predicted collision impacts to each designated site considered in the non-breeding season only, based on the apportionment process detailed in Application Document 13, Appendix 13-1: Caledonia North Apportioning Technica Note and Application Document 14, Appendix 14-1: Caledonia South Apportioning Technica Note.

Table 10-94 Herring gull predicted collision risk impacts during the O&M phase attributed to SPAs during the non-breeding season and resultant change in survival rate percentage point change compared to citation and most recent population counts.

SPA	Population Size (Breeding Adults)	Collision risk impact	
		Breeding adults per annum	Change in Average Survival Rate (% Point Change)
East Caithness Cliffs SPA	Citation (18,800)	0.04	<0.001
	Latest Count (6,534)		0.001
Troup, Pennan and Lion's Head SPA	Citation (8,400)	0.02	<0.001
	Latest Count (1,106)		0.002

10.2.3.584 For all SPAs considered in Table 10-94, the level of predicted annual additional mortality due to Caledonia OWF alone collision risk is significantly less than one (0.04) breeding adult. Additionally, for all assessments the survival rate percentage point changes due to the predicted Caledonia OWF alone impacts for this impact pathway do not exceed an increase of 0.02% annually. **Therefore, for all SPAs it can be confidently concluded that there is no potential for an AEoSI in relation to potential collision risk impacts from the Proposed Development (Offshore) alone during the O&M phase. Therefore, subject to natural change, herring gull will be maintained as a feature in the long term for all SPAs.**

Great Skua

10.2.3.585 The great skua feature of a number of more distant UK SPAs from Caledonia OWF has been screened in for the assessment of collision risk for the O&M phase. In order to provide a more concise review, the following sites have been assessed within this section together:

- Hoy SPA (breeding season only);
- Fair Isle SPA (breeding season only);
- Handa SPA (breeding season only);
- Foula SPA (breeding season only);

- Noss SPA (breeding season only);
- Ronas Hill – North Roe and Trigon SPA (breeding season only);
- Fetlar SPA (breeding season only);
- Hermaness, Saxa Vord and Valla Field SPA (breeding season only); and
- St Kilda SPA (breeding season only).

10.2.3.586 Connectivity between the above SPAs and The Proposed Development (Offshore) is limited to the breeding season only (April to August), due to no great skuas being recorded within the 24 months of site-specific surveys during the non-breeding season.

O&M Phase Potential Collision Risk Impacts in Isolation

10.2.3.587 Table 10-95 below presents the apportioned predicted collision impacts to each designated site considered in the breeding season only, based on the apportionment process detailed in Application Document 13, Appendix 13-1: Caledonia North Apportioning Technica Note and Application Document 14, Appendix 14-1: Caledonia South Apportioning Technica Note.

Table 10-95: Great Skua predicted collision risk impacts during the O&M phase attributed to SPAs during the breeding season and resultant change in survival rate percentage point change compared to citation and most recent population counts.

SPA	Population Size (Breeding Adults)	Collision risk impact	
		Breeding adults per annum	Change in Average Survival Rate (% Point Change)
Hoy SPA	Citation (3,800)	0.03	0.001
	Latest Count (994)		0.003
Fair Isle SPA	Citation (220)	<0.01	0.002
	Latest Count (306)		0.001
Handa SPA	Citation (132)	<0.01	0.001
	Latest Count (168)		0.001
Foula SPA	Citation (4,540)	<0.01	<0.001
	Latest Count (616)		0.001
Noss SPA	Citation (840)	<0.01	<0.001
	Latest Count (138)		<0.001
Ronas Hill - North Roe and Tingon SPA	Citation (260)	<0.01	<0.001
	Latest Count (212)		<0.001
Fetlar SPA	Citation (1,016)	<0.01	<0.001
	Latest Count (626)		<0.001
Hermaness, Saxa Vord and Valla Field SPA	Citation (1,576)	<0.01	<0.001
	Latest Count (448)		<0.001
St Kilda SPA	Citation (540)	<0.01	<0.001
	Latest Count (56)		<0.001

10.2.3.588 For all SPAs considered in Table 10-95, the level of predicted annual additional mortality due to Caledonia OWF alone collision risk is less than one (0.03) breeding adult. Additionally, for all assessments the survival rate percentage point changes due to the predicted Caledonia OWF alone impacts for this impact pathway do not exceed an increase of 0.02% annually. **Therefore, for all SPAs it can be confidently concluded that there is no potential for an AEoSI in relation to potential collision risk impacts from the Proposed Development (Offshore) alone during the O&M phase. Therefore, subject to natural change, great skua will be maintained as a feature in the long term for all SPAs.**

Gannet

10.2.3.589 The gannet feature of a number of more distant UK SPAs from Caledonia OWF has been screened in for the assessment of distributional responses and collision risk for the O&M phase. The following sites have been assessed within this section together:

- Fair Isle SPA (Breeding and non-breeding season);
- Hermaness, Saxa Vord and Valla Field SPA (Breeding and non-breeding season);
- Noss SPA (Breeding and non-breeding season);
- North Rona and Sula Sgeir SPA (Breeding and non-breeding season);
- Sule Skerry and Sule Stack SPA (Breeding and non-breeding season); and
- Flamborough and Filey Coast SPA (non-breeding season only).

10.2.3.590 Assessments have been carried out for the breeding season of Mid-March to September and/ or the non-breeding season of October to Early March, in accordance with NatureScot seasonal guidance depending on the level of connectivity concluded during HRA Screening.

O&M Phase Potential Distributional Response Effects in Isolation

10.2.3.591 Table 10-96 below presents the predicted distributional response impacts during the O&M phase attributed to each SPA seasonally and subsequent survival rate percentage point change. Impact predictions presented are based on both the Applicant and Guidance approach. Distributional response is assessed based on the number of breeding adults within the Proposed Development (Offshore) and 2km buffer.

Table 10-96: Gannet predicted distributional response impacts during the O&M phase attributed to SPAs seasonally and resultant change in survival rate percentage point change compared to citation and most recent population counts.

SPA	Population Size (Breeding Adults)	Defined Season	Applicant Approach		Guidance Approach	
			70% Displacement; 1% Mortality	Change in Average Survival Rate (% Point Change)	70% Displacement; 1-3% Mortality	Change in Average Survival Rate (% Point Change)
Fair Isle SPA	Citation (2,332)	Breeding	0.12	0.005	0.12 – 0.35	0.005 – 0.015
		Non-breeding	0.03	0.001	0.03 – 0.09	0.001 – 0.004
		Annual	0.15	0.006	0.15 – 0.44	0.006 – 0.019
	Latest count (9,654)	Breeding	0.12	0.001	0.12 – 0.35	0.001 – 0.004
		Non-breeding	0.03	<0.001	0.03 – 0.09	<0.001 - 0.001
		Annual	0.15	0.002	0.15 – 0.44	0.002 – 0.005
Hermaness, Saxa Vord and Valla Field SPA	Citation (32,800)	Breeding	0.10	<0.001	0.10 – 0.31	<0.001 - 0.001
		Non-breeding	0.19	0.001	0.19 – 0.56	0.001 – 0.002
		Annual	0.29	0.001	0.29 – 0.88	0.001 – 0.003
	Latest count (37,478)	Breeding	0.10	<0.001	0.10 – 0.31	<0.001 - 0.001
		Non-breeding	0.19	0.001	0.19 – 0.56	0.001 – 0.002
		Annual	0.29	0.001	0.29 – 0.88	0.001 – 0.002
Noss SPA	Citation (13,720)	Breeding	0.13	0.001	0.13 – 0.39	0.001 – 0.003

SPA	Population Size (Breeding Adults)	Defined Season	Applicant Approach		Guidance Approach	
			70% Displacement; 1% Mortality	Change in Average Survival Rate (% Point Change)	70% Displacement; 1-3% Mortality	Change in Average Survival Rate (% Point Change)
		Non-breeding	0.08	0.001	0.08 – 0.23	0.001 – 0.002
		Annual	0.21	0.002	0.21 – 0.62	0.002 – 0.005
	Latest count (24,670)	Breeding	0.13	0.001	0.13 – 0.39	0.001 – 0.002
		Non-breeding	0.08	<0.001	0.08 – 0.23	<0.001 - 0.001
		Annual	0.21	0.001	0.21 – 0.62	0.001 – 0.003
North Rona and Sula Sgeir SPA	Citation (20,800)	Breeding	0.14	0.001	0.14 – 0.43	0.001 – 0.002
		Non-breeding	0.01	<0.001	0.01 – 0.03	<0.001
		Annual	0.15	0.001	0.15 – 0.45	0.001 – 0.002
	Latest count (28,495)	Breeding	0.14	0.001	0.14 – 0.43	0.001 – 0.002
		Non-breeding	0.01	<0.001	0.01 – 0.03	<0.001
		Annual	0.15	0.001	0.15 – 0.45	0.001 – 0.002
Sule Skerry and Sule Stack SPA	Citation (11,800)	Breeding	0.24	0.002	0.24 – 0.72	0.002 - 0.006
		Non-breeding	<0.01	<0.001	<0.01 - 0.01	<0.001
		Annual	0.25	0.002	0.25 – 0.74	0.002 - 0.006

SPA	Population Size (Breeding Adults)	Defined Season	Applicant Approach		Guidance Approach	
			70% Displacement; 1% Mortality	Change in Average Survival Rate (% Point Change)	70% Displacement; 1-3% Mortality	Change in Average Survival Rate (% Point Change)
	Latest count (18,130)	Breeding	0.24	0.001	0.24 – 0.72	0.001 - 0.004
		Non-breeding	<0.01	<0.001	<0.01 - 0.01	<0.001
		Annual	0.25	0.001	0.25 – 0.74	0.001 - 0.004
Flamborough and Filey Coast SPA	Citation count (16,938)	Breeding	-	-	-	-
		Non-breeding	0.11	0.001	0.11 – 0.32	0.001 - 0.002
		Annual	0.11	0.001	0.11 – 0.32	0.001 - 0.002
	Latest count (30,466)	Breeding	-	-	-	-
		Non-breeding	0.11	<0.001	0.11 – 0.32	<0.001 - 0.001
		Annual	0.11	<0.001	0.11 – 0.32	<0.001 - 0.001

10.2.3.592 For all SPAs considered in Table 10-96, the level of predicted annual additional mortality due to Caledonia OWF alone distributional responses effects is less than one (0.11 - 0.74) breeding adult per annum to any SPA. Additionally, for all assessments the survival rate percentage point changes due to the predicted Caledonia OWF alone impacts for this impact pathway do not exceed an increase of 0.02% annually when considering the Applicant and Guidance Approach. **Therefore, for all SPAs it can be confidently concluded that there is no potential for an AEoSI in relation to potential distributional response effects from the Proposed Development (Offshore) alone during the O&M phase. Therefore, subject to natural change, gannet will be maintained as a feature in the long term for all SPAs.**

O&M Phase Potential Collision Risk Impacts in Isolation

10.2.3.593 Table 10-97 below presents predicted collision risk impacts during the O&M phase attributed to each SPA seasonally and subsequent survival rate percentage point change.

Table 10-97: Gannet predicted collision risk impacts during the O&M phase attributed to SPAs during the non-breeding season and resultant change in survival rate percentage point change compared to citation and most recent population counts.

SPA	Population Size (Breeding Adults)	Defined Season	Applicant Approach		Guidance Approach	
			Breeding Adults per Annum	Change in Average Survival Rate (% Point Change)	Breeding Adults per Annum	Change in Average Survival Rate (% Point Change)
Fair Isle SPA	Citation (2,332)	Breeding	0.07	0.003	0.23	0.010
		Non-breeding	0.01	<0.001	0.01	<0.001
		Annual	0.08	0.003	0.24	0.010
	Latest count (9,654)	Breeding	0.07	0.001	0.23	0.002
		Non-breeding	0.01	<0.001	0.01	<0.001
		Annual	0.08	0.001	0.24	0.002
Hermaness, Saxa Vord and Valla Field SPA	Citation (32,800)	Breeding	0.06	<0.001	0.20	0.001
		Non-breeding	0.06	<0.001	0.06	<0.001
		Annual	0.12	<0.001	0.27	0.001
	Latest count (37,478)	Breeding	0.06	<0.001	0.20	0.001
		Non-breeding	0.06	<0.001	0.06	<0.001
		Annual	0.12	<0.001	0.27	0.001
Noss SPA	Citation (13,720)	Breeding	0.08	0.001	0.25	0.002
		Non-breeding	0.02	<0.001	0.02	<0.001

SPA	Population Size (Breeding Adults)	Defined Season	Applicant Approach		Guidance Approach	
			Breeding Adults per Annum	Change in Average Survival Rate (% Point Change)	Breeding Adults per Annum	Change in Average Survival Rate (% Point Change)
		Annual	0.10	0.001	0.28	0.002
	Latest count (24,670)	Breeding	0.08	<0.001	0.25	0.001
		Non-breeding	0.02	<0.001	0.02	<0.001
		Annual	0.10	<0.001	0.28	0.001
North Rona and Sula Sgeir SPA	Citation (20,800)	Breeding	0.08	<0.001	0.28	0.001
		Non-breeding	<0.01	<0.001	<0.01	<0.001
		Annual	0.09	<0.001	0.28	0.001
	Latest count (28,495)	Breeding	0.08	<0.001	0.28	0.001
		Non-breeding	<0.01	<0.001	<0.01	<0.001
		Annual	0.09	<0.001	0.28	0.001
Sule Skerry and Sule Stack SPA	Citation (11,800)	Breeding	0.14	0.001	0.47	0.004
		Non-breeding	<0.01	<0.001	<0.01	<0.001
		Annual	0.14	0.001	0.47	0.004
	Latest count (18,130)	Breeding	0.14	0.001	0.47	0.003
		Non-breeding	<0.01	<0.001	<0.01	-

SPA	Population Size (Breeding Adults)	Defined Season	Applicant Approach		Guidance Approach	
			Breeding Adults per Annum	Change in Average Survival Rate (% Point Change)	Breeding Adults per Annum	Change in Average Survival Rate (% Point Change)
		Annual	0.14	0.001	0.47	0.003
Flamborough and Filey Coast SPA	Citation count (16,938)	Breeding	-	-	-	-
		Non-breeding	0.03	<0.001	0.03	<0.001
		Annual	0.03	<0.001	0.03	<0.001
	Latest count (30,466)	Breeding	-	-	-	-
		Non-breeding	0.03	<0.001	0.03	<0.001
		Annual	0.03	<0.001	0.03	<0.001

10.2.3.594 For all SPAs considered in Table 10-97, the level of predicted annual additional mortality due to Caledonia OWF alone collision risk is less than one (0.03 – 0.47) breeding adult per annum to any SPA. Additionally, for all assessments the survival rate percentage point changes due to the predicted Caledonia OWF alone impacts for this impact pathway do not exceed an increase of 0.02% annually when considering the Applicant and Guidance Approach. **Therefore, for all SPAs it can be confidently concluded that there is no potential for an AEoSI in relation to potential collision risk impacts from the Proposed Development (Offshore) alone during the O&M phase. Therefore, subject to natural change, gannet will be maintained as a feature in the long term for all SPAs.**

O&M Phase Combined Distributional Effects and Collision Risk Impacts

10.2.3.595 For all SPAs considered the level of predicted annual additional mortality due to Caledonia OWF alone combined distributional responses and collision risk is at most one (0.35 – 1.21) breeding adult per annum to any SPA. Additionally, for all assessments, with the exception of Fair Isle SPA, the survival rate percentage point changes do not exceed an increase of 0.02% annually due to the combined distributional responses and collision Caledonia OWF alone impacts. In relation to Fair Isle SPA, the level of predicted annual additional mortality is less than a single (0.38 - 0.65) breeding adult per annum. Such a level of impact can confidently be classified as intangible, regardless of the predicted survival rate percentage point change. However, in line with NatureScot Guidance, PVA has been undertaken for Fair Isle SPA and presented for further information within Application Document 13, Appendix 13-2: Caledonia North Habitats Regulations Appraisal Population Viability Analysis Technical Report and Application Document 14, Appendix 14-2: Caledonia South Habitats Regulations Appraisal Population Viability Analysis Technical Report. The PVA analysis concluded that the predicted level of effect attributed would result in an undetectable level of change at the colony. **Therefore, for all SPAs it can be confidently concluded that there is no potential for an AEoSI in relation to potential combined distributional responses and collision risk impacts from the Proposed Development (Offshore) alone during the O&M phase. Therefore, subject to natural change, gannet will be maintained as a feature in the long term for all SPAs.**

Conclusion of Assessment of Offshore and Intertidal Ornithology from The Proposed Development (Offshore) alone

10.2.3.596 40 designated sites were identified to have a potential for LSE from the Proposed Development (Offshore), covering 36 species, Section 10.1.1. Assessments were undertaken for several effects collision risk, distributional responses and migratory collision risk.

10.2.3.597 **For all identified sites, a conclusion of no AEoSI was drawn for all designated features from the Proposed Development (Offshore) alone.** It is worth noting that as the conclusions of no AEoSI were not drawn from a lack of pathway, the effects are still considered in-combination (see Section 10.3.3).

10.2.4 Migratory Fish

Assessment Criteria

10.2.4.1 The approach taken to the assessment of migratory fish is based upon the following:

- The distance between the Caledonia OWF/Caledonia OECC and the relevant European site;
- Sensitivity of the receptors (including consideration of the vulnerability, recoverability, value and importance of the receptors);
- Magnitude of impact (drawing on the spatial extent of any interaction, the likelihood, duration, frequency and reversibility of a potential impact); and
- The effects screened in for LSE.

10.2.4.2 For the RIAA, the assessment of potential for adverse effect draws on the conclusions of Volume 2, Chapter 5: Fish and Shellfish Ecology but specifically in the context of the designated fish features (or supporting habitats), in light of the relevant conservation objectives, site-based advice and feature condition.

Worst Case Scenario

10.2.4.3 Table 10-98 below provides the WCSs considered for migratory fish in relation to underwater noise impacts, as described in Table 4.7 within Volume 2, Chapter 5: Fish and Shellfish Ecology. The full project description is provided in, Volume 1, Chapter 3: Proposed Development Description (Offshore) for full reference. Note: as the assessment for underwater noise within the RIAA is only focused on Group 1 and 2 fleeing receptors, the WCS scenario presented is tailored as such for the underwater noise impact.

Table 10-98: Worst Case Scenario for Migratory fish for the Proposed Development (Offshore).

Potential Impact	Assessment Parameter	Explanation
Construction		
Mortality, injury and behavioural changes resulting from UWN	**Spatial worst-case scenario:** *Cumulative Sound Exposure Level* Concurrent piling of eight pin pile foundations at two locations in a 24-hour period represents the worst-case scenario for the cumulative sound exposure level (SEL_{cum}) for the remaining SEL_{cum} thresholds (mortality and potential mortal injury, recoverable injury and Temporary Threshold Shift (TTS). This is comprised of: - 140 WTGs on pin pile foundations (4m diameter pin piles per jacket) = 560 pin piles; - Four OSPs on pin pile foundations (4m diameter pin piles) = 16 pin piles; and - Maximum hammer energy 4,400 kJ (186 dB SEL_{cum} produces a maximum impact range of 14,000km^2). *Peak Sound Pressure Level* Additionally, the concurrent piling of two monopile foundations within a 24-hour period at multiple locations represent the greatest spatial impact range for fish and shellfish for peak sound pressure levels (SPL_{peak}) for mortality injury ranges (213 dB SPL_{peak} and 213 dB SPL_{peak}) as well as the cumulative sound exposure level (SEL_{cum}) for recoverable injury for fleeing receptors (203 dB SEL_{cum}). This is comprised of: - 140 WTGs on monopile foundations (5m diameter monopile) = 140 monopiles. - Four OSPs on monopile foundations (5m diameter monopiles) = 4 monopiles.	In a 24-hour period, it is expected that two anchor pile foundations, two monopiles or four multi-leg pile foundations can be installed sequentially from the same piling vessel, which has been taken into consideration for the modelling. There is also the possibility that two piling vessels could be operational and piling across the Caledonia OWF. It should be noted that both SEL_{cum} and SPL_{peak} can be used to assess the risk of potential lethal and sub-lethal effects, as both metrics describe different characteristics of sound waves. The standard approach is to use SEL_{cum} values to account for the duration of piling and any associated effects on TTS and TTS-induced changes in fitness. The spatial worst-case scenario is represented by the sequential installation of four pin piles in a 24-hour period. This was provided by the model results of sequential piling of four pin piles at UWN modelling location CAL01 concurrently with four pin piles at UWN modelling location CAL08. Full details are presented in Volume 7, Appendix 6. The temporal worst-case scenario represents the longest duration of effects from subsea

Potential Impact	Assessment Parameter	Explanation
	▪ Maximum hammer energy 6,600 kJ (186 dB SEL_{cum} produces a maximum impact range of 11,000km^2). **Temporal worst-case scenario:** Sequential piling of pin piles for bottom-fixed foundations (jackets) and anchor pin piles for floating foundations (tension leg platforms). This is comprised of: ▪ 101 WTGs and 4 OSPs on jacket with pin pile foundations (4m diameter pin piles per jacket) = 420 pin piles (four pin piles per jacket); o Maximum hammer energy 4,400 kJ (186 dB SELcum (St) 14,000km2); o Four pin piles per day; o 105 piling days; ▪ 39 WTGs on floating foundations (tension leg platform) with pin piles for anchors (4.8m diameter of anchor) = 702 anchors (18 anchors per WTG); o Maximum hammer energy 2,000 kJ; o Max two pin piles per day; o 410 piling days (assumes average of 1.71 anchor/day) ▪ 515 piling days (over an approximate 18 month piling period); and ▪ Cumulative sound exposure level (SEL_{cum}) for the remaining SEL_{cum} thresholds; mortality and potential mortal injury, and recoverable injury and TTS for each receptor group. **UXO clearance:** ▪ Two clearance events within 24 hours; and ▪ Undertaken over a 12-month period.	noise and is from the piling of a up to four pin piles or two anchor piles in a 24-hour period. The worst-case scenario for UXO is based on the Applicant's experience from Moray East and Moray West OWFs. A detailed UXO survey will be completed prior to construction. The type, size and number of possible low order clearance (deflagration) and duration of UXO clearance operations is therefore not known at this stage. Other seabed clearance and installation activities such as cable laying, dredging and vessel movements may introduce an effect receptor pathway for UWN, however these activities are established as producing low levels of noise, in the case of vessel movement no greater than the existing baseline of regional vessel noise, affecting a relatively small area in the immediate vicinity of activities. These general activities are therefore considered to fall within the worst-case scenario associated with piling and as such are not considered separately.
Operation and Maintenance		

Potential Impact	Assessment Parameter	Explanation
Electromagnetic fields (EMF) effects arising from cables	▪ 140 inter-array cables: o 655km combined length, operating at up to 132kV; o Minimum cable burial depth: 1m; ▪ Two interconnector cables: o 60km combined length, operating at up to 275kV; o Minimum cable burial depth: 1m; ▪ Four offshore export cables: o 330km combined length, operating at up to 275kV; o Minimum cable burial depth: 1m; and Operational lifetime of the Proposed Development (Offshore): 35 years.	The maximum length and operating current of inter-array (including dynamic), interconnector and offshore export cables will result in the greatest potential for EMF effects. The minimum target cable burial depth represents the worst-case scenario as EMF exposure will be reduced with greater burial depth. Dynamic inter-array cables represent the worst-case scenario for EMF due to being suspended in the water column and having a greater attenuation of EMF compared to buried cables.
Decommissioning		
Mortality, injury and behavioural changes resulting from UWN	The worst-case design scenario will be equal to (or less than) that of the construction phase	The worst-case design scenario assumes complete removal of all infrastructure, including cables and cable protection where it is possible and appropriate to do so. If any infrastructure is left in situ, this will result in reduced disturbance during decommissioning. It should be noted that there will be no piledriving activities (which represent the worst-case scenario for UWN) during decommissioning and, therefore, effects from UWN will be significantly lower compared to the construction phase.

10.2.4.4 Each WCS is assessed against the conservation objectives for each site, which are considered in turn below.

River Spey SAC

10.2.4.5 The River Spey SAC is screened into the assessment for Atlantic salmon, FWPM, and sea lamprey. This site is 58.87km away from the Caledonida OWF, and 26.96km away from the Caledonia OECC.

Conservation Objectives

10.2.4.6 The conservation objectives of the site related to these features are:

- To ensure that the qualifying features of the River Spey SAC are in Favourable condition and make an appropriate contribution to achieving Favourable conservation status;
- To ensure that the integrity of the River Spey SAC is restored by:
  - Restoring the population of the features, including range of genetic types, as a viable component of the site;
  - Restoring the distribution of the features throughout the site;
  - Restoring the habitats supporting the features within the site and availability of food; and
  - Restoring the distribution and viability of freshwater mussel host species and their supporting habitats (Freshwater pearl mussel only).

Site Status

10.2.4.7 The River Spey SAC is located near the mouth of the Moray Firth north-east Scotland and lists Atlantic salmon, FWPM, and sea lamprey as qualifying features.

Atlantic Salmon

10.2.4.8 Atlantic salmon are a priority fish species in the UK Biodiversity Action Plan (BAP) and are classified by the International Union for Conservation of Nature (IUCN) as "endangered" within the UK, and "near threatened" internationally (IUCN, 2023)[92]. They are anadromous fish, spawning in freshwater and then feeding at sea. They are recorded in multiple rivers both designated and not within the Moray Firth (Volume 7B, Appendix 5-1: Fish and Shellfish Ecology Technical Baseline Report). Salmon typically spawn (although not exclusively) in upper reaches of rivers or where suitable spawning gravel is located. They generally spend one to three years as fry and parr before undergoing a metamorphosis to survive the marine environment and migrating to sea as smolts in the spring. At sea, salmon grow rapidly, and after one to four years return to their natal river to spawn (Vladić and Petersson, 2015[93]). Many salmon die after spawning, though some return to sea and regain condition to be able to spawn again (Mills, 1989[94]).

10.2.4.9 Atlantic salmon have been confirmed present within the Moray Firth area with the site-specific surveys. They are predicted to only be within the vicinity of the Proposed Development (Offshore) during their migratory phases, which within the Moray Firth is recorded to occur principally between April and June (Malcom *et al.* 2015). Based on fishery statistics the species have been suffering a significant decline across the country, with a 77% decrease in catch numbers in 2023 compared to the previous 5 year average (Scottish Fisheries Statistics, 2023).

10.2.4.10 The baseline assessment concludes that despite declines in the population, due to the Moray Firth being a key migration route to the various rivers including the designated sites screened in, there is a high likelihood of Atlantic salmon being present within the ZoI of the Proposed Development (Offshore), with site specific eDNA surveys recording the presence of two OTUs of salmonids within the study area.

10.2.4.11 The condition of Atlantic salmon at the River Spey SAC is recorded as favourable, with the last assessment being carried out within 2011 (SEPA and NatureScot, 2024[95]).

10.2.4.12 The River Spey supports one of the largest Atlantic salmon populations in Scotland, with little evidence of modification by non-native stocks. Adults spawn throughout the entirety of the river's length, and good quality nursery habitat can be found in abundance in the main river and multiple tributaries. Salmon in the Spey system face few impacts from artificial barriers to migration, and the water in the catchment are largely unpolluted. The salmon population includes fish of all ages including migrating smolt and returning adults (NatureScot, 2020[96]).

Sea Lamprey

10.2.4.13 Sea lamprey are designated at the River Spey SAC which was screened in for assessment. Sea lamprey spend most of their adult lives in the oceans but return to freshwater to reproduce. Relatively little is known about them after they reach the sea, where they have been found in both shallow coastal and deep offshore waters (Maitland, 2003[97]). Sea lamprey is an OSPAR threatened and/or declining species and are designated as an Annex II Fish Species under the UK Habitats Regulations. Although possible, the likelihood of sea lamprey being present within the ZoI of the Proposed Development (Offshore) is low, with no records in site specific eDNA data.

10.2.4.14 Sea lamprey require water bodies in good ecological status or higher. The River Spey confluence to the tidal limit was classified by SEPA as being in Moderate ecological status due to effects of phosphorous associated with sewage discharge (NatureScot 2020[96]).

10.2.4.15 The condition of sea lamprey as a designated site feature is recorded as favourable, with the last assessment being carried out in 2011 (SEPA and NatureScot[95]).

Freshwater Pearl Mussel (FWPM)

10.2.4.16 With consideration of the obligatory host phase of FWPMs development, using Atlantic salmon as a carrier, the baseline environment for this species is considered the same as the Atlantic salmon as there is no other pathway for effect aside from during this life phase.

10.2.4.17 FWPM mussel populations are vulnerable to changes to water quality, habitat degradation of the river banks and beds, illegal pearl fishing and availability of host species. It is likely that FWPM in the River Spey have an artificially low population due to historic unsustainable pear fishing (NatureScot, 2020[96]).

10.2.4.18 The condition of FWPM at River Spey SAC is recorded as unfavourable, with the last assessment being carried out within 2014 (SEPA and NatureScot, 2024[95]).

Assessment of AEoSI

Atlantic Salmon

Construction and Decommissioning

Underwater Noise

10.2.4.19 This section addresses the potential for AEoSI from effects associated with underwater noise impacts arising during the construction and decommissioning phases of the Proposed Development (Offshore) on the Atlantic salmon feature of the River Spey SAC.

10.2.4.20 Separate assessments of Caledonia North and Caledonia South each concluded no AEoSI on this site and feature, based on the highly mobile nature of Atlantic salmon, the amount of available habitat, and the localised impact ranges of noise generated during construction and decommissioning. Between those assessments and that for the Proposed Development (Offshore), the amount of generated noise is the only differentiating factor.

10.2.4.21 Of all the sources of underwater noise associated with the Proposed Development (Offshore), only underwater noise generated from piling activities and UXO clearance (if required) are considered within this assessment. Other construction and pre-construction activities are not considered to have any material effect on migratory fish species (including seabed preparation, vessel movements, and geophysical or seismic surveys) and therefore have been excluded from this assessment. Underwater noise from piling and UXO clearance however are considered to have potentially significant effects and are therefore assessed.

10.2.4.22 Atlantic salmon are a Group 2 species (as defined in Section 6.4), as their hearing does not involve the swim bladder or other gas volume and are more sensitive to particle motion than sound pressure (Popper *et al*., 2014[98]).

Underwater Noise from Piling

10.2.4.23 Being a Group 2 species, Atlantic salmon are moderately sensitive to underwater noise effects, but particularly particle motion effects. Atlantic salmon are highly mobile and able to flee from disturbance and are therefore considered to be fleeing receptors. They are considered to be transient across the Proposed Development (Offshore) during their migration but will not likely remain in the nearfield area for an extended period of time. While not much information is currently understood about Atlantic salmon migration around Scotland, it is considered that they are widespread when out of natal rivers.

10.2.4.24 Despite the moderate vulnerability to noise impacts, the transient nature of the species across the site during migration means that Atlantic salmon are expected to recover quickly from any potential impacts, returning to normal behaviours, and repopulating areas shortly after disturbance. Furthermore, the noise generated by piling is temporary and intermittent, with breaks in the piling activity. Given the recovery of Atlantic salmon from noise impacts as discussed above, it is considered that the noise generated would not be significant enough of an impact to result in any long-term impacts to migration. Taking this into account, the receptors are deemed to not have a significant sensitivity to underwater noise effects.

10.2.4.25 As mentioned above, Atlantic salmon are considered to be a fleeing receptor and it is anticipated that individuals would display a fleeing response to noise, and therefore would experience less overall exposure. In the context of this assessment, fleeing receptors are anticipated to flee from the source at a consistent rate of 1.5ms-1 (Lepper *et al*., 2019[21]).

10.2.4.26 Based on the worst-case scenarios for underwater noise from piling of foundations within the Caledonia OWF, mortal injury effects on fleeing fish receptors will only occur in the immediate vicinity of the piling activity from the sequential piling of pin pile or monopile foundations (<100m (210dB SELcum) from the piling of pin-pile foundations and 380m (>207dB SPLpeak) from the piling of monopiles). The worst case recoverable injury impact ranges, will occur from the simultaneous sequential pilling of 4 pin piles in a 24-hour period at both the NW (CAL01) and SE locations (CAL08) of the Caledonia OWF, resulting in an in-combination area of effect of 300km^2 for fleeing receptors. The worst-case TTS impact ranges result from will occur from the simultaneous sequential pilling of pin pile foundations, at both the NW (CAL01) and SE locations (CAL08) of the Caledonia OWF, resulting in an in-combination area of effect of 8,100km^2 for fleeing receptors (Figure 8 4).

10.2.4.27 Taking into consideration the distance of the Caledonia OWF from the River Spey SAC (58.87km from the Caledonia OWF), there are no anticipated effects from underwater noise on the Atlantic salmon features within the designated site, in addition, soft-start procedures will be implemented to allow fleeing fish receptors to move outside of the impact range before sounds levels reach a level likely to cause mortality.

10.2.4.28 As defined above, there are no quantitative thresholds advised to be used to assess behavioural impacts, however, Popper *et al*. (2014[98]) provide qualitative behavioural criteria for fish from a range of sources. When considering these criteria, the risk of behavioural effects or auditory masking for Atlantic salmon is low and within the immediate field (100s of meters). Near field impacts are considered likely to be contained within the TTS effects described above. Therefore, there are not considered to be any significant behavioural impacts on Atlantic salmon.

10.2.4.29 Considering the ZoI for piling within the Caledonia OWF, and the transient nature of Atlantic salmon and the low sensitivity of the receptors to underwater noise, there will be no direct impacts from underwater noise from piling activities on Atlantic salmon at the designated site, and consequently no barriers to migratory behaviours. Any impacts from underwater noise from piling activities on Atlantic salmon within the vicinity of the Proposed Development (Offshore) that may be attributed as features of the designated site will be of localised nature, with no population level effects anticipated.

10.2.4.30 **As mentioned above, the potential for effects during decommissioning will likely fall within, and be no worse (likely significantly lower) than, the degree of effect during construction, with any such decommissioning being subject to the relevant licensing requirements at that time. Therefore, there are no adverse effects on the Atlantic salmon feature of the River Spey SAC anticipated to occur during the decommissioning phase of the Proposed Development (Offshore).**

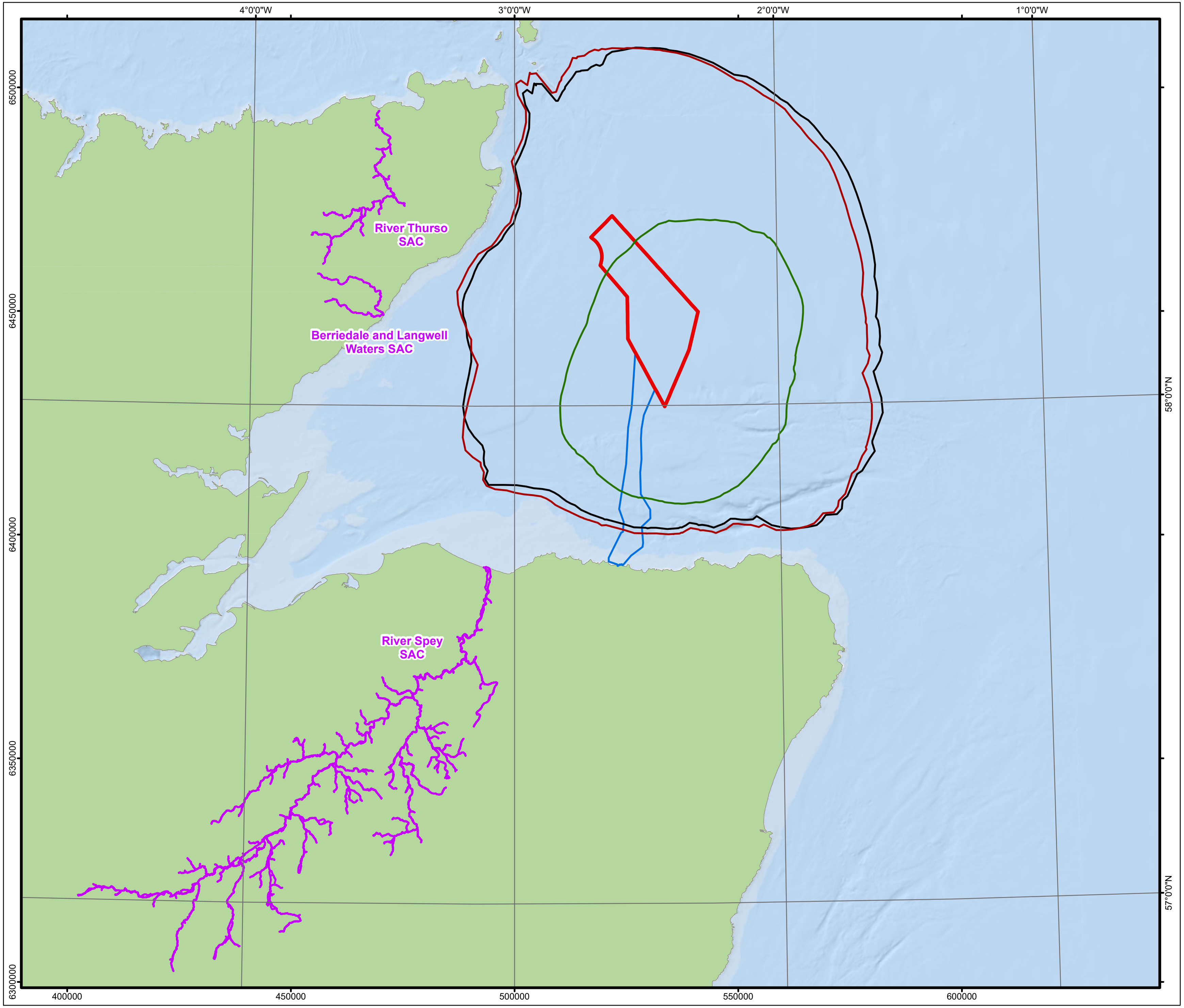
Underwater Noise from UXO Clearance

10.2.4.31 Consideration of impacts from UXO is made on a risk of injury basis and a disturbance element. Volume 2, Chapter 5: Fish and Shellfish Ecology considers that UXO clearance activities are one of the loudest anthropogenic noise sources that occur underwater, with source levels that can be higher than those from piling (depending on the methodology used). UXO clearance has the potential to result in mortality, potential mortal injury, recoverable injury, TTS and disturbance to fish and shellfish species, depending on the proximity of the individuals to the UXO location and the size of the UXO. Small scale mortality of fish as a result of UXO clearance are evidenced (Dahl *et al*., 2020[117]), with dead fish recorded floating at the surface following clearance, typically within the immediate vicinity of the clearance and as such this is expected to be a localised impact. However, recoverable injury and disturbance effects will impact a progressively larger area, with TTS and behavioural effects potentially occurring up to 11km from the UXO location.

10.2.4.32 For the purpose of UXO clearance, low order deflagration is considered as the primary clearance method to be used. Volume 2, Chapter 5: Fish and Shellfish Ecology concluded that while individual UXO detonations have the potential to result in impact ranges comparable to piling events (as described above) the short-term (seconds) and discrete nature of a UXO clearance is considered to result in a lesser effect. This is because UXO clearance is a discrete event, and while this may result in some temporary disturbance to migratory fish, it is unlikely to result in any significant disturbance compared to more continuous noise sources such as piling that may occur intermittently over a longer period. Furthermore, Atlantic salmon are considered transient receptors across the site during migration and are able to flee from noise disturbance, and consequently will have less exposure to underwater noise. Taking the above into consideration, there are not anticipated to be any impacts on Atlantic salmon within the River Spey SAC. Furthermore, there are not anticipated to be any population level effects on Atlantic salmon outside of the site that may be attributed as features of the designated site.

10.2.4.33 Furthermore, based on the transient nature of the species and the significant distances involved, there are not anticipated to be any population level effects on Atlantic salmon outside of the site that may be attributed as features of the designated site.

10.2.4.34 **Therefore, based on the transitory nature of Atlantic salmon, short-term and spatially limited nature of the impact, it is concluded that there is no AEoSI to the Atlantic salmon for the River Spey SAC from the Proposed Development (Offshore) during construction and decommissioning and therefore, subject to natural change, the populations of Atlantic salmon will be maintained in the long-term with respect to underwater noise associated with UXO clearance.**



Caledonia OWF
Offshore Export Cable Corridor
Special Area of Conservation (SAC)
Monopiles x2 Contours (Concurrent) (Fleeing) 186dB (SELcum)
Pin Piles x4 Contours (Concurrent) (Fleeing) 186dB (SELcum)
Anchor Pile Contours (Fleeing) 186dB (SELcum)

0 10 20 30 40 km

01	05/11/2024	Approved	EV	BB	DH
REV	DATE	DOC STATUS	ORIGIN	REVIEW	APP

CALEDONIA Offshore Wind Farm
GoBe APEM Group

CONTRACTOR DRAWING NO	CONTRACTOR REV
UKCAL1_GO_WNF_HRA_MAP_00168	01

GEODETIC PARAMETERS
WGS 84 / UTM zone 30N (EPSG: 32630)

DRAWING TITLE
Figure 10-4: Predicted Worst Case Impact Ranges for Group 1 and 2 Fleeing Receptors from the Simultaneous Sequential Pilling of 2 Monopiles, 4 Pin Piles and Anchor Piles at Caledonia OWF

STATUS	SCALE	
Approved	1:1,150,000	
DRAWING NUMBER	SHEET NO	REV
N/A	01 of 01	N/A

10.2.4.35 As for Caledonia North and South alone, there are no quantitative thresholds advised to be used to assess behavioural impacts, however, Popper *et al*., (2014[98]) provide qualitative behavioural criteria for fish from a range of sources. When considering these criteria, the risk of behavioural effects or auditory masking for Atlantic salmon is low and within the immediate field (100s of meters). Near field impacts are considered likely to be contained within the TTS effects described above. Therefore, there are not considered to be any significant behavioural impacts on Atlantic salmon.

10.2.4.36 Considering the localised nature of underwater noise from piling within the Caledonia OWF, and the transient nature of Atlantic salmon and the low sensitivity of the receptors to underwater noise, there will be no direct impacts from underwater noise from piling activities on Atlantic salmon at the designated site, and consequently no barriers to migratory behaviours. Any impacts from underwater noise from piling activities on Atlantic salmon within the vicinity of the Proposed Development (Offshore) that may be attributed as features of the designated site will be of localised nature, with no population level effects anticipated.

10.2.4.37 As mentioned above, the potential for effects during decommissioning will likely fall within, and be no worse than, the degree of effect during construction, with any such decommissioning being subject to the relevant licensing requirements at that time. Therefore, there are no adverse effects on the Atlantic salmon feature of the River Spey SAC anticipated to occur during the construction or decommissioning phase of the Proposed Development (Offshore).

Conclusion on AEoSI from Underwater Noise

10.2.4.38 **Due to the transient nature and low sensitivity of Atlantic salmon, and the localised impact ranges from underwater noise it is considered that there is, therefore, no AEoSI to the Atlantic salmon features of the River Spey SAC from the Proposed Development (Offshore) alone during construction and decommissioning and therefore, subject to natural change, the population of Atlantic salmon will be maintained in the long-term with respect to underwater noise from construction and decommissioning from the Proposed Development (Offshore).**

O&M

EMF

10.2.4.39 Atlantic salmon are known to have magneto-receptors, with this thought to primarily be for the purposes of navigation (Walker *et al*., 2007[99]). There have been suggestions (Gill and Kimber, 2005[100]) that the presence of magnetic fields generated by cables may interrupt navigation and consequently migration.

10.2.4.40 EMFs monitored around subsea electricity cables have been shown to attenuate exponentially vertically and horizontally away from the cables, with the magnetic field generated by the cables typically having reached zero within 10m of the cable (reviewed by Tricas and Gill, 2011[101]). Burial of the cables and protection with cable protection where shallow buried or surface laid will not reduce the strength of the fields, however, it moves the cables further from the receptors, and as such the receptors will be subject to reduced field strengths.

10.2.4.41 Atlantic salmon are highly mobile and able to flee from noise disturbance, and are therefore considered to be fleeing receptors. They are considered to be transient across the Proposed Development (Offshore) during their migration but will not likely remain in the nearfield area for an extended period of time. It is considered that given the habitat range available for Atlantic salmon migration, and their highly mobile nature there is no potential for a significant interaction between migrating individuals and the EMF effects caused by the Proposed Development (Offshore).

Conclusion on AEoSI from EMF

10.2.4.42 **Therefore, due to the highly mobile and transient nature of Atlantic salmon, the comparatively localised impact ranges from EMF effects (<10m) compared to the available habitat and the distance to the site (26.96km to the Caledonia OECC), it is considered that there is no AEoSI to the Atlantic salmon feature of the River Spey SAC from the Proposed Development (Offshore) alone during O&M and therefore, subject to natural change, the population of Atlantic salmon will be maintained in the long-term with respect to EMF from the O&M from the Proposed Development (Offshore).**

10.2.4.43

FWPM

All Phases and Effects

10.2.4.44 FWPM spend the early stages of their life history within the gills of salmonid species, having been released by gravid females and reaching the host species passively with the water current (Young and Williams, 1984a[102]; 1984b[103]; Bauer and Vogel, 1987[104]; Ziuganov *et al*., 1994[105]; Hastie and Young, 2000[106]; Denic *et al*., 2015[107]). After being inhaled by the host fish, the mussel larvae encyst on the gills and become encapsulated by epithelial cells of the host (Young and Williams, 1984a[102]; Bauer, 1987[108]; Ziuganov *et al*., 1994[105]; Rogers-Lowery and Dimock, 2006[109]). There they stay for approximately 11 months while they metamorphose into juvenile mussels (Bauer and Vogel, 1987[108]; Denic *et al*., 2015[107]) prior to emerging from the gills of the host to bury themselves within the sediment of river beds for approximately 5 years (Young and Williams, 1984b[103]; Bauer, 1991[110], 1997[111]; Ziuganov *et al*., 1994[105]; Hastie and Young, 2000[106]).

10.2.4.45 Given this life history, the only potential time where the Proposed Development (Offshore) can impact FWPM is during this initial 11-month stage when it is within the gills of salmonids. Of the salmonid species that FWPM have specialised to live within, Atlantic salmon are considered within this report and the assessments presented for Atlantic salmon at this site are considered directly comparable.

Conclusion on AEoSI from All Phases and Effects

10.2.4.46 **Given the conclusion of no AEoSI to Atlantic salmon at the River Spey SAC for identified effects, it is considered that there is no AEoSI to the FWPM feature of the River Spey SAC from the Proposed Development (Offshore) alone during construction and decommissioning and therefore, subject to natural change, the population of FWPM will be maintained in the long-term with respect to underwater noise and EMF from the construction and decommissioning of the Proposed Development (Offshore).**

Sea Lamprey

Construction and Decommissioning

Underwater Noise

10.2.4.47 This section addresses the potential for AEoSI from effects associated with underwater noise impacts arising during the construction and decommissioning phases of the Proposed Development (Offshore) on the sea lamprey feature of the River Spey SAC.

10.2.4.48 The Screening Report (Application Document 12) determined that the potential for LSE in relation to underwater noise during decommissioning would be similar to, and likely less than, those outlined in the construction phase. Effectively, the potential for effect during decommissioning would fall within, and be no worse than, the degree of effect during construction, with any such decommissioning being subject to the relevant licensing requirements at that time. Therefore, the main focus of this assessment is in relation to the potential for effects during the construction phase of the Proposed Development (Offshore).

10.2.4.49 Sea lamprey is a Group 1 species, as they have no swim bladder or other gas chamber, meaning they are only sensitive to particle motion and a very narrow band of frequencies. (Popper *et al*., 2014[98]).

Underwater Noise from Piling within the Proposed Development (Offshore)

10.2.4.50 Sea lamprey are highly mobile and able to flee from noise disturbance, and are therefore considered to be fleeing receptors. They are considered to be transient across the Proposed Development (Offshore) during their migration but will not likely remain in the nearfield area for an extended period of time. While not much information is currently understood about sea lamprey migration around Scotland specifically, sea lamprey are widely distributed species when out of the natal rivers and have been found within shallow coastal waters and deep offshore waters (Maitland, 2003[112]). Sea lamprey are not thought to specifically migrate back to their natal rivers (Bergstedt and Seelye, 1995[113]; Waldman *et al*., 2008[114]); instead, they are thought to return to rivers within the regional area, navigating primarily by detection of larval pheromones to identify suitable rivers (specifically, those with pre-existing larvae) (reviewed in Hansen *et al*., 2016[115]). This flexibility in homing behaviour of this anadromous fish, combined with the low sensitivity of this species to underwater noise, suggests that noise impacts would only have a very localised effect.

10.2.4.51 Based on their low vulnerability to noise impacts, and their transient nature across the site during migration, sea lamprey are expected to recover quickly, returning to normal behaviours, and recolonising areas shortly after disturbance.

10.2.4.52 As mentioned above, sea lamprey are considered to be a fleeing receptor and it is anticipated that individuals would display a fleeing response to noise, and therefore would experience less overall exposure. In the context of this assessment, fleeing receptors are anticipated to flee from the source at a consistent rate of 1.5ms^{-1} (Lepper *et al*., 2019[116]).

10.2.4.53 Based on the WCS for underwater noise from piling of foundations within the Caledonia OWF, the maximum predicted range of impact for mortality and potential mortal injury of fleeing Group 1 receptors occurs within the immediate vicinity of the works is less than 100m (>219dB SEL_{cum}) from the sequential piling pin-pile foundations and 140m (>213dB SPL_{peak}) from the sequential piling of monopiles. The maximum predicted range of impact for recoverable injury of fleeing Group 1 receptors occurs within the immediate vicinity of the works less than 100m (>216dB SEL_{cum}) for the sequential piling of pin-pile foundations and 140m for (>213dB SPL_{peak}) from the sequential piling of monopiles foundations. The maximum predicted range of impact for TTS results from the simultaneous sequential pilling of four pin piles in a 24-hour period at both the northwest (CAL01) and southeast (CAL08) of the Caledonia OWF, and results in an in-combination effect of 8,100km^2 for fleeing receptors. Taking into consideration the distance of the Proposed Development (Offshore) Site from the River Spey SAC (58.87km), there are no anticipated effects from underwater noise on the sea lamprey feature within the designated site.

10.2.4.54 As defined above, there are no quantitative thresholds advised to be used to assess behavioural impacts, however, Popper *et al*. (2014[98]) provide qualitative behavioural criteria for fish from a range of sources. When considering these criteria, the risk of behavioural effects or auditory masking for sea lamprey is low and within the immediate field (100s of meters). Near field impacts are considered likely to be contained within the TTS effects described above. Therefore, there are not considered to be any significant behavioural impacts on sea lamprey.

10.2.4.55 Considering the localised nature of underwater noise from piling within the Proposed Development (Offshore) area, the transient nature of sea lamprey and the low sensitivity of the receptors to underwater noise, there will be no direct impacts from underwater noise from piling activities on sea lamprey at the designated site, and consequently no barriers to migratory behaviours. Any impacts from underwater noise from piling activities on sea lamprey within the vicinity of the Proposed Development (Offshore) that may be attributed as features of the designated site will be of localised nature, with no population level effects anticipated.

10.2.4.56 As mentioned above, the potential for effects during decommissioning will likely fall within, and be no worse than, the degree of effect during construction, with any such decommissioning being subject to the relevant licensing requirements at that time. **Therefore, there are no AEoSI on the sea lamprey feature of the River Spey SAC anticipated to occur during the decommissioning phase of the Proposed Development (Offshore).**

Underwater Noise from UXO Clearance

10.2.4.57 Consideration of impacts from UXO is made on a risk of injury basis and a disturbance element. Volume 2, Chapter 5: Fish and Shellfish considers that UXO clearance activities are one of the loudest anthropogenic noise sources that occur underwater, with source levels that can be higher than those from piling (depending on the methodology used). UXO clearance has the potential to result in mortality, potential mortal injury, recoverable injury, TTS and disturbance to fish and shellfish species, depending on the proximity of the individuals to the UXO location and the size of the UXO. Small scale mortality of fish as a result of UXO clearance are evidenced (Dahl *et al*., 2020[117]), with dead fish recorded floating at the surface following clearance, typically within the immediate vicinity of the clearance and as such this is expected to be a localised impact. However, recoverable injury and disturbance effects will impact a progressively larger area, with TTS and behavioural effects potentially occurring 11km from the UXO location for a stationary receptor or 450m for a fleeing receptor (based on the largest UXO device considered (698kg + donor charge) (Volume 7, Appendix 6: Underwater Noise Assessment).

10.2.4.58 For the purpose of UXO clearance, low order is considered as the primary clearance method to be used. Volume 2, Chapter 5: Fish and Shellfish Ecology concluded that while individual UXO detonations have the potential to result in impact ranges comparable to piling events (as described above) the short-term (seconds) and discrete nature of a UXO clearance is considered to result in a lesser effect. This is because UXO clearance is a discrete event, and while this may result in some temporary disturbance to migratory fish, it is unlikely to result in any significant disturbance compared to more continuous noise sources such as piling that may occur intermittently over a longer period. As stated above, the maximum range of potential effect is 11km, and when taking into consideration the distance to the River Spey SAC (58.87km), there are no anticipated effects from underwater noise from UXO clearance on the sea lamprey features within the designated site.

10.2.4.59 Furthermore, based on the transient nature of the species and the significant distances involved, there are not anticipated to be any population level effects on sea lamprey outside of the site that may be attributed as features of the designated site.

10.2.4.60 **Therefore, based on the transitory nature of sea lamprey, short-term and spatially limited nature of the impact, it is concluded that there is no AEoSI to the sea lamprey for the River Spey SAC from the Proposed Development (Offshore) during construction and decommissioning and therefore, subject to natural change, the populations of sea lamprey will be maintained in the long-term with respect to underwater noise associated with UXO clearance.**

Conclusion on AEoSI from Underwater Noise

10.2.4.61 **Due to the transient nature and low sensitivity of sea lamprey, and the potential localised impact ranges from underwater noise it is considered that there is, therefore, no AEoSI to the sea lamprey features of the River Spey SAC from the Proposed Development (Offshore) alone during construction and decommissioning and therefore, subject to natural change, the population of sea lamprey will be maintained in the long-term with respect to underwater noise from construction and decommissioning from the Proposed Development (Offshore).**

O&M

EMF

10.2.4.62 Many fish and shellfish species are thought to be able to sense electric and magnetic fields, with some species having developed specialised organs to facilitate this. Some fish species are known to have magneto-receptors, with this thought to primarily be for the purposes of navigation (Walker *et al*., 2007[99]). However, most of the research to date on magneto-reception in fish has been undertaken in migratory species such as Salmonidae, Anguillidae and Scombridae, with information on other species being limited (reviewed in Tricas and Gill, 2011[101]). There have been suggestions (Gill and Kimber, 2005[100]) that the presence of magnetic fields generated by cables may interrupt navigation and consequently migration.

10.2.4.63 EMFs monitored around subsea electricity cables have been shown to attenuate exponentially vertically and horizontally away from the cables, with the magnetic field generated by the cables typically having reached zero within 10m of the cable (reviewed by Tricas and Gill, 2011[101]). Burial of the cables and protection with cable protection where shallow buried or surface laid will not reduce the strength of the fields, however, it moves the cables further from the receptors, and as such the receptors will be subject to reduced field strengths.

10.2.4.64 Sea lampreys have ampullary organs located on their heads and bodies, which, as shown by Bodznick and Preston (1983[118]), are sensitive to weak, low-frequency electric fields. However, there is no evidence that sea lampreys can detect magnetic (B) fields (Gill & Bartlett, 2010[119]). As a result, there is no indication that EMF detection plays a role in their migration from feeding areas to coastal regions and estuaries. While various studies have documented physiological responses to electric fields (reviewed by Normandeau Associates, 2011[120]) and no direct tests have been conducted on lamprey behavioural responses to EMFs from cables or simulations of such fields.

10.2.4.65 Research on neuroendocrine responses in adult sea lampreys exposed to weak electric fields has shown minimal active behaviour. Wild-caught adult sea lampreys captured during spawning migration tended to remain attached to the wall of the test arena, often near the cathode, which may indicate a form of attraction (Chung-Davidson *et al*., 2008[121]). Sea lamprey are highly mobile and are therefore considered to be fleeing receptors. They are considered to be transient across the Proposed Development (Offshore) during their migration but will not likely remain in the nearfield area for an extended period of time. It is considered that given the habitat range available for sea lamprey migration, and their highly mobile nature there is no potential for a significant interaction between migrating individuals and the EMF effects caused by the Proposed Development (Offshore).

Conclusion on AEoSI from EMF

10.2.4.66 **Therefore, due to the highly mobile and transient nature of sea lamprey, the comparatively localised impact ranges from EMF effects (<10m) compared to the available habitat and the distance to the site (26.96km to Caledonia OECC), it is considered that there is no AEoSI to the sea lamprey feature of the River Spey SAC from the Proposed Development (Offshore) alone during O&M and therefore, subject to natural change, the population of sea lamprey will be maintained in the long-term with respect to EMF from the O&M from the Proposed Development (Offshore).**

Berriedale and Langwell Waters SAC

10.2.4.67 The Berriedale and Langwell Waters SAC is screened into the assessment for Atlantic salmon. This site is 49.34km away from the Caledonia OWF, and 56.85km away from the Caledonia OECC.

Conservation Objectives

10.2.4.68 The conservation objectives of the site are:

- To ensure that the qualifying feature of the Berriedale and Langwell Waters SAC is in favourable condition and makes an appropriate contribution to achieving favourable conservation status;
- To ensure that the integrity of the Berriedale and Langwell Waters SAC is maintained by:
  - Maintaining the population of Atlantic salmon, including range of genetic types, as a viable component of the site;
  - Maintaining the distribution of Atlantic salmon throughout the site; and

- Maintaining the habitats supporting Atlantic salmon within the site and availability of food.

Site Status

10.2.4.69 The Berriedale and Langwell Waters SAC is located near the mouth of the Moray Firth north-east Scotland and lists Atlantic salmon as a qualifying feature.

Atlantic Salmon

10.2.4.70 The condition of Atlantic salmon at the Berriedale and Langwell Waters SAC is recorded as favourable, with the last assessment being carried out within 2011 (SEPA and NatureScot, 2024[95]).

10.2.4.71 Atlantic salmon numbers have declined throughout their geographic range, including in Scottish rivers. They may be impacted by a range of pressures in the freshwater and marine phases of their lifecycle. The river is also vulnerable to introduction of other new species through a number of routes which could have a negative impact (NatureScot, 2020[122]).

Assessment of AEoSI

Atlantic Salmon

All Phases and Effects

10.2.4.72 As the only feature being considered for the Berriedale and Langwell Waters SAC is the same as for the River Spey SAC (Atlantic salmon) and the high level of similarity in conservation objectives, it is considered that the assessment presented above for the River Spey SAC is directly applicable to the Berriedale and Langwell Waters SAC. The only notable difference in the conservation objectives is to 'maintain' the features at this site compared to 'restore' at the River Spey SAC as the features are in a better condition at this site.

10.2.4.73 **Given that the distance between the Berriedale and Langwell Waters SAC and the Proposed Development (Offshore) is greater than that of the River Spey SAC which concluded no AEoSI on Atlantic salmon from any effect from the Proposed Development (Offshore), it is also considered that there is no AEoSI on the Berriedale and Langwell Waters SAC.**

Conclusion on AEoSI from All Phases and Effects

10.2.4.74 **Therefore, due to the transient nature and low sensitivity of Atlantic salmon, and the localised impact ranges of potential effects it is considered that there is, therefore, no AEoSI to the Atlantic salmon feature of the Berriedale and Langwell Waters SAC from the Proposed Development (Offshore) alone during all phases of development and therefore, subject to natural change, the population of Atlantic salmon will be maintained in the long-term with respect to underwater noise and EMF from all phases of the Proposed Development (Offshore).**

River Thurso SAC

10.2.4.75 The River Thurso SAC is screened into the assessment for Atlantic salmon. This site is 69.80km away from the Caledonia OWF, and 88.16km away from the Caledonia OECC.

Conservation Objectives

10.2.4.76 The conservation objectives of the site are:

- To ensure that the qualifying features of the River Thurso SAC are in Favourable condition and make an appropriate contribution to achieving Favourable conservation status;
- To ensure that the integrity of the River Thurso SAC is restored by restoring the population of the features, including range of genetic types, as a viable component of the site; and
  - Restore the distribution of the features throughout the site;
  - Restore the habitats supporting the features within the site and availability of food.

Site Status

10.2.4.77 The River Thurso so located on the north-east coast of Scotland with the mouth of the river feeding into Thurso Bay and lists Atlantic salmon as a qualifying feature.

Atlantic Salmon

10.2.4.78 The condition of Atlantic salmon at the River Thurso SAC is recorded as favourable, with the last assessment being carried out within 2011 (SEPA and NatureScot, 2024[95]).

10.2.4.79 Atlantic salmon have been assessed through NatureScot's Site Condition Monitoring programme as being in unfavourable condition at this site due to the low number of salmon parr in the river. Management measures are in place to increase the salmon population through restrictions on number of fish taken by anglers, ceasing artificial stocking of young salmon and by restoring water quality issues. The overall assessment by NatureScot is therefore the Atlantic salmon in the River Thurso are in 'unfavourable recovering' condition (NatureScot, 2020[123]).

Assessment of AEoSI

Atlantic Salmon

All Phases and Effects

10.2.4.80 As the feature being considered for the River Thurso SAC is the same as for the River Spey SAC (Atlantic salmon) and the same conservation objectives for the feature, it is considered that the assessment presented above for the River Spey SAC is directly applicable to the River Thurso SAC.

10.2.4.81 **Given that the distance between the River Thurso SAC and the Proposed Development (Offshore) is greater than that of the River**

Spey SAC which concluded no AEoSI on Atlantic salmon from any effect from the Proposed Development (Offshore), it is also considered that there is no AEoSI on the River Thurso SAC.

Conclusion on AEoSI from All Phases and Effects

10.2.4.82 **Therefore, due to the transient nature and low sensitivity of Atlantic salmon, and the localised impact ranges of potential effects it is considered that there is, therefore, no AEoSI to the Atlantic salmon feature of the River Thurso SAC from the Proposed Development (Offshore) alone during all phases of development and therefore, subject to natural change, the population of Atlantic salmon will be maintained in the long-term with respect to underwater noise and EMF from all phases of the Proposed Development (Offshore).**

Conclusion of Assessment of Migratory Fish from the Proposed Development (Offshore) Alone

10.2.4.83 Three designated sites were identified to have a potential for AEoSI from the Proposed Development (Offshore), covering three Annex II migratory fish species, Atlantic salmon, sea lamprey and FWPM. Assessments were undertaken for several effects including underwater noise and EMF.

10.2.4.84 **For all identified sites, a conclusion of no AEoSI was drawn for all designated features from the Proposed Development (Offshore) alone.**

10.2.4.85 In-combination effects for migratory fish are presented in Section 10.3.4.

10.3 Assessment of Adverse Effect In-Combination

10.3.1 Overview

10.3.1.1 The assessment of adverse effects in-combination with other projects/ plans is carried out on the basis of assessing the Proposed Development as a whole, and does not consider Caledonia North and Caledonia South as separate projects. The following assessment considers the impacts of both Caledonia North and Caledonia South alone together based on the assessment provided in Section 10.2, in-combination with other plans or projects screened in within Section 10.1.2.

10.3.2 Marine Mammals

10.3.2.1 The potential for LSE from the Proposed Development (Offshore) alone with regard to marine mammals is summarised in Section 10.2.2, with the in-combination assessment of AEoSI presented below.

10.3.2.2 As stated within Section 10.2.2, sites where no potential for LSE alone was concluded are still considered for assessment in-combination apart from where no pathway for effect exists. On this basis the only site assessed in-combination here is the Moray Firth SAC (designated for bottlenose dolphins).

10.3.2.3 Information to inform the Proposed Development (Offshore) alone assessment of AEoSI for marine mammals is provided in Section 10.2.2, which assesses impacts on bottlenose dolphin associated with the Moray Firth SAC during construction, O&M and decommissioning. Table 10-3 lists the projects and plans which have been identified for this in-combination assessment for marine mammals.

10.3.2.4 Following the outcomes of the alone assessment presented above, and the conclusions of Volume 2, Chapter 7: Marine Mammals, several of the impacts assessed for the Proposed Development (Offshore) alone are not considered relevant to the in-combination assessment presented here. The reasons for exclusion include:

- the highly localised nature of the impacts; and
- management and mitigation measures in place at the Proposed Development (Offshore) that will result in a negligible impact.

10.3.2.5 Therefore, based on these conclusions, the in-combination assessment excludes several impacts assessed for the Proposed Development (Offshore) alone. Table 10-99 presents the impacts that are excluded from the in-combination assessment for marine mammals, along with the justification for their exclusion.

Table 10-99: Impacts screened out of the marine mammal in-combination impact assessment.

Impact Screened Out Following Alone Assessment	Justification
Underwater noise (PTS effects during construction, O&M, and decommissioning)	Where PTS may result from activities such as pile driving, geophysical surveys and UXO clearance, as a requirement of European Protected Species legislation, suitable mitigation must be put in place to reduce injury risk to marine mammals to negligible levels across all projects considered in the in-combination assessment . Similarly, any risk of PTS during decommissioning will be determined via appropriate decommissioning plans and if required, mitigated. Any non-piling construction noise sources will have a very local spatial extent and therefore represent a minimal risk of injury. Moreover, it is anticipated that underwater noise associated with vessel activity will deter animals from the injury zone. As such, assuming application of appropriate mitigation measures, any risk of injury it is considered highly unlikely and potential for in-combination effects on marine mammals due to PTS as a result of piling, UXO, other non-piling construction activities and decommissioning was not considered further.
Underwater noise (disturbance from UXOs during construction, O&M, and decommissioning)	In line with the DEFRA *et al*. (2021[124]) joint interim position statement, it is expected that, where feasible, across all projects, UXO clearance campaigns will be conducted using low-order deflagration techniques. These techniques are now considered to have 100% success rate. Moreover, it is expected that the clearance of a UXO would elicit a startle response and potentially very short-duration behavioural responses and would therefore not be expected to cause widespread and prolonged displacement (JNCC 2020[24]). Given that behavioural disturbance is considered negligible in the context of UXO clearance as the duration of the impact (underwater noise) is extremely short, the potential for in-combination effects is considered unlikely and this impact was not considered further.
Underwater noise (disturbance from non-piling construction activities)	Disturbance from other (non-piling) construction activities is anticipated to be highly localised and is closely associated with the disturbance from vessel presence required for the activity. As such, in-combination effects have been assessed under "disturbance from vessels" impact and potential for in-combination effects due to other (non-piling) construction activities was not considered further.
Underwater noise (injury and disturbance from cable "snapping")	Given the consideration of underwater noise from the presence of cables and the "snapping noise" generated, it is clear that the underwater noise will be below any injurious criteria for marine mammals. Therefore, the risk of injury to marine mammals as a result of the presence of cables associated with floating offshore wind turbines is negligible. Regarding disturbance, it is apparent that the maximum distance of disturbance would be within the immediate vicinity of the array (a few km) of the cables, which given the wide-ranging nature of bottlenose dolphins and lack of sensitivity to the noise results in a negligible risk to species

Impact Screened Out Following Alone Assessment	Justification
	alone or in-combination, and therefore this impact is not considered further.
Collision risk during construction, O&M, and decommissioning	It is expected that all projects will follow best industry practice and that vessel movements will be managed through the implementation of vessel codes of conduct that will limit the negative impacts to marine mammals (for example, limited vessel speeds, adherence to vessel transit routes), following relevant guidance to minimise the risks of injury to marine mammals. As such, the potential for significant in-combination effects is negligible and this impact was not considered further.
Changes to prey during construction, O&M, and decommissioning	The changes in prey availability and EMF are expected to be highly localised across all projects. As such, the potential for significant in-combination effects is negligible and therefore this impact was not considered further.

10.3.2.6 The impacts that are therefore considered in the in-combination assessment are as follows:

- The potential for disturbance from underwater noise from piling during construction of offshore wind farms and the construction of other projects and developments;
- The potential for disturbance from vessel activity during construction, operation and decommissioning of projects and developments;
- The potential for disturbance from high resolution geophysical surveys; and
- The potential for disturbance from operational noise.

10.3.2.7 As with the Proposed Development (Offshore) alone assessments presented in Section 10.2.2, the in-combination assessment for marine mammals assesses whether the impacts listed above have the potential to prevent the conservation objectives of the relevant designated sites being met. However, for brevity, the conservation objectives are not repeated here.

10.3.2.8 The in-combination assessment for marine mammals has been determined based on the plans and projects described where there is potential for any phase of such projects to have temporal or spatial overlap with that of the Proposed Development (Offshore), and there is a potential for the effects screened in to occur from the project. No information is currently available regarding oil and gas seismic surveys so they have not been included further within this assessment. Similarly, CCS projects are not considered for underwater noise given the nature of the projects.

10.3.2.9 For clarity, a ZoI has been applied to screen in relevant offshore projects. The ZoI for marine mammals is the species-specific MU, which for the identified site is the Coastal East Scotland MU and Greater North Sea MU for bottlenose dolphin.

10.3.2.10 The assessment presented here draws on the cumulative assessments presented in Volume 2, Chapter 7: Marine Mammals.

10.3.2.11 For a project to be screened in for the in-combination assessment, there needs to be potential for relevant works to occur within the same timeframe as relevant works at the Proposed Development (Offshore). Each project has been considered on the basis of effect–receptor pathway, data confidence and the temporal and spatial scales involved.

10.3.2.12 The time period considered for the marine mammal assessment is 2027-2033 inclusive. This allows for the quantification of impacts both prior to the construction of the Proposed Development (Offshore) (since the baseline was collated) and during the period when piling at the Proposed Development (Offshore) is anticipated in between 2028 and 2032. The impact window has been extended to include 2033 to allow for any impacts potentially associated with other construction activities at the Proposed Development (Offshore) and the Caledonia OECC that may act in-combination with piling at the Proposed Development (Offshore). Therefore, the Moray West offshore wind farm is excluded from further assessment as construction will be completed within 2025, therefore it is not in the consideration window (2027-2033).

10.3.2.13 Where possible for each project, information on the expected impacts on marine mammal features of the relevant designated sites have been collated and used to inform the in-combination assessment presented below.

Moray Firth SAC

Construction and Decommissioning

Disturbance from underwater noise from piling

10.3.2.14 There is a potential for an AEoSI in-combination as a result of underwater noise on bottlenose dolphins during construction and decommissioning at the Moray Firth SAC. The potential for AEoSI during decommissioning would be similar to, and potentially less than, that outlined in the construction phase.

10.3.2.15 Of the projects identified in Table 10-3 those with the potential for an in-combination effect with the Proposed Development (Offshore) with respect to underwater noise are limited to those with potential for a temporal overlap of the construction phases (specifically piling or, if known, UXO or seismic survey).

10.3.2.16 Timeframes for decommissioning are highly uncertain for all projects and therefore an assessment of the potential for an in-combination effect during decommissioning cannot be made at this time. However, it is likely that the potential for effect during decommissioning would be less than that during construction and would in any case be assessed in line with the regulatory requirements at the time.

10.3.2.17 The potential for underwater noise to result in AEoSI during construction of the Proposed Development (Offshore), together with the sensitivity of bottlenose dolphin to such noise, has been discussed in Section 10.2.2 as part of the assessment of AEoSI alone, with that information not repeated here.

10.3.2.18 Following the ZoI considered (the species specific MU) and the timescale associated with the Proposed Development (Offshore), it is considered that three of the projects identified within Table 10-3 (Berwick Bank, GreenVolt and Salamander) have the potential to act in-combination with the Proposed Development (Offshore). These projects are all within Tier 1, with no Tier 2 or Tier 3 projects screened in for assessment.

10.3.2.19 It should be noted that in the assessment of in-combination impacts due to piling, for projects for which indicative piling schedules were provided within the submission documents, these were used in the in-combination assessment. For example, construction of Berwick Bank is expected to take place between 2025 and 2033, however, based on information provided in the Berwick Bank EIA iPCoD Appendix (SSE Renewables, 2022)[125], piling can be anticipated only between April to December in 2026, 2027 and 2031.

10.3.2.20 The number of bottlenose dolphin predicted to be disturbed within the CES MU per day (the MU within which the Moray Firth SAC sits) ranges between four (1.63% CES MU) in 2033 to 79 individuals (32.24% CES MU) in 2028 (Table 10-100). This assumes piling activities at the Proposed Development (Offshore) and Salamander on the same day. The sequential scenario is presented below as the impacts per year were the same for both the sequential and concurrent scenario, however the sequential impacts had a longer duration.

Table 10-100: Number of bottlenose dolphins within the CES MU potentially disturbed by underwater noise from the projects identified for the in-combination assessment of the Moray Firth SAC.

Project	Technology	2027	2028	2029	2030	2031	2032	2033
Proposed Development (Offshore) (In-combination Sequential Scenario)	Mixed	-	52	52	52	52	52	-
Berwick Bank	Fixed	5	-	-	-	5	-	-
Ossian	Floating	-	-	-	-	4	4	4
Salamander	Floating	-	27	-	-	-	-	-
Total number of animals		5	79	52	52	61	56	4
Total % of MU		2.04	32.24	21.22	21.22	24.90	22.86	1.63

10.3.2.21 It should be noted that assessments for Salamander, Berwick Bank and Ossian used harbour porpoise dose-response and therefore are likely to overestimate dolphin response.

10.3.2.22 To determine whether this level of disturbance is expected to result in population level impacts, cumulative iPCoD modelling was conducted for the MU population.

10.3.2.23 For the CES MU, the worst-case scenario was the sequential scenario, with the impacted population size predicted to be 91.08% of the un-impacted population size in 2032, coinciding with the end of the third and final year of piling at the Caledonia South. Following the cessation of piling at the Proposed Development (Offshore), the population size fluctuates and at the end of 2050 it is at 93.11% of the un-impacted population size. Although the impacted CES MU population is reduced in size compared to the un-impacted population, for all scenarios the impacted population continues increasing in trajectory (Figure 10-5).

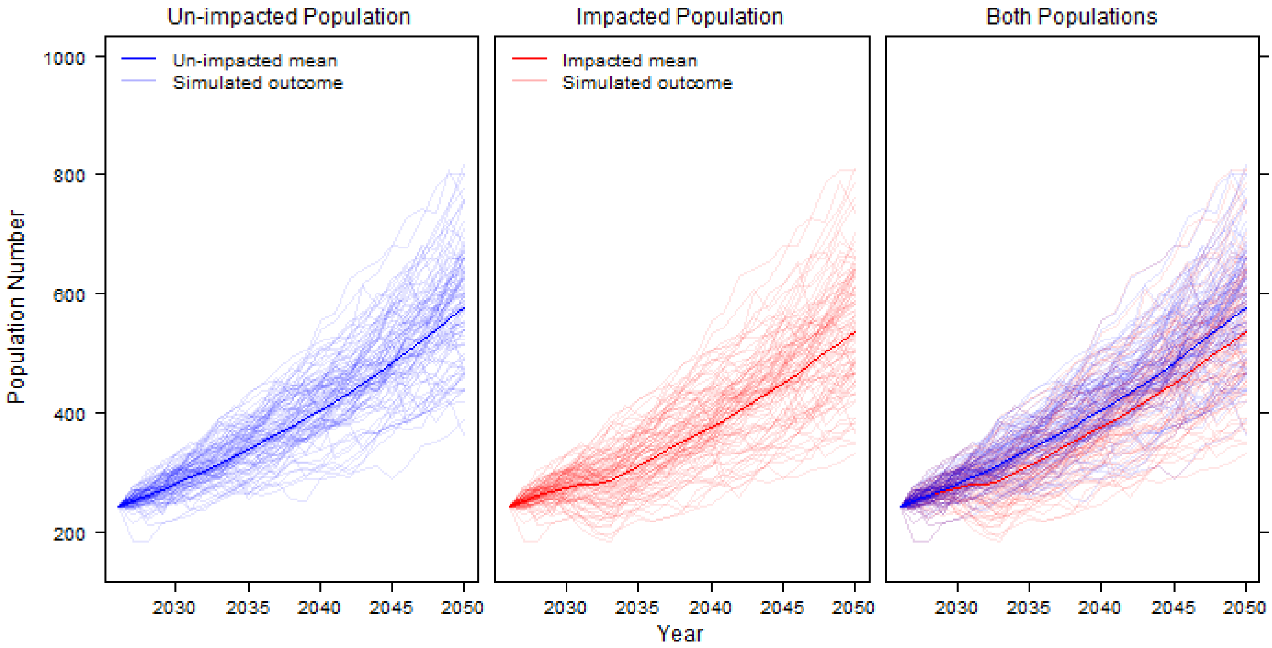


Figure 10-5: Predicted population trajectories for the un-impacted (baseline) and impacted bottlenose dolphin iPCoD simulations for in-combination sequential scenario for the CES MU

10.3.2.24 It is worth noting that both the disturbance numbers and modelling presented above are for the CES MU as a whole rather than the Moray Firth SAC specifically. However, it is considered that the Moray Firth SAC population is accounted for within the overall MU population, and therefore as the MU population is determined to continue increasing in trajectory, the same is anticipated for the SAC population.

10.3.2.25 The impact will cover a wide area, and will occur regularly within the timeframe considered due to different projects piling at different times. There is the potential for a temporary change in distribution of bottlenose dolphins from the underwater noise generation, of up to 9% of the CES MU (which includes the Moray Firth SAC population).

10.3.2.26 However, it is considered that this disturbance will be intermittent and not continuous over the construction phase, meaning that the individuals will not be permanently disturbed from the SAC during the construction phase of the Proposed Development (Offshore). Furthermore, there is evidence to suggest that bottlenose dolphins are not particularly vulnerable to disturbance effects from underwater noise. A study on bottlenose dolphins within the Moray Firth has shown that bottlenose dolphins have the ability to compensate for behavioural responses as a result of increased commercial vessel activity, where longer term overall activity time budget remained the same despite the immediate behavioural response to disturbance (New *et al.*, 2013). Therefore, while there remains the potential for disturbance and displacement to affect individual behaviour, it is not expected that this would result in an overall change in individual energy budget since animals have been shown to compensate for time lost due to disturbance. Additionally it is considered that the dynamic social structure of populations (Connor *et al*., 2001[18]), the lack of predation or competition for food, and wide range of the species, result in a higher perceived tolerance of disturbance when compared to other marine mammal species (for example, porpoises).

10.3.2.27 While the assessments present a potential impact on the SAC population, the assessment outcomes are considered to be over precautionary, resulting in exaggerated impacts compared to what would be realistically expected. With respect to the disturbance numbers for the MU as a whole, the harbour porpoise dose-response function was used, which is considered to be precautionary for bottlenose dolphins given the difference in hearing thresholds between the two species.

10.3.2.28 With respect to the iPCoD modelling, the model for bottlenose dolphin disturbance was last updated following the expert elicitation in 2013 (Harwood *et al*., 2014). When this expert elicitation was conducted, the experts provided responses on the assumption that a disturbed individual would not forage for 24 hours. However, the most recent expert elicitation in 2018 highlighted that this was an unrealistic assumption for harbour porpoises (generally considered to be more responsive than minke whales and bottlenose dolphins), and was amended to assume that disturbance resulted in 6 hours of non-foraging time (Booth *et al*., 2019[126]). Unfortunately, bottlenose dolphins were not included in the updated expert elicitation for disturbance, and thus the iPCoD model still assumes 24 hours of non-foraging time for bottlenose dolphins. This is unrealistic considering what we now know about marine mammal behavioural responses to pile driving. A recent study estimated energetic costs associated with disturbance from sonar, where it was assumed that 1 hour of feeding cessation was classified as a mild response, 2 hours of feeding cessation was classified as a strong response and 8 hours of feeding cessation was classified as an extreme response

(Czapanskiy *et al*., 2021[127]). Assuming 24 hours of feeding cessation for bottlenose dolphins in the iPCoD model is significantly beyond that which is considered to be an extreme response, and is therefore considered to be unrealistic and has over-estimated the true disturbance levels expected from the Proposed Development (Offshore).

10.3.2.29 Furthermore, the iPCoD model assumes there is no density dependence for the species based on an insufficient amount of data to parameterise this relationship. This means that the model does not reflect the ability of the population to increase in size and return to carrying capacity following disturbance, whereas in reality it is possible for populations with a positive growth rate and increasing population (such as the Moray Firth SAC) to continue to increase in the absence of disturbance.

10.3.2.30 At a recent expert elicitation, conducted for the purpose of modelling population impacts of the Deepwater Horizon oil spill (Schwacke *et al*., 2021[128]), experts agreed that there would likely be a concave density dependence on fertility. That means, for a population which is assumed to be stable (specifically, neither increasing or decreasing), it would be expected that if the impacted population declines, it would later recover to carrying capacity, rather than continuing at a stable trajectory that is smaller than that of the un-impacted population. Note that in the iPCoD model, for stable populations, carrying capacity is assumed to be equal to the size of un-impacted population –specifically, it is assumed the un-impacted population is at carrying capacity.

10.3.2.31 Demographic stochasticity (variation among individuals in their realised vital rates as a result of random processes) and environmental variation (the variation in demographic rates among years as a result of changes in environmental conditions) are also important factors that need to be considered within the models (Harwood *et al*., 2014). The model tries to account for this, however ultimately the results demonstrate that the change in population size resulting from the impact of disturbance is significantly smaller than that driven by the environmental and demographic stochasticity in the model.

10.3.2.32 **Therefore, based on the intermittent nature of effect, high tolerance for disturbance, lack of evidence to suggest any long-term population level effects, and limitations within the models and assessments, it is considered that there is no potential for AEoSI in-combination with any other plans or projects for the bottlenose dolphin at Moray Firth SAC in relation to underwater noise during construction and decommissioning.**

Disturbance from Vessel Activity

10.3.2.33 It is challenging to reliably quantify the level of increased disturbance to marine mammals resulting from increased vessel activity in-combination, given the large degree of temporal and spatial variation in vessel movements between projects and regions, coupled with the spatial and temporal variation in marine mammal movements across the region.

10.3.2.34 Although some OWF vessels (such as crew transport and supply vessels) may transit to and from the wind farm at higher speeds, they often travel in repeated / predictable routes within the site. Many other vessels (for example, jack-up vessels and pilot or attending vessels) travel more slowly within the wind farm site or spend long periods of time jacked-up, at anchor (minimising movement and acoustic signature from engines) or using dynamic positioning systems (minimising movement, although still generating noise).

10.3.2.35 Vessel routes to and from offshore windfarms and other offshore projects will, for the majority, use existing vessel routes for pre-existing vessel traffic which individuals will be accustomed to. They may also have become habituated to the volume of regular vessel movements and therefore the additional risk is predominantly confined to construction sites. The vessel movements for OWFs are likely to be limited and slow, resulting in less risk of disturbance to bottlenose dolphin. In addition, most projects are likely to adopt VMPs and/or comply with the existing Marine Wildlife Watching Codes such as 2017a[129]) and 2017b[130]) to minimise any potential effects on marine mammals.

10.3.2.36 It is likely that projects will have their highest number of vessels on site at any one time during the construction phase. Although construction vessels will be moving across a large area (considering the number of projects anticipated to be constructing off the east coast of Scotland), the impact is considered to be localised to the vicinity of the moving vessel. The impact will be temporary (only when the vessel is moving or stationary with engine running) and will occur throughout the construction period of up to six years (medium term). It is likely that the effect will occur at moderate frequency. However, although it could affect a small proportion of respective populations across the duration of the construction, it is unlikely to alter population trajectories in the long-term due to the fact that it will be taking place in areas already characterised by relatively high vessel traffic. Additionally, as considered for the alone assessment, bottlenose dolphins are anticipated to have a high tolerance to vessel disturbance (Lusseau *et al*., 2011[55]; New *et al*., 2013; Pirotta *et al*., 2013; Constantine *et al*., 2004[131]; La Manna *et al*., 2013[132]; and Bejder *et al*., 2009[133]).

10.3.2.37 **Therefore, based on the nature of vessel movements associated with OWF developments (both with respect to the predictable/repeated nature of movements and the vessel speed), the established mitigation on both the Proposed Development (Offshore) and projects considered in-combination, the predictable/repeated nature of movements, and the high tolerance of the species, it is considered that there will be no potential for AEoSI in-combination with any other plans or projects for the bottlenose dolphin at Moray Firth SAC in relation to vessel disturbance during the construction and decommissioning phase.**

Disturbance from High Resolution Geophysical Surveys

10.3.2.38 Geophysical surveys are anticipated to take place during the construction of the three projects included within this assessment.

10.3.2.39 As discussed in Section 10.2.2 for the Proposed Development (Offshore) alone, the expected sound frequency during operation of MBES and SSS is above 200 kHz and therefore above the hearing frequency range of bottlenose dolphins.

10.3.2.40 JNCC *et al*. (2010[31]) EPS Guidance concludes that the use of SBPs in geophysical surveys "*could, in a few cases, cause localised short-term impacts on behaviour such as avoidance*." However, it is unlikely that this would be considered as disturbance in the terms of the EPS Regulations.

10.3.2.41 For SBP, USBL and UHRS, it is predicted that any disturbance arising from the geophysical survey works within the Caledonia OWF and Caledonia OECC of each OWF project will be of localised spatial extent (up to a maximum of 5km EDR, as per (JNCC, 2023[134]). The effect is likely to occur but at low frequency. Although the effect could affect a small proportion of the respective species populations, population trajectories would not be altered.

10.3.2.42 **Therefore, based on the nature of noise generated by geophysical surveys, the distances between considered projects and the Moray Firth SAC, the lack of population level impacts, and the low sensitivity of the species, it is considered that there will be no potential for AEoSI in-combination with any other plans or projects for the bottlenose dolphin at Moray Firth SAC in relation to geophysical surveys during construction and decommissioning.**

O&M

Disturbance from Vessel Activity

10.3.2.43 The information presented above for vessel disturbance impacts during the construction stage is considered to apply within the O&M phase and is not repeated in detail here.

10.3.2.44 During the O&M phase, the number of vessels associated with respective projects at any one time is likely to decrease compared to the construction phase (for example, during O&M phase at the Proposed Development (Offshore) up to five vessels are anticipated to be onsite at any one time, compared to 25 vessels during the construction phase). As such, considering current levels of traffic on the east coast of Scotland associated with various industries, such increase will be localised and barely discernible from the baseline traffic. As the assessment for the construction phase concluded no potential for AEoSI, the same conclusion can be drawn for the O&M phase.

10.3.2.45 **Therefore, based on the nature of vessel movements associated with OWF developments (both with respect to the predictable/repeated nature of movements and the vessel speed), the established mitigation on both the Proposed Development (Offshore) and projects**

considered in-combination, the predictable/repeated nature of movements, and the high tolerance of the species, it is considered that there will be no potential for AEoSI in-combination with any other plans or projects for the bottlenose dolphin at Moray Firth SAC in relation to vessel disturbance during the O&M phase.

Disturbance from Operational Noise

10.3.2.46 As presented in Section 10.2.2, for operational noise at the Proposed Development (Offshore), it is anticipated that behavioural disturbance is likely to be localised. For fixed and floating WTGs, the maximum range where the behavioural disturbance may occur has been estimated as 120 m to 150 m, respectively. Low-frequency components of WTG noise have been recorded up to a few kilometres outside of wind farm arrays (Bellman *et al*., 2023)[135].

10.3.2.47 While operational noise from wind farms is likely to be audible to bottlenose dolphin within the Caledonia OWF, it is noted that bottlenose dolphin have been recorded as present within the vicinity of dynamic renewable energy structures (Malinka *et al*., 2018) .

10.3.2.48 Based on the alone assessment and the above, it is anticipated that any potential behavioural response arising from exposure to operational noise will be limited to the array area of respective projects, and will therefore not result in any potential impacts to the SAC as there is no overlap between any of the identified projects and the Moray Firth SAC. Therefore, the in-combination impact of operational noise for the identified projects (Table 10-3) would only affect only a very small proportion of the SAC population if any, and it would be unlikely to have any result on population trajectories.

10.3.2.49 **Therefore, based on the nature of operational noise, distances between considered projects and the Moray Firth SAC, the lack of population level impacts, and the low sensitivity of the species, it is considered that there will be no potential for AEoSI in-combination with any other plans or projects for the bottlenose dolphin at Moray Firth SAC in relation to underwater noise during O&M.**

Conclusion of Assessment of Marine Mammals from the Proposed Development (Offshore) In-combination

10.3.2.50 One designated site was identified to have a potential for AEoSI from the Proposed Development (Offshore) in-combination with other plans and projects, the Moray Firth, designated for bottlenose dolphins. The only potential effects considered for in-combination within the assessment (underwater noise), concluded no AEoSI. **Therefore, there is no AEoSI on the bottlenose dolphin feature of the Moray Firth SAC with respect to the Proposed Development (Offshore) in-combination with other plans and projects.**

10.3.3 Offshore and Intertidal Ornithology

Construction and Decommissioning

10.3.3.1 A number of sites were screened in for LSE in relation to in-combination disturbance and displacement effects during the construction and decommissioning phase (Application Document 12). On review of the projects considered for inclusion within the in-combination assessment, it is concluded that none of the potential significant effects from the Project require further consideration for AEoSI in-combination for the construction or decommissioning phase. This is due to the Project having no definitive temporal or spatial overlap with other projects within a reasonable distance which would result in a possible in-combination impact on the same features of any designated site assessed within this RIAA.

O&M

10.3.3.2 As concluded within the HRA Screening Report (Application Document 12) and seen in Table 10-1, the potential for a LSE could not be ruled out for a number of designated sites and features when considering the potential for in-combination distributional response effects and collision risk during the O&M phase. Following completion of the alone assessments for the Proposed Development (Offshore) as presented in Section 10.2.3, the potential for an LSE in-combination has been re-evaluated as presented within Table 10-101.

10.3.3.3 For the majority of project alone assessments, the predicted impacts from the Proposed Development (Offshore) alone, even when considering the worst-case scenario, predicted an impact of less than a single breeding adult per annum, which when accounting for the multiple layers of precaution included within assessments (as outlined in Volume 7B, Appendix 6-2, Annex 4: Review of Relevant Evidence), can be confidently concluded as an intangible level of potential effect. This level of mortality per annum can be concluded as a trivial and inconsequential level of effect, that would be well within the error margins of the assessment and undetectable from any natural changes in the population. In these instances, it can therefore be concluded that the level of predicted impact from the Proposed Development (Offshore) would not materially contribute to any in-combination effect. Therefore, an AEoSI in-combination can be ruled out.

10.3.3.4 For the in-combination assessments detailed within this section, the projects screened in are the proposed, consented, under-construction and operating OWFs in the UK waters of the North Sea and English Channel, as identified in Section 10.1.2. They have been screened in on the basis of the species' sensitivity to the presence of the WTGs, the activities which will take place within those wind farm areas during O&M and following review of the most recent in-combination assessments carried out for UK OWFs in recent years. The Proposed Development (Offshore) and multiple other OWFs are within the MMFR +1SD foraging distance (Woodward *et al*. 2019[78]) to the colony or based on tracking data are known to have connectivity to the colony.

Accordingly, multiple OWFs are screened in during the breeding season. Outside of the breeding season seabirds are known to range more widely, so consideration is provided to OWFs within the wider UK North Sea (and English Channel where appropriate) BDMPS area. The exception to this rule is guillemot, where a regional approach is considered for the non-breeding season, based on NatureScot (2023) guidance note 6. The different seasons for consideration of assessing potential risk from O&M phase impacts in-combination remain the same as those assessed for the Proposed Development (Offshore) alone in Section 10.2.3 based on NatureScot (2020) seasonal guidance.

10.3.3.5 In the absence of the Cumulative Effects Framework (CEF) tool being available, the most appropriate dataset to inform in-combination assessments was identified as the In-combination and Cumulative Totals for Seabird Species of Key Importance to Northeast and East Scotwind Projects (RoyalHaskoningDHV, 2024[136]). Since publication of this dataset, a number of planned projects have either submitted applications (Culzean, Salamander and Ossian) or have published updated impact predictions (for example Five Estuaries and Outer Dowsing). These updated values have been incorporated within assessments, with specific details of updates provided in further detail in the assessment sections below.

Scenarios

10.3.3.6 Three in-combination effects totals are presented where applicable for the sites and features screened in for in-combination assessments, these are;

- All consented projects plus Caledonia OWF, projects awaiting consent decision may ultimately not gain consent or may significantly revise their MDS prior to consent award, therefore this scenario is provided to account for such level of uncertainty;
- All projects excluding Berwick Bank has been provided on the request of NatureScot within consultation (meeting 14/12/2023); and
- All projects where information is available (plus Caledonia).

Table 10-101: Summary of the sites and features considered for disturbance and displacement assessment during the O&M phase in-combination.

Designated Site	Features Screened In	Impact Pathway During O&M	Considered for In-combination?
East Caithness Cliffs SPA	Herring gull	Collision risk	No – as presented in Section 10.2.3, the assessment alone concluded potential for an intangible effect only, which would not materially contribute to any in-combination effect, especially considering the level of precaution applied within assessments and low connectivity with the site feature.
	Great black-backed gull	Collision risk	No – as presented in Section 10.2.3, the assessment alone concluded potential for an intangible effect only, which would not materially contribute to any in-combination effect, especially considering the level of precaution applied within assessments and low connectivity with the site feature.
	Kittiwake	Distributional responses	Yes
		Collision risk	Yes
	Guillemot	Distributional responses	Yes
	Razorbill	Distributional responses	Yes
Moray Firth SPA	Fulmar	Barrier effects	No - as presented in Section 7.3.6, the assessment alone concluded potential for an intangible effect only, which would not materially contribute to any in-combination effect.
	Common scoter	Distributional responses	No – During the O&M phase the export cable will be installed and subterranean. Any maintenance requirements will be highly localised both spatially and temporally, therefore no potential for an in-combination effect to occur.
		Migratory Collision risk	No - When considering the intangible impact contribution (Section 7.3.10) the Proposed Development (Offshore) would add to any in-combination effect, combined with the conclusions of the strategic assessment (WWT and MacArthur Green, 2014) it can be confidently concluded there is no potential for an AEoSI for the

Designated Site	Features Screened In	Impact Pathway During O&M	Considered for In-combination?
			Proposed Development (Offshore) in-combination with other plans and projects.
	Eider	Distributional responses	No – During the O&M phase the export cable will be installed and subterranean. Any maintenance requirements will be highly localised both spatially and temporally, therefore no potential for an in-combination effect to occur.
		Migratory Collision risk	No - When considering the intangible impact contribution (Section 7.3.10) the Proposed Development (Offshore) would add to any in-combination effect, combined with the conclusions of the strategic assessment (WWT and MacArthur Green, 2014) it can be confidently concluded there is no potential for an AEoSI for the Proposed Development (Offshore) in-combination with other plans and projects.
	Goldeneye	Distributional responses	No – During the O&M phase the export cable will be installed and subterranean. Any maintenance requirements will be highly localised both spatially and temporally, therefore no potential for an in-combination effect to occur.
		Migratory Collision risk	No - When considering the intangible impact contribution (Section 7.3.10) the Proposed Development (Offshore) would add to any in-combination effect, combined with the conclusions of the strategic assessment (WWT and MacArthur Green, 2014) it can be confidently concluded there is no potential for an AEoSI for the Proposed Development (Offshore) in-combination with other plans and projects.
	Great northern diver	Distributional responses	No – During the O&M phase the export cable will be installed and subterranean. Any maintenance requirements will be highly localised both spatially and temporally, therefore no potential for an in-combination effect to occur.
		Migratory Collision risk	No - When considering the intangible impact contribution (Section 7.3.10) the Proposed Development (Offshore) would add to any in-combination effect, combined with the conclusions of the

Designated Site	Features Screened In	Impact Pathway During O&M	Considered for In-combination?
			strategic assessment (WWT and MacArthur Green, 2014) it can be confidently concluded there is no potential for an AEoSI for the Proposed Development (Offshore) in-combination with other plans and projects.
	Long-tailed duck	Distributional responses	No – During the O&M phase the export cable will be installed and subterranean. Any maintenance requirements will be highly localised both spatially and temporally, therefore no potential for an in-combination effect to occur.
		Migratory Collision risk	No - When considering the intangible impact contribution (Section 7.3.10) the Proposed Development (Offshore) would add to any in-combination effect, combined with the conclusions of the strategic assessment (WWT and MacArthur Green, 2014) it can be confidently concluded there is no potential for an AEoSI for the Proposed Development (Offshore) in-combination with other plans and projects.
	Red-breasted merganser	Distributional responses	No – During the O&M phase the export cable will be installed and subterranean. Any maintenance requirements will be highly localised both spatially and temporally, therefore no potential for an in-combination effect to occur.
		Migratory Collision risk	No - When considering the intangible impact contribution (Section 7.3.10) the Proposed Development (Offshore) would add to any in-combination effect, combined with the conclusions of the strategic assessment (WWT and MacArthur Green, 2014) it can be confidently concluded there is no potential for an AEoSI for the Proposed Development (Offshore) in-combination with other plans and projects.
	Red-throated diver	Distributional responses	No – During the O&M phase the export cable will be installed and subterranean. Any maintenance requirements will be highly localised both spatially and temporally, therefore no potential for an in-combination effect to occur.

Designated Site	Features Screened In	Impact Pathway During O&M	Considered for In-combination?
		Migratory Collision risk	No - When considering the intangible impact contribution (Section 7.3.10) the Proposed Development (Offshore) would add to any in-combination effect, combined with the conclusions of the strategic assessment (WWT and MacArthur Green, 2014) it can be confidently concluded there is no potential for an AEoSI for the Proposed Development (Offshore) in-combination with other plans and projects.
	Scaup	Distributional responses	No – During the O&M phase the export cable will be installed and subterranean. Any maintenance requirements will be highly localised both spatially and temporally, therefore no potential for an in-combination effect to occur.
		Migratory Collision risk	No - When considering the intangible impact contribution (Section 7.3.10) the Proposed Development (Offshore) would add to any in-combination effect, combined with the conclusions of the strategic assessment (WWT and MacArthur Green, 2014) it can be confidently concluded there is no potential for an AEoSI for the Proposed Development (Offshore) in-combination with other plans and projects.
	Slavonian grebe	Distributional responses	No – During the O&M phase the export cable will be installed and subterranean. Any maintenance requirements will be highly localised both spatially and temporally, therefore no potential for an in-combination effect to occur.
		Migratory Collision risk	No - When considering the intangible impact contribution (Section 7.3.10) the Proposed Development (Offshore) would add to any in-combination effect, combined with the conclusions of the strategic assessment (WWT and MacArthur Green, 2014) it can be confidently concluded there is no potential for an AEoSI for the Proposed Development (Offshore) in-combination with other plans and projects.
	Velvet scoter	Distributional responses	No – During the O&M phase the export cable will be installed and subterranean. Any maintenance requirements will be highly

Designated Site	Features Screened In	Impact Pathway During O&M	Considered for In-combination?
			localised both spatially and temporally, therefore no potential for an in-combination effect to occur.
		Migratory Collision risk	No - When considering the intangible impact contribution (Section 7.3.10) the Proposed Development (Offshore) would add to any in-combination effect, combined with the conclusions of the strategic assessment (WWT and MacArthur Green, 2014) it can be confidently concluded there is no potential for an AEoSI for the Proposed Development (Offshore) in-combination with other plans and projects.
	Shag	Distributional responses	No – During the O&M phase the export cable will be installed and subterranean. Any maintenance requirements will be highly localised both spatially and temporally, therefore no potential for an in-combination effect to occur.
North Caithness Cliffs SPA	Guillemot	Distributional responses	Yes
	Razorbill	Distributional responses	Yes
	Puffin	Distributional responses	Yes
	Kittiwake	Distributional responses	No – as presented in Section 10.2.3, the assessment alone concluded potential for an intangible effect only, which would not materially contribute to any in-combination effect, especially considering the level of precaution applied within assessments.
		Collision risk	No – as presented in Section 10.2.3, the assessment alone concluded potential for an intangible effect only, which would not materially contribute to any in-combination effect, especially considering the level of precaution applied within assessments.
	Fulmar	Barrier effects	No - as presented in Section 7.3.6, the assessment alone concluded potential for an intangible effect only, which would not materially contribute to any in-combination effect.
	Guillemot	Distributional responses	Yes

Designated Site	Features Screened In	Impact Pathway During O&M	Considered for In-combination?
Troup, Pennan and Lion's Heads SPA	Razorbill	Distributional responses	Yes
	Herring gull	Collision risk	No – as presented in Section 10.2.3, the assessment alone concluded potential for an intangible effect only, which would not materially contribute to any in-combination effect, especially considering the level of precaution applied within assessments and low connectivity with the site feature.
	Kittiwake	Distributional responses	Yes
		Collision risk	Yes
	Fulmar	Barrier effects	No - as presented in Section 7.3.6, the assessment alone concluded potential for an intangible effect only, which would not materially contribute to any in-combination effect.
Pentland Firth Islands SPA	Arctic tern	Migratory collision risk	No – As detailed in Section 7.3.10, Arctic tern was recorded in limited numbers within the 24 months of site specific DAS, as expected given the Proposed Development (Offshore) is outwith of the species foraging range (Woodward *et al*., 2019) and expected migratory corridor. Given the above information, the Proposed Development (Offshore) would certainly not provide any tangible contribution to any in-combination effect.
Moray and Nairn Coast SPA	Bar-tailed godwit	Migratory collision risk	No - When considering the intangible impact contribution (Section 7.3.10) the Proposed Development (Offshore) would add to any in-combination effect, combined with the conclusions of the strategic assessment (WWT and MacArthur Green, 2014) it can be confidently concluded there is no potential for an AEoSI for the Proposed Development (Offshore) in-combination with other plans and projects.
	Greylag goose	Migratory collision risk	No - When considering the intangible impact contribution (Section 7.3.10) the Proposed Development (Offshore) would add to any in-combination effect, combined with the conclusions of the strategic assessment (WWT and MacArthur Green, 2014) it can be confidently concluded there is no potential for an AEoSI for the

Designated Site	Features Screened In	Impact Pathway During O&M	Considered for In-combination?
			Proposed Development (Offshore) in-combination with other plans and projects.
	Pink footed goose	Migratory collision risk	No - When considering the intangible impact contribution (Section 7.3.10) the Proposed Development (Offshore) would add to any in-combination effect, combined with the conclusions of the strategic assessment (WWT and MacArthur Green, 2014) it can be confidently concluded there is no potential for an AEoSI for the Proposed Development (Offshore) in-combination with other plans and projects.
	Redshank	Migratory collision risk	No - When considering the intangible impact contribution (Section 7.3.10) the Proposed Development (Offshore) would add to any in-combination effect, combined with the conclusions of the strategic assessment (WWT and MacArthur Green, 2014) it can be confidently concluded there is no potential for an AEoSI for the Proposed Development (Offshore) in-combination with other plans and projects.
	Dunlin	Migratory collision risk	No - When considering the intangible impact contribution (Section 7.3.10) the Proposed Development (Offshore) would add to any in-combination effect, combined with the conclusions of the strategic assessment (WWT and MacArthur Green, 2014) it can be confidently concluded there is no potential for an AEoSI for the Proposed Development (Offshore) in-combination with other plans and projects.
	Oystercatcher	Migratory collision risk	No - When considering the intangible impact contribution (Section 7.3.10) the Proposed Development (Offshore) would add to any in-combination effect, combined with the conclusions of the strategic assessment (WWT and MacArthur Green, 2014) it can be confidently concluded there is no potential for an AEoSI for the Proposed Development (Offshore) in-combination with other plans and projects.
	Red-breasted merganser	Migratory collision risk	No - When considering the intangible impact contribution (Section 7.3.10) the Proposed Development (Offshore) would add to any

Designated Site	Features Screened In	Impact Pathway During O&M	Considered for In-combination?
			in-combination effect, combined with the conclusions of the strategic assessment (WWT and MacArthur Green, 2014) it can be confidently concluded there is no potential for an AEoSI for the Proposed Development (Offshore) in-combination with other plans and projects.
	Wigeon	Migratory collision risk	No - When considering the intangible impact contribution (Section 7.3.10) the Proposed Development (Offshore) would add to any in-combination effect, combined with the conclusions of the strategic assessment (WWT and MacArthur Green, 2014) it can be confidently concluded there is no potential for an AEoSI for the Proposed Development (Offshore) in-combination with other plans and projects.
Moray and Nairn Coast Ramsar	Greylag goose	Migratory collision risk	No - When considering the intangible impact contribution (Section 7.3.10) the Proposed Development (Offshore) would add to any in-combination effect, combined with the conclusions of the strategic assessment (WWT and MacArthur Green, 2014) it can be confidently concluded there is no potential for an AEoSI for the Proposed Development (Offshore) in-combination with other plans and projects.
	Pink footed goose	Migratory collision risk	No - When considering the intangible impact contribution (Section 7.3.10) the Proposed Development (Offshore) would add to any in-combination effect, combined with the conclusions of the strategic assessment (WWT and MacArthur Green, 2014) it can be confidently concluded there is no potential for an AEoSI for the Proposed Development (Offshore) in-combination with other plans and projects.
	Redshank	Migratory collision risk	No - When considering the intangible impact contribution (Section 7.3.10) the Proposed Development (Offshore) would add to any in-combination effect, combined with the conclusions of the strategic assessment (WWT and MacArthur Green, 2014) it can be confidently concluded there is no potential for an AEoSI for the

Designated Site	Features Screened In	Impact Pathway During O&M	Considered for In-combination?
			Proposed Development (Offshore) in-combination with other plans and projects.
Copinsay SPA	Kittiwake	Distributional responses	No – as presented in Section 10.2.3, the assessment alone concluded potential for an intangible effect only, which would not materially contribute to any in-combination effect, especially considering the level of precaution applied within assessments.
		Collision risk	No – as presented in Section 10.2.3, the assessment alone concluded potential for an intangible effect only, which would not materially contribute to any in-combination effect, especially considering the level of precaution applied within assessments.
	Great black-backed gull	Collision risk	No – as presented in Section 10.2.3, the assessment alone concluded potential for an intangible effect only, which would not materially contribute to any in-combination effect, especially considering the level of precaution applied within assessments and low connectivity with the site feature.
	Guillemot	Distributional responses	Yes
	Fulmar	Barrier effects	No - as presented in Section 7.3.6, the assessment alone concluded potential for an intangible effect only, which would not materially contribute to any in-combination effect.
Hoy SPA	Greater black-backed gull	Collision risk	No – as presented in Section 10.2.3, the assessment alone concluded potential for an intangible effect only, which would not materially contribute to any in-combination effect, especially considering the level of precaution applied within assessments and low connectivity with the site feature.
	Great skua	Collision risk	No – as presented in Section 10.2.3, the assessment alone concluded potential for an intangible effect only, which would not materially contribute to any in-combination effect, especially considering the level of precaution applied within assessments and low connectivity with the site feature.
	Guillemot	Distributional responses	Yes

Designated Site	Features Screened In	Impact Pathway During O&M	Considered for In-combination?
	Puffin	Distributional responses	No – as presented in Section 10.2.3, the assessment alone concluded potential for an intangible effect only, which would not materially contribute to any in-combination effect, especially considering the level of precaution applied within assessments.
	Kittiwake	Distributional responses	No – as presented in Section 10.2.3, the assessment alone concluded potential for an intangible effect only, which would not materially contribute to any in-combination effect, especially considering the level of precaution applied within assessments.
		Collision risk	No – as presented in Section 10.2.3, the assessment alone concluded potential for an intangible effect only, which would not materially contribute to any in-combination effect, especially considering the level of precaution applied within assessments.
	Fulmar	Barrier effects	No - as presented in Section 7.3.6, the assessment alone concluded potential for an intangible effect only, which would not materially contribute to any in-combination effect.
Buchan Ness to Collieston Coast SPA	Kittiwake	Distributional responses	Yes
		Collision risk	Yes
	Fulmar	Barrier effects	No - as presented in Section 7.3.6, the assessment alone concluded potential for an intangible effect only, which would not materially contribute to any in-combination effect.
Auskerry SPA	Storm petrel	Distributional responses	No – As detailed within Section 7.3.4, no storm petrel species were recorded within the full 24 months of DAS suggesting no potential connectivity with any storm petrel features screened in for assessment. This conclusion is then corroborated when considering the additional evidence presented regarding storm petrel distribution. It can therefore be concluded, there is no potential for the Proposed Development (Offshore) to contribute to any in-combination effect.

Designated Site	Features Screened In	Impact Pathway During O&M	Considered for In-combination?
Dornoch Firth and Loch Fleet SPA	Bar-tailed godwit	Migratory collision risk	No - When considering the intangible impact contribution (Section 7.3.10) the Proposed Development (Offshore) would add to any in-combination effect, combined with the conclusions of the strategic assessment (WWT and MacArthur Green, 2014) it can be confidently concluded there is no potential for an AEoSI for the Proposed Development (Offshore) in-combination with other plans and projects.
	Greylag goose	Migratory collision risk	No - When considering the intangible impact contribution (Section 7.3.10) the Proposed Development (Offshore) would add to any in-combination effect, combined with the conclusions of the strategic assessment (WWT and MacArthur Green, 2014) it can be confidently concluded there is no potential for an AEoSI for the Proposed Development (Offshore) in-combination with other plans and projects.
	Osprey	Migratory collision risk	No - When considering the intangible impact contribution (Section 7.3.10) the Proposed Development (Offshore) would add to any in-combination effect, combined with the conclusions of the strategic assessment (WWT and MacArthur Green, 2014) it can be confidently concluded there is no potential for an AEoSI for the Proposed Development (Offshore) in-combination with other plans and projects.
	Wigeon	Migratory collision risk	No - When considering the intangible impact contribution (Section 7.3.10) the Proposed Development (Offshore) would add to any in-combination effect, combined with the conclusions of the strategic assessment (WWT and MacArthur Green, 2014) it can be confidently concluded there is no potential for an AEoSI for the Proposed Development (Offshore) in-combination with other plans and projects.
Dornoch Firth and Loch Fleet Ramsar	Bar-tailed godwit	Migratory collision risk	No - When considering the intangible impact contribution (Section 7.3.10) the Proposed Development (Offshore) would add to any in-combination effect, combined with the conclusions of the strategic assessment (WWT and MacArthur Green, 2014) it can

Designated Site	Features Screened In	Impact Pathway During O&M	Considered for In-combination?
			be confidently concluded there is no potential for an AEoSI for the Proposed Development (Offshore) in-combination with other plans and projects.
	Greylag goose	Migratory collision risk	No - When considering the intangible impact contribution (Section 7.3.10) the Proposed Development (Offshore) would add to any in-combination effect, combined with the conclusions of the strategic assessment (WWT and MacArthur Green, 2014) it can be confidently concluded there is no potential for an AEoSI for the Proposed Development (Offshore) in-combination with other plans and projects.
	Wigeon	Migratory collision risk	No - When considering the intangible impact contribution (Section 7.3.10) the Proposed Development (Offshore) would add to any in-combination effect, combined with the conclusions of the strategic assessment (WWT and MacArthur Green, 2014) it can be confidently concluded there is no potential for an AEoSI for the Proposed Development (Offshore) in-combination with other plans and projects.
Rousay SPA	Guillemot	Distributional responses	No – On review of Northeast and East Scotwind Projects (RoyalHaskoningDHV, 2024[136]) in-combination datasets and recently submitted applications in Scotland (Culzean, Salamander and Ossian) no projects were found to contribute to an in-combination effect.
	Kittiwake	Distributional responses	No – as presented in Section 10.2.3, the assessment alone concluded potential for an intangible effect only, which would not materially contribute to any in-combination effect, especially considering the level of precaution applied within assessments.
		Collision risk	No – as presented in Section 10.2.3, the assessment alone concluded potential for an intangible effect only, which would not materially contribute to any in-combination effect, especially considering the level of precaution applied within assessments.

Designated Site	Features Screened In	Impact Pathway During O&M	Considered for In-combination?
	Fulmar	Barrier effects	No - as presented in Section 7.3.6, the assessment alone concluded potential for an intangible effect only, which would not materially contribute to any in-combination effect.
Marwick Head SPA	Guillemot	Distributional responses	Yes
	Kittiwake	Distributional responses	No – as presented in Section 10.2.3, the assessment alone concluded potential for an intangible effect only, which would not materially contribute to any in-combination effect, especially considering the level of precaution applied within assessments.
		Collision risk	No – as presented in Section 10.2.3, the assessment alone concluded potential for an intangible effect only, which would not materially contribute to any in-combination effect, especially considering the level of precaution applied within assessments.
Calf of Eday SPA	Guillemot	Distributional responses	No – On review of Northeast and East Scotwind Projects (RoyalHaskoningDHV, 2024[136]) in-combination datasets and recently submitted applications in Scotland (Culzean, Salamander and Ossian) no projects were found to contribute to an in-combination effect.
	Kittiwake	Distributional responses	No – as presented in Section 10.2.3, the assessment alone concluded potential for an intangible effect only, which would not materially contribute to any in-combination effect, especially considering the level of precaution applied within assessments.
		Collision risk	No – as presented in Section 10.2.3, the assessment alone concluded potential for an intangible effect only, which would not materially contribute to any in-combination effect, especially considering the level of precaution applied within assessments.
	Fulmar	Barrier effects	No - as presented in Section 7.3.6, the assessment alone concluded potential for an intangible effect only, which would not materially contribute to any in-combination effect.
Cromarty Firth SPA	Bar-tailed godwit	Migratory collision risk	No - When considering the intangible impact contribution (Section 7.3.10) the Proposed Development (Offshore) would add to any

Designated Site	Features Screened In	Impact Pathway During O&M	Considered for In-combination?
			in-combination effect, combined with the conclusions of the strategic assessment (WWT and MacArthur Green, 2014) it can be confidently concluded there is no potential for an AEoSI for the Proposed Development (Offshore) in-combination with other plans and projects.
	Greylag goose	Migratory collision risk	No - When considering the intangible impact contribution (Section 7.3.10) the Proposed Development (Offshore) would add to any in-combination effect, combined with the conclusions of the strategic assessment (WWT and MacArthur Green, 2014) it can be confidently concluded there is no potential for an AEoSI for the Proposed Development (Offshore) in-combination with other plans and projects.
	Whooper swan	Migratory collision risk	No - When considering the intangible impact contribution (Section 7.3.10) the Proposed Development (Offshore) would add to any in-combination effect, combined with the conclusions of the strategic assessment (WWT and MacArthur Green, 2014) it can be confidently concluded there is no potential for an AEoSI for the Proposed Development (Offshore) in-combination with other plans and projects.
Cromarty Firth Ramsar	Bar-tailed godwit	Migratory collision risk	No - When considering the intangible impact contribution (Section 7.3.10) the Proposed Development (Offshore) would add to any in-combination effect, combined with the conclusions of the strategic assessment (WWT and MacArthur Green, 2014) it can be confidently concluded there is no potential for an AEoSI for the Proposed Development (Offshore) in-combination with other plans and projects.
	Greylag goose	Migratory collision risk	No - When considering the intangible impact contribution (Section 7.3.10) the Proposed Development (Offshore) would add to any in-combination effect, combined with the conclusions of the strategic assessment (WWT and MacArthur Green, 2014) it can be confidently concluded there is no potential for an AEoSI for the

Designated Site	Features Screened In	Impact Pathway During O&M	Considered for In-combination?
			Proposed Development (Offshore) in-combination with other plans and projects.
	Common tern	Migratory collision risk	No – As detailed in Section 7.3.10, Arctic tern was recorded in limited numbers within the 24 months of site specific DAS, as expected given the Proposed Development (Offshore) is outwith of the species foraging range (Woodward *et al*., 2019) and expected migratory corridor. Given the above information, the Proposed Development (Offshore) would certainly not provide any tangible contribution to any in-combination effect.
	Dunlin	Migratory collision risk	No - When considering the intangible impact contribution (Section 7.3.10) the Proposed Development (Offshore) would add to any in-combination effect, combined with the conclusions of the strategic assessment (WWT and MacArthur Green, 2014) it can be confidently concluded there is no potential for an AEoSI for the Proposed Development (Offshore) in-combination with other plans and projects.
	Knot	Migratory collision risk	No - When considering the intangible impact contribution (Section 7.3.10) the Proposed Development (Offshore) would add to any in-combination effect, combined with the conclusions of the strategic assessment (WWT and MacArthur Green, 2014) it can be confidently concluded there is no potential for an AEoSI for the Proposed Development (Offshore) in-combination with other plans and projects.
	Oystercatcher	Migratory collision risk	No - When considering the intangible impact contribution (Section 7.3.10) the Proposed Development (Offshore) would add to any in-combination effect, combined with the conclusions of the strategic assessment (WWT and MacArthur Green, 2014) it can be confidently concluded there is no potential for an AEoSI for the Proposed Development (Offshore) in-combination with other plans and projects.
	Red-breasted merganser	Migratory collision risk	No - When considering the intangible impact contribution (Section 7.3.10) the Proposed Development (Offshore) would add to any

Designated Site	Features Screened In	Impact Pathway During O&M	Considered for In-combination?
			in-combination effect, combined with the conclusions of the strategic assessment (WWT and MacArthur Green, 2014) it can be confidently concluded there is no potential for an AEoSI for the Proposed Development (Offshore) in-combination with other plans and projects.
	Redshank	Migratory collision risk	No - When considering the intangible impact contribution (Section 7.3.10) the Proposed Development (Offshore) would add to any in-combination effect, combined with the conclusions of the strategic assessment (WWT and MacArthur Green, 2014) it can be confidently concluded there is no potential for an AEoSI for the Proposed Development (Offshore) in-combination with other plans and projects.
	Scaup	Migratory collision risk	No - When considering the intangible impact contribution (Section 7.3.10) the Proposed Development (Offshore) would add to any in-combination effect, combined with the conclusions of the strategic assessment (WWT and MacArthur Green, 2014) it can be confidently concluded there is no potential for an AEoSI for the Proposed Development (Offshore) in-combination with other plans and projects.
	Wigeon	Migratory collision risk	No - When considering the intangible impact contribution (Section 7.3.10) the Proposed Development (Offshore) would add to any in-combination effect, combined with the conclusions of the strategic assessment (WWT and MacArthur Green, 2014) it can be confidently concluded there is no potential for an AEoSI for the Proposed Development (Offshore) in-combination with other plans and projects.
West Westray SPA	Guillemot	Distributional responses	Yes
	Razorbill	Distributional responses	No – as presented in Section 10.2.3, the assessment alone concluded potential for an intangible effect only, which would not materially contribute to any in-combination effect, especially considering the level of precaution applied within assessments.

Designated Site	Features Screened In	Impact Pathway During O&M	Considered for In-combination?
	Kittiwake	Distributional responses	No – as presented in Section 10.2.3, the assessment alone concluded potential for an intangible effect only, which would not materially contribute to any in-combination effect, especially considering the level of precaution applied within assessments.
		Collision risk	No – as presented in Section 10.2.3, the assessment alone concluded potential for an intangible effect only, which would not materially contribute to any in-combination effect, especially considering the level of precaution applied within assessments.
	Fulmar	Barrier effects	No - as presented in Section 7.3.6, the assessment alone concluded potential for an intangible effect only, which would not materially contribute to any in-combination effect.
Inner Moray Firth SPA	Bar-tailed godwit	Migratory collision risk	No - When considering the intangible impact contribution (Section 7.3.10) the Proposed Development (Offshore) would add to any in-combination effect, combined with the conclusions of the strategic assessment (WWT and MacArthur Green, 2014) it can be confidently concluded there is no potential for an AEoSI for the Proposed Development (Offshore) in-combination with other plans and projects.
	Greylag goose	Migratory collision risk	No - When considering the intangible impact contribution (Section 7.3.10) the Proposed Development (Offshore) would add to any in-combination effect, combined with the conclusions of the strategic assessment (WWT and MacArthur Green, 2014) it can be confidently concluded there is no potential for an AEoSI for the Proposed Development (Offshore) in-combination with other plans and projects.
	Red-breasted merganser	Migratory collision risk	No - When considering the intangible impact contribution (Section 7.3.10) the Proposed Development (Offshore) would add to any in-combination effect, combined with the conclusions of the strategic assessment (WWT and MacArthur Green, 2014) it can be confidently concluded there is no potential for an AEoSI for the Proposed Development (Offshore) in-combination with other plans and projects.

Designated Site	Features Screened In	Impact Pathway During O&M	Considered for In-combination?
	Redshank	Migratory collision risk	No - When considering the intangible impact contribution (Section 7.3.10) the Proposed Development (Offshore) would add to any in-combination effect, combined with the conclusions of the strategic assessment (WWT and MacArthur Green, 2014) it can be confidently concluded there is no potential for an AEoSI for the Proposed Development (Offshore) in-combination with other plans and projects.
	Curlew	Migratory collision risk	No - When considering the intangible impact contribution (Section 7.3.10) the Proposed Development (Offshore) would add to any in-combination effect, combined with the conclusions of the strategic assessment (WWT and MacArthur Green, 2014) it can be confidently concluded there is no potential for an AEoSI for the Proposed Development (Offshore) in-combination with other plans and projects.
	Goldeneye	Migratory collision risk	No - When considering the intangible impact contribution (Section 7.3.10) the Proposed Development (Offshore) would add to any in-combination effect, combined with the conclusions of the strategic assessment (WWT and MacArthur Green, 2014) it can be confidently concluded there is no potential for an AEoSI for the Proposed Development (Offshore) in-combination with other plans and projects.
	Oystercatcher	Migratory collision risk	No - When considering the intangible impact contribution (Section 7.3.10) the Proposed Development (Offshore) would add to any in-combination effect, combined with the conclusions of the strategic assessment (WWT and MacArthur Green, 2014) it can be confidently concluded there is no potential for an AEoSI for the Proposed Development (Offshore) in-combination with other plans and projects.
	Scaup	Migratory collision risk	No - When considering the intangible impact contribution (Section 7.3.10) the Proposed Development (Offshore) would add to any in-combination effect, combined with the conclusions of the strategic assessment (WWT and MacArthur Green, 2014) it can

Designated Site	Features Screened In	Impact Pathway During O&M	Considered for In-combination?
			be confidently concluded there is no potential for an AEoSI for the Proposed Development (Offshore) in-combination with other plans and projects.
	Teal	Migratory collision risk	No - When considering the intangible impact contribution (Section 7.3.10) the Proposed Development (Offshore) would add to any in-combination effect, combined with the conclusions of the strategic assessment (WWT and MacArthur Green, 2014) it can be confidently concluded there is no potential for an AEoSI for the Proposed Development (Offshore) in-combination with other plans and projects.
	Wigeon	Migratory collision risk	No - When considering the intangible impact contribution (Section 7.3.10) the Proposed Development (Offshore) would add to any in-combination effect, combined with the conclusions of the strategic assessment (WWT and MacArthur Green, 2014) it can be confidently concluded there is no potential for an AEoSI for the Proposed Development (Offshore) in-combination with other plans and projects.
Inner Moray Firth Ramsar	Bar-tailed godwit	Migratory collision risk	No - When considering the intangible impact contribution (Section 7.3.10) the Proposed Development (Offshore) would add to any in-combination effect, combined with the conclusions of the strategic assessment (WWT and MacArthur Green, 2014) it can be confidently concluded there is no potential for an AEoSI for the Proposed Development (Offshore) in-combination with other plans and projects.
	Greylag goose	Migratory collision risk	No - When considering the intangible impact contribution (Section 7.3.10) the Proposed Development (Offshore) would add to any in-combination effect, combined with the conclusions of the strategic assessment (WWT and MacArthur Green, 2014) it can be confidently concluded there is no potential for an AEoSI for the Proposed Development (Offshore) in-combination with other plans and projects.

Designated Site	Features Screened In	Impact Pathway During O&M	Considered for In-combination?
	Red-breasted merganser	Migratory collision risk	No - When considering the intangible impact contribution (Section 7.3.10) the Proposed Development (Offshore) would add to any in-combination effect, combined with the conclusions of the strategic assessment (WWT and MacArthur Green, 2014) it can be confidently concluded there is no potential for an AEoSI for the Proposed Development (Offshore) in-combination with other plans and projects.
	Redshank	Migratory collision risk	No - When considering the intangible impact contribution (Section 7.3.10) the Proposed Development (Offshore) would add to any in-combination effect, combined with the conclusions of the strategic assessment (WWT and MacArthur Green, 2014) it can be confidently concluded there is no potential for an AEoSI for the Proposed Development (Offshore) in-combination with other plans and projects.
Fowlsheugh SPA	Kittiwake	Distributional responses	No – as presented in Section 10.2.3, the assessment alone concluded potential for an intangible effect only, which would not materially contribute to any in-combination effect, especially considering the level of precaution applied within assessments.
		Collision risk	No – as presented in Section 10.2.3, the assessment alone concluded potential for an intangible effect only, which would not materially contribute to any in-combination effect, especially considering the level of precaution applied within assessments.
	Razorbill	Distributional responses	No – as presented in Section 10.2.3, the assessment alone concluded potential for an intangible effect only, which would not materially contribute to any in-combination effect, especially considering the level of precaution applied within assessments.
	Fulmar	Barrier effects	No - as presented in Section 7.3.6, the assessment alone concluded potential for an intangible effect only, which would not materially contribute to any in-combination effect.
Cape Wrath SPA	Puffin	Distributional responses	No – as presented in Section 10.2.3, the assessment alone concluded potential for an intangible effect only, which would not

Designated Site	Features Screened In	Impact Pathway During O&M	Considered for In-combination?
			materially contribute to any in-combination effect, especially considering the level of precaution applied within assessments.
	Kittiwake	Distributional responses	No – as presented in Section 10.2.3, the assessment alone concluded potential for an intangible effect only, which would not materially contribute to any in-combination effect, especially considering the level of precaution applied within assessments.
		Collision risk	No – as presented in Section 10.2.3, the assessment alone concluded potential for an intangible effect only, which would not materially contribute to any in-combination effect, especially considering the level of precaution applied within assessments.
	Fulmar	Barrier effects	No - as presented in Section 7.3.6, the assessment alone concluded potential for an intangible effect only, which would not materially contribute to any in-combination effect.
Sule Skerry and Sule Stack SPA	Gannet	Distributional responses	No – as presented in Section 10.2.3, the assessment alone concluded potential for an intangible effect only, which would not materially contribute to any in-combination effect, especially considering the level of precaution applied within assessments.
		Collision risk	No – as presented in Section 10.2.3, the assessment alone concluded potential for an intangible effect only, which would not materially contribute to any in-combination effect, especially considering the level of precaution applied within assessments.
	Puffin	Distributional responses	Yes
	Storm petrel	Distributional responses	No – As detailed within Section 7.3.4, no storm petrel species were recorded within the full 24 months of DAS suggesting no potential connectivity with any storm petrel features screened in for assessment. This conclusion is then corroborated when considering the additional evidence presented regarding storm petrel distribution. It can therefore be concluded, there is no potential for the Proposed Development (Offshore) to contribute to any in-combination effect.

Designated Site	Features Screened In	Impact Pathway During O&M	Considered for In-combination?
Fair Isle SPA	Gannet	Distributional responses	No – as presented in Section 10.2.3, the assessment alone concluded potential for an intangible effect only, which would not materially contribute to any in-combination effect, especially considering the level of precaution applied within assessments.
		Collision risk	No – as presented in Section 10.2.3, the assessment alone concluded potential for an intangible effect only, which would not materially contribute to any in-combination effect, especially considering the level of precaution applied within assessments.
	Razorbill	Distributional responses	No – as presented in Section 10.2.3, the assessment alone concluded potential for an intangible effect only, which would not materially contribute to any in-combination effect, especially considering the level of precaution applied within assessments.
	Puffin	Distributional responses	Yes
	Great skua	Collision risk	No – Assessment alone concluded potential for an intangible level of effect, that would be well within the error margins of the assessment, and therefore no potential for any contribution to an in-combination effect.
	Kittiwake	Distributional responses	No – as presented in Section 10.2.3, the assessment alone concluded potential for an intangible effect only, which would not materially contribute to any in-combination effect, especially considering the level of precaution applied within assessments.
		Collision risk	No – as presented in Section 10.2.3, the assessment alone concluded potential for an intangible effect only, which would not materially contribute to any in-combination effect, especially considering the level of precaution applied within assessments.
Sumburgh Head SPA	Kittiwake	Distributional responses	No – as presented in Section 10.2.3, the assessment alone concluded potential for an intangible effect only, which would not materially contribute to any in-combination effect, especially considering the level of precaution applied within assessments.

Designated Site	Features Screened In	Impact Pathway During O&M	Considered for In-combination?
		Collision risk	No – as presented in Section 10.2.3, the assessment alone concluded potential for an intangible effect only, which would not materially contribute to any in-combination effect, especially considering the level of precaution applied within assessments.
	Fulmar	Barrier effects	No - as presented in Section 7.3.6, the assessment alone concluded potential for an intangible effect only, which would not materially contribute to any in-combination effect.
Foula SPA	Great skua	Collision risk	No – as presented in Section 10.2.3, the assessment alone concluded potential for an intangible effect only, which would not materially contribute to any in-combination effect, especially considering the level of precaution applied within assessments.
	Kittiwake	Distributional responses	No – as presented in Section 10.2.3, the assessment alone concluded potential for an intangible effect only, which would not materially contribute to any in-combination effect, especially considering the level of precaution applied within assessments.
		Collision risk	No – as presented in Section 10.2.3, the assessment alone concluded potential for an intangible effect only, which would not materially contribute to any in-combination effect, especially considering the level of precaution applied within assessments.
	Puffin	Distributional responses	Yes
	Fulmar	Barrier effects	No - as presented in Section 7.3.6, the assessment alone concluded potential for an intangible effect only, which would not materially contribute to any in-combination effect.
North Rona and Sula Sgeir SPA	Gannet	Distributional responses	No – as presented in Section 10.2.3, the assessment alone concluded potential for an intangible effect only, which would not materially contribute to any in-combination effect, especially considering the level of precaution applied within assessments.
		Collision risk	No – as presented in Section 10.2.3, the assessment alone concluded potential for an intangible effect only, which would not

Designated Site	Features Screened In	Impact Pathway During O&M	Considered for In-combination?
			materially contribute to any in-combination effect, especially considering the level of precaution applied within assessments.
	Storm petrel	Distributional responses	No – As detailed within Section 7.3.4, no storm petrel species were recorded within the full 24 months of DAS suggesting no potential connectivity with any storm petrel features screened in for assessment. This conclusion is then corroborated when considering the additional evidence presented regarding storm petrel distribution. It can therefore be concluded, there is no potential for the Proposed Development (Offshore) to contribute to any in-combination effect.
	Kittiwake	Distributional responses	No – as presented in Section 10.2.3, the assessment alone concluded potential for an intangible effect only, which would not materially contribute to any in-combination effect, especially considering the level of precaution applied within assessments.
		Collision risk	No – as presented in Section 10.2.3, the assessment alone concluded potential for an intangible effect only, which would not materially contribute to any in-combination effect, especially considering the level of precaution applied within assessments.
	Puffin	Distributional responses	No – as presented in Section 10.2.3, the assessment alone concluded potential for an intangible effect only, which would not materially contribute to any in-combination effect, especially considering the level of precaution applied within assessments.
	Fulmar	Barrier effects	No - as presented in Section 7.3.6, the assessment alone concluded potential for an intangible effect only, which would not materially contribute to any in-combination effect.
Mousa SPA	Storm petrel	Distributional responses	No – As detailed within Section 7.3.4, no storm petrel species were recorded within the full 24 months of DAS suggesting no potential connectivity with any storm petrel features screened in for assessment. This conclusion is then corroborated when considering the additional evidence presented regarding storm petrel distribution. It can therefore be concluded, there is no

Designated Site	Features Screened In	Impact Pathway During O&M	Considered for In-combination?
			potential for the Proposed Development (Offshore) to contribute to any in-combination effect.
Forth Islands SPA	Gannet	Distributional responses	Yes
		Collision risk	Yes
	Razorbill	Distributional responses	No – as presented in Section 10.2.3, the assessment alone concluded potential for an intangible effect only, which would not materially contribute to any in-combination effect, especially considering the level of precaution applied within assessments.
	Kittiwake	Distributional responses	No – as presented in Section 10.2.3, the assessment alone concluded potential for an intangible effect only, which would not materially contribute to any in-combination effect, especially considering the level of precaution applied within assessments.
		Collision risk	No – as presented in Section 10.2.3, the assessment alone concluded potential for an intangible effect only, which would not materially contribute to any in-combination effect, especially considering the level of precaution applied within assessments.
Noss SPA	Gannet	Distributional responses	No – as presented in Section 10.2.3, the assessment alone concluded potential for an intangible effect only, which would not materially contribute to any in-combination effect, especially considering the level of precaution applied within assessments.
		Collision risk	No – as presented in Section 10.2.3, the assessment alone concluded potential for an intangible effect only, which would not materially contribute to any in-combination effect, especially considering the level of precaution applied within assessments.
	Great skua	Collision risk	No – as presented in Section 10.2.3, the assessment alone concluded potential for an intangible effect only, which would not materially contribute to any in-combination effect, especially considering the level of precaution applied within assessments and low connectivity with the site feature.

Designated Site	Features Screened In	Impact Pathway During O&M	Considered for In-combination?
	Kittiwake	Distributional responses;	No – as presented in Section 10.2.3, the assessment alone concluded potential for an intangible effect only, which would not materially contribute to any in-combination effect, especially considering the level of precaution applied within assessments.
		Collision risk	No – as presented in Section 10.2.3, the assessment alone concluded potential for an intangible effect only, which would not materially contribute to any in-combination effect, especially considering the level of precaution applied within assessments.
	Puffin	Distributional responses	No – as presented in Section 10.2.3, the assessment alone concluded potential for an intangible effect only, which would not materially contribute to any in-combination effect, especially considering the level of precaution applied within assessments.
	Fulmar	Barrier effects	No - as presented in Section 7.3.6, the assessment alone concluded potential for an intangible effect only, which would not materially contribute to any in-combination effect.
St Abb's Head to Fast Castle SPA	Kittiwake	Distributional responses	No – as presented in Section 10.2.3, the assessment alone concluded potential for an intangible effect only, which would not materially contribute to any in-combination effect, especially considering the level of precaution applied within assessments.
		Collision risk	No – as presented in Section 10.2.3, the assessment alone concluded potential for an intangible effect only, which would not materially contribute to any in-combination effect, especially considering the level of precaution applied within assessments.
Farne Islands SPA	Kittiwake	Distributional responses	No – as presented in Section 10.2.3, the assessment alone concluded potential for an intangible effect only, which would not materially contribute to any in-combination effect, especially considering the level of precaution applied within assessments.
		Collision risk	No – as presented in Section 10.2.3, the assessment alone concluded potential for an intangible effect only, which would not materially contribute to any in-combination effect, especially considering the level of precaution applied within assessments.

Designated Site	Features Screened In	Impact Pathway During O&M	Considered for In-combination?
Ronas Hill – North Roe and Tingon SPA	Great skua	Collision risk	No – as presented in Section 10.2.3, the assessment alone concluded potential for an intangible effect only, which would not materially contribute to any in-combination effect, especially considering the level of precaution applied within assessments and low connectivity with the site feature.
Fetlar SPA	Great skua	Collision risk	No – as presented in Section 10.2.3, the assessment alone concluded potential for an intangible effect only, which would not materially contribute to any in-combination effect, especially considering the level of precaution applied within assessments and low connectivity with the site feature.
	Fulmar	Barrier effects	No - as presented in Section 7.3.6, the assessment alone concluded potential for an intangible effect only, which would not materially contribute to any in-combination effect.
Hermaness, Saxa Vord and Valla Field SPA	Kittiwake	Distributional responses	No – as presented in Section 10.2.3, the assessment alone concluded potential for an intangible effect only, which would not materially contribute to any in-combination effect, especially considering the level of precaution applied within assessments.
		Collision risk	No – as presented in Section 10.2.3, the assessment alone concluded potential for an intangible effect only, which would not materially contribute to any in-combination effect, especially considering the level of precaution applied within assessments.
	Gannet	Distributional responses	Yes
		Collision risk	Yes
	Great skua	Collision risk	No – as presented in Section 10.2.3, the assessment alone concluded potential for an intangible effect only, which would not materially contribute to any in-combination effect, especially considering the level of precaution applied within assessments and low connectivity with the site feature.

Designated Site	Features Screened In	Impact Pathway During O&M	Considered for In-combination?
	Fulmar	Barrier effects	No - as presented in Section 7.3.6, the assessment alone concluded potential for an intangible effect only, which would not materially contribute to any in-combination effect.
Handa SPA	Kittiwake	Distributional responses	No – as presented in Section 10.2.3, the assessment alone concluded potential for an intangible effect only, which would not materially contribute to any in-combination effect, especially considering the level of precaution applied within assessments.
		Collision risk	No – as presented in Section 10.2.3, the assessment alone concluded potential for an intangible effect only, which would not materially contribute to any in-combination effect, especially considering the level of precaution applied within assessments.
	Great skua	Collison risk	No – as presented in Section 10.2.3, the assessment alone concluded potential for an intangible effect only, which would not materially contribute to any in-combination effect, especially considering the level of precaution applied within assessments and low connectivity with the site feature.
	Fulmar	Barrier effects	No - as presented in Section 7.3.6, the assessment alone concluded potential for an intangible effect only, which would not materially contribute to any in-combination effect.
Shiant Isles SPA	Kittiwake	Distributional responses	No – as presented in Section 10.2.3, the assessment alone concluded potential for an intangible effect only, which would not materially contribute to any in-combination effect, especially considering the level of precaution applied within assessments.
		Collision risk	No – as presented in Section 10.2.3, the assessment alone concluded potential for an intangible effect only, which would not materially contribute to any in-combination effect, especially considering the level of precaution applied within assessments.
	Fulmar	Barrier effects	No - as presented in Section 7.3.6, the assessment alone concluded potential for an intangible effect only, which would not materially contribute to any in-combination effect.

Designated Site	Features Screened In	Impact Pathway During O&M	Considered for In-combination?
St Kilda SPA	Great skua	Collison risk	No – as presented in Section 10.2.3, the assessment alone concluded potential for an intangible effect only, which would not materially contribute to any in-combination effect, especially considering the level of precaution applied within assessments and low connectivity with the site feature.
	Fulmar	Barrier effects	No - as presented in Section 7.3.6, the assessment alone concluded potential for an intangible effect only, which would not materially contribute to any in-combination effect.
Flamborough and Filey Coast SPA	Gannet	Distributional responses	No – as presented in Section 10.2.3, the assessment alone concluded potential for an intangible effect only, which would not materially contribute to any in-combination effect, especially considering the level of precaution applied within assessments.
		Collision risk	No – as presented in Section 10.2.3, the assessment alone concluded potential for an intangible effect only, which would not materially contribute to any in-combination effect, especially considering the level of precaution applied within assessments.
	Fulmar	Barrier effects	No - as presented in Section 7.3.6, the assessment alone concluded potential for an intangible effect only, which would not materially contribute to any in-combination effect.
Coquet Island SPA	Fulmar	Barrier effects	No - as presented in Section 7.3.6, the assessment alone concluded potential for an intangible effect only, which would not materially contribute to any in-combination effect.
Ythan Estuary SPA	Sandwich tern	Distributional responses (Caledonia OECC)	No - as presented in Section 7.3.8, the assessment alone concluded potential for an intangible effect only, which would not materially contribute to any in-combination effect.

East Caithness Cliffs SPA

Kittiwake

10.3.3.7 Kittiwake has been screened in to assess the impacts from distributional responses and collision risk from the Proposed Development (Offshore) during the O&M phase in-combination with other projects in relation to the following relevant conservation objective for this species, as a feature of the SPA:

- Maintain the population as a viable component of the site.

Distributional Responses

10.3.3.8 Projects identified for in-combination distributional response for the kittiwake feature of East Caithness Cliffs SPA are listed in Table 10-102, with the respective impact predictions for the different seasonal in-combination scenarios presented in Table 10-103. The predicted apportioned abundance for planned and operational projects included within Table 10-102, are primarily based on the Northeast and East Scotwind Projects Cumulative totals dataset (RoyalHaskoningDHV, 2024[136]), with the addition of abundance totals for Five Estuaries (GoBe, 2024a[137]), Outer Dowsing (GoBe, 2024b[138]), Rampion (APEM, 2024[139]), Rampion 2 (APEM, 2023[140]), Ossian (NIRAS and RPS, 2024[141]) and Salamander (ERM, 2024[142]) derived from their respective RIAAs.

10.3.3.9 Due to English projects ruling out the potential for a LSE in relation to distributional response effects for kittiwake features all projects in English waters have been excluded from in-combination assessment for this impact pathway.

10.3.3.10 Kittiwake have been assessed for distributional responses as requested by NatureScot within consultation; however, the Applicant remains of the position that kittiwake do not require assessment for distributional responses due to the evidence base detailed within Volume 7B, Appendix 6-2, Annex 4: Review of Relevant Evidence suggesting kittiwake show limited behavioural response to OWFs. A Guidance approach only is, therefore, presented for kittiwake based on a displacement rate of 30% and a 1-3% mortality rate for O&M phase distributional response impacts in-combination.

10.3.3.11 A displacement matrix is also presented for the annual apportioned in-combination abundance for East Caithness Cliffs SPA, when considering the all projects scenarios presented in Table 10-103.

Table 10-102: In-combination abundance totals for kittiwake attributed to East Caithness Cliffs SPA.

Development	Predicted Abundance		
	Breeding Season	Non-breeding Season	Total
Aberdeen (EOWDC)	-	3	3
Beatrice	2,000	151	2,151
Berwick Bank (Scoping Approach)	17	1,717	1,734
Blyth Demonstration Site	-	100	100
Culzean	-	-	-
Dogger Bank A & B	-	-	-
Dogger Bank C & Sofia	-	-	-
Dogger Bank South	-	-	-
Dudgeon	-	-	-
East Anglia One	-	-	-
East Anglia ONE North	-	-	-
East Anglia Three	-	-	-
East Anglia TWO	-	-	-
Five Estuaries	-	-	-
Galloper	-	-	-
Greater Gabbard	-	-	-
Green Volt	19	15	34
Gunfleet Sands	-	-	-
Hornsea Four	-	-	-
Hornsea Project One	-	-	-
Hornsea Project Two	-	-	-
Hornsea Three	-	-	-
Humber Gateway	-	-	-

Development	Predicted Abundance		
	Breeding Season	Non-breeding Season	Total
Hywind 2 Demonstration	-	-	-
Inch Cape	-	145	145
Kentish Flats	-	-	-
Kentish Flats Extension	-	-	-
Kincardine	-	-	-
Lincs, Lynn & Inner Dowsing	-	-	-
London Array	-	-	-
Methil	-	-	-
Moray East	3,833	-	3,833
Moray West	5,000	169	5,169
Neart na Gaoithe	-	129	129
Norfolk Boreas	-	-	-
Norfolk Vanguard	-	-	-
North Falls	-	-	-
Outer Dowsing	-	-	-
Pentland Floating OWF	38	10	48
Race Bank	-	-	-
Rampion	-	-	-
Rampion 2	-	-	-
Scroby Sands	-	-	-
Seagreen Alpha & Bravo	-	-	-
Sheringham Shoal	-	-	-
Sheringham Shoal and Dudgeon Extension Project	-	-	-
Teesside	-	-	-

Development	Predicted Abundance		
	Breeding Season	Non-breeding Season	Total
Thanet	-	-	-
Triton Knoll	-	-	-
Westermost Rough	-	-	-
Ossian	167	78	244
Salamander	184	17	201
West of Orkney[ii]	162	141	303
Caledonia	499	28	527
All Projects	11,919	2,702	14,621
All Projects Excl. Berwick Bank	11,902	985	12,887
Consented (plus Caledonia)	11,389	750	12,139

[ii] These numbers for West of Orkney are subject to change, but have been included to support this assessment on a precautionary basis.

Table 10-103: Seasonal and annual displacement estimates of kittiwake for the Proposed Development (Offshore) in-combination with other projects during the operational phase, as per the Guidance Approach.

Population Size (Breeding Adults)	Defined Season	Estimated Number of Mortalities (Individuals Per Annum) (Displacement Rate; Mortality Rate)		Change in Average Survival Rate (% Point Change) (Displacement Rate; Mortality Rate)	
		30%; 1%	30%; 3%	30%; 1%	30%; 3%
All Projects					
Citation (65,000)	Breeding season (Mid-April to August)	35.76	107.27	0.055	0.165
	Non-breeding season (September to early-April)	8.11	24.32	0.012	0.037
	Annual total	43.86	131.59	0.067	0.202
Latest (48,920)	Breeding season (Mid-April to August)	35.76	107.27	0.073	0.219
	Non-breeding season (September to early-April)	8.11	24.32	0.017	0.050
	Annual total	43.86	131.59	0.090	0.269
All Projects Excluding Berwick Bank					
Citation (65,000)	Breeding season (Mid-April to August)	35.71	107.12	0.055	0.165
	Non-breeding season (September to early-April)	2.96	8.87	0.005	0.014
	Annual total	38.66	115.99	0.059	0.178
Latest (48,920)	Breeding season (Mid-April to August)	35.71	107.12	0.073	0.219

Population Size (Breeding Adults)	Defined Season	Estimated Number of Mortalities (Individuals Per Annum) (Displacement Rate; Mortality Rate)		Change in Average Survival Rate (% Point Change) (Displacement Rate; Mortality Rate)	
		30%; 1%	30%; 3%	30%; 1%	30%; 3%
	Non-breeding season (September to early-April)	2.96	8.87	0.006	0.018
	Annual total	38.66	115.99	0.079	0.237
All Consented Projects plus Caledonia					
Citation (65,000)	Breeding season (Mid-April to August)	34.17	102.50	0.053	0.158
	Non-breeding season (September to early-April)	2.25	6.75	0.003	0.010
	Annual total	36.42	109.25	0.056	0.168
Latest (48,920)	Breeding season (Mid-April to August)	34.17	102.50	0.070	0.210
	Non-breeding season (September to early-April)	2.25	6.75	0.004	0.014
	Annual total	36.42	109.25	0.074	0.233

Breeding Season

10.3.3.12 During the breeding season, the in-combination abundance for kittiwake is up to 11,919 (11,389.42 - 11,918.95) breeding adults of East Caithness Cliffs SPA, depending on the scenario under consideration (Table 10-102). Assuming a displacement rate of 30% and a mortality rate of 1 to 3%, the consequent potential mortality is estimated to be up to 36 to 107 (34.17 - 102.50 and 35.76 - 107.27) breeding adults per annum during the breeding season, depending on the scenario under consideration.

10.3.3.13 Using the citation colony count of 65,000 breeding adults and an annual background mortality of 9,490 breeding adults, the addition of 36 to 107 predicted breeding adult mortalities per annum would result in a 0.055 to 0.165 survival rate percentage point change during the breeding season per annum. When considering the most up to date counts of 48,920 breeding adults and an annual background mortality of 7,142 breeding adults, this results in a 0.070 to 0.219 survival rate percentage point change during the breeding season per annum (Table 10-103).

Non-Breeding Season

10.3.3.14 During the non-breeding season, the in-combination abundance for kittiwake is up to 2,702 (749.65 - 2,702.20) individuals of East Caithness Cliffs SPA, depending on the scenario under consideration (Table 10-102). Assuming a displacement rate of 30% and a mortality rate of 1 to 3%, the consequent potential mortality is estimated to be up to eight to 24 (2.25 - 6.75 and 8.11 - 24.32) breeding adults per annum during the non-breeding season.

10.3.3.15 Using the citation colony count of 65,000 breeding adults and an annual background mortality of 9,490 breeding adults, the addition of eight to 24 predicted breeding adult mortalities would result in a 0.012 - 0.037 survival rate percentage point change during the non-breeding season per annum. When considering the most up to date counts of 48,920 breeding adults and an annual background mortality of 7,142 breeding adults, this results in a 0.017 to 0.050 survival rate percentage point change during the non-breeding season per annum (Table 10-103).

Annual Total

10.3.3.16 The annual total of kittiwake subject to mortality due to in-combination distributional response at East Caithness Cliffs SPA is estimated to be between 44 to 132 (43.86 - 131.59) breeding adults per annum when considering all projects presented in Table 10-102. This is predicted to result in a survival rate percentage point change against the citation and most recently published counts of 0.067 - 0.202 and 0.090 - 0.269, respectively (see Table 10-103).

10.3.3.17 To note, the removal of Berwick Bank from the assessment reduces predicted mortality to be 39 to 116 (38.66 - 115.99) breeding birds per annum. Using the citation colony count and most recently published count, this equates to a 0.059 - 0.178 and 0.079 - 0.237 percentage point survival rate change within this population respectively.

10.3.3.18 As the survival rate percentage point change exceeds NatureScot's threshold of 0.02% when considering the Guidance approach, further consideration of the level of effect predicted has been analysed using PVA.

10.3.3.19 As consideration of two impacts are needed for kittiwake, in order to simplify the assessment a single review of combined distribution response and collision risk are provided in Table 10-108.

Table 10-104: Kittiwake O&M phase disturbance annual in-combination displacement matrix for all projects impacts apportioned to East Caithness Cliffs SPA.

Annual Total Displacement Rate (%)	Mortality Rate (%)													
	1	2	3	5	10	20	30	40	50	60	70	80	90	100
10	15	29	44	73	146	292	439	585	731	877	1,023	1,170	1,316	1,462
20	29	58	88	146	292	585	877	1,170	1,462	1,755	2,047	2,339	2,632	2,924
30	44	88	132	219	439	877	1,316	1,755	2,193	2,632	3,070	3,509	3,948	4,386
40	58	117	175	292	585	1,170	1,755	2,339	2,924	3,509	4,094	4,679	5,264	5,848
50	73	146	219	366	731	1,462	2,193	2,924	3,655	4,386	5,117	5,848	6,580	7,311
60	88	175	263	439	877	1,755	2,632	3,509	4,386	5,264	6,141	7,018	7,895	8,773
70	102	205	307	512	1,023	2,047	3,070	4,094	5,117	6,141	7,164	8,188	9,211	10,235
80	117	234	351	585	1,170	2,339	3,509	4,679	5,848	7,018	8,188	9,358	10,527	11,697
90	132	263	395	658	1,316	2,632	3,948	5,264	6,580	7,895	9,211	10,527	11,843	13,159
100	146	292	439	731	1,462	2,924	4,386	5,848	7,311	8,773	10,235	11,697	13,159	14,621
Note, outputs highlighted in dark blue represent the predicted annual mortality estimates as per the Guidance Approach. For further information regarding the Guidance and Applicant Approach see Section 2.5 of Volume 7B, Appendix 6-2: Offshore Ornithology Distributional Responses Technical Report and Volume 7B, Appendix 6-2, Annex 4: Review of Relevant Evidence.														

Collision Risk

10.3.3.20 Projects identified for in-combination collision risk for the kittiwake feature of East Caithness Cliffs SPA are listed in Table 10-105, with the respective impact predictions for the different in-combination scenarios presented in Table 10-106.

10.3.3.21 Estimated collision risk for kittiwake per defined season for each project in-scope for in-combination assessment are presented in Table 10-106. The predicted collisions for planned and operational projects included within Table 10-105, are primarily based on the Northeast and East Scotwind Projects Cumulative totals dataset (excluding as-built updates), with the addition/ update of totals for Five Estuaries (GoBe, 2024a[137]), Outer Dowsing (GoBe, 2024b[138]), Rampion (APEM, 2024[139]), Rampion 2 (APEM, 2023[140]), Ossian (NIRAS and RPS, 2024[141]) and Salamander (ERM, 2024[142]). Additionally, since publication of the Northeast and East Scotwind Projects in-combination totals dataset, a further guidance update has occurred regarding recommended avoidance rate (Joint SNCB, 2024[143]) for kittiwake. This update has therefore been applied accordingly where appropriate to projects which historically used an avoidance rate of 0.989, to align with the recommendation of an avoidance rate of 0.9929.

Table 10-105: In-combination collision totals per season and annually to East Caithness Cliffs SPA.

Development	Predicted Collisions		
	Breeding Season	Non-breeding Season	Total
Aberdeen (EOWDC)	-	0.27	0.27
Beatrice	16.05	2.39	18.43
Berwick Bank (Scoping Approach)	0.32	16.14	16.46
Blyth Demonstration Site	-	0.16	0.16
Culzean	-	-	-
Dogger Bank A & B	-	19.81	19.81
Dogger Bank C & Sofia	-	14.23	14.23
Dogger Bank South	-	4.46	4.46
Dudgeon	-	-	-
East Anglia One	-	8.38	8.38
East Anglia ONE North	-	0.48	0.48

Development	Predicted Collisions		
	Breeding Season	Non-breeding Season	Total
East Anglia Three	-	4.47	4.47
East Anglia TWO	-	0.57	0.57
Five Estuaries	-	0.75	0.75
Galloper	-	2.63	2.63
Greater Gabbard	-	1.13	1.13
Green Volt	0.52	0.45	0.97
Gunfleet Sands	-	-	-
Hornsea Four	-	0.75	0.75
Hornsea Project One	-	3.15	3.15
Hornsea Project Two	-	0.49	0.49
Hornsea Three	-	1.83	1.83
Humber Gateway	-	0.22	0.22
Hywind 2 Demonstration	-	0.08	0.08
Inch Cape	-	1.28	1.28
Kentish Flats	-	0.07	0.07
Kentish Flats Extension	-	0.13	0.13
Kincardine	-	0.39	0.39
Lincs, Lynn & Inner Dowsing	-	0.08	0.08
London Array	-	0.18	0.18
Methil	-	0.00	0.00
Moray East	10.33	0.32	10.65
Moray West	32.31	1.22	33.53
Neart na Gaoithe	-	0.74	0.74
Norfolk Boreas	-	1.81	1.81
Norfolk Vanguard	-	1.58	1.58

Development	Predicted Collisions		
	Breeding Season	Non-breeding Season	Total
North Falls	-	1.67	1.67
Outer Dowsing	-	0.40	0.40
Pentland Floating OWF	0.36	0.04	0.40
Race Bank	-	1.18	1.18
Rampion	-	0.84	0.84
Rampion 2	-	1.23	1.23
Scroby Sands	-	-	-
Seagreen Alpha & Bravo	-	9.23	9.23
Sheringham Shoal	-	-	-
Sheringham Shoal and Dudgeon Extension Project	-	0.32	0.32
Teesside	-	1.03	1.03
Thanet	-	0.04	0.04
Triton Knoll	-	7.50	7.50
Westermost Rough	-	0.01	0.01
Ossian	1.40	0.80	2.20
Salamander	0.73	0.10	0.83
West of Orkney[iii]	2.41	16.96	19.37
Caledonia	13.53	0.77	14.30
All Projects	77.96	132.76	210.71
All Projects Excl. Berwick Bank	77.63	116.62	194.25
Consented (plus Caledonia)	73.09	95.45	168.55

[iii] These numbers for West of Orkney are subject to change, but have been included to support this assessment on a precautionary basis.

Table 10-106: Seasonal and annual collision risk estimates of kittiwake for the Proposed Development (Offshore) in-combination with other projects during the operational phase, as per the Guidance Approach.

Population Size (Breeding Adults)	Defined Season	Estimated Number of Mortalities (Individuals Per Annum)	Change in Average Survival Rate (% Point Change)
All Projects			
Citation (65,000)	Breeding season (Mid-April to August)	77.96	0.120
	Non-breeding season (September to early-April)	132.76	0.204
	Annual total	210.71	0.324
Latest (48,920)	Breeding season (Mid-April to August)	11,918.95	0.159
	Non-breeding season (September to early-April)	2,702.20	0.271
	Annual total	14,621.16	0.431
All Projects Excluding Berwick Bank			
Citation (65,000)	Breeding season (Mid-April to August)	77.63	0.119
	Non-breeding season (September to early-April)	116.62	0.179
	Annual total	194.25	0.299
Latest (48,920)	Breeding season (Mid-April to August)	77.63	0.159
	Non-breeding season (September to early-April)	116.62	0.238
	Annual total	194.25	0.397
All Consented Projects plus Caledonia			
Citation (65,000)	Breeding season (Mid-April to August)	73.09	0.112

Population Size (Breeding Adults)	Defined Season	Estimated Number of Mortalities (Individuals Per Annum)	Change in Average Survival Rate (% Point Change)
	Non-breeding season (September to early-April)	95.45	0.147
	Annual total	168.55	0.259
Latest (48,920)	Breeding season (Mid-April to August)	73.09	0.149
	Non-breeding season (September to early-April)	95.45	0.195
	Annual total	168.55	0.345

Breeding Season

10.3.3.22 During the breeding season, up to 78 (73.09 to 77.96) breeding adult kittiwakes of the East Caithness Cliffs SPA are predicted to be subject to collision mortality per annum, when considering all projects in-combination presented in Table 10-105.

10.3.3.23 Using the citation colony count of 65,000 breeding adults and an annual background mortality of 9,490 breeding adults, the addition of 78 predicted breeding adult mortalities would result in a 0.120 survival rate percentage point change during the breeding season per annum. When considering the most up to date counts of 48,920 breeding adults and an annual background mortality of 7,142 breeding adults, this results in a 0.159 survival rate percentage point change during the breeding season per annum (Table 10-106).

Non-Breeding Season

10.3.3.24 During the non-breeding season, up to 133 (95.45 to 132.76) kittiwakes of the East Caithness Cliffs SPA are predicted to be subject to collision mortality per annum, when considering the all projects in-combination scenario presented in Table 10-105.

10.3.3.25 Using the citation colony count of 65,000 breeding adults and an annual background mortality of 9,490 breeding adults, the addition of 133 predicted breeding adult mortalities would result in a 0.204 survival rate percentage point change during the breeding season per annum. When considering the most up to date counts of 48,920 breeding adults and an annual background mortality of 7,142 breeding adults, this results in a 0271 survival rate percentage point change during the breeding season per annum (Table 10-106).

Annual Total

10.3.3.26 The annual total of kittiwake subject to mortality due to collision at East Caithness Cliffs SPA is estimated to be up to 211 (168.55 to 210.71) breeding adults per annum for all projects in-combination. This is predicted to result in a survival rate percentage point change against the citation and most recently published counts of 0.324 and 0.431, respectively (see Table 10-106).

10.3.3.27 To note, the removal of Berwick Bank from the assessment reduces predicted mortality to 194 (194.25) breeding adults per annum. Using the citation colony count and most recently published count, this equates to a 0.299 and 0.397 percentage point survival rate change within this population respectively.

10.3.3.28 As the survival rate percentage point change exceeds NatureScot's threshold of 0.02%, further consideration of the level of effect predicted has been analysed using PVA.

10.3.3.29 As consideration of two impacts are needed for kittiwake in order to simplify the assessment a single review of combined distribution response and collision risk are provided in Table 10-107.

Combined Distributional Response and Collision Risk

10.3.3.30 Projects identified for in-combination combined distributional response and collision risk for the kittiwake feature of East Caithness Cliff SPA are listed in Table 10-102 and Table 10-105 with the respective impact predictions for the different seasonal in-combination scenarios are presented in Table 10-102 and Table 10-105.

Table 10-107: Seasonal and annual distributional responses and collision risk estimates of kittiwake for the Proposed Development (Offshore) in-combination with other projects during the operational phase, as per the Guidance Approach, for East Caithness Cliffs.

Population Size (Breeding Adults)	Defined Season	Estimated number of mortalities from combined CRM and Distributional responses per annum		Change in Average Survival Rate (% Point Change) (Displacement Rate; Mortality Rate)	
		30%; 1%	30%; 3%	30%; 1%	30%; 3%
All Projects					
Citation (65,000)	Breeding season (Mid-April to August)	35.99	107.97	0.175	0.285
	Non-breeding season (September to early-April)	8.50	25.51	0.217	0.242
	Annual total	44.50	133.49	0.392	0.527
Latest (48,920)	Breeding season (Mid-April to August)	35.99	107.97	0.232	0.379
	Non-breeding season (September to early-April)	8.50	25.51	0.288	0.321
	Annual total	44.50	133.49	0.520	0.700
All Projects Excluding Berwick Bank					
Citation (65,000)	Breeding season (Mid-April to August)	35.94	107.82	0.174	0.284

Population Size (Breeding Adults)	Defined Season	Estimated number of mortalities from combined CRM and Distributional responses per annum		Change in Average Survival Rate (% Point Change) (Displacement Rate; Mortality Rate)	
		30%; 1%	30%; 3%	30%; 1%	30%; 3%
	Non-breeding season (September to early-April)	3.35	10.06	0.184	0.193
	Annual total	39.29	117.88	0.358	0.477
Latest (48,920)	Breeding season (Mid-April to August)	35.94	107.82	0.232	0.378
	Non-breeding season (September to early-April)	3.35	10.06	0.244	0.257
	Annual total	39.29	117.88	0.476	0.634
All Consented Projects plus Caledonia					
Citation (65,000)	Breeding season (Mid-April to August)	34.39	103.16	0.165	0.270
	Non-breeding season (September to early-April)	2.54	7.61	0.150	0.157
	Annual total	36.92	110.77	0.315	0.427
Latest (48,920)	Breeding season (Mid-April to August)	34.39	103.16	0.219	0.359

Population Size (Breeding Adults)	Defined Season	Estimated number of mortalities from combined CRM and Distributional responses per annum		Change in Average Survival Rate (% Point Change) (Displacement Rate; Mortality Rate)	
		30%; 1%	30%; 3%	30%; 1%	30%; 3%
	Non-breeding season (September to early-April)	2.54	7.61	0.200	0.209
	Annual total	36.92	110.77	0.419	0.568

10.3.3.31 As presented in Table 10-107, for all combined in-combination collision risk and distributional response scenarios considered, the percentage point change in survival rate exceeded the 0.02 threshold as set by NatureScot, PVA has therefore been completed for these scenarios to further consider such a level of effect.

Population Viability Analysis

10.3.3.32 The potential for distributional responses and collision risk separately and combined has been assessed against the latest 2016 colony count population size of 48,920 breeding adults according to Swann (2016[84]) database. A range of impact values from 205 (204.96) to 342 (342.30) breeding adult additional mortalities per annum were modelled when considering the in-combination scenarios in Table 10-108. This allows for the Guidance approach predicted impact levels.

10.3.3.33 The PVA outputs for the kittiwake feature of East Caithness Cliffs SPA predicted a reduction in the growth rate of between 0.496 – 0.827% annually when considering an increase of 205 to 342 additional breeding adult mortalities per annum based on the Guidance approach of a 30% displacement and 1-3% mortality rate (Table 10-108).

10.3.3.34 When considering such predicted reductions in annual growth rate, it is important to consider the known colony growth trend to understand the colony's resilience. The known population sizes for the kittiwake feature of East Caithness Cliffs would suggest significant decreases in population size between the 1985-1987 citation count of 65,000 breeding adults and the latest 2016 colony count of 48,920 breeding adults. As significant declines in kittiwake have been recorded at the East Caithness Cliffs SPA (Burnell *et al.*, 2023[86]), the level of in-combination impact predicted would likely compromise the resilience of the colony over the 35 year period. In light of the above information, although the level of predicted impact of the project alone is considered small, **the potential for an AEoSI is therefore concluded when considering the level of potential effect predicted from the Guidance approach in-combination**.

Table 10-108: PVA results for the kittiwake feature of East Caithness Cliffs SPA when considering combined distributional response and collision risk effects for the Proposed Development (Offshore) alone and in-combination.

Scenario	Season	Predicted Mortality	Median Growth rate (±SD)	Median Pop. Size (±SD)	Decrease in CGR per annum (%)	Decrease in CPS after 35 years (%)
Caledonia South						
Alone - collision	Breeding	10.51	1.000 (<0.001)	0.991 (0.018)	0.026	0.934
	Annual Total	10.96	1.000 (<0.001)	0.991 (0.019)	0.025	0.927
Alone; combined - Guidance (30%, 1%)	Breeding	11.74	1.000 (<0.001)	0.989 (0.018)	0.029	1.072
	Annual Total	12.16	1.000 (<0.001)	0.989 (0.019)	0.030	1.138
Alone; combined - Guidance (30%, 3%)	Breeding	13.71	1.000 (<0.001)	0.988 (0.019)	0.033	1.207
	Annual Total	14.68	1.000 (<0.001)	0.987 (0.018)	0.035	1.266
Caledonia OWF						
Alone - collision	Breeding	13.70	1.000 (<0.001)	0.986 (0.018)	0.039	1.402
	Annual Total	14.30	1.000 (<0.001)	0.983 (0.018)	0.047	1.675
	Annual Total	15.65	1.000 (<0.001)	0.988 (0.018)	0.033	1.152
	Annual Total	19.01	1.000 (<0.001)	0.988 (0.018)	0.035	1.218
In-combination all consented projects plus Caledonia OWF						
	Breeding	107.26	0.997 (<0.001)	0.911 (0.017)	0.259	8.897

Scenario	Season	Predicted Mortality	Median Growth rate (±SD)	Median Pop. Size (±SD)	Decrease in CGR per annum (%)	Decrease in CPS after 35 years (%)
Combined - Guidance (30%, 1%)	Non-breeding	97.70	0.998 (<0.001)	0.918 (0.017)	0.236	8.183
	Annual Total	204.96	0.995 (<0.001)	0.836 (0.016)	0.496	16.405
Combined - Guidance (30%, 3%)	Breeding	175.60	0.996 (<0.001)	0.858 (0.016)	0.425	14.163
	Non-breeding	102.20	0.998 (<0.001)	0.915 (0.017)	0.247	8.535
	Annual Total	277.80	0.993 (<0.001)	0.784 (0.015)	0.672	21.563
In-combination all projects plus Caledonia OWF						
Combined - Guidance (30%, 1%)	Breeding	113.71	0.997 (<0.001)	0.906 (0.017)	0.275	9.437
	Non-breeding	140.87	0.997 (<0.001)	0.884 (0.017)	0.341	11.567
	Annual Total	254.58	0.994 (<0.001)	0.801 (0.015)	0.615	19.879
Combined - Guidance (30%, 3%)	Breeding	185.23	0.996 (<0.001)	0.851 (0.016)	0.447	14.887
	Non-breeding	157.08	0.996 (<0.001)	0.872 (0.016)	0.380	12.840
	Annual Total	342.30	0.992 (<0.001)	0.742 (0.014)	0.827	25.847
In-combination all projects minus Berwick Bank plus Caledonia OWF						
	Breeding	113.34	0.997 (<0.001)	0.906 (0.017)	0.273	9.396

Scenario	Season	Predicted Mortality	Median Growth rate (±SD)	Median Pop. Size (±SD)	Decrease in CGR per annum (%)	Decrease in CPS after 35 years (%)
Combined - Guidance (30%, 1%)	Non-breeding	119.58	0.997 (<0.001)	0.901 (0.017)	0.289	9.859
	Annual Total	232.92	0.994 (<0.001)	0.816 (0.015)	0.563	18.389
Combined - Guidance (30%, 3%)	Breeding	184.75	0.996 (<0.001)	0.851 (0.016)	0.446	14.855
	Non-breeding	125.49	0.997 (<0.001)	0.897 (0.017)	0.303	10.349
	Annual Total	310.24	0.993 (<0.001)	0.763 (0.014)	0.750	23.716

Guillemot

10.3.3.1 Guillemot has been screened in to assess the impacts from distributional responses from the Proposed Development (Offshore) during the O&M phase in-combination with other projects in relation to the following relevant conservation objective for this species, as a feature of the SPA:

- Maintain the population as a viable component of the site.

10.3.3.2 Projects identified for in-combination distributional response for the guillemot feature of East Caithness Cliffs SPA are listed in Table 10-109 along with the respective impact predictions for the different seasonal in-combination scenarios presented in Table 10-110. The predicted apportioned abundance for planned and operational projects included within Table 10-103, are based on the Northeast and East Scotwind Projects Cumulative totals dataset (RoyalHaskoningDHV, 2024[136]).

10.3.3.3 The main focus of the assessment is based on the Applicant Approach of a displacement rate of 50% and a 1% mortality rate. NatureScot advise that distributional response assessment for guillemot should be based on a displacement rate of 60% and a mortality rate of up to 3 - 5% depending on the season being assessed, therefore such levels of predicted effect are also provided in Table 10-110.

10.3.3.4 As the Berwick Bank OWF is out of foraging range for guillemot, this scenario has not been presented for this species.

10.3.3.5 A displacement matrix is also presented for the annual apportioned in-combination abundance for East Caithness Cliffs SPA (Table 10-113), when considering the all projects scenario presented in Table 10-110.

Table 10-109: In-combination abundance totals for guillemot attributed to East Caithness Cliffs SPA.

Development	Predicted Abundance		
	Breeding Season	Non-breeding Season	Total
Aberdeen	-	-	-
Beatrice	12,467	1,452	13,918
Berwick Bank	-	-	-
Blyth Demo	-	-	-
Green Volt	1,268	4,956	6,224
Hywind	-	-	-
Inch Cape	-	-	-
Kincardine	-	-	-
Forthwind	-	-	-
Moray East	9,152	667	9,818
Moray West	11,333	19,162	30,495
Neart na Gaoithe	-	-	-
Ossian	-	-	-
PFOWF	48	240	288
Salamander	-	-	-
Seagreen Alpha & Bravo	-	-	-
West of Orkney[iv]	88	52	140
Caledonia	6,267	1,898	8,164
All Projects	40,622	28,426	69,048
Consented (plus Caledonia)	40,534	28,374	68,908

[iv] These numbers for West of Orkney are subject to change, but have been included to support this assessment on a precautionary basis.

Table 10-110: Seasonal and annual distributional response estimates of guillemot for the Proposed Development (Offshore) in-combination with other projects during the operational phase, as per the Applicant and Guidance Approach.

Population Size (Breeding Adults)	Defined Season	Estimated Number of Mortalities (Individuals Per Annum) (Displacement Rate; Mortality Rate)			Change in Average Survival Rate (% Point Change) (Displacement Rate; Mortality Rate)		
		50%; 1% 50%; 1%	60%; 3% 60%; 1%	60%; 5% 60%; 3%	50%; 1% 50%; 1%	60%; 3% 60%; 1%	60%; 5% 60%; 3%
All Projects							
Citation (106,700)	Breeding season (April to mid-August)	203.11	731.2	1,218.66	0.19	0.685	1.142
	Non-breeding season (Late August to March)	142.13	170.55	511.66	0.133	0.16	0.48
	Annual total	345.24	901.75	1,730.32	0.324	0.845	1.622
Latest (199,992)	Breeding season (April to mid-August)	203.11	731.2	1,218.66	0.102	0.366	0.609
	Non-breeding season (Late August to March)	142.13	170.55	511.66	0.071	0.085	0.256
	Annual total	345.24	901.75	1,730.32	0.173	0.451	0.865
All Consented Projects plus Caledonia							
Citation (106,700)	Breeding season (April to mid-August)	202.67	729.62	1,216.03	0.19	0.684	1.14

Population Size (Breeding Adults)	Defined Season	Estimated Number of Mortalities (Individuals Per Annum) (Displacement Rate; Mortality Rate)			Change in Average Survival Rate (% Point Change) (Displacement Rate; Mortality Rate)		
		50%; 1% 50%; 1%	60%; 3% 60%; 1%	60%; 5% 60%; 3%	50%; 1% 50%; 1%	60%; 3% 60%; 1%	60%; 5% 60%; 3%
	Non-breeding season (Late August to March)	141.87	170.24	510.73	0.133	0.16	0.479
	Annual total	344.54	899.86	1,726.76	0.323	0.843	1.618
Latest (199,992)	Breeding season (April to mid-August)	202.67	729.62	1,216.03	0.101	0.365	0.608
	Non-breeding season (Late August to March)	141.87	170.24	510.73	0.071	0.085	0.255
	Annual total	344.54	899.86	1,726.76	0.172	0.45	0.863

Breeding Season

10.3.3.6 During the breeding season, the in-combination abundance for guillemot is up to 40,622 (40,534.25 - 40,621.96) breeding adults apportioned to East Caithness Cliffs SPA, when considering the in-combination scenarios presented in Table 10-110. Assuming a displacement rate of 50% and a mortality rate of 1%, the consequent potential mortality is estimated to be up to 203 (202.67 - 203.11) breeding adults per annum during the breeding season.

10.3.3.7 Using the citation colony count of 106,700 breeding adults and an annual background mortality of 6,509 breeding adults, the addition of 203 predicted breeding adult mortalities would result in up to a 0.190 survival rate percentage point change during the breeding season per annum. When considering the most up to date counts of 199,992 breeding adults and an annual background mortality of 12,120 breeding adults, this results in up to a 0.102 survival rate percentage point change during the breeding season per annum (Table 10-110).

Non-Breeding Season

10.3.3.8 During the non-breeding season, the in-combination abundance for guillemot is up to 28,426 (28,373.76 - 28,425.72) individuals of East Caithness Cliffs SPA for projects identified when considering the in-combination scenarios presented in Table 10-110. Assuming a displacement rate of 50% and a mortality rate of 1%, the consequent potential mortality is estimated to be 142 (141.87 - 142.13) breeding adults per annum during the non-breeding season, depending on the scenario considered.

10.3.3.9 Using the citation colony count of 106,700 breeding adults and an annual background mortality of 6,509 breeding adults, the addition of 142 predicted breeding adult mortalities would result in up to a 0.133 survival rate percentage point change during the non-breeding season per annum. When considering the most up to date counts of 199,992 breeding adults and an annual background mortality of 12,120 breeding adults, this results in up to a 0.071 survival rate percentage point change during the non-breeding season per annum (Table 10-110).

Annual Total

10.3.3.10 The annual total of guillemots subject to mortality due to in-combination distributional response at East Caithness Cliffs SPA is estimated to be up to 345 (344.54 - 345.24) breeding adults per annum depending on the scenarios presented in Table 10-110. This is predicted to result in a survival rate percentage point change against the citation and most recently published counts of up to 0.323 and 0.173 respectively depending on the in-combination scenario considered (see Table 10-110).

10.3.3.11 When considering the Guidance approach, a total of 900 – 1,730 (899.86 – 1,730.32) breeding adult mortalities are predicted due to potential distributional response effects per annum. This results in a survival rate percentage point change of 0.843 – 1.622 against the citation and 0.450 – 0.865 against the most recently published count (Table 10-110).

10.3.3.12 As the survival rate percentage point change exceeds NatureScot's threshold of 0.02% when considering both the Applicant and Guidance approach, further consideration of the level of effect predicted has been analysed using PVA.

Population Viability Analysis

10.3.3.13 The potential for distributional responses in-combination has been assessed against the latest 2016 colony count population size of 199,992 breeding adults according to Swann (2016[84]). A range of impact values from 345 (345.24) to 1,730 (1,730.32) breeding adult additional mortalities per annum were modelled when considering the in-combination scenarios in Table 10-112. This allows for consideration of both the Applicant and Guidance Approach predicted impact levels. For the reasons detailed within Section 7.3.3, this assessment is focussed on the consideration of the counterfactual of growth rate only, though the counterfactual of population size is also presented for consideration in Table 10-112. The PVA outputs for the guillemot feature of East Caithness Cliffs SPA predicted a reduction in the growth rate of 0.194% annually when considering an increase of 345 additional breeding adult mortalities per annum based on the Applicant Approach of a 50% displacement and 1% mortality rate. When considering the Guidance approach (60% displacement and 3-5% mortality rate), a reduction in the growth rate of between 0.288 - 0.973% annually is predicted, when considering an increase of 512 - 1,730 additional adult mortalities per annum (Table 10-112).

10.3.3.14 When considering such predicted reductions in annual growth rate, it is important to consider the known colony growth trend to understand the colony's resilience. The known population sizes and annual compound growth rates for the guillemot feature of East Caithness Cliffs are presented in Table 10-111 based on the latest Seabird Census report (Burnell *et al*., 2023[86]) and Swann (2016[84]). The compound growth rates presented would suggest the East Caithness Cliffs colony in the long term has been on a stable increase in population size since 1986 to 2015, despite known declines reported in the Scottish guillemot population in the early 2000s, due to prey shortages resulting in poor productivity (Burnell *et al*., 2023[86]). Due to lack of available data, the colony growth trend in the recent years and effect of HPAI is unknown, though for surrounding colonies (North Caithness Cliffs SPA, Buchan Ness to Collieston Coast SPA and Troup, Pennan and Lion's Head SPA) impact of HAPI was reported as minor with colony study plots reporting positive growth rates (+3% to +33% change) when comparing pre and post HPAI counts (RSPB, 2024[144]).

10.3.3.15 Finally, given that the majority of predicted impact relates to the Moray Firth Zone (Beatrice, Moray East and Moray West), the post construction monitoring completed for Beatrice (Trinder *et al*., 2024[145]) provides valuable insight into the likely level of predicted effect. As detailed within Volume 7B, Appendix 6-2, Annex 4: Review of Relevant Evidence post-construction monitoring results for Beatrice stated no indication of avoidance of the OWF or individual turbines and in some cases higher densities of auks in proximity to turbines (MacArthur Green, 2023[146]). Overall, it was concluded that the displacement rates of 30% to 70% currently applied to displacement assessments for auks are considerably over-estimated, at least in the breeding season for similar OWFs (MacArthur Green, 2021[147]).

10.3.3.16 In light of the above information, although the level of predicted impact when considering the Applicant and lower range of the Guidance Approach is not insignificant, available evidence suggests that the colony is in stable condition with enough resilience to withstand such a level of potential effect in-combination. **Therefore, the potential for an AEoSI can be ruled out when considering the Applicant Approach and lower range of the Guidance Approach in-combination effect with other plans and projects.**

10.3.3.17 Whilst the evidence would suggest that the potential for the Guidance approach upper impact is highly unlikely to occur, and under all growth rate scenarios presented in Table 10-111 the population would be predicted to remain positive, such a level of effect would likely compromise the resilience of the colony over the 35 year period. As such, the upper limit of the Guidance approach would be considered to have a significant effect on the guillemot feature of East Caithness Cliffs when considering the Proposed Development (Offshore) in-combination with other plans and projects. **The potential for an AEoSI is therefore concluded when considering the level of potential effect predicted from the upper range of the Guidance approach in-combination.**

Table 10-111 Annual colony compound growth rate for the guillemot feature of the East Caithness Cliffs SPA between 1986 and 2015 based on Burnell *et al*. (2023[86]) and Swann (2016[84]).

Years	Population Size (Breeding Adults)	Colony Annual Compound Growth Rate (%)
1986 - 2015	106,700 – 199,992	2.19%
1986 - 2000	106,700 – 159,005	2.89%
2000 - 2015	159,005 – 199,992	1.54%

Table 10-112. PVA results for the guillemot feature of East Caithness Cliffs SPA when considering distributional responses effects for the Proposed Development (Offshore) alone and in-combination.

Scenario	Season	Predicted Mortality	Median Growth Rate (±SD)	Median Pop. Size (±SD)	Decrease in CGR per Annum (%)	Decrease in CPS after 35 years (%)
Caledonia North						
Alone - Guidance (60%, 3%	Breeding	50.61	1.000 (<0.001)	0.990 (0.005)	0.029	1.034
Alone - Guidance (60%, 3%; 60%, 1%)	Annual Total	53.04	1.000 (<0.001)	0.989 (0.005)	0.030	1.074
Alone - Guidance (60%, 5%)	Breeding	84.35	1.000 (<0.001)	0.983 (0.005)	0.047	1.695
Alone - Guidance (60%, 5%; 60%, 3%)	Annual Total	91.64	0.999 (<0.001)	0.981 (0.005)	0.051	1.856
Caledonia South						
Alone - Guidance (60%, 3%	Breeding	79.37	1.000 (<0.001)	0.984 (0.005)	0.045	1.601
Alone - Guidance (60%, 3%; 60%, 1%)	Annual Total	89.19	0.999 (<0.001)	0.982 (0.005)	0.050	1.796
Alone - Guidance (60%, 5%)	Breeding	132.29	0.999 (<0.001)	0.974 (0.005)	0.074	2.644
Alone - Guidance (60%, 5%; 60%, 3%)	Annual Total	161.75	1.000 (<0.001)	0.961 (0.005)	0.091	3.236

Scenario	Season	Predicted Mortality	Median Growth Rate (±SD)	Median Pop. Size (±SD)	Decrease in CGR per Annum (%)	Decrease in CPS after 35 years (%)
Caledonia OWF						
Applicant (50%, 1%)	Annual Total	40.82	1.00 (<0.001)	0.992 (0.005)	0.023	0.826
Alone - Guidance (60%, 3%	Breeding	112.80	0.999 (<0.001)	0.977 (0.005)	0.064	2.262
Alone - Guidance (60%, 3%; 60%, 1%)	Annual Total	124.19	0.999 (<0.001)	0.975 (0.005)	0.070	2.483
Alone - Guidance (60%, 5%)	Breeding	188.00	0.999 (<0.001)	0.963 (0.005)	0.105	3.733
Alone - Guidance (60%, 5%; 60%, 3%)	Annual Total	222.16	0.999 (<0.001)	0.956 (0.005)	0.125	4.417
In-combination all consented projects plus Caledonia OWF						
Applicant (50%, 1%)	Breeding	202.67	0.999 (<0.001)	0.960 (0.005)	0.114	4.022
Applicant (50%, 1%)	Non-breeding	141.87	0.999 (<0.001)	0.972 (0.005)	0.080	2.828
Applicant (50%, 1%)	Annual Total	344.54	0.998 (<0.001)	0.932 (0.005)	0.194	6.750
Guidance (60%, 3%)	Breeding	729.62	0.996 (<0.001)	0.862 (0.005)	0.410	13.763
Guidance (60%, 1%)	Non-breeding	170.24	0.999 (<0.001)	0.996 (0.005)	0.096	3.392
Guidance (60%, 3%; 60%, 1%)	Annual Total	899.86	0.995 (<0.001)	0.833 (0.005)	0.506	16.698
Guidance (60%, 5%)	Breeding	1,216.03	0.993 (<0.001)	0.781 (0.004)	0.684	21.897

Scenario	Season	Predicted Mortality	Median Growth Rate (±SD)	Median Pop. Size (±SD)	Decrease in CGR per Annum (%)	Decrease in CPS after 35 years (%)
Guidance (60%, 3%)	Non-breeding	510.73	0.997 (<0.001)	0.902 (0.005)	0.287	9.838
Guidance (60%, 5%; 60%, 3%)	Annual Total	1,726.76	0.990 (<0.001)	0.704 (0.004)	0.970	29.614
In-combination all projects plus Caledonia OWF						
Applicant (50%, 1%)	Breeding	203.11	0.999 (<0.001)	0.960 (0.005)	0.114	4.027
Applicant (50%, 1%)	Non-breeding	142.13	0.999 (<0.001)	0.972 (0.005)	0.080	2.844
Applicant (50%, 1%)	Annual Total	345.24	0.998 (<0.001)	0.932 (0.005)	0.194	6.765
Guidance (60%, 3%)	Breeding	731.20	0.996 (<0.001)	0.862 (0.005)	0.411	13.782
Guidance (60%, 1%)	Non-breeding	170.55	0.999 (<0.001)	0.966 (0.005)	0.096	3.395
Guidance (60%, 3%; 60%, 1%)	Annual Total	901.75	0.995 (<0.001)	0.833 (0.005)	0.507	16.725
Guidance (60%, 5%)	Breeding	1,218.66	0.993 (<0.001)	0.781 (0.004)	0.685	21.920
Guidance (60%, 3%)	Non-breeding	511.66	0.997 (<0.001)	0.902 (0.005)	0.288	9.884
Guidance (60%, 5%; 60%, 3%)	Annual Total	1,730.32	0.990 (<0.001)	0.703 (0.004)	0.973	29.665

Table 10-113: Guillemot O&M phase disturbance annual in-combination displacement matrix for all projects impacts apportioned to East Caithness Cliffs SPA.

Annual Total Displacement Rate (%)	Mortality Rate (%)													
	1	2	3	5	10	20	30	40	50	60	70	80	90	100
10	69	138	207	345	690	1,381	2,071	2,762	3,452	4,143	4,833	5,524	6,214	6,905
20	138	276	414	690	1,381	2,762	4,143	5,524	6,905	8,286	9,667	11,048	12,429	13,810
30	207	414	621	1,036	2,071	4,143	6,214	8,286	10,357	12,429	14,500	16,571	18,643	20,714
40	276	552	829	1,381	2,762	5,524	8,286	11,048	13,810	16,571	19,333	22,095	24,857	27,619
50	345	690	1,036	1,726	3,452	6,905	10,357	13,810	17,262	20,714	24,167	27,619	31,071	34,524
60	414	829	1,243	2,071	4,143	8,286	12,429	16,571	20,714	24,857	29,000	33,143	37,286	41,429
70	483	967	1,450	2,417	4,833	9,667	14,500	19,333	24,167	29,000	33,833	38,667	43,500	48,333
80	552	1,105	1,657	2,762	5,524	11,048	16,571	22,095	27,619	33,143	38,667	44,191	49,714	55,238
90	621	1,243	1,864	3,107	6,214	12,429	18,643	24,857	31,071	37,286	43,500	49,714	55,929	62,143
100	690	1,381	2,071	3,452	6,905	13,810	20,714	27,619	34,524	41,429	48,333	55,238	62,143	69,048
Note, outputs highlighted in dark blue represent the predicted annual mortality estimates as per the Guidance Approach and those highlighted in yellow represent the predicted annual mortality estimates as per the Applicant Approach. For further information regarding the Guidance and Applicant Approach see Section 2.5 of Volume 7B, Appendix 6-2: Offshore Ornithology Distributional Responses Technical Report and Volume 7B, Appendix 6-2, Annex 4: Review of Relevant Evidence.														

Razorbill

10.3.3.18 Razorbill has been screened in to assess the impacts from distributional responses from the Proposed Development (Offshore) during the O&M phase in-combination with other projects in relation to the following relevant conservation objective for this species, as a feature of the SPA:

- Maintain the population as a viable component of the site.

10.3.3.19 Projects identified for in-combination distributional response for the razorbill feature of East Caithness Cliffs SPA are listed in Table 10-114, with the respective impact predictions for the different seasonal in-combination scenarios presented in Table 10-115. The predicted apportioned abundance for planned and operational projects included within Table 10-114, are primarily based on the Northeast and East Scotwind Projects Cumulative totals dataset (RoyalHaskoningDHV, 2024[136]), with the addition of abundance totals for Ossian (NIRAS and RPS, 2024) and Salamander (ERM, 2024) derived from their respective RIAAs.

10.3.3.20 The main focus of the assessment is based on the Applicant Approach of a displacement rate of 50% and a 1% mortality rate for O&M phase in-combination distributional response impacts. NatureScot advise that distributional response assessment for razorbill should be based on a displacement rate of 60% and a mortality rate of up to 3 - 5% depending on the season being assessed, therefore such levels of predicted effect are also provided in Table 10-114.

10.3.3.21 A displacement matrix is also presented for the annual apportioned in-combination abundance for East Caithness Cliffs SPA (Table 10-118), when considering the all projects scenario presented in Table 10-115.

Table 10-114: Razorbill in-combination season and total abundance estimates attributed to East Caithness Cliffs SPA.

Development	Predicted Abundance		
	Breeding Season	Non-breeding Season	Total
Aberdeen (EOWDC)	-	4	4
Beatrice	855	89	944
Berwick Bank	50	738	788
Blyth Demonstration Project	-	10	10
DEP	-	62	62
Dogger Bank A2	-	301	301
Dogger Bank B2	-	378	378
Dogger Bank C3	-	127	127
Dogger Bank South (PEIR)	-	558	558
Dudgeon	-	55	55
East Anglia ONE	-	21	21
East Anglia ONE North	-	14	14
East Anglia THREE	-	163	163
East Anglia TWO	-	16	16
Five Estuaries	-	92	92
Forthwind	-	-	-
Galloper	-	22	22
Greater Gabbard	-	17	17
Green Volt	142	4	146
Gunfleet Sands	-	1	1
Hornsea Project Four	-	217	217
Hornsea Project One	-	331	331
Hornsea Project Three	-	299	299

Development	Predicted Abundance		
	Breeding Season	Non-breeding Season	Total
Hornsea Project Two	-	273	273
Humber Gateway	-	2	2
Hywind	-	31	31
Inch Cape	-	144	144
Kentish Flats and Extension	-	-	-
Kincardine	-	-	-
Lincs & LID	-	4	4
London Array	-	2	2
Moray East	2,377	55	2,431
Moray West	1,333	307	1,641
Neart na Gaoithe	-	249	249
Norfolk Boreas	-	62	62
Norfolk Vanguard	-	104	104
North Falls (PEIR)	-	178	178
Ossian	-	77	77
Outer Dowsing	-	402	402
PFOWF	27	2	29
Race Bank	-	5	5
Rampion	-	186	186
Rampion 2	-	308	308
Salamander	-	17	17
Scroby Sands	-	-	-
Seagreen Alpha	-	38	38
Seagreen Bravo	-	44	44
SEP	-	201	201

Development	Predicted Abundance		
	Breeding Season	Non-breeding Season	Total
Sheringham Shoal	-	65	65
Sofia3	-	199	199
Teesside	-	3	3
Thanet	-	1	1
Triton Knoll	-	45	45
West of Orkney[v]	35	13	48
Westermost Rough	-	14	14
Caledonia	640	82	721
All Projects	5,458	6,632	12,090
All Projects Excl. Berwick Bank	5,408	5,894	11,302
Consented (plus Caledonia)	5,373	4,250	9,623

[v] These numbers for West of Orkney are subject to change, but have been included to support this assessment on a precautionary basis.

Table 10-115: Seasonal and annual displacement estimates of razorbill for the Proposed Development (Offshore) in-combination with other projects during the operational phase, as per the Applicant and Guidance Approach.

Population Size (Breeding Adults)	Defined Season	Estimated Number of Mortalities (Individuals Per Annum) (Displacement Rate; Mortality Rate)			Change in Average Survival Rate (% Point Change) (Displacement Rate; Mortality Rate)		
		50%; 1% 50%; 1%	60%; 3% 60%; 1%	60%; 5% 60%; 3%	50%; 1% 50%; 1%	60%; 3% 60%; 1%	60%; 5% 60%; 3%
All Projects							
Citation (15,800)	Breeding season (April to mid-August)	27.29	98.25	163.75	0.173	0.622	1.036
	Non-breeding season (Late August to March)	33.16	39.79	119.37	0.21	0.252	0.756
	Annual total	60.45	138.04	283.12	0.383	0.874	1.792
Latest (40,256)	Breeding season (April to mid-August)	27.29	98.25	163.75	0.068	0.244	0.407
	Non-breeding season (Late August to March)	33.16	39.79	119.37	0.082	0.099	0.297
	Annual total	60.45	138.04	283.12	0.15	0.343	0.703
All Projects Excluding Berwick Bank							
Citation (15,800)	Breeding season (April to mid-August)	27.04	97.35	162.25	0.171	0.616	1.027

Population Size (Breeding Adults)	Defined Season	Estimated Number of Mortalities (Individuals Per Annum) (Displacement Rate; Mortality Rate)			Change in Average Survival Rate (% Point Change) (Displacement Rate; Mortality Rate)		
		50%; 1% 50%; 1%	60%; 3% 60%; 1%	60%; 5% 60%; 3%	50%; 1% 50%; 1%	60%; 3% 60%; 1%	60%; 5% 60%; 3%
	Non-breeding season (Late August to March)	29.47	35.37	106.1	0.187	0.224	0.671
	Annual total	56.51	132.71	268.34	0.358	0.84	1.698
Latest (40,256)	Breeding season (April to mid-August)	27.04	97.35	162.25	0.067	0.242	0.403
	Non-breeding season (Late August to March)	29.47	35.37	106.1	0.073	0.088	0.264
	Annual total	56.51	132.71	268.34	0.14	0.33	0.667
All Consented Projects plus Caledonia							
Citation (15,800)	Breeding season (April to mid-August)	26.87	96.72	161.19	0.17	0.612	1.02
	Non-breeding season (Late August to March)	21.25	25.5	76.49	0.134	0.161	0.484
	Annual total	48.11	122.21	238.68	0.305	0.773	1.504
Latest (40,256)	Breeding season (April to mid-August)	26.87	96.72	161.19	0.067	0.24	0.4

Population Size (Breeding Adults)	Defined Season	Estimated Number of Mortalities (Individuals Per Annum) (Displacement Rate; Mortality Rate)			Change in Average Survival Rate (% Point Change) (Displacement Rate; Mortality Rate)		
		50%; 1% 50%; 1%	60%; 3% 60%; 1%	60%; 5% 60%; 3%	50%; 1% 50%; 1%	60%; 3% 60%; 1%	60%; 5% 60%; 3%
	Non-breeding season (Late August to March)	21.25	25.5	76.49	0.053	0.063	0.19
	Annual total	48.11	122.21	238.68	0.12	0.304	0.59

Breeding Season

10.3.3.22 During the breeding season, the in-combination abundance for razorbill is up to 5,458 (5,373.09 - 5,458.23) breeding adults of East Caithness Cliffs SPA, depending on the scenario in-combination scenarios considered (Table 10-114). Assuming a displacement rate of 50% and a mortality rate of 1%, the consequent potential mortality is estimated to be up to 27 (26.87 to 27.29) breeding adults per annum during the breeding season, depending on the scenario considered.

10.3.3.23 Using the citation colony count of 15,800 breeding adults and an annual background mortality of 1,659 breeding adults, the addition of 27 predicted breeding adult mortalities would result in a up to a 0.173 survival rate percentage point change during the breeding season per annum. When considering the most up to date counts of 40,256 breeding adults and an annual background mortality of 4,227 breeding adults, this results in up to a 0.068 survival rate percentage point change during the breeding season per annum (Table 10-115).

Non-Breeding Season

10.3.3.24 During the non-breeding season, the in-combination abundance for razorbill is is up to 6,632 (4,249.55 - 6,631.93) individuals of East Caithness Cliffs SPA, depending on the scenario in-combination scenarios considered (Table 10-114). Assuming a displacement rate of 50% and a mortality rate of 1%, the consequent potential mortality is estimated to up to 33 (21.25 - 33.16) breeding adults per annum during the non-breeding season, depending on the scenario considered.

10.3.3.25 Using the citation colony count of 15,800 breeding adults and an annual background mortality of 1,659 breeding adults, the addition of 33 predicted breeding adult mortalities would result in up to a 0.210 survival rate percentage point change during the non-breeding season per annum. When considering the most up to date counts of 40,256 breeding adults and an annual background mortality of 4,227 breeding adults, this results in up to a 0.082 survival rate percentage point change during the non-breeding season per annum (Table 10-115).

Annual Total

10.3.3.26 The annual total of razorbill subject to mortality due to in-combination distributional response at East Caithness Cliffs SPA is estimated to be up to 60 (48.11 - 60.45) breeding adults per annum depending on the scenarios presented in Table 10-114. This is predicted to result in a survival rate percentage point change against the citation and most recently published counts of up to 0.383 and 0.150 respectively depending on the in-combination scenario considered (see Table 10-115).

10.3.3.27 To note, the removal of Berwick Bank from the assessment reduces predicted mortality to 57 (56.51) breeding adults per annum. Using the citation colony count and most recently published count, this equates to a 0.358 and 0.140 percentage point survival rate change within this population respectively.

10.3.3.28 When considering the Guidance approach, a total of 122 to 283 (122.21 to 283.12) breeding adult mortalities are predicted due to potential distributional response effects per annum. This results in a survival rate percentage point change of 0.773 to 1.792 against the citation and 0.340 to 0.703 against the most recently published count (Table 10-115).

10.3.3.29 As the survival rate percentage point change exceeds NatureScot's threshold of 0.02% when considering both the Applicant and Guidance approach, further consideration of the level of effect predicted has been analysed using PVA.

Population Viability Analysis

10.3.3.30 The potential for distributional responses in-combination has been assessed against the latest 2016 colony count population size of 40,256 breeding adults according to the Swann (2016[84]). A range of impact values from 61 (60.45) to 283 (283.12) breeding adult additional mortalities per annum were modelled (when considering the in-combination scenarios), which allows for consideration of both the Applicant and Guidance Approach predicted impact levels. For the reasons detailed within Section 7.3.3, this assessment is based on the consideration of the counterfactual of growth rate only, though the counterfactual of population size is also presented for consideration in Table 10-117. The PVA outputs for the razorbill feature of East Caithness Cliff SPA predicted a reduction in the annual growth rate of 0.181% when considering an increase of 61 additional adult mortalities per annum (based on a 50% displacement and 1% mortality rate) to 0.843% when considering an increase of 283 additional adult mortalities per annum (60% displacement and 3-5% mortality rate).

10.3.3.31 When considering such predicted reductions in annual growth rate, it is important to consider the known colony growth trend to understand the colony's resilience. The known population sizes and annual compound growth rates for the razorbill feature of East Caithness Cliffs are presented in Table 10-116 based on the Latest seabird census report (Burnell *et al.*, 2023[86]) and Swann (2016[84]). The compound growth rates presented would suggest the East Caithness Cliffs colony in the long term has been on a stable increase in population size since 1986 to 2015, despite known declines reported in the Scottish razorbill population in 2007, due to prey shortages resulting in a significant wreck event (Burnell *et al.*, 2023[86]). Due to lack of available data, the colony growth trend in the recent years and effect of HPAI is unknown, though to note low mortality was reported across UK razorbill colonies in 2023, suggesting limited effect from HPAI (RSPB, 2024[154]).

10.3.3.32 Finally, given that the majority of predicted impact relates to the Moray Firth Zone (Beatrice, Moray East and Moray West), the post construction monitoring completed for Beatrice (Trinder *et al.*, 2024[145]) provides valuable insight into the likely level of predicted effect. As detailed within Volume 7B, Appendix 6-2, Annex 4: Review of Relevant Evidence post-construction monitoring results for Beatrice stated no indication of avoidance of the OWF or individual turbines and in some cases higher densities of auks in proximity to turbines (MacArthur Green, 2023[146]). Overall, it was concluded that the displacement rates of 30% to 70% currently applied to displacement assessments for auks are considerably over-estimated, at least in the breeding season for similar OWFs (MacArthur Green, 2021[147]).

10.3.3.33 In light of the above information, although the level of predicted impact when considering the Applicant and Guidance Approach is not insignificant, available evidence suggests that the colony is in stable condition with enough resilience to withstand such a level of potential effect in-combination. There is, therefore, **no potential for an AEoSI to the conservation objectives of the razorbill feature of East Caithness Cliffs SPA in relation to distributional response effects in the O&M phase from the Proposed Development (Offshore) in-combination. Subject to natural change, razorbill will be maintained as a feature in the long term.**

Table 10-116 Annual colony compound growth rate for the razorbill feature of the East Caithness Cliffs SPA between 1986 and 2015 based on Burnell *et al*. (2023[86]) and Swann (2016[84]).

Years	Population Size (Breeding Adults)	Colony Annual Compound Growth Rate (%)
1986 - 2015	15,800 – 40,256	3.28%
2000 - 2015	17,857 – 40,256	5.57%
1986 - 2000	15,800 – 17,857	0.88%

Table 10-117 : PVA results for the razorbill feature of East Caithness Cliffs SPA when considering distributional responses effects for the Proposed Development (Offshore) alone and in-combination.

Scenario	Season	Predicted Mortality	Median Growth rate (±SD)	Median Pop. Size (±SD)	Decrease in CGR per annum (%)	Decrease in CPS after 35 years (%)
Caledonia North						
Alone - Guidance (60%, 3%	Breeding	9.58	1.000 (0.001)	0.988 (0.039)	0.030	1.185
Alone - Guidance (60%, 3%; 60%, 1%)	Annual Total	10.68	1.000 (0.001)	0.988 (0.040)	0.034	1.188
Caledonia South						
Alone - Guidance (60%, 3%	Breeding	11.86	1.000 (0.001)	0.988 (0.038)	0.036	1.247
Alone - Guidance (60%, 3%; 60%, 1%)	Annual Total	12.47	1.000 (0.001)	0.986 (0.037)	0.037	1.363
Caledonia OWF						
Alone - Guidance (60%, 3%	Breeding	11.52	1.000 (0.001)	0.989 (0.028)	0.033	1.145
Alone - Guidance (60%, 3%; 60%, 1%)	Annual Total	12.00	1.000 (0.001)	0.988 (0.028)	0.033	1.180
Alone - Guidance (60%, 5%; 60%, 3%)	Breeding	19.19	0.999 (0.001)	0.980 (0.028)	0.055	1.980
Alone - Guidance (60%, 5%; 60%, 3%)	Annual Total	20.66	0.999 (0.001)	0.979 (0.028)	0.060	2.110

Scenario	Season	Predicted Mortality	Median Growth rate (±SD)	Median Pop. Size (±SD)	Decrease in CGR per annum (%)	Decrease in CPS after 35 years (%)
In-combination all consented projects plus Caledonia OWF						
Applicant (50%, 1%)	Breeding	26.87	0.999 (0.001)	0.972 (0.040)	0.077	2.819
Applicant (50%, 1%)	Non-breeding	21.25	0.999 (0.001)	0.978 (0.040)	0.062	2.197
Applicant (50%, 1%)	Annual Total	48.11	0.999 (0.001)	0.949 (0.038)	0.145	5.136
Guidance (60%, 3%)	Breeding	96.72	0.997 (0.001)	0.902 (0.037)	0.286	9.848
Guidance (60%, 1%)	Non-breeding	25.50	0.999 (0.001)	0.973 (0.039)	0.074	2.674
Guidance (60%, 3%; 60%, 1%)	Annual Total	122.21	0.996 (0.001)	0.876 (0.037)	0.368	12.369
Guidance (60%, 5%)	Breeding	161.19	0.995 (0.001)	0.840 (0.035)	0.481	15.994
Guidance (60%, 3%)	Non-breeding	76.49	0.998 (0.001)	0.921 (0.038)	0.228	7.875
Guidance (60%, 5%; 60%, 3%)	Annual Total	237.68	0.993 (0.001)	0.774 (0.033)	0.709	22.612
In-combination all projects plus Caledonia OWF						
Applicant (50%, 1%)	Breeding	27.29	0.999 (0.001)	0.971 (0.040)	0.082	2.881
Applicant (50%, 1%)	Non-breeding	33.16	0.999 (0.001)	0.965 (0.039)	0.098	3.451
Applicant (50%, 1%)	Annual Total	60.45	0.998 (0.001)	0.936 (0.039)	0.181	6.361

Scenario	Season	Predicted Mortality	Median Growth rate (±SD)	Median Pop. Size (±SD)	Decrease in CGR per annum (%)	Decrease in CPS after 35 years (%)
Guidance (60%, 3%)	Breeding	98.25	0.997 (0.001)	0.900 (0.037)	0.290	9.985
Guidance (60%, 1%)	Non-breeding	39.79	0.999 (0.001)	0.959 (0.038)	0.118	4.109
Guidance (60%, 3%; 60%, 1%)	Annual Total	138.04	0.996 (0.001)	0.862 (0.036)	0.411	13.830
Guidance (60%, 5%)	Breeding	163.75	0.995 (0.001)	0.839 (0.035)	0.488	16.099
Guidance (60%, 3%)	Non-breeding	119.37	0.996 (0.001)	0.880 (0.036)	0.354	12.019
Guidance (60%, 5%; 60%, 3%)	Annual Total	283.12	0.992 (0.001)	0.737 (0.031)	0.843	26.305
In-combination all projects minus Berwick Bank plus Caledonia OWF						
Applicant (50%, 1%)	Breeding	27.04	0.999 (0.001)	0.971 (0.013)	0.082	2.883
Applicant (50%, 1%)	Non-breeding	29.47	0.999 (<0.001)	0.969 (0.012)	0.088	3.141
Applicant (50%, 1%)	Annual Total	56.51	0.998 (<0.001)	0.941 (0.012)	0.168	5.904
Guidance (60%, 3%)	Breeding	97.35	0.997 (<0.001)	0.901 (0.012)	0.291	9.937
Guidance (60%, 1%)	Non-breeding	35.37	0.999 (<0.001)	0.963 (0.012)	0.106	3.736

Scenario	Season	Predicted Mortality	Median Growth rate (±SD)	Median Pop. Size (±SD)	Decrease in CGR per annum (%)	Decrease in CPS after 35 years (%)
Guidance (60%, 3%; 60%, 1%)	Annual Total	132.71	0.996 (<0.001)	0.867 (0.011)	0.396	13.313
Guidance (60%, 5%)	Breeding	162.25	0.995 (<0.001)	0.840 (0.011)	0.484	16.042
Guidance (60%, 3%)	Non-breeding	106.10	0.997 (<0.001)	0.892 (0.012)	0.317	10.796
Guidance (60%, 5%; 60%, 3%)	Annual Total	268.34	0.992 (<0.001)	0.749 (0.010)	0.800	25.101

Table 10-118: Razorbill O&M phase disturbance annual in-combination displacement matrix for all project impacts apportioned to East Caithness Cliffs SPA.

Annual Total	Mortality Rate (%)													
Displacement Rate (%)	1	2	3	5	10	20	30	40	50	60	70	80	90	100
10	12	24	36	60	121	242	363	484	605	725	846	967	1,088	1,209
20	24	48	73	121	242	484	725	967	1,209	1,451	1,693	1,934	2,176	2,418
30	36	73	109	181	363	725	1,088	1,451	1,814	2,176	2,539	2,902	3,264	3,627
40	48	97	145	242	484	967	1,451	1,934	2,418	2,902	3,385	3,869	4,352	4,836
50	60	121	181	302	605	1,209	1,814	2,418	3,023	3,627	4,232	4,836	5,441	6,045
60	73	145	218	363	725	1,451	2,176	2,902	3,627	4,352	5,078	5,803	6,529	7,254
70	85	169	254	423	846	1,693	2,539	3,385	4,232	5,078	5,924	6,770	7,617	8,463
80	97	193	290	484	967	1,934	2,902	3,869	4,836	5,803	6,770	7,738	8,705	9,672
90	109	218	326	544	1,088	2,176	3,264	4,352	5,441	6,529	7,617	8,705	9,793	10,881
100	121	242	363	605	1,209	2,418	3,627	4,836	6,045	7,254	8,463	9,672	10,881	12,090
Note, outputs highlighted in dark blue represent the predicted annual mortality estimates as per the Guidance Approach and those highlighted in yellow represent the predicted annual mortality estimates as per the Applicant Approach. For further information regarding the Guidance and Applicant Approach see Section 2.5 of Volume 7B, Appendix 6-2: Offshore Ornithology Distributional Responses Technical Report and Volume 7B, Appendix 6-2, Annex 4: Review of Relevant Evidence.														

North Caithness Cliffs SPA

Guillemot

10.3.3.34 Guillemot has been screened in to assess the impacts from distributional responses from the Proposed Development (Offshore) during the O&M phase in-combination with other projects in relation to the following relevant conservation objective for this species, as a feature of the SPA:

- Maintain the population as a viable component of the site.

10.3.3.35 Projects identified for in-combination distributional response for the guillemot feature of North Caithness Cliffs SPA are listed in Table 10-119, with the respective impact predictions for the different seasonal in-combination scenarios presented in Table 10-120. The predicted apportioned abundance for planned and operational projects included within Table 10-119 are based on the Northeast and East Scotwind Projects Cumulative totals dataset (RoyalHaskoningDHV, 2024[136]).

10.3.3.36 The main focus of the assessment is based on the Applicant Approach of a displacement rate of 50% and a 1% mortality rate for O&M phase in-combination distributional response impacts. NatureScot advise that distributional response assessment for guillemot should be based on a displacement rate of 60% and a mortality rate of up to 3 - 5% depending on the season being assessed, therefore such levels of predicted effect are also provided in Table 10-120.

10.3.3.37 As the Berwick Bank OWF is out of foraging range for guillemot, this scenario has not been presented for this species.

10.3.3.38 A displacement matrix is also presented for the annual apportioned in-combination abundance for North Caithness Cliffs SPA (Table 10-122), when considering the all projects scenario presented in Table 10-120.

Table 10-119: Guillemot in-combination season and total abundance estimates attributed to North Caithness Cliffs SPA.

Development	Predicted Abundance		
	Breeding Season	Non-breeding Season	Total
Aberdeen	-	-	-
Beatrice	415	90	505
Berwick Bank	-	-	-
Green Volt	173	678	851
Hywind	-	-	-
Inch Cape	-	-	-
Kincardine	-	-	-
Forthwind	-	-	-
Moray East	304	41	345
Moray West	370	878	1,248
Neart na Gaoithe	-	-	-
Ossian	-	-	-
PFOWF	923	107	1,030
Salamander	-	-	-
Seagreen Alpha & Bravo	-	-	-
West of Orkney[vi]	104	62	166
Caledonia	698	594	1,292
All Projects	2,987	2,450	5,437
Consented (plus Caledonia)	2,883	2,388	5,271

[vi] These numbers for West of Orkney are subject to change, but have been included to support this assessment on a precautionary basis.

Table 10-120: Seasonal and annual displacement estimates of guillemot for the Proposed Development (Offshore) in-combination with other projects during the operational phase, as per the Applicant and Guidance Approach.

Population Size (Breeding Adults)	Defined Season	Estimated Number of Mortalities (Individuals Per Annum) (Displacement Rate; Mortality Rate)			Change in Average Survival Rate (% Point Change) (Displacement Rate; Mortality Rate)		
		50%; 1% 50%; 1%	60%; 3% 60%; 1%	60%; 5% 60%; 3%	50%; 1% 50%; 1%	60%; 3% 60%; 1%	60%; 5% 60%; 3%
All Projects							
Citation (38,300)	Breeding season (April to mid-August)	14.94	53.77	89.62	0.039	0.14	0.234
	Non-breeding season (Late August to March)	12.25	14.7	44.1	0.032	0.038	0.115
	Annual total	27.19	68.47	133.72	0.071	0.179	0.349
Latest (62,599)	Breeding season (April to mid-August)	14.94	53.77	89.62	0.024	0.086	0.143
	Non-breeding season (Late August to March)	12.25	14.7	44.1	0.020	0.023	0.07
	Annual total	27.19	68.47	133.72	0.043	0.109	0.214
All Consented Projects plus Caledonia							
Citation (38,300)	Breeding season (April to mid-August)	14.42	51.9	86.49	0.038	0.135	0.226
	Non-breeding	11.94	14.33	42.99	0.031	0.037	0.112

Population Size (Breeding Adults)	Defined Season	Estimated Number of Mortalities (Individuals Per Annum) (Displacement Rate; Mortality Rate)			Change in Average Survival Rate (% Point Change) (Displacement Rate; Mortality Rate)		
		50%; 1% 50%; 1%	60%; 3% 60%; 1%	60%; 5% 60%; 3%	50%; 1% 50%; 1%	60%; 3% 60%; 1%	60%; 5% 60%; 3%
	season (Late August to March)						
	Annual total	26.36	66.23	129.48	0.069	0.173	0.338
Latest (62,599)	Breeding season (April to mid-August)	14.42	51.9	86.49	0.023	0.083	0.138
	Non-breeding season (Late August to March)	11.94	14.33	42.99	0.019	0.023	0.069
	Annual total	26.36	66.23	129.48	0.042	0.106	0.207

Breeding Season

10.3.3.39 During the breeding season, the in-combination abundance for guillemot is up to 2,987 (2,883.09 - 2,987.44) breeding adults of North Caithness Cliffs SPA, when considering the in-combination scenarios presented in Table 10-119. Assuming a displacement rate of 50% and a mortality rate of 1%, the consequent potential mortality is estimated to be up to 15 (14.42 - 14.94) breeding adults per annum during the breeding season, depending on the scenario considered.

10.3.3.40 Using the citation colony count of 38,300 breeding adults and an annual background mortality of 2,336 breeding adults, the addition of up to 15 predicted breeding adult mortalities would result in a up to a 0.039 survival rate percentage point change during the breeding season per annum. When considering the most up to date counts of 62,599 breeding adults and an annual background mortality of 3,819 breeding adults, this results in up to a 0.024 survival rate percentage point change during the breeding season per annum (Table 10-120).

Non-Breeding Season

10.3.3.41 During the non-breeding season, the in-combination abundance for guillemot is up to 2,450 (2,388 - 2,450.04) breeding individuals of North Caithness Cliffs SPA, when considering the in-combination scenarios presented in Table 10-119. Assuming a displacement rate of 50% and a mortality rate of 1%, the consequent potential mortality is estimated to be 12 (11.94 - 12.25) breeding adults per annum during the non-breeding season, depending on the scenario considered.

10.3.3.42 Using the citation colony count of 38,300 breeding adults and an annual background mortality of 2,336 breeding adults, the addition of 12 predicted breeding adult mortalities would result in a 0.032 survival rate percentage point change during the non-breeding season per annum. When considering the most up to date counts of 62,599 breeding adults and an annual background mortality of 3,819 breeding adults, this results in up to a 0.020 survival rate percentage point change during the non-breeding season per annum (Table 10-120).

Annual Total

10.3.3.43 The annual total of guillemot subject to mortality due to in-combination distributional response at North Caithness Cliffs SPA is estimated to be up to 27 (26.36 - 27.19) breeding adults per annum depending on the scenarios presented in Table 10-119 This is predicted to result in a survival rate percentage point change against the citation and most recently published counts of 0.071 and 0.043 respectively depending on the in-combination scenario considered (see Table 10-120).

10.3.3.44 When considering the Guidance approach, a total of 66 – 134 (66.23 – 133.72) breeding adult mortalities are predicted due to potential distributional response effects per annum. This results in a survival rate percentage point change of 0.173 – 0.349 against the citation and 0.106 – 0.214 against the most recently published count (Table 10-120).

10.3.3.45 As survival rate percentage point change exceeds NatureScot's threshold of 0.02% when considering both the Applicant and Guidance approach, further consideration of the level of effect predicted has been analysed using PVA.

Population Viability Analysis

10.3.3.46 The potential for distributional responses in-combination has been assessed against the latest 2015 to 2023 colony count population size of 199,992 breeding adults according to the Seabird Monitoring Programme (2020) data base. A range of impact values from 27 (27.19) to 134 (133.72) breeding adult additional mortalities per annum were modelled (when considering the in-combination scenarios), which allows for consideration of both the Applicant and Guidance Approach predicted impact levels. For the reasons detailed within Section 7.3.3, this assessment is based on the consideration of the counterfactual of growth rate only, though the counterfactual of population size is also presented for consideration in Table 10-121. The PVA outputs for the guillemot feature of North Caithness Cliffs SPA predicted a reduction in the growth rate of up to 0.05% when considering an increase of 27 additional adult mortalities per annum (based on a 50% displacement and 1% mortality rate) to 0.24% when considering an increase of 134 additional adult mortalities per annum (60% displacement and 3-5% mortality rate).

10.3.3.47 Whilst recognising the population at this site has fluctuated through declines and increases since the citation count in 1985 – 1987, overall, it is considered to be in 'favourable maintained' condition. The reasons for the fluctuations are unclear, but not considered to be linked to the development of offshore wind farms within the Moray Firth, which have only been in operation for a short period. It is also worth noting that distributional responses are not considered likely to be at the upper end of the Guidance approach, particularly when considering monitoring studies from the operational Beatrice offshore wind farm within the Moray Firth (Trinder *et al.*, 2024[145]). However, when considering the Applicant or Guidance Approach the impacts from Caledonia in-combination with all other projects would have a limited effect on the overall status or trajectory of the population, as the resulting reduction in growth rate would at most be 0.24% annually for these scenarios.

10.3.3.48 **Therefore, there is no potential for an AEoSI to the conservation objectives of the guillemot feature of North Caithness Cliffs SPA in relation to distributional response effects in the O&M phase from the Proposed Development (Offshore) in-combination with all other projects. Subject to natural change, guillemot will be maintained as a feature in the long term**.

Table 10-121: PVA results for the guillemot feature of North Caithness Cliffs SPA when considering distributional responses effects for the Proposed Development (Offshore) alone and in-combination.

Scenario	Season	Predicted Mortality	Median Growth rate (±SD)	Median Pop. Size (±SD)	Decrease in CGR per annum (%)	Decrease in CPS after 35 years (%)
Caledonia South						
Alone - Guidance (60%, 3%	Breeding	8.84	1.000 (<0.001)	0.994 (0.010)	0.016	0.564
Alone - Guidance (60%, 3%; 60%, 1%)	Annual Total	11.92	1.000 (<0.001)	0.993 (0.010)	0.022	0.744
Alone - Guidance (60%, 5%)	Breeding	14.74	1.000 (<0.001)	0.990 (0.010)	0.026	0.957
Alone - Guidance (60%, 5%; 60%, 3%)	Annual Total	23.96	1.000 (<0.001)	0.985 (0.009)	0.043	1.528
Caledonia OWF						
Alone - Guidance (60%, 3%	Breeding	12.57	1.000 (<0.001)	0.992 (0.010)	0.022	0.793
Alone - Guidance (60%, 3%; 60%, 1%)	Annual Total	38.87	0.999 (<0.001)	0.975 (0.009)	0.069	2.475
Alone - Guidance (60%, 5%)	Breeding	20.95	1.000 (<0.001)	0.987 (0.009)	0.037	1.340
Alone - Guidance (60%, 5%; 60%, 3%)	Annual Total	69.54	0.999 (<0.001)	0.956 (0.009)	0.124	4.374
In-combination all consented projects plus Caledonia OWF						
Applicant (50%, 1%)	Breeding	14.42	1.000 (<0.001)	0.991 (0.009)	0.026	0.942

Scenario	Season	Predicted Mortality	Median Growth rate (±SD)	Median Pop. Size (±SD)	Decrease in CGR per annum (%)	Decrease in CPS after 35 years (%)
Applicant (50%, 1%)	Non-breeding	11.94	1.000 (<0.001)	0.992 (0.009)	0.022	0.768
Applicant (50%, 1%)	Annual Total	26.36	1.000 (<0.001)	0.983 (0.009)	0.047	1.701
Guidance (60%, 3%)	Breeding	51.90	0.999 (<0.001)	0.967 (0.009)	0.094	3.323
Guidance (60%, 1%)	Non-breeding	14.33	1.000 (<0.001)	0.991 (0.009)	0.026	0.947
Guidance (60%, 3%; 60%, 1%)	Annual Total	66.23	0.999 (<0.001)	0.958 (0.009)	0.119	4.195
Guidance (60%, 5%)	Breeding	86.49	0.998 (<0.001)	0.945 (0.009)	0.156	5.460
Guidance (60%, 3%)	Non-breeding	42.99	0.999 (<0.001)	0.973 (0.009)	0.078	2.750
Guidance (60%, 5%; 60%, 3%)	Annual Total	129.48	0.998 (<0.001)	0.920 (0.009)	0.233	8.047
In-combination all projects plus Caledonia OWF						
Applicant (50%, 1%)	Breeding	14.94	1.000 (<0.001)	0.990 (0.009)	0.028	0.989
Applicant (50%, 1%)	Non-breeding	12.25	1.000 (<0.001)	0.992 (0.009)	0.022	0.818
Applicant (50%, 1%)	Annual Total	27.19	1.000 (<0.001)	0.983 (0.009)	0.050	1.746
Guidance (60%, 3%)	Breeding	53.77	0.999 (<0.001)	0.965 (0.009)	0.097	3.454
Guidance (60%, 1%)	Non-breeding	14.70	1.000 (<0.001)	0.991 (0.009)	0.027	0.946

Scenario	Season	Predicted Mortality	Median Growth rate (±SD)	Median Pop. Size (±SD)	Decrease in CGR per annum (%)	Decrease in CPS after 35 years (%)
Guidance (60%, 3%; 60%, 1%)	Annual Total	68.47	0.999 (<0.001)	0.956 (0.009)	0.124	4.358
Guidance (60%, 5%)	Breeding	89.62	0.998 (<0.001)	0.994 (0.009)	0.161	5.645
Guidance (60%, 3%)	Non-breeding	44.10	0.999 (<0.001)	0.972 (0.009)	0.079	2.805
Guidance (60%, 5%; 60%, 3%)	Annual Total	133.72	0.998 (<0.001)	0.917 (0.009)	0.240	8.299

Table 10-122: Guillemot O&M phase disturbance annual in-combination displacement matrix for all project impacts apportioned to North Caithness Cliffs SPA.

Annual Total	Mortality Rate (%)													
Displacement Rate (%)	1	2	3	5	10	20	30	40	50	60	70	80	90	100
10	5	11	16	27	54	109	163	217	272	326	381	435	489	544
20	11	22	33	54	109	217	326	435	544	652	761	870	979	1,087
30	16	33	49	82	163	326	489	652	816	979	1,142	1,305	1,468	1,631
40	22	43	65	109	217	435	652	870	1,087	1,305	1,522	1,740	1,957	2,175
50	27	54	82	136	272	544	816	1,087	1,359	1,631	1,903	2,175	2,447	2,719
60	33	65	98	163	326	652	979	1,305	1,631	1,957	2,284	2,610	2,936	3,262
70	38	76	114	190	381	761	1,142	1,522	1,903	2,284	2,664	3,045	3,426	3,806
80	43	87	130	217	435	870	1,305	1,740	2,175	2,610	3,045	3,480	3,915	4,350
90	49	98	147	245	489	979	1,468	1,957	2,447	2,936	3,426	3,915	4,404	4,894
100	54	109	163	272	544	1,087	1,631	2,175	2,719	3,262	3,806	4,350	4,894	5,437
Note, outputs highlighted in dark blue represent the predicted annual mortality estimates as per the Guidance Approach and those highlighted in yellow represent the predicted annual mortality estimates as per the Applicant Approach. For further information regarding the Guidance and Applicant Approach see Section 2.5 of Volume 7B, Appendix 6-2: Offshore Ornithology Distributional Responses Technical Report and Volume 7B, Appendix 6-2, Annex 4: Review of Relevant Evidence.														

Razorbill

10.3.3.49 Razorbill has been screened in to assess the impacts from distributional responses from the Proposed Development (Offshore) during the O&M phase in-combination with other projects in relation to the following relevant conservation objective for this species, as a feature of the SPA:

- Maintain the population as a viable component of the site.

10.3.3.50 Projects identified for in-combination distributional response for the razorbill feature of North Caithness Cliffs SPA are listed in Table 10-123, with the respective impact predictions for the different seasonal in-combination scenarios presented in Table 10-124. The predicted apportioned abundance for planned and operational projects included within Table 10-123, are primarily based on the Northeast and East Scotwind Projects Cumulative totals dataset (RoyalHaskoningDHV, 2024[136]), with the addition of abundance totals for Ossian (NIRAS and RPS, 2024[141]) and Salamander (ERM, 2024[142]) derived from their respective RIAAs.

10.3.3.51 The main focus of the assessment is based on the Applicant Approach of a displacement rate of 50% and a 1% mortality rate for O&M phase in-combination distributional response impacts. NatureScot advise that distributional response assessment for razorbill should be based on a displacement rate of 60% and a mortality rate of up to 3 - 5% depending on the season being assessed, therefore such levels of predicted effect are also provided in Table 10-123.

10.3.3.52 A displacement matrix is also presented for the annual apportioned in-combination abundance for North Caithness Cliffs SPA (Table 10-126), when considering the all projects scenario presented in Table 10-124.

Table 10-123: Razorbill in-combination season and total abundance estimates attributed to North Caithness Cliffs SPA.

Development	Predicted Abundance		
	Breeding Season	Non-breeding Season	Total
Aberdeen (EOWDC)	-	1	1
Beatrice	9	12	21
Berwick Bank	-	96	96
Blyth Demonstration Project	-	1	1
DEP	-	8	8
Dogger Bank A2	-	39	39
Dogger Bank B2	-	49	49
Dogger Bank C3	-	17	17
Dogger Bank South (PEIR)	-	73	73
Dudgeon	-	7	7
East Anglia ONE	-	3	3
East Anglia ONE North	-	2	2
East Anglia THREE	-	21	21
East Anglia TWO	-	2	2
Five Estuaries	-	12	12
Forthwind	-	-	-
Galloper	-	3	3
Greater Gabbard	-	2	2
Green Volt	8	1	8
Gunfleet Sands	-	-	-
Hornsea Project Four	-	28	28
Hornsea Project One	-	43	43
Hornsea Project Three	-	40	40

Development	Predicted Abundance		
	Breeding Season	Non-breeding Season	Total
Hornsea Project Two	-	35	35
Humber Gateway	-	0	0
Hywind	-	4	4
Inch Cape	-	19	19
Kentish Flats and Extension	-	-	-
Kincardine	-	-	-
Lincs & LID	-	-	-
London Array	-	-	-
Moray East	24	7	32
Moray West	16	40	56
Neart na Gaoithe	-	32	32
Norfolk Boreas	-	8	8
Norfolk Vanguard	-	14	14
North Falls (PEIR)	-	24	24
Ossian	-	10	10
Outer Dowsing	-	52	52
PFOWF	217	0	217
Race Bank	-	1	1
Rampion	-	24	24
Rampion 2	-	40	40
Salamander	-	3	3
Scroby Sands	-	-	-
Seagreen Alpha	-	5	5
Seagreen Bravo	-	6	6
SEP	-	26	26

Development	Predicted Abundance		
	Breeding Season	Non-breeding Season	Total
Sheringham Shoal	-	8	8
Sofia 3	-	26	26
Teesside	-	-	-
Thanet	-	-	-
Triton Knoll	-	6	6
West of Orkney[vii]	20	2	22
Westermost Rough	-	2	2
Caledonia	98	11	109
All Projects	393	866	1,259
All Projects Excl. Berwick Bank	393	771	1,164
Consented (plus Caledonia)	373	555	928

[vii] These numbers for West of Orkney are subject to change, but have been included to support this assessment on a precautionary basis.

Table 10-124: Seasonal and annual displacement estimates of razorbill for the Proposed Development (Offshore) in-combination with other projects during the operational phase, as per the Applicant and Guidance Approach.

Population Size (Breeding Adults)	Defined Season	Estimated Number of Mortalities (Individuals Per Annum) (Displacement Rate; Mortality Rate)			Change in Average Survival Rate (% Point Change) (Displacement Rate; Mortality Rate)		
		50%; 1% 50%; 1%	60%; 3% 60%; 1%	60%; 5% 60%; 3%	50%; 1% 50%; 1%	60%; 3% 60%; 1%	60%; 5% 60%; 3%
All Projects							
Citation (4,000)	Breeding season (April to Mid-August)	1.96	7.07	11.78	0.049	0.177	0.295
	Non-breeding season (Late-August to March)	4.33	5.2	15.59	0.108	0.13	0.39
	Annual total	6.3	12.27	27.38	0.157	0.307	0.684
Latest (13,384)	Breeding season (April to Mid-August)	1.96	7.07	11.78	0.015	0.053	0.088
	Non-breeding season (Late-August to March)	4.33	5.2	15.59	0.032	0.039	0.117
	Annual total	6.3	12.27	27.38	0.047	0.092	0.205
All Projects Excluding Berwick Bank							
Citation (4,000)	Breeding season (April to Mid-August)	1.96	7.07	11.78	0.049	0.177	0.295

Population Size (Breeding Adults)	Defined Season	Estimated Number of Mortalities (Individuals Per Annum) (Displacement Rate; Mortality Rate)			Change in Average Survival Rate (% Point Change) (Displacement Rate; Mortality Rate)		
		50%; 1% 50%; 1%	60%; 3% 60%; 1%	60%; 5% 60%; 3%	50%; 1% 50%; 1%	60%; 3% 60%; 1%	60%; 5% 60%; 3%
	Non-breeding season (Late-August to March)	3.85	4.62	13.87	0.096	0.166	0.347
	Annual total	5.82	11.69	25.66	0.145	0.292	0.641
Latest (13,384)	Breeding season (April to Mid-August)	1.96	7.07	11.78	0.015	0.053	0.088
	Non-breeding season (Late-August to March)	3.85	4.62	13.87	0.029	0.035	0.104
	Annual total	5.82	11.69	25.66	0.043	0.087	0.192
All Consented Projects plus Caledonia							
Citation (4,000)	Breeding season (April to Mid-August)	1.86	6.71	11.19	0.047	0.168	0.28
	Non-breeding season (Mid-August to March)	2.78	3.33	9.99	0.069	0.083	0.25
	Annual total	4.64	10.04	21.18	0.116	0.251	0.529

Population Size (Breeding Adults)	Defined Season	Estimated Number of Mortalities (Individuals Per Annum) (Displacement Rate; Mortality Rate)			Change in Average Survival Rate (% Point Change) (Displacement Rate; Mortality Rate)		
		50%; 1% 50%; 1%	60%; 3% 60%; 1%	60%; 5% 60%; 3%	50%; 1% 50%; 1%	60%; 3% 60%; 1%	60%; 5% 60%; 3%
Latest (13,384)	Breeding season (April to Mid-August)	1.86	6.71	11.19	0.014	0.05	0.084
	Non-breeding season (Late-August to March)	2.78	3.33	9.99	0.021	0.025	0.075
	Annual total	4.64	10.04	21.18	0.035	0.075	0.158

Breeding Season

10.3.3.53 During the breeding season, the in-combination abundance for razorbill is up to 393 (372.85 - 392.77) breeding adults of North Caithness Cliffs SPA for projects identified (Table 10-123). Assuming a displacement rate of 50% and a mortality rate of 1%, the consequent potential mortality is estimated to be two (1.86 - 1.96) breeding adults per annum during the breeding season, depending on the scenario considered.

10.3.3.54 Using the citation colony count of 4,000 breeding adults and an annual background mortality of 420 breeding adults, the addition of two predicted breeding adult mortalities would result in up to a 0.049 survival rate percentage point change during the breeding season per annum. When considering the most up to date counts of 13,384 breeding adults and an annual background mortality of 1,405 breeding adults, this results in up to a 0.015 survival rate percentage point change during the breeding season per annum (Table 10-124).

Non-Breeding Season

10.3.3.55 During the non-breeding season, the in-combination abundance for razorbill is up to 866 (555.13 - 866.38) breeding individuals of North Caithness Cliffs SPA for projects identified (Table 10-123). Assuming a displacement rate of 50% and a mortality rate of 1%, the consequent potential mortality is estimated to be up to four (2.78 - 4.33) breeding adults per annum during the non-breeding season, depending on the scenario considered.

10.3.3.56 Using the citation colony count of 4,000 breeding adults and an annual background mortality of 420 breeding adults, the addition of three to four predicted breeding adult mortalities would result in up to a 0.108 survival rate percentage point change during the non-breeding season per annum. When considering the most up to date counts of 13,384 breeding adults and an annual background mortality of 1,405 breeding adults, this results in up to a 0.032 survival rate percentage point change during the non-breeding season per annum (Table 10-124).

Annual Total

10.3.3.57 The annual total of razorbill subject to mortality due to in-combination distributional response at North Caithness Cliffs SPA is estimated to be up to six (4.64 - 6.30) breeding adults per annum depending on the scenarios presented in Table 10-123. This is predicted to result in a survival rate percentage point change against the citation and most recently published counts of 0.157 and 0.047 respectively depending on the in-combination scenario considered (see Table 10-124).

10.3.3.58 To note, the removal of Berwick Bank from the assessment reduces predicted mortality to six (5.82) birds per annum. Using the citation colony count and most recently published count, this equates to a 0.145 and 0.043 percentage point survival rate change within this population respectively.

10.3.3.59 When considering the Guidance approach, a total of 10 – 27 (10.04 – 27.38) breeding adult mortalities are predicted due to potential distributional response effects per annum. This results in a survival rate percentage point change of 0.251 – 0.684 against the citation and 0.075 – 0.205 against the most recently published count (Table 10-124).

10.3.3.60 As the survival rate percentage point change exceeds NatureScot's threshold of 0.02% when considering both the Applicant and Guidance approach, further consideration of the level of effect predicted has been analysed using PVA, as set out below.

Population Viability Analysis

10.3.3.61 The potential for distributional responses in-combination has been assessed against the latest 2015 -2023 colony count population size of 13,384 breeding adults according to the Seabird Monitoring Programme (2020) database. A range of impact values from six (6.30) to 27 (27.38) breeding adult additional mortalities per annum were modelled (when considering the in-combination scenarios), which allows for consideration of both the Applicant and Guidance Approach predicted impact levels. For the reasons detailed within Section 7.3.3, this assessment is based on the consideration of the counterfactual of growth rate only, though the counterfactual of population size is also presented for consideration in Table 10-125. The PVA outputs for the razorbill feature of North Caithness Cliffs SPA predicted a reduction in the growth rate of up to 0.06% when considering an increase of six additional adult mortalities per annum (based on a 50% displacement and 1% mortality rate) to 0.25% when considering an increase of 27 additional adult mortalities per annum (60% displacement and 3-5% mortality rate).

10.3.3.62 Whilst recognising the population at this site has fluctuated through declines and increases since the citation count in 1985 – 1987 (Burnell *et al.*, 2023[86]; SMP, 2024[152]), overall it is considered to be in 'favourable maintained' condition. The reasons for the fluctuations are unclear, but not considered to be linked to the development of offshore wind farms within the Moray Firth, which have only been in operation for a short period. It is also worth noting that distributional responses are not considered likely to be at the upper end of the Guidance approach, particularly when considering monitoring studies from the operational Beatrice offshore wind farm within the Moray Firth (Trinder *et al.*, 2024[145]). However, When considering the Applicant or Guidance Approach the impacts from the Proposed Development (Offshore) in-combination with all other projects would have a limited effect on the overall status or trajectory of the population, as the resulting reduction in growth rate would at most be 0.2% annually for these scenarios.

10.3.3.63 **Therefore, there is no potential for an AEoSI to the conservation objectives of the razorbill feature of North Caithness Cliffs SPA in relation to distributional response effects in the O&M phase from the Proposed Development (Offshore) in-combination with all other projects. Subject to natural change, razorbill will be maintained as a feature in the long term.**

Table 10-125: PVA results for the razorbill feature of North Caithness Cliffs SPA when considering distributional responses effects for the Proposed Development (Offshore) alone and in-combination.

Scenario	Season	Predicted Mortality	Median Growth rate (±SD)	Median Pop. Size (±SD)	Decrease in CGR per annum (%)	Decrease in CPS after 35 years (%)
Caledonia OWF						
Alone - Guidance (60%, 3%; 60%, 1%)	Annual Total	1.84	1.000 (0.001)	0.995(0.048)	0.013	0.520
Alone - Guidance (60%, 5%)	Breeding	2.95	1.000 (0.001)	0.991 (0.047)	0.023	0.879
Alone - Guidance (60%, 5%; 60%, 3%)	Annual Total	3.14	1.000 (0.001)	0.991 (0.047)	0.025	0.879
In-combination all consented projects plus Caledonia OWF						
Applicant (50%, 1%)	Breeding	1.86	1.000 (0.002)	0.993 (0.058)	0.021	0.688
Applicant (50%, 1%)	Non-breeding	2.78	1.000 (0.002)	0.991 (0.057)	0.026	0.870
Applicant (50%, 1%)	Annual Total	4.64	1.000 (0.002)	0.986 (0.057)	0.041	1.446
Guidance (60%, 3%)	Breeding	6.71	0.999 (0.002)	0.978 (0.057)	0.061	2.237
Guidance (60%, 1%)	Non-breeding	3.33	1.000 (0.002)	0.990 (0.057)	0.027	0.985
Guidance (60%, 3%; 60%, 1%)	Annual Total	10.04	0.999 (0.002)	0.966 (0.056)	0.096	3.403
Guidance (60%, 5%)	Breeding	11.19	0.999 (0.002)	0.963 (0.056)	0.101	3.665
Guidance (60%, 3%)	Non-breeding	9.99	0.999 (0.002)	0.990 (0.057)	0.092	3.232

Scenario	Season	Predicted Mortality	Median Growth rate (±SD)	Median Pop. Size (±SD)	Decrease in CGR per annum (%)	Decrease in CPS after 35 years (%)
Guidance (60%, 5%; 60%, 3%)	Annual Total	21.18	0.998 (0.002)	0.932 (0.056)	0.197	6.830
In-combination all projects plus Caledonia OWF						
Applicant (50%, 1%)	Breeding	1.96	1.000 (0.002)	0.994 (0.059)	0.018	0.644
Applicant (50%, 1%)	Non-breeding	4.33	1.000 (0.002)	0.985 (0.058)	0.043	1.539
Applicant (50%, 1%)	Annual Total	6.30	0.999 (0.002)	0.980 (0.058)	0.057	2.047
Guidance (60%, 3%)	Breeding	7.07	0.999 (0.002)	0.977 (0.059)	0.067	2.300
Guidance (60%, 1%)	Non-breeding	5.20	0.999 (0.002)	0.983 (0.058)	0.051	1.745
Guidance (60%, 3%; 60%, 1%)	Annual Total	12.27	0.999 (0.002)	0.961 (0.056)	0.108	3.916
Guidance (60%, 5%)	Breeding	11.78	0.999 (0.002)	0.961 (0.057)	0.109	3.874
Guidance (60%, 3%)	Non-breeding	15.59	0.999 (0.002)	0.951 (0.056)	0.141	4.916
Guidance (60%, 5%; 60%, 3%)	Annual Total	27.38	0.998 (0.002)	0.915 (0.055)	0.247	8.491
In-combination all projects minus Berwick Bank plus Caledonia OWF						
Applicant (50%, 1%)	Breeding	1.96	1.000 (0.002)	0.994 (0.059)	0.018	0.644
Applicant (50%, 1%)	Non-breeding	3.85	1.000 (0.002)	0.986 (0.057)	0.036	1.398
Applicant (50%, 1%)	Annual Total	5.82	0.999 (0.002)	0.981 (0.056)	0.054	1.926

Scenario	Season	Predicted Mortality	Median Growth rate (±SD)	Median Pop. Size (±SD)	Decrease in CGR per annum (%)	Decrease in CPS after 35 years (%)
Guidance (60%, 3%)	Breeding	7.07	0.999 (0.002)	0.977 (0.059)	0.067	2.300
Guidance (60%, 1%)	Non-breeding	4.62	1.000 (0.002)	0.984 (0.059)	0.041	1.551
Guidance (60%, 3%; 60%, 1%)	Annual Total	11.69	0.999 (0.002)	0.961 (0.057)	0.108	3.881
Guidance (60%, 5%)	Breeding	11.78	0.999 (0.002)	0.961 (0.057)	0.109	3.874
Guidance (60%, 3%)	Non-breeding	13.87	0.999 (0.002)	0.956 (0.056)	0.125	4.397
Guidance (60%, 5%; 60%, 3%)	Annual Total	25.66	0.988 (0.002)	0.921 (0.055)	0.231	7.923

Table 10-126: Razorbill O&M phase disturbance annual in-combination displacement matrix for all project impacts apportioned to North Caithness Cliffs SPA.

Annual Total Displacement Rate (%)	Mortality Rate (%)													
	1	2	3	5	10	20	30	40	50	60	70	80	90	100
10	1	3	4	6	13	25	38	50	63	76	88	101	113	126
20	3	5	8	13	25	50	76	101	126	151	176	201	227	252
30	4	8	11	19	38	76	113	151	189	227	264	302	340	378
40	5	10	15	25	50	101	151	201	252	302	353	403	453	504
50	6	13	19	31	63	126	189	252	315	378	441	504	567	630
60	8	15	23	38	76	151	227	302	378	453	529	604	680	755
70	9	18	26	44	88	176	264	353	441	529	617	705	793	881
80	10	20	30	50	101	201	302	403	504	604	705	806	907	1,007
90	11	23	34	57	113	227	340	453	567	680	793	907	1,020	1,133
100	13	25	38	63	126	252	378	504	630	755	881	1,007	1,133	1,259
Note, outputs highlighted in dark blue represent the predicted annual mortality estimates as per the Guidance Approach and those highlighted in yellow represent the predicted annual mortality estimates as per the Applicant Approach. For further information regarding the Guidance and Applicant Approach see Section 2.5 of Volume 7B, Appendix 6-2: Offshore Ornithology Distributional Responses Technical Report and Volume 7B, Appendix 6-2, Annex 4: Review of Relevant Evidence.														

Puffin

10.3.3.64 Puffin has been screened in to assess the impacts from distributional responses from the Proposed Development (Offshore) during the O&M phase in-combination with other projects in relation to the following relevant conservation objective for this species, as a feature of the SPA:

- Maintain the population as a viable component of the site.

10.3.3.65 Projects identified for in-combination distributional response for the puffin feature of North Caithness Cliffs SPA are listed in Table 10-127, with the respective impact predictions for the different seasonal in-combination scenarios presented in Table 10-128. The predicted apportioned abundance for planned and operational projects included within Table 10-127, are primarily based on the Northeast and East Scotwind Projects Cumulative totals dataset (RoyalHaskoningDHV, 2024[136]), with the addition of abundance totals for Ossian (NIRAS and RPS, 2024[141]) and Salamander (ERM, 2024[142]) derived from their respective RIAAs.

10.3.3.66 The main focus of the assessment is based on the Applicant Approach of a displacement rate of 50% and a 1% mortality rate for O&M phase in-combination distributional response impacts. NatureScot advise that distributional response assessment for puffin should be based on a displacement rate of 60% and a mortality rate of up to 3 - 5% depending on the season being assessed, therefore such levels of predicted effect are also provided in Table 10-127.

10.3.3.67 A displacement matrix is also presented for the annual apportioned in-combination abundance for North Caithness Cliffs SPA (Table 10-131 and Table 10-132), when considering the all projects scenarios presented in Table 10-127.

Table 10-127: Puffin in-combination season and total abundance estimates attributed to North Caithness Cliffs SPA.

Development	Predicted Abundance		
	Breeding Season	Non-breeding Season	Total
Aberdeen (EOWDC)	-	-	-
Beatrice	969	3	972
Berwick Bank	7	11	18
Blyth Demonstration Site	-	-	-
DEP	-	-	-
Dogger Bank A	-	-	-
Dogger Bank B	-	1	1
Dogger Bank C	-	-	-
Dogger Bank South (PEIR)	-	1	1
Dudgeon	-	-	-
East Anglia One	-	-	-
East Anglia One North	-	-	-
East Anglia Three	-	-	-
East Anglia Two	-	-	-
Five Estuaries	-	-	-
Forthwind	-	-	-
Galloper	-	-	-
Greater Gabbard	-	-	-
Green Volt	13	-	13
Gunfleet Sands	-	-	-
Hornsea Project Four	-	1	1
Hornsea Project One	-	2	2
Hornsea Project Three	-	-	-

Development	Predicted Abundance		
	Breeding Season	Non-breeding Season	Total
Hornsea Project Two	-	3	3
Humber Gateway	-	-	-
Hywind 2 Demonstration	-	-	-
Inch Cape	-	3	3
Kentish Flats	-	-	-
Kentish Flats Extension	-	-	-
Kincardine	-	-	-
Lincs, Lynn and Inner Dowsing	-	-	-
London Array	-	-	-
Moray East	2,122	1	2,123
Moray West	162	5	167
Neart na Gaoithe	-	3	3
Norfolk Boreas	-	-	-
Norfolk Vanguard	-	-	-
North Falls (PEIR)	-	-	-
Ossian	-	-	-
Outer Dowsing	-	1	1
PFOWF	300	-	300
Race Bank	-	-	-
Rampion	-	-	-
Rampion 2	-	-	-
Salamander	7	-	7
Scroby Sands	-	-	0
Seagreen Alpha	-	2	2
Seagreen Bravo	-	5	5

Development	Predicted Abundance		
	Breeding Season	Non-breeding Season	Total
SEP	-	-	-
Sheringham Shoal	-	-	-
Sofia	-	-	-
Teesside	-	-	-
Thanet	-	-	-
Triton Knoll	-	-	-
West of Orkney[viii]	-	3	3
Westermost Rough	-	-	-
Caledonia (Guidance)	54	2	56
Caledonia (Applicant)	18	4	22
All Projects (Guidance)	3,633	47	3,681
All Projects (Applicant)	3,597	50	3,647
All Projects Excl. Berwick Bank (Guidance)	3,627	36	3,663
All Projects Excl. Berwick Bank (Applicant)	3,591	38	3,629
Consented (plus Caledonia) (Guidance)	3,620	32	3,652
Consented (plus Caledonia) (Applicant)	3,584	34	3,618
Note, the Applicant has decided to include the Year 1 August count in the non-breeding season rather than during the breeding season. This is due to the Year 1 August abundance being considered to reflect migration rather than individuals present in the breeding season. Note, the predicted abundances for puffin have also been presented with the August count included in the breeding season as per the Guidance Approach.			

[viii] These numbers for West of Orkney are subject to change, but have been included to support this assessment.

Table 10-128: Seasonal and annual displacement estimates of puffin for the Proposed Development (Offshore) in-combination with other projects during the operational phase, as per the Applicant and Guidance Approach.

Population Size (Breeding Adults)	Defined Season	Estimated Number of Mortalities (Individuals Per Annum) (Displacement Rate; Mortality Rate)			Change in Average Survival Rate (% Point Change) (Displacement Rate; Mortality Rate)		
		50%; 1% 50%; 1%	60%; 3% 60%; 1%	60%; 5% 60%; 3%	50%; 1% 50%; 1%	60%; 3% 60%; 1%	60%; 5% 60%; 3%
All Projects (Guidance)							
Citation (4,160)	Breeding season (April to Mid-August)	18.17	65.4	109	0.437	1.572	2.62
	Non-breeding season (Late-August to March)	0.24	0.28	0.85	0.006	0.007	0.021
	Annual total	18.4	65.68	109.85	0.442	1.579	2.641
Latest (3,011)	Breeding season (April to Mid-August)	18.17	65.4	109	0.603	2.172	3.62
	Non-breeding season (Late-August to March)	0.24	0.28	0.85	0.008	0.009	0.028
	Annual total	18.4	65.68	109.85	0.611	2.181	3.648
All Projects (Applicant)							
Citation (4,160)	Breeding season (April to Mid-August)	17.99	64.75	107.92	0.432	1.557	2.594
	Non-breeding season (Late-August to March)	0.25	0.30	0.89	0.006	0.007	0.021

Population Size (Breeding Adults)	Defined Season	Estimated Number of Mortalities (Individuals Per Annum) (Displacement Rate; Mortality Rate)			Change in Average Survival Rate (% Point Change) (Displacement Rate; Mortality Rate)		
		50%; 1% 50%; 1%	60%; 3% 60%; 1%	60%; 5% 60%; 3%	50%; 1% 50%; 1%	60%; 3% 60%; 1%	60%; 5% 60%; 3%
	Annual total	18.23	65.05	108.82	0.438	1.564	2.616
Latest (3,011)	Breeding season (April to Mid-August)	17.99	64.75	107.92	0.597	2.151	3.584
	Non-breeding season (Late-August to March)	0.25	0.30	0.89	0.008	0.01	0.03
	Annual total	18.23	65.05	108.82	0.606	2.16	3.614
All Projects Excluding Berwick Bank (Guidance)							
Citation (4,160)	Breeding season (April to Mid-August)	18.13	65.28	108.8	0.436	1.569	2.615
	Non-breeding season (Late-August to March)	0.18	0.22	0.65	0.004	0.005	0.016
	Annual total	18.31	65.50	109.45	0.44	1.574	2.631
Latest (3,011)	Breeding season (April to Mid-August)	18.13	65.28	108.8	0.602	2.168	3.613
	Non-breeding season (Late-August to March)	0.18	0.22	0.65	0.006	0.007	0.022
	Annual total	18.31	65.50	109.45	0.608	2.175	3.635

Population Size (Breeding Adults)	Defined Season	Estimated Number of Mortalities (Individuals Per Annum) (Displacement Rate; Mortality Rate)			Change in Average Survival Rate (% Point Change) (Displacement Rate; Mortality Rate)		
		50%; 1% 50%; 1%	60%; 3% 60%; 1%	60%; 5% 60%; 3%	50%; 1% 50%; 1%	60%; 3% 60%; 1%	60%; 5% 60%; 3%
All Projects Excluding Berwick Bank (Applicant)							
Citation (4,160)	Breeding season (April to Mid-August)	17.95	64.63	107.72	0.432	1.554	2.59
	Non-breeding season (Late-August to March)	0.19	0.23	0.69	0.005	0.006	0.017
	Annual total	18.15	64.86	108.41	0.436	1.559	2.606
Latest (3,011)	Breeding season (April to Mid-August)	17.95	64.63	107.72	0.596	2.147	3.578
	Non-breeding season (Late-August to March)	0.19	0.23	0.69	0.006	0.008	0.023
	Annual total	18.15	64.86	108.41	0.603	2.154	3.601
All Consented Projects plus Caledonia (Guidance)							
Citation (4,160)	Breeding season (April to Mid-August)	18.10	65.16	108.60	0.435	1.566	2.611
	Non-breeding season (Late-August to March)	0.16	0.19	0.57	0.004	0.005	0.014
	Annual total	18.26	65.35	109.17	0.439	1.571	2.624

Population Size (Breeding Adults)	Defined Season	Estimated Number of Mortalities (Individuals Per Annum) (Displacement Rate; Mortality Rate)			Change in Average Survival Rate (% Point Change) (Displacement Rate; Mortality Rate)		
		50%; 1% 50%; 1%	60%; 3% 60%; 1%	60%; 5% 60%; 3%	50%; 1% 50%; 1%	60%; 3% 60%; 1%	60%; 5% 60%; 3%
Latest (3,011)	Breeding season (April to Mid-August)	18.10	65.16	108.60	0.601	2.164	3.607
	Non-breeding season (Late-August to March)	0.16	0.19	0.57	0.005	0.006	0.019
	Annual total	18.26	65.35	109.17	0.606	2.170	3.626
All Consented Projects plus Caledonia (Applicant)							
Citation (4,160)	Breeding season (April to Mid-August)	17.92	64.51	107.52	0.431	1.551	2.585
	Non-breeding season (Late-August to March)	0.17	0.20	0.61	0.004	0.005	0.015
	Annual total	18.09	64.72	108.13	0.435	1.556	2.599
Latest (3,011)	Breeding season (April to Mid-August)	17.92	64.51	107.52	0.595	2.143	3.571
	Non-breeding season (Late-August to March)	0.17	0.20	0.61	0.006	0.007	0.020
	Annual total	18.09	64.72	108.13	0.601	2.149	3.591

Breeding Season

10.3.3.68 During the breeding season, the in-combination abundance for puffin is up to 3,597 (3,584.12 - 3,597.45) breeding adults of North Caithness Cliffs SPA for projects identified (Table 10-127). Assuming a displacement rate of 50% and a mortality rate of 1%, the consequent potential mortality is estimated to be 18 (17.92 - 17.99) breeding adults per annum during the breeding season, depending on the scenario considered.

10.3.3.69 Using the citation colony count of 4,160 breeding adults and an annual background mortality of 391 breeding adults, the addition of 18 predicted breeding adult mortalities would result in up to a 0.432 survival rate percentage point change during the breeding season per annum. When considering the most up to date counts of 3,011 breeding adults and an annual background mortality of 283 breeding adults, this results in up to a 0.597 survival rate percentage point change during the breeding season per annum (Table 10-128).

Non-Breeding Season

10.3.3.70 During the non-breeding season, the in-combination abundance for puffin is up to 50 (33.79 - 49.54) breeding individuals of North Caithness Cliffs SPA for projects identified (Table 10-127). Assuming a displacement rate of 50% and a mortality rate of 1%, the consequent potential mortality is estimated to be less than one (0.17 - 0.25) breeding adults per annum during the non-breeding season, depending on the scenario considered.

10.3.3.71 Using the citation colony count of 4,160 breeding adults and an annual background mortality of 391 breeding adults, the addition of less than one predicted breeding adult mortalities would result in up to a 0.006 survival rate percentage point change during the non-breeding season per annum. When considering the most up to date counts of 3,011 breeding adults and an annual background mortality of 283 breeding adults, this results in up to a 0.008 survival rate percentage point change during the non-breeding season per annum (Table 10-128).

Annual Total

10.3.3.72 The annual total of puffin subject to mortality due to in-combination distributional response at North Caithness Cliffs SPA is estimated to be 18 (18.09 - 18.23) breeding adults per annum depending on the scenarios presented in Table 10-127. This is predicted to result in a survival rate percentage point change against the citation and most recently published counts of 0.435 to 0.438 and 601 to 0.606 respectively depending on the in-combination scenario considered (see Table 10-128).

10.3.3.73 To note, the removal of Berwick Bank from the assessment reduces predicted mortality to 18 (18.75) breeding birds per annum. Using the citation colony count and most recently published count, this equates to a 0.436 and 0.606 percentage point survival rate change within this population respectively.

10.3.3.74 When considering the Guidance approach, a total of 65 – 109 (64.72 to 108.82) breeding adult mortalities are predicted due to potential distributional response effects per annum. This results in a survival rate percentage point change of 1.556 – 2.616 against the citation and 2.149 – 3.614 against the most recently published count (Table 10-128).

10.3.3.75 As the survival rate percentage point change exceeds NatureScot's threshold of 0.02% when considering both the Applicant and Guidance approach, further consideration of the level of effect predicted has been analysed using PVA, as set out below.

Population Viability Analysis

10.3.3.76 The potential for distributional responses in-combination has been assessed against the latest 2016 -2023 colony count population size of 3,011 breeding adults according to the Seabird Monitoring Programme (2020) database. A range of impact values from 18 (17.92) and 109 (108.82) breeding adult additional mortalities per annum were modelled (when considering the in-combination scenarios), which allows for consideration of both the Applicant and Guidance Approach predicted impact levels. For the reasons detailed within Section 7.3.3, this assessment is based on the consideration of the counterfactual of growth rate only, though the counterfactual of population size is also presented for consideration in Table 10-129. The PVA outputs for the puffin feature of North Caithness Cliffs SPA predicted a reduction in the growth rate of up to 0.72% when considering an increase of 18 additional adult mortalities per annum (based on a 50% displacement and 1% mortality rate) to 4.31% when considering an increase of 109 additional adult mortalities per annum (60% displacement and 3-5% mortality rate).

10.3.3.77 The population at this site has seen long term decline in population since the citation designation in 1985 – 1987, with the current status of colony classified as 'unfavourable' and 'decline'. The reasons for the long term decline are not considered to be linked to the development of offshore wind farms within the region, which have only been in operation for a short period. The level of predicted effect, especially when considering the upper range of the Guidance approach in-combination, would pose a significant level of effect if true.

10.3.3.78 Given that the majority of predicted impact relates to the Moray Firth Zone (Beatrice, Moray East and Moray West), the post construction monitoring completed for Beatrice (Trinder *et al*., 2024[145]) provides valuable insight into the likely level of predicted effect. As detailed within Volume 7B, Appendix 6-2, Annex 4: Review of Relevant Evidence post-construction monitoring results for Beatrice stated no indication of avoidance of the OWF or individual turbines and in some cases higher densities of auks in proximity to turbines (MacArthur Green, 2023[146]). Overall, it was concluded that the displacement rates of 30% to 70% currently applied to displacement assessments for auks are considerably over-estimated, at least in the breeding season for similar OWFs (MacArthur Green, 2021[147]).

10.3.3.79 It is also important to consider the Proposed Development (Offshore) contribution to such a level of effect. When considering all projects identified, the Proposed Development (Offshore) provides an impact contribution of only 0.6% - 1.5%, which can be considered a non-material contribution to the overall effect. Inclusion of the Proposed Development (Offshore) certainly wouldn't be the tipping point for any in-combination predicted impact total causing an AEoSI, given it's contribution to the overall effect. **In light of the above an AEoSI to the conservation objectives of the puffin features of North Caithness Cliffs SPA can be ruled out for the Proposed Development (Offshore), based on not tangibly contributing to the predicted in-combination effect from Distributional Responses.**

Table 10-129: PVA results for the puffin feature of North Caithness Cliffs SPA when considering distributional responses effects for the Proposed Development (Offshore) alone and in-combination. Note, this table presents the Guidance Approach for puffin, whereby the Year 1 August abundance has been incorporated as part of the breeding season (further details are provided in Volume 7B, Appendix 6-2: Offshore Ornithology Distributional Responses Technical Report).

Scenario	Season	Predicted Mortality	Median Growth rate (±SD)	Median Pop. Size (±SD)	Decrease in CGR per annum (%)	Decrease in CPS after 35 years (%)
Caledonia North						
Alone - Guidance (60%, 3%	Breeding	1.05	0.975 (0.003)	0.409 (0.042)	2.459	59.183
Alone - Guidance (60%, 3%; 60%, 1%)	Annual Total	1.05	0.975 (0.003)	0.408 (0.042)	0.039	1.293
Alone - Guidance (60%, 5%)	Breeding	62.61	1.000 (0.002)	0.987 (0.086)	2.453	59.144
Alone - Guidance (60%, 5%; 60%, 3%)	Annual Total	62.61	1.000 (0.002)	0.984 (0.087)	0.045	1.589
Caledonia South						
Alone - Guidance (60%, 5%)	Breeding	0.95	1.000 (0.002)	0.986 (0.087)	0.037	1.389
Alone - Guidance (60%, 5%; 60%, 3%)	Annual Total	0.97	1.000 (0.002)	0.984 (0.087)	0.044	1.622
Caledonia OWF						
Alone - Guidance (60%, 3%	Breeding	0.98	1.000 (0.003)	0.985 (0.113)	0.037	1.544
Alone - Guidance (60%, 3%; 60%, 1%)	Annual Total	0.99	1.000 (0.003)	0.984 (0.117)	0.041	1.574

Scenario	Season	Predicted Mortality	Median Growth rate (±SD)	Median Pop. Size (±SD)	Decrease in CGR per annum (%)	Decrease in CPS after 35 years (%)
Alone - Guidance (60%, 5%)	Breeding	1.63	0.999 (0.003)	0.976 (0.112)	0.067	2.371
Alone - Guidance (60%, 5%; 60%, 3%)	Annual Total	1.66	0.999 (0.003)	0.976 (0.113)	0.064	2.370
In-combination all consented projects plus Caledonia OWF						
Applicant (50%, 1%)	Breeding	18.10	0.993 (0.003)	0.775 (0.079)	0.707	22.498
Applicant (50%, 1%)	Annual Total	18.26	0.993 (0.003)	0.772 (0.077)	0.717	22.790
Guidance (60%, 3%)	Breeding	65.16	0.974 (0.003)	0.393 (0.047)	2.553	60.665
Guidance (60%, 3%; 60%, 1%)	Annual Total	65.35	0.974 (0.003)	0.393 (0.046)	2.560	60.710
Guidance (60%, 5%)	Breeding	108.60	0.957 (0.004)	0.207 (0.030)	4.272	79.256
Guidance (60%, 5%; 60%, 3%)	Annual Total	109.17	0.957 (0.004)	0.206 (0.030)	4.294	79.402
In-combination all projects plus Caledonia OWF						
Applicant (50%, 1%)	Breeding	18.17	0.993 (0.003)	0.772 (0.078)	0.714	22.756
Applicant (50%, 1%)	Annual Total	18.40	0.993 (0.003)	0.771 (0.078)	0.720	22.912
Guidance (60%, 3%)	Breeding	65.40	0.974 (0.003)	0.392 (0.046)	2.562	60.781
Guidance (60%, 3%; 60%, 1%)	Annual Total	65.68	0.974 (0.003)	0.391 (0.047)	2.574	60.907

Scenario	Season	Predicted Mortality	Median Growth rate (±SD)	Median Pop. Size (±SD)	Decrease in CGR per annum (%)	Decrease in CPS after 35 years (%)
Guidance (60%, 5%)	Breeding	109.00	0.957 (0.004)	0.207 (0.030)	4.278	79.274
Guidance (60%, 3%)	Non-breeding	0.85	1.000 (0.003)	0.990 (0.096)	0.029	0.962
Guidance (60%, 5%; 60%, 3%)	Annual Total	109.85	0.957 (0.004)	0.205 (0.030)	4.306	79.524
In-combination all projects minus Berwick Bank plus Caledonia OWF						
Applicant (50%, 1%)	Breeding	18.13	0.993 (0.003)	0.774 (0.078)	0.708	22.607
Applicant (50%, 1%)	Annual Total	18.31	0.993 (0.003)	0.773 (0.079)	0.716	22.664
Guidance (60%, 3%)	Breeding	108.80	0.974 (0.003)	0.393 (0.047	2.557	60.692
Guidance (60%, 3%)	Non-breeding	109.00	0.957 (0.004)	0.209 (0.029)	4.264	79.138
Guidance (60%, 5%)	Annual Total	108.80	0.974 (0.003)	0.393 (0.047	2.557	60.692
Guidance (60%, 3%; 60%, 1%)	Breeding	0.65	1.000 (0.003)	0.992 (0.097)	0.020	0.761
Guidance (60%, 5%; 60%, 3%)	Annual Total	109.45	0.957 (0.004)	0.206 (0.029)	4.289	79.395

Table 10-130: PVA results for the puffin feature of North Caithness Cliffs SPA when considering distributional responses effects for the Proposed Development (Offshore) alone and in-combination. Note, this table presents the Applicant Approach for puffin, whereby the Year 1 August abundance has been incorporated as part of the non-breeding season (further details are provided in Volume 7B, Appendix 6-2: Offshore Ornithology Distributional Responses Technical Report).

Scenario	Season	Predicted Mortality	Median Growth rate (±SD)	Median Pop. Size (±SD)	Decrease in CGR per annum (%)	Decrease in CPS after 35 years (%)
In-combination all consented projects plus Caledonia OWF						
Applicant (50%, 1%)	Breeding	17.92	0.993 (0.003)	0.777 (0.080)	0.693	22.267
Applicant (50%, 1%)	Annual Total	18.09	0.993 (0.003)	0.774 (0.077)	0.706	22.591
Guidance (60%, 3%)	Breeding	64.51	0.975 (0.003)	0.397 (0.048)	2.532	60.295
Guidance (60%, 3%; 60%, 1%)	Annual Total	64.72	0.975 (0.003)	0.398 (0.047)	2.525	60.231
Guidance (60%, 5%)	Breeding	107.52	0.958 (0.004)	0.211 (0.030)	4.225	78.859
Guidance (60%, 3%)	Non-breeding	0.61	1.000 (0.003)	0.993 (0.097)	0.020	0.672
Guidance (60%, 5%; 60%, 3%)	Annual Total	108.13	0.958 (0.004)	0.210 (0.030)	4.225	78.966
In-combination all projects plus Caledonia OWF						
Applicant (50%, 1%)	Breeding	17.99	0.993 (0.003)	0.774 (0.079)	0.706	22.581
Applicant (50%, 1%)	Annual Total	18.23	0.993 (0.003)	0.773 (0.078)	0.714	22.734
Guidance (60%, 3%)	Breeding	64.75	0.975 (0.003)	0.397 (0.047)	2.538	60.323

Scenario	Season	Predicted Mortality	Median Growth rate (±SD)	Median Pop. Size (±SD)	Decrease in CGR per annum (%)	Decrease in CPS after 35 years (%)
Guidance (60%, 3%; 60%, 1%)	Annual Total	78.42	0.969 (0.003)	0.325 (0.041)	3.079	67.534
Guidance (60%, 5%)	Breeding	107.92	0.958 (0.004)	0.210 (0.031)	4.236	78.953
Guidance (60%, 3%)	Non-breeding	0.89	0.993 (0.003)	0.773 (0.078)	0.714	22.734
Guidance (60%, 5%; 60%, 3%)	Annual Total	108.82	0.957 (0.004)	0.208 (0.030)	4.268	79.185
In-combination all projects minus Berwick Bank plus Caledonia OWF						
Applicant (50%, 1%)	Breeding	17.95	0.993 (0.003)	0.778 (0.078)	0.702	22.222
Applicant (50%, 1%)	Annual Total	18.15	0.993 (0.003)	0.775 (0.079)	0.708	22.521
Guidance (60%, 3%)	Breeding	64.63	0.975 (0.003)	0.397 (0.047)	2.531	78.892
Guidance (60%, 3%; 60%, 1%)	Annual Total	64.86	0.975 (0.003)	0.396 (0.047)	2.538	60.377
Guidance (60%, 5%)	Breeding	107.72	0.958 (0.004)	0.211 (0.030)	4.226	78.892
Guidance (60%, 3%)	Non-breeding	0.69	1.000 (0.003)	0.991 (0.096)	0.021	0.942
Guidance (60%, 5%; 60%, 3%)	Annual Total	108.41	0.958 (0.004)	0.210 (0.029)	4.247	79.040

Table 10-131: Puffin O&M phase disturbance annual in-combination displacement matrix for all project impacts apportioned to North Caithness Cliffs SPA (Guidance Approach).

Annual Total	Mortality Rate (%)													
Displacement Rate (%)	1	2	3	5	10	20	30	40	50	60	70	80	90	100
10	4	7	11	18	37	74	110	147	184	221	258	294	331	368
20	7	15	22	37	74	147	221	294	368	442	515	589	663	736
30	11	22	33	55	110	221	331	442	552	663	773	883	994	1,104
40	15	29	44	74	147	294	442	589	736	883	1,031	1,178	1,325	1,472
50	18	37	55	92	184	368	552	736	920	1,104	1,288	1,472	1,656	1,840
60	22	44	66	110	221	442	663	883	1,104	1,325	1,546	1,767	1,988	2,208
70	26	52	77	129	258	515	773	1,031	1,288	1,546	1,804	2,061	2,319	2,577
80	29	59	88	147	294	589	883	1,178	1,472	1,767	2,061	2,356	2,650	2,945
90	33	66	99	166	331	663	994	1,325	1,656	1,988	2,319	2,650	2,981	3,313
100	37	74	110	184	368	736	1,104	1,472	1,840	2,208	2,577	2,945	3,313	3,681

Note, outputs highlighted in dark blue represent the predicted annual mortality estimates as per the Guidance Approach and those highlighted in yellow represent the predicted annual mortality estimates as per the Applicant Approach. For further information regarding the Guidance and Applicant Approach see Section 2.5 of Volume 7B, Appendix 6-2: Offshore Ornithology Distributional Responses Technical Report and Volume 7B, Appendix 6-2, Annex 4: Review of Relevant Evidence.

Table 10-132: Puffin O&M phase disturbance annual in-combination displacement matrix for all project impacts apportioned to North Caithness Cliffs SPA (Applicant Approach).

Annual Total	Mortality Rate (%)													
Displacement Rate (%)	1	2	3	5	10	20	30	40	50	60	70	80	90	100
10	4	7	11	18	36	73	109	146	182	219	255	292	328	365
20	7	15	22	36	73	146	219	292	365	438	511	584	656	729
30	11	22	33	55	109	219	328	438	547	656	766	875	985	1,094
40	15	29	44	73	146	292	438	584	729	875	1,021	1,167	1,313	1,459
50	18	36	55	91	182	365	547	729	912	1,094	1,276	1,459	1,641	1,823
60	22	44	66	109	219	438	656	875	1,094	1,313	1,532	1,751	1,969	2,188
70	26	51	77	128	255	511	766	1,021	1,276	1,532	1,787	2,042	2,298	2,553
80	29	58	88	146	292	584	875	1,167	1,459	1,751	2,042	2,334	2,626	2,918
90	33	66	98	164	328	656	985	1,313	1,641	1,969	2,298	2,626	2,954	3,282
100	36	73	109	182	365	729	1,094	1,459	1,823	2,188	2,553	2,918	3,282	3,647
Note, outputs highlighted in dark blue represent the predicted annual mortality estimates as per the Guidance Approach and those highlighted in yellow represent the predicted annual mortality estimates as per the Applicant Approach. For further information regarding the Guidance and Applicant Approach see Section 2.5 of Volume 7B, Appendix 6-2: Offshore Ornithology Distributional Responses Technical Report and Volume 7B, Appendix 6-2, Annex 4: Review of Relevant Evidence.														

Troup, Pennan and Lion's Heads SPA

Kittiwake

10.3.3.80 Kittiwake has been screened in to assess the impacts from distributional responses and collision risk from the Proposed Development (Offshore) during the O&M phase in-combination with other projects in relation to the following relevant conservation objective for this species, as a feature of the SPA:

- Maintain the population as a viable component of the site.

Distributional Responses

10.3.3.81 Projects identified for in-combination distributional response for the kittiwake feature of Troup, Pennan and Lion's Heads SPA are listed in Table 10-133, with the respective impact predictions for the different seasonal in-combination scenarios presented in Table 10-134. The predicted apportioned abundance for planned and operational projects included within Table 10-133, are primarily based on the Northeast and East Scotwind Projects Cumulative totals dataset (RoyalHaskoningDHV, 2024[136]), with the addition of abundance totals for Five Estuaries (GoBe, 2024a[137]), Outer Dowsing (GoBe, 2024b[138]), Rampion (APEM, 2024[139]), Rampion 2 (APEM, 2023[140]), Ossian (NIRAS and RPS, 2024[141]) and Salamander (ERM, 2024[142]) derived from their respective RIAAs.

10.3.3.82 Due to English projects ruling out the potential for a LSE in relation to distributional response effects for kittiwake features all projects in English waters have been excluded from in-combination assessment for this impact pathway.

10.3.3.83 Kittiwake have been assessed for distributional responses as requested by NatureScot within consultation; however, the Applicant remains of the position that kittiwake do not require assessment for distributional responses due to the evidence base detailed within Volume 7B, Appendix 6-2, Annex 4: Review of Relevant Evidence suggesting kittiwake show limited behavioural response to OWFs. A Guidance approach only is therefore presented for kittiwake based on a displacement rate of 30% and a 1-3% mortality rate for O&M phase distributional response impacts in-combination.

10.3.3.84 A displacement matrix is also presented for the annual apportioned in-combination abundance for Troup, Pennan and Lion's Heads SPA (Table 10-135), when considering the all projects scenarios presented in Table 10-134.

Table 10-133: In-combination abundance totals for kittiwake attributed to Troup, Pennan and Lion's Head SPA.

Development	Predicted Abundance		
	Breeding Season	Non-breeding Season	Total
Aberdeen (EOWDC)	-	1	1
Beatrice	-	56	56
Berwick Bank (Scoping Approach)	83	633	716
Blyth Demonstration Site	-	37	37
Culzean	-	-	-
Dogger Bank A & B	-	-	-
Dogger Bank C & Sofia	-	-	-
Dogger Bank South	-	-	-
Dudgeon	-	-	-
East Anglia One	-	-	-
East Anglia ONE North	-	-	-
East Anglia Three	-	-	-
East Anglia TWO	-	-	-
Five Estuaries	-	-	-
Galloper	-	-	-
Greater Gabbard	-	-	-
Green Volt	21	6	27
Gunfleet Sands	-	-	-
Hornsea Four	-	-	-
Hornsea Project One	-	-	-
Hornsea Project Two	-	-	-
Hornsea Three	-	-	-
Humber Gateway	-	-	-

Development	Predicted Abundance		
	Breeding Season	Non-breeding Season	Total
Hywind 2 Demonstration	-	-	-
Inch Cape	-	53	53
Kentish Flats	-	-	-
Kentish Flats Extension	-	-	-
Kincardine	-	-	-
Lincs, Lynn & Inner Dowsing	-	-	-
London Array	-	-	-
Methil	-	-	-
Moray East	667	-	667
Moray West	500	62	62
Neart na Gaoithe	-	47	47
Norfolk Boreas	-	-	-
Norfolk Vanguard	-	-	-
North Falls	-	-	-
Outer Dowsing	-	-	-
Pentland Floating OWF	-	4	4
Race Bank	-	-	-
Rampion	-	-	-
Rampion 2	-	-	-
Scroby Sands	-	-	-
Seagreen Alpha & Bravo	-	-	-
Sheringham Shoal	-	-	-
Sheringham Shoal and Dudgeon Extension Project	-	-	-
Teesside	-	-	-

Development	Predicted Abundance		
	Breeding Season	Non-breeding Season	Total
Thanet	-	-	-
Triton Knoll	-	-	-
Westermost Rough	-	-	-
Ossian	167	22	189
Salamander	421	6	428
West of Orkney[ix]	27	52	79
Caledonia	205	10	6
All Projects	2,091	990	2,371
All Projects Excl. Berwick Bank	2,008	357	1,655
Consented (plus Caledonia)	1,392	276	959

[ix] These numbers for West of Orkney are subject to change, but have been included to support this assessment on a precautionary basis.

Table 10-134: Seasonal and annual displacement estimates of kittiwake for the Proposed Development (Offshore) in-combination with other projects during the operational phase, as per the Guidance Approach.

Population Size (Breeding Adults)	Defined Season	Estimated Number of Mortalities (Individuals Per Annum) (Displacement Rate; Mortality Rate)		Change in Average Survival Rate (% Point Change) (Displacement Rate; Mortality Rate)	
		30%; 1%	30%; 3%	30%; 1%	30%; 3%
All Projects					
Citation (63,200)	Breeding season (Mid-April to August)	6.27	18.82	0.010	0.030
	Non-breeding season (September to early-April)	2.97	8.91	0.005	0.014
	Annual total	9.24	27.72	0.015	0.044
Latest (27,344)	Breeding season (Mid-April to August)	6.27	18.82	0.023	0.069
	Non-breeding season (September to early-April)	2.97	8.91	0.011	0.033
	Annual total	9.24	27.72	0.034	0.101
All Projects Excluding Berwick Bank					
Citation (63,200)	Breeding season (Mid-April to August)	6.02	18.07	0.010	0.029
	Non-breeding season (September to early-April)	1.07	3.21	0.002	0.005
	Annual total	7.09	21.28	0.011	0.034
Latest (27,344)	Breeding season (Mid-April to August)	6.02	18.07	0.022	0.066
	Non-breeding season	1.07	3.21	0.004	0.012

Population Size (Breeding Adults)	Defined Season	Estimated Number of Mortalities (Individuals Per Annum) (Displacement Rate; Mortality Rate)		Change in Average Survival Rate (% Point Change) (Displacement Rate; Mortality Rate)	
		30%; 1%	30%; 3%	30%; 1%	30%; 3%
	(September to early-April)				
	Annual total	7.09	21.28	0.026	0.078
All Consented Projects plus Caledonia					
Citation (63,200)	Breeding season (Mid-April to August)	4.18	12.53	0.007	0.020
	Non-breeding season (September to early-April)	0.83	2.49	0.001	0.004
	Annual total	5.01	15.02	0.008	0.024
Latest (27,344)	Breeding season (Mid-April to August)	4.18	12.53	0.015	0.046
	Non-breeding season (September to early-April)	0.83	2.49	0.003	0.009
	Annual total	5.01	15.02	0.018	0.055

Breeding Season

10.3.3.85 During the breeding season, the in-combination abundance for kittiwake is up to 2,091 (1,392.35 - 2,090.86) breeding adults of Troup, Pennan and Lion's Head SPA, when considering all projects identified (Table 10-133). Assuming a displacement rate of 30% and a mortality rate of 1 to 3%, the consequent potential mortality is estimated to be up to six to 19 (4.18 - 12.53 and 6.27 - 18.82) breeding adults per annum during the breeding season.

10.3.3.86 Using the citation colony count of 63,200 breeding adults and an annual background mortality of 9,227 breeding adults, the addition of six to 19 predicted breeding adult mortalities would result in up to a 0.010 - 0.030 survival rate percentage point change during the breeding season per annum. When considering the most up to date counts of 27,344 breeding adults and an annual background mortality of 3,992 breeding adults, this results in up to a 0.023 - 0.069 survival rate percentage point change during the breeding season per annum (Table 10-134).

Non-Breeding Season

10.3.3.87 During the non-breeding season, the in-combination abundance for kittiwake is up to 990 (276.33 - 989.59) individuals of Troup, Pennan and Lion's Head SPA for all projects identified (Table 10-133). Assuming a displacement rate of 30% and a mortality rate of 1 - 3%, the consequent potential mortality is estimated to be up to three to nine (0.83 - 2.49 and 2.97 - 8.91) breeding adults per annum during the non-breeding season.

10.3.3.88 Using the citation colony count of 63,200 breeding adults and an annual background mortality of 9,227 breeding adults, the addition of three to nine predicted breeding adult mortalities would result in up to a 0.005 - 0.014 survival rate percentage point change during the non-breeding season per annum. When considering the most up to date counts of 27,344 breeding adults and an annual background mortality of 3,992 breeding adults, this results in up to a 0.011 – 0.033 survival rate percentage point change during the non-breeding season per annum (Table 10-134).

Annual Total

10.3.3.89 The annual total of kittiwake subject to mortality due to in-combination distributional response at Troup, Pennan and Lion's Head SPA is estimated to be up to nine to 28 (5.01 - 15.02 and 9.24 - 27.72) breeding adults per annum when considering all projects presented in Table 10-133. This is predicted to result in a survival rate percentage point change against the citation and most recently published counts of up to 0.015 - 0.044 and 0.034 - 0.101, respectively (see Table 10-134).

10.3.3.90 To note, the removal of Berwick Bank from the assessment reduces predicted mortality to seven to 21 (7.09 - 21.28) breeding birds per annum. Using the citation colony count and most recently published count, this equates to a 0.026 and 0.078 percentage point survival rate change within this population respectively.

10.3.3.91 As the survival rate percentage point change exceeds NatureScot's threshold of 0.02% when considering both the Applicant and Guidance approach, further consideration of the level of effect predicted has been analysed using PVA.

10.3.3.92 As consideration of two impacts are needed for kittiwake in order to simplify the assessment a single review of combined distribution response and collision risk are provided in Table 10-139.

Table 10-135: Kittiwake O&M phase disturbance annual in-combination displacement matrix for all projects impacts apportioned to Troup, Pennan and Lion's Head SPA.

Annual Total	Mortality Rate (%)												
Displacement Rate (%)	1	2	3	5	10	20	30	40	50	60	70	80	90	100
10	2	5	7	12	24	47	71	95	119	142	166	190	213	237
20	5	9	14	24	47	95	142	190	237	285	332	379	427	474
30	7	14	21	36	71	142	213	285	356	427	498	569	640	711
40	9	19	28	47	95	190	285	379	474	569	664	759	854	949
50	12	24	36	59	119	237	356	474	593	711	830	949	1,067	1,186
60	14	28	43	71	142	285	427	569	711	854	996	1,138	1,280	1,423
70	17	33	50	83	166	332	498	664	830	996	1,162	1,328	1,494	1,660
80	19	38	57	95	190	379	569	759	949	1,138	1,328	1,518	1,707	1,897
90	21	43	64	107	213	427	640	854	1,067	1,280	1,494	1,707	1,921	2,134
100	24	47	71	119	237	474	711	949	1,186	1,423	1,660	1,897	2,134	2,371
Note, outputs highlighted in dark blue represent the predicted annual mortality estimates as per the Guidance Approach. For further information regarding the Guidance and Applicant Approach see Section 2.5 of Volume 7B, Appendix 6-2: Offshore Ornithology Distributional Responses Technical Report and Volume 7B, Appendix 6-2, Annex 4: Review of Relevant Evidence.													

Collision Risk

10.3.3.93 Projects identified for in-combination collision risk for the kittiwake feature of Troup, Pennan and Lion's Head SPA are listed in Table 10-136, with the respective impact predictions for the different in-combination scenarios presented in Table 10-137.

10.3.3.94 Estimated collision risk for kittiwake per defined season for each project in-scope for in-combination assessment are presented in Table 10-137. The predicted collisions for planned and operational projects included within Table 10-136, are primarily based on the Northeast and East Scotwind Projects Cumulative totals dataset (excluding as-built updates), with the addition/ update of totals for Five Estuaries (GoBe, 2024a[137]), Outer Dowsing (GoBe, 2024b[138]), Rampion (APEM, 2024[139]), Rampion 2 (APEM, 2023[140]), Ossian (NIRAS and RPS, 2024[141]) and Salamander (ERM, 2024[142]). Additionally, since publication of the Northeast and East Scotwind Projects in-combination totals dataset, a further guidance update has occurred regarding recommended avoidance rate (Joint SNCB, 2024[143]) for kittiwake. This update has therefore been applied accordingly where appropriate to projects which historically used an avoidance rate of 0.989, to align with the recommendation of an avoidance rate of 0.9929.

Table 10-136: In-combination collision totals per season and annually to Troup, Pennan and Lion's Head SPA.

Development	Predicted Collisions		
	Breeding Season	Non-breeding Season	Total
Aberdeen (EOWDC)	-	0.10	0.10
Beatrice	1.15	0.88	2.03
Berwick Bank (Scoping Approach)	1.74	5.94	7.68
Blyth Demonstration Site	-	0.06	0.06
Culzean	-	-	-
Dogger Bank A & B	-	7.31	7.31
Dogger Bank C & Sofia	-	5.25	5.25
Dogger Bank South	-	1.64	1.64
Dudgeon	-	-	-
East Anglia One	-	3.09	3.09
East Anglia ONE North	-	0.18	0.18

Development	Predicted Collisions		
	Breeding Season	Non-breeding Season	Total
East Anglia Three	-	1.65	1.65
East Anglia TWO	-	0.21	0.21
Five Estuaries	-	0.27	0.27
Galloper	-	0.97	0.97
Greater Gabbard	-	0.42	0.42
Green Volt	0.58	0.17	0.76
Gunfleet Sands	-	-	-
Hornsea Four	-	0.28	0.28
Hornsea Project One	-	1.16	1.16
Hornsea Project Two	-	0.18	0.18
Hornsea Three	-	0.67	0.67
Humber Gateway	-	0.08	0.08
Hywind 2 Demonstration	1.29	0.03	1.32
Inch Cape	-	0.47	0.47
Kentish Flats	-	0.03	0.03
Kentish Flats Extension	-	0.05	0.05
Kincardine	-	0.14	0.14
Lincs, Lynn & Inner Dowsing	-	0.03	0.03
London Array	-	0.07	0.07
Methil	0.65	0.00	0.65
Moray East	-	0.12	0.12
Moray West	3.17	0.45	3.62
Neart na Gaoithe	-	0.27	0.27
Norfolk Boreas	-	0.67	0.67
Norfolk Vanguard	-	0.58	0.58

Development	Predicted Collisions		
	Breeding Season	Non-breeding Season	Total
North Falls	-	0.62	0.62
Outer Dowsing	-	0.15	0.15
Pentland Floating OWF	-	0.01	0.01
Race Bank	-	0.43	0.43
Rampion	-	0.31	0.31
Rampion 2	-	0.45	0.45
Scroby Sands	-	-	-
Seagreen Alpha & Bravo	-	3.40	3.40
Sheringham Shoal	-	-	-
Sheringham Shoal and Dudgeon Extension Project	-	0.12	0.12
Teesside	-	0.38	0.38
Thanet	-	0.01	0.01
Triton Knoll	-	2.76	2.76
Westermost Rough	-	0.00	0.00
Ossian	0.84	1.58	2.42
Salamander	1.66	0.03	1.69
West of Orkney[x]	0.40	15.94	16.34
Caledonia	5.55	0.29	5.84
All Projects	17.03	59.91	73.77
All Projects Excl. Berwick Bank	15.29	53.97	66.09
Consented (plus Caledonia)	12.39	35.21	44.42

[x] These numbers for West of Orkney are subject to change, but have been included to support this assessment on a precautionary basis.

Table 10-137: Seasonal and annual collision risk estimates of kittiwake for the Proposed Development (Offshore) in-combination with other projects during the operational phase, as per the Guidance Approach.

Population Size (Breeding Adults)	Defined Season	Estimated Number of Mortalities (Individuals Per Annum)	Change in Average Survival Rate (% Point Change)
All Projects			
Citation (63,200)	Breeding season (Mid-April to August)	17.03	0.027
	Non-breeding season (September to early-April)	59.91	0.095
	Annual total	73.32	0.116
Latest (27,344)	Breeding season (Mid-April to August)	17.03	0.062
	Non-breeding season (September to early-April)	59.91	0.219
	Annual total	73.32	0.268
All Projects Excluding Berwick Bank			
Citation (63,200)	Breeding season (Mid-April to August)	15.29	0.024
	Non-breeding season (September to early-April)	53.97	0.085
	Annual total	65.64	0.104
Latest (27,344)	Breeding season (Mid-April to August)	15.29	0.056
	Non-breeding season (September to early-April)	53.97	0.197
	Annual total	65.64	0.240
All Consented Projects plus Caledonia			
Citation (63,200)	Breeding season (Mid-April to August)	12.39	0.020

Population Size (Breeding Adults)	Defined Season	Estimated Number of Mortalities (Individuals Per Annum)	Change in Average Survival Rate (% Point Change)
	Non-breeding season (September to early-April)	35.21	0.056
	Annual total	43.97	0.070
Latest (27,344)	Breeding season (Mid-April to August)	12.39	0.045
	Non-breeding season (September to early-April)	35.21	0.129
	Annual total	43.97	0.161

Breeding Season

10.3.3.95 During the breeding season, up to 17 (12.39 and 17.03) kittiwakes of the Troup, Pennan and Lion's Head SPA are predicted to be subject to collision mortality per annum, when considering all projects in-combination presented in Table 10-136.

10.3.3.96 Using the citation colony count of 63,200 breeding adults and an annual background mortality of 9,227 breeding adults, the addition of 17 predicted breeding adult mortalities would result in up to a 0.020 to 0.027 survival rate percentage point change during the breeding season per annum. When considering the most up to date counts of 27,344 breeding adults and an annual background mortality of 3,992 breeding adults, this results in up to a 0.045 to 0.062 survival rate percentage point change during the breeding season per annum (Table 10-137).

Non-Breeding Season

10.3.3.97 During the non-breeding season, up to 60 (35.21 and 59.91) kittiwakes of the Troup, Pennan and Lion's Head SPA are predicted to be subject to collision mortality per annum, when considering the all projects in-combination scenario presented in Table 10-136.

10.3.3.98 Using the citation colony count of 63,200 breeding adults and an annual background mortality of 9,227 breeding adults, the addition of 60 predicted breeding adult mortalities would result in up to a 0.056 to 0.095 survival rate percentage point change during the non-breeding season per annum. When considering the most up to date counts of 27,344 breeding adults and an annual background mortality of 3,992 breeding adults, this results in up to a 0.129 to 0.219 survival rate percentage point change during the non-breeding season per annum (Table 10-137).

Annual Total

10.3.3.99 The annual total of kittiwake subject to mortality due to collision at Troup, Pennan and Lion's Head SPA is estimated to be up to 73 (43.97 and 73.32) breeding adults per annum for all projects in-combination. This is predicted to result in a survival rate percentage point change against the citation and most recently published counts of up to 0.104 and 0.240, respectively (see Table 10-137).

10.3.3.100 To note, the removal of Berwick Bank from the assessment reduces predicted mortality to 66 (65.64) breeding adults per annum. Using the citation colony count and most recently published count, this equates to a 0.104 and 0.240 percentage point survival rate change within this population respectively.

10.3.3.101 As the survival rate percentage point change exceeds NatureScot's threshold of 0.02%, further consideration of the level of effect predicted has been analysed using PVA.

10.3.3.102 As consideration of two impacts are needed for kittiwake in order to simplify the assessment a single review of combined distribution response and collision risk are provided in Table 10-139.

Combined Distributional Response and Collision Risk

10.3.3.103 Projects identified for in-combination combined distributional response and collision risk for the kittiwake feature of Troup, Pennan and Lion's Head SPA are listed in Table 10-134 and Table 10-136, with the respective impact predictions for the different seasonal in-combination scenarios are presented in Table 10-134 and Table 10-137.

Table 10-138: Seasonal and annual displacement and collision risk estimates of kittiwake for the Proposed Development (Offshore) in-combination with other projects during the operational phase, as per the Guidance Approach.

Population Size (Breeding Adults)	Defined Season	Estimated number of mortalities from combined CRM and Distributional responses per annum		Change in Average Survival Rate (% Point Change) (Displacement Rate; Mortality Rate)	
		30%; 1%	30%; 3%	30%; 1%	30%; 3%
All Projects					
Citation (63,200)	Breeding season (Mid-April to August)	23.30	35.85	0.037	0.057
	Non-breeding season (September to early-April)	62.88	68.81	0.099	0.109
	Annual total	86.18	104.66	0.136	0.166
Latest (27,344)	Breeding season (Mid-April to August)	23.30	35.85	0.085	0.131
	Non-breeding season (September to early-April)	62.88	68.81	0.230	0.252
	Annual total	86.18	104.66	0.315	0.383
All Projects Excluding Berwick Bank					
Citation (63,200)	Breeding season (Mid-April to August)	21.31	33.35	0.034	0.053
	Non-breeding season (September to early-April)	55.04	57.18	0.087	0.090
	Annual total	76.35	90.53	0.121	0.143

Population Size (Breeding Adults)	Defined Season	Estimated number of mortalities from combined CRM and Distributional responses per annum		Change in Average Survival Rate (% Point Change) (Displacement Rate; Mortality Rate)	
		30%; 1%	30%; 3%	30%; 1%	30%; 3%
Latest (27,344)	Breeding season (Mid-April to August)	21.31	33.35	0.078	0.112
	Non-breeding season (September to early-April)	55.04	57.18	0.201	0.209
	Annual total	76.35	90.53	0.279	0.331
All Consented Projects plus Caledonia					
Citation (63,200)	Breeding season (Mid-April to August)	16.56	24.92	0.026	0.039
	Non-breeding season (September to early-April)	36.03	37.69	0.057	0.060
	Annual total	52.60	62.61	0.083	0.099
Latest (27,344)	Breeding season (Mid-April to August)	16.56	24.92	0.061	0.091
	Non-breeding season (September to early-April)	36.03	37.69	0.132	0.138
	Annual total	52.60	62.61	0.192	0.229

10.3.3.104 As presented in Table 10-138, for all combined in-combination collision risk and distributional response scenarios considered, the percentage point change in survival rate exceeded the 0.02 threshold as set by NatureScot, PVA has therefore been completed for these scenarios to further consider such a level of effect.

Population Viability Analysis

10.3.3.105 The potential for distributional responses and collision risk separately and combined has been assessed against the latest 2017 - 2023 colony count population size of 27,344 breeding adults according to Swann (2016[84]) database. A range of impact values from 49 (48.98) to 255 (254.58) breeding adult additional mortalities per annum were modelled when considering the in-combination scenarios in Table 10-139. This allows for the Guidance approach predicted impact levels.

10.3.3.106 The PVA outputs for the kittiwake feature of Troup, Pennan and Lion's Head SPA predicted a reduction in the growth rate of between 0.212 – 0.615% annually when considering an increase of 49 to 255 additional breeding adult mortalities per annum based on the Guidance approach of a 30% displacement and 1-3% mortality rate (Table 10-139).

10.3.3.107 When considering such predicted reductions in annual growth rate, it is important to consider the known colony growth trend to understand the colony's resilience. The known population sizes for the kittiwake feature of Troup, Pennan and Lion's Head SPA would suggest significant decreases in population size between the 1995 citation count of 63,200 breeding adults and the latest 2017 - 2023 colony count of 27,344 breeding adults. In addition, the Troup, Pennan and Lion's Head SPA is considered to be in 'unfavourable' and 'declining' condition.

10.3.3.108 As significant declines in kittiwake have been recorded at the Troup, Pennan and Lion's Head SPA (Burnell *et al.*, 2023[86]), the level of in-combination impact predicted would likely compromise the resilience of the colony over the 35 year period. In light of the above information, although the level of predicted impact of the project alone is considered small, **the potential for an AEoSI is therefore concluded when considering the level of potential effect predicted from the Guidance approach in-combination**.

Table 10-139: PVA results for the kittiwake feature of Troup, Pennan and Lion's Head SPA when considering combined distributional response and collision risk effects for the Proposed Development (Offshore) alone and in-combination.

Scenario	Season	Predicted Mortality	Median Growth rate (±SD)	Median Pop. Size (±SD)	Decrease in CGR per annum (%)	Decrease in CPS after 35 years (%)
Caledonia South						
Alone; combined - Guidance (30%, 3%)	Annual Total	6.02	1.000 (0.001)	0.991 (0.025)	0.025	0.900
Caledonia OWF						
Alone - collision	Breeding	5.55	1.000 (0.001)	0.991 (0.023)	0.023	0.891
	Annual Total	5.83	1.000 (0.001)	0.992 (0.023)	0.023	0.835
Alone; combined - Guidance (30%, 1%)	Annual Total	6.56	1.000 (0.001)	0.990 (0.023)	0.027	0.969
Alone; combined - Guidance (30%, 3%)	Annual Total	7.66	1.000 (0.001)	0.988 (0.023)	0.035	1.212
In-combination all consented projects plus Caledonia OWF						
Combined - Guidance (30%, 1%)	Breeding	16.56	0.999 (0.001)	0.981 (0.023)	0.052	1.865
	Non-breeding	36.03	0.998 (0.001)	0.947 (0.022)	0.151	5.325
	Annual Total	48.98	0.998 (0.001)	0.933 (0.022)	0.192	6.704
Combined - Guidance (30%, 3%)	Breeding	23.30	0.999 (0.001)	0.962 (0.022)	0.107	3.791
	Non-breeding	62.88	0.998 (0.001)	0.943 (0.022)	0.163	5.701

Scenario	Season	Predicted Mortality	Median Growth rate (±SD)	Median Pop. Size (±SD)	Decrease in CGR per annum (%)	Decrease in CPS after 35 years (%)
	Annual Total	82.56	0.997 (0.001)	0.912 (0.022)	0.256	8.797
In-combination all projects plus Caledonia OWF						
Combined - Guidance (30%, 1%)	Breeding	113.71	0.999 (0.001)	0.965 (0.023)	0.098	3.464
	Non-breeding	140.87	0.997 (0.001)	0.907 (0.022)	0.271	9.335
	Annual Total	254.58	0.996 (0.001)	0.880 (0.021)	0.356	12.041
Combined - Guidance (30%, 3%)	Breeding	185.23	0.996 (<0.001)	0.851 (0.016)	0.447	14.887
	Non-breeding	157.08	0.996 (<0.001)	0.872 (0.016)	0.380	12.840
	Annual Total	342.30	0.992 (<0.001)	0.742 (0.014)	0.827	25.847
In-combination all projects minus Berwick Bank plus Caledonia OWF						
Combined - Guidance (30%, 1%)	Breeding	113.34	0.999 (0.001)	0.968 (0.023)	0.090	3.164
	Non-breeding	119.58	0.998 (0.001)	0.918 (0.022)	0.237	8.190
	Annual Total	232.92	0.997 (0.001)	0.893 (0.022)	0.313	10.710
Combined - Guidance (30%, 3%)	Breeding	184.75	0.999 (0.001)	0.950 (0.023)	0.142	5.012
	Non-breeding	125.49	0.998 (0.001)	0.916 (0.022)	0.245	8.420
	Annual Total	310.24	0.996 (0.001)	0.874 (0.021)	0.375	12.638

Guillemot

10.3.3.109 Guillemot has been screened in to assess the impacts from distributional responses from the Proposed Development (Offshore) during the O&M phase in-combination with other projects in relation to the following relevant conservation objective for this species, as a feature of the SPA:

- Maintain the population as a viable component of the site.

10.3.3.110 Projects identified for in-combination distributional response for the guillemot feature of Troup, Pennan and Lion's Heads SPA are listed in Table 10-140, with the respective impact predictions for the different seasonal in-combination scenarios presented in Table 10-141. The predicted apportioned abundance for planned and operational projects included within Table 10-140, are based on the Northeast and East Scotwind Projects Cumulative totals dataset (RoyalHaskoningDHV, 2024[136]).

10.3.3.111 The main focus of the assessment is based on the Applicant Approach of a displacement rate of 50% and a 1% mortality rate for O&M phase in-combination distributional response impacts. NatureScot advise that distributional response assessment for guillemot should be based on a displacement rate of 60% and a mortality rate of up to 3 - 5% depending on the season being assessed, therefore, such levels of predicted effect are also provided in Table 10-141.

10.3.3.112 As the Berwick Bank OWF is out of foraging range for guillemot, this scenario has not been presented for this species.

10.3.3.113 A displacement matrix is also presented for the annual apportioned in-combination abundance for Troup, Pennan and Lion's Heads SPA (Table 10-143), when considering the all projects scenario presented in Table 10-141.

Table 10-140: Guillemot in-combination season and total abundance estimates attributed to Troup, Pennan and Lion's Heads SPA.

Development	Predicted Abundance		
	Breeding Season	Non-breeding Season	Total
Aberdeen	-	-	-
Beatrice	125	25	150
Berwick Bank	183	317	500
Forthwind	-	-	-
Green Volt	344	1,345	1,688
Hywind	62	-	62

Development	Predicted Abundance		
	Breeding Season	Non-breeding Season	Total
Inch Cape	-	-	-
Kincardine	-	-	-
Moray East	-	-	-
Moray West	427	658	1,085
Neart na Gaoithe	-	-	-
Ossian	-	-	-
PFOWF	-	-	-
Salamander	823	2,092	2,915
Seagreen Alpha & Bravo	-	-	-
West of Orkney[xi]	-	-	-
Caledonia	874	453	1,327
All Projects	2,843	4,889	7,732
Consented (plus Caledonia)	1,836	2,481	4,317

[xi] These numbers for West of Orkney are subject to change, but have been included to support this assessment on a precautionary basis.

Table 10-141: Seasonal and annual displacement estimates of guillemot for the Proposed Development (Offshore) in-combination with other projects during the operational phase, as per the Applicant and Guidance Approach.

Population Size (Breeding Adults)	Defined Season	Estimated Number of Mortalities (Individuals Per Annum) (Displacement Rate; Mortality Rate)			Change in Average Survival Rate (% Point Change) (Displacement Rate; Mortality Rate)		
		50%; 1% 50%; 1%	60%; 3% 60%; 1%	60%; 5% 60%; 3%	50%; 1% 50%; 1%	60%; 3% 60%; 1%	60%; 5% 60%; 3%
All Projects							
Citation (44,600)	Breeding season (April to mid-August)	14.21	51.17	85.29	0.032	0.115	0.191
	Non-breeding season (Late August to March)	24.45	29.33	88.00	0.055	0.066	0.197
	Annual total	38.66	80.51	173.29	0.087	0.181	0.389
Latest (47,719)	Breeding season (April to mid-August)	14.21	51.17	85.29	0.030	0.107	0.179
	Non-breeding season (Late August to March)	24.45	29.33	88.00	0.051	0.061	0.184
	Annual total	38.66	80.51	173.29	0.081	0.169	0.363
All Consented Projects plus Caledonia							
Citation (44,600)	Breeding season (April to mid-August)	9.18	33.05	55.09	0.021	0.074	0.124

Population Size (Breeding Adults)	Defined Season	Estimated Number of Mortalities (Individuals Per Annum) (Displacement Rate; Mortality Rate)			Change in Average Survival Rate (% Point Change) (Displacement Rate; Mortality Rate)		
		50%; 1% 50%; 1%	60%; 3% 60%; 1%	60%; 5% 60%; 3%	50%; 1% 50%; 1%	60%; 3% 60%; 1%	60%; 5% 60%; 3%
	Non-breeding season (Late August to March)	12.40	14.88	44.65	0.028	0.033	0.100
	Annual total	21.58	47.94	99.74	0.048	0.107	0.224
Latest (47,719)	Breeding season (April to mid-August)	9.18	33.05	55.09	0.019	0.069	0.115
	Non-breeding season (Late August to March)	12.40	14.88	44.65	0.026	0.031	0.094
	Annual total	21.58	47.94	99.74	0.045	0.100	0.209

Breeding Season

10.3.3.114 During the breeding season, the in-combination abundance for guillemot is up to 2,843 (1,836 – 2,843) breeding adults from Troup, Pennan and Lion's Heads SPA for projects identified (Table 10-140). Assuming a displacement rate of 50% and a mortality rate of 1%, the consequent potential mortality is estimated to be 14 (9.18 - 14.21) breeding adults per annum during the breeding season, depending on the scenario considered.

10.3.3.115 Using the citation colony count of 44,600 breeding adults and an annual background mortality of 2,721 breeding adults, the addition of nine predicted breeding adult mortalities would result in up to a 0.032 survival rate percentage point change during the breeding season per annum. When considering the most up to date counts of 47,719 breeding adults and an annual background mortality of 2,911 breeding adults, this results in up to a 0.030 survival rate percentage point change during the breeding season per annum (Table 10-141).

Non-Breeding Season

10.3.3.116 During the non-breeding season, the in-combination abundance for guillemot is up to 4,889 (2,480 – 4,889) breeding adults from Troup, Pennan and Lion's Heads SPA for projects identified (Table 10-140). Assuming a displacement rate of 50% and a mortality rate of 1%, the consequent potential mortality is estimated to be 24 (12.40 – 24.45) breeding adults per annum during the non-breeding season, depending on the scenario considered.

10.3.3.117 Using the citation colony count of 44,600 breeding adults and an annual background mortality of 2,721 breeding adults, the addition of 24 predicted breeding adult mortalities would result in up to a 0.055 survival rate percentage point change during the non-breeding season per annum. When considering the most up to date counts of 47,719 breeding adults and an annual background mortality of 2,911 breeding adults, this results in up to a 0.051 survival rate percentage point change during the non-breeding season per annum (Table 10-141).

Annual Total

10.3.3.118 The annual total of guillemot subject to mortality due to in-combination distributional response at Troup, Pennan and Lion's Heads SPA is estimated to be up to 39 (21.58 – 38.66) breeding adults per annum depending on the scenarios presented in Table 10-141. This is predicted to result in a survival rate percentage point change against the citation and most recently published counts of 0.087 and 0.081,respectively depending on the scenario considered (see Table 10-141).

10.3.3.119 When considering the Guidance approach, a total of 81 - 173 (80.51 – 173.29) breeding adult mortalities are predicted due to potential distributional response effects per annum. This results in a survival rate percentage point change of 0.181 – 0.389 against the citation and 0.169 – 0.363 against the most recently published count (Table 10-141).

10.3.3.120 As the survival rate percentage point change exceeds NatureScot's threshold of 0.02% when considering both the Applicant and Guidance Approach, further consideration of the level of effect predicted has been analysed using PVA.

Population Viability Analysis

10.3.3.121 The potential for distributional responses in-combination has been assessed against the latest 2017 to 2023 colony count population size of 47,719 breeding adults according to the Seabird Monitoring Programme (2020) database. A range of impact values from 39 (38.66) to 173 (173.29) breeding adult additional mortalities per annum were modelled (when considering the in-combination scenarios), which allows for consideration of both the Applicant and Guidance Approach predicted impact levels. For the reasons detailed within Section 7.3.3, this assessment is based on the consideration of the counterfactual of growth rate only, though the counterfactual of population size is also presented for consideration in Table 10-142. The PVA outputs for the guillemot feature of Troup, Pennan and Lion's Heads SPA predicted a reduction in the growth rate of 0.091% when considering an increase of 39 additional adult mortalities per annum (based on a 50% displacement and 1% mortality rate) to 0.409% when considering an increase of 173 additional adult mortalities per annum (60% displacement and 3-5% mortality rate).

10.3.3.122 Whilst recognising the population at this site has fluctuated since the citation count in 1995 and is considered to be in 'unfavourable' and 'recovering' condition, the reasons for this decline are not linked to the development of offshore wind farms within the region, which have only been in operation for a short period. It is also worth noting that distributional responses are not considered likely to be at the upper end of the Guidance approach, particularly when considering monitoring studies from the operational Beatrice offshore wind farm within the Moray Firth (Trinder *et al*., 2024[145]). However, when considering the Applicant or Guidance Approach the impacts from the Proposed Development (Offshore) in-combination with all other projects would have a limited effect on the overall status or trajectory of the population, as the resulting reduction in growth rate would at most be 0.409% annually for these scenarios.

10.3.3.123 Therefore, there is no potential for an AEoSI to the conservation objectives of the guillemot feature of Troup, Pennan and Lion's Head SPA in relation to distributional response effects in the O&M phase from the Proposed Development (Offshore) in-combination with all other projects. Subject to natural change, guillemot will be maintained as a feature in the long term.

Table 10-142: PVA results for the guillemot feature of Troup, Pennan and Lion's Head SPA when considering distributional responses effects for the Proposed Development (Offshore) alone and in-combination.

Scenario	Season	Predicted Mortality	Median Growth rate (±SD)	Median Pop. Size (±SD)	Decrease in CGR per annum (%)	Decrease in CPS after 35 years (%)
Caledonia North						
Alone - Guidance (60%, 5%)	Breeding	11.76	1.000 (<0.001)	0.990 (0.011)	0.028	1.020
Alone - Guidance (60%, 5%)	Annual Total	13.50	1.000 (<0.001)	0.988 (0.011)	0.032	1.166
Caledonia South						
Alone - Guidance (60%, 3%)	Breeding	11.07	1.000 (<0.001)	0.991 (0.011)	0.026	0.927
Alone - Guidance (60%, 3%; 60%, 1%)	Annual Total	13.41	1.000 (<0.001)	0.999 (0.011)	0.031	1.122
Alone - Guidance (60%, 5%)	Breeding	18.45	1.000 (<0.001)	0.984 (0.011)	0.043	1.586
Alone - Guidance (60%, 5%; 60%, 3%)	Annual Total	25.48	0.999 (<0.001)	0.978 (0.011)	0.059	2.118
Caledonia OWF						
Alone - Guidance (60%, 3%)	Breeding	15.73	1.000 (<0.001)	0.987 (0.011)	0.037	1.334
Alone - Guidance (60%, 3%; 60%, 1%)	Annual Total	18.45	1.000 (<0.001)	0.984 (0.011)	0.043	1.569

Scenario	Season	Predicted Mortality	Median Growth rate (±SD)	Median Pop. Size (±SD)	Decrease in CGR per annum (%)	Decrease in CPS after 35 years (%)
Alone - Guidance (60%, 5%)	Breeding	26.22	0.999 (<0.001)	0.978 (0.011)	0.062	2.193
Alone - Guidance (60%, 5%; 60%, 3%)	Annual Total	34.37	0.999 (<0.001)	0.971 (0.011)	0.081	2.868
In-combination all consented projects plus Caledonia OWF						
Applicant (50%, 1%)	Breeding	9.18	1.000 (<0.001)	0.992 (0.010)	0.022	0.801
Applicant (50%, 1%)	Non-breeding	12.40	1.000 (<0.001)	0.990 (0.010)	0.029	1.018
Applicant (50%, 1%)	Annual Total	21.58	0.999 (<0.001)	0.982 (0.010)	0.051	1.818
Guidance (60%, 3%)	Breeding	33.05	0.999 (<0.001)	0.972 (0.010)	0.078	2.783
Guidance (60%, 1%)	Non-breeding	14.88	1.000 (<0.001)	0.988 (0.010)	0.035	1.246
Guidance (60%, 3%; 60%, 1%)	Annual Total	47.94	0.999 (<0.001)	0.960 (0.010)	0.114	3.999
Guidance (60%, 5%)	Breeding	55.09	0.999 (<0.001)	0.954 (0.010)	0.130	4.572
Guidance (60%, 3%)	Non-breeding	44.65	0.999 (<0.001)	0.963 (0.010)	0.106	3.720
Guidance (60%, 5; 60%, 3%)	Annual Total	99.74	0.998 (<0.001)	0.919 (0.010)	0.235	8.114
In-combination all projects plus Caledonia OWF						
Applicant (50%, 1%)	Breeding	14.21	1.000 (<0.001)	0.988 (0.010)	0.034	1.203

Scenario	Season	Predicted Mortality	Median Growth rate (±SD)	Median Pop. Size (±SD)	Decrease in CGR per annum (%)	Decrease in CPS after 35 years (%)
Applicant (50%, 1%)	Non-breeding	24.45	0.999 (<0.001)	0.980 (0.010)	0.057	2.017
Applicant (50%, 1%)	Annual Total	38.66	0.999 (<0.001)	0.968 (0.010)	0.091	3.229
Guidance (60%, 3%)	Breeding	51.17	0.999 (<0.001)	0.958 (0.010)	0.121	4.235
Guidance (60%, 1%)	Non-breeding	29.33	0.999 (<0.001)	0.975 (0.010)	0.070	2.472
Guidance (60%, 3%; 60%, 1%)	Annual Total	80.51	0.998 (<0.001)	0.934 (0.010)	0.189	6.601
Guidance (60%, 5%)	Breeding	85.29	0.998 (<0.001)	0.930 (0.010)	0.202	6.997
Guidance (60%, 3%)	Non-breeding	88.00	0.998 (<0.001)	0.928 (0.010)	0.208	7.195
Guidance (60%, 5; 60%, 3%)	Annual Total	173.29	0.996 (<0.001)	0.863 (0.009)	0.409	13.696

Table 10-143: Guillemot O&M phase disturbance annual in-combination displacement matrix for all project impacts apportioned to Troup, Pennan and Lion's Heads SPA.

Annual Total Displacement Rate (%)	Mortality Rate (%)													
	1	2	3	5	10	20	30	40	50	60	70	80	90	100
10	8	15	23	39	77	155	232	309	387	464	541	619	696	773
20	15	31	46	77	155	309	464	619	773	928	1,082	1,237	1,392	1,546
30	23	46	70	116	232	464	696	928	1,160	1,392	1,624	1,856	2,088	2,320
40	31	62	93	155	309	619	928	1,237	1,546	1,856	2,165	2,474	2,783	3,093
50	39	77	116	193	387	773	1,160	1,546	1,933	2,320	2,706	3,093	3,479	3,866
60	46	93	139	232	464	928	1,392	1,856	2,320	2,783	3,247	3,711	4,175	4,639
70	54	108	162	271	541	1,082	1,624	2,165	2,706	3,247	3,789	4,330	4,871	5,412
80	62	124	186	309	619	1,237	1,856	2,474	3,093	3,711	4,330	4,948	5,567	6,186
90	70	139	209	348	696	1,392	2,088	2,783	3,479	4,175	4,871	5,567	6,263	6,959
100	77	155	232	387	773	1,546	2,320	3,093	3,866	4,639	5,412	6,186	6,959	7,732
Note, outputs highlighted in dark blue represent the predicted annual mortality estimates as per the Guidance Approachand those highlighted in yellow represent the predicted annual mortality estimates as per the Applicant Approach. For further information regarding the Guidance and Applicant Approach see Section 2.5 of Volume 7B, Appendix 6-2: Offshore Ornithology Distributional Responses Technical Report and Volume 7B, Appendix 6-2, Annex 4: Review of Relevant Evidence.														

Razorbill

10.3.3.124 Razorbill has been screened in assess the impacts from distributional responses from the Proposed Development (Offshore) during the O&M phase in-combination with other projects in relation to the following relevant conservation objective for this species, as a feature of the SPA:

- Maintain the population as a viable component of the site.

10.3.3.125 Projects identified for in-combination distributional response for the razorbill feature of Troup, Pennan and Lion's Heads SPA are listed in Table 10-144, with the respective impact predictions for the different seasonal in-combination scenarios presented in Table 10-145. The predicted apportioned abundance for planned and operational projects included within Table 10-144, are primarily based on the Northeast and East Scotwind Projects Cumulative totals dataset (RoyalHaskoningDHV, 2024[136]), with the addition of abundance totals for Ossian (NIRAS and RPS, 2024[141]) and Salamander (ERM, 2024[142]) derived from their respective RIAAs.

10.3.3.126 The main focus of the assessment is based on the Applicant Approach of a displacement rate of 50% and a 1% mortality rate for O&M phase in-combination distributional response impacts. NatureScot advise that distributional response assessment for razorbill should be based on a displacement rate of 60% and a mortality rate of up to 3 - 5% depending on the season being assessed, therefore such levels of predicted effect are also provided in Table 10-144.

10.3.3.127 A displacement matrix is also presented for the annual apportioned in-combination abundance for Troup, Pennan and Lion's Heads SPA (Table 10-147), when considering the all projects scenarios presented in Table 10-145.

Table 10-144: Razorbill in-combination season and total abundance estimates attributed to Troup, Pennan and Lion's Heads SPA.

Development	Predicted Abundance		
	Breeding Season	Non-breeding Season	Total
Aberdeen (EOWDC)	-	1	1
Beatrice	-	12	12
Berwick Bank	44	96	140
Blyth Demonstration Project	-	1	1
DEP	-	8	8
Dogger Bank A2	-	39	39
Dogger Bank B2	-	49	49
Dogger Bank C3	-	17	17
Dogger Bank South (PEIR)	-	73	73
Dudgeon	-	7	7
East Anglia ONE	-	3	3
East Anglia ONE North	-	2	2
East Anglia THREE	-	21	21
East Anglia TWO	-	2	2
Five Estuaries	-	12	12
Forthwind	-	-	-
Galloper	-	3	3
Greater Gabbard	-	2	2
Green Volt	40	1	40
Gunfleet Sands	-	-	-
Hornsea Project Four	-	28	28
Hornsea Project One	-	43	43
Hornsea Project Three	-	40	40

Development	Predicted Abundance		
	Breeding Season	Non-breeding Season	Total
Hornsea Project Two	-	35	35
Humber Gateway	-	-	-
Hywind	7	4	11
Inch Cape	-	19	19
Kentish Flats and Extension	-	-	-
Kincardine	-	-	-
Lincs & LID	-	-	-
London Array	-	-	-
Moray East	-	7	7
Moray West	48	40	88
Neart na Gaoithe	-	32	32
Norfolk Boreas	-	8	8
Norfolk Vanguard	-	14	14
North Falls (PEIR)	-	24	24
Ossian	-	10	10
Outer Dowsing	-	52	52
PFOWF	-	-	-
Race Bank	-	1	1
Rampion	-	24	24
Rampion 2	-	40	40
Salamander	52	2	54
Scroby Sands	-	-	-
Seagreen Alpha	-	5	5
Seagreen Bravo	-	6	6
SEP	-	26	26

Development	Predicted Abundance		
	Breeding Season	Non-breeding Season	Total
Sheringham Shoal	-	8	8
Sofia3	-	26	26
Teesside	-	-	-
Thanet	-	-	-
Triton Knoll	-	6	6
West of Orkney[xii]	1	2	3
Westermost Rough	-	2	2
Caledonia	104	11	116
All Projects	297	867	1,164
All Projects Excl. Berwick Bank	252	771	1,023
Consented (plus Caledonia)	199	556	755

[xii] These numbers for West of Orkney are subject to change, but have been included to support this assessment on a precautionary basis.

Table 10-145: Seasonal and annual displacement estimates of razorbill for the Proposed Development (Offshore) in-combination with other projects during the operational phase, as per the Applicant and Guidance Approach.

Population Size (Breeding Adults)	Defined Season	Estimated Number of Mortalities (Individuals Per Annum) (Displacement Rate; Mortality Rate)			Change in Average Survival Rate (% Point Change) (Displacement Rate; Mortality Rate)		
		50%; 1% 50%; 1%	60%; 3% 60%; 1%	60%; 5% 60%; 3%	50%; 1% 50%; 1%	60%; 3% 60%; 1%	60%; 5% 60%; 3%
All Projects							
Citation (4,800)	Breeding season (April to Mid-August)	1.48	5.34	8.90	0.031	0.111	0.185
	Non-breeding season (Late-August to March)	4.33	5.20	15.60	0.090	0.108	0.325
	Annual total	5.82	10.54	24.50	0.121	0.220	0.510
Latest (8,801)	Breeding season (April to Mid-August)	1.48	5.34	8.90	0.017	0.061	0.101
	Non-breeding season (Late-August to March)	4.33	5.20	15.60	0.049	0.059	0.177
	Annual total	5.82	10.54	24.50	0.066	0.120	0.278
All Projects Excluding Berwick Bank							
Citation (4,800)	Breeding season (April to Mid-August)	1.26	4.54	7.57	0.026	0.095	0.158

Population Size (Breeding Adults)	Defined Season	Estimated Number of Mortalities (Individuals Per Annum) (Displacement Rate; Mortality Rate)			Change in Average Survival Rate (% Point Change) (Displacement Rate; Mortality Rate)		
		50%; 1% 50%; 1%	60%; 3% 60%; 1%	60%; 5% 60%; 3%	50%; 1% 50%; 1%	60%; 3% 60%; 1%	60%; 5% 60%; 3%
	Non-breeding season (Late-August to March)	3.86	4.63	13.88	0.080	0.096	0.289
	Annual total	5.12	9.17	21.45	0.107	0.191	0.447
Latest (8,801)	Breeding season (April to Mid-August)	1.26	4.54	7.57	0.014	0.052	0.086
	Non-breeding season (Late-August to March)	3.86	4.63	13.88	0.044	0.053	0.158
	Annual total	5.12	9.17	21.45	0.058	0.104	0.244
All Consented Projects plus Caledonia							
Citation (4,800)	Breeding season (April to Mid-August)	1.00	3.59	5.98	0.021	0.075	0.125
	Non-breeding season (Late-August to March)	2.78	3.34	10.01	0.058	0.069	0.208
	Annual total	3.78	6.92	15.99	0.079	0.144	0.333
Latest (8,801)	Breeding season (April to Mid-August)	1.00	3.59	5.98	0.011	0.041	0.068

Population Size (Breeding Adults)	Defined Season	Estimated Number of Mortalities (Individuals Per Annum) (Displacement Rate; Mortality Rate)			Change in Average Survival Rate (% Point Change) (Displacement Rate; Mortality Rate)		
		50%; 1% 50%; 1%	60%; 3% 60%; 1%	60%; 5% 60%; 3%	50%; 1% 50%; 1%	60%; 3% 60%; 1%	60%; 5% 60%; 3%
	Non-breeding season (Late-August to March)	2.78	3.34	10.01	0.032	0.038	0.114
	Annual total	3.78	6.92	15.99	0.043	0.079	0.182

Breeding Season

10.3.3.128 During the breeding season, the in-combination abundance for razorbill is up to 297 (199 - 296) breeding adults of Troup, Pennan and Lion's Heads SPA for projects identified (Table 10-144). Assuming a displacement rate of 50% and a mortality rate of 1%, the consequent potential mortality is estimated to be up to two (1.00 to 1.48) breeding adults per annum during the breeding season, depending on the scenario considered.

10.3.3.129 Using the citation colony count of 4,800 breeding adults and an annual background mortality of 504 (504.00) breeding adults, the addition of two predicted breeding adult mortalities would result in up to a 0.031 survival rate percentage point change during the breeding season per annum. When considering the most up to date counts of 8,801 breeding adults and an annual background mortality of 924 (924.11) breeding adults, this results in up to a 0.017 survival rate percentage point change during the breeding season per annum (Table 10-145).

Non-breeding Season

10.3.3.130 During the non-breeding season, the in-combination abundance for razorbill is up to 897 (555 - 866) individuals of Troup, Pennan and Lion's Heads SPA for projects identified (Table 10-144). Assuming a displacement rate of 50% and a mortality rate of 1%, the consequent potential mortality is estimated to be up to four (2.78 to 4.33) breeding adults per annum during the non-breeding season, depending on the scenario considered.

10.3.3.131 Using the citation colony count of 4,800 breeding adults and an annual background mortality of 504 (504.00) breeding adults, the addition of four (2.78 to 4.33) predicted breeding adult mortalities would result in up to a 0.090 survival rate percentage point change during the non-breeding season per annum. When considering the most up to date counts of 8,801 breeding adults and an annual background mortality of 924 (924.11) breeding adults, this results in up to a 0.049 survival rate percentage point change during the non-breeding season per annum (Table 10-145).

Annual Total

10.3.3.132 The annual total of razorbill subject to mortality due to in-combination distributional response at Troup, Pennan and Lion's Heads SPA is estimated to be up to five (3.28 to 5.82) breeding adults per annum depending on the scenarios presented in Table 10-144. This is predicted to result in a survival rate percentage point change against the citation and most recently published counts of 0.121 and 0.066 respectively depending on the in-combination scenario considered (see Table 10-145).

10.3.3.133 To note, the removal of Berwick Bank from the assessment reduces predicted mortality to five (5.12) birds per annum. Using the citation colony count and most recently published count, this equates to a 0.107 and 0.058 percentage point survival rate change within this population respectively.

10.3.3.134 When considering the Guidance approach, a total of 10 – 25 (10.04 – 24.50) breeding adult mortalities are predicted due to potential distributional response effects per annum. This results in a survival rate percentage point change of 0.220 – 0.510 against the citation and 0.120 – 0.278 against the most recently published count (Table 10-145).

10.3.3.135 As the survival rate percentage point change exceeds NatureScot's threshold of 0.02% when considering both the Applicant and Guidance approach, further consideration of the level of effect predicted has been analysed using PVA.

Population Viability Analysis

10.3.3.136 The potential for distributional responses in-combination has been assessed against the latest 2017 - 2023 colony count population size of 8,801 breeding adults according to the Seabird Monitoring Programme (2020) database. A range of impact values from six (5.82) to 25 (24.50) breeding adult additional mortalities per annum were modelled (when considering the in-combination scenarios), which allows for consideration of both the Applicant and Guidance Approach predicted impact levels. For the reasons detailed within Section 7.3.3, this assessment is based on the consideration of the counterfactual of growth rate only, though the counterfactual of population size is also presented for consideration in Table 10-146. The PVA outputs for the razorbill feature of Troup, Pennan and Lion's Head SPA predicted a reduction in the growth rate of between 0.083% when considering an increase of six additional adult mortalities per annum (based on a 50% displacement and 1% mortality rate) to 0.34% when considering an increase of 25 additional adult mortalities per annum (60% displacement and 3-5% mortality rate).

10.3.3.137 Whilst recognising the population at this site has fluctuated through declines and increases since the citation count in 1985 – 1987 (Burnell *et al.*, 2023[86]; SMP, 2024[152]), overall it is considered to be in 'favourable' and 'recovered' condition. The reasons for the fluctuations are unclear, but not considered to be linked to the development of offshore wind farms within the Moray Firth, which have only been in operation for a short period. It is also worth noting that distributional responses are not considered likely to be at the upper end of the Guidance approach, particularly when considering monitoring studies from the operational Beatrice offshore wind farm within the Moray Firth (Trinder *et al.*, 2024[145]). However, when considering the Applicant or Guidance Approach the impacts from the Proposed Development (Offshore) in-combination with all other projects would have a limited effect on the overall status or trajectory of the population, as the resulting reduction in growth rate would at most be 0.34% annually for these scenarios.

10.3.3.138 **Therefore, there is no potential for an AEoSI to the conservation objectives of the razorbill feature of Troup, Pennan and Lion's Head SPA in relation to distributional response effects in the O&M phase from the Proposed Development (Offshore) in-combination with all other projects. Subject to natural change, razorbill will be maintained as a feature in the long term.**

Table 10-146: PVA results for the razorbill feature of Troup, Pennan and Lion's Head SPA when considering distributional responses effects for the Proposed Development (Offshore) alone and in-combination.

Scenario	Season	Predicted Mortality	Median Growth rate (±SD)	Median Pop. Size (±SD)	Decrease in CGR per annum (%)	Decrease in CPS after 35 years (%)
Caledonia South						
Alone - Guidance (60%, 5%)	Breeding	1.94	1.000 (0.002)	0.991 (0.082)	0.028	0.898
Alone - Guidance (60%, 5%)	Annual Total	2.02	1.000 (0.002)	0.990 (0.082)	0.029	0.996
Caledonia OWF						
Alone - Guidance (60%, 3%)	Breeding	1.88	1.000 (0.002)	0.989 (0.70)	0.034	1.146
Alone - Guidance (60%, 3%)	Annual Total	1.95	1.000 (0.002)	0.989 (0.71)	0.032	1.117
Alone - Guidance (60%, 5%)	Breeding	3.13	1.000 (0.002)	0.984 (0.70)	0.049	1.608
Alone - Guidance (60%, 5%)	Annual Total	3.34	1.000 (0.002)	0.982(0.72)	0.054	1.919
In-combination all consented projects plus Caledonia OWF						
Applicant (50%, 1%)	Breeding	1.00	1.000 (0.002)	0.992 (0.072)	0.020	0.796
Applicant (50%, 1%)	Non-breeding	2.78	1.000 (0.002)	0.987 (0.072)	0.036	1.334
Applicant (50%, 1%)	Annual Total	3.78	0.999 (0.002)	0.979 (0.071)	0.060	2.051
Guidance (60%, 3%; 60%)	Breeding	3.59	0.999 (0.002)	0.981 (0.072	0.054	1.856
Guidance (60%, 1%)	Non-breeding	3.34	0.999 (0.002)	0.974 (0.070)	0.071	2.564

Scenario	Season	Predicted Mortality	Median Growth rate (±SD)	Median Pop. Size (±SD)	Decrease in CGR per annum (%)	Decrease in CPS after 35 years (%)
Guidance (60%, 3%; 60%, 1%)	Annual Total	6.92	0.999 (0.002)	0.966 (0.069)	0.094	3.362
Guidance (60%, 5%)	Breeding	5.98	0.999 (0.002)	0.981 (0.072)	0.091	3.189
Guidance (60%, 3%)	Non-breeding	10.01	0.999 (0.002)	0.953 (0.070)	0.135	4.680
Guidance (60%, 5; 60%, 3%)	Annual Total	15.99	0.988 (0.002)	0.923 (0.068	0.221	7.721
In-combination all projects plus Caledonia OWF						
Applicant (50%, 1%)	Breeding	1.48	1.000 (0.002)	0.991 (0.072)	0.026	0.928
Applicant (50%, 1%)	Non-breeding	4.33	0.999 (0.002)	0.979 (0.072)	0.060	2.054
Applicant (50%, 1%)	Annual Total	5.82	0.999 (0.002)	0.970 (0.071)	0.083	3.000
Guidance (60%, 3%; 60%)	Breeding	5.34	0.999 (0.002)	0.974 (0.071)	0.073	2.632
Guidance (60%, 1%)	Non-breeding	5.20	0.999 (0.002)	0.965 (0.070)	0.098	3.474
Guidance (60%, 3%; 60%, 1%)	Annual Total	10.54	0.999 (0.002)	0.949 (0.070)	0.146	5.122
Guidance (60%, 5%)	Breeding	8.90	0.999 (0.002)	0.956 (0.070)	0.127	4.441
Guidance (60%, 3%)	Non-breeding	15.60	0.998 (0.002)	0.925 (0.067)	0.216	7.500
Guidance (60%, 5; 60%, 3%)	Annual Total	24.50	0.997 (0.002)	0.885 (0.064)	0.340	11.511

Scenario	Season	Predicted Mortality	Median Growth rate (±SD)	Median Pop. Size (±SD)	Decrease in CGR per annum (%)	Decrease in CPS after 35 years (%)
In-combination all projects minus Berwick Bank plus Caledonia OWF						
Applicant (50%, 1%)	Breeding	1.26	1.000 (0.002)	0.992 (0.071)	0.023	0.785
Applicant (50%, 1%)	Non-breeding	3.86	0.999 (0.002)	0.978 (0.071)	0.062	2.245
Applicant (50%, 1%)	Annual Total	5.12	0.999 (0.002)	0.975 (0.070)	0.073	2.543
Guidance (60%, 3%; 60%)	Breeding	4.54	0.999 (0.002)	0.979 (0.071)	0.060	2.092
Guidance (60%, 1%)	Non-breeding	4.63	0.999 (0.002)	0.977 (0.071)	0.066	2.289
Guidance (60%, 3%; 60%, 1%)	Annual Total	9.17	0.999 (0.002)	0.954 (0.070)	0.133	4.592
Guidance (60%, 5%)	Breeding	7.57	0.999 (0.002)	0.961 (0.070)	0.109	3.894
Guidance (60%, 3%)	Non-breeding	13.88	0.998 (0.002)	0.931 (0.068)	0.195	6.851
Guidance (60%, 5; 60%, 3%)	Annual Total	21.45	0.997 (0.002)	0.899 (0.067)	0.295	10.077

Table 10-147: Razorbill O&M phase disturbance annual in-combination displacement matrix for all project impacts apportioned to Troup, Pennan and Lion's Heads SPA.

Annual Total	Mortality Rate (%)													
Displacement Rate (%)	1	2	3	5	10	20	30	40	50	60	70	80	90	100
10	1	2	3	6	12	23	35	47	58	70	81	93	105	116
20	2	5	7	12	23	47	70	93	116	140	163	186	209	233
30	3	7	10	17	35	70	105	140	175	209	244	279	314	349
40	5	9	14	23	47	93	140	186	233	279	326	372	419	465
50	6	12	17	29	58	116	175	233	291	349	407	465	524	582
60	7	14	21	35	70	140	209	279	349	419	489	559	628	698
70	8	16	24	41	81	163	244	326	407	489	570	652	733	814
80	9	19	28	47	93	186	279	372	465	559	652	745	838	931
90	10	21	31	52	105	209	314	419	524	628	733	838	942	1,047
100	12	23	35	58	116	233	349	465	582	698	814	931	1,047	1,164
Note, outputs highlighted in dark blue represent the predicted annual mortality estimates as per the Guidance Approach and those highlighted in yellow represent the predicted annual mortality estimates as per the Guidance Approach Applicant Approach. For further information regarding the Guidance and Applicant Approach see Section 2.5 of Volume 7B, Appendix 6-2: Offshore Ornithology Distributional Responses Technical Report and Volume 7B, Appendix 6-2, Annex 4: Review of Relevant Evidence.														

Copinsay SPA

Guillemot

10.3.3.139 Guillemot has been screened in to assess the impacts from distributional responses from the Proposed Development (Offshore) during the O&M phase in-combination with other projects in relation to the following relevant conservation objective for this species, as a feature of the SPA:

- Maintain the population as a viable component of the site.

10.3.3.140 Projects identified for in-combination distributional response for the guillemot feature of Copinsay SPA are listed in Table 10-148, with the respective impact predictions for the different seasonal in-combination scenarios presented in Table 10-149. The predicted apportioned abundance for planned and operational projects included within Table 10-148, are based on the Northeast and East Scotwind Projects Cumulative totals dataset (RoyalHaskoningDHV, 2024[136]).

10.3.3.141 The main focus of the assessment is based on the Applicant Approach of a displacement rate of 50% and a 1% mortality rate for O&M phase in-combination distributional response impacts. NatureScot advise that distributional response assessment for guillemot should be based on a displacement rate of 60% and a mortality rate of up to 3 - 5% depending on the season being assessed, therefore, such levels of predicted impacts are also provided in Table 10-149.

10.3.3.142 As the Berwick Bank OWF is out of foraging range for guillemot, this scenario has not been presented for this species.

10.3.3.143 A displacement matrix is also presented for the annual apportioned in-combination abundance for Copinsay SPA (Table 10-151), when considering the scenarios the all projects scenario presented in Table 10-149.

Table 10-148: Guillemot in-combination season and total abundance estimates attributed to Copinsay SPA.

Development	Predicted Abundance		
	Breeding Season	Non-breeding Season	Total
Aberdeen	-	-	-
Beatrice	-	-	-
Berwick Bank	-	-	-
Forthwind	-	-	-
Green Volt	82	322	405
Hywind	-	-	-
Inch Cape	-	-	-
Kincardine	-	-	-
Moray East	-	-	-
Moray West	-	-	-
Neart na Gaoithe	-	-	-
Ossian	-	-	-
PFOWF	-	-	-
Salamander	-	-	-
Seagreen Alpha & Bravo	-	-	-
West of Orkney[xiii]	-	-	-
Caledonia	82	104	186
All Projects	165	426	591
Consented (plus Caledonia)	165	426	591

[xiii] These numbers for West of Orkney are subject to change, but have been included to support this assessment on a precautionary basis.

Table 10-149: Seasonal and annual displacement estimates of guillemot for the Proposed Development (Offshore) in-combination with other projects during the operational phase, as per the Applicant and Guidance Approach.

Population Size (Breeding Adults)	Defined Season	Estimated Number of Mortalities (Individuals Per Annum) (Displacement Rate; Mortality Rate)			Change in Average Survival Rate (% Point Change) (Displacement Rate; Mortality Rate)		
		50%; 1% 50%; 1%	60%; 3% 60%; 1%	60%; 5% 60%; 3%	50%; 1% 50%; 1%	60%; 3% 60%; 1%	60%; 5% 60%; 3%
All Projects							
Citation (29,450)	Breeding season (April to mid-August)	0.82	2.96	4.94	0.003	0.010	0.017
	Non-breeding season (Late-August to March)	2.13	2.56	7.67	0.007	0.009	0.026
	Annual total	2.95	5.52	12.61	0.010	0.019	0.043
Latest (10,967)	Breeding season (April to mid-August)	0.82	2.96	4.94	0.008	0.027	0.045
	Non-breeding season (Late-August to March)	2.13	2.56	7.67	0.019	0.023	0.070
	Annual total	2.95	5.52	12.61	0.027	0.050	0.115
All Consented Projects plus Caledonia							
Citation (29,450)	Breeding season (April to mid-August)	0.82	2.96	4.94	0.003	0.010	0.017

Population Size (Breeding Adults)	Defined Season	Estimated Number of Mortalities (Individuals Per Annum) (Displacement Rate; Mortality Rate)			Change in Average Survival Rate (% Point Change) (Displacement Rate; Mortality Rate)		
		50%; 1% 50%; 1%	60%; 3% 60%; 1%	60%; 5% 60%; 3%	50%; 1% 50%; 1%	60%; 3% 60%; 1%	60%; 5% 60%; 3%
	Non-breeding season (Late-August to March)	2.13	2.56	7.67	0.007	0.009	0.026
	Annual total	2.95	5.52	12.61	0.010	0.019	0.043
Latest (10,967)	Breeding season (April to mid-August)	0.82	2.96	4.94	0.008	0.027	0.045
	Non-breeding season (Late-August to March)	2.13	2.56	7.67	0.019	0.023	0.070
	Annual total	2.95	5.52	12.61	0.027	0.050	0.115

Breeding Season

10.3.3.144 During the breeding season, the in-combination abundance for guillemot is 165 (164.61) breeding adults from Copinsay SPA for projects identified (Table 10-148). Assuming a displacement rate of 50% and a mortality rate of 1%, the consequent potential mortality is estimated to be under one (0.82) breeding adult per annum during the breeding season.

10.3.3.145 Using the citation colony count of 29,450 breeding adults and an annual background mortality of 1,796 breeding adults, the addition of under one predicted breeding adult mortalities would result in a 0.003 survival rate percentage point change during the breeding season per annum. When considering the most up to date counts of 10,967 breeding adults and an annual background mortality of 669 breeding adults, this results in a 0.008 survival rate percentage point change during the breeding season per annum (Table 10-149).When considering the most up to date counts of 10,967 breeding adults and an annual background mortality of 669 breeding adults, this results in a 0.008 survival rate percentage point change during the breeding season per annum (Table 10-149).

Non-Breeding Season

10.3.3.146 During the non-breeding season, the in-combination abundance for guillemot is 426 (426.32) breeding adults from Copinsay SPA for projects identified (Table 10-148). Assuming a displacement rate of 50% and a mortality rate of 1%, the consequent potential mortality is estimated to be two (2.13) breeding adults per annum during the non-breeding season.

10.3.3.147 Using the citation colony count of 29,450 breeding adults and an annual background mortality of 1,796 breeding adults, the addition of two predicted breeding adult mortalities would result in a 0.007 survival rate percentage point change during the non-breeding season per annum. When considering the most up to date counts of 10,967 breeding adults and an annual background mortality of 669 breeding adults, this results in a 0.019 survival rate percentage point change during the non-breeding season per annum (Table 10-149).When considering the most up to date counts of 10,967 breeding adults and an annual background mortality of 669 breeding adults, this results in a 0.019 survival rate percentage point change during the non-breeding season per annum (Table 10-149).

Annual Total

10.3.3.148 The annual total of guillemot subject to mortality due to in-combination distributional response at Copinsay SPA is estimated to be three (2.95) breeding adults per annum (Table 10-149). This is predicted to result in a survival rate percentage point change against the citation and most recently published counts of 0.010 to 0.027, respectively.

10.3.3.149 When considering the Guidance approach, a total of six to 13 (5.52 – 12.61) breeding adult mortalities are predicted due to potential distributional response effects per annum. This results in a survival rate percentage point change of 0.019 – 0.043 against the citation and 0.050 – 0.115 against the most recently published count (Table 10-149).

10.3.3.150 As survival rate percentage point change exceeds NatureScot's threshold of 0.02%, when considering both the Applicant and Guidance Approach against the latest colony count, further consideration of the level of effect predicted has been analysed using PVA.

Population Viability Analysis

10.3.3.151 The potential for distributional responses in-combination has been assessed against the latest 2015 to 2023 colony count population size of 10,967 breeding adults according to (2.95) to 23 (22.92) Seabird Monitoring Programme (2020) database. A range of impact values from three (2.95) to 13 (12.61) breeding adult additional mortalities per annum were modelled (when considering the in-combination scenarios), which allows for consideration of both the Applicant and Guidance Approach predicted impact levels. This assessment is based on the consideration of the counterfactual of growth rate only, though the counterfactual of population size is also presented for consideration in Table 10-150. The PVA outputs for the guillemot feature of Copinsay SPA predicted a reduction in the growth rate of between 0.032% when considering an increase of three additional adult mortalities per annum (based on a 50% displacement and 1% mortality rate) to 0.129% when considering an increase of 13 additional adult mortalities per annum (60% displacement and 3-5% mortality rate).

10.3.3.152 Whilst recognising the population at this site has declined since the citation count in 1994 and is considered to be in unfavourable and declining condition, the reasons for this decline are not linked to the development of offshore wind farms within the region, which have only been in operation for a short period. It is also worth noting that distributional responses are not considered likely to be at the upper end of the Guidance approach, particularly when considering monitoring studies from the operational Beatrice offshore wind farm within the Moray Firth (Trinder *et al*., 2024[145]). Therefore, when considering the Applicant or Guidance Approach, it is clear that the loss of three to 13 birds per annum would likely be intangible from the natural baseline mortality per annum, as this would lead to a reduction in the growth rate of at most 0.13% annually.

10.3.3.153 **Therefore, there is no potential for an AEoSI to the conservation objectives of the guillemot feature of Copinsay SPA in relation to distributional response effects in the O&M phase from the Proposed Development (Offshore) in-combination with all other projects. Subject to natural change, guillemot will be maintained as a feature in the long term.**

Table 10-150: PVA results for the guillemot feature of Copinsay SPA when considering distributional responses effects for the Proposed Development (Offshore) alone and in-combination.

Scenario	Season	Predicted Mortality	Median Growth rate (±SD)	Median Pop. Size (±SD)	Decrease in CGR per annum (%)	Decrease in CPS after 35 years (%)
Caledonia South						
Alone - Guidance (60%, 5%; 60%, 3%)	Annual Total	3.35	1.000 (0.001)	0.998 (0.022)	0.034	1.159
Caledonia OWF						
Alone - Guidance (60%, 5%)	Breeding	2.47	1.000 (0.001)	0.991 (0.022)	0.026	0.912
Alone - Guidance (60%, 5%; 60%, 3%)	Annual Total	4.34	1.000 (0.001)	0.984 (0.022)	0.044	1.650
In-combination all consented projects plus Caledonia OWF						
Applicant (50%, 1%)	Annual Total	4.96	1.000 (0.001)	0.989 (0.022)	0.032	1.117
Guidance (60%, 3%)	Breeding	7.60	1.000 (0.001)	0.989 (0.022)	0.031	1.105
Guidance (60%, 1%)	Non-breeding	2.85	1.000 (0.001)	0.991 (0.022)	0.025	0.931
Guidance (60%, 3%; 60%, 1%)	Annual Total	11.02	0.999 (0.001)	0.979 (0.022)	0.058	2.064

Scenario	Season	Predicted Mortality	Median Growth rate (±SD)	Median Pop. Size (±SD)	Decrease in CGR per annum (%)	Decrease in CPS after 35 years (%)
Guidance (60%, 5%)	Breeding	12.66	0.999 (0.001)	0.982 (0.022)	0.051	1.806
Guidance (60%, 3%)	Non-breeding	10.26	0.999 (0.001)	0.972 (0.022)	0.078	2.819
Guidance (60%, 5; 60%, 3%)	Annual Total	22.92	0.999 (0.001)	0.954 (0.021)	0.130	4.590
In-combination all projects plus Caledonia OWF						
Applicant (50%, 1%)	Annual Total	2.95	1.000 (<0.001)	0.989 (0.016)	0.032	1.084
Guidance (60%, 3%)	Breeding	2.96	1.000 (<0.001)	0.989 (0.016)	0.031	1.095
Guidance (60%, 1%)	Non-breeding	2.56	1.000 (<0.001)	0.991 (0.016)	0.026	0.942
Guidance (60%, 3%; 60%, 1%)	Annual Total	5.52	0.999 (<0.001)	0.980 (0.016)	0.057	2.020
Guidance (60%, 5%)	Breeding	4.94	0.999 (<0.001)	0.982 (0.016)	0.051	1.790
Guidance (60%, 3%)	Non-breeding	7.67	0.999 (<0.001)	0.973 (0.016)	0.077	2.749
Guidance (60%, 5; 60%, 3%)	Annual Total	12.61	0.999 (<0.001)	0.980 (0.016)	0.129	4.548

Table 10-151: Guillemot O&M phase disturbance annual in-combination displacement matrix for all project impacts apportioned to Copinsay SPA.

Annual Total	Mortality Rate (%)													
Displacement Rate (%)	1	2	3	5	10	20	30	40	50	60	70	80	90	100
10	1	1	2	3	6	12	18	24	30	35	41	47	53	59
20	1	2	4	6	12	24	35	47	59	71	83	95	106	118
30	2	4	5	9	18	35	53	71	89	106	124	142	160	177
40	2	5	7	12	24	47	71	95	118	142	165	189	213	236
50	3	6	9	15	30	59	89	118	148	177	207	236	266	295
60	4	7	11	18	35	71	106	142	177	213	248	284	319	355
70	4	8	12	21	41	83	124	165	207	248	290	331	372	414
80	5	9	14	24	47	95	142	189	236	284	331	378	425	473
90	5	11	16	27	53	106	160	213	266	319	372	425	479	532
100	6	12	18	30	59	118	177	236	295	355	414	473	532	591

Note, outputs highlighted in dark blue represent the predicted annual mortality estimates as per the Guidance Approach and those highlighted in yellow represent the predicted annual mortality estimates as per the Applicant Approach. For further information regarding the Guidance and Applicant Approach see Section 2.5 of Volume 7B, Appendix 6-2: Offshore Ornithology Distributional Responses Technical Report and Volume 7B, Appendix 6-2, Annex 4: Review of Relevant Evidence.

Hoy SPA

Guillemot

10.3.3.154 Guillemot has been screened in to assess the impacts from distributional responses from the Proposed Development (Offshore) during the O&M phase in-combination with other projects in relation to the following relevant conservation objective for this species, as a feature of the SPA:

- Maintain the population as a viable component of the site.

10.3.3.155 Projects identified for in-combination distributional response for the guillemot feature of Hoy SPA are listed in Table 10-152, with the respective impact predictions for the different seasonal in-combination scenarios presented in Table 10-153. The predicted apportioned abundance for planned and operational projects included within Table 10-152, are based on the Northeast and East Scotwind Projects Cumulative totals dataset (RoyalHaskoningDHV, 2024[136]).

10.3.3.156 The main focus of the assessment is based on the Applicant Approach of a displacement rate of 50% and a 1% mortality rate for O&M phase in-combination distributional response impacts. NatureScot advise that distributional response assessments for guillemot should be based on a displacement rate of 60% and a mortality rate of up to 3 - 5% depending on the season being assessed, therefore, such levels of predicted impacts are also provided in Table 10-153.

10.3.3.157 A displacement matrix is also presented for the annual apportioned in-combination abundance for Hoy SPA (Table 10-152), when considering the all project scenarios presented in Table 10-155.

Table 10-152: Guillemot in-combination season and total abundance estimates attributed to Hoy SPA.

Development	Predicted Abundance		
	Breeding Season	Non-breeding Season	Total
Aberdeen	-	-	-
Beatrice	-	-	-
Berwick Bank	-	-	-
Forthwind	-	-	-
Green Volt	-	-	-
Hywind	-	-	-
Inch Cape	-	-	-
Kincardine	-	-	-
Moray East	-	-	-
Moray West	-	-	-
Neart na Gaoithe	-	-	-
Ossian	-	-	-
PFOWF	65	13	78
Salamander	-	-	-
Seagreen Alpha & Bravo	-	-	-
West of Orkney[xiv]	-	-	-
Caledonia	108	155	263
All Projects	173	168	342
Consented (plus Caledonia)	173	168	342

[xiv] These numbers for West of Orkney are subject to change, but have been included to support this assessment on a precautionary basis.

Table 10-153: Seasonal and annual displacement estimates of guillemot for the Proposed Development (Offshore) in-combination with other projects during the operational phase, as per the Applicant and Guidance Approach.

Population Size (Breeding Adults)	Defined Season	Estimated Number of Mortalities (Individuals Per Annum) (Displacement Rate; Mortality Rate)			Change in Average Survival Rate (% Point Change) (Displacement Rate; Mortality Rate)		
		50%; 1% 50%; 1%	60%; 3% 60%; 1%	60%; 5% 60%; 3%	50%; 1% 50%; 1%	60%; 3% 60%; 1%	60%; 5% 60%; 3%
All Projects							
Citation (26,800)	Breeding season (April to Mid-August)	0.87	3.12	5.19	0.003	0.012	0.019
	Non-breeding season (Mid-August to March)	0.84	1.01	3.03	0.003	0.004	0.011
	Annual total	1.71	4.13	8.23	0.006	0.015	0.031
Latest (16,346)	Breeding season (April to Mid-August)	0.87	3.12	5.19	0.005	0.019	0.032
	Non-breeding season (Mid-August to March)	0.84	1.01	3.03	0.005	0.006	0.019
	Annual total	1.71	4.13	8.23	0.010	0.025	0.050
All Consented Projects plus Caledonia							
Citation (26,800)	Breeding season (April to Mid-August)	0.87	3.12	5.19	0.003	0.012	0.019

Population Size (Breeding Adults)	Defined Season	Estimated Number of Mortalities (Individuals Per Annum) (Displacement Rate; Mortality Rate)			Change in Average Survival Rate (% Point Change) (Displacement Rate; Mortality Rate)		
		50%; 1% 50%; 1%	60%; 3% 60%; 1%	60%; 5% 60%; 3%	50%; 1% 50%; 1%	60%; 3% 60%; 1%	60%; 5% 60%; 3%
	Non-breeding season (Mid-August to March)	0.84	1.01	3.03	0.003	0.004	0.011
	Annual total	1.71	4.13	8.23	0.006	0.015	0.031
Latest (16,346)	Breeding season (April to Mid-August)	0.87	3.12	5.19	0.005	0.019	0.032
	Non-breeding season (Mid-August to March)	0.84	1.01	3.03	0.005	0.006	0.019
	Annual total	1.71	4.13	8.23	0.010	0.025	0.050

Breeding Season

10.3.3.158 During the breeding season, the in-combination abundance for guillemot is 173 (173.16) individuals of Hoy SPA for projects identified (Table 10-153). Assuming a displacement rate of 50% and a mortality rate of 1%, the consequent potential mortality is estimated to be under one (0.87) breeding adult per annum during the breeding season.

10.3.3.159 Using the citation colony count of 26,800 breeding adults and an annual background mortality of 1,635 breeding adults, the addition of one predicted breeding adult mortality would result in a 0.003 survival rate percentage point change during the breeding season per annum. When considering the most up to date counts of 16,346 breeding adults and an annual background mortality of 997 breeding adults, this results in a 0.005 survival rate percentage point change during the breeding season per annum (Table 10-153).

Non-Breeding Season

10.3.3.160 During the non-breeding season, the in-combination abundance for guillemot is 168 (168.42) breeding adults from Hoy SPA for projects identified (Table 10-153). Assuming a displacement rate of 50% and a mortality rate of 1%, the consequent potential mortality is estimated to be under one (0.84) breeding adult per annum during the non-breeding season.

10.3.3.161 Using the citation colony count of 26,800 breeding adults and an annual background mortality of 1,635 breeding adults, the addition of one predicted breeding adult mortality would result in a 0.003 survival rate percentage point change during the non-breeding season per annum. When considering the most up to date counts of 16,346 breeding adults and an annual background mortality of 997 breeding adults, this results in a 0.005 survival rate percentage point change during the non-breeding season per annum (Table 10-153).

Annual Total

10.3.3.162 The annual total of guillemot subject to mortality due to in-combination distributional response at Hoy SPA is estimated to be under two (1.71) breeding adults per annum following the Applicant Approach presented in Table 10-153. This is predicted to result in a survival rate percentage point change against the citation and most recently published counts of 0.006 and 0.010, respectively.

10.3.3.163 When considering the Guidance approach, a total of four to eight (4.13 - 8.23) breeding adult mortalities are predicted due to potential distributional response effects per annum. This results in a survival rate percentage point change of 0.015 to 0.031 against the citation count and 0.025 to 0.050 against the most recently published count (Table 10-153).

10.3.3.164 The survival rate percentage point change does not exceed NatureScot's threshold of 0.02% when considering the Applicant Approach, but does when considering the Guidance approach, so further consideration of the level of effect predicted has been analysed using PVA.

Population Viability Analysis

10.3.3.165 The potential for distributional responses in-combination has been assessed against the latest 2016 - 2017 colony count population size of 16,345 breeding adults according to the Seabird Monitoring Programme (2020) database. A range of impact values from four to eight breeding adult additional mortalities per annum were modelled (when considering the in-combination scenarios), which allows for consideration of the Guidance approach predicted impact levels. For the reasons detailed within Section 7.3.3, this assessment is based on the consideration of the counterfactual of growth rate only, though the counterfactual of population size is also presented for consideration in Table 10-154. The PVA outputs for the guillemot feature of Hoy SPA predicted a reduction in the growth rate of between 0.029 – 0.055% when considering an increase of four to eight additional adult mortalities per annum based on the Guidance approach scenarios.

10.3.3.1 Whilst recognising the population at this site has declined since the citation count in 2000 and is considered to be in unfavourable condition, the reasons for this decline are not linked to the development of offshore wind farms within the region, which have only been in operation for a short period. It is also worth noting that distributional responses are not considered likely to be at the upper end of the Guidance approach, particularly when considering monitoring studies from the operational Beatrice offshore wind farm within the Moray Firth (Trinder *et al.*, 2024[145]). Therefore, when considering the Applicant or Guidance Approach, it is clear that the loss of under two to eight birds per annum would likely be intangible from the natural baseline mortality per annum. Whether considering the Applicant Approach or Guidance approach the impacts from Caledonia in-combination with all other projects would have a limited effect on the overall status or trajectory of the population, as the resulting reduction in growth rate would be well under 0.1% for all scenarios.

10.3.3.2 **Therefore, there is no potential for an AEoSI to the conservation objectives of the guillemot feature of Hoy SPA in relation to distributional response effects in the O&M phase from the Proposed Development (Offshore) in-combination with all other projects. Subject to natural change, guillemot will be maintained as a feature in the long term.**

Table 10-154: PVA results for the guillemot feature of Hoy SPA when considering distributional responses effects for the Proposed Development (Offshore) alone and in-combination.

Scenario	Season	Predicted Mortality	Median Growth rate (±SD)	Median Pop. Size (±SD)	Decrease in CGR per annum (%)	Decrease in CPS after 35 years (%)
Caledonia OWF						
Alone - Guidance (60%, 5%; 60%, 3%)	Annual Total	6.04	1.000 (<0.001)	0.985 (0.018)	0.041	1.526
In-combination all consented projects plus Caledonia OWF						
Guidance (60%, 3%; 60%, 1%)	Annual Total	4.13	1.000 (<0.001)	0.989 (0.018)	0.029	1.052
Guidance (60%, 5%)	Breeding	5.19	1.000 (<0.001)	0.987 (0.018)	0.036	1.308
Guidance (60%, 5%; 60%, 3%)	Annual Total	8.23	0.999 (<0.001)	0.980 (0.018)	0.055	2.040
In-combination all projects plus Caledonia OWF						
Guidance (60%, 3%; 60%, 1%)	Annual Total	4.13	1.000 (<0.001)	0.989 (0.018)	0.029	1.052
Guidance (60%, 5%)	Breeding	5.19	1.000 (<0.001)	0.987 (0.018)	0.036	1.308
Guidance (60%, 5%; 60%, 3%)	Annual Total	8.23	0.999 (<0.001)	0.980 (0.018)	0.055	2.040

Table 10-155: Guillemot O&M phase disturbance annual in-combination displacement matrix for all project impacts apportioned to Hoy SPA.

Annual Total	Mortality Rate (%)												
Displacement Rate (%)	1	2	3	5	10	20	30	40	50	60	70	80	90	100
10	0	1	1	2	3	7	10	14	17	20	24	27	31	34
20	1	1	2	3	7	14	20	27	34	41	48	55	61	68
30	1	2	3	5	10	20	31	41	51	61	72	82	92	102
40	1	3	4	7	14	27	41	55	68	82	96	109	123	137
50	2	3	5	9	17	34	51	68	85	102	120	137	154	171
60	2	4	6	10	20	41	61	82	102	123	143	164	184	205
70	2	5	7	12	24	48	72	96	120	143	167	191	215	239
80	3	5	8	14	27	55	82	109	137	164	191	219	246	273
90	3	6	9	15	31	61	92	123	154	184	215	246	277	307
100	3	7	10	17	34	68	102	137	171	205	239	273	307	342

Note, outputs highlighted in dark blue represent the predicted annual mortality estimates as per the Guidance Approach and those highlighted in yellow represent the predicted annual mortality estimates as per the Applicant Approach. For further information regarding the Guidance and Applicant Approach see Section 2.5 of Volume 7B, Appendix 6-2: Offshore Ornithology Distributional Responses Technical Report and Volume 7B, Appendix 6-2, Annex 4: Review of Relevant Evidence.

Buchan Ness to Collieston Coast SPA

Kittiwake

10.3.3.3 Kittiwake has been screened in to assess the impacts from distributional responses and collision risk from the Proposed Development (Offshore) during the O&M phase in-combination with other projects in relation to the following relevant conservation objective for this species, as a feature of the SPA:

- Maintain the population as a viable component of the site.

Distributional Responses

10.3.3.4 Projects identified for in-combination distributional response for the kittiwake feature of Buchan Ness to Collieston Coast SPA are listed in Table 10-156, with the respective impact predictions for the different seasonal in-combination scenarios presented in Table 10-157. The predicted apportioned abundance for planned and operational projects included within Table 10-156, are primarily based on the Northeast and East Scotwind Projects Cumulative totals dataset (RoyalHaskoningDHV, 2024[136]), with the addition of abundance totals for Five Estuaries (GoBe, 2024a[137]), Outer Dowsing (GoBe, 2024b[138]), Rampion (APEM, 2024[139]), Rampion 2 (APEM, 2023[140]), Ossian (NIRAS and RPS, 2024[141]) and Salamander (ERM, 2024[142]) derived from their respective RIAAs.

10.3.3.5 Due to English projects ruling out the potential for a LSE in relation to distributional response effects for kittiwake features all projects in English waters have been excluded from in-combination assessment.

10.3.3.6 Kittiwake have been assessed for distributional responses as requested by NatureScot within consultation; however, the Applicant remains of the position that kittiwake do not require assessment for distributional responses due to the evidence base detailed within Volume 7B, Appendix 6-2, Annex 4: Review of Relevant Evidence suggesting kittiwake show limited behavioural response to OWFs. A Guidance approach only is therefore presented for kittiwake based on a displacement rate of 30% and a 1-3% mortality rate for O&M phase distributional response impacts in-combination.

10.3.3.7 A displacement matrix is also presented for the annual apportioned in-combination abundance for Buchan Ness to Collieston Coast SPA (Table 10-158), when considering the all project scenarios presented in Table 10-157.

Table 10-156: In-combination abundance totals for kittiwake attributed to Buchan Ness to Collieston Coast SPA.

Development	Predicted Abundance		
	Breeding Season	Non-breeding Season	Total
Aberdeen (EOWDC)	-	1	1
Beatrice	-	47	47
Berwick Bank (Scoping Approach)	217	533	750
Blyth Demonstration Site	-	31	31
Culzean	-	-	-
Dogger Bank A & B	-	-	-
Dogger Bank C & Sofia	-	-	-
Dogger Bank South	-	-	-
Dudgeon	-	-	-
East Anglia One	-	-	-
East Anglia ONE North	-	-	-
East Anglia Three	-	-	-
East Anglia TWO	-	-	-
Five Estuaries	-	-	-
Galloper	-	-	-
Greater Gabbard	-	-	-
Green Volt	28	5	33
Gunfleet Sands	-	-	-
Hornsea Four	-	-	-
Hornsea Project One	-	-	-
Hornsea Project Two	-	-	-
Hornsea Three	-	-	-
Humber Gateway	-	-	-

Development	Predicted Abundance		
	Breeding Season	Non-breeding Season	Total
Hywind 2 Demonstration	-	-	-
Inch Cape	-	45	45
Kentish Flats	-	-	-
Kentish Flats Extension	-	-	-
Kincardine	-	-	-
Lincs, Lynn & Inner Dowsing	-	-	-
London Array	-	-	-
Methil	-	-	-
Moray East	-	-	-
Moray West	-	52	52
Neart na Gaoithe	-	40	40
Norfolk Boreas	-	-	-
Norfolk Vanguard	-	-	-
North Falls	-	-	-
Outer Dowsing	-	-	-
Pentland Floating OWF	-	3	3
Race Bank	-	-	-
Rampion	-	-	-
Rampion 2	-	-	-
Scroby Sands	-	-	-
Seagreen Alpha & Bravo	-	-	-
Sheringham Shoal	-	-	-
Sheringham Shoal and Dudgeon Extension Project	-	-	-
Teesside	-	-	-

Development	Predicted Abundance		
	Breeding Season	Non-breeding Season	Total
Thanet	-	-	-
Triton Knoll	-	-	-
Westermost Rough	-	-	-
Ossian	33	22	56
Salamander	1,289	5	1,294
West of Orkney[xv]	12	44	55
Caledonia	68	9	77
All Projects	1,647	837	2,483
All Projects Excl. Berwick Bank	1,430	304	1,734
Consented (plus Caledonia)	96	233	329

[xv] These numbers for West of Orkney are subject to change, but have been included to support this assessment on a precautionary basis.

Table 10-157: Seasonal and annual displacement estimates of kittiwake for the Proposed Development (Offshore) in-combination with other projects during the operational phase, as per the Guidance Approach.

Population Size (Breeding Adults)	Defined Season	Estimated Number of Mortalities (Individuals Per Annum) (Displacement Rate; Mortality Rate)		Change in Average Survival Rate (% Point Change) (Displacement Rate; Mortality Rate)	
		30%; 1%	30%; 3%	30%; 1%	30%; 3%
All Projects					
Citation (60,904)	Breeding season (Mid-April to August)	4.94	14.82	0.008	0.024
	Non-breeding season (September to early-April)	2.51	7.53	0.004	0.012
	Annual total	7.45	22.35	0.012	0.037
Latest (27,094)	Breeding season (Mid-April to August)	4.94	14.82	0.018	0.055
	Non-breeding season (September to early-April)	2.51	7.53	0.009	0.028
	Annual total	7.45	22.35	0.027	0.082
All Projects Excluding Berwick Bank					
Citation (60,904)	Breeding season (Mid-April to August)	4.29	12.87	0.007	0.021
	Non-breeding season (September to early-April)	0.91	2.73	0.001	0.004
	Annual total	5.20	15.60	0.009	0.026
Latest (27,094)	Breeding season (Mid-April to August)	4.29	12.87	0.016	0.048
	Non-breeding season	0.91	2.73	0.003	0.010

Population Size (Breeding Adults)	Defined Season	Estimated Number of Mortalities (Individuals Per Annum) (Displacement Rate; Mortality Rate)		Change in Average Survival Rate (% Point Change) (Displacement Rate; Mortality Rate)	
		30%; 1%	30%; 3%	30%; 1%	30%; 3%
	(September to early-April)				
	Annual total	5.20	15.60	0.019	0.058
All Consented Projects plus Caledonia					
Citation (60,904)	Breeding season (Mid-April to August)	0.29	0.86	<0.001	0.001
	Non-breeding season (September to early-April)	0.70	2.09	0.001	0.003
	Annual total	0.99	2.96	0.002	0.005
Latest (27,094)	Breeding season (Mid-April to August)	0.29	0.86	0.001	0.003
	Non-breeding season (September to early-April)	0.70	2.09	0.003	0.008
	Annual total	0.99	2.96	0.004	0.011

Breeding Season

10.3.3.8 During the breeding season, the in-combination abundance for kittiwake is up to 1,647 (95.93 - 1,646.64) breeding adults of Buchan Ness to Collieston Coast SPA, when considering all projects identified (Table 10-156). Assuming a displacement rate of 30% and a mortality rate of 1 - 3%, the consequent potential mortality is estimated to be up to five to 15 (4.94 to 14.82) breeding adults per annum during the breeding season.

10.3.3.9 Using the citation colony count of 60,904 breeding adults and an annual background mortality of 8,892 breeding adults, the addition of five to 15 predicted breeding adult mortalities would result in up to a 0.001 - 0.024 survival rate percentage point change during the breeding season per annum. When considering the most up to date counts of 27,094 breeding adults and an annual background mortality of 3,956 breeding adults, this results in up to a 0.003 - 0.055 survival rate percentage point change during the breeding season per annum (Table 10-157).

Non-Breeding Season

10.3.3.10 During the non-breeding season, the in-combination abundance for kittiwake is up to 837 (232.66 - 836.80) individuals of Buchan Ness to Collieston Coast SPA for all projects identified (Table 10-156). Assuming a displacement rate of 30% and a mortality rate of 1 to 3%, the consequent potential mortality is estimated to be up to two to eight (2.51 - 7.53) breeding adults per annum during the non-breeding season.

10.3.3.11 Using the citation colony count of 60,904 breeding adults and an annual background mortality of 8,892 breeding adults, the addition of one - two and three - eight predicted breeding adult mortalities would result in up to a 0.003 - 0.012 survival rate percentage point change during the non-breeding season per annum. When considering the most up to date counts of 27,094 breeding adults and an annual background mortality of 3,956 breeding adults, this results in up to a 0.008 - 0.028 survival rate percentage point change during the non-breeding season per annum (Table 10-157).

Annual Total

10.3.3.12 The annual total of kittiwake subject to mortality due to in-combination distributional response at Buchan Ness to Collieston Coast SPA is estimated to be between one to three and seven to 22.35 breeding adults per annum when considering all projects presented in Table 10-156. This is predicted to result in a survival rate percentage point change against the citation and most recently published counts of 0.005 - 0.037 and 0.011 - 0.082, respectively (see Table 10-157).

10.3.3.13 To note, the removal of Berwick Bank from the assessment reduces predicted mortality to five to 16 (5.20 - 15.60) breeding birds per annum. Using the citation colony count and most recently published count, this equates to a 0.009 to 0.026 and 0.019 to 0.058 percentage point survival rate change within this population respectively.

10.3.3.14 As the survival rate percentage point change exceeds NatureScot's threshold of 0.02% when considering both the Applicant and Guidance approach, further consideration of the level of effect predicted has been analysed using PVA.

10.3.3.15 As consideration of two impacts are needed for kittiwake in order to simplify the assessment a single review of combined distribution response and collision risk are provided in Table 10-162.

Table 10-158: Kittiwake O&M phase disturbance annual in-combination displacement matrix for all projects impacts apportioned to Buchan Ness to Collieston Coast SPA.

Annual Total	Mortality Rate (%)												
Displacement Rate (%)	1	2	3	5	10	20	30	40	50	60	70	80	90	100
10	2	5	7	12	25	50	75	99	124	149	174	199	224	248
20	5	10	15	25	50	99	149	199	248	298	348	397	447	497
30	7	15	22	37	75	149	224	298	373	447	522	596	671	745
40	10	20	30	50	99	199	298	397	497	596	695	795	894	993
50	12	25	37	62	124	248	373	497	621	745	869	993	1,118	1,242
60	15	30	45	75	149	298	447	596	745	894	1,043	1,192	1,341	1,490
70	17	35	52	87	174	348	522	695	869	1,043	1,217	1,391	1,565	1,738
80	20	40	60	99	199	397	596	795	993	1,192	1,391	1,589	1,788	1,987
90	22	45	67	112	224	447	671	894	1,118	1,341	1,565	1,788	2,012	2,235
100	25	50	75	124	248	497	745	993	1,242	1,490	1,738	1,987	2,235	2,483

Note, outputs highlighted in dark blue represent the predicted annual mortality estimates as per the Guidance Approach. For further information regarding the Guidance and Applicant Approach see Section 2.5 of Volume 7B, Appendix 6-2: Offshore Ornithology Distributional Responses Technical Report and Volume 7B, Appendix 6-2, Annex 4: Review of Relevant Evidence.

Collision Risk

10.3.3.16 Projects identified for in-combination collision risk for the kittiwake feature of Buchan Ness to Collieston Coast SPA are listed in Table 10-159, with the respective impact predictions for the different in-combination scenarios presented in Table 10-160.

10.3.3.17 Estimated collision risk for kittiwake per defined season for each project in-scope for in-combination assessment are presented in Table 10-159. The predicted collisions for planned and operational projects included within Table 10-159 are primarily based on the Northeast and East Scotwind Projects Cumulative totals dataset (excluding as-built updates), with the addition/ update of totals for Five Estuaries (GoBe, 2024a[137]), Outer Dowsing (GoBe, 2024b[138]), Rampion (APEM, 2024[139]), Rampion 2 (APEM, 2023[140]), Ossian (NIRAS and RPS, 2024[141]) and Salamander (ERM, 2024[142]). Additionally, since publication of the Northeast and East Scotwind Projects in-combination totals dataset, a further guidance update has occurred regarding recommended avoidance rate (Joint SNCB, 2024[143]) for kittiwake. This update has therefore been applied accordingly where appropriate to projects which historically used an avoidance rate of 0.989, to align with the recommendation of an avoidance rate of 0.9929.

Table 10-159: In-combination collision totals per season and annually to Buchan Ness to Collieston Coast SPA.

Development	Predicted Collisions		
	Breeding Season	Non-breeding Season	Total
Aberdeen (EOWDC)	3.60	0.08	0.08
Beatrice	-	0.74	0.74
Berwick Bank (Scoping Approach)	4.20	5.94	10.13
Blyth Demonstration Site	-	0.05	0.05
Culzean	-	-	-
Dogger Bank A & B	-	6.15	6.15
Dogger Bank C & Sofia	-	4.42	4.42
Dogger Bank South	-	1.38	1.38
Dudgeon	-	-	-
East Anglia One	-	2.60	2.60
East Anglia ONE North	-	0.15	0.15

Development	Predicted Collisions		
	Breeding Season	Non-breeding Season	Total
East Anglia Three	-	1.39	1.39
East Anglia TWO	-	0.18	0.18
Five Estuaries	-	0.23	0.23
Galloper	-	0.82	0.82
Greater Gabbard	-	0.35	0.35
Green Volt	0.75	0.15	0.90
Gunfleet Sands	-	-	-
Hornsea Four	-	0.23	0.23
Hornsea Project One	-	0.98	0.98
Hornsea Project Two	-	0.15	0.15
Hornsea Three	-	0.57	0.57
Humber Gateway	-	0.07	0.07
Hywind 2 Demonstration	6.48	0.02	6.48
Inch Cape	-	0.40	0.40
Kentish Flats	-	0.02	0.02
Kentish Flats Extension	-	0.04	0.04
Kincardine	3.23	0.12	0.12
Lincs, Lynn & Inner Dowsing	-	0.02	0.02
London Array	-	0.05	0.05
Methil	-	-	-
Moray East	-	0.10	0.10
Moray West	-	0.38	0.38
Neart na Gaoithe	-	0.23	0.23
Norfolk Boreas	-	0.56	0.56
Norfolk Vanguard	-	0.49	0.49

Development	Predicted Collisions		
	Breeding Season	Non-breeding Season	Total
North Falls	-	0.52	0.52
Outer Dowsing	-	0.12	0.12
Pentland Floating OWF	-	0.01	0.01
Race Bank	-	0.37	0.37
Rampion	-	0.26	0.26
Rampion 2	-	0.38	0.38
Scroby Sands	-	-	-
Seagreen Alpha & Bravo	-	2.86	2.86
Sheringham Shoal	-	-	-
Sheringham Shoal and Dudgeon Extension Project	-	0.10	0.10
Teesside	-	0.32	0.32
Thanet	-	0.01	0.01
Triton Knoll	-	2.33	2.33
Westermost Rough	-	-	-
Ossian	3.10	0.20	3.30
Salamander	5.09	0.04	5.13
West of Orkney[xvi]	0.11	15.84	15.95
Caledonia	1.84	0.24	2.08
All Projects	28.37	52.69	74.23
All Projects Excl. Berwick Bank	24.17	46.75	64.09
Consented (plus Caledonia)	15.87	29.64	38.69

[xvi] These numbers for West of Orkney are subject to change, but have been included to support this assessment on a precautionary basis.

Table 10-160: Seasonal and annual collision risk estimates of kittiwake for the Proposed Development (Offshore) in-combination with other projects during the operational phase, as per the Guidance Approach.

Population Size (Breeding Adults)	Defined Season	Estimated Number of Mortalities (Individuals Per Annum)	Change in Average Survival Rate (% Point Change)
All Projects			
Citation (60,904)	Breeding season (Mid-April to August)	28.37	0.047
	Non-breeding season (September to early-April)	52.69	0.087
	Annual total	73.85	0.121
Latest (27,094)	Breeding season (Mid-April to August)	28.37	0.105
	Non-breeding season (September to early-April)	52.69	0.194
	Annual total	73.85	0.273
All Projects Excluding Berwick Bank			
Citation (60,904)	Breeding season (Mid-April to August)	24.17	0.040
	Non-breeding season (September to early-April)	46.75	0.077
	Annual total	63.72	0.105
Latest (27,094)	Breeding season (Mid-April to August)	24.17	0.089
	Non-breeding season (September to early-April)	46.75	0.173
	Annual total	63.72	0.235
All Consented Projects plus Caledonia			
Citation (60,904)	Breeding season (Mid-April to August)	15.87	0.026

Population Size (Breeding Adults)	Defined Season	Estimated Number of Mortalities (Individuals Per Annum)	Change in Average Survival Rate (% Point Change)
	Non-breeding season (September to early-April)	29.64	0.049
	Annual total	38.31	0.063
Latest (27,094)	Breeding season (Mid-April to August)	15.87	0.059
	Non-breeding season (September to early-April)	29.64	0.109
	Annual total	38.31	0.141

Breeding Season

10.3.3.18 During the breeding season, up to 16 to 28 (15.87 - 28.37) kittiwakes of the Buchan Ness to Collieston Coast SPA are predicted to be subject to collision mortality per annum, when considering all projects in-combination presented in Table 10-159.

10.3.3.19 Using the citation colony count of 60,904 breeding adults and an annual background mortality of 8,892 breeding adults, the addition of 16 to 28 predicted breeding adult mortalities would result in a 0.047 survival rate percentage point change during the breeding season per annum. When considering the most up to date counts of 27,094 breeding adults and an annual background mortality of 3,956 breeding adults, this results in a 0.105 survival rate percentage point change during the breeding season per annum (Table 10-160).

Non-Breeding Season

10.3.3.20 During the non-breeding season, up to 30 to 53 (29.64 - 52.69) kittiwakes of the Buchan Ness to Collieston Coast SPA are predicted to be subject to collision mortality per annum, when considering the all projects in-combination scenario presented in Table 10-159.

10.3.3.21 Using the citation colony count of 60,904 breeding adults and an annual background mortality of 8,892 breeding adults, the addition of 30 to 53 predicted breeding adult mortalities would result in a 0.087 survival rate percentage point change during the non-breeding season per annum. When considering the most up to date counts of 27,094 breeding adults and an annual background mortality of 3,956 breeding adults, this results in 0.194 survival rate percentage point change during the non-breeding season per annum (Table 10-160).

Annual Total

10.3.3.22 The annual total of kittiwake subject to mortality due to collision at Buchan Ness to Collieston Coast SPA is estimated to be up to 38 to 74 (38.31 - 73.85) breeding adults per annum for all projects in-combination. This is predicted to result in a survival rate percentage point change against the citation and most recently published counts of 0.121 and 0.273,respectively (see Table 10-160).

10.3.3.23 To note, the removal of Berwick Bank from the assessment reduces predicted mortality to 64 (63.72) breeding adults per annum. Using the citation colony count and most recently published count, this equates to a 0.105 and 0.235 percentage point survival rate change within this population respectively.

10.3.3.24 As the survival rate percentage point change exceeds NatureScot's threshold of 0.02%, further consideration of the level of effect predicted has been analysed using PVA.

10.3.3.25 As consideration of two impacts are needed for kittiwake in order to simplify the assessment a single review of combined distribution response and collision risk are provided in Table 10-162.

Combined Distributional Response and Collision Risk

10.3.3.26 Projects identified for in-combination combined distributional response and collision risk for the kittiwake feature of Buchan Ness to Collieston Coast SPA are listed in Table 10-156 and Table 10-159, with the respective impact predictions for the different seasonal in-combination scenarios are presented in Table 10-156 and Table 10-159.

Table 10-161: Seasonal and annual displacement and collision risk estimates of kittiwake for the Proposed Development (Offshore) in-combination with other projects during the operational phase, as per the Guidance Approach.

Population Size (Breeding Adults)	Defined Season	Estimated number of mortalities from combined CRM and Distributional responses per annum		Change in Average Survival Rate (% Point Change) (Displacement Rate; Mortality Rate)	
		30%; 1%	30%; 3%	30%; 1%	30%; 3%
All Projects					
Citation (60,904)	Breeding season (Mid-April to August)	33.31	43.19	0.055	0.071
	Non-breeding season (September to early-April)	55.20	60.22	0.091	0.099
	Annual total	88.51	103.41	0.145	0.170
Latest (27,094)	Breeding season (Mid-April to August)	33.31	43.19	0.123	0.159
	Non-breeding season (September to early-April)	55.20	60.22	0.204	0.222
	Annual total	88.51	103.41	0.327	0.382
All Projects Excluding Berwick Bank					
Citation (60,904)	Breeding season (Mid-April to August)	28.46	37.04	0.047	0.061
	Non-breeding season (September to early-April)	47.66	49.48	0.078	0.081
	Annual total	76.12	86.53	0.125	0.142

Population Size (Breeding Adults)	Defined Season	Estimated number of mortalities from combined CRM and Distributional responses per annum		Change in Average Survival Rate (% Point Change) (Displacement Rate; Mortality Rate)	
		30%; 1%	30%; 3%	30%; 1%	30%; 3%
Latest (27,094)	Breeding season (Mid-April to August)	28.46	37.04	0.105	0.137
	Non-breeding season (September to early-April)	47.66	49.48	0.176	0.183
	Annual total	76.12	86.53	0.281	0.319
All Consented Projects plus Caledonia					
Citation (60,904)	Breeding season (Mid-April to August)	16.16	16.74	0.027	0.027
	Non-breeding season (September to early-April)	30.34	31.73	0.050	0.052
	Annual total	46.50	48.47	0.076	0.080
Latest (27,094)	Breeding season (Mid-April to August)	16.16	16.74	0.060	0.062
	Non-breeding season (September to early-April)	30.34	31.73	0.112	0.117
	Annual total	46.50	48.47	0.172	0.179

10.3.3.27 As presented in Table 10-161, for all combined in-combination collision risk and distributional response scenarios considered, the percentage point change in survival rate exceeded the 0.02 threshold as set by NatureScot, PVA has therefore been completed for these scenarios to further consider such a level of effect.

Population Viability Analysis

10.3.3.28 The potential for distributional responses and collision risk separately and combined has been assessed against the latest 2023 colony count population size of 27,094 breeding adults according to Seabird Monitoring Programme (2023) database. A range of impact values from 39 (39.29) to 96 (96.20) breeding adult additional mortalities per annum were modelled when considering the in-combination scenarios in Table 10-162. This allows for the Guidance approach predicted impact levels.

10.3.3.29 The PVA outputs for the kittiwake feature of Buchan Ness to Collieston Coast SPA predicted a reduction in the growth rate of between 0.172 – 0.420% annually when considering an increase of 39 to 96 additional breeding adult mortalities per annum based on the Guidance approach of a 30% displacement and 1-3% mortality rate (Table 10-162).

10.3.3.30 When considering such predicted reductions in annual growth rate, it is important to consider the known colony growth trend to understand the colony's resilience. The known population sizes for the kittiwake feature of Buchan Ness to Collieston Coast SPA would suggest significant decreases in population size between the 1998 citation count of 60,904 breeding adults and the latest 2019 colony count of 27,094 breeding adults. In addition, the Buchan Ness to Collieston Coast SPA is considered to be in 'unfavourable' condition with 'no change'.

10.3.3.31 As significant declines in kittiwake have been recorded at the Buchan Ness to Collieston Coast SPA (Burnell *et al.*, 2023[86]), the level of in-combination impact predicted would likely compromise the resilience of the colony over the 35 year period. In light of the above information, although the level of predicted impact of the project alone is considered small, **the potential for an AEoSI is therefore concluded when considering the level of potential effect predicted from the Guidance approach in-combination**.

Table 10-162 : PVA results for the kittiwake feature of Buchan Ness to Collieston SPA when considering combined distributional response and collision risk effects for the Proposed Development (Offshore) alone and in-combination.

Scenario	Season	Predicted Mortality	Median Growth rate (±SD)	Median Pop. Size (±SD)	Decrease in CGR per annum (%)	Decrease in CPS after 35 years (%)
In-combination all consented projects plus Caledonia OWF						
Guidance (30%, 1%)	Breeding	16.16	0.999 (0.001)	0.976 (0.026)	0.069	2.424
	Non-breeding	30.34	0.999 (0.001)	0.953 (0.027)	0.132	4.676
	Annual Total	39.29	0.998 (0.001)	0.940 (0.027)	0.172	6.040
Guidance (30%, 3%)	Breeding	16.74	0.999 (0.001)	0.974 (0.023)	0.072	2.577
	Non-breeding	31.73	0.999 (0.001)	0.951 (0.023)	0.139	4.881
	Annual Total	41.26	0.998 (0.001)	0.937 (0.022)	0.179	6.301
In-combination all projects plus Caledonia OWF						
Guidance (30%, 1%)	Breeding	33.31	0.999 (0.001)	0.948 (0.026)	0.145	5.157
	Non-breeding	55.20	0.998 (0.001)	0.917 (0.026)	0.240	8.332
	Annual Total	81.30	0.996 (0.001)	0.879 (0.024)	0.356	12.056
Guidance (30%, 3%)	Breeding	43.19	0.998 (0.001)	0.935 (0.022)	0.187	6.493
	Non-breeding	60.22	0.997 (0.001)	0.910 (0.022)	0.263	9.033
	Annual Total	96.20	0.996 (0.001)	0.859 (0.021)	0.420	14.096

Scenario	Season	Predicted Mortality	Median Growth rate (±SD)	Median Pop. Size (±SD)	Decrease in CGR per annum (%)	Decrease in CPS after 35 years (%)
In-combination all projects minus Berwick Bank plus Caledonia OWF						
Guidance (30%, 1%)	Breeding	28.46	0.999 (0.001)	0.956 (0.026)	0.125	4.443
	Non-breeding	47.66	0.998 (0.001)	0.928 (0.026)	0.208	7.207
	Annual Total	68.92	0.997 (0.001)	0.897 (0.025)	0.301	10.311
Guidance (30%, 3%)	Breeding	37.04	0.998 (0.001)	0.943 (0.026)	0.162	5.668
	Non-breeding	49.48	0.998 (0.001)	0.925 (0.026)	0.215	7.479
	Annual Total	79.32	0.997 (0.001)	0.883 (0.025)	0.347	11.713

Marwick Head SPA

Guillemot

10.3.3.32 Guillemot has been screened in to assess the impacts from distributional responses from the Proposed Development (Offshore) during the O&M phase in-combination with other projects in relation to the following relevant conservation objective for this species, as a feature of the SPA:

- Maintain the population as a viable component of the site.

10.3.3.33 Projects identified for in-combination distributional response for the guillemot feature of Marwick Head SPA are listed in Table 10-163, with the respective impact predictions for the different seasonal in-combination scenarios presented in Table 10-164. The predicted apportioned abundance for planned and operational projects included within Table 10-163, are based on the Northeast and East Scotwind Projects Cumulative totals dataset (RoyalHaskoningDHV, 2024[136]).

10.3.3.34 The main focus of the assessment is based on the Applicant Approach of a displacement rate of 50% and a 1% mortality rate for O&M phase in-combination distributional response impacts. NatureScot advise that distributional response assessment for guillemot should be based on a displacement rate of 60% and a mortality rate of up to 3 - 5% depending on the season being assessed, therefore such levels of predicted effect are also provided in Table 10-164.

10.3.3.35 As the Berwick Bank OWF is out of foraging range for guillemot, this scenario has not been presented for this species.

10.3.3.36 A displacement matrix is also presented for the annual apportioned in-combination abundance for Marwick Head SPA (Table 10-166), when considering the all project scenario presented in Table 10-163.

Table 10-163: Guillemot in-combination season and total abundance estimates attributed to Marwick Head SPA.

Development	Predicted Abundance		
	Breeding Season	Non-breeding Season	Total
Aberdeen	-	-	-
Beatrice	-	-	-
Berwick Bank	-	-	-
Forthwind	-	-	-
Green Volt	-	-	-
Hywind	-	-	-
Inch Cape	-	-	-
Kincardine	-	-	-
Moray East	-	-	-
Moray West	-	-	-
Neart na Gaoithe	-	-	-
Ossian	-	-	-
PFOWF	53	25	78
Salamander	-	-	-
Seagreen Alpha & Bravo	-	-	-
West of Orkney[xvii]	-	-	-
Caledonia	45	121	167
All Projects	99	146	245
Consented (plus Caledonia)	99	146	245

[xvii] These numbers for West of Orkney are subject to change, but have been included to support this assessment on a precautionary basis.

Table 10-164: Seasonal and annual displacement estimates of guillemot for the Proposed Development (Offshore) in-combination with other projects during the operational phase, as per the Applicant and Guidance Approach.

Population Size (Breeding Adults)	Defined Season	Estimated Number of Mortalities (Individuals Per Annum) (Displacement Rate; Mortality Rate)			Change in Average Survival Rate (% Point Change) (Displacement Rate; Mortality Rate)		
		50%; 1% 50%; 1%	60%; 3% 60%; 1%	60%; 5% 60%; 3%	50%; 1% 50%; 1%	60%; 3% 60%; 1%	60%; 5% 60%; 3%
All Projects							
Citation (37,700)	Breeding season (April to Mid-August)	0.49	1.78	2.96	0.001	0.005	0.008
	Non-breeding season (Mid-August to March)	0.73	0.88	2.64	0.002	0.002	0.007
	Annual total	1.23	2.66	5.60	0.003	0.007	0.015
Latest (12,800)	Breeding season (April to Mid-August)	0.49	1.78	2.96	0.004	0.014	0.023
	Non-breeding season (Mid-August to March)	0.73	0.88	2.64	0.006	0.007	0.021
	Annual total	1.23	2.66	5.60	0.010	0.021	0.044
All Consented Projects plus Caledonia							
Citation (37,700)	Breeding season (April to Mid-August)	0.49	1.78	2.96	0.001	0.005	0.008

Population Size (Breeding Adults)	Defined Season	Estimated Number of Mortalities (Individuals Per Annum) (Displacement Rate; Mortality Rate)			Change in Average Survival Rate (% Point Change) (Displacement Rate; Mortality Rate)		
		50%; 1% 50%; 1%	60%; 3% 60%; 1%	60%; 5% 60%; 3%	50%; 1% 50%; 1%	60%; 3% 60%; 1%	60%; 5% 60%; 3%
	Non-breeding season (Mid-August to March)	0.73	0.88	2.64	0.002	0.002	0.007
	Annual total	1.23	2.66	5.60	0.003	0.007	0.015
Latest (12,800)	Breeding season (April to Mid-August)	0.49	1.78	2.96	0.004	0.014	0.023
	Non-breeding season (Mid-August to March)	0.73	0.88	2.64	0.006	0.007	0.021
	Annual total	1.23	2.66	5.60	0.010	0.021	0.044

Breeding Season

10.3.3.37 During the breeding season, the in-combination abundance for guillemot is 99 (98.81) breeding adults of Marwick Head SPA for projects identified (Table 10-164). Assuming a displacement rate of 50% and a mortality rate of 1%, the consequent potential mortality is estimated to be well under one (0.49) breeding adult per annum during the breeding season.

10.3.3.38 Using the citation colony count of 37,700 breeding adults and an annual background mortality of 2,300 (2,299.70) breeding adults, the addition of under one (0.49) predicted breeding adult mortality would result in a 0.001 survival rate percentage point change during the breeding season per annum. When considering the most up to date counts of 12,800 breeding adults and an annual background mortality of 781 (780.80) breeding adults, this results in a 0.004 survival rate percentage point change during the breeding season per annum (Table 10-164).

Non-Breeding Season

10.3.3.39 During the non-breeding season, the in-combination abundance for guillemot is 146 (146.45) breeding adults from Marwick Head SPA for projects identified (Table 10-164). Assuming a displacement rate of 50% and a mortality rate of 1%, the consequent potential mortality is estimated to be under one (0.73) breeding adult per annum during the non-breeding season.

10.3.3.40 Using the citation colony count of 37,700 breeding adults and an annual background mortality of 2,300 (2,299.70) breeding adults, the addition of under one (0.73) predicted breeding adult mortality would result in a 0.002 survival rate percentage point change during the non-breeding season per annum. When considering the most up to date counts of 12,800 breeding adults and an annual background mortality of 781 (780.80) breeding adults, this results in a 0.006 survival rate percentage point change during the non-breeding season per annum (Table 10-164).

Annual Total

10.3.3.41 The annual total of guillemot subject to mortality due to in-combination distributional response at Marwick Head SPA is estimated to be one (1.23) breeding adult per annum (Table 10-164). This is predicted to result in a survival rate percentage point change against the citation and most recently published counts of 0.003 and 0.010, respectively (see Table 10-164).

10.3.3.42 When considering the Guidance approach, a total of three to six (2.66 - 5.60) breeding adult mortalities are predicted due to potential distributional response effects per annum. This results in a survival rate percentage point change of 0.007 – 0.015 against the citation and 0.021 – 0.044 against the most recently published count (Table 10-164).

10.3.3.43 The survival rate percentage point change does not exceed NatureScot's threshold of 0.02% when considering the Applicant Approach, but does when considering the Guidance approach, so further consideration of the level of effect predicted has been analysed using PVA.

Population Viability Analysis

10.3.3.44 The potential for distributional responses in combination has been assessed against the latest 2023 colony count population size of 12,800 breeding adults according to the Seabird Monitoring Programme (2020) database. A range of impact values from three to six breeding adult additional mortalities per annum were modelled (when considering the in-combination scenarios), which allows for consideration of both the Applicant and Guidance Approach predicted impact levels. For the reasons detailed within Section 7.3.3, this assessment is based on the consideration of the counterfactual of growth rate only, though the counterfactual of population size is also presented for consideration in Table 10-165. The PVA outputs for the guillemot feature of Marwick Head SPA predicted a reduction in the growth rate of between 0.024 – 0.051% when considering an increase of 2.66 – 5.60 additional adult mortalities per annum (60% displacement and 3-5% mortality rate).

10.3.3.45 Whilst recognising the population at this site has declined since the citation count in 1994 the guillemot feature is considered to be in unfavourable condition with no change. However, the reasons for the long term decline are not considered to be linked to the development of offshore wind farms within the region, which have only been in operation for a short period. The most recent trend from 2018 to 2023 is for growth of 1.32% year on year for the colony, perhaps reflecting the start of a recovery.

10.3.3.46 Distributional responses are not considered likely to be at the upper end of the Guidance approach, particularly when considering monitoring studies from the operational Beatrice offshore wind farm within the Moray Firth (Trinder *et al*., 2024[145]). Therefore, when considering the Applicant or Guidance Approach, it is clear that the loss of one to six birds per annum would likely be intangible from the natural baseline mortality per annum. However, even considering the Guidance approach, the maximum predicted reduction to the colony's growth rate of 0.05% would not tip the current trajectory of the colony (current growth rate of 1.32%) into decline when considering all impacts from the Proposed Development (Offshore) in-combination with all other projects.

10.3.3.47 **Therefore, there is no potential for an AEoSI to the conservation objectives of the guillemot feature of Marwick Head SPA in relation to distributional response effects in the O&M phase from the Proposed Development (Offshore) in-combination with all other projects. Subject to natural change, guillemot will be maintained as a feature in the long term.**

Table 10-165: PVA results for the guillemot feature of Marwick Head SPA when considering distributional responses effects for the Proposed Development (Offshore) alone and in-combination.

Scenario	Season	Predicted Mortality	Median Growth rate (±SD)	Median Pop. Size (±SD)	Decrease in CGR per annum (%)	Decrease in CPS after 35 years (%)
Caledonia OWF						
Alone - Guidance (60%, 5%; 60%, 3%)	Annual Total	3.55	1.000 (0.001)	0.989 (0.020)	0.031	1.118
In-combination all consented projects plus Caledonia OWF						
Guidance (60%,3%; 60%, 1%)	Annual Total	2.66	1.000 (0.001)	0.991 (0.021)	0.024	0.868
Guidance (60%, 5%)	Breeding	2.96	1.000 (0.001)	0.990 (0.020)	0.026	0.969
Guidance (60%, 3%)	Non-breeding	2.64	1.000 (0.001)	0.991 (0.020)	0.023	0.852
Guidance (60%, 5%; 60%, 3%)	Annual Total	5.60	0.999 (0.001)	0.982 (0.019)	0.050	1.763
In-combination all projects plus Caledonia OWF						
Guidance (60%, 3%; 60%, 1%)	Annual Total	2.66	1.000 (0.001)	0.991 (0.020)	0.024	0.890
Guidance (60%, 3%)	Non-breeding	2.64	1.000 (<0.001)	0.991 (0.020)	0.023	0.884
Guidance (60%, 5%; 60%, 3%)	Annual Total	5.60	0.999 (0.001)	0.982 (0.020)	0.051	1.829

Table 10-166: Guillemot O&M phase disturbance annual in-combination displacement matrix for all project impacts apportioned to Marwick Head SPA.

Annual Total	Mortality Rate (%)													
Displacement Rate (%)	1	2	3	5	10	20	30	40	50	60	70	80	90	100
10	0	0	1	1	2	5	7	10	12	15	17	20	22	25
20	0	1	1	2	5	10	15	20	25	29	34	39	44	49
30	1	1	2	4	7	15	22	29	37	44	52	59	66	74
40	1	2	3	5	10	20	29	39	49	59	69	78	88	98
50	1	2	4	6	12	25	37	49	61	74	86	98	110	123
60	1	3	4	7	15	29	44	59	74	88	103	118	132	147
70	2	3	5	9	17	34	52	69	86	103	120	137	155	172
80	2	4	6	10	20	39	59	78	98	118	137	157	177	196
90	2	4	7	11	22	44	66	88	110	132	155	177	199	221
100	2	5	7	12	25	49	74	98	123	147	172	196	221	245
Note, outputs highlighted in dark blue represent the predicted annual mortality estimates as per the Guidance Approach and those highlighted in yellow represent the predicted annual mortality estimates as per the Applicant Approach. For further information regarding the Guidance and Applicant Approach see Section 2.5 of Volume 7B, Appendix 6-2: Offshore Ornithology Distributional Responses Technical Report and Volume 7B, Appendix 6-2, Annex 4: Review of Relevant Evidence.														

West Westray SPA

Guillemot

10.3.3.48 Guillemot has been screened in to assess the impacts from distributional responses from the Proposed Development (Offshore) during the O&M phase in-combination with other projects in relation to the following relevant conservation objective for this species, as a feature of the SPA:

- Maintain the population as a viable component of the site.

10.3.3.49 Projects identified for in-combination distributional response for the guillemot feature of West Westray SPA are listed in Table 10-167, with the respective impact predictions for the different seasonal in-combination scenarios presented in Table 10-168. The predicted apportioned abundance for planned and operational projects included within Table 10-167, are based on the Northeast and East Scotwind Projects Cumulative totals dataset (RoyalHaskoningDHV, 2024[136]).

10.3.3.50 The main focus of the assessment is based on the Applicant Approach of a displacement rate of 50% and a 1% mortality rate for O&M phase in-combination distributional response impacts. NatureScot advise that distributional response assessment for guillemot should be based on a displacement rate of 60% and a mortality rate of up to 3 - 5% depending on the season being assessed, therefore such levels of predicted effect are also provided in Table 10-168.

10.3.3.51 As the Berwick Bank OWF is out of foraging range for guillemot, this scenario has not been presented for this species.

10.3.3.52 A displacement matrix is also presented for the annual apportioned in-combination abundance for West Westray SPA (Table 10-170), when considering the all projects scenario presented in Table 10-167.

Table 10-167: Guillemot in-combination season and total abundance estimates attributed to West Westray SPA.

Development	Predicted Abundance		
	Breeding Season	Non-breeding Season	Total
Aberdeen	-	-	-
Beatrice	-	-	-
Berwick Bank	-	-	-
Forthwind	-	-	-
Green Volt	-	-	-
Hywind	-	-	-
Inch Cape	-	-	-
Kincardine	-	-	-
Moray East	-	-	-
Moray West	-	-	-
Neart na Gaoithe	-	-	-
Ossian	-	-	-
PFOWF	25	77	102
Salamander	-	-	-
Seagreen Alpha & Bravo	-	-	-
West of Orkney[xviii]	-	-	-
Caledonia	108	386	494
All Projects	133	463	595
Consented (plus Caledonia)	133	463	595

[xviii] These numbers for West of Orkney are subject to change, but have been included to support this assessment on a precautionary basis.

Table 10-168: Seasonal and annual displacement estimates of guillemot for the Proposed Development (Offshore) in-combination with other projects during the operational phase, as per the Applicant and Guidance Approach.

Population Size (Breeding Adults)	Defined Season	Estimated Number of Mortalities (Individuals Per Annum) (Displacement Rate; Mortality Rate)			Change in Average Survival Rate (% Point Change) (Displacement Rate; Mortality Rate)		
		50%; 1% 50%; 1%	60%; 3% 60%; 1%	60%; 5% 60%; 3%	50%; 1% 50%; 1%	60%; 3% 60%; 1%	60%; 5% 60%; 3%
All Projects							
Citation (42,150)	Breeding season (April to Mid-August)	0.66	2.39	3.98	0.002	0.006	0.009
	Non-breeding season (Mid-August to March)	2.31	2.78	8.33	0.005	0.007	0.020
	Annual total	2.98	5.16	12.30	0.007	0.012	0.029
Latest (40,673)	Breeding season (April to Mid-August)	0.66	2.39	3.98	0.002	0.006	0.010
	Non-breeding season (Mid-August to March)	2.31	2.78	8.33	0.006	0.007	0.020
	Annual total	2.98	5.16	12.30	0.007	0.013	0.030
All Consented Projects plus Caledonia							
Citation (42,150)	Breeding season (April to Mid-August)	0.66	2.39	3.98	0.002	0.006	0.009

Population Size (Breeding Adults)	Defined Season	Estimated Number of Mortalities (Individuals Per Annum) (Displacement Rate; Mortality Rate)			Change in Average Survival Rate (% Point Change) (Displacement Rate; Mortality Rate)		
		50%; 1% 50%; 1%	60%; 3% 60%; 1%	60%; 5% 60%; 3%	50%; 1% 50%; 1%	60%; 3% 60%; 1%	60%; 5% 60%; 3%
	Non-breeding season (Mid-August to March)	2.31	2.78	8.33	0.005	0.007	0.020
	Annual total	2.98	5.16	12.30	0.007	0.012	0.029
Latest (40,673)	Breeding season (April to Mid-August)	0.66	2.39	3.98	0.002	0.006	0.010
	Non-breeding season (Mid-August to March)	2.31	2.78	8.33	0.006	0.007	0.020
	Annual total	2.98	5.16	12.30	0.007	0.013	0.030

Breeding Season

10.3.3.53 During the breeding season, the in-combination abundance for guillemot is 133 (132.59) breeding adults of West Westray SPA for projects identified (Table 10-168). Assuming a displacement rate of 50% and a mortality rate of 1%, the consequent potential mortality is estimated to be under one (0.66) breeding adult per annum during the breeding season.

10.3.3.54 Using the citation colony count of 42,150 breeding adults and an annual background mortality of 2,571 (2,571.15) breeding adults, the addition of one (0.66) predicted breeding adult mortalities would result in a 0.002 survival rate percentage point change during the breeding season per annum. When considering the most up to date counts of 40,673 breeding adults and an annual background mortality of 2,481 (2,481.05) breeding adults, this results in a 0.002 survival rate percentage point change during the breeding season per annum (Table 10-168).

Non-Breeding Season

10.3.3.55 During the non-breeding season, the in-combination abundance for guillemot is 463 (462.59) individuals of West Westray SPA for projects identified (Table 10-167). Assuming a displacement rate of 50% and a mortality rate of 1%, the consequent potential mortality is estimated to be two (2.31) breeding adults per annum during the non-breeding season.

10.3.3.56 Using the citation colony count of 42,150 breeding adults and an annual background mortality of 2,571 (2,571.15) breeding adults, the addition of two (2.31) predicted breeding adult mortalities would result in a 0.005 survival rate percentage point change during the non-breeding season per annum. When considering the most up to date counts of 40,673 breeding adults and an annual background mortality of 2,481 (2,481.05), this results in a 0.006 survival rate percentage point change during the non-breeding season per annum (Table 10-168).

Annual Total

10.3.3.57 The annual total of guillemot subject to mortality due to in-combination distributional response at West Westry SPA is estimated to be three (2.98) breeding adults per annum (Table 10-168). This is predicted to result in a survival rate percentage point change against the citation and most recently published counts of 0.007 and 0.007, respectively (see Table 10-168).

10.3.3.58 When considering the Guidance approach, a total of five to 12 (5.16 - 12.30) breeding adult mortalities are predicted due to potential distributional response effects per annum. This results in a survival rate percentage point change of 0.012 - 0.029 against the citation and 0.013 – 0.030 against the most recently published count (Table 10-168).

10.3.3.59 The survival rate percentage point change does not exceed NatureScot's threshold of 0.02% when considering the Applicant Approach, but does when considering the upper end of the Guidance approach, so further consideration of the level of effect predicted has been analysed using PVA.

Population Viability Analysis

10.3.3.60 The potential for distributional responses in-combination has been assessed against the latest 2017 - 2023 colony count population size of 40,673 breeding adults according to the Seabird Monitoring Programme (2020) database. A range of impact values up to 12 breeding adult additional mortalities per annum were modelled (when considering the in-combination scenarios), which allows for consideration of the Guidance approach predicted upper impact levels. For the reasons detailed within Section 7.3.3, this assessment is based on the consideration of the counterfactual of growth rate only, though the counterfactual of population size is also presented for consideration in Table 10-169. The PVA outputs for the guillemot feature of West Westray predicted a reduction in the growth rate of 0.035% when considering an increase of 12.30 additional adult mortalities per annum (60% displacement and 3-5% mortality rate).

10.3.3.61 Whilst recognising the population at this site has fluctuated with increases and decreases over time it has declined slightly since the citation count in 1998 and is considered to be in unfavourable condition, but unchanged. It is also worth noting that distributional responses are not considered likely to be at the upper end of the Guidance approach, particularly when considering monitoring studies from the operational Beatrice offshore wind farm within the Moray Firth (Trinder *et al*., 2024[145]). Therefore, when considering the Applicant Approach, it is clear that the loss of under three to 12 birds per annum would likely be intangible from the natural baseline mortality per annum. When considering the Applicant or Guidance Approach the impacts from the Proposed Development (Offshore) in-combination with all other projects would have a limited effect on the overall status or trajectory of the population, as the resulting reduction in growth rate would be under 0.1% for these scenarios.

10.3.3.62 **Therefore, there is no potential for an AEoSI to the conservation objectives of the guillemot feature of West Westray SPA in relation to distributional response effects in the O&M phase from the Proposed Development (Offshore) in-combination with all other projects. Subject to natural change, guillemot will be maintained as a feature in the long term.**

Table 10-169: PVA results for the guillemot feature of West Westray SPA when considering distributional responses effects for the Proposed Development (Offshore) alone and in-combination.

Scenario	Season	Predicted Mortality	Median Growth rate (±SD)	Median Pop. Size (±SD)	Decrease in CGR per annum (%)	Decrease in CPS after 35 years (%)
Caledonia OWF						
Alone - Guidance (60%, 5%; 60%, 3%)	Annual Total	10.17	1.000 (<0.001)	0.990 (0.012)	0.028	1.018
In-combination all consented projects plus Caledonia OWF						
Guidance (60%, 3%)	Non-breeding	8.33	1.000 (<0.001)	0.992 (0.011)	0.024	0.830
Guidance (60%, 3%)	Annual Total	12.30	1.000 (<0.001)	0.988 (0.011)	0.035	1.222
In-combination all projects plus Caledonia OWF						
Guidance (60%, 3%)	Non-breeding	8.33	1.000 (<0.001)	0.992 (0.011)	0.024	0.830
Guidance (60%, 3%)	Annual Total	12.30	1.000 (<0.001)	0.988 (0.011)	0.035	1.222

Table 10-170: Guillemot O&M phase disturbance annual in-combination displacement matrix for all project impacts apportioned to West Westray SPA.

Annual Total Displacement Rate (%)	Mortality Rate (%)													
	1	2	3	5	10	20	30	40	50	60	70	80	90	100
10	1	1	2	3	6	12	18	24	30	36	42	48	54	60
20	1	2	4	6	12	24	36	48	60	71	83	95	107	119
30	2	4	5	9	18	36	54	71	89	107	125	143	161	179
40	2	5	7	12	24	48	71	95	119	143	167	190	214	238
50	3	6	9	15	30	60	89	119	149	179	208	238	268	298
60	4	7	11	18	36	71	107	143	179	214	250	286	321	357
70	4	8	12	21	42	83	125	167	208	250	292	333	375	417
80	5	10	14	24	48	95	143	190	238	286	333	381	429	476
90	5	11	16	27	54	107	161	214	268	321	375	429	482	536
100	6	12	18	30	60	119	179	238	298	357	417	476	536	595

Note, outputs highlighted in dark blue represent the predicted annual mortality estimates as per the Guidance Approach and those highlighted in yellow represent the predicted annual mortality estimates as per the Applicant Approach. For further information regarding the Guidance and Applicant Approach see Section 2.5 of Volume 7B, Appendix 6-2: Offshore Ornithology Distributional Responses Technical Report and Volume 7B, Appendix 6-2, Annex 4: Review of Relevant Evidence.

Sule Skerry and Sule Stack SPA

Puffin

10.3.3.63 Puffin has been screened in to assess the impacts from distributional responses from the Proposed Development (Offshore) during the O&M phase in-combination with other projects in relation to the following relevant conservation objective for this species, as a feature of the SPA:

- Maintain the population as a viable component of the site.

10.3.3.64 Projects identified for in-combination distributional response for the puffin feature of Sule Skerry and Sule Stack SPA are listed in Table 10-171, with the respective impact predictions for the different seasonal in-combination scenarios presented in Table 10-172. The predicted apportioned abundance for planned and operational projects included within Table 10-171, are primarily based on the Northeast and East Scotwind Projects Cumulative totals dataset (RoyalHaskoningDHV, 2024[136]), with the addition of abundance totals for Ossian (NIRAS and RPS, 2024[141]) and Salamander (ERM, 2024[142]) derived from their respective RIAAs.

10.3.3.65 The main focus of the assessment is based on the Applicant Approach of a displacement rate of 50% and a 1% mortality rate for O&M phase in-combination distributional response impacts. NatureScot advise that distributional response assessment for puffin should be based on a displacement rate of 60% and a mortality rate of up to 3 - 5% depending on the season being assessed, therefore such levels of predicted effect are also provided in Table 10-171.

10.3.3.66 A displacement matrix is also presented for the annual apportioned in-combination abundance for Sule Skerry and Sule Stack SPA (Table 10-178), when considering the all project scenarios presented in Table 10-172.

Table 10-171: Puffin in-combination season and total abundance estimates attributed to Sule Skerry and Sule Stack SPA.

Development	Predicted Abundance		
	Breeding Season	Non-breeding Season	Total
Aberdeen (EOWDC)	-	-	-
Beatrice	-	1	1
Berwick Bank	-	5	5
Blyth Demonstration Site	-	-	-
DEP	-	-	-
Dogger Bank A	-	-	-
Dogger Bank B	-	-	-
Dogger Bank C	-	-	-
Dogger Bank South (PEIR)	-	-	-
Dudgeon	-	-	-
East Anglia One	-	-	-
East Anglia One North	-	-	-
East Anglia Three	-	-	-
East Anglia Two	-	-	-
Five Estuaries	-	-	-
Forthwind	-	-	-
Galloper	-	-	-
Greater Gabbard	-	-	-
Green Volt	108	0	108
Gunfleet Sands	-	-	-
Hornsea Project Four	-	-	-
Hornsea Project One	-	1	1
Hornsea Project Three	-	-	-
Hornsea Project Two	-	1	1
Humber Gateway	-	-	-

Development	Predicted Abundance		
	Breeding Season	Non-breeding Season	Total
Hywind 2 Demonstration	-	-	-
Inch Cape	-	1	1
Kentish Flats	-	-	-
Kentish Flats Extension	-	-	-
Kincardine	-	-	-
Lincs, Lynn and Inner Dowsing	-	-	-
London Array	-	-	-
Moray East	-	-	-
Moray West	-	2	2
Neart na Gaoithe	-	1	1
Norfolk Boreas	-	-	-
Norfolk Vanguard	-	-	-
North Falls (PEIR)	-	-	-
Ossian	-	-	-
Outer Dowsing	-	-	-
PFOWF	3,667	-	3,667
Race Bank	-	-	-
Rampion	-	-	-
Rampion 2	-	-	-
Salamander	52	-	52
Scroby Sands	-	-	-
Seagreen Alpha	-	1	1
Seagreen Bravo	-	2	2
SEP	-	-	-
Sheringham Shoal	-	-	-
Sofia	-	-	-

Development	Predicted Abundance		
	Breeding Season	Non-breeding Season	Total
Teesside	-	-	-
Thanet	-	-	-
Triton Knoll	-	-	-
West of Orkney[xix]	7,152	1	7,154
Westermost Rough	-	-	-
Caledonia (Guidance)	612	1	613
Caledonia (Applicant)	207	2	209
All Projects (Guidance)	11,592	19	11,611
All Projects (Applicant)	11,187	20	11,207
All Projects Excl. Berwick Bank (Guidance)	11,592	15	11,606
All Projects Excl. Berwick Bank (Applicant)	11,187	16	11,202
Consented (plus Caledonia) (Guidance)	4,387	13	4,400
Consented (plus Caledonia Applicant)	3,983	14	3,996
Note, the Applicant has decided to include the Year 1 August count in the non-breeding season rather than during the breeding season. This is due to the Year 1 August abundance being considered to reflect migration rather than individuals present in the breeding season. Note, the predicted abundances for puffin have also been presented with the August count included in the breeding season as per the Guidance Approach.			

[xix] These numbers for West of Orkney are subject to change, but have been included to support this assessment on a precautionary basis.

Table 10-172: Seasonal and annual displacement estimates of puffin for the Proposed Development (Offshore) in-combination with other projects during the operational phase, as per the Applicant and Guidance Approach.

Population Size (Breeding Adults)	Defined Season	Estimated Number of Mortalities (Individuals Per Annum) (Displacement Rate; Mortality Rate)			Change in Average Survival Rate (% Point Change) (Displacement Rate; Mortality Rate)		
		50%; 1% 50%; 1%	60%; 3% 60%; 1%	60%; 5% 60%; 3%	50%; 1% 50%; 1%	60%; 3% 60%; 1%	60%; 5% 60%; 3%
All Projects (Guidance)							
Citation (93,800)	Breeding season (April to Mid-August)	57.96	208.65	347.75	0.062	0.222	0.371
	Non-breeding season (Mid-August to March)	0.10	0.12	0.35	<0.001	<0.001	<0.001
	Annual total	58.06	208.77	348.10	0.062	0.223	0.371
Latest (95,484)	Breeding season (April to Mid-August)	57.96	208.65	347.75	0.061	0.219	0.364
	Non-breeding season (Mid-August to March)	0.10	0.12	0.35	<0.001	<0.001	<0.001
	Annual total	58.06	208.77	348.10	0.061	0.219	0.365

Population Size (Breeding Adults)	Defined Season	Estimated Number of Mortalities (Individuals Per Annum) (Displacement Rate; Mortality Rate)			Change in Average Survival Rate (% Point Change) (Displacement Rate; Mortality Rate)		
		50%; 1% 50%; 1%	60%; 3% 60%; 1%	60%; 5% 60%; 3%	50%; 1% 50%; 1%	60%; 3% 60%; 1%	60%; 5% 60%; 3%
All Projects (Applicant)							
Citation (93,800)	Breeding season (April to Mid-August)	55.93	201.36	335.61	0.060	0.215	0.358
	Non-breeding season (Mid-August to March)	0.10	0.12	0.36	<0.001	<0.001	<0.001
	Annual total	56.03	201.48	335.97	0.060	0.215	0.358
Latest (95,484)	Breeding season (April to Mid-August)	55.93	201.36	335.61	0.059	0.211	0.351
	Non-breeding season (Mid-August to March)	0.10	0.12	0.36	<0.001	<0.001	<0.001
	Annual total	56.03	201.48	335.97	0.059	0.211	0.352
All Projects Excluding Berwick Bank (Guidance)							
Citation (93,800)	Breeding season (April to Mid-August)	57.96	208.65	347.75	0.062	0.222	0.371

Population Size (Breeding Adults)	Defined Season	Estimated Number of Mortalities (Individuals Per Annum) (Displacement Rate; Mortality Rate)			Change in Average Survival Rate (% Point Change) (Displacement Rate; Mortality Rate)		
		50%; 1% 50%; 1%	60%; 3% 60%; 1%	60%; 5% 60%; 3%	50%; 1% 50%; 1%	60%; 3% 60%; 1%	60%; 5% 60%; 3%
	Non-breeding season (Mid-August to March)	0.07	0.09	0.26	<0.001	<0.001	<0.001
	Annual total	58.03	208.74	348.02	0.062	0.223	0.371
Latest (95,484)	Breeding season (April to Mid-August)	57.96	208.65	347.75	0.061	0.219	0.364
	Non-breeding season (Mid-August to March)	0.07	0.09	0.26	<0.001	<0.001	<0.001
	Annual total	58.03	208.74	348.02	0.061	0.219	0.364
All Projects Excluding Berwick Bank (Applicant)							
Citation (93,800)	Breeding season (April to Mid-August)	55.93	201.36	335.61	0.060	0.215	0.358
	Non-breeding season (Mid-August to March)	0.08	0.09	0.28	<0.001	<0.001	<0.001
	Annual total	56.01	201.46	335.89	0.060	0.215	0.358
Latest (95,484)	Breeding season (April to Mid-August)	55.93	201.36	335.61	0.059	0.211	0.351

Population Size (Breeding Adults)	Defined Season	Estimated Number of Mortalities (Individuals Per Annum) (Displacement Rate; Mortality Rate)			Change in Average Survival Rate (% Point Change) (Displacement Rate; Mortality Rate)		
		50%; 1% 50%; 1%	60%; 3% 60%; 1%	60%; 5% 60%; 3%	50%; 1% 50%; 1%	60%; 3% 60%; 1%	60%; 5% 60%; 3%
	Non-breeding season (Mid-August to March)	0.08	0.09	0.28	<0.001	<0.001	<0.001
	Annual total	56.01	201.46	335.89	0.059	0.211	0.351
All Consented Projects plus Caledonia (Guidance)							
Citation (93,800)	Breeding season (Mid-April to August)	21.94	78.97	131.62	0.023	0.084	0.140
	Non-breeding season (September to early-April)	0.06	0.08	0.23	<0.001	<0.001	<0.001
	Annual total	22.00	79.05	131.86	0.023	0.084	0.141
Latest (95,484)	Breeding season (Mid-April to August)	21.94	78.97	131.62	0.023	0.083	0.138
	Non-breeding season (September to early-April)	0.06	0.08	0.23	<0.001	<0.001	<0.001
	Annual total	22.00	79.05	131.86	0.023	0.083	0.138

Population Size (Breeding Adults)	Defined Season	Estimated Number of Mortalities (Individuals Per Annum) (Displacement Rate; Mortality Rate)			Change in Average Survival Rate (% Point Change) (Displacement Rate; Mortality Rate)		
		50%; 1% 50%; 1%	60%; 3% 60%; 1%	60%; 5% 60%; 3%	50%; 1% 50%; 1%	60%; 3% 60%; 1%	60%; 5% 60%; 3%
All Consented Projects plus Caledonia (Applicant)							
Citation (93,800)	Breeding season (Mid-April to August)	19.91	71.69	119.48	0.021	0.076	0.127
	Non-breeding season (September to early-April)	0.07	0.08	0.25	<0.001	<0.001	<0.001
	Annual total	19.98	71.77	119.72	0.021	0.077	0.128
Latest (95,484)	Breeding season (Mid-April to August)	19.91	71.69	119.48	0.021	0.075	0.125
	Non-breeding season (September to early-April)	0.07	0.08	0.25	<0.001	<0.001	<0.001
	Annual total	19.98	71.77	119.72	0.021	0.075	0.125

Breeding Season

10.3.3.67 During the breeding season, the in-combination abundance for puffin is 11,187 (3,982.51 - 11,186.84) breeding adults of Sule Skerry and Sule Stack SPA for projects identified (Table 10-171). Assuming a displacement rate of 50% and a mortality rate of 1%, the consequent potential mortality is estimated to be up to 56 (19.98 - 56.03) breeding adults per annum during the breeding season, depending on the scenario considered.

10.3.3.68 Using the citation colony count of 93,800 breeding adults and an annual background mortality of 8,817 breeding adults, the addition of up to 56 (19.91 - 55.93) predicted breeding adult mortalities would result in a 0.060 survival rate percentage point change during the breeding season per annum. When considering the most up to date counts of 95,484 breeding adults and an annual background mortality of 8,976 breeding adults, this results in a 0.059 survival rate percentage point change during the breeding season per annum (Table 10-172).

Non-Breeding Season

10.3.3.69 During the non-breeding season, the in-combination abundance for puffin is up to 20 (13.72 - 20.12) individuals of Sule Skerry and Sule Stack SPA for projects identified (Table 10-171Table 10-171). Assuming a displacement rate of 50% and a mortality rate of 1%, the consequent potential mortality is estimated to be less than one (0.07 to 0.10) breeding adults per annum during the non-breeding season, depending on the scenario considered.

10.3.3.70 Using the citation colony count of 93,800 breeding adults and an annual background mortality of 8,817 breeding adults, the addition of 20 predicted breeding adult mortalities would result in a <0.001 survival rate percentage point change during the non-breeding season per annum. When considering the most up to date counts of 95,484 breeding adults and an annual background mortality of 8,817 breeding adults, this results in a <0.001 survival rate percentage point change during the non-breeding season per annum (Table 10-172).

Annual Total

10.3.3.71 The annual total of puffin subject to mortality due to in-combination distributional response at Sule Skerry and Sule Stack SPA is estimated to be between up to 56 (19.98 to 56.03) breeding adults per annum depending on the scenarios presented in Table 10-171. This is predicted to result in a survival rate percentage point change against the citation and most recently published counts of 0.060 and 0.059 respectively depending on the in-combination scenario considered (see Table 10-172).

10.3.3.72 To note, the removal of Berwick Bank from the assessment reduces predicted mortality to 56 (56.01) birds per annum. Using the citation colony count and most recently published count, this equates to a 0.060 and 0.059 percentage point survival rate change within this population respectively.

10.3.3.73 When considering the Guidance approach, a total of 72 – 336 (71.77 – 335.97) breeding adult mortalities are predicted due to potential distributional response effects per annum. This results in a survival rate percentage point change of 0.077– 0.358 against the citation and 0.075 – 0.352 against the most recently published count (Table 10-172).

10.3.3.74 As the survival rate percentage point change exceeds NatureScot's threshold of 0.02% when considering both the Applicant and Guidance approach, further consideration of the level of effect predicted has been analysed using PVA.

Population Viability Analysis

10.3.3.75 The potential for distributional responses in-combination has been assessed against the latest 2018 colony count population size of 95,484 breeding adults according to the Seabird Monitoring Programme (2020) database. A range of impact values from 20 (19.98) to 56 (56.01) breeding adult additional mortalities per annum were modelled (when considering the in-combination scenarios), which allows for consideration of both the Applicant and Guidance Approach predicted impact levels. For the reasons detailed within Section 7.3.3, this assessment is based on the consideration of the counterfactual of growth rate only, though the counterfactual of population size is also presented for consideration in Table 10-174 and Table 10-175. The PVA outputs for the puffin feature of Sule Skerry and Sule Stack SPA predicted a reduction in the growth rate of 0.25% when considering an increase of 201 additional adult mortalities per annum (based on a 50% displacement and 1% mortality rate) to 0.42% when considering an increase of 336 additional adult mortalities per annum (60% displacement and 3-5% mortality rate).

10.3.3.76 As presented in Table 10-173, the long term colony trend has been relatively stable, with minimal change between the original citation count and the latest 2020 census, though colony appeared to have peaked in size in the early 2000s. currently the colony status is classified as 'favourable maintained' condition which aligns with the overall trend presented in Table 10-173. Due to lack of available data, the colony growth trend in the recent years and effect of HPAI is unknown, though to note low mortality was reported across UK puffin colonies in 2022, suggesting limited effect from HPAI (RSPB, 2024[144]).

10.3.3.77 When considering the Applicant Approach in-combination effect for all projects, the minor reduction in growth rate per annum of 0.181% is unlikely to be distinguishable from the natural fluctuation in the population and is not considered to cause a signficiant effect when considering the stable trend of the colony. Therefore, **the potential for an AEoSI can be ruled out when considering the Applicant Approach in-combination effect with other plans and projects.**

10.3.3.78 Whilst the evidence would suggest that the potential for the Guidance approach impact is unlikely to occur (As detailed within Volume 7B, Appendix

6-2, Annex 4: Review of Relevant Evidence), a reduction in growth rate annually of up to 0.84% would be considered to have a significant effect on the puffin feature of Sule Skerry and Sule Stack SPA when considering the Proposed Development (Offshore) in-combination with other plans and projects. **The potential for an AEoSI is therefore concluded when considering the level of potential effect predicted from the Guidance approach in-combination.**

Table 10-173: Annual colony compound growth rate for the puffin feature of Sule Skerry and Sule Stack SPA between 1984 and 2020 based on Burnell *et al*. (2023) and SMP (2020).

Years	Population Size (Breeding Adults)	Colony Annual Compound Growth Rate (%)
1994 – 2020	93,800 – 95,484	0.07%
1994 - 2000	93,800 – 118,942	4.04%
2000 - 2020	118,942 – 95,484	-1.09%

Table 10-174. PVA results for the puffin feature of Sule Skerry and Sule Stack SPA when considering distributional responses effects for the Proposed Development (Offshore) alone and in-combination. Note, this table presents the Guidance Approach for puffin, whereby the Year 1 August abundance has been incorporated as part of the breeding season (further details are provided in Volume 7B, Appendix 6-2: Offshore Ornithology Distributional Responses Technical Report).

Scenario	Season	Predicted Mortality	Median Growth rate (±SD)	Median Pop. Size (±SD)	Decrease in CGR per annum (%)	Decrease in CPS after 35 years (%)
Caledonia OWF						
Alone - Guidance (60%, 3%)	Breeding	11.02	1.000 (<0.001)	0.995 (0.019)	0.014	0.537
Alone - Guidance (60%, 3%; 60%, 1%)	Annual Total	1,837.14	0.977 (0.001)	0.437 (0.011)	2.274	56.349
Alone - Guidance (60%, 5%; 60%, 3%)	Breeding	18.38	1.000 (<0.001)	0.991 (0.019)	0.023	0.864
Alone - Guidance (60%, 5%; 60%, 3%)	Annual Total	11.02	1.000 (<0.001)	0.995 (0.019)	0.014	0.537
In-combination all consented projects plus Caledonia OWF						
Guidance (60%, 3%; 60%, 1%)	Annual Total	79.05	0.999 (<0.001)	0.965 (0.019)	0.098	3.475
Guidance (60%, 5%; 60%, 3%)	Annual Total	131.86	0.998 (<0.001)	0.943 (0.018)	0.163	5.738
In-combination all projects plus Caledonia OWF						
Guidance (60%, 3%; 60%, 1%)	Annual Total	208.77	0.997 (0.001)	0.910 (0.018)	0.260	9.007

Scenario	Season	Predicted Mortality	Median Growth rate (±SD)	Median Pop. Size (±SD)	Decrease in CGR per annum (%)	Decrease in CPS after 35 years (%)
Guidance (60%, 5%; 60%, 3%)	Annual Total	348.10	0.996 (0.001)	0.856 (0.017)	0.430	14.380
In-combination all projects minus Berwick Bank plus Caledonia OWF						
Applicant (50%, 1%)	Annual Total	208.74	0.997 (<0.001)	0.910 (0.017)	0.259	8.965
Guidance (60%, 3%)	Annual Total	348.02	0.996 (0.001)	0.856 (0.017)	0.432	14.448

Table 10-175. PVA results for the puffin feature of Sule Skerry and Sule Stack SPA when considering distributional responses effects for the Proposed Development (Offshore) alone and in-combination. Note, this table presents the Applicant Approach for puffin, whereby the Year 1 August abundance has been incorporated as part of the non-breeding season (further details are provided in Volume 7B, Appendix 6-2: Offshore Ornithology Distributional Responses Technical Report).

Scenario	Season	Predicted Mortality	Median Growth rate (±SD)	Median Pop. Size (±SD)	Decrease in CGR per annum (%)	Decrease in CPS after 35 years (%)
In-combination all consented projects plus Caledonia OWF						
Guidance (60%, 3%; 60%, 1%)	Annual Total	201.48	0.999 (0.001)	0.968 (0.018)	0.089	3.181
Guidance (60%, 5%; 60%, 3%)	Annual Total	335.97	0.999 (<0.001)	0.948 (0.018)	0.149	5.223
In-combination all projects plus Caledonia OWF						
Guidance (60%, 3%; 60%, 1%)	Annual Total	201.46	0.998 (0.001)	0.914 (0.017)	0.250	8.648
Guidance (60%, 5%; 60%, 3%)	Annual Total	335.89	0.996 (0.001)	0.860 (0.017)	0.417	14.018
In-combination all projects minus Berwick Bank plus Caledonia OWF						
Guidance (60%, 3%; 60%, 1%)	Annual Total	71.77	0.998 (0.001)	0.914 (0.018)	0.249	8.584
Guidance (60%, 5%; 60%, 3%)	Annual Total	119.72	0.996 (0.001)	0.860 (0.017)	0.417	13.988

Table 10-176:Puffin O&M phase disturbance annual displacement matrix for impacts apportioned to Sule Skerry and Sule Stack SPA. (Guidance Approach).

Annual Total	Mortality Rate (%)													
Displacement Rate (%)	1	2	3	5	10	20	30	40	50	60	70	80	90	100
10	12	23	35	58	116	232	348	464	581	697	813	929	1,045	1,161
20	23	46	70	116	232	464	697	929	1,161	1,393	1,626	1,858	2,090	2,322
30	35	70	104	174	348	697	1,045	1,393	1,742	2,090	2,438	2,787	3,135	3,483
40	46	93	139	232	464	929	1,393	1,858	2,322	2,787	3,251	3,716	4,180	4,644
50	58	116	174	290	581	1,161	1,742	2,322	2,903	3,483	4,064	4,644	5,225	5,806
60	70	139	209	348	697	1,393	2,090	2,787	3,483	4,180	4,877	5,573	6,270	6,967
70	81	163	244	406	813	1,626	2,438	3,251	4,064	4,877	5,689	6,502	7,315	8,128
80	93	186	279	464	929	1,858	2,787	3,716	4,644	5,573	6,502	7,431	8,360	9,289
90	104	209	313	522	1,045	2,090	3,135	4,180	5,225	6,270	7,315	8,360	9,405	10,450
100	116	232	348	581	1,161	2,322	3,483	4,644	5,806	6,967	8,128	9,289	10,450	11,611
Note, outputs highlighted in dark blue represent the predicted annual mortality estimates as per the Guidance Approach and those highlighted in yellow represent the predicted annual mortality estimates as per the Applicant Approach. For further information regarding the Guidance and Applicant Approach see Section 2.5 of Volume 7B, Appendix 6-2: Offshore Ornithology Distributional Responses Technical Report and Volume 7B, Appendix 6-2, Annex 4: Review of Relevant Evidence.														

Table 10-177: Puffin O&M phase disturbance annual displacement matrix for impacts apportioned to Sule Skerry and Sule Stack SPA. (Applicant Approach).

Annual Total	Mortality Rate (%)												
Displacement Rate (%)	1	2	3	5	10	20	30	40	50	60	70	80	90	100
10	11	22	34	56	112	224	336	448	560	672	784	897	1,009	1,121
20	22	45	67	112	224	448	672	897	1,121	1,345	1,569	1,793	2,017	2,241
30	34	67	101	168	336	672	1,009	1,345	1,681	2,017	2,353	2,690	3,026	3,362
40	45	90	134	224	448	897	1,345	1,793	2,241	2,690	3,138	3,586	4,035	4,483
50	56	112	168	280	560	1,121	1,681	2,241	2,802	3,362	3,922	4,483	5,043	5,603
60	67	134	202	336	672	1,345	2,017	2,690	3,362	4,035	4,707	5,379	6,052	6,724
70	78	157	235	392	784	1,569	2,353	3,138	3,922	4,707	5,491	6,276	7,060	7,845
80	90	179	269	448	897	1,793	2,690	3,586	4,483	5,379	6,276	7,172	8,069	8,966
90	101	202	303	504	1,009	2,017	3,026	4,035	5,043	6,052	7,060	8,069	9,078	10,086
100	112	224	336	560	1,121	2,241	3,362	4,483	5,603	6,724	7,845	8,966	10,086	11,207
Note, outputs highlighted in dark blue represent the predicted annual mortality estimates as per the Guidance Approach and those highlighted in yellow represent the predicted annual mortality estimates as per the Applicant Approach. For further information regarding the Guidance and Applicant Approach see Section 2.5 of Volume 7B, Appendix 6-2: Offshore Ornithology Distributional Responses Technical Report and Volume 7B, Appendix 6-2, Annex 4: Review of Relevant Evidence.													

Fair Isle

Puffin

10.3.3.79 Puffin has been screened in to assess the impacts from distributional responses from the Proposed Development (Offshore) during the O&M phase in-combination with other projects in relation to the following relevant conservation objective for this species, as a feature of the SPA:

- Maintain the population as a viable component of the site.

10.3.3.80 Projects identified for in-combination distributional response for the puffin feature of Fair Isle SPA are listed in Table 10-178, with the respective impact predictions for the different seasonal in-combination scenarios presented in Table 10-179. The predicted apportioned abundance for planned and operational projects included within Table 10-178, are primarily based on the Northeast and East Scotwind Projects Cumulative totals dataset (RoyalHaskoningDHV, 2024[136]), with the addition of abundance totals for Ossian (NIRAS and RPS, 2024[141]) and Salamander (ERM, 2024[142]) derived from their respective RIAAs.

10.3.3.81 The main focus of the assessment is based on the Applicant Approach of a displacement rate of 50% and a 1% mortality rate for O&M phase in-combination distributional response impacts. NatureScot advise that distributional response assessment for puffin should be based on a displacement rate of 60% and a mortality rate of up to 3 - 5% depending on the season being assessed, therefore such levels of predicted effect are also provided in Table 10-179.

10.3.3.82 A displacement matrix is also presented for the annual apportioned in-combination abundance for Fair Isle SPA (Table 10-182 and Table 10-183), when considering the all projects scenarios presented in Table 10-179.

Table 10-178: Puffin in-combination season and total abundance estimates for puffin attributed to Fair Isle SPA.

Development	Predicted Abundance		
	Breeding Season	Non-breeding Season	Total
Aberdeen (EOWDC)	-	1	1
Beatrice	-	34	34
Berwick Bank	-	123	123
Blyth Demonstration Site	-	2	2
DEP	-	1	1
Dogger Bank A	-	4	4
Dogger Bank B	-	10	10
Dogger Bank C	-	4	4
Dogger Bank South (PEIR)	-	11	11
Dudgeon	-	-	-
East Anglia One	-	-	-
East Anglia One North	-	-	-
East Anglia Three	-	4	4
East Anglia Two	-	-	-
Five Estuaries	-	-	-
Forthwind	-	-	-
Galloper	-	-	-
Greater Gabbard	-	-	-
Green Volt	12	1	13
Gunfleet Sands	-	-	-
Hornsea Project Four	-	6	6
Hornsea Project One	-	17	17
Hornsea Project Three	-	1	1

Development	Predicted Abundance		
	Breeding Season	Non-breeding Season	Total
Hornsea Project Two	-	28	28
Humber Gateway	-	-	-
Hywind 2 Demonstration	-	1	1
Inch Cape	-	37	37
Kentish Flats	-	-	-
Kentish Flats Extension	-	-	-
Kincardine	-	-	-
Lincs, Lynn and Inner Dowsing	-	-	-
London Array	-	-	-
Moray East	-	9	9
Moray West	-	55	55
Neart na Gaoithe	-	29	29
Norfolk Boreas	-	-	-
Norfolk Vanguard	-	2	2
North Falls (PEIR)	-	-	-
Ossian	-	-	-
Outer Dowsing	-	9	9
PFOWF	5	-	5
Race Bank	-	-	
Rampion	-	-	
Rampion 2	-	-	
Salamander	9	-	9
Scroby Sands	-	-	-
Seagreen Alpha	-	21	1
Seagreen Bravo	-	53	53

Development	Predicted Abundance		
	Breeding Season	Non-breeding Season	Total
SEP	-	-	-
Sheringham Shoal	-	-	-
Sofia	-	5	5
Teesside	-	-	-
Thanet	-	-	-
Triton Knoll	-	1	1
West of Orkney[xx]	-	30	30
Westermost Rough	-	-	-
Caledonia (Guidance)	35	19	53
Caledonia (Applicant)	12	42	53
All Projects (Guidance)	60	520	580
All Projects (Applicant)	37	543	580
All Projects Excl. Berwick Bank (Guidance)	60	397	457
All Projects Excl. Berwick Bank (Applicant)	37	420	457
Consented (plus Caledonia) (Guidance)	52	347	399
Consented (plus Caledonia)	29	370	399
Note, the Applicant has decided to include the Year 1 August count in the non-breeding season rather than during the breeding season. This is due to the Year 1 August abundance being considered to reflect migration rather than individuals present in the breeding season. Note, the predicted abundances for puffin have also been presented with the August count included in the breeding season as per the Guidance Approach.			

[xx] These numbers for West of Orkney are subject to change, but have been included to support this assessment on a precautionary basis.

Table 10-179: Seasonal and annual displacement estimates of puffin for the Proposed Development (Offshore) in-combination with other projects during the operational phase, as per the Applicant and Guidance Approach.

Population Size (Breeding Adults)	Defined Season	Estimated Number of Mortalities (Individuals Per Annum) (Displacement Rate; Mortality Rate)			Change in Average Survival Rate (% Point Change) (Displacement Rate; Mortality Rate)		
		50%; 1% 50%; 1%	60%; 3% 60%; 1%	60%; 5% 60%; 3%	50%; 1% 50%; 1%	60%; 3% 60%; 1%	60%; 5% 60%; 3%
All Projects (Guidance)							
Citation (23,000)	Breeding season (April to Mid-August)	0.30	1.09	1.81	0.001	0.005	0.008
	Non-breeding season (Mid-August to March)	2.60	3.12	9.36	0.011	0.014	0.041
	Annual total	2.90	4.21	11.17	0.013	0.018	0.049
Latest (6,666)	Breeding season (April to Mid-August)	0.30	1.09	1.81	0.039	0.016	0.027
	Non-breeding season (Mid-August to March)	2.60	3.12	9.36	0.039	0.047	0.140
	Annual total	2.90	4.21	11.17	0.044	0.063	0.168
All Projects (Applicant)							
Citation (23,000)	Breeding season (April to Mid-August)	0.19	0.67	1.12	0.001	0.003	0.005

Population Size (Breeding Adults)	Defined Season	Estimated Number of Mortalities (Individuals Per Annum) (Displacement Rate; Mortality Rate)			Change in Average Survival Rate (% Point Change) (Displacement Rate; Mortality Rate)		
		50%; 1% 50%; 1%	60%; 3% 60%; 1%	60%; 5% 60%; 3%	50%; 1% 50%; 1%	60%; 3% 60%; 1%	60%; 5% 60%; 3%
	Non-breeding season (Mid-August to March)	2.72	3.26	9.77	0.012	0.014	0.042
	Annual total	2.90	3.93	10.89	0.013	0.017	0.047
Latest (6,666)	Breeding season (April to Mid-August)	0.19	0.67	1.12	0.003	0.010	0.017
	Non-breeding season (Mid-August to March)	2.72	3.26	9.77	0.041	0.049	0.147
	Annual total	2.90	3.93	10.89	0.044	0.059	0.163
All Projects Excluding Berwick Bank (Guidance)							
Citation (23,000)	Breeding season (April to Mid-August)	0.26	0.93	1.55	0.001	0.004	0.007
	Non-breeding season (Mid-August to March)	1.74	2.08	6.25	0.008	0.009	0.027
	Annual total	2.00	3.02	7.80	0.009	0.013	0.034
Latest (6,666)	Breeding season (April to Mid-August)	0.26	0.93	1.55	0.004	0.014	0.023

Population Size (Breeding Adults)	Defined Season	Estimated Number of Mortalities (Individuals Per Annum) (Displacement Rate; Mortality Rate)			Change in Average Survival Rate (% Point Change) (Displacement Rate; Mortality Rate)		
		50%; 1% 50%; 1%	60%; 3% 60%; 1%	60%; 5% 60%; 3%	50%; 1% 50%; 1%	60%; 3% 60%; 1%	60%; 5% 60%; 3%
	Non-breeding season (Mid-August to March)	1.74	2.08	6.25	0.026	0.031	0.094
	Annual total	2.00	3.02	7.80	0.030	0.045	0.117
All Projects Excluding Berwick Bank (Applicant)							
Citation (23,000)	Breeding season (April to Mid-August)	0.14	0.52	0.86	0.001	0.003	0.005
	Non-breeding season (Mid-August to March)	1.85	2.22	6.67	0.012	0.014	0.042
	Annual total	2.00	2.74	7.53	0.013	0.017	0.047
Latest (6,666)	Breeding season (April to Mid-August)	0.14	0.52	0.86	0.003	0.010	0.017
	Non-breeding season (Mid-August to March)	1.85	2.22	6.67	0.041	0.049	0.147
	Annual total	2.00	2.74	7.53	0.044	0.059	0.163

Population Size (Breeding Adults)	Defined Season	Estimated Number of Mortalities (Individuals Per Annum) (Displacement Rate; Mortality Rate)			Change in Average Survival Rate (% Point Change) (Displacement Rate; Mortality Rate)		
		50%; 1% 50%; 1%	60%; 3% 60%; 1%	60%; 5% 60%; 3%	50%; 1% 50%; 1%	60%; 3% 60%; 1%	60%; 5% 60%; 3%
All Consented Projects plus Caledonia (Guidance)							
Citation (23,000)	Breeding season (Mid-April to August)	0.26	0.93	1.55	0.001	0.004	0.007
	Non-breeding season (September to early-April)	1.74	2.08	6.25	0.008	0.009	0.027
	Annual total	2.00	3.02	7.80	0.009	0.013	0.034
Latest (6,666)	Breeding season (Mid-April to August)	0.26	0.93	1.55	0.004	0.014	0.023
	Non-breeding season (September to early-April)	1.74	2.08	6.25	0.026	0.031	0.094
	Annual total	2.00	3.02	7.80	0.030	0.045	0.117
All Consented Projects plus Caledonia (Applicant)							
Citation (23,000)	Breeding season (Mid-April to August)	0.14	0.52	0.86	0.001	0.002	0.004
	Non-breeding season (September to early-April)	1.85	2.22	6.67	0.008	0.010	0.029

Population Size (Breeding Adults)	Defined Season	Estimated Number of Mortalities (Individuals Per Annum) (Displacement Rate; Mortality Rate)			Change in Average Survival Rate (% Point Change) (Displacement Rate; Mortality Rate)		
		50%; 1% 50%; 1%	60%; 3% 60%; 1%	60%; 5% 60%; 3%	50%; 1% 50%; 1%	60%; 3% 60%; 1%	60%; 5% 60%; 3%
	Annual total	2.00	2.74	7.53	0.009	0.012	0.033
Latest (6,666)	Breeding season (Mid-April to August)	0.14	0.52	0.86	0.002	0.008	0.013
	Non-breeding season (September to early-April)	1.85	2.22	6.67	0.028	0.033	0.100
	Annual total	2.00	2.74	7.53	0.030	0.041	0.113

Breeding Season

10.3.3.83 During the breeding season, the in-combination abundance for puffin is up to 37 (28.71 - 37.26) breeding adults of Fair Isle SPA for projects identified (Table 10-178). Assuming a displacement rate of 50% and a mortality rate of 1%, the consequent potential mortality is estimated to be less than one (0.14 to 0.16) breeding adults per annum during the breeding season, depending on the scenario considered.

10.3.3.84 Using the citation colony count of 23,000 breeding adults and an annual background mortality of 2,162 breeding adults, the addition of less than one predicted breeding adult mortalities would result in a 0.001 survival rate percentage point change during the breeding season per annum. When considering the most up to date counts of 6,666 breeding adults and an annual background mortality of 627 breeding adults, this results in a 0.003 survival rate percentage point change during the breeding season per annum (Table 10-179).

Non-Breeding Season

10.3.3.85 During the non-breeding season, the in-combination abundance for puffin is 543 (370.41 - 543.03) individuals of Fair Isle SPA for projects identified (Table 10-178). Assuming a displacement rate of 50% and a mortality rate of 1%, the consequent potential mortality is estimated to be three (1.85 - 2.70) breeding adults per annum during the non-breeding season, depending on the scenario considered.

10.3.3.86 Using the citation colony count of 23,000 breeding adults and an annual background mortality of 2,162 breeding adults, the addition of three predicted breeding adult mortalities would result in a 0.012 survival rate percentage point change during the non-breeding season per annum. When considering the most up to date counts of 6,666 breeding adults and an annual background mortality of 627 breeding adults, this results in a 0.041 survival rate percentage point change during the non-breeding season per annum (Table 10-179).

Annual Total

10.3.3.87 The annual total of puffin subject to mortality due to in-combination distributional response at Fair Isle SPA is estimated to be between three (2.00 - 2.90) breeding adults per annum depending on the scenarios presented in Table 10-178. This is predicted to result in a survival rate percentage point change against the citation and most recently published counts of 0.009 and 0.100 respectively depending on the in-combination scenario considered (see Table 10-179).

10.3.3.88 To note, the removal of Berwick Bank from the assessment reduces predicted mortality to two (2.00) birds per annum. Using the citation colony count and most recently published count, this equates to a 0.013 and 0.044 percentage point survival rate change within this population respectively.

10.3.3.89 When considering the Guidance approach, a total of two – 11 (2.74 – 10.89) breeding adult mortalities are predicted due to potential distributional response effects per annum. This results in a survival rate percentage point change of 0.012 – 0.047 against the citation and 0.041 – 0.163 against the most recently published count (Table 10-179).

10.3.3.90 As the survival rate percentage point change exceeds NatureScot's threshold of 0.02% when considering both the Applicant and Guidance approach, further consideration of the level of effect predicted has been analysed using PVA.

Population Viability Analysis

10.3.3.91 The potential for distributional responses in-combination has been assessed against the latest 2015 colony count population size of 6,666 breeding adults according to the Seabird Monitoring Programme (2020) database. A range of impact values from three (2.90) to 11 (10.89) breeding adult additional mortalities per annum were modelled (when considering the in-combination scenarios), which allows for consideration of both the Applicant and Guidance approach predicted impact levels. For the reasons detailed within Section 7.3.3, this assessment is based on the consideration of the counterfactual of growth rate only, though the counterfactual of population size is also presented for consideration in Table 10-180 and Table 10-181. The PVA outputs for the puffin feature of Fair Isle SPA predicted a reduction in the growth rate of 0.05% when considering an increase of three additional adult mortalities per annum (based on a 50% displacement and 1% mortality rate) to 0.20% when considering an increase of 11 additional adult mortalities per annum (60% displacement and 3-5% mortality rate).

10.3.3.92 Whilst recognising the population at this site has fluctuated with increases and decreases over time it has declined slightly since the citation count in 1998 and is considered to be in 'unfavourable declining' condition. It is also worth noting that distributional responses are not considered likely to be at the upper end of the Guidance approach, particularly when considering monitoring studies from the operational Beatrice offshore wind farm within the Moray Firth (Trinder *et al.*, 2024[145]). Therefore, when considering the Applicant or Guidance approach, it is clear that the loss of two to eight birds per annum would likely be intangible from the natural baseline mortality per annum. Even when considering the Guidance approach, the reduction in growth rate remains low at 0.19% at most per annum for all projects in-combination, this is considered to have a limited effect on the overall status or trajectory of the population.

10.3.3.93 **Therefore, there is no potential for an AEoSI to the conservation objectives of the puffin feature of Fair Isle SPA in relation to distributional response effects in the O&M phase from the Proposed Development (Offshore) in-combination with all other projects. Subject to natural change, puffin will be maintained as a feature in the long term.**

Table 10-180: PVA results for the puffin feature of Fair Isle SPA when considering distributional responses effects for the Proposed Development (Offshore) alone and in-combination. Note, this table presents the Guidance Approach for puffin, whereby the Year 1 August abundance has been incorporated as part of the breeding season (further details are provided in Volume 7B, Appendix 6-2: Offshore Ornithology Distributional Responses Technical Report).

Scenario	Season	Predicted Mortality	Median Growth rate (±SD)	Median Pop. Size (±SD)	Decrease in CGR per annum (%)	Decrease in CPS after 35 years (%)
Caledonia OWF						
Alone - Guidance (60%, 5%; 60%, 3%)	Annual Total	1.38	1.000 (0.002)	0.991 (0.066)	0.026	0.898
In-combination all consented projects plus Caledonia OWF						
Applicant (50%, 1%)	Non-breeding	1.74	1.000 (0.002)	0.988 (0.074)	0.033	1.187
Applicant (50%, 1%)	Annual Total	2.00	1.000 (0.002)	0.985 (0.075)	0.036	1.462
Guidance (60%, 1%)	Non-breeding	2.08	1.000 (0.002)	0.985 (0.075)	0.040	1.528
Guidance (60%, 3%; 60%, 1%)	Annual Total	3.02	0.999 (0.002)	0.980 (0.075)	0.054	1.958
Guidance (60%, 5%)	Breeding	1.55	1.000 (0.002)	0.989 (0.075)	0.028	1.147
Guidance (60%, 3%)	Non-breeding	6.25	0.999 (0.002)	0.959 (0.072)	0.117	4.096
Guidance (60%, 5%; 60%, 3%)	Annual Total	7.80	0.999 (0.002)	0.950 (0.073)	0.136	4.957
In-combination all projects plus Caledonia OWF						
Applicant (50%, 1%)	Breeding	2.60	1.000 (0.002)	0.983 (0.075)	0.047	1.722

Scenario	Season	Predicted Mortality	Median Growth rate (±SD)	Median Pop. Size (±SD)	Decrease in CGR per annum (%)	Decrease in CPS after 35 years (%)
Applicant (50%, 1%)	Non-breeding	2.60	1.000 (0.002)	0.983 (0.076)	0.047	1.673
Applicant (50%, 1%)	Annual Total	2.90	0.999 (0.002)	0.981 (0.075)	0.052	1.922
Guidance (60%, 1%)	Non-breeding	3.12	0.999 (0.002)	0.99 (0.074)	0.057	2.112
Guidance (60%, 1%)	Annual Total	4.21	0.999 (0.002)	0.972 (0.075)	0.075	2.768
Guidance (60%, 5%)	Breeding	1.81	1.000 (0.002)	0.988 (0.075)	0.036	1.226
Guidance (60%, 3%)	Non-breeding	9.36	0.998 (0.002)	0.943 (0.073)	0.164	5.713
Guidance (60%, 5%; 60%, 3%)	Annual Total	11.17	0.998 (0.002)	0.930 (0.072)	0.200	6.961
In-combination all projects minus Berwick Bank plus Caledonia OWF						
Applicant (50%, 1%)	Non-breeding	1.74	1.000 (0.002)	0.988 (0.075)	0.035	1.219
Applicant (50%, 1%)	Annual Total	2.00	1.000 (0.002)	0.988 (0.076)	0.035	1.216
Guidance (60%, 1%)	Breeding	2.08	1.000 (0.002)	0.985 (0.075)	0.041	1.528
Guidance (60%, 3%; 60%, 1%)	Annual Total	3.02	0.999 (0.002)	0.980 (0.075)	0.057	2.035
Guidance (60%, 5%)	Breeding	1.55	1.000 (0.002)	0.989 (0.076)	0.029	1.087
Guidance (60%, 3%)	Non-breeding	6.25	0.999 (0.002)	0.960 (0.075)	0.113	4.004
Guidance (60%, 5%; 60%, 3%)	Annual Total	7.80	0.999 (0.002)	0.952 (0.073)	0.136	4.761

Table 10-181: PVA results for the puffin feature of Fair Isle SPA when considering distributional responses effects for the Proposed Development (Offshore) alone and in-combination. Note, this table presents the Applicant Approach for puffin, whereby the Year 1 August abundance has been incorporated as part of the non-breeding season (further details are provided in Volume 7B, Appendix 6-2: Offshore Ornithology Distributional Responses Technical Report).

Scenario	Season	Predicted Mortality	Median Growth rate (±SD)	Median Pop. Size (±SD)	Decrease in CGR per annum (%)	Decrease in CPS after 35 years (%)
In-combination all consented projects plus Caledonia OWF						
Applicant (50%, 1%)	Non-breeding	1.85	1.000 (0.002)	0.988 (0.074)	0.033	1.155
Applicant (50%, 1%)	Annual Total	2.00	1.000 (0.002)	0.988 (0.075)	0.034	1.211
Guidance (60%, 3%)	Non-breeding	2.22	1.000 (0.002)	0.987 (0.075)	0.036	1.324
Guidance (60%, 1%)	Annual Total	2.74	1.000 (0.002)	0.985 (0.075)	0.046	1.461
Guidance (60%, 3%; 60%, 1%)	Non-breeding	6.67	0.999 (0.002)	0.958 (0.074)	0.117	4.198
Guidance (60%, 5%)	Annual Total	7.53	0.999 (0.002)	0.952 (0.073)	0.134	4.772
In-combination all projects plus Caledonia OWF						
Applicant (50%, 1%)	Non-breeding	2.72	0.999 (0.002)	0.981 (0.075)	0.054	1.883
Applicant (50%, 1%)	Annual Total	2.90	0.999 (0.002)	0.983 (0.076)	0.052	1.703
Guidance (60%, 3%)	Non-breeding	3.26	0.999 (0.002)	0.980 (0.075)	0.057	2.036
Guidance (60%, 1%)	Annual Total	3.93	0.999 (0.002)	0.965 (0.074)	0.098	3.544
Guidance (60%, 3%; 60%, 1%)	Non-breeding	9.77	0.998 (0.002)	0.940 (0.073)	0.176	6.040

Scenario	Season	Predicted Mortality	Median Growth rate (±SD)	Median Pop. Size (±SD)	Decrease in CGR per annum (%)	Decrease in CPS after 35 years (%)
Guidance (60%, 5%)	Annual Total	10.89	0.998 (0.002)	0.931 (0.071)	0.200	6.933
In-combination all projects minus Berwick Bank plus Caledonia OWF						
Applicant (50%, 1%)	Non-breeding	1.85	1.000 (0.002)	0.988 (0.074)	0.033	1.155
Applicant (50%, 1%)	Annual Total	2.00	1.000 (0.002)	0.988 (0.075)	0.034	1.211
Guidance (60%, 1%)	Non-breeding	2.22	1.000 (0.002)	0.987 (0.075)	0.036	1.324
Guidance (60%, 3%; 60%, 1%)	Annual Total	2.74	1.000 (0.002)	0.985 (0.075)	0.046	1.461
Guidance (60%, 3%)	Non-breeding	6.67	0.999 (0.002)	0.958 (0.074)	0.117	4.198
Guidance (60%, 5%; 60%, 3%)	Annual Total	7.53	0.999 (0.002)	0.952 (0.073)	0.134	4.772

Table 10-182: Puffin O&M phase disturbance annual displacement matrix for impacts apportioned to Fair Isle SPA (Guidance Approach).

Annual Total	Mortality Rate (%)													
Displacement Rate (%)	1	2	3	5	10	20	30	40	50	60	70	80	90	100
10	1	1	2	3	6	12	17	23	29	35	41	46	52	58
20	1	2	3	6	12	23	35	46	58	70	81	93	104	116
30	2	3	5	9	17	35	52	70	87	104	122	139	157	174
40	2	5	7	12	23	46	70	93	116	139	162	186	209	232
50	3	6	9	15	29	58	87	116	145	174	203	232	261	290
60	3	7	10	17	35	70	104	139	174	209	244	279	313	348
70	4	8	12	20	41	81	122	162	203	244	284	325	366	406
80	5	9	14	23	46	93	139	186	232	279	325	371	418	464
90	5	10	16	26	52	104	157	209	261	313	366	418	470	522
100	6	12	17	29	58	116	174	232	290	348	406	464	522	580

Note, outputs highlighted in dark blue represent the predicted annual mortality estimates as per the Guidance Approach and those highlighted in yellow represent the predicted annual mortality estimates as per the Applicant Approach. For further information regarding the Guidance and Applicant Approach see Section 2.5 of Volume 7B, Appendix 6-2: Offshore Ornithology Distributional Responses Technical Report and Volume 7B, Appendix 6-2, Annex 4: Review of Relevant Evidence.

Table 10-183: Puffin O&M phase disturbance annual displacement matrix for impacts apportioned to Fair Isle SPA (Applicant Approach).

Annual Total	Mortality Rate (%)													
Displacement Rate (%)	1	2	3	5	10	20	30	40	50	60	70	80	90	100
10	1	1	2	3	6	12	17	23	29	35	41	46	52	58
20	1	2	3	6	12	23	35	46	58	70	81	93	104	116
30	2	3	5	9	17	35	52	70	87	104	122	139	157	174
40	2	5	7	12	23	46	70	93	116	139	162	186	209	232
50	3	6	9	15	29	58	87	116	145	174	203	232	261	290
60	3	7	10	17	35	70	104	139	174	209	244	279	313	348
70	4	8	12	20	41	81	122	162	203	244	284	325	366	406
80	5	9	14	23	46	93	139	186	232	279	325	371	418	464
90	5	10	16	26	52	104	157	209	261	313	366	418	470	522
100	6	12	17	29	58	116	174	232	290	348	406	464	522	580
Note, outputs highlighted in dark blue represent the predicted annual mortality estimates as per the Guidance Approach and those highlighted in yellow represent the predicted annual mortality estimates as per the Applicant Approach. For further information regarding the Guidance and Applicant Approach see Section 2.5 of Volume 7B, Appendix 6-2: Offshore Ornithology Distributional Responses Technical Report and Volume 7B, Appendix 6-2, Annex 4: Review of Relevant Evidence.														

Foula SPA

Puffin

10.3.3.94 Puffin has been screened in to assess the impacts from distributional responses from the Proposed Development (Offshore) during the O&M phase in-combination with other projects in relation to the following relevant conservation objective for this species, as a feature of the SPA:

- Maintain the population as a viable component of the site.

10.3.3.95 Projects identified for in-combination distributional response for the puffin feature of Foula SPA are listed in Table 10-184, with the respective impact predictions for the different seasonal in-combination scenarios presented in Table 10-185. The predicted apportioned abundance for planned and operational projects included within Table 10-184, are primarily based on the Northeast and East Scotwind Projects Cumulative totals dataset (RoyalHaskoningDHV, 2024[136]), with the addition of abundance totals for Ossian (NIRAS and RPS, 2024[141]) and Salamander (ERM, 2024[142]) derived from their respective RIAAs.

10.3.3.96 The main focus of the assessment is based on the Applicant Approach of a displacement rate of 50% and a 1% mortality rate for O&M phase in-combination distributional response impacts. NatureScot advise that distributional response assessment for puffin should be based on a displacement rate of 60% and a mortality rate of up to 3 - 5% depending on the season being assessed, therefore such levels of predicted effect are also provided in Table 10-184.

10.3.3.97 A displacement matrix is also presented for the annual apportioned in-combination abundance for Foula SPA (Table 10-188 and Table 10-189), when considering the all projects scenarios presented in Table 10-185.

Table 10-184: Puffin in-combination season and total abundance estimates attributed to Foula SPA.

Development	Predicted Abundance		
	Breeding Season	Non-breeding Season	Total
Aberdeen (EOWDC)	-	2	2
Beatrice	-	71	71
Berwick Bank	-	259	259
Blyth Demonstration Site	-	4	4
DEP	-	1	1
Dogger Bank A	-	9	9
Dogger Bank B	-	22	22
Dogger Bank C	-	8	8
Dogger Bank South (PEIR)	-	23	23
Dudgeon	-	0	0
East Anglia One	-	1	1
East Anglia One North	-	-	-
East Anglia Three	-	9	9
East Anglia Two	-	0	
Five Estuaries	-	-	-
Forthwind	-	-	-
Galloper	-	-	-
Greater Gabbard	-	-	-
Green Volt	6	1	7
Gunfleet Sands	-	-	-
Hornsea Project Four	-	13	13
Hornsea Project One	-	37	37
Hornsea Project Three	-	2	2
Hornsea Project Two	-	59	59

Development	Predicted Abundance		
	Breeding Season	Non-breeding Season	Total
Humber Gateway	-	-	-
Hywind 2 Demonstration	-	2	2
Inch Cape	-	78	78
Kentish Flats	-	-	-
Kentish Flats Extension	-	-	-
Kincardine	-	-	-
Lincs, Lynn and Inner Dowsing	-	-	-
London Array	-	-	-
Moray East	-	19	19
Moray West	-	115	115
Neart na Gaoithe	-	61	61
Norfolk Boreas	-	1	1
Norfolk Vanguard	-	3	3
North Falls (PEIR)	-	-	-
Ossian	-	-	-
Outer Dowsing	-	19	19
PFOWF	-	-	-
Race Bank	-	-	-
Rampion	-	-	-
Rampion 2	-	-	-
Salamander	-	-	-
Scroby Sands	-	-	-
Seagreen Alpha	-	44	44
Seagreen Bravo	-	112	112
SEP	-	1	1

Development	Predicted Abundance		
	Breeding Season	Non-breeding Season	Total
Sheringham Shoal	-	1	1
Sofia	-	10	10
Teesside	-	1	1
Thanet	-	-	-
Triton Knoll	-	2	2
West of Orkney[xxi]	-	62	62
Westermost Rough	-	1	1
Caledonia (Guidance)	17	39	56
Caledonia (Applicant)	6	87	93
All Projects (Guidance)	22	1,093	1,115
All Projects (Applicant)	11	1,141	1,153
All Projects Excl. Berwick Bank (Guidance)	22	834	856
All Projects Excl. Berwick Bank (Applicant)	11	882	894
Consented (plus Caledonia) (Guidance)	22	730	752
Consented (plus Caledonia) (Applicant)	11	778	790
Note, the Applicant has decided to include the Year 1 August count in the non-breeding season rather than during the breeding season. This is due to the Year 1 August abundance being considered to reflect migration rather than individuals present in the breeding season. Note, the predicted abundances for puffin have also been presented with the August count included in the breeding season as per the Guidance Approach.			

[xxi] These numbers for West of Orkney are subject to change, but have been included to support this assessment on a precautionary basis.

Table 10-185: Seasonal and annual displacement estimates of puffin for the Proposed Development (Offshore) in-combination with other projects during the operational phase, as per the Applicant and Guidance Approach.

Population Size (Breeding Adults)	Defined Season	Estimated Number of Mortalities (Individuals Per Annum) (Displacement Rate; Mortality Rate)			Change in Average Survival Rate (% Point Change) (Displacement Rate; Mortality Rate)		
		50%; 1% 50%; 1%	60%; 3% 60%; 1%	60%; 5% 60%; 3%	50%; 1% 50%; 1%	60%; 3% 60%; 1%	60%; 5% 60%; 3%
All Projects (Guidance)							
Citation (96,000)	Breeding season (April to Mid-August)	0.11	0.40	0.67	<0.001	<0.001	0.001
	Non-breeding season (Mid-August to March)	5.46	6.56	19.67	0.006	0.007	0.020
	Annual total	5.58	6.96	20.34	0.006	0.007	0.021
Latest (6,351)	Breeding season (April to Mid-August)	0.11	0.40	0.67	0.002	0.006	0.011
	Non-breeding season (Mid-August to March)	5.46	6.56	19.67	0.086	0.103	0.310
	Annual total	5.58	6.96	20.34	0.088	0.110	0.320

Population Size (Breeding Adults)	Defined Season	Estimated Number of Mortalities (Individuals Per Annum) (Displacement Rate; Mortality Rate)			Change in Average Survival Rate (% Point Change) (Displacement Rate; Mortality Rate)		
		50%; 1% 50%; 1%	60%; 3% 60%; 1%	60%; 5% 60%; 3%	50%; 1% 50%; 1%	60%; 3% 60%; 1%	60%; 5% 60%; 3%
All Projects (Applicant)							
Citation (96,000)	Breeding season (April to Mid-August)	0.06	0.20	0.34	<0.001	<0.001	<0.001
	Non-breeding season (Mid-August to March)	5.71	6.85	20.54	0.006	0.007	0.021
	Annual total	5.76	7.05	20.88	0.006	0.007	0.022
Latest (6,351)	Breeding season (April to Mid-August)	0.06	0.20	0.34	0.001	0.003	0.005
	Non-breeding season (Mid-August to March)	5.71	6.85	20.54	0.090	0.108	0.323
	Annual total	5.76	7.05	20.88	0.091	0.111	0.329
All Projects Excluding Berwick Bank (Guidance)							
Citation (96,000)	Breeding season (April to Mid-August)	0.11	0.40	0.67	<0.001	<0.001	0.001

Population Size (Breeding Adults)	Defined Season	Estimated Number of Mortalities (Individuals Per Annum) (Displacement Rate; Mortality Rate)			Change in Average Survival Rate (% Point Change) (Displacement Rate; Mortality Rate)		
		50%; 1% 50%; 1%	60%; 3% 60%; 1%	60%; 5% 60%; 3%	50%; 1% 50%; 1%	60%; 3% 60%; 1%	60%; 5% 60%; 3%
	Non-breeding season (Mid-August to March)	3.65	4.38	13.14	0.004	0.005	0.014
	Annual total	3.76	4.78	13.81	0.004	0.005	0.014
Latest (6,351)	Breeding season (April to Mid-August)	0.11	0.40	0.67	0.002	0.006	0.011
	Non-breeding season (Mid-August to March)	3.65	4.38	13.14	0.057	0.069	0.207
	Annual total	3.76	4.78	13.81	0.059	0.075	0.217
All Projects Excluding Berwick Bank (Applicant)							
Citation (96,000)	Breeding season (April to Mid-August)	0.06	0.20	0.34	<0.001	<0.001	<0.001
	Non-breeding season (Mid-August to March)	3.89	4.67	14.01	0.004	0.005	0.015
	Annual total	3.95	4.87	14.35	0.004	0.005	0.015

Population Size (Breeding Adults)	Defined Season	Estimated Number of Mortalities (Individuals Per Annum) (Displacement Rate; Mortality Rate)			Change in Average Survival Rate (% Point Change) (Displacement Rate; Mortality Rate)		
		50%; 1% 50%; 1%	60%; 3% 60%; 1%	60%; 5% 60%; 3%	50%; 1% 50%; 1%	60%; 3% 60%; 1%	60%; 5% 60%; 3%
Latest (6,351)	Breeding season (April to Mid-August)	0.06	0.20	0.34	0.001	0.003	0.005
	Non-breeding season (Mid-August to March)	3.89	4.67	14.01	0.061	0.074	0.221
	Annual total	3.95	4.87	14.35	0.062	0.077	0.226
All Consented Projects plus Caledonia (Guidance)							
Citation (96,000)	Breeding season (Mid-April to August)	0.11	0.40	0.67	<0.001	<0.001	0.001
	Non-breeding season (September to early-April)	3.65	4.38	13.14	0.004	0.005	0.014
	Annual total	3.76	4.78	13.81	0.004	0.005	0.014
Latest (6,351)	Breeding season (Mid-April to August)	0.11	0.40	0.67	0.002	0.006	0.011
	Non-breeding season (September to early-April)	3.65	4.38	13.14	0.057	0.069	0.207

Population Size (Breeding Adults)	Defined Season	Estimated Number of Mortalities (Individuals Per Annum) (Displacement Rate; Mortality Rate)			Change in Average Survival Rate (% Point Change) (Displacement Rate; Mortality Rate)		
		50%; 1% 50%; 1%	60%; 3% 60%; 1%	60%; 5% 60%; 3%	50%; 1% 50%; 1%	60%; 3% 60%; 1%	60%; 5% 60%; 3%
	Annual total	3.76	4.78	13.81	0.059	0.075	0.217
All Consented Projects plus Caledonia (Applicant)							
Citation (96,000)	Breeding season (Mid-April to August)	0.06	0.20	0.34	<0.001	<0.001	<0.001
	Non-breeding season (September to early-April)	3.89	4.67	14.01	0.004	0.005	0.015
	Annual total	3.95	4.87	14.35	0.004	0.005	0.015
Latest (6,351)	Breeding season (Mid-April to August)	0.06	0.20	0.34	0.001	0.003	0.005
	Non-breeding season (September to early-April)	3.89	4.67	14.01	0.061	0.074	0.221
	Annual total	3.95	4.87	14.35	0.062	0.077	0.226

Breeding Season

10.3.3.98 During the breeding season, the in-combination abundance for puffin is 11 (11.35) breeding adults of Foula SPA for projects identified (Table 10-185). Assuming a displacement rate of 50% and a mortality rate of 1%, the consequent potential mortality is estimated to be less than one (0.06) breeding adults per annum during the breeding season, depending on the scenario considered.

10.3.3.99 Using the citation colony count of 96,000 breeding adults and an annual background mortality of 9,024 (9,024.00) breeding adults, the addition of less than one (0.06) predicted breeding adult mortalities would result in a <0.001 survival rate percentage point change during the breeding season per annum. When considering the most up to date counts of 6,351 breeding adults and an annual background mortality of 597 (596.99) breeding adults, this results in a 0.001 survival rate percentage point change during the breeding season per annum (Table 10-185).

Non-Breeding Season

10.3.3.100 During the non-breeding season, the in-combination abundance for puffin is estimated to be up to 1,141 (778.42 - 1,141.18) breeding adults of Foula SPA for projects identified, depending on the scenario considered (Table 10-185). Assuming a displacement rate of 50% and a mortality rate of 1%, the consequent potential mortality is estimated to be up to six (3.89 to 5.71) breeding adults per annum during the non-breeding season, depending on the scenario considered.

10.3.3.101 Using the citation colony count of 96,000 breeding adults and an annual background mortality of 9,024 (9,024.00) breeding adults, the addition of six (3.89 - 5.71) predicted breeding adult mortalities would result in up to a 0.006 survival rate percentage point change during the non-breeding season per annum. When considering the most up to date counts of 6,351 breeding adults and an annual background mortality of 597 (596.99) breeding adults, this results in up to a 0.090 survival rate percentage point change during the non-breeding season per annum (Table 10-185).

Annual Total

10.3.3.102 The annual total of puffin subject to mortality due to in-combination distributional response at Foula SPA is estimated to be up to six (3.95- 5.76) breeding adults per annum depending on the scenarios presented in Table 10-185. This is predicted to result in a survival rate percentage point change against the citation and most recently published counts of 0.006 and 0.091 respectively depending on the in-combination scenario considered, respectively.

10.3.3.103 To note, the removal of Berwick Bank from the assessment reduces predicted mortality to four (3.95) birds per annum. Using the citation colony count and most recently published count, this equates to a 0.004 and 0.062 percentage point survival rate change within this population respectively.

10.3.3.104 When considering the Guidance approach, a total of seven – 21 (7.05 – 20.88) breeding adult mortalities are predicted due to potential distributional response effects per annum. This results in a survival rate percentage point change of 0.005 – 0.022 against the citation and 0.077 – 0.329 against the most recently published count (Table 10-185).

10.3.3.105 As the survival rate percentage point change exceeds NatureScot's threshold of 0.02% when considering both the Applicant and Guidance approach, further consideration of the level of effect predicted has been analysed using PVA.

Population Viability Analysis

10.3.3.106 The potential for distributional responses in-combination has been assessed against the latest 2016 colony count population size of 6,351 breeding adults according to the Seabird Monitoring Programme (2020) database. A range of impact values from five (5.76) to 21 (20.88) breeding adult additional mortalities per annum were modelled (when considering the in-combination scenarios), which allows for consideration of both the Applicant and Guidance Approach predicted impact levels. For the reasons detailed within Section 7.3.3, this assessment is based on the consideration of the counterfactual of growth rate only, though the counterfactual of population size is also presented for consideration in Table 10-186 and Table 10-187. The PVA outputs for the puffin feature of Foula SPA predicted a reduction in the growth rate of between 0.10% when considering an increase of five additional adult mortalities per annum (based on a 50% displacement and 1% mortality rate) to 9.38% when considering an increase of 21 additional adult mortalities per annum (60% displacement and 3-5% mortality rate).

10.3.3.107 The population at this site has seen significant long term decline in the population since the citation designation in 1985 – 1987, with the current status of colony classified as 'unfavourable' and 'no change'. The reasons for the long-term decline are not considered to be linked to the development of offshore wind farms within the region, which have only been in operation for a short period. Given the level of predicted effect, especially when considering the upper range of the Guidance approach in-combination, although only a minor effect would further undermine the integrity of the colony.

10.3.3.108 The majority of predicted impact relates to the non-breeding season. Post breeding puffins quickly disperse from Scottish colonies to wintering grounds (Furness, 2015[87]). The likely post-breeding migratory routes of Foula puffins is to travel either east, west or north to a wide range of potential wintering grounds from the North Atlantic to the Skagerrak, rather than moving south into the Southern North Sea (Wernham *et al*., 2002[148]; Furness, 2015[87]), as is currently assumed following the current recommended approach for non-breeding season connectivity (NatureScot, 2023[149]). The potential for all projects considered in-combination to result in a 60% displacement rate and 3% consequential mortality during the non-breeding is considered implausible given the limited potential for connectivity during the non-breeding season.

10.3.3.109 It is also important to consider the materiality of the Proposed Development (Offshore) contribution to such a level of effect. Even when considering the Guidance approach upper range of displacement effect (60% displacement; 3 – 5% mortality), only a single (1.2) breeding adult is predicted to be subject to mortality annually, for which the majority of impact is predicted within the non-breeding season (0.7 of a breeding adult).

10.3.3.110 Despite the unfavourable condition of the colony, considering the likely intangible contribution from the Proposed Development (Offshore), significant over estimation of effect and the minimal reduction in growth rate predicted, **the potential for an AEoSI can be ruled out in relation to distributional response effects in the O&M phase from the Proposed Development (Offshore) in-combination with all other projects. Subject to natural change, puffin will be maintained as a feature in the long term.**

Table 10-186: PVA results for the puffin feature of Foula SPA when considering distributional responses effects for the Proposed Development (Offshore) alone and in-combination. Note, this table presents the Guidance Approach for puffin, whereby the Year 1 August abundance has been incorporated as part of the breeding season (further details are provided in Volume 7B, Appendix 6-2: Offshore Ornithology Distributional Responses Technical Report).

Scenario	Season	Predicted Mortality	Median Growth rate (±SD)	Median Pop. Size (±SD)	Decrease in CGR per annum (%)	Decrease in CPS after 35 years (%)
In-combination all consented projects plus Caledonia OWF						
Applicant (50%, 1%)	Non-breeding	3.65	0.998 (0.002)	0.915 (0.072)	0.245	8.487
Guidance (60%, 1%)	Non-Breeding	4.38	0.999 (0.002)	0.975 (0.074)	0.070	2.479
Guidance (60%, 3%)	Non-breeding	13.14	0.999 (0.002)	0.970 (0.076)	0.083	3.016
Applicant (50%, 1%)	Annual Total	3.76	0.997 (0.002)	0.910 (0.071)	0.258	8.968
Guidance (60%, 3%; 60%, 1%)	Annual Total	4.78	0.998 (0.002)	0.915 (0.072)	0.245	8.487
Guidance (60%, 5%; 60%, 3%)	Annual Total	13.81	0.999 (0.002)	0.975 (0.074)	0.070	2.479
In-combination all projects plus Caledonia OWF						
Applicant (50%, 1%)	Non-breeding	5.46	0.999 (0.002)	0.964 (0.075)	0.096	3.553
Guidance (60%, 1%)	Non-Breeding	6.56	0.968 (0.062)	0.999 (0.002)	3.194	0.125

Scenario	Season	Predicted Mortality	Median Growth rate (±SD)	Median Pop. Size (±SD)	Decrease in CGR per annum (%)	Decrease in CPS after 35 years (%)
Guidance (60%, 3%)	Non-breeding	19.67	0.909 (0.058)	0.996 (0.002)	9.126	0.371
Applicant (50%, 1%)	Annual Total	5.58	0.972 (0.062)	0.999 (0.002)	2.808	0.105
Guidance (60%, 3%; 60%, 1%)	Annual Total	6.96	0.968 (0.061)	0.999 (0.002)	3.232	0.128
Guidance (60%, 5%; 60%, 3%)	Annual Total	20.34	0.906 (0.058)	0.996 (0.002)	9.383	0.377
In-combination all projects minus Berwick Bank plus Caledonia OWF						
Applicant (50%, 1%)	Non-breeding	3.65	0.999 (0.002)	0.975 (0.076)	0.068	3.170
Guidance (60%, 1%)	Non-Breeding	4.38	0.999 (0.002)	0.968 (0.074)	0.086	8.487
Guidance (60%, 3%)	Non-breeding	13.14	0.998 (0.002)	0.915 (0.072)	0.245	2.479
Applicant (50%, 1%)	Annual Total	3.76	0.999 (0.002)	0.975 (0.074)	0.070	3.016
Guidance (60%, 3%; 60%, 1%)	Annual Total	4.78	0.999 (0.002)	0.970 (0.076)	0.083	8.968
Guidance (60%, 5%; 60%, 3%)	Annual Total	13.81	0.997 (0.002)	0.910 (0.071)	0.258	3.170

Table 10-187: PVA results for the puffin feature of Foula SPA when considering distributional responses effects for the Proposed Development (Offshore) alone and in-combination. Note, this table presents the Applicant Approach for puffin, whereby the Year 1 August abundance has been incorporated as part of the non-breeding season (further details are provided in Volume 7B, Appendix 6-2: Offshore Ornithology Distributional Responses Technical Report).

Scenario	Season	Predicted Mortality	Median Growth rate (±SD)	Median Pop. Size (±SD)	Decrease in CGR per annum (%)	Decrease in CPS after 35 years (%)
In-combination all consented projects plus Caledonia OWF						
Applicant (50%, 1%)	Non-breeding	3.89	0.999 (0.002)	0.974 (0.075)	0.072	2.616
Guidance (60%, 1%)	Non-Breeding	4.67	0.999 (0.002)	0.969 (0.074)	0.089	3.133
Guidance (60%, 3%)	Non-breeding	14.01	0.997 (0.002)	0.909 (0.071)	0.265	9.096
Applicant (50%, 1%)	Annual Total	3.95	0.999 (0.002)	0.975 (0.076)	0.073	2.540
Guidance (60%, 3%; 60%, 1%)	Annual Total	4.87	0.999 (0.002)	0.967 (0.076)	0.090	3.343
Guidance (60%, 5%; 60%, 3%)	Annual Total	14.35	0.997 (0.002)	0.905 (0.070)	0.272	9.487
In-combination all projects plus Caledonia OWF						
Applicant (50%, 1%)	Non-breeding	5.71	0.999 (0.002)	0.963 (0.074)	0.101	3.660
Guidance (60%, 1%)	Non-Breeding	6.85	0.999 (0.002)	0.956 (0.074)	0.120	4.365

Scenario	Season	Predicted Mortality	Median Growth rate (±SD)	Median Pop. Size (±SD)	Decrease in CGR per annum (%)	Decrease in CPS after 35 years (%)
Guidance (60%, 3%)	Non-breeding	20.54	0.996 (0.002)	0.872 (0.070)	0.379	12.831
Applicant (50%, 1%)	Annual Total	5.76	0.999 (0.002)	0.963 (0.074)	0.108	3.707
Guidance (60%, 3%; 60%, 1%)	Annual Total	7.05	0.999 (0.002)	0.954 (0.074)	0.130	4.618
Guidance (60%, 5%; 60%, 3%)	Annual Total	20.88	0.996 (0.002)	0.869 (0.069)	0.387	13.090
In-combination all projects minus Berwick Bank plus Caledonia OWF						
Applicant (50%, 1%)	Non-breeding	3.89	0.999 (0.002)	0.974 (0.075)	0.073	2.571
Guidance (60%, 1%)	Non-Breeding	4.67	0.999 (0.002)	0.970 (0.074)	0.086	2.966
Guidance (60%, 3%)	Non-breeding	14.01	0.997 (0.002)	0.910 (0.071)	0.261	9.029
Applicant (50%, 1%)	Annual Total	3.95	0.999 (0.002)	0.973 (0.074)	0.074	2.699
Guidance (60%, 3%; 60%, 1%)	Annual Total	4.87	0.999 (0.002)	0.969 (0.073)	0.086	3.075
Guidance (60%, 5%; 60%, 3%)	Annual Total	14.35	0.997 (0.002)	0.909 (0.070)	0.269	9.149

.

Table 10-188: Puffin O&M phase disturbance annual displacement matrix for impacts apportioned to Foula SPA (Guidance Approach).

Annual Total	Mortality Rate (%)													
Displacement Rate (%)	1	2	3	5	10	20	30	40	50	60	70	80	90	100
10	1	2	3	6	11	22	33	45	56	67	78	89	100	112
20	2	4	7	11	22	45	67	89	112	134	156	178	201	223
30	3	7	10	17	33	67	100	134	167	201	234	268	301	335
40	4	9	13	22	45	89	134	178	223	268	312	357	401	446
50	6	11	17	28	56	112	167	223	279	335	390	446	502	558
60	7	13	20	33	67	134	201	268	335	401	468	535	602	669
70	8	16	23	39	78	156	234	312	390	468	546	624	702	781
80	9	18	27	45	89	178	268	357	446	535	624	714	803	892
90	10	20	30	50	100	201	301	401	502	602	702	803	903	1,004
100	11	22	33	56	112	223	335	446	558	669	781	892	1,004	1,115
Note, outputs highlighted in dark blue represent the predicted annual mortality estimates as per the Guidance Approach and those highlighted in yellow represent the predicted annual mortality estimates as per the Applicant Approach. For further information regarding the Guidance and Applicant Approach see Section 2.5 of Volume 7B, Appendix 6-2: Offshore Ornithology Distributional Responses Technical Report and Volume 7B, Appendix 6-2, Annex 4: Review of Relevant Evidence.														

Table 10-189: Puffin O&M phase disturbance annual displacement matrix for impacts apportioned to Foula SPA (Applicant Approach).

Annual Total	Mortality Rate (%)												
Displacement Rate (%)	1	2	3	5	10	20	30	40	50	60	70	80	90	100
10	1	2	3	6	12	23	35	46	58	69	81	92	104	115
20	2	5	7	12	23	46	69	92	115	138	161	184	207	231
30	3	7	10	17	35	69	104	138	173	207	242	277	311	346
40	5	9	14	23	46	92	138	184	231	277	323	369	415	461
50	6	12	17	29	58	115	173	231	288	346	403	461	519	576
60	7	14	21	35	69	138	207	277	346	415	484	553	622	692
70	8	16	24	40	81	161	242	323	403	484	565	645	726	807
80	9	18	28	46	92	184	277	369	461	553	645	738	830	922
90	10	21	31	52	104	207	311	415	519	622	726	830	934	1,037
100	12	23	35	58	115	231	346	461	576	692	807	922	1,037	1,153
Note, outputs highlighted in dark blue represent the predicted annual mortality estimates as per the Guidance Approach and those highlighted in yellow represent the predicted annual mortality estimates as per the Applicant Approach. For further information regarding the Guidance and Applicant Approach see Section 2.5 of Volume 7B, Appendix 6-2: Offshore Ornithology Distributional Responses Technical Report and Volume 7B, Appendix 6-2, Annex 4: Review of Relevant Evidence.														

Forth Islands SPA

Gannet

10.3.3.111 Gannet has been screened in to assess the impacts from distributional responses and collision risk from the Proposed Development (Offshore) during the O&M phase in-combination with other projects in relation to the following relevant conservation objective for this species, as a feature of the SPA:

- Maintain the population as a viable component of the site.

Distributional Response

10.3.3.112 Projects identified for in-combination distributional response for the gannet feature of Forth Islands SPA are listed in Table 10-190 with the respective impact predictions for the different seasonal in-combination scenarios presented in Table 10-191. The predicted apportioned abundance for planned and operational projects included within Table 10-190, are primarily based on the Northeast and East Scotwind Projects Cumulative totals dataset, with the addition/ update of abundance totals for Dogger Bank South (Royal Haskoning DHV (2024[136]), Ossian (NIRAS and RPS, 2024[141]) and Salamander (ERM, 2024[142]) derived from their respective RIAAs.

10.3.3.113 The main focus of the assessment is based on the Applicant Approach of a displacement rate of 70% and a 1% mortality rate for O&M phase in-combination distributional response impacts. NatureScot advise that distributional response assessment for gannet should be based on a displacement rate of 70% and a mortality rate of up to 3%, therefore such level of predicted effect is also provided.

10.3.3.114 For further details regarding the differences between the Guidance Approach and the Applicant Approach for the distributional response assessments, along with justification for the use of the latter, please refer to Volume 7B, Appendix 6-2, Annex 4: Review of Relevant Evidence.

10.3.3.115 A displacement matrix is also presented for the annual apportioned in-combination abundance for Forth Islands SPA (Table 10-192), when considering the all projects scenarios presented in Table 10-191.

Table 10-190: Gannet in-combination season and total abundance estimates attributed to Forth Islands SPA.

Development	Predicted Abundance		
	Breeding Season	Non-breeding Season	Total
Aberdeen OWF (EOWDC)	-	1	1
Beatrice	-	-	-
Berwick Bank (Scoping Approach)	4,200	449	4,649
Blyth Demonstration Site	-	-	-
Dogger Bank A & B	112	621	733
Dogger Bank C & Sofia	218	361	579
Dogger Bank South	101	425	525
Dudgeon	-	10	10
East Anglia One	-	908	908
East Anglia ONE North	-	128	128
East Anglia Three	-	472	472
East Anglia TWO	-	277	277
Five Estuaries	-	177	177
Forthwind	-	-	-
Galloper	-	307	307
Greater Gabbard	-	50	50
Green Volt	69	38	106
Gunfleet Sands	-	6	6
Hornsea Four	-	318	318
Hornsea Project One	-	247	247
Hornsea Project Two	-	316	316
Hornsea Three	-	403	403

Development	Predicted Abundance		
	Breeding Season	Non-breeding Season	Total
Humber Gateway	-	-	-
Hywind 2 Demonstration	-	1	1
Inch Cape	2,085	237	2,322
Kentish Flats	-	-	-
Kentish Flats Extension	-	3	3
Kincardine	-	-	-
Lincs, Lynn & Inner Dowsing	-	-	-
London Array	-	-	-
Moray East	-	79	79
Moray West	-	152	152
Neart na Gaoithe	1,733	222	1,955
Norfolk Boreas	-	583	583
Norfolk Vanguard	-	733	733
North Falls	-	187	187
Outer Dowsing	-	149	149
Pentland Floating OWF	16	8	24
Race Bank	-	17	17
Rampion	-	143	143
Rampion 2	-	63	63
Scroby Sands	-	-	-
Seagreen Alpha & Bravo	2,573	265	2,839
Sheringham Shoal	-	8	8

Development	Predicted Abundance		
	Breeding Season	Non-breeding Season	Total
Sheringham Shoal and Dudgeon Extension Project	-	173	173
Teesside	-	-	-
Thanet	-	-	-
Triton Knoll	-	11	11
Westermost Rough	-	-	-
Ossian	986	202	1,187
Salamander	12	88	101
West of Orkney[xxii]	-	328	328
Caledonia	183	77	260
All Projects	12,288	9,244	21,532
All Projects Excluding Berwick Bank	8,088	8,795	16,883
All Consented Projects plus Caledonia	6,989	7,176	14,165

[xxii] These numbers for West of Orkney are subject to change, but have been included to support this assessment on a precautionary basis.

Table 10-191: Seasonal and annual displacement estimates of gannet for the Proposed Development (Offshore) in-combination with other projects during the operational phase, as per the Applicant and Guidance Approach.

Population Size (Breeding Adults)	Defined Season	Estimated Number of Mortalities (Individuals Per Annum) (Displacement Rate; Mortality Rate)		Change in Average Survival Rate (% Point Change) (Displacement Rate; Mortality Rate)	
		70%; 1%	70%; 3%	70%; 1%	70%; 3%
All Projects					
Citation (43,200)	Breeding season (Mid-March to September)	86.01	258.04	0.199	0.597
	Non-breeding season (October to early March)	64.71	194.12	0.150	0.449
	Annual total	150.72	452.16	0.349	1.047
Latest (150,518)	Breeding season (Mid-March to September)	86.01	258.04	0.057	0.171
	Non-breeding season (October to early March)	64.71	194.12	0.043	0.129
	Annual total	150.72	452.16	0.100	0.300
Forth Islands SPA updated count (162,000)*	Breeding season (Mid-March to September)	86.01	258.04	0.053	0.159
	Non-breeding season (October to early March)	64.71	194.12	0.040	0.129

Population Size (Breeding Adults)	Defined Season	Estimated Number of Mortalities (Individuals Per Annum) (Displacement Rate; Mortality Rate)		Change in Average Survival Rate (% Point Change) (Displacement Rate; Mortality Rate)	
		70%; 1%	70%; 3%	70%; 1%	70%; 3%
	Annual total	150.72	452.16	0.093	0.300
All Projects Excluding Berwick Bank					
Citation (43,200)	Breeding season (Mid-March to September)	56.61	169.84	0.131	0.393
	Non-breeding season (October to early March)	61.56	184.69	0.143	0.428
	Annual total	118.18	354.53	0.274	0.821
Latest (150,518)	Breeding season (Mid-March to September)	56.61	169.84	0.038	0.113
	Non-breeding season (October to early March)	61.56	184.69	0.041	0.123
	Annual total	118.18	354.53	0.079	0.236
Forth Islands SPA updated count (162,000)*	Breeding season (Mid-March to September)	56.61	169.84	0.035	0.731
	Non-breeding season (October to early March)	61.56	184.69	0.038	0.114

Population Size (Breeding Adults)	Defined Season	Estimated Number of Mortalities (Individuals Per Annum) (Displacement Rate; Mortality Rate)		Change in Average Survival Rate (% Point Change) (Displacement Rate; Mortality Rate)	
		70%; 1%	70%; 3%	70%; 1%	70%; 3%
	Annual total	118.18	354.53	0.073	0.219
All Consented Projects plus Caledonia					
Citation (43,200)	Breeding season (Mid-March to September)	48.92	146.77	0.113	0.340
	Non-breeding season (October to early March)	50.23	150.70	0.116	0.349
	Annual total	99.16	297.47	0.230	0.689
Latest (150,518)	Breeding season (Mid-March to September)	48.92	146.77	0.033	0.098
	Non-breeding season (October to early March)	50.23	150.70	0.033	0.100
	Annual total	99.16	297.47	0.066	0.198
Forth Islands SPA updated count (162,000)*	Breeding season (Mid-March to September)	48.92	146.77	0.030	0.091
	Non-breeding season (October to early March)	50.23	150.70	0.031	0.093

Population Size (Breeding Adults)	Defined Season	Estimated Number of Mortalities (Individuals Per Annum) (Displacement Rate; Mortality Rate)		Change in Average Survival Rate (% Point Change) (Displacement Rate; Mortality Rate)	
		70%; 1%	70%; 3%	70%; 1%	70%; 3%
	Annual total	99.16	297.47	0.061	0.184

* The Forth Islands SPA updated count takes into account the 2021 estimated Bass Rock drone count of 81,000 AOS (Harris *et al*. 2023[90]; Wanless *et al*. 2023[91]). Further information regarding this approach is outlined within Section 7.3.11 and apportionment is presented within Application Document 13, Appendix 13-1: Caledonia North Apportioning Technical Note and Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note.

Breeding Season

10.3.3.116 During the breeding season, the in-combination abundance for gannet is 12,288 (6,989.17 - 12,287.86) breeding adults of Forth Islands SPA for all projects identified (Table 10-190). Assuming a displacement rate of 70% and a mortality rate of 1%, the consequent potential mortality is estimated to be up to 86 (48.92 - 86.01) breeding adults per annum during the breeding season.

10.3.3.117 Using the citation colony count of 43,200 breeding adults and an annual background mortality of 3,499 breeding adults, the addition of up to 86 predicted breeding adult mortalities would result in a 0.199 survival rate percentage point change during the breeding season per annum. When considering the most up to date counts of 150,518 breeding adults and an annual background mortality of 12,192 breeding adults, this results in a 0.057 survival rate percentage point change during the breeding season per annum (Table 10-191). When considering the Forth Islands SPA updated counts of 162,000 breeding adults and an annual background mortality of 13,122 breeding adults, this results in a 0.053 survival rate percentage point change during the breeding season per annum.

Non-Breeding Season

10.3.3.118 During the non-breeding season, the in-combination abundance for gannet is up to 9,244 (7,176.15 - 9,243.65) individuals of Forth Islands SPA for all projects identified (Table 10-190). Assuming a displacement rate of 70% and a mortality rate of 1%, the consequent potential mortality is estimated to be up to 194 (64.71 – 194.12) breeding adults per annum during the non-breeding season.

10.3.3.119 Using the citation colony count of 43,200 breeding adults and an annual background mortality of 3,499 breeding adults, the addition of 194 predicted breeding adult mortalities would result in a 0.150 survival rate percentage point change during the breeding season per annum. When considering the most up to date counts of 150,518 breeding adults and an annual background mortality of 12,192 breeding adults, this results in a 0.043 survival rate percentage point change during the breeding season per annum (Table 10-191). When considering the Forth Islands SPA updated counts of 162,000 breeding adults and an annual background mortality of 13,122 breeding adults, this results in a 0.040 survival rate percentage point change during the breeding season per annum.

Annual Total

10.3.3.120 The annual total of gannet subject to mortality due to in-combination distributional response at Forth Islands SPA is estimated to be up to 151 (150.72) breeding adults per annum depending on the all projects scenario presented in Table 10-190. This is predicted to result in a survival rate percentage point change against the citation, most recent and Forth Island counts of 0.349, 0.100 and 0.093, respectively (see Table 10-191).

10.3.3.121 When considering a displacement rate of 70% and a mortality rate of 1-3% annually, a total of 151 to 452 (150.72 – 452.16) breeding adults are predicted to be subject of distributional response effect consequential mortality for all projects identified in-combination. This equates to a survival rate percentage point change against the citation and most recently published counts of 1.047, 0.300 and 0.300 respectively (see Table 10-191).

10.3.3.122 To note, the removal of Berwick Bank from the assessment reduces predicted mortality to up to 355 (118.18 – 354.53) breeding adults per annum (when considering a displacement rate of 70% and mortality rate of 1- 3% annually). Using the citation colony count, most recent and Forth Island count, this equates to a 0.821, 0.236 and 0.219 percentage point survival rate change within this population, respectively.

10.3.3.123 As the survival rate percentage point change exceeds NatureScot's threshold of 0.02% when considering both the Applicant and Guidance approach, further consideration of the level of effect predicted has been analysed using PVA (See combined distributional responses and collision risk section for results).

Table 10-192: Gannet O&M phase disturbance annual displacement matrix for all project impacts apportioned to Forth Islands SPA.

Annual Total	Mortality Rate (%)												
Displacement Rate (%)	1	2	3	5	10	20	30	40	50	60	70	80	90	100
10	22	43	65	108	215	431	646	861	1,077	1,292	1,507	1,723	1,938	2,153
20	43	86	129	215	431	861	1,292	1,723	2,153	2,584	3,014	3,445	3,876	4,306
30	65	129	194	323	646	1,292	1,938	2,584	3,230	3,876	4,522	5,168	5,814	6,459
40	86	172	258	431	861	1,723	2,584	3,445	4,306	5,168	6,029	6,890	7,751	8,613
50	108	215	323	538	1,077	2,153	3,230	4,306	5,383	6,459	7,536	8,613	9,689	10,766
60	129	258	388	646	1,292	2,584	3,876	5,168	6,459	7,751	9,043	10,335	11,627	12,919
70	151	301	452	754	1,507	3,014	4,522	6,029	7,536	9,043	10,550	12,058	13,565	15,072
80	172	345	517	861	1,723	3,445	5,168	6,890	8,613	10,335	12,058	13,780	15,503	17,225
90	194	388	581	969	1,938	3,876	5,814	7,751	9,689	11,627	13,565	15,503	17,441	19,378
100	215	431	646	1,077	2,153	4,306	6,459	8,613	10,766	12,919	15,072	17,225	19,378	21,532

Note, outputs highlighted in dark blue represent the predicted annual mortality estimates as per the Guidance Approach and those highlighted in light blue represent the overlapping predicted annual mortality estimates from both the Guidance Approach and Applicant Approach. For further information regarding the Guidance and Applicant Approach see Section 2.5 of Volume 7B, Appendix 6-2: Offshore Ornithology Distributional Responses Technical Report and Volume 7B, Appendix 6-2, Annex 4: Review of Relevant Evidence.

Collision Risk

10.3.3.124 Projects identified for in-combination collision risk for the gannet feature of Forth Islands SPA are listed in Table 10-193, with the respective impact predictions for the different seasonal in-combination scenarios presented in Table 10-194.

10.3.3.125 The predicted collisions for planned and operational projects included within Table 10-193, are primarily based on the Northeast and East Scotwind Projects Cumulative totals dataset (excluding as-built updates), with the addition/update of totals for Five Estuaries (GoBe, 2024a[137]), Outer Dowsing (GoBe, 2024b[138]), Rampion 2 (APEM, 2023[140]), Ossian (NIRAS and RPS, 2024[141]) and Salamander (ERM, 2024[142]). Since publication of the Northeast and East Scotwind Projects Cumulative totals dataset, a further guidance update has occurred regarding recommended avoidance rate (Joint SNCB, 2024[143]) for gannet. This update has therefore been applied accordingly where appropriate to projects which historically used an avoidance rate of 0.989, to align with the recommendation of an avoidance rate of 0.9929. Additionally, consideration of macro avoidance is also now recommended for gannet (Joint SNCB, 2024143) which alleviate the issue of double counting of effects. Macro avoidance has been applied appropriately for all season for English projects and for the non-breeding season only for Scottish projects.

10.3.3.126 To note two approaches are considered for gannet collision risk for the Proposed Development (Offshore), an Applicant Approach which includes a 70% macro avoidance rate applied to all seasons and a Guidance approach which includes a 70% macro avoidance rate to the non-breeding season only. The focus of assessments relates to the Applicant Approach for the Proposed Development (Offshore) only given the minimal difference in impact predictions in-combination. However, impact predictions for the Guidance approach for the Proposed Development (Offshore) in-combination are provided in Table 10-193.

Table 10-193: Gannet in-combination collision totals per season and annually to Forth Islands SPA.

Development	Predicted Collisions		
	Breeding Season	Non-breeding Season	Total
Aberdeen OWF (EOWDC)	1.10	0.25	1.34
Beatrice	-	2.87	2.87
Berwick Bank (Scoping Approach)	94.75	1.03	95.78
Blyth Demonstration Site	0.66	0.27	0.93
Culzean	-	-	-
Dogger Bank A & B	1.53	7.23	8.76
Dogger Bank C & Sofia	0.27	1.13	1.40
Dogger Bank South	2.60	3.28	5.88
Dudgeon	-	2.99	2.99
East Anglia One	-	6.55	6.55
East Anglia ONE North	-	0.58	0.58
East Anglia Three	-	2.15	2.15
East Anglia TWO	-	1.33	1.33
Five Estuaries	-	0.74	0.74
Galloper	-	2.22	2.22
Greater Gabbard	-	0.71	0.71
Green Volt	4.11	0.25	4.35
Gunfleet Sands	-	-	-
Hornsea Four	-	0.33	0.33
Hornsea Project One	-	2.87	2.87
Hornsea Project Two	-	1.02	1.02
Hornsea Three	-	0.47	0.47
Humber Gateway	-	0.14	0.14

Development	Predicted Collisions		
	Breeding Season	Non-breeding Season	Total
Hywind 2 Demonstration	2.52	0.09	2.60
Inch Cape	60.67	0.48	61.15
Kentish Flats	-	0.10	0.10
Kentish Flats Extension	-	-	-
Kincardine	1.23	0.00	1.23
Lincs, Lynn & Inner Dowsing	-	0.18	0.18
London Array	-	0.17	0.17
Methil	3.74	-	3.74
Moray East	-	2.21	2.21
Moray West	-	0.11	0.11
Neart na Gaoithe	57.45	0.75	58.20
Norfolk Boreas	-	0.83	0.83
Norfolk Vanguard	-	1.20	1.20
North Falls	-	0.67	0.67
Outer Dowsing	-	0.08	0.08
Pentland Floating OWF	0.13	-	0.13
Race Bank	-	0.80	0.80
Rampion	-	3.12	3.12
Rampion 2	-	0.54	0.54
Scroby Sands	-	-	-
Seagreen Alpha & Bravo	160.85	1.65	162.50
Sheringham Shoal	-	0.16	0.16
Sheringham Shoal and Dudgeon Extension Project	-	0.16	0.16
Teesside	-	0.08	0.08

Development	Predicted Collisions		
	Breeding Season	Non-breeding Season	Total
Thanet	-	0.00	0.00
Triton Knoll	-	4.84	4.84
Westermost Rough	-	0.02	0.02
Ossian	19.90	0.27	20.17
Salamander	0.15	0.17	0.32
West of Orkney[xxiii]	-	0.75	0.75
Caledonia (Guidance approach to macro-avoidance)	2.49	0.17	2.66
Caledonia (Applicant Approach to macro-avoidance)	0.75	0.17	0.92
All Projects (Guidance approach to macro-avoidance)	414.14	57.99	472.13
All Projects (Applicant Approach to macro-avoidance)	412.40	57.99	470.39
All Projects Excl. Berwick Bank (Guidance approach to macro-avoidance)	319.38	56.97	376.35
All Projects Excl. Berwick Bank (Applicant Approach to macro-avoidance)	317.64	56.97	374.61
Consented (plus Caledonia) (Guidance approach to macro-avoidance)	296.73	50.48	347.21
Consented (plus Caledonia) (Applicant Approach to macro-avoidance)	294.99	50.48	345.47

[xxiii] These numbers for West of Orkney are subject to change, but have been included to support this assessment on a precautionary basis.

Table 10-194: Seasonal and annual collision risk estimates of gannet for the Proposed Development (Offshore) in-combination with other projects during the operational phase.

Population Size (Breeding Adults)	Defined Season	Estimated Number of Mortalities (Individuals Per Annum)	Change in Average Survival Rate (% Point Change)
All Projects (Guidance approach to macro-avoidance)			
Citation (43,200)	Breeding season (Mid-April to August)	414.14	0.959
	Non-breeding season (September to early-April)	57.99	0.134
	Annual total	472.13	1.093
Latest (150,518)	Breeding season (Mid-April to August)	414.14	0.275
	Non-breeding season (September to early-April)	57.99	0.039
	Annual total	472.13	0.314
Forth Islands SPA updated count (162,000)*	Breeding season (Mid-April to August)	414.14	0.256
	Non-breeding season (September to early-April)	57.99	0.036
	Annual total	472.13	0.291

Population Size (Breeding Adults)	Defined Season	Estimated Number of Mortalities (Individuals Per Annum)	Change in Average Survival Rate (% Point Change)
All Projects (Applicant Approach to macro-avoidance)			
Citation (43,200)	Breeding season (Mid-April to August)	412.40	0.955
	Non-breeding season (September to early-April)	57.99	0.134
	Annual total	470.39	1.089
Latest (150,518)	Breeding season (Mid-April to August)	412.40	0.274
	Non-breeding season (September to early-April)	57.99	0.039
	Annual total	470.39	0.313
Forth Islands SPA updated count (162,000)*	Breeding season (Mid-April to August)	412.40	0.255
	Non-breeding season (September to early-April)	57.99	0.036
	Annual total	470.39	0.290
All Projects Excluding Berwick Bank (Guidance approach to macro-avoidance)			
Citation (43,200)	Breeding season (Mid-April to August)	319.38	0.739

Population Size (Breeding Adults)	Defined Season	Estimated Number of Mortalities (Individuals Per Annum)	Change in Average Survival Rate (% Point Change)
	Non-breeding season (September to early-April)	56.97	0.132
	Annual total	376.35	0.871
Latest (150,518)	Breeding season (Mid-April to August)	319.38	0.212
	Non-breeding season (September to early-April)	56.97	0.038
	Annual total	376.35	0.250
Forth Islands SPA updated count (162,000)*	Breeding season (Mid-April to August)	319.38	0.197
	Non-breeding season (September to early-April)	56.97	0.035
	Annual total	376.35	0.232
All Projects Excluding Berwick Bank (Applicant Approach to macro-avoidance)			
Citation (43,200)	Breeding season (Mid-April to August)	317.64	0.735
	Non-breeding season (September to early-April)	56.97	0.132
	Annual total	374.61	0.867

Population Size (Breeding Adults)	Defined Season	Estimated Number of Mortalities (Individuals Per Annum)	Change in Average Survival Rate (% Point Change)
Latest (150,518)	Breeding season (Mid-April to August)	317.64	0.211
	Non-breeding season (September to early-April)	56.97	0.038
	Annual total	374.61	0.249
Forth Islands SPA updated count (162,000)*	Breeding season (Mid-April to August)	317.64	0.196
	Non-breeding season (September to early-April)	56.97	0.035
	Annual total	374.61	0.231
All Consented Projects plus Caledonia (Guidance approach to macro-avoidance)			
Citation (43,200)	Breeding season (Mid-April to August)	296.73	0.687
	Non-breeding season (September to early-April)	50.48	0.117
	Annual total	347.21	0.804
Latest (150,518)	Breeding season (Mid-April to August)	296.73	0.197
	Non-breeding season (September to early-April)	50.48	0.034

Population Size (Breeding Adults)	Defined Season	Estimated Number of Mortalities (Individuals Per Annum)	Change in Average Survival Rate (% Point Change)
	Annual total	347.21	0.231
Forth Islands SPA updated count (162,000)*	Breeding season (Mid-April to August)	296.73	0.183
	Non-breeding season (September to early-April)	50.48	0.031
	Annual total	347.21	0.214
All Consented Projects plus Caledonia (Applicant Approach to macro-avoidance)			
Citation (43,200)	Breeding season (Mid-April to August)	294.99	0.683
	Non-breeding season (September to early-April)	50.48	0.117
	Annual total	345.47	0.800
Latest (150,518)	Breeding season (Mid-April to August)	294.99	0.196
	Non-breeding season (September to early-April)	50.48	0.034
	Annual total	345.47	0.230
Forth Islands SPA updated count (162,000)*	Breeding season (Mid-March to September)	294.99	0.182

Population Size (Breeding Adults)	Defined Season	Estimated Number of Mortalities (Individuals Per Annum)	Change in Average Survival Rate (% Point Change)
	Non-breeding season (October to early March)	50.48	0.031
	Annual total	345.47	0.213
* The Forth Islands SPA updated count takes into account the 2021 estimated Bass Rock drone count of 81,000 AOS (Harris *et al*. 2023[90]; Wanless *et al*. 2023[91]). Further information regarding this approach is outlined within Section 7.3.11 and apportionment is presented within Application Document 13, Appendix 13-1: Caledonia North Apportioning Technical Note and Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note.			

Breeding Season

10.3.3.127 During the breeding season, up to 412 (294.99 - 412.40) gannets of the Forth Islands SPA are predicted to be subject to collision mortality per annum, when considering all projects in-combination (Applicant Approach) presented in Table 10-193.

10.3.3.128 Using the citation colony count of 43,200 breeding adults and an annual background mortality of 3,499 breeding adults, the addition of up to 412 (294.99 - 412.40) predicted breeding adult mortalities would result in a 0.955 survival rate percentage point change during the breeding season per annum. When considering the most up to date counts of 150,518 breeding adults and an annual background mortality of 12,192 breeding adults, this results in a 0.274 survival rate percentage point change during the breeding season per annum (Table 10-194). When considering the Forth Islands SPA updated counts of 162,000 breeding adults and an annual background mortality of 13,122 breeding adults, this results in a 0.255 survival rate percentage point change during the breeding season per annum.

Non-Breeding Season

10.3.3.129 During the non-breeding season, up to 58 (50.48 - 57.99) gannets of the Forth Islands SPA are predicted to be subject to collision mortality per annum, when considering all projects in-combination (Applicant Approach) presented in Table 10-193.

10.3.3.130 Using the citation colony count of 43,200 breeding adults and an annual background mortality of 3,499 breeding adults, the addition of 58 predicted breeding adult mortalities would result in a 0.134 survival rate percentage point change during the breeding season per annum. When considering the most up to date counts of 150,518 breeding adults and an annual background mortality of 12,192 breeding adults, this results in a 0.039 survival rate percentage point change during the breeding season per annum (Table 10-194). When considering the Forth Islands SPA updated counts of 162,000 breeding adults and an annual background mortality of 13,122 breeding adults, this results in 0.036 survival rate percentage point change during the breeding season per annum.

Annual Total

10.3.3.131 The annual total of gannet subject to mortality due to collision at Forth Islands SPA is estimated to be up to 470 (345.47 - 470.39) breeding adults per annum for all projects identified in-combination (Applicant Approach). This is predicted to result in a survival rate percentage point change against the citation, most recent and Forth Island counts of counts of 1.089, 0.313 and 0.290, respectively (see Table 10-194).

10.3.3.132 To note, the removal of Berwick Bank from the assessment reduces predicted mortality to 375 (374.61) breeding adults per annum. Using the citation colony count, most recent and Forth Island count, this equates to a 0.867, 0.249 and 0.231 percentage point survival rate change within this population respectively.

10.3.3.133 As the survival rate percentage point change exceeds NatureScot's threshold of 0.02% when considering both the Applicant and Guidance approach to macro-avoidance, further consideration of the level of effect predicted has been analysed using PVA (See combined distributional responses and collision risk section for results).

Combined Distributional Response and Collision Risk Impact

10.3.3.134 In-combination combined distributional response and collision risk impact predictions are presented in Table 10-190 (Applicant Approach to macro-avoidance) and Table 10-193 (Guidance approach to macro-avoidance) for the gannet feature of Forth Islands SPA.

10.3.3.135 As presented in Table 10-195 and Table 10-196, for all combined in-combination collision risk and distributional response scenarios considered, the percentage point change in survival rate exceeded the 0.02 threshold as set by NatureScot, PVA has therefore been completed for these scenarios to further consider such a level of effect.

Table 10-195: Seasonal and annual displacement and collision risk estimates of gannet for the Proposed Development (Offshore) in-combination with other projects during the operational phase, for the Applicant Approach to macro-avoidance applied to the Proposed Development (Offshore).

Population Size (Breeding Adults)	Defined Season (Months)	Applicant Approach 70% Displacement; 1% Mortality		Guidance Approach 70% Displacement; 1-3% Mortality	
		Estimated number of mortalities from combined CRM and Distributional responses per annum	Change in Average Survival Rate (% Point Change)	Estimated number of mortalities from combined CRM and Distributional responses per annum	Change in Average Survival Rate (% Point Change)
All Projects					
Citation (43,200)	Breeding season (Mid-April to August)	498.41	1.154	498.341 – 670.44	1.154 – 1.552
	Non-breeding season (September to early-April)	122.70	0.284	122.70 – 252.11	0.284 – 0.584
	Annual total	621.11	1.438	621.11 – 922.55	1.438 – 2.136
Latest (150,518)	Breeding season (Mid-April to August)	498.41	0.331	498.341 – 670.44	0.331 – 0.445
	Non-breeding season (September to early-April)	122.70	0.082	122.70 – 252.11	0.082 – 0.167
	Annual total	621.11	0.413	621.11 – 922.55	0.413 – 0.613

Population Size (Breeding Adults)	Defined Season (Months)	Applicant Approach 70% Displacement; 1% Mortality		Guidance Approach 70% Displacement; 1-3% Mortality	
		Estimated number of mortalities from combined CRM and Distributional responses per annum	Change in Average Survival Rate (% Point Change)	Estimated number of mortalities from combined CRM and Distributional responses per annum	Change in Average Survival Rate (% Point Change)
Forth Islands SPA updated count (162,000)*	Breeding season (Mid-April to August)	498.41	0.308	498.341 – 670.44	0.308 – 0.414
	Non-breeding season (September to early-April)	122.70	0.076	122.70 – 252.11	0.076 – 0.156
	Annual total	621.11	0.383	621.11 – 922.55	0.383 – 0.569
All Projects Excluding Berwick Bank					
Citation (43,200)	Breeding season (Mid-April to August)	374.26	0.866	374.26 – 487.49	0.866 – 1.128
	Non-breeding season (September to early-April)	118.53	0.274	118.53 – 241.66	0.274 – 0.559
	Annual total	492.79	1.141	492.79 – 729.14	1.141 – 1.688
Latest (150,518)	Breeding season (Mid-April to August)	374.26	0.249	374.26 – 487.49	0.249 – 0.324

Population Size (Breeding Adults)	Defined Season (Months)	Applicant Approach 70% Displacement; 1% Mortality		Guidance Approach 70% Displacement; 1-3% Mortality	
		Estimated number of mortalities from combined CRM and Distributional responses per annum	Change in Average Survival Rate (% Point Change)	Estimated number of mortalities from combined CRM and Distributional responses per annum	Change in Average Survival Rate (% Point Change)
	Non-breeding season (September to early-April)	118.53	0.079	118.53 – 241.66	0.079 – 0.161
	Annual total	492.79	0.327	492.79 – 729.14	0.327 – 0.484
Forth Islands SPA updated count (162,000)*	Breeding season (Mid-April to August)	374.26	0.231	374.26 – 487.49	0.231 – 0.301
	Non-breeding season (September to early-April)	118.53	0.073	118.53 – 241.66	0.073 – 0.149
	Annual total	492.79	0.304	492.79 – 729.14	0.304 – 0.450
All Consented Projects plus Caledonia					
Citation (43,200)	Breeding season (Mid-April to August)	343.92	0.796	343.92 – 441.77	0.796 – 1.023
	Non-breeding season	100.71	0.233	100.71 – 201.18	0.233 – 0.466

Population Size (Breeding Adults)	Defined Season (Months)	Applicant Approach 70% Displacement; 1% Mortality		Guidance Approach 70% Displacement; 1-3% Mortality	
		Estimated number of mortalities from combined CRM and Distributional responses per annum	Change in Average Survival Rate (% Point Change)	Estimated number of mortalities from combined CRM and Distributional responses per annum	Change in Average Survival Rate (% Point Change)
	(September to early-April)				
	Annual total	444.63	1.029	444.63 – 642.94	1.029 – 1.488
Latest (150,518)	Breeding season (Mid-April to August)	343.92	0.228	343.92 – 441.77	0.228 – 0.293
	Non-breeding season (September to early-April)	100.71	0.067	100.71 – 201.18	0.067 – 0.134
	Annual total	444.63	0.295	444.63 – 642.94	0.295 – 0.427
Forth Islands SPA updated count (162,000)*	Breeding season (Mid-April to August)	343.92	0.212	343.92 – 441.77	0.212 – 0.273
	Non-breeding season (September to early-April)	100.71	0.062	100.71 – 201.18	0.062 – 0.124
	Annual total	444.63	0.274	444.63 – 642.94	0.274 – 0.397

Population Size (Breeding Adults)	Defined Season (Months)	Applicant Approach 70% Displacement; 1% Mortality		Guidance Approach 70% Displacement; 1-3% Mortality	
		Estimated number of mortalities from combined CRM and Distributional responses per annum	Change in Average Survival Rate (% Point Change)	Estimated number of mortalities from combined CRM and Distributional responses per annum	Change in Average Survival Rate (% Point Change)

* The Forth Islands SPA updated count takes into account the 2021 estimated Bass Rock drone count of 81,000 AOS (Harris *et al*. 2023[90]; Wanless *et al*. 2023[91]). Further information regarding this approach is outlined within Section 7.3.11 and apportionment is presented within Application Document 13, Appendix 13-1: Caledonia North Apportioning Technical Note and Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note.

Table 10-196: Seasonal and annual displacement and collision risk estimates of gannet for the Proposed Development (Offshore) in-combination with other projects during the operational phase, for the Guidance Approach to macro-avoidance applied to the Proposed Development (Offshore)

Population Size (Breeding Adults)	Defined Season (Months)	Applicant Approach 70% Displacement; 1% Mortality		Guidance Approach 70% Displacement; 1-3% Mortality	
		Estimated number of mortalities from combined CRM and Distributional responses per annum	Change in Average Survival Rate (% Point Change)	Estimated number of mortalities from combined CRM and Distributional responses per annum	Change in Average Survival Rate (% Point Change)
All Projects					
Citation (43,200)	Breeding season (Mid-April to August)	500.15	1.158	500.15 – 672.18	1.158 – 1.556
	Non-breeding season (September to early-April)	122.70	0.284	122.70 – 252.11	0.284 – 0.584
	Annual total	622.85	1.442	622.85 – 924.29	1.442 – 2.140
Latest (150,518)	Breeding season (Mid-April to August)	500.15	0.332	500.15 – 672.18	0.332 – 0.447
	Non-breeding season (September to early-April)	122.70	0.082	122.70 – 252.11	0.082 – 0.167
	Annual total	622.85	0.414	622.85 – 924.29	0.414 – 0.614

Population Size (Breeding Adults)	Defined Season (Months)	Applicant Approach 70% Displacement; 1% Mortality		Guidance Approach 70% Displacement; 1-3% Mortality	
		Estimated number of mortalities from combined CRM and Distributional responses per annum	Change in Average Survival Rate (% Point Change)	Estimated number of mortalities from combined CRM and Distributional responses per annum	Change in Average Survival Rate (% Point Change)
Forth Islands SPA updated count (162,000)*	Breeding season (Mid-April to August)	500.15	0.309	500.15 – 672.18	0.309 – 0.415
	Non-breeding season (September to early-April)	122.70	0.076	122.70 – 252.11	0.076 – 0.156
	Annual total	622.85	0.384	622.85 – 924.29	0.384 – 0.571
All Projects Excluding Berwick Bank					
Citation (43,200)	Breeding season (Mid-April to August)	376.00	0.870	376.00 – 489.23	0.870 – 1.132
	Non-breeding season (September to early-April)	118.53	0.274	118.53 – 241.66	0.274 – 0.559
	Annual total	494.53	1.145	494.53 – 730.88	1.145 – 1.692
Latest (150,518)	Breeding season (Mid-April to August)	376.00	0.250	376.00 – 489.23	0.250 – 0.325

Population Size (Breeding Adults)	Defined Season (Months)	Applicant Approach 70% Displacement; 1% Mortality		Guidance Approach 70% Displacement; 1-3% Mortality	
		Estimated number of mortalities from combined CRM and Distributional responses per annum	Change in Average Survival Rate (% Point Change)	Estimated number of mortalities from combined CRM and Distributional responses per annum	Change in Average Survival Rate (% Point Change)
	Non-breeding season (September to early-April)	118.53	0.079	118.53 – 241.66	0.079 – 0.161
	Annual total	494.53	0.329	494.53 – 730.88	0.329 – 0.486
Forth Islands SPA updated count (162,000)*	Breeding season (Mid-April to August)	376.00	0.232	376.00 – 489.23	0.232 – 0.302
	Non-breeding season (September to early-April)	118.53	0.073	118.53 – 241.66	0.073 – 0.149
	Annual total	494.53	0.305	494.53 – 730.88	0.305 – 0.451
All Consented Projects plus Caledonia					
Citation (43,200)	Breeding season (Mid-April to August)	345.66	0.800	345.66 – 443.51	0.800 – 1.027
	Non-breeding season	100.71	0.233	100.71 – 201.18	0.233 – 0.466

Population Size (Breeding Adults)	Defined Season (Months)	Applicant Approach 70% Displacement; 1% Mortality		Guidance Approach 70% Displacement; 1-3% Mortality	
		Estimated number of mortalities from combined CRM and Distributional responses per annum	Change in Average Survival Rate (% Point Change)	Estimated number of mortalities from combined CRM and Distributional responses per annum	Change in Average Survival Rate (% Point Change)
	(September to early-April)				
	Annual total	446.37	1.033	446.37 – 644.68	1.033 – 1.492
Latest (150,518)	Breeding season (Mid-April to August)	345.66	0.230	345.66 – 443.51	0.230 – 0.295
	Non-breeding season (September to early-April)	100.71	0.067	100.71 – 201.18	0.067 – 0.134
	Annual total	446.37	0.297	446.37 – 644.68	0.297 – 0.428
Forth Islands SPA updated count (162,000)*	Breeding season (Mid-April to August)	345.66	0.213	345.66 – 443.51	0.213 – 0.274
	Non-breeding season (September to early-April)	100.71	0.062	100.71 – 201.18	0.062 – 0.124
	Annual total	446.37	0.276	446.37 – 644.68	0.276 – 0.398

Population Size (Breeding Adults)	Defined Season (Months)	Applicant Approach 70% Displacement; 1% Mortality		Guidance Approach 70% Displacement; 1-3% Mortality	
		Estimated number of mortalities from combined CRM and Distributional responses per annum	Change in Average Survival Rate (% Point Change)	Estimated number of mortalities from combined CRM and Distributional responses per annum	Change in Average Survival Rate (% Point Change)
* The Forth Islands SPA updated count takes into account the 2021 estimated Bass Rock drone count of 81,000 AOS (Harris *et al*. 2023[90]; Wanless *et al*. 2023[91]). Further information regarding this approach is outlined within Section 7.3.11 and apportionment is presented within Application Document 13, Appendix 13-1: Caledonia North Apportioning Technical Note and Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note.					

Population Viability Analysis

10.3.3.136 When considering such predicted reductions in annual growth rate presented in Table 10-198 and Table 10-199, it is important to consider the known colony growth trend to understand the colony's resilience. The known population sizes and annual compound growth rates for the gannet feature of Forth Islands are presented in Table 10-197 based on the Latest seabird census report (Burnell *et al*., 2023[86]) and Harris *et al*. (2023[90]). The compound growth rates presented would suggest the Forth Islands colony in the long term has been on a stable increase in population size since 1990 (citation count), though the colony is known to have been increasing in numbers for over 100 years (Jeglinski *et al*., 2022[150]). Although the 2021 is extrapolation only, the reduction of growth rate predicted is likely to be consistent with the actual trend, as the colony (pre-HPAI) was close to carrying capacity in the early 2020s (Harris *et al*., 2023[90]). In 2022, the Forth Islands gannet population was significantly impacted by HPAI, with 5,035 confirmed cases of dead gannets at the SPA and a stark reduction in colony size in 2022 (total of 21,227 birds recorded in June 2022) as reported in Lane *et al*., (2023[151]). Surveys undertaken in 2023 recorded a total of 51,428 birds indicating an increase of 142% in contrast to the 2022 count and above the citation count, though still a marked reduction in size in contrast to the previous 2014 census (41% decline). No count is currently available for 2024, though counts for other gannetries significantly impacted by HPAI have reported significant increases in numbers in contrast to 2022 (SMP, 2024[152]). Additionally, only two confirmed cases of HPAI between 1st October to 28th March 2024 (DEFRA, 2022[153]), suggesting limited current and future effect from the virus.

10.3.3.137 **At this current time the potential for an AEoSI cannot be ruled out for potential effects of collision risk, distributional responses and combined effects in-combination for the Proposed Development with other plans and projects given the significant impact of HPAI on the integrity of the site.**

10.3.3.138 As noted within Harris *et al*., (2023[90]), recovery of the Forth Islands population is dependent on the number of potential recruits. The Forth Islands colony has been producing thousands of young which previously were considered to recruit into other UK gannetries due to limited space at the Forth Islands Colony (Burnell *et al*., 2023[86]). This would suggest that there is a significant recruitment pool to ensure the Forth Islands colony will recover from the effects of HPAI. The current commissioning date for the Proposed Development (Offshore) is 2030 with an operational lifespan of approximately 35 years. If the colony undergoes a similar growth trend to what has been historically recorded (Table 10-197), there is potential the colony will build up enough resilience to withstand such level of predicted in-combination effects within the operational timeframe of the Proposed Development (Offshore).

Table 10-197: Annual compound growth rates for the Forth Islands SPA gannet feature for the years o 1990 – 2023, based on Burnell *et al*. (2023[86]) and Harris *et al*. (2023[90]).

Years	Population Size (Breeding Adults)	Colony Annual Compound Growth Rate (%)
1990 - 2023	43,200 – 51,428	0.53%
1990 – 2021	43,200 - 162,000	4.36%
1990 – 2014	43,200 - 150,518	5.34%
2003 – 2021	96,130 – 162,000	2.94%
2014 - 2021	150,518 – 162,000	1.06%

Table 10-198: PVA results for the gannet feature of Forth Islands SPA when considering combined distributional response and collision risk effects for the Proposed Development (Offshore) alone and in-combination (Guidance Approach to macro-avoidance*).

Scenario	Season	Predicted Mortality	Median Growth rate (±SD)	Median Pop. Size (±SD)	Decrease in CGR per annum (%)	Decrease in CPS after 35 years (%)
In-combination all consented projects plus Caledonia OWF						
SMP- Applicant (70%, 1%)	Breeding	345.66	0.997 (<0.001)	0.906 (0.009)	0.272	9.364
	Non-breeding	100.71	0.999 (<0.001)	0.972 (0.009)	0.080	2.814
	Annual Total	446.37	0.996 (<0.001)	0.881 (0.009)	0.352	11.897
SMP-Guidance (70%, 1-3%)	Breeding	345.66 – 443.51	0.997 (<0.001)	0.882 - 0.906 (0.009)	0.272 – 0.349	9.364 – 11.831
	Non-breeding	100.71 – 201.18	0.998 - 0.999 (<0.001)	0.972 - 0.994 (0.009)	0.080 – 0.159	2.814 – 5.553
	Annual Total	446.37 – 644.68	0.995 – 0.996 (<0.001)	0.881 – 0.883 (0.008 - 0.009)	0.352 – 0.507	11.897 – 16.719
Forth Islands - Applicant (70%, 1%)	Breeding	345.66	0.997 (<0.001)	0.913 (0.008)	0.253	8.724
	Non-breeding	100.71	0.999 (<0.001)	0.974 (0.008)	0.074	2.608
	Annual Total	446.37	0.997 (<0.001)	0.889 (0.008)	0.326	11.104
Forth Islands - Guidance (70%, 1-3)	Breeding	345.66 – 443.51	0.997 (<0.001)	0.890 - 0.913 (0.008)	0.253 – 0.324	8.724 – 11.041
	Non-breeding	100.71 – 201.18	0.999 (<0.001)	0.948 - 0.974 (0.008)	0.074 – 0.147	2.608 – 5.152

Scenario	Season	Predicted Mortality	Median Growth rate (±SD)	Median Pop. Size (±SD)	Decrease in CGR per annum (%)	Decrease in CPS after 35 years (%)
	Annual Total	446.37 – 644.68	0.995 – 0.997 (<0.001)	0.884 - 0.889 (0.008)	0.326 – 0.471	11.104 – 15.632
In-combination all projects plus Caledonia OWF						
SMP- Applicant (70%, 1%)	Breeding	500.15	0.996 (<0.001)	0.868 (0.008)	0.394	13.244
	Non-breeding	122.70	0.999 (<0.001)	0.966 (0.009)	0.096	3.402
	Annual Total	622.85	0.995 (<0.001)	0.838 (0.008)	0.490	16.214
SMP-Guidance (70%, 1-3)	Breeding	500.15 – 672.18	0.995 – 0.996 (<0.001)	0.826 - 0.868 (0.008)	0.394 – 0.529	13.244 – 17.392
	Non-breeding	122.70 – 252.11	0.998 – 0.999 (<0.001)	0.931 - 0.966 (0.009)	0.096 – 0.198	3.402 – 6.887
	Annual Total	622.85 – 924.29	0.993 - 0.995 (<0.001)	0.769 - 0.838 (0.008)	0.490 – 0.727	16.214 – 23.108
Forth Islands - Applicant (70%, 1%)	Breeding	500.15	0.996 (<0.001)	0.876 (0.008)	0.366	12.368
	Non-breeding	122.70	0.999 (<0.001)	0.968 (0.008)	0.090	3.186
	Annual Total	622.85	0.995 (<0.001)	0.848 (0.007)	0.456	15.165
Forth Islands - Guidance (70%, 1-3%)	Breeding	500.15 – 672.18	0.995 – 0.996 (<0.001)	0.876 – 0.838 (0.008)	0.366 – 0.492	12.368 – 16.241
	Non-breeding	122.70 – 252.11	0.998 – 0.999 (<0.001)	0.936 – 0.968 (0.008)	0.090 – 0.184	3.186 – 6.431

Scenario	Season	Predicted Mortality	Median Growth rate (±SD)	Median Pop. Size (±SD)	Decrease in CGR per annum (%)	Decrease in CPS after 35 years (%)
	Annual Total	622.85 – 924.29	0.993 – 0.995 (<0.001)	0.783 – 0.848 (0.007)	0.456 – 0.676	15.165 – 21.675
In-combination all projects minus Berwick Bank plus Caledonia OWF						
SMP-Applicant (70%, 1%)	Breeding	376.00	0.997 (<0.001)	0.899 (0.009)	0.296	10.124
	Non-breeding	118.53	0.999 (<0.001)	0.967 (0.009)	0.093	3.290
	Annual Total	494.53	0.996 (<0.001)	0.869 (0.008)	0.389	13.097
SMP-Guidance (70%, 1-3%)	Breeding	376.00 - 489.23	0.996 – 0.997 (<0.001)	0.870 – 0.899 (0.009)	0.296 - 0.386	10.124 - 12.982
	Non-breeding	118.53 – 241.66	0.998 - 0.999 (<0.001)	0.934 - 0.967 (0.009)	0.093 – 0.190	3.285 – 6.613
	Annual Total	494.53 – 730.88	0.994 – 0.996 (<0.001)	0.813 - 0.869 (0.008)	0.389 – 0.575	13.097 – 18.744
Forth Islands - Applicant (70%, 1%)	Breeding	376.00	0.997 (<0.001)	0.906 (0.008)	0.274	9.415
	Non-breeding	118.53	0.999 (<0.001)	0.969 (0.008)	0.086	3.060
	Annual Total	494.53	0.996 (<0.001)	0.878 (0.007)	0.361	12.197
Forth Islands - Guidance (70%, 1-3%)	Breeding	376.00 - 489.23	0.996 – 0.997 (<0.001)	0.879 - 0.906 (0.008)	0.274 – 0.358	9.415 – 12.113
	Non-breeding	118.53 – 241.66	0.998 – 0.999 (<0.001)	0.938 - 0.969 (0.008)	0.086 – 0.177	3.060 – 6.165

Scenario	Season	Predicted Mortality	Median Growth rate (±SD)	Median Pop. Size (±SD)	Decrease in CGR per annum (%)	Decrease in CPS after 35 years (%)
	Annual Total	494.53 – 730.88	0.995 – 0.996 (<0.001)	0.878 (0.007)	0.361 – 0.535	12.197 – 17.548
*Note, this table presents the Guidance Approach a macro-avoidance rate of 70% has been applied to gannet densities during the non-breeding season, whereas during the breeding season the monthly in-flight densities have not been adjusted for macro-avoidance (further details are provided in Volume 2, Chapter 6: Offshore Ornithology).						

Table 10-199: PVA results for the gannet feature of Forth Islands SPA when considering combined distributional response and collision risk effects for the Proposed Development (Offshore) alone and in-combination (Applicant Approach to macro-avoidance*).

Scenario	Season	Predicted Mortality	Median Growth rate (±SD)	Median Pop. Size (±SD)	Decrease in CGR per annum (%)	Decrease in CPS after 35 years (%)
In-combination all consented projects plus Caledonia OWF						
SMP- Applicant (70%, 1%)	Breeding	343.92	0.997 (<0.001)	0.907 (0.009)	0.271	9.315
	Non-breeding	100.71	0.999 (<0.001)	0.972 (0.009)	0.08	2.807
	Annual Total	444.63	0.996 (<0.001)	0.882 (0.009)	0.35	11.847
SMP-Guidance (70%, 1-3%; 0%)	Breeding	343.92 - 441.77	0.997 (<0.001)	0.882 - 0.907 (0.009)	0.271 - 0.348	9.315 - 11.775
	Non-breeding	100.71 - 201.18	0.998 - 0.999 (<0.001)	0.944 - 0.972 (0.009)	0.080 - 0.159	2.807 - 5.560
	Annual Total	444.63 - 642.94	0.995 - 0.996 (<0.001)	0.833 - 0.882 (0.008 - 0.009)	0.350 - 0.506	11.847 - 16.682
Forth Islands - Applicant (70%, 1%)	Breeding	343.92	0.997 (<0.001)	0.914 (0.008)	2.510	8.649
	Non-breeding	100.71	0.999 (<0.001)	0.974 (0.008)	0.074	2.631
	Annual Total	444.63	0.997 (<0.001)	0.889 (0.008)	0.325	11.052
Forth Islands - Guidance (70%, 1-3%; 70%)	Breeding	343.92 - 441.77	0.997 (<0.001)	0.890 - 0.914 (0.008)	0.323 - 2.510	8.649 - 11.002
	Non-breeding	100.71 - 201.18	0.999 (<0.001)	0.948 - 0.974 (0.008)	0.074 – 0.147	2.631 - 5.157

Scenario	Season	Predicted Mortality	Median Growth rate (±SD)	Median Pop. Size (±SD)	Decrease in CGR per annum (%)	Decrease in CPS after 35 years (%)
	Annual Total	444.63 - 642.94	0.995 - 0.997 (<0.001)	0.844 - 0.889 (0.008)	0.325 - 0.471	11.052 - 15.610
In-combination all projects plus Caledonia OWF						
SMP- Applicant (70%, 1%)	Breeding	498.41	0.996 (<0.001)	0.863 (0.008)	0.393	13.202
	Non-breeding	122.70	0.999 (<0.001)	0.966 (0.008)	0.096	3.427
	Annual Total	621.11	0.995 (<0.001)	0.838 (0.008)	0.489	16.170
SMP-Guidance (70%, 1-3%; 70%)	Breeding	498.41 - 670.44	0.995 - 0.996 (<0.001)	0.863 - 0.827 (0.008)	0.393 – 0.528	13.202 - 17.333
	Non-breeding	122.70 - 252.11	0.998 - 0.999 (<0.001)	0.966 - 0.931 (0.009)	0.096 - 0.199	3.427 - 6.905
	Annual Total	621.11 - 922.55	0.995 - 0.993 (<0.001)	0.838 - 0.769 (0.008)	0.0489 - 0.726	16.170 - 23.062
Forth Islands - Applicant (70%, 1%)	Breeding	498.41	0.996 (<0.001)	0.877 (0.008)	0.364	12.309
	Non-breeding	122.70	0.999 (<0.001)	0.968 (0.008)	0.089	3.162
	Annual Total	621.11	0.995 (<0.001)	0.849 (0.007)	0.454	15.096
Forth Islands - Guidance (70%, 1-3%; 70%)	Breeding	498.41 - 670.44	0.838 – 0.996 (<0.001 – 0.008)	0.844 - 0.877 (0.007- 0.008)	0.364 – 0.490	12.309 – 16.212

Scenario	Season	Predicted Mortality	Median Growth rate (±SD)	Median Pop. Size (±SD)	Decrease in CGR per annum (%)	Decrease in CPS after 35 years (%)
	Non-breeding	122.70 - 252.11	0.936 - 0.999 (<0.001 – 0.008)	0.968 (0.008)	0.089 – 0.184	3.162-6.440
	Annual Total	621.11 - 922.55	0.784 - 0.995 (<0.001)	0.811 - 0.849 (0.007)	0.454 – 0.675	15.096 – 21.632
In-combination all projects minus Berwick Bank plus Caledonia OWF						
SMP- Applicant (70%, 1%)	Breeding	374.26	0.997 (<0.001)	0.899 (0.009)	0.295	10.094
	Non-breeding	118.53	0.999 (<0.001)	0.967 (0.009)	0.094	3.293
	Annual Total	492.79	0.996 (<0.001)	0.870 (0.008)	0.388	13.044
SMP-Guidance (70%, 1-3%; 70%)	Breeding	374.26 - 487.49	0.996 - 0.997 (<0.001)	0.871 - 0.899 (0.008 - 0.009)	0.295 - 0.384	10.094 - 12.916
	Non-breeding	118.53 - 241.66	0.998 - 0.999 (<0.001)	0.934 - 0.967 (0.009)	0.094 - 0.190	3.293 - 6.622
	Annual Total	492.79 - 729.14	0.994 - 0.996 (<0.001)	0.813 - 0.870 (0.008)	0.388 - 0.574	13.044 - 18.723
Forth Islands - Applicant (70%, 1%)	Breeding	374.26	0.997 (<0.001)	0.906 (0.008)	0.274	9.398
	Non-breeding	118.53	0.999 (<0.001)	0.969 (0.009)	0.087	3.073
	Annual Total	492.79	0.996 (<0.001)	0.878 (0.008)	0.361	12.19
	Breeding	374.26 - 487.49	0.996 - 0.997 (<0.001)	0.879 - 0.906 (0.008)	0.274 - 0.356	9.398 - 12.070

Scenario	Season	Predicted Mortality	Median Growth rate (±SD)	Median Pop. Size (±SD)	Decrease in CGR per annum (%)	Decrease in CPS after 35 years (%)
Forth Islands - Guidance (70%, 1-3%; 70%)	Non-breeding	118.53 - 241.66	0.998 - 0.999 (<0.001)	0.938 - 0.969 (0.008 - 0.009)	0.087 - 0.177	3.073 – 6.166
	Annual Total	492.79 - 729.14	0.995 - 0.996 (<0.001)	0.825 - 0.878 (0.007 - 0.008)	0.361 - 0.533	12.19 – 17.516
*Note, this table presents the Applicant Approach a macro-avoidance rate of 70% has been applied to all months (further details are provided in Volume 2, Chapter 6: Offshore Ornithology).						

Hermaness, Saxa Vord and Valla Field SPA

Gannet

10.3.3.139 Gannet has been screened in to assess the impacts from distributional responses and collision risk from the Proposed Development (Offshore) during the O&M phase in-combination with other projects in relation to the following relevant conservation objective for this species, as a feature of the SPA:

- Maintain the population as a viable component of the site.

Distributional response

10.3.3.140 Projects identified for in-combination distributional response for the gannet feature of Hermaness, Saxa Vord and Valla Field SPA are listed in Table 10-200, with the respective impact predictions for the different seasonal in-combination scenarios presented in Table 10-201. The predicted apportioned abundance for planned and operational projects included within Table 10-200, are primarily based on the Northeast and East Scotwind Projects Cumulative totals dataset, with the addition/update of abundance totals for Dogger Bank South (Royal Haskoning DHV (2024[136]) Ossian (RPS, 2024[154]) and Salamander (Salamander, 2024[155]) derived from their respective RIAAs.

10.3.3.141 The main focus of the assessment is based on the Applicant Approach of a displacement rate of 70% and a 1% mortality rate for O&M phase in-combination distributional response impacts. NatureScot advise that distributional response assessment for gannet should be based on a displacement rate of 70% and a mortality rate of up to 3%, therefore such level of predicted effect is also provided.

10.3.3.142 For further details regarding the differences between the Guidance Approach and the Applicant Approach for the distributional response assessments, along with justification for the use of the latter, please refer to Volume 7B, Appendix 6-2, Annex 4: Review of Relevant Evidence.

10.3.3.143 A displacement matrix is also presented for the annual apportioned in-combination abundance for Hermaness, Saxa Vord and Valla Field SPA (Table 10-202), when considering the all projects scenario presented in Table 10-201.

Table 10-200:Gannet in-combination season and total abundance estimates attributed to Hermaness, Saxa Vord and Valla Field SPA.

Development	Predicted Abundance		
	Breeding Season	Non-breeding Season	Total
Aberdeen OWF (EOWDC)	-	-	-
Beatrice	-	-	-
Berwick Bank (Scoping Approach)	29	165	194
Blyth Demonstration Site	-	-	-
Dogger Bank A & B	-	229	229
Dogger Bank C & Sofia	-	139	139
Dogger Bank South	-	153	153
Dudgeon	-	4	4
East Anglia One	-	321	321
East Anglia ONE North	-	46	46
East Anglia Three	-	180	180
East Anglia TWO	-	102	102
Five Estuaries	-	64	64
Galloper	-	115	115
Greater Gabbard	-	20	20
Green Volt	6	16	22
Gunfleet Sands	-	2	2
Hornsea Four	-	123	123
Hornsea Project One	-	94	94
Hornsea Project Two	-	114	114
Hornsea Three	-	156	156
Humber Gateway	-	-	-
Hywind 2 Demonstration	-	1	1

Development	Predicted Abundance		
	Breeding Season	Non-breeding Season	Total
Inch Cape	-	89	89
Kentish Flats	-	-	-
Kentish Flats Extension	-	1	1
Kincardine	-	-	-
Lincs, Lynn & Inner Dowsing	-	-	-
London Array	-	-	-
Methil	-	-	-
Moray East	-	29	29
Moray West	-	57	57
Neart na Gaoithe	-	86	86
Norfolk Boreas	-	219	219
Norfolk Vanguard	-	269	269
North Falls	-	72	72
Outer Dowsing	-	55	55
Pentland Floating OWF	6	3	9
Race Bank	-	7	7
Rampion	-	50	50
Rampion 2	-	26	26
Scroby Sands	-	-	-
Seagreen Alpha & Bravo	-	102	102
Sheringham Shoal	-	3	3
Sheringham Shoal and Dudgeon Extension Project	-	62	62
Teesside	-	-	-
Thanet	-	-	-

Development	Predicted Abundance		
	Breeding Season	Non-breeding Season	Total
Triton Knoll	-	5	5
Westermost Rough	-	-	-
Ossian	29	71	100
Salamander	1	51	52
West of Orkney[xxiv]	-	119	119
Caledonia	15	27	42
All Projects	85	3,448	3,533
All Projects Excl. Berwick Bank	56	3,283	3,188
Consented (plus Caledonia)	26	2,890	2,916

[xxiv] These numbers for West of Orkney are subject to change, but have been included to support this assessment on a precautionary basis.

Table 10-201: Seasonal and annual displacement estimates of gannet for the Proposed Development (Offshore) in-combination with other projects during the operational phase, as per the Applicant and Guidance Approach.

Population Size (Breeding Adults)	Defined Season	Estimated Number of Mortalities (Individuals Per Annum) (Displacement Rate; Mortality Rate)		Change in Average Survival Rate (% Point Change) (Displacement Rate; Mortality Rate)	
		70%; 1%	70%; 3%	70%; 1%	70%; 3%
All Projects					
Citation (32,800)	Breeding season (Mid-March to September)	0.59	1.78	0.002	0.005
	Non-breeding season (October to early March)	24.14	72.41	0.074	0.221
	Annual total	24.73	74.19	0.075	0.226
Latest (37,478)	Breeding season (Mid-March to September)	0.59	1.78	0.002	0.005
	Non-breeding season (October to early March)	24.14	72.41	0.064	0.193
	Annual total	24.73	74.19	0.066	0.198
All Projects Excluding Berwick Bank					
Citation (32,800)	Breeding season (Mid-March to September)	0.39	1.18	0.001	0.004
	Non-breeding season (October to early March)	22.98	68.95	0.070	0.210
	Annual total	23.38	70.13	0.071	0.214

Population Size (Breeding Adults)	Defined Season	Estimated Number of Mortalities (Individuals Per Annum) (Displacement Rate; Mortality Rate)		Change in Average Survival Rate (% Point Change) (Displacement Rate; Mortality Rate)	
		70%; 1%	70%; 3%	70%; 1%	70%; 3%
Latest (37,478)	Breeding season (Mid-March to September)	0.39	1.18	0.001	0.003
	Non-breeding season (October to early March)	22.98	68.95	0.061	0.184
	Annual total	23.38	70.13	0.062	0.187
All Consented Projects plus Caledonia					
Citation (32,800)	Breeding season (Mid-March to September)	0.18	0.55	0.001	0.002
	Non-breeding season (October to early March)	20.23	60.68	0.062	0.185
	Annual total	20.41	61.24	0.062	0.187
Latest (37,478)	Breeding season (Mid-March to September)	0.18	0.55	<0.001	0.001
	Non-breeding season (October to early March)	20.23	60.68	0.054	0.162
	Annual total	20.41	61.24	0.054	0.163

Breeding Season

10.3.3.144 During the breeding season, the in-combination abundance for gannet is up to 85 (26.40 - 84.69) breeding adults of Hermaness, Saxa Vord and Valla Field SPA for all projects identified (Applicant Approach presented in Table 10-201). Assuming a displacement rate of 70% and a mortality rate of 1%, the consequent potential mortality is estimated to be 25 (0.59 - 24.73) breeding adults per annum during the breeding season.

10.3.3.145 Using the citation colony count of 32,800 breeding adults and an annual background mortality of 2,657 breeding adults, the addition of up to one predicted breeding adult mortalities would result in up to a 0.002 survival rate percentage point change during the breeding season per annum. When considering the most up to date counts of 37,478 breeding adults and an annual background mortality of 3,036 breeding adults, this results in up to a 0.002 survival rate percentage point change during the breeding season per annum (Table 10-201).

Non-Breeding Season

10.3.3.146 During the non-breeding season, the in-combination abundance for gannet is up to 3,448 (2,889.70 - 3,448.31) individuals of Hermaness, Saxa Vord and Valla Field SPA for all projects identified (Applicant Approach presented in Table 10-201). Assuming a displacement rate of 70% and a mortality rate of 1%, the consequent potential mortality is estimated to be 24 (8.67 to 24.14) breeding adults per annum during the non-breeding season.

10.3.3.147 Using the citation colony count of 32,800 breeding adults and an annual background mortality of 2,657 breeding adults, the addition of 25 predicted breeding adult mortalities would result in up to a 0.074 survival rate percentage point change during the non-breeding season per annum. When considering the most up to date counts of 37,478 breeding adults and an annual background mortality of 3,036 breeding adults, this results in up to a 0.064 survival rate percentage point change during the non-breeding season per annum (Table 10-201).

Annual Total

10.3.3.148 The annual total of gannet subject to mortality due to in-combination distributional response at Hermaness, Saxa Vord and Valla Field SPA is estimated to be up to 25 (20.41-24.73) breeding adults per annum depending on the scenarios presented in Table 10-201. This is predicted to result in a survival rate percentage point change against the citation and most recently published counts of up to 0.075 and 0.066, respectively (see Table 10-201).

10.3.3.149 When considering a displacement rate of 70% and a mortality rate of 3% annually, a total of 26 (25.92 and 26.24) breeding adults are predicted to be subject of distributional response effect consequential mortality for all projects identified in-combination. This equates to a survival rate percentage point change against the citation and most recently published counts of up to 0.226 and 0.198, respectively.

10.3.3.150 To note, the removal of Berwick Bank from the assessment reduces predicted mortality to 2 breeding adults per annum (when considering a displacement rate of 70% and mortality rate of 1- 3% annually). Using the citation colony count and most recently published count, this equates to a 0.214 and 0.187 percentage point survival rate change within this population, respectively.

10.3.3.151 As the survival rate percentage point change exceeds NatureScot's threshold of 0.02% when considering both the Applicant and Guidance approach, further consideration of the level of effect predicted has been analysed using PVA (See combined distributional responses and collision risk section for results).

Table 10-202: Gannet O&M phase disturbance annual displacement matrix for all project impacts apportioned to Hermaness, Saxa Vord and Valla Field SPA.

Annual Total	Mortality Rate (%)												
Displacement Rate (%)	1	2	3	5	10	20	30	40	50	60	70	80	90	100
10	4	7	11	18	35	71	106	141	177	212	247	283	318	353
20	7	14	21	35	71	141	212	283	353	424	495	565	636	707
30	11	21	32	53	106	212	318	424	530	636	742	848	954	1,060
40	14	28	42	71	141	283	424	565	707	848	989	1,131	1,272	1,413
50	18	35	53	88	177	353	530	707	883	1,060	1,237	1,413	1,590	1,767
60	21	42	64	106	212	424	636	848	1,060	1,272	1,484	1,696	1,908	2,120
70	25	49	74	124	247	495	742	989	1,237	1,484	1,731	1,978	2,226	2,473
80	28	57	85	141	283	565	848	1,131	1,413	1,696	1,978	2,261	2,544	2,826
90	32	64	95	159	318	636	954	1,272	1,590	1,908	2,226	2,544	2,862	3,180
100	35	71	106	177	353	707	1,060	1,413	1,767	2,120	2,473	2,826	3,180	3,533
Note, outputs highlighted in dark blue represent the predicted annual mortality estimates as per the Guidance Approach and those highlighted in light blue represent the overlapping predicted annual mortality estimates from both the Guidance Approach and Applicant Approach. For further information regarding the Guidance and Applicant Approach see Section 2.5 of Volume 7B, Appendix 6-2: Offshore Ornithology Distributional Responses Technical Report and Volume 7B, Appendix 6-2, Annex 4: Review of Relevant Evidence.														

Collision Risk

10.3.3.152 Projects identified for in-combination collision risk for the gannet feature of Hermaness, Saxa Vord and Valla Field SPA are listed in Table 10-203, with the respective impact predictions for the different seasonal in-combination scenarios presented in Table 10-204.

10.3.3.153 The predicted collisions for planned and operational projects included within Table 10-204, are primarily based on the Northeast and East Scotwind Projects Cumulative totals dataset (excluding as-built updates), with the addition/ update of totals for Culzean (Xodus Group, 2024[156]), Five Estuaries (GoBe, 2024a[137]), Outer Dowsing (GoBe, 2024b[138]), Rampion 2 (APEM, 2023[140]), Ossian (NIRAS and RPS, 2024[141]) and Salamander (ERM, 2024[142]). Since publication of the Northeast and East Scotwind Projects Cumulative totals dataset, a further guidance update has occurred regarding recommended avoidance rate (Joint SNCB, 2024[143]) for gannet. This update has therefore been applied accordingly where appropriate to projects which historically used an avoidance rate of 0.989, to align with the recommendation of an avoidance rate of 0.9929. Additionally, consideration of macro avoidance is also now recommended for gannet (Joint SNCB, 2024[143]) which alleviate the issue of double counting of effects. Macro avoidance has been applied appropriately for all season for English projects and for the non-breeding season only for Scottish projects.

10.3.3.154 To note two approaches are considered for gannet collision risk for the Proposed Development (Offshore), an Applicant Approach which includes a 70% macro avoidance rate applied to all seasons and a Guidance approach which includes a 70% macro avoidance rate to the non-breeding season only. The focus of assessments relates to the Applicant Approach for the Proposed Development (Offshore) only given the minimal difference in impact predictions in-combination. However, impact predictions for the Guidance approach for the Proposed Development (Offshore) in-combination are provided in Table 10-204.

Table 10-203: Gannet in-combination collision totals per season and annually to Hermaness, Saxa Vord and Valla Field SPA.

Development	Predicted Collisions		
	Breeding Season	Non-breeding Season	Total
Aberdeen OWF (EOWDC)	-	0.09	0.09
Beatrice	-	1.06	1.06
Berwick Bank (Scoping Approach)	0.52	0.38	0.89
Blyth Demonstration Site	-	0.11	0.11
Culzean	-	-	-
Dogger Bank A & B	-	2.83	2.83
Dogger Bank C & Sofia	-	0.45	0.45
Dogger Bank South	-	1.17	1.17
Dudgeon	-	1.15	1.15
East Anglia One	-	2.33	2.33
East Anglia ONE North	-	0.21	0.21
East Anglia Three	-	0.81	0.81
East Anglia TWO	-	0.49	0.49
Five Estuaries	-	0.27	0.27
Galloper	-	0.85	0.85
Greater Gabbard	-	0.27	0.27
Green Volt	0.39	0.09	0.47
Gunfleet Sands	-	-	-
Hornsea Four	-	0.12	0.12
Hornsea Project One	-	1.13	1.13
Hornsea Project Two	-	0.39	0.39
Hornsea Three	-	0.19	0.19
Humber Gateway	-	0.06	0.06

Development	Predicted Collisions		
	Breeding Season	Non-breeding Season	Total
Hywind 2 Demonstration	-	0.03	0.03
Inch Cape	-	0.19	0.19
Kentish Flats	-	0.04	0.04
Kentish Flats Extension	-	-	-
Kincardine	-	-	-
Lincs, Lynn & Inner Dowsing	-	0.07	0.07
London Array	-	0.07	0.07
Methil	-	-	-
Moray East	-	0.82	0.82
Moray West	-	0.04	0.04
Neart na Gaoithe	-	0.30	0.30
Norfolk Boreas	-	0.31	0.31
Norfolk Vanguard	-	0.45	0.45
North Falls	-	0.26	0.26
Outer Dowsing	-	0.03	0.03
Pentland Floating OWF	0.10	-	0.10
Race Bank	-	0.30	0.30
Rampion	-	1.11	1.11
Rampion 2	-	0.21	0.21
Scroby Sands	-	-	-
Seagreen Alpha & Bravo	-	0.67	0.67
Sheringham Shoal	-	0.06	0.06
Sheringham Shoal and Dudgeon Extension Project	-	0.06	0.06
Teesside	-	0.03	0.03

Development	Predicted Collisions		
	Breeding Season	Non-breeding Season	Total
Thanet	-		-
Triton Knoll	-	1.86	1.86
Westermost Rough	-	0.01	0.01
Ossian	0.7	0.09	0.79
Salamander	0.01	0.06	0.07
West of Orkney[xxv]	-	0.28	0.28
Caledonia (Guidance approach to macro-avoidance)	0.20	0.06	0.26
Caledonia (Applicant Approach to macro-avoidance)	0.06	0.06	0.12
All Projects (Guidance approach to macro-avoidance)	1.91	21.85	23.77
All Projects (Applicant Approach to macro-avoidance)	1.77	21.85	23.63
All Projects Excl. Berwick Bank (Guidance approach to macro-avoidance)	1.40	21.47	22.87
All Projects Excl. Berwick Bank (Applicant Approach to macro-avoidance)	1.26	21.47	22.73
Consented (plus Caledonia) (Guidance approach to macro-avoidance)	0.69	19.11	19.79
Consented (plus Caledonia) (Applicant Approach to macro-avoidance)	0.55	19.11	19.65

[xxv] These numbers for West of Orkney are subject to change, but have been included to support this assessment on a precautionary basis.

Table 10-204: Seasonal and annual collision risk estimates of gannet for the Proposed Development (Offshore) in-combination with other projects during the operational phase.

Population Size (Breeding Adults)	Defined Season	Estimated Number of Mortalities (Individuals Per Annum)	Change in Average Survival Rate (% Point Change)
All Projects (Guidance approach to macro-avoidance)			
Citation (32,800)	Breeding season (Mid-April to August)	1.91	0.006
	Non-breeding season (September to early-April)	21.85	0.067
	Annual total	23.77	0.072
Latest (37,478)	Breeding season (Mid-April to August)	1.91	0.005
	Non-breeding season (September to early-April)	21.85	0.058
	Annual total	23.77	0.063
All Projects (Applicant Approach to macro-avoidance)			
Citation (32,800)	Breeding season (Mid-April to August)	1.46	0.004
	Non-breeding season (September to early-April)	20.28	0.062
	Annual total	21.74	0.066
Latest (37,478)	Breeding season (Mid-April to August)	1.46	0.004
	Non-breeding season (September to early-April)	20.28	0.054
	Annual total	21.74	0.058
All Projects Excluding Berwick Bank (Guidance approach to macro-avoidance)			
Citation (32,800)	Breeding season (Mid-April to August)	1.40	0.004

Population Size (Breeding Adults)	Defined Season	Estimated Number of Mortalities (Individuals Per Annum)	Change in Average Survival Rate (% Point Change)
	Non-breeding season (September to early-April)	21.47	0.065
	Annual total	22.87	0.070
Latest (37,478)	Breeding season (Mid-April to August)	1.40	0.004
	Non-breeding season (September to early-April)	21.47	0.057
	Annual total	22.87	0.061
All Projects Excluding Berwick Bank (Applicant Approach to macro-avoidance)			
Citation (32,800)	Breeding season (Mid-April to August)	1.46	0.004
	Non-breeding season (September to early-April)	19.82	0.062
	Annual total	21.28	0.065
Latest (37,478)	Breeding season (Mid-April to August)	1.46	0.004
	Non-breeding season (September to early-April)	19.82	0.053
	Annual total	21.28	0.057
All Consented Projects plus Caledonia (Guidance approach to macro-avoidance)			
Citation (32,800)	Breeding season (Mid-April to August)	0.69	0.006
	Non-breeding season (September to early-April)	19.11	0.067
	Annual total	19.79	0.073
Latest (37,478)	Breeding season (Mid-April to August)	0.69	0.005

Population Size (Breeding Adults)	Defined Season	Estimated Number of Mortalities (Individuals Per Annum)	Change in Average Survival Rate (% Point Change)
	Non-breeding season (September to early-April)	19.11	0.058
	Annual total	19.79	0.064
All Consented Projects plus Caledonia (Applicant Approach to macro-avoidance)			
Citation (32,800)	Breeding season (Mid-April to August)	1.26	0.004
	Non-breeding season (September to early-April)	16.44	0.050
	Annual total	17.69	0.054
Latest (37,478)	Breeding season (Mid-April to August)	1.26	0.003
	Non-breeding season (September to early-April)	16.44	0.044
	Annual total	17.69	0.047

Breeding Season

10.3.3.155 During the breeding season, up to one (1.26 - 1.46) gannets of the Hermaness, Saxa Vord and Valla Field SPA are predicted to be subject to collision mortality per annum, when considering all projects in-combination (Applicant Approach) presented in Table 10-203.

10.3.3.156 Using the citation colony count of 32,800 breeding adults and an annual background mortality of 2,657 breeding adults, the addition of one predicted breeding adult mortalities would result in up to a 0.004 survival rate percentage point change during the non-breeding season per annum. When considering the most up to date counts of 37,478 breeding adults and an annual background mortality of 3,036 breeding adults, this results in up to a 0.004 survival rate percentage point change during the breeding season per annum (Table 10-204).

Non-Breeding Season

10.3.3.157 During the non-breeding season, up to 22 (21.85) gannets of the Hermaness, Saxa Vord and Valla Field SPA are predicted to be subject to collision mortality per annum, when considering all projects in-combination (Applicant Approach) presented in Table 10-203.

10.3.3.158 Using the citation colony count of 32,800 breeding adults and an annual background mortality of 2,657 breeding adults, the addition of 22 predicted breeding adult mortalities would result in up to a 0.062 survival rate percentage point change during the non-breeding season per annum. When considering the most up to date counts of 37,478 breeding adults and an annual background mortality of 3,036 breeding adults, this results in up to a 0.054 survival rate percentage point change during the breeding season per annum (Table 10-204).

Annual Total

10.3.3.159 The annual total of gannet subject to mortality due to collision at Hermaness, Saxa Vord and Valla Field SPA is estimated to up to 22 (21.74) breeding adults per annum for all projects identified in-combination (Applicant Approach). This is predicted to result in a survival rate percentage point change against the citation and most recently published counts of up to 0.066 and 0.058, respectively (see Table 10-204).

10.3.3.160 To note, the removal of Berwick Bank from the assessment reduces predicted mortality to 21 (21.47) breeding adults per annum. Using the citation colony count and most recently published count, this equates to a 0.065 and 0.057 percentage point survival rate change within this population respectively.

10.3.3.161 As the survival rate percentage point change exceeds NatureScot's threshold of 0.02% when considering both the Applicant and Guidance approach to macro-avoidance, further consideration of the level of effect predicted has been analysed using PVA (See combined distributional responses and collision risk section for results).

Combined Distributional Response and Collision Risk Impact

10.3.3.162 In-combination combined distributional response and collision risk impact predictions are presented in Table 10-205 (Applicant Approach to macro-avoidance) and Table 10-206 (Guidance approach to macro-avoidance) for the gannet feature of Hermaness, Saxa Vord and Valla Field SPA.

Table 10-205: Seasonal and annual distributional responses and collision risk estimates of gannet for the Proposed Development (Offshore) in-combination with other projects during the operational phase, for both the Applicant Approach to macro-avoidance applied to the Proposed Development (Offshore).

Population Size (Breeding Adults)	Defined Season (Months)	Applicant Approach 70% displacement; 1 % mortality		Guidance Approach 70% Displacement; 1-3% Mortality	
		Estimated number of mortalities from combined CRM and Distributional responses per annum	Change in Average Survival Rate (% Point Change)	Estimated number of mortalities from combined CRM and Distributional responses per annum	Change in Average Survival Rate (% Point Change)
All Projects					
Citation (32,800)	Breeding season (Mid-March to September)	2.05	0.006	2.05 – 3.24	0.006 – 0.010
	Non-breeding season (October to Early-March)	44.42	0.135	44.42 - 92.69	0.135 – 0.283
	Annual	46.47	0.142	46.47 - 95.93	0.142 – 0.292
Latest count (37,478)	Breeding season (Mid-March to September)	2.05	0.005	2.05 – 3.24	0.005 – 0.009
	Non-breeding season (October to Early-March)	44.42	0.119	44.42 - 92.69	0.119 – 0.247
	Annual	46.47	0.124	46.47 - 95.93	0.124 – 0.256

Population Size (Breeding Adults)	Defined Season (Months)	Applicant Approach 70% displacement; 1 % mortality		Guidance Approach 70% Displacement; 1-3% Mortality	
		Estimated number of mortalities from combined CRM and Distributional responses per annum	Change in Average Survival Rate (% Point Change)	Estimated number of mortalities from combined CRM and Distributional responses per annum	Change in Average Survival Rate (% Point Change)
All Projects Excluding Berwick Bank					
Citation (32,800)	Breeding season (Mid-March to September)	1.85	0.006	1.85 - 2.64	0.006 – 0.008
	Non-breeding season (October to Early-March)	42.81	0.131	42.81 - 88.77	0.131 – 0.271
	Annual	44.66	0.136	44.66 - 91.41	0.136 – 0.279
Latest count (37,478)	Breeding season (Mid-March to September)	1.85	0.005	1.79 – 2.58	0.005 – 0.007
	Non-breeding season (October to Early-March)	42.81	0.114	44.46 – 90.42	0.114 – 0.237
	Annual	44.66	0.119	46.25 – 93.00	0.119 – 0.244
All Consented Projects plus Caledonia					
Citation (32,800)	Breeding season (Mid-March to September)	1.44	0.004	1.44 - 1.81	0.004 – 0.006

Population Size (Breeding Adults)	Defined Season (Months)	Applicant Approach 70% displacement; 1 % mortality		Guidance Approach 70% Displacement; 1-3% Mortality	
		Estimated number of mortalities from combined CRM and Distributional responses per annum	Change in Average Survival Rate (% Point Change)	Estimated number of mortalities from combined CRM and Distributional responses per annum	Change in Average Survival Rate (% Point Change)
	Non-breeding season (October to Early-March)	36.66	0.112	36.66 - 77.12	0.112 – 0.235
	Annual	38.11	0.116	38.11 - 78.93	0.116 – 0.241
Latest count (37,478)	Breeding season (Mid-March to September)	1.44	0.004	1.44 - 1.81	0.004 – 0.005
	Non-breeding season (October to Early-March)	36.66	0.098	36.66 - 77.12	0.098 – 0.206
	Annual	38.11	0.102	38.11 - 78.93	0.102 – 0.211

Table 10-206: Seasonal and annual displacement and collision risk estimates of gannet for the Proposed Development (Offshore) in-combination with other projects during the operational phase, for the Guidance Approach to macro-avoidance applied to the Proposed Development (Offshore)

Population Size (Breeding Adults)	Defined Season (Months)	Applicant Approach 70% Displacement; 1% Mortality		Guidance Approach 70% Displacement; 1-3% Mortality	
		Estimated number of mortalities from combined CRM and Distributional responses per annum	Change in Average Survival Rate (% Point Change)	Estimated number of mortalities from combined CRM and Distributional responses per annum	Change in Average Survival Rate (% Point Change)
All Projects					
Citation (32,800)	Breeding season (Mid-March to September)	2.51	0.008	2.51 – 3.69	0.008 – 0.011
	Non-breeding season (October to Early-March)	45.99	0.140	45.99 – 94.27	0.140 – 0.287
	Annual	48.50	0.148	48.50 – 97.96	0.148 – 0.299
Latest count (37,478)	Breeding season (Mid-March to September)	2.51	0.007	2.51 – 3.69	0.007 – 0.010
	Non-breeding season (October to Early-March)	45.99	0.123	45.99 – 94.27	0.123 – 0.241
	Annual	48.50	0.129	48.50 – 97.96	0.129 – 0.261

Population Size (Breeding Adults)	Defined Season (Months)	Applicant Approach 70% Displacement; 1% Mortality		Guidance Approach 70% Displacement; 1-3% Mortality	
		Estimated number of mortalities from combined CRM and Distributional responses per annum	Change in Average Survival Rate (% Point Change)	Estimated number of mortalities from combined CRM and Distributional responses per annum	Change in Average Survival Rate (% Point Change)
All Projects Excluding Berwick Bank					
Citation (32,800)	Breeding season (Mid-March to September)	1.79	0.005	1.79 – 2.58	0.005 – 0.008
	Non-breeding season (October to Early-March)	44.46	0.131 – 0.271	44.46 – 90.42	0.092 – 0.276
	Annual	46.25	0.136 – 0.279	46.25 – 93.00	0.097
Latest count (37,478)	Breeding season (Mid-March to September)	1.79	0.005	1.79 – 2.58	0.005 – 0.007
	Non-breeding season (October to Early-March)	44.46	0.119	44.46 – 90.42	0.119 – 0.241
	Annual	46.25	0.123	46.25 – 93.00	0.123 – 0.248
All Consented Projects plus Caledonia					
Citation (32,800)	Breeding season (Mid-March to September)	0.87	0.003	0.87 – 1.24	0.003 – 0.004

Population Size (Breeding Adults)	Defined Season (Months)	Applicant Approach 70% Displacement; 1% Mortality		Guidance Approach 70% Displacement; 1-3% Mortality	
		Estimated number of mortalities from combined CRM and Distributional responses per annum	Change in Average Survival Rate (% Point Change)	Estimated number of mortalities from combined CRM and Distributional responses per annum	Change in Average Survival Rate (% Point Change)
	Non-breeding season (October to Early-March)	39.33	0.120	39.33 – 79.79	0.120 – 0.243
	Annual	40.21	0.123	40.21 – 81.03	0.123 – 0.247
Latest count (37,478)	Breeding season (Mid-March to September)	0.87	0.002	0.87 – 1.24	0.002 – 0.003
	Non-breeding season (October to Early-March)	39.33	0.105	39.33 – 79.79	0.105 – 0.213
	Annual	40.21	0.107	40.21 – 81.03	0.107 – 0.216

10.3.3.163 As presented in Table 10-205 and Table 10-206, for all combined in-combination collision risk and distributional response scenarios considered, the percentage point change in survival rate exceeded the 0.02 threshold as set by NatureScot, PVA has therefore been completed for these scenarios to further consider such a level of effect.

Population Viability Analysis

10.3.3.164 When considering such predicted reductions in annual growth rate presented in Table 10-208 and Table 10-209, it is important to consider the known colony growth trend to understand the colony's resilience. The known population sizes and annual compound growth rates for the gannet feature of Hermaness, Saxa Vord and Valla Field SPA are presented in Table 10-208 based on the latest seabird census report (Burnell *et al*., 2023[86]) and SMP database (SMP, 2024[152]). The compound growth rates presented would suggest the colony in the long term has been on a stable increase in population size since 1999 (citation count), though will minor fluctuations in size. Similar to Forth Islands SPA, the Hermaness, Saxa Vord and Valla Field SPA gannetry has also been significantly impacted by the recent HPAI outbreak with approximately 37% reduction in population size between the 2013 and 2023 count (Table 10-207). No count is currently available for 2024, though counts for other gannetries significantly impacted by HPAI have reported significant increases in numbers in contrast to 2022 (SMP, 2024[152]). Additionally, only two confirmed cases of HPAI between 1st October to 28th March 2024 (DEFRA, 2022[153]), suggesting limited current and future effect from the virus.

10.3.3.165 However, despite the effects of HPAI only a minimal reduction in the growth rate of at most 0.30% (Table 10-205 and Table 10-206) is predicted annually when considering the Guidance approach upper range of effect. Even when accounting for the long-term growth trend inclusive of the effect of HPAI (1999 – 2023 with a growth rate of 0.56% per annum; Table 10-205 and Table 10-206), the colony is still predicted to maintain a positive growth trend. **The potential for an AEoSI can therefore be confidently ruled out in relation to potential effects of collision risk, distributional responses and combined effects in-combination for the Proposed Development with other plans and projects. Subject to natural change, gannet will be maintained as a feature in the long term**.

Table 10-207: Annual compound growth rates for Hermaness, Saxa Vord and Valla Field SPA gannet feature for the years of 1999 – 2023 based on Burnell *et al.*, (2023[86]) and SMP database (SPM, 2024[152])

Years	Population Size (Breeding Adults)	Colony Annual Compound Growth Rate (%)
1999 – 2023	32,800 – 37,478	0.56%
1999 - 2013	32,800 – 59,124	4.30%
2003 - 2013	31,266 - 59,124	6.58%
2013 - 2023	59,124 - 37,478	-4.46%

Table 10-208: PVA results for the gannet feature of Hermaness, Saxa Vord and Valla Field SPA when considering combined distributional response and collision risk effects for the Proposed Development (Offshore) alone and in-combination (Guidance Approach to macro-avoidance*).

Scenario	Season	Predicted Mortality	Median Growth rate (±SD)	Median Pop. Size (±SD)	Decrease in CGR per annum (%)	Decrease in CPS after 35 years (%)
In-combination all consented projects plus Caledonia OWF						
Applicant (70%, 1%)	Non-breeding	39.33	0.999 (<0.001)	0.956 (0.017)	0.125	4.427
	Annual Total	40.21	0.997 (<0.001)	0.955 (0.016)	0.129	4.54
Guidance (70%, 1-3%)	Non-breeding	39.33 - 79.79	0.999 (<0.001)	0.913 – 0.956 (0.017 - 0.016)	0.125 -0.253	4.427 - 8.719
	Annual Total	40.21 - 81.03	0.997 (<0.001)	0.912 – 0.955 (0.016)	0.129 - 0.255	4.540 - 8.799
In-combination all projects plus Caledonia OWF						
Applicant (70%, 1%)	Non-breeding	45.99	0.999 (<0.001)	0.949 (0.017)	0.145	5.087
	Annual Total	48.5	0.999 (<0.001)	0.947 (0.017)	0.299	10.183
Guidance (70%, 1-3%)	Non-breeding	45.99 - 94.27	0.998 - 0.999 (<0.001)	0.949 - 0.898 (0.017 - 0.016)	0.153 – 0.145	5.337 – 5.087
	Annual Total	48.50 - 97.96	0.998 - 0.999 (<0.001)	0.947 - 0.895 (0.017 - 0.016)	0.309 - 0.299	10.535 – 10.183
In-combination all projects minus Berwick Bank plus Caledonia OWF						
Applicant (70%, 1%)	Non-breeding	44.46	0.999 (<0.001)	0.951 (0.017)	0.14	4.901
	Annual Total	46.25	0.999 (<0.001)	0.949 (0.017)	0.146	5.106

Scenario	Season	Predicted Mortality	Median Growth rate (±SD)	Median Pop. Size (±SD)	Decrease in CGR per annum (%)	Decrease in CPS after 35 years (%)
Guidance (70%, 1-3%)	Non-breeding	44.46 - 90.42	0.997 - 0.997 (<0.001)	0.902 – 0.951(0.017 - 0.016)	0.140 0.286	4.901 - 9.805
	Annual Total	46.25 - 93.00	0.997 - 0.999 (<0.001)	0.900 (0.017) – 0.949 (0.016)	0.146 - 0.294	5.106 - 10.043
* Note, this table presents the Guidance Approach a macro-avoidance rate of 70% has been applied to gannet densities during the non-breeding season, whereas during the breeding season the monthly in-flight densities have not been adjusted for macro-avoidance (further details are provided in Volume 2, Chapter 6: Offshore Ornithology).						

Table 10-209. PVA results for the gannet feature of Hermaness, Saxa Vord and Valla Field SPA when considering combined distributional response and collison risk effects for the Proposed Development (Offshore) alone and in-combination (Applicant Approach to macro-avoidance*).

Scenario	Season	Predicted Mortality	Median Growth rate (±SD)	Median Pop. Size (±SD)	Decrease in CGR per annum (%)	Decrease in CPS after 35 years (%)
In-combination all consented projects plus Caledonia OWF						
Applicant (70%, 1%)	Non-breeding	36.66	0.999 (<0.001)	0.959 (0.017)	0.115	4.052
	Annual Total	38.11	0.999 (<0.001)	0.958 (0.017)	0.120	4.214
Guidance (70%, 1-3%)	Non-breeding	36.66 - 77.12	0.999 (<0.001)	0.959 - 0.916 (0.017 - 0.016)	0.115 - 0.244	4.052 - 8.417
	Annual Total	38.11 - 78.93	0.999 - 0.998 (<0.001)	0.958 - 0.914 (0.017 - 0.016)	0.120 - 0.246	4.214 - 8.556
In-combination all projects plus Caledonia OWF						
Applicant (70%, 1%)	Non-breeding	44.42	0.999 (<0.001)	0.951 (0.016)	0.140	4.931
	Annual Total	46.47	0.999 (<0.001)	0.948 (0.016)	0.148	5.182
Guidance (70%, 1-3%)	Non-breeding	44.42 - 92.69	0.999 - 0.997 (<0.001)	0.951 - 0.899 (0.016)	0.140 - 0.293	4.931 - 10.054
	Annual Total	46.47 - 95.93	0.999 - 0.997 (<0.001)	0.948 - 0.897 (0.016 - 0.015)	0.148 - 0.304	5.182 - 10.347
In-combination all projects excluding Berwick Bank plus Caledonia OWF						
Applicant (70%, 1%)	Non-breeding	42.81	0.999 (<0.001)	0.953 (0.017)	0.135	4.736
	Annual Total	44.66	0.999 (<0.001)	0.951 (0.017)	0.140	4.892

Scenario	Season	Predicted Mortality	Median Growth rate (±SD)	Median Pop. Size (±SD)	Decrease in CGR per annum (%)	Decrease in CPS after 35 years (%)
SMP-Guidance (70%, 1-3%)	Non-breeding	42.81 - 88.77	0.999 - 0.997 (<0.001)	0.953 - 0.904 (0.017 - 0.016)	0.135 - 0.248	4.736 - 9.628
	Annual Total	44.66 - 91.41	0.999 - 0.997 (<0.001)	0.951 - 0.901 (0.017 - 0.016)	0.140 - 0.288	4.892 - 9.852

* Note, this table presents the Applicant Approach a macro-avoidance rate of 70% has been applied to all months (further details are provided in Volume 2, Chapter 6: Offshore Ornithology).

Conclusion of Assessment of Offshore and Intertidal Ornithology from the Proposed Development (Offshore) In-combination

10.3.3.166 **Forty designated sites were identified to have a potential for LSE from the Proposed Development (Offshore), covering 36 species, Section 10.1.1. Alone assessments were undertaken for several effects collision risk, distributional responses and migratory collision risk resulting from the Proposed Development (Offshore). Considering the conclusions of the Proposed Development (Offshore) alone assessment, 13 designated sites were identified to have a potential tangible contribution in-combination with other plans and projects.**

10.3.3.167 **Of the 13 sites assessed in-combination with other plans and projects, five sites have concluded AEoSI including:**

- **East Caithness Cliffs SPA for guillemot and kittiwake;**
- **Forth Islands SPA for gannet;**
- **Sule Skerry and Sule Stack SPA for puffin;**
- **Buchan Ness to Collieston Coast SPA for kittiwake; and**
- **Troup, Pennan and Lion's Head SPA for kittiwake.**

10.3.4 Migratory Fish

10.3.4.1 The potential for LSE from the Proposed Development (Offshore) alone with regard to migratory fish is summarised in Section 10.2.4, with the in-combination assessment presented below.

10.3.4.2 As stated within Section 10.2.4, sites with where no potential for LSE alone was concluded are still considered for assessment in-combination apart from where no pathway for effect exists. On this basis the only sites assessed in-combination here is the River Thurso SAC, Berriedale and Langwell Waters SAC and River Spey SAC.

10.3.4.3 Information to inform the Proposed Development (Offshore) alone assessment of AEoSI for migratory fish is provided in Section 10.2.4, which assesses impacts on designated features associated with the sites screened in for migratory fish during construction, O&M and decommissioning. Table 10-5 lists the projects and plans which have been identified for this in-combination assessment for migratory fish. These can be summarised into four main types of projects:

- OWFs – both planned and consented;
- Aggregate and disposal areas;
- Oil and gas platforms; and
- Cable projects.

10.3.4.4 The impacts that are considered in the in-combination assessment are as follows:

- Underwater noise; and
- EMF.

10.3.4.5 As with the Proposed Development (Offshore) alone assessment presented in Section 10.2.4, the in-combination assessment for migratory fish assesses whether the impacts listed above have the potential to prevent the conservation objectives of the relevant designated sites being met. However, for brevity, the conservation objectives are not repeated.

10.3.4.6 The in-combination assessment for migratory fish has been determined based on the plans and projects described where there is potential for any phase of such projects to have temporal or spatial overlap with that of the Proposed Development (Offshore), and there is a potential for the effects screened in to occur from the project. No information is currently available regarding oil and gas seismic surveys so they have not been included further within this assessment. Similarly, CCS projects are not considered for underwater noise given the nature of the projects.

10.3.4.7 For clarity, a ZoI has been applied to screen in relevant offshore projects. The ZoI for migratory fish is 100km from the designated sites.

10.3.4.8 The assessment presented here draws on the cumulative assessments presented in Volume 2, Chapter 5: Fish and Shellfish Ecology.

10.3.4.9 For a project to be screened in for the in-combination assessment, there needs to be potential for relevant works to occur within the same timeframe as relevant works at the Proposed Development (Offshore). Each project has been considered on the basis of effect–receptor pathway, data confidence and the temporal and spatial scales involved.

10.3.4.10 The time period considered for the migratory fish assessment is 2027-2034 inclusive. This allows for the quantification of impacts both prior to the construction of the Proposed Development (Offshore) (since the baseline was collated) and during the period when piling at the Proposed Development (Offshore) is anticipated in between 2028 and 2032. The impact window has been extended to include 2033 to allow for any impacts potentially associated with other construction activities at Proposed Development (Offshore) and the Caledonia OECC that may act in-combination with piling at the Proposed Development (Offshore).

10.3.4.11 Where possible for each project, information on the expected impacts on migratory fish features of the relevant designated sites have been collated and used to inform the in-combination assessment presented below.

River Thurso SAC

10.3.4.12 The feature screened in for assessment for the River Thurso SAC is Atlantic Salmon, and the conservation objectives are the same as those presented for the Proposed Development (Offshore) alone.

Construction and Decommissioning

Underwater Noise

10.3.4.13 Of the projects identified in Table 10-5, those with the potential for an in-combination effect with the Proposed Development (Offshore) with respect to underwater noise are limited to those with potential for a temporal overlap of the construction phases (specifically piling or, if known, UXO or seismic surveys).

10.3.4.14 Timeframes for decommissioning are not certain for most projects and therefore an assessment of the potential for an in-combination effect during decommissioning cannot be made at this time. However, it can be concluded that the potential for an effect during the decommissioning phase would be less than that during construction and would in any case be assessed in line with the regulatory requirements at the time.

10.3.4.15 As highlighted in the assessment of AEoSI for the Proposed Development (Offshore) alone, there are a number of potential sources of underwater noise associated with the construction of an OWF. Comment on these for the purposes of the in-combination assessment is provided below:

- Percussive piling – to be carried through to the assessment for projects screened in in-combination;
- UXO clearance – planned and licensed UXO activity associated with projects screened in is included (where that information is in the public domain); and
- Geophysical and seismic survey - planned geophysical/seismic survey included within the screening range (where that information is in the public domain).

10.3.4.16 The potential for underwater noise to result during construction of the Proposed Development (Offshore), together with the sensitivity of Atlantic salmon to such noise, has been discussed in Section 10.2.4 as part of the alone assessment, with that information not repeated here.

10.3.4.17 It is considered that assessing underwater noise in-combination impacts on Atlantic salmon within 100km of the Proposed Development (Offshore) is considered a highly precautionary buffer upon which to include projects within the area. However, if in-combination effects on Atlantic Salmon were to occur, the activities presenting the highest risk are pile driving activities during the construction phase of OWFs. Specifically, based on the screening range and the timeline of projects this would include the following projects (tiers applied as per Table 10-2):

- Moray West OWF (Tier 1);
- Ayre OWF (Tier 3);
- Pentland OWF (Tier 1);
- Stromar OWF (Tier 2); and
- West of Orkney (Tier 1).

10.3.4.18 It is considered that in-combination risks of mortality or potential mortal injury or recoverable injury of Atlantic Salmon from piling noise would not be expected to occur as a result of the Proposed Development (Offshore) and the projects listed above due to the small range within which potential injury effects would be expected (specifically, predicted to occur within <100m of piling activity). Given that the distances between the OWF projects are larger than the mortality and injurious impact ranges from piling (the closest project, Moray West, is approximately 14km away), there is no overlap of injurious impacts considered. Due to the small impact ranges for mortality or injurious impacts, it is reasonable to conclude that very low numbers of Atlantic salmon that would be associated with the site will be exposed to the impact even when at sea, including as a result of in-combination effects. Therefore, in-combination risks of injurious impacts are not expected to manifest at levels that could compromise the extent, distribution, structure, and function of the habitats, structure and function of the species, supporting processes, or the population and distribution of the species.

10.3.4.19 With respect to TTS impacts, it is considered that in-combination risks from piling noise would not be expected to occur as a result of the Proposed Development (Offshore) and the projects listed above due to the range within which potential injury effects would be expected. However Atlantic salmon are anticipated to be transient across the site, and therefore any temporal impacts on these receptors are anticipated to be minimal. In late spring to early summer, adult Atlantic salmon return to rivers to spawn, whilst juvenile salmon migrate out to sea to feed. As there are no rivers associated with migrating Atlantic salmon within the impact zone, there is no potential for the underwater noise to result in a barrier to migration. It is reasonable to conclude that very low numbers of Atlantic salmon that would be associated with the site will be exposed to the impact even when at sea, including as a result of in-combination effects. Therefore, in-combination risks of injurious impacts are not expected to manifest at levels that could compromise the extent, distribution, structure, and function of the habitats, structure and function of the species, supporting processes, or the population and distribution of the species.

10.3.4.20 With regard to the in-combination behavioural effects associated with underwater noise as a result of the identified projects and the Proposed Development (Offshore), the assessment considers all phases of the projects that overlap either temporally or spatially with the proposed works. As with the alone assessment for Atlantic Salmon presented in Section 10.20, the in-combination assessment of whether behavioural changes could cause an AEoSI on the River Thurso SAC focuses on whether in-combination impacts could compromise the maintenance of the size of the site-specific salmon populations.

10.3.4.21 Behavioural effects on Atlantic salmon as a result of piling noise are predicted to be dependent on the nature of the receptors, with larger impact ranges predicted for fish with a swim bladder compared to those without. Atlantic salmon do not use their swim bladder as part of their hearing system and are not considered to have high sensitivity to underwater noise, and therefore behavioural effects are anticipated to be limited. Between piling events, fish may resume normal behaviour and distribution, as evidenced by work of McCauley *et al*. (2000[157]) which showed that fish returned to normal behavioural patterns within 14 to 30 minutes after the cessation of seismic airgun firing. Therefore, due to the long distances between projects, and between projects and the site, alongside the reduced sensitivity of the species, the noted behavioural response, and recovery from noise impacts, it is considered that in-combination behavioural impacts are not expected to manifest at levels that could compromise the extent, distribution, structure, and function of the habitats, structure and function of the species, supporting processes, or the population and distribution of the species.

10.3.4.22 **Therefore, it is concluded that there is no AEoSI to the conservation objectives for the River Thurso SAC from the Proposed Development (Offshore) in-combination with identified plans and projects and therefore, subject to natural change, the populations of Atlantic Salmon will be maintained in the long-term with respect to underwater noise associated with the construction and decommissioning phase.**

O&M

EMF

10.3.4.23 There is potential for in-combination impacts arising from EMF as a result of operation activities associated with the Proposed Development (Offshore) and other projects. As determined by Volume 2, Chapter 5: Fish and Shellfish Ecology, the projects that have the potential to contribute to in-combination impacts arising from EMF includes OWF projects within the 10km secondary ZoI (array area/OECC from other projects).

10.3.4.24 There is direct overlap from both the Moray East and Morray West OECC with the Caledonia OECC, leading to potential in-combination impacts arising from EMF. These impacts could include barrier effects for electro sensitive, migratory species such as Atlantic salmon associated with the River Thurso SAC.

10.3.4.25 Despite EMF being emitted throughout the life cycle of the Proposed Development (Offshore), measures will be implemented to mitigate exposure to EMF emissions from the Proposed Development (Offshore). These measures will include cable burial and/or the implementation of cable protection measures. These actions will be carried out in accordance with management plans, including the Cable and Pipeline (CaP) plan, to reduce the impact of EMF emissions on surrounding environments and organisms. In instances where cables cannot be buried, as such with inter-array cables between FWTG, measures can be put in place such as cables being monitored regularly for wear and tear.

10.3.4.26 Therefore, the potential impact of EMF is very spatially limited, which combined with the transient nature of the Atlantic Salmon associated with the River Thurso SAC means that any potential effect is not considered likely to occur. **Therefore, it is concluded that there is no AEoSI to the conservation objectives for the River Thurso SAC from the Proposed Development (Offshore) in-combination with identified plans and projects and therefore, subject to natural change, the populations of Atlantic Salmon will be maintained in the long-term with respect to EMF associated with the O&M phase.**

Berriedale and Langwell Waters SAC

10.3.4.27 The feature screened in for assessment for the Berriedale and Langwell Waters SAC is Atlantic Salmon, and the conservation objectives are the same as those presented for the Proposed Development (Offshore) alone.

10.3.4.28 The same projects as considered for the River Thurso SAC have been considered for the Berriedale and Langwell Waters SAC. Given the spatial extents considered for the identified effects and the ranges between the designated site and the projects considered in-combination, it is considered that no effects are expected to manifest at levels that could compromise the extent, distribution, structure, and function of the habitats, structure and function of the species, supporting processes, or the population and distribution of the species.

10.3.4.29 **Therefore, it is concluded that there is no AEoSI to the conservation objectives for the Berriedale and Langwell Waters SAC from the Proposed Development (Offshore) in-combination with identified plans and projects and therefore, subject to natural change, the populations of Atlantic Salmon will be maintained in the long-term with respect to underwater noise associated with the construction and decommissioning phase, and EMF associated with the O&M phase**.

River Spey SAC

10.3.4.30 The feature screened in for assessment for the River Spey SAC is Atlantic Salmon, sea lamprey, and FWPM and the conservation objectives are the same as those presented for the Proposed Development (Offshore) alone.

Atlantic Salmon

10.3.4.31 The same projects as considered for the River Thurso SAC have been considered for the Spey SAC. Given the spatial extents considered for the identified effects and the ranges between the designated site and the projects considered in-combination, it is considered that no effects are expected to manifest at levels that could compromise the extent, distribution, structure, and function of the habitats, structure and function of the species, supporting processes, or the population and distribution of the species.

10.3.4.32 **Therefore, it is concluded that there is no AEoSI to the conservation objectives for the River Spey SAC from the Proposed Development (Offshore) in-combination with identified plans and projects and therefore, subject to natural change, the populations of Atlantic Salmon will be maintained in the long-term with respect to underwater noise associated with the construction and decommissioning phase, and EMF associated with the O&M phase.**

Sea Lamprey

Construction and Decommissioning

Underwater Noise

10.3.4.33 Of the projects identified in Table 10-5 above, those with the potential for an in-combination effect with the Proposed Development (Offshore) with respect to underwater noise are limited to those with potential for a temporal overlap of the construction phases (specifically piling or, if known, UXO or seismic surveys).

10.3.4.34 Timeframes for decommissioning are not certain for most projects and therefore an assessment of the potential for an in-combination effect during decommissioning cannot be made at this time. However, it can be concluded that the potential for an effect during the decommissioning phase would be less than that during construction and would in any case be assessed in line with the regulatory requirements at the time.

10.3.4.35 As highlighted in the assessment of AEoSI for the Proposed Development (Offshore) alone, there are a number of potential sources of underwater noise associated with the construction of an OWF. Comment on these for the purposes of the in-combination assessment is provided below:

- Percussive piling – to be carried through to the assessment for projects screened in in-combination; UXO clearance – planned and licensed UXO activity associated with projects screened in is included (where that information is in the public domain); and Geophysical and seismic survey - planned geophysical/seismic survey included within the screening range (where that information is in the public domain).

10.3.4.36 The potential for underwater noise to result during construction of the Proposed Development (Offshore), together with the sensitivity of Atlantic salmon to such noise, has been discussed in Section 10.2.4 as part of the alone assessment, with that information not repeated here.

10.3.4.37 It is considered that assessing underwater noise in-combination impacts on Atlantic salmon within 100km of the Proposed Development (Offshore) is considered a highly precautionary buffer upon which to include projects within the area. However, if in-combination effects on sea lamprey were to occur, the activities presenting the highest risk are pile driving activities during the construction phase of OWFs. Specifically, based on the screening range and the timeline of projects this would include the following projects (tiers applied as per Table 10-2):

- Ayre OWF (Tier 3);
- Pentland OWF (Tier 1);
- Stromar OWF (Tier 2); and
- West of Orkney (Tier 1).

10.3.4.38 It is considered that in-combination risks of mortality or potential mortal injury or recoverable injury of sea lamprey from piling noise would not be expected to occur as a result of the Proposed Development (Offshore) and the projects listed above due to the small range within which potential injury effects would be expected (specifically, predicted to occur within <100m of piling activity). Given that the distances between the OWF projects are larger than the mortality and injurious impact ranges from piling (the closest project, Moray West, is approximately 14km away), there is no overlap of injurious impacts considered. Due to the small impact ranges for mortality or injurious impacts, it is reasonable to conclude that very low numbers of sea lamprey that would be associated with the site will be exposed to the impact even when at sea, including as a result of in-combination effects. Therefore, in-combination risks of injurious impacts are not expected to manifest at levels that could compromise the extent, distribution, structure, and function of the habitats, structure and function of the species, supporting processes, or the population and distribution of the species.

10.3.4.39 With respect to TTS impacts, it is considered that in-combination risks from piling noise would not be expected to occur as a result of the Proposed Development (Offshore) and the projects listed above due to the range within which potential injury effects would be expected. However, sea lamprey are both Group 1 species and therefore not sensitive to underwater noise, and anticipated to be transient across the site, and therefore any temporal impacts on these receptors are anticipated to be minimal. It is reasonable to conclude that very low numbers of sea lamprey that would be associated with the site will be exposed to the impact even when at sea, including as a result of in-combination effects. Therefore, in-combination risks of injurious impacts are not expected to manifest at levels that could compromise the extent, distribution, structure, and function of the habitats, structure and function of the species, supporting processes, or the population and distribution of the species.

10.3.4.40 With regard to the in-combination behavioural effects associated with underwater noise as a result of the identified projects and the Proposed Development (Offshore), the assessment considers all phases of the projects that overlap either temporally or spatially with the proposed works. As with the alone assessment for sea lamprey presented in Section 10.2.4, the in-combination assessment of whether behavioural changes could cause an AEoSI on the River Spey SAC focuses on whether in-combination impacts could compromise the maintenance of the size of the site-specific lamprey populations.

10.3.4.41 Behavioural effects on sea lamprey as a result of piling noise are predicted to be dependent on the nature of the receptors, with larger impact ranges predicted for fish with a swim bladder compared to those without. Sea lamprey are Group 1 species and are not considered sensitive to underwater noise, and therefore behavioural effects are anticipated to be limited. Between piling events, fish may resume normal behaviour and distribution, as evidenced by work of McCauley *et al.* (2000[157]) which showed that fish returned to normal behavioural patterns within 14 to 30 minutes after the cessation of seismic airgun firing. Therefore, due to the long distances between projects, and between projects and the site, alongside the reduced sensitivity of the species, the noted behavioural response, and recovery from noise impacts, it is considered that in-combination behavioural impacts are not expected to manifest at levels that could compromise the extent, distribution, structure, and function of the habitats, structure and function of the species, supporting processes, or the population and distribution of the species.

10.3.4.42 **Therefore, it is concluded that there is no AEoSI to the conservation objectives for the River Spey SAC from the Proposed Development (Offshore) in-combination with identified plans and projects and therefore, subject to natural change, the populations of sea lamprey will be maintained in the long-term with respect to underwater noise associated with the construction and decommissioning phase.**

O&M

EMF

10.3.4.43 There is potential for in-combination impacts arising from EMF as a result of operation activities associated with the Proposed Development (Offshore) and other projects. As determined by Volume 2, Chapter 5: Fish and Shellfish Ecology, the projects that have the potential to contribute to in-combination impacts arising from EMF includes OWF projects within the 10km secondary ZoI (array area/OECC from other projects).

10.3.4.44 There is direct overlap from both the Moray East and Morray West OECC with the Caledonia OECC, leading to potential in-combination impacts arising from EMF. Despite EMF being emitted throughout the life cycle of the Proposed Development (Offshore), measures will be implemented to mitigate exposure to EMF emissions from it. These measures will include cable burial and/or the implementation of cable protection measures. These actions will be carried out in accordance with management plans, including the Cable and Pipeline (CaP) plan, to reduce the impact of EMF emissions on surrounding environments and organisms. In instances where cables cannot be buried, as such with inter-array cables between FWTG, measures can be put in place such as cables being monitored regularly for wear and tear.

10.3.4.45 Furthermore, sea lamprey are highly mobile and considered to be transient, not remaining in the nearfield area for an extended period of time. It is considered that given the habitat range available for sea lamprey migration, and their highly mobile nature there is no potential for a significant interaction between migrating individuals and any EMF effects generated by the Proposed Development (Offshore) and other projects in-combination.

10.3.4.46 Therefore, the potential impact of EMF is very spatially limited, which combined with the transient nature of the sea lamprey associated with the River Thurso SAC means that any potential effect is not considered likely to occur. **Therefore, it is concluded that there is no AEoSI to the conservation objectives for the River Thurso SAC from the Proposed Development (Offshore) in-combination with identified plans and projects and therefore, subject to natural change, the populations of sea lamprey will be maintained in the long-term with respect to EMF associated with the O&M phase.**

Freshwater Pearl Mussel

10.3.4.47 Given the life history of FWPM as established in the alone assessment (Section 10.2.4), the only potential time where the Proposed Development (Offshore) can impact FWPM is during the initial 11-month stage when it is within the gills of salmonids. Of the salmonid species that FWPM have specialised to live within, Atlantic salmon are considered within this report and the assessments presented for Atlantic salmon at this site are considered directly comparable.

10.3.4.48 **Given the conclusion of no AEoSI to Atlantic salmon at the River Spey SAC for identified effects in-combination, it is considered that there is no AEoSI to the FWPM feature of the River Spey SAC from the Proposed Development (Offshore) in-combination during construction and decommissioning and therefore, subject to natural change, the population of FWPM will be maintained in the long-term with respect to underwater noise and EMF from the construction and decommissioning of the Proposed Development (Offshore) in-combination with other plans and projects.**

Conclusion of Assessment of Migratory Fish from the Proposed Development (Offshore) In-combination

10.3.4.49 Three designated sites were identified to have a potential for AEoSI from the Proposed Development (Offshore) in-combination with other plans and projects, the River Spey SAC, Berriedale and Langwell Waters SAC and River Thurso SAC designated for Atlantic salmon, FWPM and sea lamprey. Assessment was undertaken for several effects including underwater noise and EMF all of which concluded no AEoSI. **Therefore, there is no AEoSI on the designated features of the SACs designated for migratory fish with respect to the Proposed Development (Offshore) in-combination with other plans and projects.**

11 Transboundary Statement for the Proposed Development (Offshore)

11.3.1.1 The HRA Screening process identified a number of transboundary sites as having features that met Criteria 2 (having designated seabird features that are within MMF+1SD of the Proposed Development (Offshore)).

11.3.1.2 However, both seabird features of these sites (fulmar and Manx shearwater) have very low vulnerability to displacement and collision (Furness and Wade, 2012[79]; Furness *et al*., 2013[80]; Bradbury *et al*., 2014[81]; NatureScot, 2023[82]; JNCC, 2024[83]), due to the large foraging range for these species, it was determined that significant effects would not manifest on these SPAs after the likelihood and severity of effects on the SPAs have been apportioned to all SPAs within foraging range. Therefore, within the HRA Screening process, LSE was discounted in relation to all transboundary effects alone or in-combination.

11.3.1.3 This transboundary screening assessment was submitted alongside the EIA scoping report. In regard to transboundary impacts, the Scottish Ministers advised that the following SPAs should be considered to have LSE and be screened in for assessment in the AA: Rathlin Island SPA for fulmar; Copeland Islands SPA for Manx shearwater; Glannau Aberdaron ac Ynys Enlli/ Aberdaron Coast SPA and Bardsey Island SPA for Manx shearwater; Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA for Manx shearwater; Isles of Scilly SPA for fulmar and Manx shearwater.

11.3.1.4 Consultation has been ongoing for the Proposed Development (Offshore), in addition to more formal consultation, the Applicant has engaged with NatureScot and RSPB throughout the pre-application stage via bilateral meetings to discuss Offshore and Intertidal Ornithology. Following screening assessment responses, it was advised during consultation (meeting held on 09/05/2024) that rather than screening out fulmar a qualitative assessment should be undertaken for potential barrier effects. This assessment has been included within Section 7.3.6 and results suggested that when considering the species extensive foraging ranges and versatile foraging behaviour, no potential for an AEoSI with respect to barrier effect on fulmar features of all designated sites screened in for assessment can confidently be concluded. With regards to manx shearwater, when reviewing the 24 months of site-specific DAS data, this species was recorded infrequently and in low abundances. Consequently, any potential impact at an SPA level would be intangiable and there is no potential for any transboundary effects.

11.3.1.5 As such, although previous OWF projects have shown that they have a moderate avoidance rate (Dierschke *et al*., 2016[158]; Furness *et al*., 2013[159]), due to the large foraging range for these species, it was determined that significant effects would not manifest on these SPAs after the likelihood and severity of effects on the SPAs have been apportioned to all SPAs within foraging range. Therefore, based on the information presented above **it can be concluded that no AEoSI exists for an effect from the Project alone and/or in-combination on any transboundary sites identified in other EEA states.**

12 Conclusions of the Assessment

12.3.1.1 The Stage 2 AA of implications for European sites in light of their conservation objectives was completed in compliance with Scottish law and relevant European Commission and national guidelines to determine whether or not AEoSI of any European site would occur as a result of the construction, O&M, or decommissioning of the Proposed Development (Offshore).

12.3.1.2 This RIAA has been prepared to inform and to enable the competent authority to determine if the Proposed Development (Offshore), alone or in-combination with any other plans or projects will have AEoSI on any European site when they are undertaking an AA.

12.3.1.3 Having considered site specific surveys, scientific investigations, and assessments (which are set out in the RIAA and its appendices) and in light of the best scientific knowledge in the field, all aspects of the Proposed Development (Offshore) which may affect European Sites alone or in-combination with any other plans or projects, have been considered.

12.3.1.4 This RIAA contains information which the relevant public authority, and competent authority, must consider in making its own complete, precise and definitive findings and conclusions and upon which the relevant public authority is capable of determining that all reasonable scientific doubt has been removed as to the effects of the Proposed Development (Offshore) on the integrity of the relevant European sites.

12.3.1.5 **In light of the conclusions of the assessment conducted in this RIAA, the Applicant is of the view that the construction, O&M and decommissioning of the Proposed Development (Offshore) will result in no AEoSI alone or in-combination for sites designated for marine mammals and migratory fish for Caledonia North, Caledonia South and the Proposed Development (Offshore). For sites designated for offshore and intertidal ornithology all sites concluded no AEoSI alone; however, the following sites concluded AEoSI in-combination with other plans and projects:**

- **East Caithness Cliffs SPA for guillemot; distributional response effects in-combination with other plans and projects when considering the level of potential effect predicted from the upper range of the Guidance approach;**
- **East Caithness Cliffs SPA for kittiwake; combined collision risk distributional response effects in-combination with other plans and projects;**
- **Forth Islands SPA for gannet; combined collision risk and distributional response effects in-combination with other plans and projects;**
- **Sule Skerry and Sule Stack SPA for puffin; distributional response effects in-combination with other plans and projects when**

considering the level of potential effect predicted from the Guidance approach;

- **Buchan Ness to Collieston Coast SPA for kittiwake; combined collision risk and distributional response effects in-combination with other plans and projects; and**
- **Troup, Pennan and Lion's Head SPA for kittiwake; combined collision risk and distributional response effects in-combination with other plans and projects.**

References

[1] David Tyldesley and Associates (DTA). (2015). Habitats Regulations Appraisal of Plans. Guidance for Plan-making Bodies in Scotland. Version 3.0, January 2015. Available at: Habitats Regulations Appraisal of Plans - plan-making bodies in Scotland - Jan 2015.pdf (nature.scot) (Accessed 01/10/2024)

[2] The Planning Inspectorate. (2022). Advice Note Ten: Habitats Regulations Assessment relevant to nationally significant infrastructure projects. Available at: https://infrastructure.planninginspectorate.gov.uk/legislation-and-advice/advice-notes/advicenote-ten/ (Accessed 01/10/2024)

[3] Rogan, E., Garagouni, M., Nykänen, M., Whitaker, A. and Ingram, S., (2018). Bottlenose dolphin survey in the Lower River Shannon SAC, 2018. Report to the National Parks and Wildlife Service, Department of Culture, Heritage and the Gaeltacht. University College Cork. 19pp. Cover image: A group of bottlenose dolphins in the outer Shannon Estuary DCHG, p.2.

[4] Hague, E. L., Sinclair, R. R. and Sparling, C. E. (2020). Regional baselines for marine mammal knowledge across the North Sea and Atlantic areas of Scottish waters. Scottish Marine and Freshwater Science Vol 11 No 12.

[5] Thompson, P. M., K. L. Brookes, and L. S. Cordes. (2015). Integrating passive acoustic and visual data to model spatial patterns of occurrence in coastal dolphins. ICES Journal of Marine Science:11.

[6] Quick, N. J., M. Arso Civil, B. Cheney, V. Islas, V. Janik, P. M. Thompson, and P. S. Hammond. (2014). The east coast of Scotland bottlenose dolphin population: Improving understanding of ecology outside the Moray Firth SAC. This document was produced as part of the UK Department of Energy and Climate Change's offshore energy Strategic Environmental Assessment programme.

[7] Palmer, K., J., Brookes, K., L, Davies, I., M, Edwards, E, and Rendell, L. (2019). Habitat use of a coastal delphinid population investigated using passive acoustic monitoring. Aquatic Conservation: Marine and Freshwater Ecosystems, 29(S1), 254-270.

[8] Cheney, B.J., Arso Civil, M., Hammond, P.S. and Thompson, P.M. 2024. Site Condition Monitoring of bottlenose dolphins within the Moray Firth Special Area of Conservation 2017-2022. NatureScot Research Report 1360

[9] Aynsley, C.L. 2017. Bottlenose dolphins (Tursips truncatus) in north-east England: A preliminary investigation into a population beyond the southern extreme of its range. Master's Thesis. Newcastle University.

[10] Citizenfins. 2022. From Tayside to Scarborough. Available at: https://citizenfins.wp.st-andrews.ac.uk/2022/03/11/from-tayside-to-scarborough/ (Accessed 01/10/2024)

[11] IAMMWG. (2023). Review of Management Unit boundaries for cetaceans in UK waters (2023). JNCC Report 734, JNCC, Peterborough, ISSN 0963-8091.

[12] Cheney, B., Graham, I. M., Barton, T., Hammond, P. S. and Thompson, P. M. (2018). Site Condition Monitoring of bottlenose dolphins within the Moray Firth Special Area 288 of Conservation: 2014-2016. Scottish National Heritage Research Report No 1021.

[13] Hammond, P.S., Lacey, C., Gilles, A., Viquerat, S., Boerjesson, P., Herr, H., Macleod, K., Ridoux, V., Santos, M.B., Scheidat, M., Teilmann, J., Vingada, J.V. and Oeien, N. (2021). Estimates of cetacean abundance in European Atlantic waters in summer 2016 from the SCANS-III aerial and shipboard surveys. Final Report. University of St Andrews, UK.

[14] Gilles, A., Authier, M., Ramirez-Martinez, N.C., Araujo, H., Blanchard, A., Carlstrom, J., Eira, C., Dorémus, G., Fernandez-Maldonad, C., Geelhoed, S.C.V. and Kyhn, L. (2023). Estimates of cetacean abundance in European Atlantic waters in summer 2022 from the SCANS-IV aerial and shipboard surveys. University of Veterinary Medicine Hannover.

[15] Arso Civil, M., N. Quick, S. Mews, E. Hague, B. J. Cheney, P. Thompson, and P. Hammond. (2021). Improving understanding of bottlenose dolphin movements along the east coast of Scotland. Final report. provided to European Offshore Wind Deployment Centre (EOWDC).

[16] Booth, C. G., Heinis, F. & Harwood, J. (2019), Updating the Interim PCoD Model: Workshop Report - New transfer functions for the effects of disturbance on vital rates in marine mammal species. Report Code SMRUC-BEI-2018-011, submitted to the Department for Business, Energy and Industrial Strategy (BEIS), February 2019 (unpublished).

[17] Fernandez-Betelu, O., Graham, I.M., Brookes, K.L., Cheney, B.J., Barton, T.R. and Thompson, P.M., 2021. Far-field effects of impulsive noise on coastal bottlenose dolphins. Frontiers in Marine Science, 8, p.664230.

[18] Connor, R.C., Heithaus, M.R., Barre, L.M. (2001). Complex social structure, alliance stability and mating access in a bottlenose dolphin 'super-alliance'. Proceedings of the Royal Society B, 268(1464):263-7

[19] New, L. F., Harwood, J., Thomas, L., Donovan, C., Clark, J. S., Hastie, G., Thompson, P. M., Cheney, B., Scott-Hayward, L. and Lusseau, D. (2013), 'Modelling the biological significance of behavioural change in coastal bottlenose dolphins in response to disturbance', Functional Ecology, 27/2: 314-322

[20] Ocean Winds. (2024). Low order deflagration of unexploded ordnance reduces underwater noise impacts from offshore wind farm construction. Ocean Winds, Seiche Ltd, University of Aberdeen, EODEX.

[21] Lepper, P. A., S.-H. Cheong, S. P. Robinson, L. Wang, J. Tougaard, E. T. Griffiths, and J. P. Hartley. (2024). In-situ comparison of high-order detonations and low-order deflagration

methodologies for underwater unexploded ordnance (UXO) disposal. Marine Pollution Bulletin 199:115965

[22] Von Benda-Beckmann, A. M., G. Aarts, H. Ö. Sertlek, K. Lucke, W. C. Verboom, R. A. Kastelein, D. R. Ketten, R. van Bemmelen, F.-P. A. Lam, and R. J. Kirkwood. (2015). Assessing the impact of underwater clearance of unexploded ordnance on harbour porpoises (Phocoena phocoena) in the southern North Sea. Aquatic Mammals 41:503

[23] Salomons, E. M., B. Binnerts, K. Betke, and A. M. v. Benda-Beckmann. (2021). Noise of underwater explosions in the North Sea. A comparison of experimental data and model predictions. The Journal of the Acoustical Society of America 149:1878-1888.

[24] JNCC, DAERA and Natural England (2020) Guidance for assessing the significance of noise disturbance against Conservation Objectives of harbour porpoise SACs England, Wales and Northern Ireland). JNCC Report No. 654. Final May 2020.

[25] Lurton, X., and S. Deruiter. (2011). Sound Radiation Of Seafloor-Mapping Echosounders In The Water Column, In Relation To The Risks Posed To Marine Mammals.

[26] Risch, D., B. Wilson, and P. Lepper. (2017). Acoustic Assessment of SIMRAD EK60 High Frequency Echo Sounder Signals (120 & 200 kHz) in the Context of Marine Mammal Monitoring.

[27] Hartley Anderson Ltd. (2020). Underwater acoustic surveys: review of source characteristics, impacts on marine species, current regulatory framework and recommendations for potential management options., NRW Evidence Report No: 448, 119pp, NRW, Bangor, UK.

[28] Crocker, S. E., and F. D. Fratantonio. (2016). Characteristics of sounds emitted during high-resolution marine geophysical surveys. OCS Study, BOEM 2016-44, NUWC-NPT Technical Report 12.

[29] Crocker, S. E., F. D. Fratantonio, P. E. Hart, D. S. Foster, T. F. O'Brien, and S. Labak. (2019). Measurement of Sounds Emitted by Certain High-Resolution Geophysical Survey Systems. Ieee Journal of Oceanic Engineering 44: 796-813

[30] Jiménez-Arranz, G., N. Banda, S. Cook, and R. Wyatt. 2020. Review on Existing Data on Underwater Sounds Produced by the Oil and Gas Industry., Report prepared by Seiche Ltd for the Joint Industry Programme on E&P Sound and Marine Life.

[31] JNCC. (2010). JNCC guidelines for minimising the risk of injury to marine

mammals from using explosives. Available at: [JNCC guidelines for minimising the risk of injury to marine mammals from using explosives]() (Accessed 01/10/2024)

[32] Thompson, P.M., Brookes, K.L., Cheney, B., and Graham, I.M. (2013). Abundance and occurrence patterns of bottlenose dolphins in relation to a 2-D seismic survey in the Moray Firth.

[33] CSA. (2020). Application for Indidental Harassment Authorization for the Non-Lethal Taking of Marine Mammals: Site Characterization Surveys.

[34] Pace, F., C. Robinson, C. E. Lumsden, and S. B. Martin. (2021). Underwater Sound Sources Characterisation Study: Energy Island, Denmark. Document 02539, Version 2.1. Technical report by JASCO Applied Sciences for Fugro Netherlands Marine B.V.:152.

[35] Southall, B., Finneran, J., Reichmuth, C., Nachtigall, P., Ketten, D., Bowles, A., Ellison, W., Nowacek, D. and Tyack, P. (2019) Marine Mammal Noise Exposure Criteria: Updated Scientific Recommendations for Residual Hearing Effects. Aquatic Mammals. 45(2), 125-232.

[36] Genesis. (2011), 'Review and Assessment of Underwater Sound Produced from Oil and Gas Sound Activities and Potential Reporting Requirements under the Marine Strategy Framework Directive. Report for the Department of Energy and Climate Change'.

[37] BERR, and DEFRA. 2008. Review of cabling techniques and environmental effects applicable to the offshore windfarm industry. This report was prepared by consultants from Royal Haskoning and BOMEL Ltd.

[38] Todd, V. L., I. B. Todd, J. C. Gardiner, E. C. Morrin, N. A. MacPherson, N. A. DiMarzio, and F. Thomsen. (2015), 'A review of impacts of marine dredging activities on marine mammals'. ICES Journal of Marine Science: Journal du Conseil 72:328-340.

[39] Evans, P. G. H. (1990), 'Marine Mammals in the English Channel in relation to proposed dredging scheme'. Sea Watch Foundation, Oxford.

[40] Thompson, F., S. R. McCully, D. Wood, F. Pace, and P. White. (2009), 'A generic investigation into noise profiles of marine dredging in relation to the acoustic sensitivity of the marine fauna in UK waters with particular emphasis on aggregate dredging: PHASE 1 Scoping and review of key issues., MALSF'.

[41] Verboom, W. (2014), 'Preliminary information on dredging and harbour porpoises'. JunoBioacoustics.

[42] Greene, J. and R. Charles (1987) "Characteristics of oil industry dredge and drilling sounds in the Beaufort Sea," J. Acoust. Soc. Am. 82(4), 1315–1324.

[43] Nedwell, J., Langworthy, J., and Howell, D. (2003), 'Assessment of sub-sea acoustic noise and vibration from offshore wind turbines and its impact on marine wildlife; initial measurements of underwater noise during construction of offshore windfarms, and comparison with background noise'. Subacoustech Report ref: 544R0423, published by COWRIE.

[44] Nedwell, J. and Howell. D. (2004) A review of offshore windfarm related underwater noise sources. (Report No. 544 R 0308). Report by Subacoustech Ltd. Report for The Crown Estate.

[45] Erbe, C., S. A. Marley, R. P. Schoeman, J. N. Smith, L. E. Trigg, and C. B. Embling. (2019). The Effects of Ship Noise on Marine Mammals—A Review. Frontiers in Marine Science 6.

[46] OSPAR. (2009a). Assessment of the impacts of shipping on the marine environment. OSPAR Commission 2009.

[47] OSPAR. (2009b). Assessment of the environmental impact of underwater noise. OSPAR Commission.

[48] Koroza, A. and Evans, P.G., 2022. Bottlenose dolphin responses to boat traffic affected by boat characteristics and degree of compliance to code of conduct. Sustainability, 14(9), p.5185.

[49] Lusseau, D., 2003. Effects of tour boats on the behavior of bottlenose dolphins: using Markov chains to model anthropogenic impacts. Conservation Biology, 17(6), pp.1785-1793.

[50] Pellegrini, A.Y., Romeu, B., Ingram, S.N. and Daura-Jorge, F.G., 2021. Boat disturbance affects the acoustic behaviour of dolphins engaged in a rare foraging cooperation with fishers. Animal Conservation, 24(4), pp.613-625.

[51] Anderwald, P., Brandecker, A., Coleman, M., Collins, C., Denniston, H., Haberlin, M. D., O'Donovan, M., Pinfield, R., Visser, F. and Walshe, L. (2013), 'Displacement responses of a mysticete, an odontocete, and a phocid seal to construction-related vessel traffic', Endangered Species Research, 21.

[52] Gregory, P.R. and Rowden, A.A., 2001. Behaviour patterns of bottlenose dolphins (Tursiops truncatus) relative to tidal state, time-of-day, and boat traffic in Cardigan Bay, West Wales. Aquatic Mammals, 27(2), pp.105-113.

[53] Pirotta, E., Merchant, N. D., Thompson, P. M., Barton, T. R. and Lusseau, D. (2015), 'Quantifying the effect of boat disturbance on bottlenose dolphin foraging activity', Biological Conservation, 181: 82-89.

[55] Lusseau, D., L. New, C. Donovan, B. Cheney, P. Thompson, G. Hastie, and J. Harwood. (2011). The development of a framework to understand and predict the population consequences of disturbances for the Moray Firth bottlenose dolphin population. Scottish Natural Heritage Commissioned Report (98pp).

[56] New, L. F., Harwood, J., Thomas, L., Donovan, C., Clark, J. S., Hastie, G., Thompson, P. M., Cheney, B., Scott-Hayward, L. and Lusseau, D. (2013), 'Modelling the biological significance

of behavioural change in coastal bottlenose dolphins in response to disturbance', Functional Ecology, 27/2: 314-322

[57] Schoeman, R. P., Patterson-Abrolat, C. and Plön, S. (2020), 'A global review of vessel collisions with marine animals', Frontiers in Marine Science, 7.

[58] Laist, D. W., Knowlton, A. R., Mead, J. G., Collet, A. S. and Podesta, M. (2001), 'Collisions between ships and whales', Marine Mammal Science, 17/1: 35-75.

[59] Vanderlaan, A. S., Taggart, C. T., Serdynska, A. R., Kenney, R. D. and Brown, M. W. (2008), 'Reducing the risk of lethal encounters: vessels and right whales in the Bay of Fundy and on the Scotian Shelf', Endangered Species Research, 4/3: 283-297.

[60] Cates, K., Acevedo-Gutiérrez, A. (2017). Harbor Seal (*Phoca vitulina*) Tolerance to Vessels Under Different Levels of Boat Traffic. Aquatic Mammals 43:193-200.

[61] Authier, M., Peltier, H., Dorémus, G., Dabin, W., Canneyt, O. V., Ridoux, V. (2014), 'How much are stranding records affected by variation in reporting rates? A case study of small delphinids in the Bay of Biscay', Biodiversity Conservation, 23: 2591-2612.

[62] Wells, R. S., Allen, J. B., Hofmann, S., Bassos-Hull, K., Fauquier, D. A. and Barros, N. B. (2008), 'Consequences of injuries on survival and reproduction of common bottlenose dolphins (Tursiops truncatus) along the west coast of Florida', Marine Mammal Science, 24: 774–794.

[63] Luksenburg, J. A. (2014), 'Prevalence of external injuries in small cetaceans in Aruban waters, southern Caribbean', PLoS ONE, 9/88988.

[64] Dukas, R. (2002), 'Behavioural and ecological consequences of limited attention', Philosophical Transactions of the Royal Society of London B, 357: 1539–1547.

[65] Nowacek, S.M., Wells, R.S. and Solow, A.R. (2001). Short-term effects of boat traffic on bottlenose dolphins, *Tursiops truncatus*, in Sarasota Bay, Florida. Marine Mammal Science 17:673-688.

[66] Lusseau, D. (2003). Male and female bottlenose dolphins Tursiops spp. have different strategies to avoid interactions with tour boats in Doubtful Sound, New Zealand. Marine Ecology Progress Series 257:267-274.

[67] Lusseau, D. (2006). The short-term behavioral reactions of bottlenose dolphins to interactions with boats in Doubtful Sound, New Zealand. Marine Mammal Science 22:802-818.

[69] Scottish Marine Stranding Scheme (SMASS). (2024). Available at: https://smass.org.uk/ (Accessed 01/10/2024)

[70] NatureScot (formerly Scottish Natural Heritage). (2017). The Scottish Marine Wildlife Watching Code.

[71]Santo, M.B., Pierce, G.J., Reid, R.J., Patterson, I.A.P., Ross, H.M. and Mente, E. (2001). Stomach contents for bottlnose dolphins (Tursiops truncatus) in Scottish waters. Journal of the Marine Biology Association, 81, 873-878

[72] NatureScot. (2024). Moray Firth SAC Conservation Management Advice August 2024. Available at: SiteLink - Moray Firth SAC (Accessed 01/10/2024)

[73] Evans, P.G.H. and Hintner, K. (2013) A Review of the Direct & Indirect Impacts of Fishing Activities on Marine Mammals in Welsh waters. CCW Policy Research Report No. 12/5: 1-172.

[74] Madsen, P., Wahlberg, M., Tougaard, J., Lucke, K. and Tyack, P. (2006). Wind turbine underwater noise and marine mammals: implications of current knowledge and data needs. Marine Ecology Progress Series, 309, 279–295.

[75] Teilmann, J., Tougaard, J., Miller, L. A., Kirketerp, T., Hansen, K., & Brando, S. (2006). Reactions of captive harbor porpoises (*Phocena Phocena*) to pinger-like sounds. Marine Mammal Science, 22(2), pp240–260.

[76] CEFAS. (2010). Strategic review of offshore wind farm monitoring data associated with FEPA licence conditions – annex 4: underwater noise., Cefas report ME1117.

[77] Brasseur, S., Aarts, G., Meesters, E., van Polanen Petel, T., Dijkman, E., Cremer, J & Reijnders, P. (2012) Habitat preferences of harbour seals in the Dutch coastal area: analysis and estimate of effects of offshore wind farms. Wageningen IMARES OWEZ R 252 T1 20120130

[78] Woodward, I., Thaxter, C.B., Owen, E. and Cook, A.S.C.P. (2019). Desk-based revision of seabird foraging ranges used for HRA screening. Report of work carried out by the British Trust for Ornithology on behalf of NIRAS and The Crown Estate. BTO Research Report No. 724.

[79] Furness, R. W., and Helen M. Wade. (2012) Vulnerability of Scottish Seabirds to Offshore Wind Turbines. Marine Scotland Science.

[80] Furness, Robert W., Helen M. Wade, and Elizabeth A. Masden. (2013). Assessing Vulnerability of Marine Bird Populations to Offshore Wind Farms. Journal of Environmental Management 119 (15 April 2013): 56–66. Available at: https://doi.org/10.1016/j.jenvman.2013.01.025 (Accessed 01/10/2024)

[81] Bradbury, G., Trinder, M., Furness, B., Banks, A.N., Caldow, R.W. and Hume, D. (2014), 'Mapping seabird sensitivity to offshore wind farms', PloS ONE 9(9): 106366.

[82] NatureScot (2023). Guidance Note 8: Guidance to support Offshore Wind Applications: Marine Ornithology Advice for assessing the distributional responses, displacement and barrier effects of Marine birds. Available at: https://www.nature.scot/doc/guidance-note-8-guidance-

support-offshore-wind-applications-marine-ornithology-advice-assessing#3.+Species+to+be+assessed%C2%A0 (Accessed October 2024).

[83] JNCC, Natural England, Natural Resources Wales, NatureScot. 2024. Joint advice note from the Statutory Nature Conservation Bodies (SNCBs) regarding bird collision risk modelling for offshore wind developments. JNCC, Peterborough. Available at: https://hub.jncc.gov.uk/f7892820-0f84-4e96-9eff-168f93bd343d (Accessed 01/10/2024)

[84] Swann, B. (2016) East and North Caithness Cliff SPAs monitoring 2013: plot counts and breeding productivity. Scottish Natural Heritage Commissioned Report No. 622. Available at: https://www.nature.scot/sites/default/files/Publication%202016%20-%20SNH%20Commissioned%20Report%20622%20- (Accessed 01/10/2024)

[85] Horswill, C. and Robinson R. A. (2015). Review of seabird demographic rates and density dependence. JNCC Report No. 552. Joint Nature Conservation Committee, Peterborough.

[86] Burnell, D., Perkins, A.J., Newton, S.F., Bolton, M, Tierney, T.D. & Dunn, T.D. 2023. Seabirds Count, A census of breeding seabirds in Britain and Ireland (2015–2021). Lynx Nature Books, Barcelona.

[87] Furness, R.W. (2015). Non-breeding season populations of seabirds in UK waters: Population sizes for Biologically Defined Minimum Population Scales (BDMPS). Natural England Commissioned Report No 164.

[88] Buckingham, L., Bogdanova, M.I., Green, J.A., Dunn, R.E., Wanless, S., Bennett, S., Bevan, R.M., Call, A., Canham, M., Corse, C.J., Harris, M.P., Heward, C.J., Jardine, D.C., Lennon, J., Parnaby, D., Redfern, C.P.F., Scott, L., Swann, R.L., Ward, R.M., Weston, E.D., Furness, R.W. and Daunt, F. (2022) 'Interspecific variation in non-breeding aggregation: a multi-colony tracking study of two sympatric seabirds'. Marine Ecology Progress Series 684: 181-197

[89] Seabird Monitoring Programme (2024). Seabird Monitoring Programme (SMP). Available at: https://app.bto.org/seabirds/public/data.jsp (Accessed 01/10/2024)

[90] Harris, M.P., Burton, E., Lewis, S., Tyndall, A., Nichol, C.J., Wade, T. and Wanless, S. (2023), Count of Northern Gannets on the Bass Rock in June 2023.

[91] Wanless, S. Harris, M.P. & Murray, S. 2023. Northern Gannet Morus bassanus. In: Burnell, D., Perkins, A.J., Newton, S.F., Bolton, M, Tierney, T.D. & Dunn, T.D. (eds). Seabirds Count, A census of breeding seabirds in Britain and Ireland (2015–2021). Lynx, Barcelona.

[92] IUCN (2023) 'IUCN Red List of Threatened Species'. Available at: https://www.iucnredlist.org (Accessed 01/10/2024)

[93] Vladić, T. and Petersson, E., 2015. Relationship between size, age and maturity in atlantic salmon. VLADIĆ, T. and PETERSSON, E. Evolutionary Biology of the Atlantic Salmon. CRC Press, Boca Raton, pp.165-184.

[94] Mills, D.M. (1989) 'Biology and Management of Atlantic Salmon'. Chapman & Hall.

[95] Scottish Environment Protection Agency & Nature Scot. (2024). Protected Nature Sites viewer. Available at: Protected Nature Sites (sepa.org.uk) (Accessed 01/10/2024)

[96]NatureScot. (2020). River Spey Special Area of Conservation - Conservation Advice Package. Available at: https://apps.snh.gov.uk/sitelink-api/v1/sites/8365/documents/66 (Accessed 01/10/2024)

[97] Maitland, P.S. (2003). Ecology of the River, Brook and Sea Lamprey. Conserving Natura 2000 Rivers Ecology Series No. 5. English Nature, Peterborough.

[98] Popper, A. N., Hawkins, A. D., Fay, R. R., Mann, D. A., Bartol, S., Carlson, T. J., Coombs, S., Ellison, W. T., Gentry, R. L., Halvorsen, M. B., Løkkeborg, S., Rogers, P. H., Southall, B. L., Zeddies, D. G., & Tavolga, W. N. (2014). Sound Exposure Guidelines for Fishes and Sea Turtles: A Technical Report prepared by ANSI-Accredited Standards Committee S3/SC1 and registered with ANSI. Springer, 1–16. Available at: https://doi.org/10.1007/978-3-319-06659-2 (Accessed 01/10/2024)

[99] Walker, M.M., Diebel, C.E., and Kirschvink, J.L. (2007). Sensory systems neuroscience. Pages 335-374 in T. J. Hara and B. Zielinski, editors. Sensory systems neuroscience: Fish Physiology, v. 25. Elsevier Academic Press.

[100] Gill, A. B. and A. A. Kimber. (2005). The potential for cooperative management of elasmobranchs and offshore renewable energy development in UK waters. Journal of the Marine Biological Association of the United Kingdom 85:1075-1081.

[101] Normandeau, E, Tricas, T and Gill, A. 2011. Effects of EMFs from Undersea Power Cables on Elasmobranchs and Other Marine Species. U.S. Dept. of the Interior, Bureau of Ocean Energy Management, Regulation, and Enforcement, Pacific OCS Region, Camarillo, CA. OCS Study

[102] Young, M.R. and Williams, J. (1984a) The reproductive biology of the freshwater pearl mussel *Margaritifera margaritifera* (Linn.) in Scotland. II. Laboratory studies, Arch. Hydrobiol.

[103] Young, M.R. and Williams, J.. (1984b). The reproductive biology of the freshwater pearl mussel *Margaritifera margaritifera* (Linn.) in Scotland. I. Field studies, Arch. Hydrobiol., 1984b, vol. 99, pp. 405–422.

[104] Bauer, G. and Vogel, C. (1987). The parasitic stage of the freshwater pearl mussel (Margaritifera margaritifera L.), I. Host response to glochidiosis, Arch. Hydrobiol., 1987, vol. 76, pp. 393–402.

[105] Ziuganov, V., Zotin, A., Nezlin, L., and Tretiakov, V. (1994). The Freshwater Pearl Mussels and Their Relationship with Salmonid Fish

[106] Hastie, L.C. and Young, M.R. (2000). Conservation of the freshwater pearl mussel. I. Captive breeding techniques, Conserv. Nat, Rivers Ecol. Ser., 2003, no. 2.

[107] Denic, M., Taeubert, J.E., and Geist, J. (2015). Trophic relationships between the larvae of two freshwater mussels and their fish hosts, Invertebrate Biol., 2015, vol. 134, pp. 129–135

[108] Bauer, G. (1987). Reproductive strategy of the freshwater pearl mussel Margaritifera margaritifera. The Journal of Animal Ecology, 691-704.

[109] Rogers-Lowery, C.L. and Dimock, R.V. (2006). Encapsulation of attached ectoparasitic glochidia larvae of freshwater mussels by epithelial tissue on fins of naive and resistant host fish, Biol. Bull, vol. 210, pp. 51–63.

[110] Bauer, G. (1991). Plasticity in life history traits of the freshwater pearl mussel—consequences for the danger of extinction and for conservation measures. In Species conservation: a population-biological approach (pp. 103-120). Basel: Birkhäuser Basel.

[111] Bauer, G. (1997). Host relationships at reversed generation times: Margaritifera (Bivalvia) and salmonids. In Vertical food web interactions: evolutionary patterns and driving forces (pp. 69-79). Berlin, Heidelberg: Springer Berlin Heidelberg.

[112] Maitland, P.S. (2003). Ecology of the River, Brook and Sea Lamprey. Conserving Natura 2000 Rivers Ecology Series No. 5. English Nature, Peterborough. MMO. 2014. Review of Post-Consent Offshore Windfarm Monitoring Data Associated with Marine Licence Conditions. A report produced for the Marine Management Organisation, pp 194. MMO Project No: 1031. ISBN: 978-1-909452-24-4.

[113] Bergstedt, R.A., and Seelye, J.G. (1995). Evidence for lack of homing by sea lampreys. Transactions of the American Fisheries Society, 124(2).

[114] Waldman, J., Grunwald, C., and Wirgin, I. (2008) Sea lamprey Petromyzon marinus: an exception to the rule of homing in anadromous fishes. Biol Lett 4:659–662.

[115] Hansen, M.J., Madenjian, C.P., Slade, J.W., Steeves, T.B., Almeida, P.R. and Quintella, B.R. (2016). Population ecology of the sea lamprey (*Petromyzon marinus*) as an invasive species in the Laurentian Great Lakes and an imperiled species in Europe. Rev Fish Biol Fisheries 26:509–535.

[116] Lepper, P.A., Theobald, P.D, and Robinson, S.P. (2019). Effectiveness of Exclusion Zones and Soft-starts as Mitigation Strategies for Minimizing Acoustic Impact from Underwater Noise Sources

[117] Dahl, P.H., Jenkins, A.K., Casper, B., Kotecki, S.E., Bowman, V., Boerger, C., Dall'Osto, D.R., Babina, M.A., Popper, A.N. (2020). Physical effects of sound exposure from underwater explosions on Pacific sardines (Sardinops sagax). J Acoust Soc Am 147(4):2383.

[118] Bodznick, D. & Preston, D.G. 1983. Physiological characterization of electroreceptors in the lampreys Ichthyomyzon unicuspis and *Petromyzon marinus*. Journal of Comparative Physiology, 152 (2) 209–217

[119] Gill, A.B. and Bartlett, M. 2010. Literature review on the potential effects of electromagnetic fields and subsea noise from marine renewable energy developments on Atlantic salmon, sea trout and European eel. Scottish Natural Heritage Commissioned Report No.401

[120] Normandeau Associates. 2011. Effects of EMFs from undersea power cables on elasmobranchs and other machine species. Report to U.S. Department of the Interior, Bureau of Ocean Energy Management, Regulation and Enforcement, Pacific OCS Region

[121] Chung-Davidson Y.W., Bryan, M.B., Teeter, J., Bedore, C.N. and Li, W. 2008. Neuroendocrine and behavioral responses to weak electric fields in adult sea lampreys (*Petromyzon marinus*). Hormones and Behavior, 54 (1), 34-40

[122] NatureScot (2020). Berriedale and Langwell Waters Special Area of Conservation – Conservation Advice Package. Available at: https://apps.snh.gov.uk/sitelink-api/v1/sites/8206/documents/66 (Accessed 01/10/2024)

[123] NatureScot. (2020). River Thurso Special Area of Conservation – Conservation Advice. Available at: https://apps.snh.gov.uk/sitelink-api/v1/sites/8368/documents/66 (Accessed 01/10/2024)

[124] Defra (2021). Changes to the Habitats Regulations 2017.

[125] SSE Renewables (2022) Berwick Bank Wind Farm Offshore Environmental Impact Assessment Appendix 10.4: Marine Mammals IPCOD Modelling Report.

[126] Booth, C. G., F. Heinis, and H. J. (2019). Updating the Interim PCoD Model: Workshop Report - New transfer functions for the effects of disturbance on vital rates in marine mammal species. Report Code SMRUC-BEI-2018-011, submitted to the Department for Business, Energy and Industrial Strategy (BEIS), February 2019 (unpublished).

[127] Czapanskiy, M.F., Savoca, M.S., Gough, W.T., Segre, P.S., Wisniewska, D.M., Cade, D.E. and Goldbogen, J.A., 2021. Modelling short-term energetic costs of sonar disturbance to cetaceans using high-resolution foraging data. Journal of Applied Ecology, 58(8), pp.1643-1657.

[128] De Guise, S., Levin, M., Jasperse, L., Herrman, J., Wells, R.S., Rowles, T. and Schwacke, L., 2021. Long-term immunological alterations in bottlenose dolphin a decade after the Deepwater Horizon oil spill in the Northern Gulf of Mexico: Potential for multigenerational effects. Environmental Toxicology and Chemistry, 40(5), pp.1308-1321.

[129] SNH. (2017a). A Guide to Best Practice for Watching Marine Wildlife SMWWC - Part 2. Scottish Natural Heritage.

[130] SNH. (2017b) The Scottish Marine Wildlife Watching Code SMWWC - Part 1. Scottish Natural Heritage.

[131] Constantine, R., D. H. Brunton, and T. Dennis. (2004). Dolphin-watching tour boats change bottlenose dolphin (Tursiops truncatus) behaviour. Biological Conservation 117:299-307.

[132] La Manna, G., M. Manghi, G. Pavan, F. Lo Mascolo, and G. Sara. (2013). Behavioural strategy of common bottlenose dolphins (Tursiops truncatus) in response to different kinds of boats in the waters of Lampedusa Island (Italy). Aquatic Conservation-Marine and Freshwater Ecosystems 23:745-757.

[133] Bejder, L., A. Samuels, H. Whitehead, H. Finn, and S. Allen. (2009). Impact assessment research: use and misuse of habituation, sensitisation and tolerance in describing wildlife responses to anthropogenic stimuli. Marine Ecology Progess Series 395:177-185

[134] JNCC. (2023). DRAFT guidelines for minimising the risk of injury to marine mammals from unexploded ordnance clearance in the marine environment.

[135] Bellmann, M., M. Müller, K. Scheiblich, and K. Betke. (2023). Experience report on operational noise: Cross-project evaluation and assessment of underwater noise measurements from the operational phase of offshore wind farmsfarms, itap report no. 3926, funded by the German Federal Maritime and Hydrographic Agency, funding no. 10054419

[136] RoyalHaskoningDHV (2024). In-combination and Cumulative Totals for Seabird Species of Key Importance to Northeast and East ScotWind Projects. Document reference PC4885-102-RHD-XX-XX-RP-X-0001

[137] GoBe. (2024a). Five Estuaries Offshore Wind Farm Environmental Statement. Volume 6, Part 5, Annex 4.8: Collision Risk Modelling Inputs and Outputs. Application Reference: EN010115

[138] GoBe. (2024b). Outer Dowsing Offshore Wind. Offshore Restricted Build Area and Revision to the Offshore Export Cable Corridor. Appendi E Collision Risk Modelling.

[139] APEM. (2024). White Cross Offhore Wind Darm. ES Addendum. Appendix Q: Ornithology Assessment.

[140] APEM. (2023). Rampion 2 Wind Farm. Category 6: Environmental Statement Volume 4, Appendix 12.3: Offshore and intertidal ornithology collision risk modelling.

[141] NIRAS & RPS. (2024). Ossian. Part 3: Assessment of Special Protected Areas and Ramsar Sites. Report to Inform Asspropriate Assessment (RIAA).

[142] ERM. (2024). Salamander Offshore Wind Farm. Offshore Report to Inform Appropriate Assessment. Volume RP.A.1, Report 1: Report to Inform Appropriate Assessment.

[143] JNCC, Natural England, Natural resources Wales, NatureScot. (2024). Joint advice note from Statutory nature Conservation bodies (SNCBs) regarding bird collision risk modelling for offshore wind developments.

[144] RSPB. (2024). Avian Influenza: a major threat to our struggling seabirds. (rspb.org.uk)

[145] Trinder, M., O'Brien, S.H. and Deimel, J. (2024) 'A new method for quantifying redistribution of seabirds within operational offshore wind farms finds no evidence of within-wind farm displacement'. Frontiers in Marine Science 11: 1235061

[146] MacArthur green (2023) Beatrice Offshore Wind Farm Year 2 Post-construction Ornithological Monitoring Report. pp146.

[147] MacArthur green (2021) Beatrice Offshore Wind Farm Year 1 Post-construction Ornithological Monitoring Report. pp116.

[148] Wernham, C., Toms, M., Marchant, J., Clark, J., Siriwardena, G. and Baillie, S. (2002) The migration atlas: movements of the birds of Britain and Ireland. London: T. & A.D. Poyser.

[149] NatureScot (2023) Guidance Note 4: Guidance to Support Offshore Wind Applications: Ornithology - Determining Connectivity of Marine Birds with Marine Special Protection Areas and Breeding Seabirds from Colony SPAs in the Non-Breeding Season. Available at: https://www.nature.scot/doc/guidance-note-4-guidance-support-offshore-wind-applications-ornithology-determining-connectivity (Accessed 01/10/2024)

[150] Jeglinski, J.W.E., Wanless, S., Murray, S., Barrett, R.T., Gardarsson, A., Harris, M.P., Dierschke, J., Strøm, H., Lorentsen, S-V. & Matthiopoulos, J (2023) Metapopulation regulation acts at multiple spatial scales: Insights from a century of seabird colony census data. Ecological Monographs c. 93(2): e1569. Available at: https://doi.org/10.1002/ecm.1569 (Accessed 01/10/2024)

[151] Lane, J.V., Jana, Avery-Gomm, S., Elmar Ballstaedt, Banyard, A.C., Tatsiana Barychka, Brown, I.H., Brugger, B., Burt, T.V., Careen, N., Johan, Christensen-Dalsgaard, S., Clifford, S., Collins, S.M., Emma, Danielsen, J., Daunt, F., Kyle, Doiron, P. and Duffy, S. (2023). High pathogenicity avian influenza (H5N1) in Northern Gannets: Global spread, clinical signs, and demographic consequences. Ibis. doi:https://doi.org/10.1111/ibi.13275.

[152] Seabird Monitoring Programme (2024). Seabird Monitoring Programme (SMP). Available at: https://app.bto.org/seabirds/public/data.jsp (Accessed 01/10/2024)

[153] Department for Environment, Food & Rural Affairs (2022). Bird flu (avian influenza): latest situation in England. [online] GOV.UK. Available at:

https://www.gov.uk/government/news/bird-flu-avian-influenza-latest-situation-in-england (Accessed 01/10/2024)

[154] RPS. (2024). Ossian - Part 3: Assessment of Special Protected Area and Ramsar Sites, Report to Inform Appropriate Assessment (RIAA).

[155] Salamander. (2024). Salamander Offshore Wind farm: Offshore Report to Inform Appropriate Assessment – Volume RP.A1, Report 1: Report to inform Appropriate Assessment.

[156] Xodus. (2024). Culzean – Floating Offshore Wind Turbine Pilot Project: HRA Report including HRA Screening and RIAA.

[157] McCauley, R. D., Fewtrell, J., Duncan, A. J., Jenner, C., Jenner, M. N., Penrose, J. D., ... & McCabe, K. (2000). Marine seismic surveys—a study of environmental implications. The APPEA Journal, 40(1), 692-708.

[158] Dierschke, Volker & Furness, Robert & Garthe, Stefan. (2016). Seabirds and offshore wind farms in European waters: Avoidance and attraction. Biological Conservation. 202. 59-68. 10.1016/j.biocon.2016.08.016.

[159] Furness, R.W., Wade, H.M. and Masden, E.A. (2013). Assessing vulnerability of marine bird populations to offshore wind farms. Journal of Environmental Management 119: 56-66.

[162] Millls, E.M.M., Piewtz, S. and Orbach, D.N. (2023). Vessel disturb Bottlenose dolphin behaviour and movement in an active ship channel. Animals. 13(22): 3441.

[163] van der Hoop, J.M., Moore, M.J., Barco, S., Cole, T. V.N., Daoust, P.Y., Henry, A.G., McAlpine, D.F., McLellan, W.A., Wimmer, T. and Solow, A.R. (2012). Assessment of management to mitigate anthropogenic effects on large whales. Conservation Biology. 27, 121–133.

Caledonia Offshore Wind Farm
5th Floor, Atria One
144 Morrison Street
Edinburgh
EH3 8EX

www.caledoniaoffshorewind.com