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Application Document 14

Part 3: Caledonia South Report to Inform Appropriate Assessment

Caledonia Offshore Wind Farm Ltd

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Application Document 14 Part 3: Caledonia South Report to Inform Appropriate Assessment

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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.

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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
cSACs	candidate SACs
CTV	Crew Transfer Vessels
DAS	Digital Aerial Survey
DEA	Drag Embedded Anchors
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	Habitats 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
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
pSPAs	potential SPAs
PTS	Permanent Threshold Shift
OECC	Offshore Export Cable Corridor
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 Protected Area
SPL_{peak}	Peak Sound Pressure Level
SOV	Service Operation Vessels
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

9 Assessment of Caledonia South

This document is Part 3 of the Caledonia South Report to Inform Appropriate Assessment (RIAA) and contains the assessment of Caledonia South. 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 the Proposed Development (Offshore) see Part 4 (Section 10).

9.1 Summary of HRA Screening

9.1.1 Screening Alone

9.1.1.1 As noted in Section 3, the first stage of the Habitats Regulations Appraisal (HRA) process is Screening, this being the process followed to identify the potential for Likely Significant Effects (LSE) from Caledonia South, alone and/or in-combination with other plans or projects, on designated sites. Screening for Caledonia South alone was initially undertaken alongside the Environmental Impact Assessment (EIA) Scoping process, with the Screening Report (Application Document 12) issued in September 2022 for consultation. Subsequently, an updated screening exercise has been undertaken to consider the design changes of Caledonia South (now aligning with Section 6) since the initial screening process.

9.1.1.2 The Screening Report (Application Document 12) includes detail on all consultation carried out during the Screening process (as summarised within Section 5). The Screening information for Caledonia South alone is summarised in Table 9-1, as adapted from the HRA Screening Report.

9.1.1.3 Table 9-1 summarises, on a site-by-site basis, the features screened in for potential LSE from Caledonia South alone. Zones of Influence (ZoI) used for the screening of sites within the Screening Report (Application Document 12) can be seen in Table 7-1 in Part 1 of the RIAA (Section 7). Information on sites/features/effects screened out from potential LSE is contained within the HRA Screening Report but is not reproduced in full here in the interests of brevity. The HRA 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 9-1, Figure 9-2 and Figure 9-3.

9.1.1.4 Note, in Table 9-1 with regards to offshore and intertidal ornithology, the distance of each colony from the Proposed Development (Offshore) was measured as the distance from the geometric centre of the Caledonia Offshore Wind Farm (OWF) (i.e., Array Area) to the geometric centre of the colony, taking the shortest at sea distance route possible (in line with NatureScot 2018 Interim Guidance). It is important to note that in order to calculate accurate at sea distance, Caledonia South is unable to be treated separately, as such distances are provided to the centre of the Caledonia OWF.

Table 9-1: Sites and Features screened in for the assessment of Adverse Effect on Site Integrity (AEoSI) for Caledonia South. "*" Identifies species which are part of an assemblage feature only.

Designated Site	Distance to Caledonia South (km)		Features Screened In	Potential for LSE Identified		
	Caledonia South Site	Caledonia South 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 Special Protected 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 Caledonia South (km)		Features Screened In	Potential for LSE Identified		
	Caledonia South Site	Caledonia South OECC		Construction	Operation and maintenance (O&M)	Decommissioning
			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 Migratory collision risk	Distributional responses

Designated Site	Distance to Caledonia South (km)		Features Screened In	Potential for LSE Identified		
	Caledonia South Site	Caledonia South OECC		Construction	Operation and maintenance (O&M)	Decommissioning
			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
			Shag (*Gulosus aristotelis*)	Distributional responses	Distributional responses	Distributional responses

Designated Site	Distance to Caledonia South (km)		Features Screened In	Potential for LSE Identified		
	Caledonia South Site	Caledonia South OECC		Construction	Operation and maintenance (O&M)	Decommissioning
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; and 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	-
			Kittiwake*	Distributional responses	Distributional responses; and Collision risk	Distributional responses

Designated Site	Distance to Caledonia South (km)		Features Screened In	Potential for LSE Identified		
	Caledonia South Site	Caledonia South OECC		Construction	Operation and maintenance (O&M)	Decommissioning
			Fulmar	-	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	-
			Red-breasted merganser* (*Mergus serrator*)	-	Migratory collision risk	-
			Wigeon* (*Anas penelope*)	-	Migratory collision risk	-

Designated Site	Distance to Caledonia South (km)		Features Screened In	Potential for LSE Identified		
	Caledonia South Site	Caledonia South OECC		Construction	Operation and maintenance (O&M)	Decommissioning
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)	-
Hoy SPA	94.1	128.0	Great black-backed gull	-	Collision risk	-
			Great skua (*Stercorarius skua*)	-	Collision risk	-

Designated Site	Distance to Caledonia South (km)		Features Screened In	Potential for LSE Identified		
	Caledonia South Site	Caledonia South OECC		Construction	Operation and maintenance (O&M)	Decommissioning
			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
Dornoch Firth and Loch Fleet SPA	77.0	72.5	Bar-tailed godwit	-	Migratory collision risk	-
			Greylag goose	-	Migratory collision risk	-

Designated Site	Distance to Caledonia South (km)		Features Screened In	Potential for LSE Identified		
	Caledonia South Site	Caledonia South OECC		Construction	Operation and maintenance (O&M)	Decommissioning
			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
			Fulmar	-	Barrier effects (see section 7.3.6)	-
Marwick head SPA	117.3	152.0	Guillemot	Distributional responses	Distributional responses	Distributional responses

Designated Site	Distance to Caledonia South (km)		Features Screened In	Potential for LSE Identified		
	Caledonia South Site	Caledonia South OECC		Construction	Operation and maintenance (O&M)	Decommissioning
			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	-
Cromarty Firth Ramsar	122.0	105.9	Bar-tailed godwit	-	Migratory collision risk	-
			Greylag goose	-	Migratory collision risk	-

Designated Site	Distance to Caledonia South (km)		Features Screened In	Potential for LSE Identified		
	Caledonia South Site	Caledonia South OECC		Construction	Operation and maintenance (O&M)	Decommissioning
			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	-
West Westray SPA	131.7	167.9	Guillemot	Distributional responses	Distributional responses	Distributional responses
			Razorbill*	Distributional responses	Distributional responses	Distributional responses

Designated Site	Distance to Caledonia South (km)		Features Screened In	Potential for LSE Identified		
	Caledonia South Site	Caledonia South 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)	-
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	-
			Goldeneye*	-	Migratory collision risk	-
			Oystercatcher*	-	Migratory collision risk	-

Designated Site	Distance to Caledonia South (km)		Features Screened In	Potential for LSE Identified		
	Caledonia South Site	Caledonia South OECC		Construction	Operation and maintenance (O&M)	Decommissioning
			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	Kittiwake	Distributional responses	Distributional responses; and Collision risk	Distributional responses
			Razorbill	Distributional responses	Distributional responses	Distributional responses

Designated Site	Distance to Caledonia South (km)		Features Screened In	Potential for LSE Identified		
	Caledonia South Site	Caledonia South OECC		Construction	Operation and maintenance (O&M)	Decommissioning
			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 (*Gannet Morus*)	Distributional responses	Distributional responses; and Collision risk	Distributional responses
			Puffin	Distributional responses	Distributional responses	Distributional responses
			Storm petrel	Distributional responses	Distributional responses	Distributional responses
Fair Isle SPA	160.6	198.5	Gannet*	Distributional responses	Distributional responses; and Collision risk	Distributional responses

Designated Site	Distance to Caledonia South (km)		Features Screened In	Potential for LSE Identified		
	Caledonia South Site	Caledonia South OECC		Construction	Operation and maintenance (O&M)	Decommissioning
			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	-
			Kittiwake*	Distributional responses	Distributional responses; and Collision risk	Distributional responses
			Puffin	Distributional responses	Distributional responses	Distributional responses

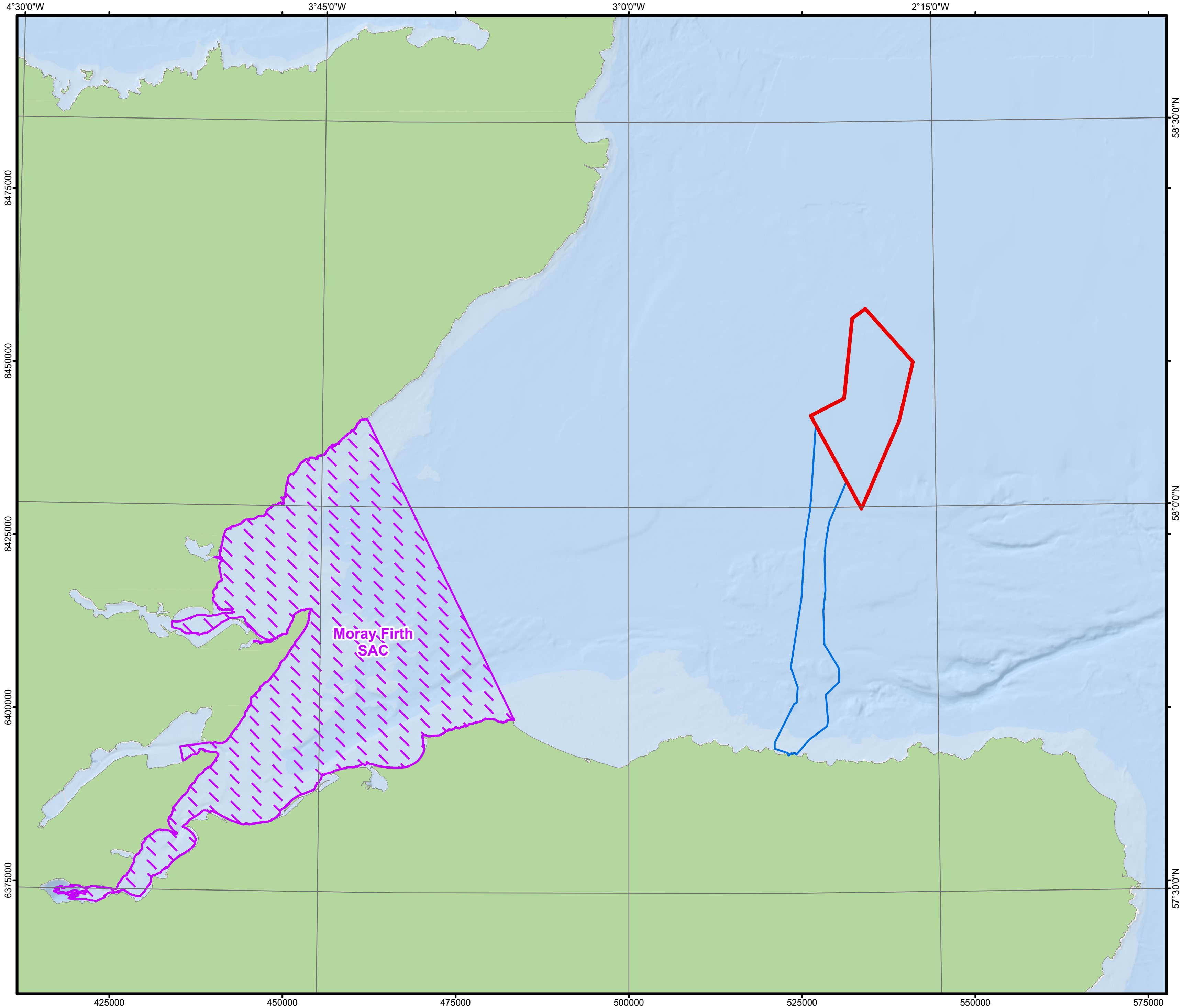
Designated Site	Distance to Caledonia South (km)		Features Screened In	Potential for LSE Identified		
	Caledonia South Site	Caledonia South OECC		Construction	Operation and maintenance (O&M)	Decommissioning
			Fulmar	-	Barrier effects (see section 7.3.6)	-
North Rona and Sula Sgeir SPA	242.6	276.4	Gannet	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
Forth Islands SPA	268.7	244.0	Gannet	Distributional responses	Distributional responses; and Collision risk	Distributional responses

Designated Site	Distance to Caledonia South (km)		Features Screened In	Potential for LSE Identified		
	Caledonia South Site	Caledonia South OECC		Construction	Operation and maintenance (O&M)	Decommissioning
			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)	-
St Abb's Head to Fast Castle SPA	272.2	247.8	Kittiwake*	Distributional responses	Distributional responses; and Collision risk	Distributional responses

Designated Site	Distance to Caledonia South (km)		Features Screened In	Potential for LSE Identified		
	Caledonia South Site	Caledonia South OECC		Construction	Operation and maintenance (O&M)	Decommissioning
Ronas Hill – North Roe and Tingon SPA	281.4	319.1	Great skua	-	Collision risk	-
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	Kittiwake	Distributional responses	Distributional responses; and Collision risk	Distributional responses
			Gannet	Distributional responses	Distributional responses; and Collision risk	Distributional responses
			Great skua	-	Collision risk	-
			Fulmar	-	Barrier effects (see section 7.3.6)	-
Handa SPA	207.5	241.3	Kittiwake	Distributional responses	Distributional responses; and Collision risk	Distributional responses

Designated Site	Distance to Caledonia South (km)		Features Screened In	Potential for LSE Identified		
	Caledonia South Site	Caledonia South OECC		Construction	Operation and maintenance (O&M)	Decommissioning
			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)	-
Coquet Island SPA	335.3	310.8	Fulmar	-	Barrier effects (see section 7.3.6)	-
Ythan Estuary SPA	117.6	93.1	Sandwich tern	Distributional responses (ECC) Section 7.3.8	-	-
Farne Islands SPA	300.9	276.5	Kittiwake*	Distributional responses	Distributional responses; and	Distributional responses

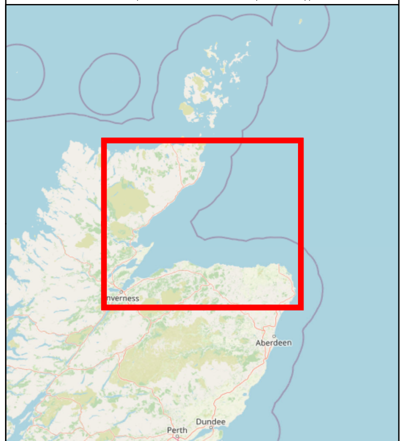
Designated Site	Distance to Caledonia South (km)		Features Screened In	Potential for LSE Identified		
	Caledonia South Site	Caledonia South OECC		Construction	Operation and maintenance (O&M)	Decommissioning
					Collision risk	
Flamborough and Filey Coast SPA	483.5	459.2	Gannet	Distributional responses	Distributional responses; and Collision risk	Distributional responses
			Fulmar	-	Barrier effects (see section 7.3.6)	-
Migratory Fish						
River Spey SAC	54.6	27.0	Atlantic salmon (*Salmo salar*); Sea lamprey (Petromyzon marinus; and Freshwater pearl mussel (*Margaritigera margaritifera*).	Underwater noise.	Electromagnetic Fields (EMF).	Underwater noise.
Berriedale and Langwell Waters SAC	55.6	56.9	Atlantic salmon	Underwater noise.	EMF.	Underwater noise.
River Thurso SAC	88.2	98.7	Atlantic salmon	Underwater noise.	EMF.	Underwater noise.



Caledonia South Site

Caledonia South Offshore Export Cable Corridor

Special Area of Conservation (SAC)



0 5 10 15 20 km

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

CALEDONIA Offshore Wind Farm

GoBe APEM Group

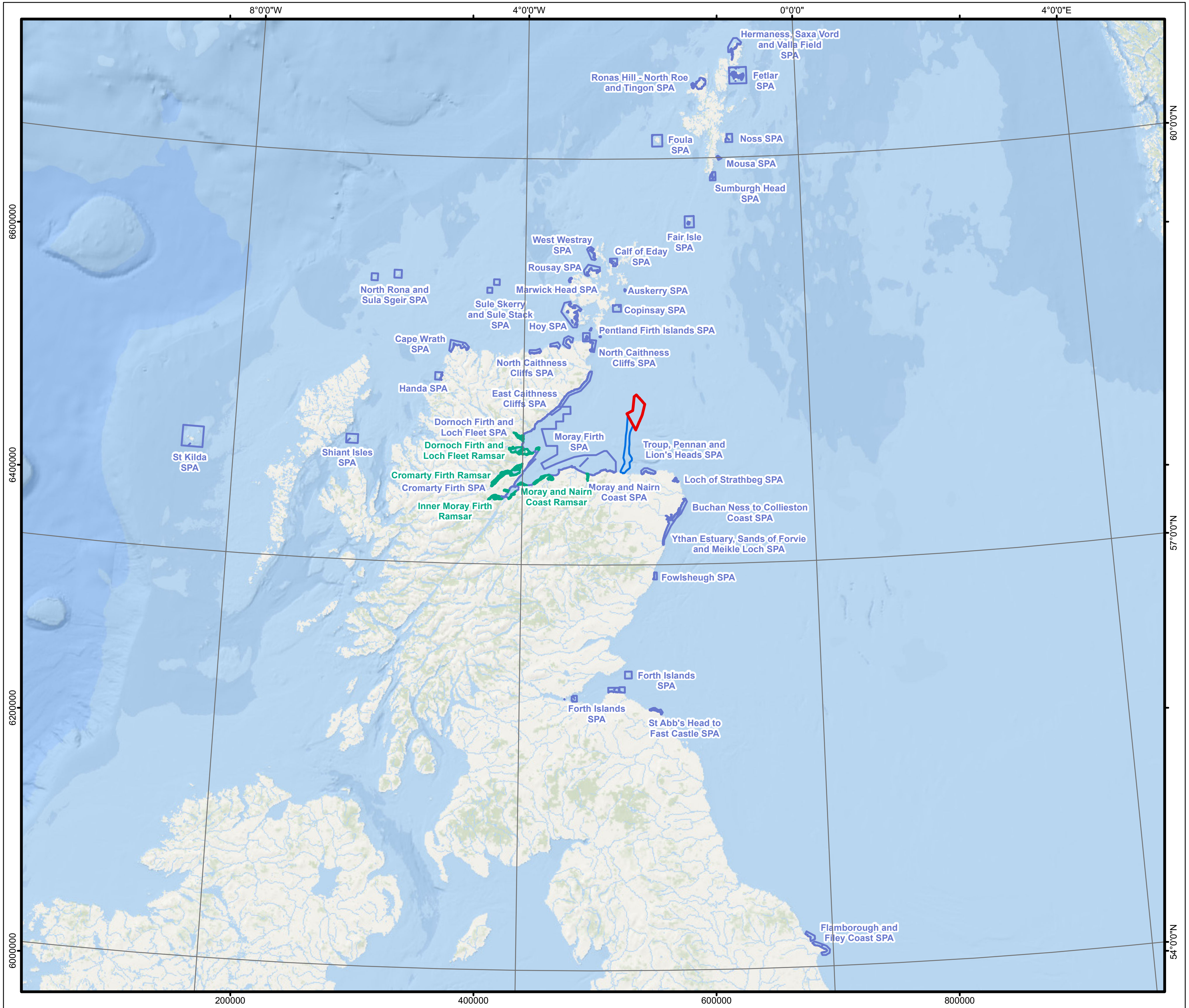
CONTRACTOR DRAWING NO	CONTRACTOR REV
UKCAL1_GO_WNF_HRA_MAP_00165	01

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

DRAWING TITLE

Figure 9-1: Caledonia South in Relation to Designated Sites Screened in for Marine Mammals

STATUS	SCALE	
Approved	1:750,000	
DRAWING NUMBER	SHEET NO	REV
N/A	01 of 01	N/A



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

Service Layer Credits: © OpenStreetMap (and) contributors, CC-BY-SA
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0 50 100 150 km

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

CALEDONIA Offshore Wind Farm

GoBe APEM Group

CONTRACTOR DRAWING NO: UKCAL1_GO_WNF_HRA_MAP_00166

CONTRACTOR REV: 01

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

DRAWING TITLE: Figure 9-2: Caledonia South in Relation to Designated Sites Screening in for Offshore and Intertidal Ornithology

STATUS: Approved

SCALE: 1:4,250,000

DRAWING NUMBER: N/A

SHEET NO: 01 of 01

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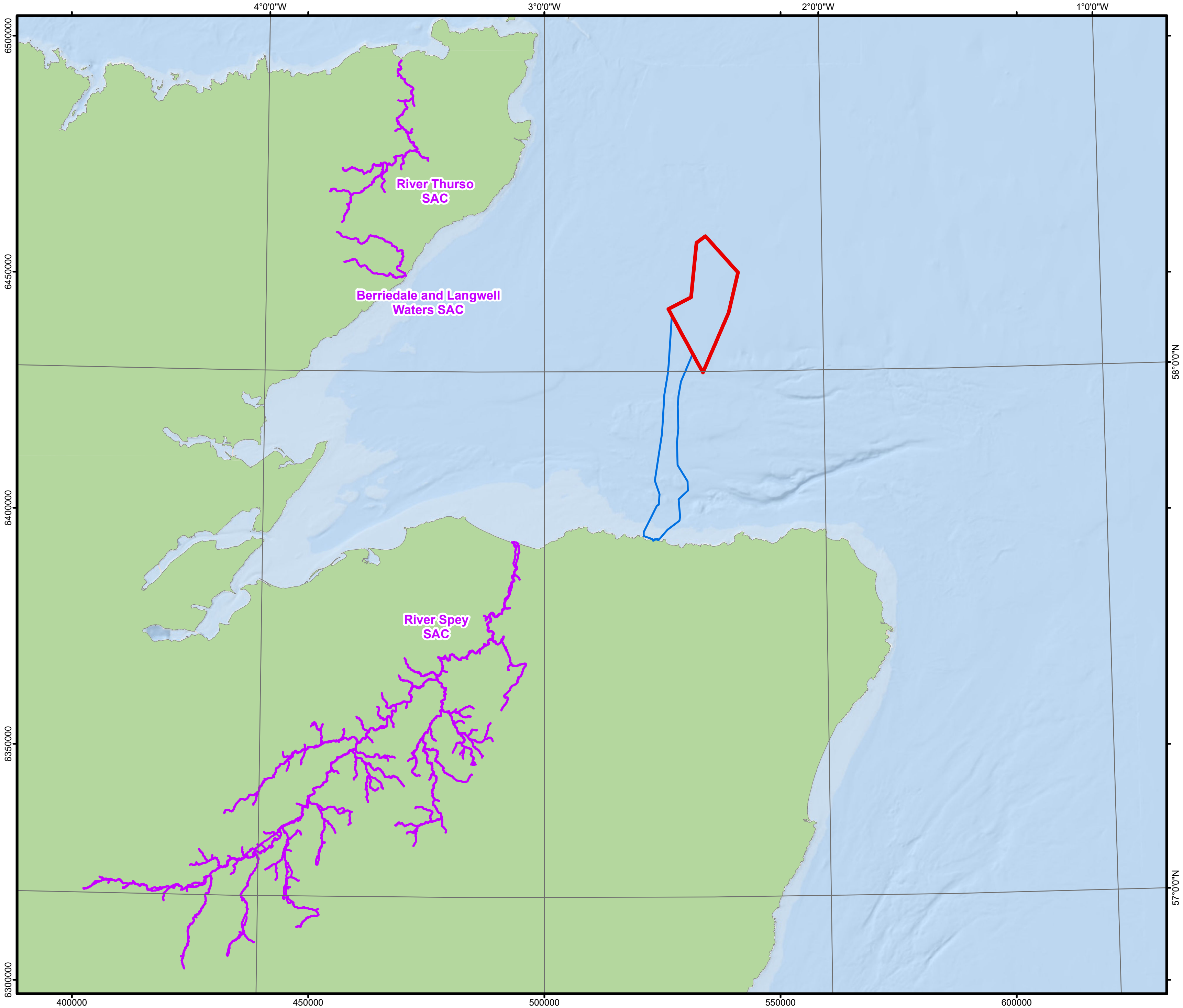


Caledonia South Site

Caledonia South Offshore Export Cable Corridor

Special Area of Conservation (SAC)

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_00167	CONTRACTOR REV 01
GEODETIC PARAMETERS WGS 84 / UTM zone 30N (EPSG: 32630)	
DRAWING TITLE Figure 9-3: Caledonia South 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

9.1.2 Screening In-Combination

9.1.2.1 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 and or in-combination with other plans or projects, where these are not directly connected with or necessary to the management of the site. The screening for Caledonia South alone is summarised above in Section 9.1.1, with the in-combination screening undertaken within the Screening Report (Application Document 12) and the conclusions confirmed here.

9.1.2.2 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) within Part 4 (Section 10.3).

9.2 Assessment of Adverse Effects Alone

9.2.1 Marine Mammals

9.2.1.1 This assessment presents the alone assessment of Caledonia South reflecting a maximum of 80 structures (78 WTGs and 2 OSPs).

Assessment Criteria

9.2.1.2 This section presents an assessment of the adverse effects from Caledonia South on sites designated for marine mammal features with an identified LSE within the Screening Report (Application Document 12). Consultation and screening advice received from various Statutory Nature Conservation Bodies (SNCBs) has been received and considered. The only qualifying species screened into this assessment is bottlenose dolphin at the Moray Firth SAC (57.7km from Caledonia South Site and 37.7km from the Caledonia South OECC).

9.2.1.3 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.

9.2.1.4 The potential effects considered are as follows:

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

Worst Case Scenario

9.2.1.5 Table 9-2 below summarises the WCSs considered for marine mammals, as described within Volume 4, Chapter 7: Marine Mammals. The full project description is provided in Volume 1, Chapter 3: Proposed Development Description (Offshore) for full reference.

Table 9-2: Worst Case Scenario for Marine Mammals for Caledonia South.

Potential Impact	Assessment Parameter	Explanation
Construction		
Underwater noise	**Low order deflagration:** ▪ 0.25kg donor **Unexploded Ordnance (UXO) timeline:** ▪ Four months; and ▪ Up to two clearance events within 24 hours.	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 the Applicant's experience from Moray East and Moray West OWFs. The maximum number of UXOs (to be provided post-consent) to be encountered within Caledonia South and the donor charge for low order deflagration will result in the greatest potential impact.
	Piling timeline: Depending on the construction scenario, piling is anticipated to take place between 2028 and 2037. **Spatial WCS:** ▪ 80 monopiles (78 Wind Turbine Generator (WTG), two Offshore Substation platforms (OSPs)) ▪ Max 6,600 kJ hammer energy ▪ 14m diameter pile ▪ Two monopiles installed per day ▪ Concurrent piling at two locations (at the same time) ▪ **Total of 40 piling days** **Temporal WCS (combination of bottom-fixed and floating):**	Installation of monopile foundations will require the highest hammer energy and therefore represent the worst-case spatial scenario. The worst-case temporal scenario is the sequential piling of a mixture of bottom-fixed jacket and floating foundations (no concurrent piling). Within this scenario there would be up to 410 piling days for anchors associated with taut mooring lines. As such, it could take up to 451 days in total to install, across three years. Note, the underwater noise modelling assumed two anchor piles to be installed per day as the worst-case spatial scenario. However, to inform the worst-case temporal scenario used in the iPCoD modelling, average number of 1.71 piles per day was used in the assessment.

Potential Impact	Assessment Parameter	Explanation
	41 bottom-fixed foundations with pin piles for jackets (39 WTG, two OSPs) ▪ Max 4,400kJ hammer energy ▪ Four legs per jacket ▪ 4m diameter piles ▪ Four piles per day ▪ 41 piling days (assuming 4 pin piles/day) 39 floating foundations with pin piles for anchors (WTGs only) ▪ Max 2,000kJ hammer energy ▪ Three legs with six tendons per leg ▪ 18 anchors per WTG ▪ A total of 702 anchors ▪ Max 4.8m diameter piled anchor ▪ Up to two piles per day ▪ 410 piling days (assuming an average of 1.71 anchor/day) ▪ **Total of up to 451 piling days**.	
	Site preparation: ▪ Dredging and rock placement **WTGS:** ▪ Pre-installation dredging, drilling **Offshore cables:** ▪ Cable laying, trenching, dredging, rock placement **Offshore Construction Timeline:** ▪ Up to three years	The WCS is informed by the type of activity and associated spatial scale of impact as well as the duration of construction.
	Geophysical surveys will include (source levels provided for SPLpk):	The WCS is informed by the source level and expected sound frequency and overlap with marine mammal hearing ranges.

Potential Impact	Assessment Parameter	Explanation
	▪ Multi-beam echosounder (MBES; 210-240dB re 1µPa for multiple beams and 197dB re 1µPa for a single beam; 200 to 400kHz) ▪ Side-scan sonar (SSS; 210dB re 1µPa; 300 to 900kHz) ▪ Sub-bottom profiler (SBP; 210-220dB re 1µPa, 2 to 15kHz) ▪ Ultra-short baseline (USBL; 187 – 206dB re 1µPa, 19 to 34kHz) ▪ Ultra-high resolution seismic (UHRS; 200-226 dB re 1µPa, 100Hz to 5kHz) ▪ Duration and frequency of geophysical surveys will be provided as a part of a separate licencing process post-consent.	
Vessel collision risk	▪ Max 25 vessels on site at once, including installation, cable lay and support, export cable, guard, CTV, scour installation vessels. ▪ Max 2,225 vessel transits. ▪ List of potential ports: Aberdeen City, Aberdeenshire (Peterhead, Fraserburgh), Moray (Buckie), Highland (Cromarty, Nigg, Wick, Ardersier). **Offshore Construction Timeline:** ▪ Up to three years	The WCS is informed by the maximum number of vessels on site at any one time as well as the duration of construction.
Vessel disturbance	Refer to vessel collision risk, 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.
Change in prey availability	Refer to Volume 4, 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 Volume 4, Chapter 5: Fish and Shellfish Ecology, Impacts 1-5.

Potential Impact	Assessment Parameter	Explanation
O&M		
Underwater noise	**Operational timeline:** ▪ 35 years **Bottom-fixed WTGs:** ▪ 24 x 25 MW WTGs ▪ Geared turbine **Floating WTGs:** ▪ 29 x 20 MW WTGs **Cables:** ▪ 29 x inter-array cables ▪ 230mm 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 (tension leg) with chains being the worst-case scenario.
Vessel collision risk	▪ Maximum of 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 maintenance 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 4, 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 4, Chapter 5: Fish and Shellfish Ecology, Impacts 6-11.
Decommissioning		
Underwater noise Vessel collision risk Vessel disturbance Change in prey availability	The worst-case design scenario will be equal to (or less than) that of the construction phase. Refer to construction impacts above.	At the end of the operational lifetime of Caledonia South, 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 and involve similar types and numbers of vessels, activities and equipment. Pile foundations would be cut at such a depth below the surface of the seabed.

Moray Firth SAC

9.2.1.6 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 South Site, and 37.7km away from the Caledonia South OECC.

Conservation Objectives

9.2.1.7 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.

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

Site Status

9.2.1.9 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[1]) 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[2]).

9.2.1.10 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[3]; Quick *et al*., 2014[4]). 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[5]). With this preference for coastal distribution, it is unlikely that individuals will be present within the offshore boundary of Caledonia South Site; however, they are anticipated to be present within the nearshore area of the Caledonia South OECC and the wider coastal regional area.

9.2.1.11 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[6]). 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[6]).

9.2.1.12 It is well documented that the range of this population extends beyond the boundary of the Moray Firth SAC (Cheney *et al*., 2024[6]), acknowledging that sightings of known individuals from this population have been recorded in English waters (Aynsley 2017[7]; Citizen Fins 2022[8]). 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[9]; Arso Civil *et al*., 2021[13]) has recently been updated to 245 (224-268 95% CI) (Cheney *et al*., 2024[6]). Where the CES MU is cited in this document, the most up-to-date population estimate of 245 individuals has been used.

9.2.1.13 The Moray Firth SAC is an important area for this species, 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[10]; 2024[6])

9.2.1.14 For the neighbouring Greater North Sea (GNS) MU, large-scale, dedicated surveys have covered the Caledonia South 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. Caledonia South 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[11]), but no bottlenose dolphins were observed within SCANS-IV survey block CS-K and therefore no population estimates were available (Gilles *et al*., 2023[12]).

9.2.1.15 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 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.

9.2.1.16 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[3]) was scaled to 50% of the current CES MU population size (Arso Civil *et al*., 2021[13]; Cheney *et al*., 2024[6]). Outside of the Moray Firth, all bottlenose dolphins within 2km of the mainland coastline were assigned to the CES MU (Quick *et al*., 2014[4]) 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 Mammals Baseline Characterisation for more details on how bottlenose dolphin densities were derived.

Construction and Decommissioning

Underwater Noise

9.2.1.17 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. 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 conclusions for the construction phase are considered to also apply to decommissioning.

9.2.1.18 There are a number of sources of underwater noise associated with Caledonia South alone during construction, with these identified within Volume 4, Chapter 7: Marine Mammals, and those screened in for potential LSE (in line with Table 9-1) being:

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

9.2.1.19 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

9.2.1.20 Underwater noise from the piling of Caledonia South has been detailed in the following EIAR chapters:

- Volume 4, Chapter 7: Marine Mammals; and
- Volume 7B, Appendix 7-2: Marine Mammals Underwater Noise Assessment Methodology.

9.2.1.21 Volume 7B, Appendix 7-2: 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

9.2.1.22 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 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.

9.2.1.23 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 the specific mitigation measures in the post-consent stage once the project design is refined.

9.2.1.24 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

9.2.1.25 As identified within Part 1 (Section 7.2), piling installation will to generate underwater noise at levels that could expose the Bottlenose dolphins 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. All worst-case scenarios that assess an impact in terms of its range are based on the spatial worst-case scenario and are an assessment of the 'instantaneous' impact. For the full set of results (all modelling locations, all foundation designs and sets of densities) see 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 7D, Appendix 7-1: 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

9.2.1.26 Under the worst-case piling scenario (Table 9-2, spatial worst-case scenario), with piling mitigation in place (M-11 and M-16 as established above), the predicted maximum instantaneous auditory injury (unweighted SPL_{peak} 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 Caledonia South 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.

9.2.1.27 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.

9.2.1.28 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[14]).

9.2.1.29 It is considered that the effects of underwater noise 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, meaning that it is anticipated that no animals are expected to experience injury and therefore there will not be a population level impact. 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

9.2.1.30 In consideration of the conservation objectives outlined in paragraph 9.2.1.7, it is considered that auditory injury (i.e., PTS) arising from pile driving, should not occur and, will not impact on the viability of the population of bottlenose dolphin associated with the site, nor will it impact on the distribution of bottlenose dolphin throughout the site.

9.2.1.31 **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

9.2.1.32 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 (i.e., two piling events taking place within Caledonia North at the same time), up to 57 individuals may experience disturbance (23.27% the SAC population) from locations 3 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).

9.2.1.33 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).

9.2.1.34 The disturbance values used in the modelling were based on the worst case in terms of number of animals disturbed across all piling locations in the Caledonia South Site for the installation of foundations. The results were as follows:

- Modelling for the CES MU:
  - 52 bottlenose dolphin per day for installation of pin piles at jackets; and
  - 46 bottlenose dolphin per day for installation of anchors.
- Modelling for the GNS MU:
  - 35 bottlenose dolphin per day for installation of pin piles at jackets; and
  - 27 bottlenose dolphin per day for installation of anchors.

9.2.1.35 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.

9.2.1.36 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 40 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.

9.2.1.37 However, for bottlenose dolphins within the CES MU population (synonymous with the SAC population) (see Table 9-2) behavioural disturbance as a result of piling may affect a larger proportion of the population and therefore lead to an at most 5.36% deviation in size 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.

9.2.1.38 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).

9.2.1.39 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*., 201363; Graham *et al*., 2017[15]; Fernandez-Betelu *et al*., 2021)[16].

9.2.1.40 Furthermore, the relatively dynamic social structure of bottlenose dolphins (Connor *et al*., 2001[17]) 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.

9.2.1.41 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)[18]. Thus, it is considered that bottlenose dolphins are not particularly adversely affected by disturbance and no change to vital rates is expected.

9.2.1.42 **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 Caledonia South alone**.

Assessment of Underwater Noise During UXO Clearance

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

9.2.1.44 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 OWF site were cleared using a low order deflagration technique, with 100% success rate (Ocean Winds, 2024[19]). As such, given that low order deflagration is a viable and effective method to be applied during UXO clearance at the Caledonia South Site and Caledonia South OECC, and the embedded mitigation M-96 mentioned above, the potential effects of high order clearance are not considered further.

9.2.1.45 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[34]) 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 due to the lack of empirical evidence from UXO clearances using these metrics, in particular the range-dependent characteristics of the peak sounds, and whether current propagation models can accurately predict the range at which these thresholds are reached.

9.2.1.46 Using both the Effective Deterrence Range (EDR) methodology and using Temporary Threshold Shift (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 9-3. UXO clearance is defined as a single pulse and thus, both the weighted SELss criteria and the unweighted SPL_{peak} criteria from Southall *et al*. (2019[34]) 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 7B, Appendix 7-2: Marine Mammals Underwater Noise Assessment Methodology.

Table 9-3: 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 μPa²s @ 1m
0.25kg	269.8	215.2

Auditory Injury

9.2.1.47 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[20]). 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 100Hz, and there is a pronounced drop-off in energy levels above ~5-10kHz (von Benda-Beckmann *et al*., 2015[21]; Salomons *et al*., 2021[22]). Spectograms for low order clearance events show sharp transient time and arrival of higher frequency components first, with detectable energy up to 7kHz (Lepper *et al*., 2024[20]). However, there is a rapid drop off to lower frequency containing most of the energy of the signal within levels up to 3kHz (Lepper *et al*., 2024[20]).

9.2.1.48 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.

9.2.1.49 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).

9.2.1.50 As UXO clearance is defined as a single pulse, both the weighted SELss criteria and the unweighted SPL_{peak} criteria (Southall *et al*., 201934) were considered. The maximum PTS impact range of UXO clearance on bottlenose dolphins is estimated to be 60m, when considering the unweighted SPL_{peak} criteria, and the adoption of the 'low-order' clearance technique and no at-source mitigation.

9.2.1.51 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.

9.2.1.52 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.

9.2.1.53 **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

9.2.1.54 Following the WCS for UXO clearance (Table 9-2), 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.

9.2.1.55 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.

9.2.1.56 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.

9.2.1.57 It is noted in the JNCC (2020[23]) 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.

9.2.1.58 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.

9.2.1.59 **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

9.2.1.60 A series of high-resolution geophysical surveys will be undertaken in the construction phase within Caledonia South Site 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 Caledonia South site.

9.2.1.61 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*. (201934) is applied here.

9.2.1.62 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 9-4. Table 9-4 presents typical values for geophysical surveys for large OWFs, 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 9-4: 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.*, 201934)
MBES	210–240 dB re 1µPa (SPL_{peak}) for multiple beams* (Lurton and Deruiter, 2011[24]) 197 dB re 1µPa (SPL_{peak}) for a single beam at an operational frequency of 200kHz (Risch *et al.*, 2017[25])	200–400kHz (Hartley Anderson Ltd, 2020[26])	Above hearing range
SSS	210 dB re 1µPa (SPL_{peak}) (Crocker and Fratantonio, 2016[27]; Crocker *et al.*, 2019[28])	300 and 900kHz (Crocker and Fratantonio, 201627)	Above hearing range
SBP	210–220 dB re 1µPa (SPL_{peak}) (Hartley Anderson Ltd, 202026)	Frequency selectable. Typically 2–15kHz with a peak frequency of 3.5kHz (Hartley Anderson Ltd, 202026)	Within hearing range
USBL	187 – 206 dB re 1 µPa (Jiménez-Arranz *et al.*, 2020[29])	19 – 34kHz (Jiménez-Arranz *et al.*, 2020[29])	Within hearing range
UHRS	200 – 226 dB re 1 µPa (Hartley Anderson Ltd, 2020[26])	100Hz to 5kHz, and average approx. 1.5kHz (Hartley Anderson Ltd, 2020[26])	Within hearing range
* The higher the frequency of operation, the lower the source level tends to be.			

9.2.1.63 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.

9.2.1.64 Additionally, given the hearing sensitivities of bottlenose dolphins and the estimated source pressure levels dictated within Table 9-4 above, the MBES and SSS have been scoped out of further assessment.

Auditory Injury

9.2.1.65 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.

9.2.1.66 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, 201124), 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 15kHz) is likely to affect only a small region of bottlenose dolphin hearing, which is unlikely to result in changes to vital rates.

9.2.1.67 The operational frequencies of USBL (19 to 34kHz) 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.

9.2.1.68 The operational frequencies of UHRS (100Hz to 5kHz) 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.

9.2.1.69 Furthermore, Caledonia South 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 Caledonia South. 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.

9.2.1.70 **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

9.2.1.71 JNCC *et al*. (2010[30]) 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[31]) 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 1m) 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[32]) 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.

9.2.1.72 With respect to both USBL and UHRS, a sound source verification exercise carried out by Pace *et al*. (2021[33]) 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.

9.2.1.73 Furthermore, Caledonia South 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 Caledonia South. 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.

9.2.1.74 **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 surveys.**

Underwater Noise from Other Construction Activities

9.2.1.75 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.

9.2.1.76 Using the non-impulsive weighted SELcum PTS thresholds from Southall *et al*. (2019[34]), PTS impact ranges of <100m for all marine mammal species for each non-piling construction activity are estimated (i.e., 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

9.2.1.77 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[35]) (see the vessel disturbance assessment beginning in paragraph 9.2.1.85). The outcomes of the vessel disturbance assessment determine that there would be little impact to vital rates.

9.2.1.78 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[36]) 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

9.2.1.79 Dredging is described as a continuous broadband sound source, with the main energy below 1kHz; however, the frequency and sound pressure level can vary considerably depending on the equipment, activity, and environmental characteristics (Todd *et al*., 2015[37]). 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 @ 1m with a frequency range of 45Hz to 7kHz (Evans, 1990[38]; Thompson *et al*., 2009[39]; Verboom, 2014[40]). It is expected that the underwater noise generated by dredging will be below the PTS-onset threshold (Todd *et al*., 2015[37]) and thus the risk of injury is unlikely. For bottlenose dolphins, their hearing sensitivity below 1kHz is relatively poor and thus it is expected that a PTS at this frequency would be unlikely to affect vital rates.

Drilling

9.2.1.80 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[41]). Recordings of drilling at the North Hoyle OWF suggest that the sound produced has a fundamental frequency at 125Hz (Nedwell *et al*., 2003[42]). For bottlenose dolphins, the hearing sensitivity below 1kHz 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

9.2.1.81 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[43]). Therefore, it is highly likely that any generated noise would be dominated by the vessel. For bottlenose dolphins, the hearing sensitivity below 1kHz is relatively poor and thus it is expected that a PTS at these low frequency ranges would be unlikely to affect vital rates.

Trenching

9.2.1.82 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 100Hz – 1kHz and in general the sound levels were only 10-15 dB above background levels (Nedwell *et al*., 200342). For bottlenose dolphins, the hearing sensitivity below 1kHz 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

9.2.1.83 Given the minimal potential for impact and lack of sensitivity of the species, a conclusion of no AEoSI 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 Caledonia South alone.

Conclusion of Underwater Noise

9.2.1.84 **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 Caledonia South alone**.

Assessment of Vessel Disturbance (Underwater Noise and Physical Presence)

9.2.1.85 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.

9.2.1.86 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[51]). Disturbance from vessels is therefore assessed in general terms separately from underwater noise assessments, covering disturbance driven by both underwater noise and vessel presence.

9.2.1.87 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 Caledonia South 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.

9.2.1.88 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 Caledonia South, 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[44]). OSPAR (2009a[45]) 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 100m in length) are expected to have broadband source levels ranging 165 to 180 dB re 1µPa, with the majority of energy below 1kHz (OSPAR, 2009b[46]). Large commercial vessels (>100m in length) produce relatively loud and predominately low frequency sounds, with the strongest energy concentrated below several hundred Hz.

9.2.1.89 During the construction phase of Caledonia South there may be up to 2,225 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.

9.2.1.90 The area surrounding Caledonia South 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 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 OECC study area with recreational vessels making up the largest percentage of vessel traffic at 420% 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.

9.2.1.91 It is worth noting that 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 Caledonia South area which is considered highly unlikely (as established within paragraphs 9.2.1.9 to 9.2.1.16). It is considered that there is no pathway for vessel noise within the Caledonia South 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.

9.2.1.92 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. This was the first study to conclusively show that boat physical presence, not just noise, plays a large role in disturbance of bottlenose dolphins. 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[47]; Lusseau, 2003[48]; Pellegrini *et al.,* 2021[49]; Pirotta *et al*., 2015[51]). Repeated disruptions may result in an overall reduced energy intake.

9.2.1.93 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[51]). In this context vessel disturbance can be considered to have a transient effect on bottlenose dolphin.

9.2.1.94 In a modelling study by Lusseau *et al*. (2011[50]), 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[18]) 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[18]).

9.2.1.95 Bottlenose dolphins have also been observed tolerating vessel disturbance, particularly in areas where vessel traffic has always been high (Pirotta *et al*. 2013[51]). Similarly, the presence of bottlenose dolphin was positively correlated with overall vessel number during the construction works of an oil pipeline in Broadhaven Bay, northwest Ireland (Anderwald *et al*., 2013[52]). However, it was unclear whether the bottlenose dolphins were attracted to the vessels themselves or to particularly high prey concentrations within the study area at the time (Anderwald *et al*., 2013[52]).

9.2.1.96 Bottlenose dolphins have capability to adapt their behaviour and tolerate certain levels of temporary disturbance, including temporary increases in vessel disturbance. In Cardigan Bay, UK, bottlenose dolphins have shown neutral and even positive response towards some vessels, which was related to vessel type and speed (Gregory and Rowden, 2001[53]). Richardson (2012[54]) investigated the effect of disturbance on bottlenose dolphin community structure in Cardigan Bay, UK, and found that group size was significantly smaller in areas of high vessel traffic. There is, however, evidence of habituation to boat traffic and therefore a slight increase may not result in high levels of disturbance.

9.2.1.97 With the consideration of these studies, it is concluded that bottlenose dolphins have reasonable adaptability, are tolerant of vessel movement and have a high recoverability to potential vessel disturbance, therefore the potential for impact is minimal.

Project Mitigation

9.2.1.98 The potential for vessel disturbance could result from construction vessels, support vessels or crew transfer vessels (CTVs) being in the Caledonia South 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.

9.2.1.99 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.

9.2.1.100 Caledonia South will implement a VMP (M-13) which, depended on construction port locations, will implement Code of Conduct (following the WiSe Scheme; NatureScot, 2017[67]). 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

9.2.1.101 **The potential for vessel disturbance at Caledonia South 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 Caledonia South alone.**

Collision Risk

9.2.1.102 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.

9.2.1.103 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[55]). With regards to injuries, both fatal and non-fatal injuries between marine mammals and vessels have been documented (Laist *et al*., 2001[56]; Vanderlaan *et al*., 2008[57]; Cates *et al*., 2017[58]). Fatalities from ship strikes, however, often go unreported (Authier *et al*., 2014[59]). 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[60]; Luksenburg, 2014[61]).

9.2.1.1 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[55]; refer to Section 9.2.1.86), although 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[62]). 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[56]), and that data on collisions with smaller marine species is scarce (Schoeman *et al*., 2020[55]). Increased detectability and predictability are predicted to be factors that reduce collision risk (Nowaceck *et al*., 2001[63]; Lusseau, 2003[64], 2006[65]).

9.2.1.2 Dolphins are relatively small and highly mobile, and 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[63]), no change despite vessel presence (Mills *et al*., 2023), and attraction responses. Given their ability to detect and respond to vessels, it is expected that they will largely avoid collision. 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[66]). Therefore, mortality of bottlenose dolphins from vessel collisions it is not considered to be a significant cause of mortality in UK waters.

9.2.1.3 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). Therefore, mortality of bottlenose dolphins from vessel collisions it is not considered to be a significant cause of mortality in UK waters.

9.2.1.4 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 out with the SAC, the amount of time spent at the Caledonia South 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 Caledonia South will follow established transit routes when transiting. It is important to note that vessels for Caledonia North will follow established transit 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[63]; Lusseau, 2003[64], 2006[65]).

9.2.1.5 Overall, given the SMASS (2024[66]) 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

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

9.2.1.7 Caledonia South will implement a VMP (M-13) which, depending on construction port locations, will implement a Code of Conduct (following the WiSe Scheme, including advice to operators to not deliberately approach marine mammals; NatureScot, 2017[67]). 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.

9.2.1.8 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

9.2.1.9 **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 Caledonia South alone**.

Changes to Prey

9.2.1.10 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

9.2.1.11 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 Caledonia South.

Assessment of Changes to Prey

9.2.1.12 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.

9.2.1.13 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 4, 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.

9.2.1.14 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[68]; NatureScot, 2024[69]). This demonstrates a very highly varied diet, and that bottlenose dolphin can be considered as generalist feeders (Evans and Hintner, 2013[70]). Bottlenose dolphin therefore have access to a wide variety of prey species across a wide foraging area, therefore any small changes at the Caledonia South site will not have an indirect impact on bottlenose dolphin associated with the Moray Firth SAC.

Conclusion of Changes to Prey

9.2.1.15 **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 construction and decommissioning for Caledonia South alone**.

O&M

Underwater Noise

9.2.1.16 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.

9.2.1.17 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[71]; Teilmann *et al*., 2006[72]; CEFAS, 2010[73]; Brasseur, *et al*., 2012[74]). This is further evidenced when using the noise modelling Specifically, that the non-impulsive weighted SEL_{cum} PTS and TTS thresholds from Southall *et al*. (2019[34]) resulted in estimated PTS and TTS impact ranges of <100m for bottlenose dolphin (being the minimum range feasible when producing modelled outputs for the SEL_{cum} values – in other words the potential range of effect is within that distance, not necessarily out to that distance).

9.2.1.18 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

9.2.1.19 **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 Caledonia South. 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

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

Assessment of Collision Risk

9.2.1.21 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 9-2), it is not expected to increase the likelihood of collisions.

9.2.1.22 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

9.2.1.23 **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 Caledonia South alone.**

Vessel Disturbance

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

Assessment of Vessel Disturbance

9.2.1.25 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 9-2), it is not expected to increase the risk of disturbance by vessels.

9.2.1.26 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 disturbance.

9.2.1.27 **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

9.2.1.28 **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 Caledonia South alone**.

Changes to Prey

9.2.1.29 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

9.2.1.30 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 Caledonia South.

9.2.1.31 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.

9.2.1.32 **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

9.2.1.33 **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 Caledonia South alone.

Conclusion of Assessment of Marine Mammals from Caledonia South Alone

9.2.1.34 **One designated site was identified to have a potential for AEoSI from Caledonia South, 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) concluded no AEoSI. Therefore, there is no AEoSI on the bottlenose dolphin feature of the Moray Firth SAC with respect to Caledonia South alone**.

9.2.1.35 In-combination effects for Marine Mammals are presented in Section 10.3.1.

9.2.2 Offshore and Intertidal Ornithology

Assessment Criteria

9.2.2.1 This section presents an assessment of the adverse effects from Caledonia South on sites designated for Offshore and Intertidal Ornithology features with an identified LSE within the HRA 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 9-1.

Worst Case Scenario

9.2.2.2 Table 9-5 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).

Table 9-5: Worst Case Scenario for Offshore and Intertidal Ornithology for Caledonia South.

Potential Impact	Assessment Parameter	Explanation
Construction		
Distributional responses	**Max number vessels on site at once:** ▪ 25 **Max number vessel transits:** ▪ 2,225 movements **List of potential ports:** ▪ Aberdeen City, Aberdeenshire (Peterhead, Fraserburgh), Moray (Buckie), Highland (Cromarty, Nigg, Wick, Ardersier).	The worst-case scenario is informed by the maximum number of vessels on the Caledonia South Site at any one time (25), maximum number of vessel movements (2,225) as well as the duration of construction (up to four years).
O&M		
Distributional responses	**Max number vessels on site at once:** ▪ 25 **Max number of vessels on-site simultaneously:** ▪ Up to 3 vessels during routine operations **Annual number of vessel movements:** ▪ 938	The worst-case scenario is informed by the maximum number of vessels on the Caledonia South Site at any one time (25), annual number of vessel movements (938).
Indirect Effects: Habitat Loss/Displacement of Prey Species	See Worst Case Assessment Scenario for the Benthic and Intertidal Ecology assessment (Volume 4, Chapter 4: Benthic Subtidal and Intertidal Ecology, Impacts 4-10) and for the Fish and Shellfish Ecology assessment (Volume 4, 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	▪ Based on WTG deployment across the Caledonia South Site (204.5km^2). ▪ 78 bottom-fixed WTGs; ▪ Rotor radius: 118m; and ▪ Minimum air gap: 35m relative to MLS (32.81m relative to HAT).	The worst-case scenario is based upon the WTG with the smallest air gap (presented within Volume 7B, Appendix 6-3: Offshore Ornithology Collision Risk Modelling Technical Report) as well as the maximum likely duration of O&M (35 years). All scenario details outlined in Volume 7B, Appendix 6-3: Offshore Ornithology Collision Risk Modelling Technical Report.
Decommissioning		
Distributional Responses	The worst-case design scenario will be equal to (or less than) that of the construction phase. Refer to the Distributional Responses impact above.	The maximum estimated number of vessels associated with the decommissioning of the Caledonia South Site.

East Caithness Cliffs SPA

9.2.2.3 The centroid of the East Caithness Cliffs SPA is 51.4km (around land) 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[75]). 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)
  - Distributional 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

9.2.2.4 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

9.2.2.5 Kittiwake have been screened into the assessment for collision risk as they are susceptible to collision due to their flight height distribution and behaviours (Bradbury *et al*., 2014[76]; JNCC *et al*., 2024[77]; NatureScot 2023a[78]; Furness and Wade, 2012[79]; Furness *et al*., 2013[80]).

9.2.2.6 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 Caledonia South 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.

9.2.2.7 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 9-6 (detailed methods are presented within Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note).

Table 9-6: 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	374.37	10.51
Non-breeding season (September to early-April)	5.84 (Autumn %) 7.72 (Spring %)	24.95	0.45
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

9.2.2.8 The SPA population of kittiwake was cited as 65,000 breeding adults in 1985-1987. The most recent count (2015) is 48,920 breeding adults (Swann, 2016[81]).

9.2.2.9 When considering a breeding adult baseline mortality rate of 0.146 (1- 0.854, Horswill and Robinson, 2015[83]), 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 recent count (2015) respectively. In terms of colony trends, significant declines of the kittiwake feature at East Caithness Cliffs have been noted by Burnell *et al*. (2023[82]) between 1998-2002 and 2015-2021.

Seasonal Apportionment of Potential Impacts

9.2.2.10 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

9.2.2.11 During the O&M phase, the potential level of impact apportioned to the SPA seasonally is summarised in Table 9-7 for the Guidance approach.

9.2.2.12 A displacement matrix is also presented for the annual apportioned abundance for the Caledonia South plus 2km buffer to East Caithness Cliffs SPA in Table 9-8.

Table 9-7: 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% Disp; 1-3% Mort	Change in Average Survival Rate (% Point Change)
Citation (65,000)	Breeding season (Mid-April to August)	1.12 - 3.37	0.002 - 0.005
	Non-breeding season (September to early-April)	0.07 - 0.22	<0.001
	Annual	1.20 - 3.59	0.002 - 0.006
Latest count (48,920)	Breeding season (Mid-April to August)	1.12 - 3.37	0.002 - 0.007
	Non-breeding season (September to early-April)	0.07 - 0.22	<0.001
	Annual	1.20 - 3.59	0.002 - 0.007

Breeding Season

9.2.2.13 The estimated kittiwake mean peak abundance during the breeding season is 1,530 (1,529.72) individuals, with an estimated 51.31% of all individuals during the breeding season deriving from East Caithness Cliffs SPA (Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note). Assuming that 53% of the kittiwake population are adults (Furness, 2015[84]) 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 374 (374.37) per annum during the breeding season (Table 9-6).

9.2.2.14 When applying a displacement rate of 30% and a mortality rate of 1-3%, the consequent potential mortality is estimated to one to three (1.12 - 3.37) breeding adults per annum.

9.2.2.15 Using the citation colony count of 65,000 breeding adults and an annual background mortality of 9,490 breeding adults, the addition of one to three predicted breeding adult mortalities would result in a 0.002 - 0.005 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 0.002 - 0.007 survival rate percentage point change during the breeding season per annum (Table 9-7).

Non-breeding Season

9.2.2.16 The estimated kittiwake mean peak abundance during the non-breeding season is 427 (427.00) individuals. Based on the Furness (2015[84]) 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 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 25 (24.95) per annum during the non-breeding season (Table 9-7).

9.2.2.17 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 (0.07 - 0.22) per annum.

9.2.2.18 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 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 survival rate percentage point change during the non-breeding season per annum (Table 9-7).

Annual Total

9.2.2.19 The predicted resultant mortality across all defined seasons from Caledonia South, attributed to East Caithness Cliffs SPA, is one to four (1.20 - 3.59) breeding adult kittiwake per annum. This is predicted to result in a survival rate percentage point change against the citation and most recent counts of 0.002 - 0.006 and 0.002 - 0.007 respectively (see Table 9-7).

9.2.2.20 For both citation and most recent 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 East Caithness Cliffs SPA in relation to potential distributional response effects from Caledonia South alone during the O&M phase. Therefore, subject to natural change, kittiwake will be maintained as a feature in the long term**.

Table 9-8: Kittiwake O&M phase disturbance annual displacement matrix for impacts apportioned to East Caithness Cliffs 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	1	1	2	4	8	12	16	20	24	28	32	36	40
20	1	2	2	4	8	16	24	32	40	48	56	64	72	80
30	1	2	4	6	12	24	36	48	60	72	84	96	108	120
40	2	3	5	8	16	32	48	64	80	96	112	128	144	160
50	2	4	6	10	20	40	60	80	100	120	140	160	180	200
60	2	5	7	12	24	48	72	96	120	144	168	192	216	240
70	3	6	8	14	28	56	84	112	140	168	196	224	252	280
80	3	6	10	16	32	64	96	128	160	192	224	256	288	319
90	4	7	11	18	36	72	108	144	180	216	252	288	323	359
100	4	8	12	20	40	80	120	160	200	240	280	319	359	399
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 Approaches 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

9.2.2.21 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 9-9.

Table 9-9: 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)	10.51	0.016
	Non-breeding season (September to early-April)	0.45	0.001
	Annual	10.96	0.017
Latest count (48,920)	Breeding season (Mid-April to August)	10.51	0.021
	Non-breeding season (September to early-April)	0.45	0.001
	Annual	10.96	0.022

Breeding Season

9.2.2.22 The predicted kittiwake collision mortality during the breeding season is 43 (42.94) individuals per annum, with an estimated 51.31% of all individuals during the breeding season deriving from East Caithness Cliffs SPA (Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note). Assuming that 53% of the population are adults (Furness, 2015[84]) 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 11 (10.51) per annum during the breeding season.

9.2.2.23 Using the citation colony count of 65,000 breeding adults and an annual background mortality of 9,490 breeding adults, the addition of 11 predicted breeding adult mortalities per annum would result in a 0.016 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 0.021 survival rate percentage point change during the breeding season per annum (see Table 9-9).

Non-breeding Season

9.2.2.24 The predicted kittiwake collision mortality during the non-breeding season is 7 (6.52) individuals. Based on the Furness (2015[84]) 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 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 one (0.45) per annum (see Table 9-9).

9.2.2.25 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 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 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 0.001 during the non-breeding season per annum (see Table 9-9).

Annual Total

9.2.2.26 The predicted resultant mortality across all defined seasons from Caledonia South, attributed to East Caithness Cliffs SPA, is 11 (10.96) breeding adults per annum. This is predicted to result in a 0.017 and 0.022 survival rate percentage point change when considering the citation count and most recent count, respectively (see Table 9-9).

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

Population Viability Analysis

9.2.2.28 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[81]). An impact value of 11 breeding adult additional mortalities per annum were modelled, as set out in Table 10-107 of Section 10.3.3. Even when considering a predicted impact of 11 breeding adult mortalities, the annual reduction in the growth rate is predicted to be at most 0.026% against the latest colony count.

9.2.2.29 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 kittiwake feature of East Caithness Cliffs SPA in relation to distributional response effects in the O&M phase from the Project 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

9.2.2.30 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 9-10.

Table 9-10: 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 counts.

Population Size (Breeding Adults)	Defined Season (Months)	Guidance Approach 30% Disp; 1-3% Mort	
		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)	11.63 - 13.88	0.018 - 0.021
	Non-breeding season (October to Early-March)	0.53 - 0.68	0.001
	Annual	12.16 - 14.55	0.019 - 0.022
Latest count (48,920)	Breeding season (Mid-March to September)	11.63 - 13.88	0.024 - 0.028
	Non-breeding season (October to Early-March)	0.53 - 0.68	0.001
	Annual	12.16 - 14.55	0.025 - 0.030

Breeding Season

9.2.2.31 As presented within (Table 9-10) the combined distributional response and collision risk impacts apportioned to the kittiwake feature of East Caithness Cliffs SPA, equates to approximately 12 - 14 (11.63 - 13.88) 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 12 - 14 predicted breeding adult mortalities would result in a 0.018 - 0.021 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 7,142 breeding adults, this results in a 0.024 - 0.028 survival rate percentage point change during the breeding season per annum (see Table 9-10).

Non-breeding Season

9.2.2.32 As presented within Table 9-10 the combined distributional response and collision risk impacts apportioned to the kittiwake feature of East Caithness Cliffs SPA, equates to approximately one (0.53 - 0.68) 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 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 0.001 survival rate percentage point change during the non-breeding season per annum (see Table 9-10).

Annual Total

9.2.2.33 The predicted resultant mortality across all defined seasons from Caledonia South, attributed to East Caithness Cliffs, is 12 - 15 (12.16 - 14.55) kittiwake per annum. This is predicted to result in survival rate percentage point change against the citation and most recent counts of 0.019 - 0.022 and 0.025 - 0.030 respectively (see Table 9-10).

9.2.2.34 As predicted 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

9.2.2.35 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[81]). A range of impact values from 12 to 15 breeding adult additional mortalities per annum were modelled, which allows for consideration of the Guidance approach predicted impact levels, as set out in Table 10-107 of Section 10.3.3. Even when considering a predicted impact of 15 breeding adult mortalities (based on 30% displacement and 1-3% mortality rate), 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 14, Appendix 14-2: Caledonia South Habitats Regulations Appraisal Population Viability Assessment Technical Report as additional information).

9.2.2.36 Regardless of the colonies 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 kittiwake feature of East Caithness Cliffs SPA in relation to distributional response effects in the O&M phase from the**

Caledonia South alone can be concluded. Therefore, subject to natural change, kittiwake will be maintained as a feature in the long term.

Great Black-Backed Gull

9.2.2.37 Great black-backed 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 great black-backed gull for all SPAs, a combined assessment for all SPAs is provided in Section 9.2.2 beginning in paragraph 9.2.2.539. As presented in paragraph 9.2.2.539, **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 Caledonia South 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

9.2.2.38 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 9.2.2, beginning in paragraph 9.2.2.543. As presented in paragraph 9.2.2.543, **the potential for an AEoSI to the conservation objectives of herring gull at East Caithness Cliffs SPA in relation to collision impacts from Caledonia South 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

9.2.2.39 Guillemot have been screened into the assessment for distributional responses as they are susceptible to displacement due to their distribution and behaviours (Bradbury *et al*., 2014[76]; NatureScot 2023[78]; Furness and Wade, 2012[79]; Furness *et al*., 2013[80]).

Status

9.2.2.40 The SPA population of guillemot was cited as 106,700 breeding adults in 1985-1987. The most recent count (2015) is 199,992 breeding adults (Swann, 2016[81]).

9.2.2.41 When considering a breeding adult baseline mortality rate of 0.061 (1- 0.939, Horswill and Robinson, 2015[83]), 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 recent 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

9.2.2.42 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

9.2.2.43 As outlined above, guillemot have been screened into the assessment for distributional responses. The level of abundance apportioned is presented in Table 9-11 (detailed methods are presented within Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note).

9.2.2.44 For guillemot, distributional responses are assessed based on the birds within the Caledonia South 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: Offshore Ornithology Review of Relevant Evidence.

Table 9-11: Guillemot 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)	38.94	4,409.53
Non-breeding season (Mid-August to March)	28.28	1,636.85

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

9.2.2.45 During the O&M phase, the potential level of impact apportioned to the SPA seasonally is summarised in Table 9-12 for both the Applicant and Guidance approach.

9.2.2.46 A displacement matrix is also presented for the annual apportioned abundance for the Caledonia South plus 2km buffer to East Caithness Cliffs SPA in Table 9-13.

Table 9-12: 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% Disp; 1% Mort	Change in Average Survival Rate (% Point Change)	60% Disp; 1-3% Mort (Non-breeding); 3-5% Mort (Breeding)	Change in Average Survival Rate (% Point Change)
Citation (106,700)	Breeding season (April to Mid-August)	22.05	0.021	79.37 - 132.29	0.074 - 0.124
	Non-breeding season (Mid-August to March)	8.18	0.008	9.82 - 29.46	0.009 - 0.028
	Annual	30.23	0.028	89.19 - 161.75	0.084 - 0.152
Latest count (199,992)	Breeding season (April to Mid-August)	22.05	0.011	79.37 - 132.29	0.040 - 0.066
	Non-breeding season (Mid-August to March)	8.18	0.004	9.82 - 29.46	0.005 - 0.015
	Annual	30.23	0.015	89.19 - 161.75	0.045 - 0.081

Breeding Season

9.2.2.47 The estimated guillemot mean peak abundance during the breeding season is 11,323 (11,322.93) individuals, with an estimated 73.46% of guillemot during the breeding season deriving from East Caithness Cliffs SPA (Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note). Assuming that 57% of the guillemot population are adults (Furness, 2015[84]) 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 4,410 (4,409.53) per annum during the breeding season (Table 9-12).

9.2.2.48 When applying a displacement rate of 50% and a mortality rate of 1%, the consequent potential mortality is estimated to 22 (22.05) breeding adults per annum.

9.2.2.49 Using the citation colony count of 106,700 breeding adults and an annual background mortality of 6,509 breeding adults, the addition of 22 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 199,992 breeding adults and an annual background mortality of 12,200 breeding adults, this results in a 0.011 survival rate percentage point change during the breeding season per annum (Table 9-12).

Non-breeding Season

9.2.2.50 The estimated guillemot mean peak abundance during the non-breeding season is 5,788 (5,787.86) 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, 2023b[85]), based on recent geolocator studies presented in Buckingham *et al.* (2022[86]). 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 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 1,637 (1,636.85) per annum during the non-breeding season (Table 9-12).

9.2.2.51 When applying a displacement rate of 50% and a mortality rate of 1%, the consequent predicted distributional response mortality of breeding adult guillemot from East Caithness Cliffs SPA during the non-breeding season is predicted at eight (8.18) per annum.

9.2.2.52 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 eight 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 199,992 breeding adults and an annual background mortality of 12,200 breeding adults, this results in a 0.004 survival rate percentage point change during the non-breeding season per annum (Table 9-12).

Annual Total

9.2.2.53 The predicted resultant mortality across all defined seasons from Caledonia South, attributed to East Caithness Cliffs SPA, is 30 (30.23) breeding adult guillemot per annum. This is predicted to result in a survival rate percentage point change against the citation and most recent counts of 0.028 and 0.015 respectively (Table 9-12).

9.2.2.54 When considering the Guidance approach, a total of 89 - 162 (89.19 - 161.75) breeding adult mortalities are predicted due to potential distributional response effects per annum. This results in a survival rate percentage point change of 0.084 - 0.152 against the citation and 0.045 - 0.081 against the most recent count (Table 9-12).

9.2.2.55 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

9.2.2.56 As most recent counts are significantly higher than the citation count and the SPA is in favourable condition, impacts are considered against the most recent count. The potential for distributional responses alone has been assessed against the latest 2015 colony count population size of 199,992 breeding adults according to Swann (2016[81]). A range of impact values from 89 to 162 breeding adult additional mortalities per annum were modelled, which allows for consideration of the Guidance approach predicted impact levels, as set out in Table 10-111 of Section 10.3.3. Even when considering a predicted impact of 162 (based on 60% displacement and 3-5% mortality rate), the annual reduction in the growth rate is predicted to be at most 0.091% against the latest colony count (PVA outputs against the citation count are presented in Application Document 14, Appendix 14-2: Caledonia South Habitats Regulations Appraisal Population Viability Assessment Technical Report as additional information).

9.2.2.57 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 East Caithness Cliffs SPA in relation to distributional response effects in the O&M phase from the Caledonia South alone. Subject to natural change, guillemot will be maintained as a feature in the long term**.

Table 9-13: 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	6	12	18	30	60	121	181	242	302	363	423	484	544	605
20	12	24	36	60	121	242	363	484	605	726	846	967	1,088	1,209
30	18	36	54	91	181	363	544	726	907	1,088	1,270	1,451	1,633	1,814
40	24	48	73	121	242	484	726	967	1,209	1,451	1,693	1,935	2,177	2,419
50	30	60	91	151	302	605	907	1,209	1,512	1,814	2,116	2,419	2,721	3,023
60	36	73	109	181	363	726	1,088	1,451	1,814	2,177	2,539	2,902	3,265	3,628
70	42	85	127	212	423	846	1,270	1,693	2,116	2,539	2,963	3,386	3,809	4,232
80	48	97	145	242	484	967	1,451	1,935	2,419	2,902	3,386	3,870	4,353	4,837
90	54	109	163	272	544	1,088	1,633	2,177	2,721	3,265	3,809	4,353	4,898	5,442
100	60	121	181	302	605	1,209	1,814	2,419	3,023	3,628	4,232	4,837	5,442	6,046
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 Approaches 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

9.2.2.58 Razorbill have been screened into the assessment for distributional responses as they are susceptible to displacement due to their distribution and behaviours (Bradbury *et al*., 2014[76]; NatureScot 2023a[78]; Furness and Wade, 2012[79] ; Furness *et al*., 2013[80]).

Status

9.2.2.59 The SPA population of razorbill was cited as 15,800 breeding adults in 1985 - 1987. The most recent count (2015) is 40,256 breeding adults (Swann, 2016[81]).

9.2.2.60 When considering a breeding adult baseline mortality rate of 0.105 (1-0.895, Horswill and Robinson, 2015[83]), 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 recent 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

9.2.2.61 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

9.2.2.62 As outlined above, razorbill have been screened into the assessment for distributional responses. The level of abundance apportioned is presented in Table 9-14 (detailed methods are presented within Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note).

9.2.2.63 For razorbill, distributional responses are assessed based on the birds within the Caledonia South 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 9-14: 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	395.44
Non-breeding season (Mid-August to March)	4.22	33.92

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

9.2.2.64 During the O&M phase, the potential level of impact apportioned to the SPA seasonally is summarised in Table 9-15 for both the Applicant and Guidance approach.

9.2.2.65 A displacement matrix is also presented for the annual apportioned abundance for the Caledonia South plus 2km buffer to East Caithness Cliffs SPA in Table 9-16.

Table 9-15: 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% Disp; 1% Mort	Change in Average Survival Rate (% Point Change)	60% Disp; 1-3% Mort (Non-breeding); 3-5% Mort (Breeding)	Change in Average Survival Rate (% Point Change)
Citation (15,800)	Breeding season (April to Mid-August)	1.98	0.013	7.12 - 11.86	0.045 - 0.075
	Non-breeding season (Mid-August to March)	0.17	0.001	0.20 - 0.61	0.001 - 0.004
	Annual	2.15	0.014	7.32 - 12.47	0.046 - 0.079
Latest count (40,256)	Breeding season (April to Mid-August)	1.98	0.005	7.12 - 11.86	0.018 - 0.029
	Non-breeding season (Mid-August to March)	0.17	<0.001	0.20 - 0.61	0.001 - 0.002
	Annual	2.15	0.005	7.32 - 12.47	0.018 - 0.031

Breeding Season

9.2.2.66 The estimated razorbill mean peak abundance during the breeding season is 1,089 (1,089.04) individuals, with an estimated 68.50% of razorbill during the breeding season deriving from East Caithness Cliffs SPA (Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note). Assuming that 57% of the razorbill population are adults (Furness, 2015[84]) 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 395 (395.44) per annum during the breeding season (Table 9-15).

9.2.2.67 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 two (1.98) breeding adults per annum.

9.2.2.68 Using the citation colony count of 15,800 breeding adults and an annual background mortality of 1,659 breeding adults, the addition of two predicted breeding adult mortalities per annum would result in a 0.013 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 0.005 survival rate percentage point change during the breeding season per annum (see Table 9-15).

Non-breeding Season

9.2.2.69 The estimated razorbill mean peak abundance during the non-breeding season is 803 (803.00) individuals. Based on the Furness (2015[84]) 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 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 34 (33.92) per annum during the non-breeding season (Table 9-15).

9.2.2.70 When applying a displacement rate of 50% and a mortality rate of 1%, the consequent predicted distributional response mortality of adult razorbill from East Caithness Cliffs SPA during the non-breeding season is predicted at less than one (0.17) per annum.

9.2.2.71 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 0.001 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 9-15).

Annual Total

9.2.2.72 The predicted resultant mortality across all defined seasons from Caledonia South, attributed to East Caithness Cliffs SPA, is two (2.15) breeding adult mortalities per annum. This is predicted to result in a survival rate percentage point change against the citation and most recent counts of 0.014 and 0.005 respectively (see Table 9-15).

9.2.2.73 When considering the Guidance approach, a total of seven - 13 (7.32 - 12.47) 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 0.018 - 0.031 against the most recent count (Table 9-15).

9.2.2.74 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

9.2.2.75 The potential for distributional responses alone has been assessed against the latest 2015 colony count population size of 40,256 breeding adults according to Swann (2016[81]). A range of impact values from seven to 13 breeding adult additional mortalities per annum were modelled, which allows for consideration of the Guidance approach predicted impact levels, as set out in Table 10-106 of Section 10.3.3. Even when considering a predicted impact of 13 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 0.037% against the latest colony count (PVA outputs against the citation count are presented in Application Document 14, Appendix 14-2: Caledonia South Habitats Regulations Appraisal Population Viability Assessment Technical Report as additional information).

9.2.2.76 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 East Caithness Cliffs SPA in relation to distributional response effects in the O&M phase from the Caledonia South can be concluded. Therefore, subject to natural change, razorbill will be maintained as a feature in the long term.**

Table 9-16: Razorbill O&M phase disturbance annual displacement matrix for 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	0	1	1	2	4	9	13	17	21	26	30	34	39	43
20	1	2	3	4	9	17	26	34	43	52	60	69	77	86
30	1	3	4	6	13	26	39	52	64	77	90	103	116	129
40	2	3	5	9	17	34	52	69	86	103	120	137	155	172
50	2	4	6	11	21	43	64	86	107	129	150	172	193	215
60	3	5	8	13	26	52	77	103	129	155	180	206	232	258
70	3	6	9	15	30	60	90	120	150	180	210	240	270	301
80	3	7	10	17	34	69	103	137	172	206	240	275	309	343
90	4	8	12	19	39	77	116	155	193	232	270	309	348	386
100	4	9	13	21	43	86	129	172	215	258	301	343	386	429

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 Approaches 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

9.2.2.77 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[75]). 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

9.2.2.78 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

9.2.2.79 Kittiwake have been screened into the assessment for collision risk as they are susceptible to collision due to their flight height distribution and behaviours (Bradbury *et al*., 2014[76]; JNCC *et al*., 2024[77]; NatureScot 2023[78]; Furness and Wade, 2012[79]; Furness *et al*., 2013[80]).

9.2.2.80 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 Caledonia South 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.

9.2.2.81 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 9-17 (detailed methods are presented within Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note).

Table 9-17: 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	41.98	1.18
Non-breeding season (September to early-April)	1.47 (Autumn %) 1.94 (Spring %)	6.27	0.11
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

9.2.2.82 The SPA population of kittiwake was cited as 26,200 breeding adults in 1986-1987. The most recent count (2015-2023) is 16,424 breeding adults (Seabird Monitoring Programme (SMP), 2024[87]).

9.2.2.83 When considering a breeding adult baseline mortality rate of 0.146 (1- 0.854, Horswill and Robinson, 2015[83]), 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 recent count (2015-2023) 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

9.2.2.84 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

9.2.2.85 During the O&M phase, the potential level of impact apportioned to the SPA seasonally is summarised in Table 9-18 for the Guidance approach.

9.2.2.86 A displacement matrix is also presented for the annual apportioned abundance for the Caledonia South plus 2km buffer to North Caithness Cliffs SPA in Table 9-19.

Table 9-18: 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% Disp; 1-3% Mort	Change in Average Survival Rate (% Point Change)
Citation (26,200)	Breeding season (Mid-April to August)	0.13 - 0.38	<0.001 – 0.001
	Non-breeding season (September to early-April)	0.02 - 0.06	<0.001
	Annual	0.14 - 0.43	0.001 - 0.002
Latest count (16,424)	Breeding season (Mid-April to August)	0.13 - 0.38	0.001 – 0.002
	Non-breeding season (September to early-April)	0.02 - 0.06	<0.001
	Annual	0.14 - 0.43	0.001 - 0.003

Breeding Season

9.2.2.87 The estimated kittiwake mean peak abundance during the breeding season is 1,530 (1,529.72) individuals, with an estimated 5.75% of all individuals during the breeding season deriving from North Caithness Cliffs SPA (Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note). Assuming that 53% of the kittiwake population are adults (Furness, 2015)[84] 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 42 (41.98) per annum during the breeding season (Table 9-18).

9.2.2.88 When applying a displacement rate of 30% and a mortality rate of 1-3%, the consequent potential mortality is estimated to less than one (0.13 - 0.38) breeding adults per annum.

9.2.2.89 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 – 0.001 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 - 0.002 survival rate percentage point change during the breeding season per annum (Table 9-18).

Non-breeding Season

9.2.2.90 The estimated kittiwake mean peak abundance during the non-breeding season is 427 (427.00) individuals. Based on the Furness (2015)[84] 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 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 six (6.27) per annum during the non-breeding season (Table 9-18).

9.2.2.91 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.

9.2.2.92 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 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 9-18).

Annual Total

9.2.2.93 The predicted resultant mortality across all defined seasons from Caledonia South, attributed to North Caithness Cliffs SPA, is less than one (0.14 - 0.43) breeding adult kittiwake per annum. This is predicted to result in a survival rate percentage point change against the citation and most recent counts of 0.001 - 0.002 and 0.001 - 0.003 respectively (see Table 9-18).

9.2.2.94 For both citation and most recent 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 North Caithness Cliffs SPA in relation to potential distributional response effects from Caledonia South alone during the O&M phase. Therefore, subject to natural change, kittiwake will be maintained as a feature in the long term**.

Table 9-19: Kittiwake O&M phase disturbance annual displacement matrix for 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	0	0	0	0	0	1	1	2	2	3	3	4	4	5
20	0	0	0	0	1	2	3	4	5	6	7	8	9	10
30	0	0	0	1	1	3	4	6	7	9	10	12	13	14
40	0	0	1	1	2	4	6	8	10	12	14	15	17	19
50	0	0	1	1	2	5	7	10	12	14	17	19	22	24
60	0	1	1	1	3	6	9	12	14	17	20	23	26	29
70	0	1	1	2	3	7	10	14	17	20	24	27	30	34
80	0	1	1	2	4	8	12	15	19	23	27	31	35	39
90	0	1	1	2	4	9	13	17	22	26	30	35	39	43
100	0	1	1	2	5	10	14	19	24	29	34	39	43	48
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 Approaches 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

9.2.2.95 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 9-20.

Table 9-20: 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)	1.18	0.004
	Non-breeding season (September to early-April)	0.11	<0.001
	Annual	1.29	0.005
Latest count (16,424)	Breeding season (Mid-April to August)	1.18	0.007
	Non-breeding season (September to early-April)	0.11	0.001
	Annual	1.29	0.008

Breeding Season

9.2.2.96 The predicted kittiwake collision mortality during the breeding season is 43 (42.94) individuals per annum, with an estimated 5.75% of all individuals during the breeding season deriving from North Caithness Cliffs SPA (Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note). Assuming that 53% of the population are adults (Furness, 2015[84]) 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 one (1.18) per annum during the breeding season.

9.2.2.97 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 per annum would result in a 0.004 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 0.007 survival rate percentage point change during the breeding season per annum (see Table 9-20).

Non-breeding Season

9.2.2.98 The predicted kittiwake collision mortality during the non-breeding season is 7 (6.52) individuals. Based on the Furness (2015[84])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 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 (0.11) per annum.

9.2.2.99 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 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 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 9-20).

Annual Total

9.2.2.100 The predicted resultant mortality across all defined seasons from Caledonia South, attributed to North Caithness Cliffs SPA, is one (1.29) breeding adults per annum. This is predicted to result in a 0.005 and 0.008 survival rate percentage point change when considering the citation count and most recent count, respectively (see Table 9-20).

9.2.2.101 For both citation and most recent 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 kittiwake at North Caithness Cliffs SPA in relation to potential collision risk effects from Caledonia South 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

9.2.2.102 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 9-21.

Table 9-21: 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% Disp; 1-3% Mort	
		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)	1.30 - 1.56	0.005 - 0.006
	Non-breeding season (October to Early-March)	0.13 - 0.17	0.001
	Annual	1.44 - 1.73	0.005 - 0.007
Latest count (16,424)	Breeding season (Mid-March to September)	1.30 - 1.56	0.008 - 0.009
	Non-breeding season (October to Early-March)	0.13 - 0.17	0.001
	Annual	1.44 - 1.73	0.009 - 0.011

Breeding Season

9.2.2.103 As presented within Table 9-21, the combined distributional response and collision risk impacts apportioned to the kittiwake feature of North Caithness Cliffs SPA, equates to approximately one - two (1.30 - 1.56) 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 one - two predicted breeding adult mortalities would result in a 0.005 - 0.006 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 0.008 - 0.009 survival rate percentage point change during the breeding season per annum (see Table 9-21).

Non-breeding Season

9.2.2.104 As presented within Table 9-21, the combined distributional response and collision risk impacts apportioned to the kittiwake feature of North Caithness Cliffs SPA, equates to approximately less than one (0.13 - 0.17) 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 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 16,424 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 (see Table 9-21).

Annual Total

9.2.2.105 The predicted resultant mortality across all defined seasons from Caledonia South, attributed to North Caithness Cliffs, is one - two (1.44 - 1.73) kittiwake per annum. This is predicted to result in survival rate percentage point change against the citation and most recent counts of 0.005 - 0.007 and 0.009 - 0.011 respectively (see Table 9-21).

9.2.2.106 For both citation and most recent 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 North Caithness Cliffs SPA in relation to potential combined distributional response and collision risk effects from Caledonia South alone during the O&M phase. Therefore, subject to natural change, kittiwake will be maintained as a feature in the long term**.

Guillemot

9.2.2.107 Guillemot have been screened into the assessment for distributional responses as they are susceptible to displacement due to their distribution and behaviours (Bradbury *et al*., 2014[76]; NatureScot 2023[78]; Furness and Wade, 2012[79]; Furness *et al*., 2013[80]).

Status

9.2.2.108 The SPA population of guillemot was cited as 38,300 breeding adults in 1985-1987. The most recent count (2015-2023) is 62,599 breeding adults (Seabird Monitoring Programme (SMP), 2024[87]).

9.2.2.109 When considering a breeding adult baseline mortality rate of 0.061 (1- 0.939, Horswill and Robinson, 2015[83]), 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 (2015-2023) respectively.

9.2.2.110 As of June 2023, the guillemot feature at North Caithness Cliffs SPA is considered to be ‘Favourable’ and ‘Maintained’.

Seasonal Apportionment of Potential Impacts

9.2.2.111 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

9.2.2.112 As outlined above, guillemot have been screened into the assessment for distributional responses. The level of abundance apportioned is presented in Table 9-22 (detailed methods are presented within Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note).

9.2.2.113 For guillemot, distributional responses are assessed based on the birds within the Caledonia South 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 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.

9.2.2.114 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 9-22: Guillemot 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)	4.34	491.27
Non-breeding season (Mid-August to March)	8.85	512.35

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

9.2.2.115 During the O&M phase, the potential level of impact apportioned to the SPA seasonally is summarised in Table 9-23 for both the Applicant and Guidance approach.

9.2.2.116 A displacement matrix is also presented for the annual apportioned abundance for the Caledonia South plus 2km buffer to North Caithness Cliffs SPA in Table 9-24.

Table 9-23: 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% Disp; 1% Mort	Change in Average Survival Rate (% Point Change)	60% Disp; 1-3% Mort (Non-breeding); 3-5% Mort (Breeding)	Change in Average Survival Rate (% Point Change)
Citation (38,300)	Breeding season (April to Mid-August)	2.46	0.006	8.84 - 14.74	0.023 - 0.038
	Non-breeding season (Mid-August to March)	2.56	0.007	3.07 - 9.22	0.008 - 0.024
	Annual	5.02	0.013	11.92 - 23.96	0.031 - 0.063
Latest count (62,599)	Breeding season (April to Mid-August)	2.46	0.004	8.84 - 14.74	0.014 - 0.024
	Non-breeding season (Mid-August to March)	2.56	0.004	3.07 - 9.22	0.005 - 0.015
	Annual	5.02	0.008	11.92 - 23.96	0.019 - 0.038

Breeding Season

9.2.2.117 The estimated guillemot mean peak abundance in the Caledonia South Site (plus 2km buffer) during the breeding season was 11,323 (11,322.93) individuals. the total mean peak of breeding adults from North Caithness Cliffs SPA potentially impacted by distributional responses are 491 (491.27) per annum during the breeding season (Table 9-23)

9.2.2.118 The consequent potential mortality is estimated to three (2.46) breeding adults per annum.

9.2.2.119 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 0.006 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 0.004

survival rate percentage point change during the breeding season per annum (Table 9-23).

Non-breeding Season

9.2.2.120 The estimated guillemot mean peak abundance during the non-breeding season is 5,788 (5,787.86) 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, 2023b[85], based on recent geolocator studies presented in Buckingham *et al.* (2022[86]). Based on the resultant SPA proportional split during the non-breeding season, 0.09% of predicted mortalities are estimated to derive from North Caithness Cliffs SPA (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 512 (512.35) per annum during the non-breeding season (Table 9-23).

9.2.2.121 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 (2.56) per annum.

9.2.2.122 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 0.007 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 0.004 survival rate percentage point change during the non-breeding season per annum (Table 9-23).

Annual Total

9.2.2.123 The predicted resultant mortality across all defined seasons from Caledonia South, attributed to North Caithness Cliffs SPA, is five (5.02) breeding adult guillemot per annum. This is predicted to result in a survival rate percentage point change against the citation and most recent counts of 0.013 and 0.008 respectively (Table 9-23).

9.2.2.124 When considering the Guidance approach, a total of 12 - 24 (11.92 - 23.96) breeding adult mortalities are predicted due to potential distributional response effects per annum. This results in a survival rate percentage point change of 0.031 - 0.063 against the citation and 0.019 - 0.038 against the most recent count (Table 9-23).

9.2.2.125 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

9.2.2.126 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 12 to 24 breeding adult additional mortalities per annum were modelled, which allows for consideration of the Guidance approach predicted impact levels, as set out in Table 10-120 of Section 10.3.3. Even when considering a predicted impact of 24 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 0.043% against the latest colony count (PVA outputs against the citation count are presented in Application Document 14, Appendix 14-2: Caledonia South Habitats Regulations Appraisal Population Viability Assessment Technical Report as additional information).

9.2.2.127 Regardless of the colonies 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 North Caithness Cliffs SPA in relation to distributional response effects in the O&M phase from the Caledonia South alone can be concluded. Therefore, subject to natural change, guillemot will be maintained as a feature in the long term.**

Table 9-24: 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	2	3	5	10	20	30	40	50	60	70	80	90	100
20	2	4	6	10	20	40	60	80	100	120	141	161	181	201
30	3	6	9	15	30	60	90	120	151	181	211	241	271	301
40	4	8	12	20	40	80	120	161	201	241	281	321	361	401
50	5	10	15	25	50	100	151	201	251	301	351	401	452	502
60	6	12	18	30	60	120	181	241	301	361	422	482	542	602
70	7	14	21	35	70	141	211	281	351	422	492	562	632	703
80	8	16	24	40	80	161	241	321	401	482	562	642	723	803
90	9	18	27	45	90	181	271	361	452	542	632	723	813	903
100	10	20	30	50	100	201	301	401	502	602	703	803	903	1,004
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 Approaches 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

9.2.2.128 Razorbill have been screened into the assessment for distributional responses as they are susceptible to displacement due to their distribution and behaviours (Bradbury *et al*., 2014[76]; NatureScot 2023[78]; Furness and Wade, 2012[79]; Furness *et al*., 2013[80]).

Status

9.2.2.129 The SPA population of razorbill was cited as 4,000 breeding adults in 1985-1987. The most recent count (2015-2023) is 13,384 breeding adults (SMP, 2024[87]).

9.2.2.130 Based on breeding adult baseline mortality rate of 0.105 (1-0.895, Horswill and Robinson, 2015[83]), 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 (2015-2023) respectively.

9.2.2.131 As of June 2023, the razorbill feature at North Caithness Cliffs SPA is considered to be 'Favourable' and 'Maintained'.

Seasonal Apportionment of Potential Impacts

9.2.2.132 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

9.2.2.133 As outlined above, razorbill have been screened into the assessment for distributional responses. The level of abundance apportioned is presented in Table 9-25 (detailed methods are presented within Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note).

9.2.2.134 Distributional responses are assessed based on the birds within the Caledonia South Site and 2km buffer. The main focus of the assessment is 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.

9.2.2.135 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 9-25: 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	60.88
Non-breeding season (Mid-August to March)	0.55	4.38

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

9.2.2.136 During the O&M phase, the potential level of impact apportioned to the SPA seasonally is summarised in Table 9-26 for both the Applicant and Guidance approach.

9.2.2.137 A displacement matrix is also presented for the annual apportioned abundance for the Caledonia South plus 2km buffer to North Caithness Cliffs SPA in Table 9-27.

Table 9-26: 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% Disp; 1% Mort	Change in Average Survival Rate (% Point Change)	60% Disp; 1-3% Mort (Non-breeding); 3-5% Mort (Breeding)	Change in Average Survival Rate (% Point Change)
Citation (4,000)	Breeding season (April to Mid-August)	0.30	0.008	1.10 - 1.83	0.027 - 0.046
	Non-breeding season (Mid-August to March)	0.02	0.001	0.03 - 0.08	0.001 - 0.002
	Annual	0.33	0.008	1.12 - 1.91	0.028 - 0.048
Latest count (13,384)	Breeding season (April to Mid-August)	0.30	0.002	1.10 - 1.83	0.008 - 0.014
	Non-breeding season (Mid-August to March)	0.02	<0.001	0.03 - 0.08	<0.001 – 0.001
	Annual	0.33	0.002	1.12 - 1.91	0.008 - 0.014

Breeding Season

9.2.2.138 The estimated razorbill mean peak abundance at the Caledonia South Site (plus 2km buffer) during the breeding season was 1,089 (1,089.04) individuals. The total proportion of breeding adults from North Caithness Cliffs SPA potentially impacted by distributional responses during the breeding season is 61 (60.88) per annum during the breeding season (Table 9-26).

9.2.2.139 The consequent potential mortality for breeding adult razorbill from North Caithness Cliffs SPA is estimated at less than one (0.30) breeding adults per annum, based on the Applicant Approach.

9.2.2.140 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 0.008 survival rate percentage point change during the breeding season. When considering the most recently published counts of 13,384 breeding adults and an annual background mortality of 1,405 breeding adults, this results in a 0.002 survival rate percentage point change during the breeding season per annum (see Table 9-26).

Non-breeding Season

9.2.2.141 The estimated razorbill mean peak abundance at the Caledonia South Site (plus 2km buffer) during the non-breeding season is 803 (803.0) individuals. The total mean peak abundance of breeding adults from the SPA potentially impacted by distributional responses are four (4.38) per annum during the non-breeding season (Table 9-26).

9.2.2.142 The consequent predicted distributional response mortality of adult razorbill from North Caithness Cliffs SPA during the non-breeding season is predicted at less than one (0.02) per annum.

9.2.2.143 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 recently published 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 9-26).

Annual Total

9.2.2.144 Based on the Applicant Approach, the predicted resultant mortality across all defined seasons from Caledonia South, attributed to North Caithness Cliffs SPA, is less than one (0.33) 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 0.008 and 0.002 respectively (see Table 9-26).

9.2.2.145 When considering the Guidance approach, a total of one - two (1.12 - 1.91) breeding adult mortalities are predicted due to potential distributional response effects per annum. This results in a survival rate percentage point change of 0.028 - 0.048 against the citation and 0.008 - 0.014 against the most recent count (Table 9-26).

9.2.2.146 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.

9.2.2.147 As most recent counts are significantly higher than the citation count and the SPA is in favourable condition, impacts are considered against the most recent count. For both 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 (PVA outputs against the citation count are presented in Application Document 14, Appendix 14-2: Caledonia South Habitats Regulations Appraisal Population Viability Assessment Technical Report as additional information). There is, **therefore, no potential for an AEoSI to the conservation objectives of razorbill at North Caithness Cliffs SPA in relation to potential distributional response effects from Caledonia South alone during the O&M phase. Therefore, subject to natural change, razorbill will be maintained as a feature in the long term**.

Table 9-27: 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	0	1	1	2	3	3	4	5	5	6	7
20	0	0	0	1	1	3	4	5	7	8	9	10	12	13
30	0	0	1	1	2	4	6	8	10	12	14	16	18	20
40	0	1	1	1	3	5	8	10	13	16	18	21	23	26
50	0	1	1	2	3	7	10	13	16	20	23	26	29	33
60	0	1	1	2	4	8	12	16	20	23	27	31	35	39
70	0	1	1	2	5	9	14	18	23	27	32	37	41	46
80	1	1	2	3	5	10	16	21	26	31	37	42	47	52
90	1	1	2	3	6	12	18	23	29	35	41	47	53	59
100	1	1	2	3	7	13	20	26	33	39	46	52	59	65
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 Approaches 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

9.2.2.148 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 Caithness Cliffs SPA, a combined assessment with other SPAs is provided in Section 9.2.2, beginning in paragraph 9.2.2.535. As presented in paragraph 9.2.2.535, **the potential for an AEoSI to the conservation objectives of puffin at North Caithness Cliffs SPA in relation to distributional response impacts from Caledonia South 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**.

Troup, Pennan and Lion’s Heads SPA

9.2.2.149 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[75]). 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

9.2.2.150 Kittiwake have been screened into the assessment for collision risk as they are susceptible to collision due to their flight height distribution and behaviours (Bradbury *et al*., 2014[76]; JNCC *et al*., 2024[77]; NatureScot 2023a [78]; Furness and Wade, 2012[79]; Furness *et al*., 2013[80]).

9.2.2.151 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 Caledonia South 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.

9.2.2.152 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 9-28 (detailed methods are presented within Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note).

Table 9-28: 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	153.54	4.31
Non-breeding season (September to early-April)	2.15 (Autumn %) 2.85 (Spring %)	9.20	0.17
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

9.2.2.153 The SPA population of kittiwake was cited as 63,200 breeding adults in 1995. The most recent count (2017-2023) is 27,344 breeding adults (SMP, 2024)[87].

9.2.2.154 When considering a breeding adult baseline mortality rate of 0.146 (1- 0.854, Horswill and Robinson, 2015[83]) 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 recent 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

9.2.2.155 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

9.2.2.156 During the O&M phase, the potential level of impact apportioned to the SPA seasonally is summarised in Table 9-29 for the Guidance approach.

9.2.2.157 A displacement matrix is also presented for the annual apportioned abundance for the Caledonia South plus 2km buffer to Troup, Pennan and Lion's Heads SPA in Table 9-30.

Table 9-29: 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% Disp; 1-3% Mort	Change in Average Survival Rate (% Point Change)
Citation (63,200)	Breeding season (Mid-April to August)	0.46 - 1.38	0.001 – 0.002
	Non-breeding season (September to early-April)	0.03 - 0.08	<0.001
	Annual	0.49 - 1.46	0.001 - 0.002
Latest count (27,344)	Breeding season (Mid-April to August)	0.46 - 1.38	0.002 – 0.005
	Non-breeding season (September to early-April)	0.03 - 0.08	<0.001
	Annual	0.49 - 1.46	0.002 – 0.005

Breeding Season

9.2.2.158 The estimated kittiwake mean peak abundance during the breeding season is 1,530 (1,529.72) individuals, with an estimated 21.04% of all individuals during the breeding season deriving from Troup, Pennan and Lion's Heads SPA (Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note). Assuming that 53% of the kittiwake population are adults (Furness, 2015[84]) 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 are154 (153.54) per annum during the breeding season (Table 9-29).

9.2.2.159 When applying a displacement rate of 30% and a mortality rate of 1-3%, the consequent potential mortality is estimated to one (0.46 - 1.38) breeding adults per annum.

9.2.2.160 Using the citation colony count of 63,200 breeding adults and an annual background mortality of 9,227 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 27,344 breeding adults and an annual background mortality of 3,992 breeding adults, this results in a 0.002 – 0.005 survival rate percentage point change during the breeding season per annum (Table 9-29).

Non-breeding Season

9.2.2.161 The estimated kittiwake mean peak abundance during the non-breeding season is 427 (427.00) individuals. Based on the Furness (2015[84]) 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 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 (9.20) per annum during the non-breeding season (Table 9-29).

9.2.2.162 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 - 0.08) per annum.

9.2.2.163 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 9-29).

Annual Total

9.2.2.164 The predicted resultant mortality across all defined seasons from Caledonia South, attributed to Troup, Pennan and Lion's Heads SPA, is one – two (0.49 - 1.46) breeding adult kittiwake per annum. This is predicted to result in a survival rate percentage point change against the citation and most recent counts of 0.001 - 0.002 and 0.002 – 0.005 respectively (Table 9-29).

9.2.2.165 For both citation and most recent 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 Troup, Pennan and Lion's Heads SPA in relation to potential distributional response effects from Caledonia South alone during the O&M phase. Therefore, subject to natural change, kittiwake will be maintained as a feature in the long term**.

Table 9-30: Kittiwake O&M phase disturbance annual displacement matrix for impacts apportioned to Troup, Pennan and Lion's Heads 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	1	2	3	5	7	8	10	11	13	15	16
20	0	1	1	2	3	7	10	13	16	20	23	26	29	33
30	0	1	1	2	5	10	15	20	24	29	34	39	44	49
40	1	1	2	3	7	13	20	26	33	39	46	52	59	65
50	1	2	2	4	8	16	24	33	41	49	57	65	73	81
60	1	2	3	5	10	20	29	39	49	59	68	78	88	98
70	1	2	3	6	11	23	34	46	57	68	80	91	103	114
80	1	3	4	7	13	26	39	52	65	78	91	104	117	130
90	1	3	4	7	15	29	44	59	73	88	103	117	132	146
100	2	3	5	8	16	33	49	65	81	98	114	130	146	163
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 Approaches 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

9.2.2.166 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 9-31.

Table 9-31: 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)	4.31	0.007
	Non-breeding season (September to early-April)	0.17	<0.001
	Annual	4.48	0.007
Latest count (27,344)	Breeding season (Mid-April to August)	4.31	0.016
	Non-breeding season (September to early-April)	0.17	0.001
	Annual	4.48	0.016

Breeding Season

9.2.2.167 The predicted kittiwake collision mortality during the breeding season is 43 (42.94) 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 14, Appendix 14-1: Caledonia South Apportioning Technical Note). Assuming that 53% of the population are adults (Furness, 2015[84]) 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 four (4.31) per annum during the breeding season.

9.2.2.168 Using the citation colony count of 63,200 breeding adults and an annual background mortality of 9,227 breeding adults, the addition of four predicted breeding adult mortalities per annum would result in a 0.007 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 0.016 survival rate percentage point change during the breeding season per annum (see Table 9-31).

Non-breeding Season

9.2.2.169 The predicted kittiwake collision mortality during the non-breeding season is 7 (6.52) individuals. Based on the Furness (2015[84]) 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 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 (0.17) per annum.

9.2.2.170 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 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 27,344 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 9-31).

Annual Total

9.2.2.171 The predicted resultant mortality across all defined seasons from Caledonia South, attributed to Troup, Pennan and Lion’s Heads SPA, is five (4.48) breeding adults per annum. This is predicted to result in a 0.007 and 0.016 survival rate percentage point change when considering the citation count and most recent count, respectively (see Table 9-31).

9.2.2.172 For both citation and most recent 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 Troup, Pennan and Lion’s Heads SPA in relation to potential collision risk effects from Caledonia South 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

9.2.2.173 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 9-32.

Table 9-32: 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% Disp; 1-3% Mort	
		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)	4.77 - 5.69	0.008 - 0.009
	Non-breeding season (October to Early-March)	0.19 - 0.25	<0.001
	Annual	4.96 - 5.94	0.008 - 0.009
Latest count (27,344)	Breeding season (Mid-March to September)	4.77 - 5.69	0.017 - 0.021
	Non-breeding season (October to Early-March)	0.19 - 0.25	0.001
	Annual	4.96 - 5.94	0.018 - 0.022

Breeding Season

9.2.2.174 As presented within (Table 9-32), the combined distributional response and collision risk impacts apportioned to the kittiwake feature of Troup, Pennan and Lion's Heads SPA, equates to approximately four-six (4.77 - 5.69) 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 four-six predicted breeding adult mortalities would result in a 0.008 - 0.009 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 0.018 - 0.022 survival rate percentage point change during the breeding season per annum (see Table 9-32).

Non-breeding Season

9.2.2.175 As presented within Table 9-32, 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 (0.19 - 0.25) 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 (see Table 9-32).

Annual Total

9.2.2.176 The predicted resultant mortality across all defined seasons from Caledonia South, attributed to Troup, Pennan and Lion's Heads, is five – six (4.96 - 5.94) kittiwake per annum. This is predicted to result in survival rate percentage point change against the citation and most recent counts of 0.008 - 0.009 and 0.018 - 0.022 respectively (see Table 9-32).

9.2.2.177 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

9.2.2.178 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 five 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 10-137 of Section 10.3.3 (see Part 4). Even when considering a predicted impact of six breeding adult mortalities (based on 30% displacement and 1-3% mortality rate), the annual reduction in the growth rate is predicted to be at most 0.025% against the latest colony count.

9.2.2.179 Regardless of the colonies 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 kittiwake feature of Troup, Pennan and Lion's Heads SPA in relation to distributional response effects in the O&M phase from the Caledonia South alone can be concluded. Therefore, subject to natural change, kittiwake will be maintained as a feature in the long term**.

Herring gull

9.2.2.180 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 9.2.2, beginning in paragraph 9.2.2.543. As presented in paragraph 9.2.2.543, **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 Caledonia South 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

9.2.2.181 Guillemot have been screened into the assessment for distributional responses as they are susceptible to displacement due to their distribution and behaviours (Bradbury *et al.*, 2014[76]; NatureScot 2023a[78]; Furness and Wade, 2012[79]; Furness *et al.*, 2013[80]).

Status

9.2.2.182 The SPA population of guillemot was cited as 44,600 breeding adults in 1995. The most recent count (2017 - 2023) is 47,719 breeding adults (SMP, 2024[87]).

9.2.2.183 When considering a breeding adult baseline mortality rate of 0.061 (1- 0.939, Horswill and Robinson, 2015[83]), 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 recent 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

9.2.2.184 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

9.2.2.185 As outlined above, guillemot have been screened into the assessment for distributional responses. The level of abundance apportioned is presented in Table 9-33 (detailed methods are presented within Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note).

9.2.2.186 For guillemot, distributional responses are assessed based on the birds within the Caledonia South 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 9-33: Guillemot 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)	5.43	614.99
Non-breeding season (Mid-August to March)	6.75	390.56

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

9.2.2.187 During the O&M phase, the potential level of impact apportioned to the SPA seasonally is summarised in for both the Applicant and Guidance approach in Table 9-34.

9.2.2.188 A displacement matrix is also presented for the annual apportioned abundance for the Caledonia South plus 2km buffer to Troup, Pennan and Lion’s Heads SPA in Table 9-35.

Table 9-34: 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 counts.

Population Size (Breeding adults)	Defined Season (Months)	Applicant Approach		Guidance Approach	
		50% Disp; 1% Mort	Change in Average Survival Rate (% Point Change)	60% Disp; 1-3% Mort (Non-breeding); 3-5% Mort (Breeding)	Change in Average Survival Rate (% Point Change)
Citation (44,600)	Breeding season (April to Mid-August)	3.07	0.007	11.07 - 18.45	0.025 - 0.041
	Non-breeding season (Mid-August to March)	1.95	0.004	2.34 - 7.03	0.005 – 0.016
	Annual	5.03	0.011	13.41 - 25.48	0.030 - 0.057
Latest count (47,719)	Breeding season (April to Mid-August)	3.07	0.006	11.07 - 18.45	0.023 - 0.039
	Non-breeding season (Mid-August to March)	1.95	0.004	2.34 - 7.03	0.005 – 0.015
	Annual	5.03	0.011	13.41 - 25.48	0.028 - 0.053

Breeding Season

9.2.2.189 The estimated guillemot mean peak abundance during the breeding season is 11,323 (11,322.93) individuals, with an estimated 10.25% of guillemot during the breeding season deriving from Troup, Pennan and Lion's Heads SPA (Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note). Assuming that 57% of the guillemot population are adults (Furness, 2015[84])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 615 (614.99) per annum during the breeding season (Table 9-34).

9.2.2.190 When applying a displacement rate of 50% and a mortality rate of 1%, the consequent potential mortality is estimated to three (3.07) breeding adults per annum.

9.2.2.191 Using the citation colony count of 44,600 breeding adults and an annual background mortality of 2,721 breeding adults, the addition of three predicted breeding adult mortalities per annum would result in a 0.007 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 0.006 survival rate percentage point change during the breeding season per annum (Table 9-34).

Non-breeding Season

9.2.2.192 The estimated guillemot mean peak abundance during the non-breeding season is 5,788 (5,787.86) 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, 2023b[85]), based on recent geolocator studies presented in Buckingham *et al.* (2022[86]). 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 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 391 (390.56) per annum during the non-breeding season (Table 9-34).

9.2.2.193 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 (1.95) per annum.

9.2.2.194 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 0.004 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 0.004 survival rate percentage point change during the non-breeding season per annum (Table 9-34).

Annual Total

9.2.2.195 The predicted resultant mortality across all defined seasons from Caledonia South, attributed to Troup, Pennan and Lion's Heads SPA, is five (5.03) breeding adult guillemot per annum. This is predicted to result in a survival rate percentage point change against the citation and most recent counts of 0.011 and 0.011 respectively (Table 9-34).

9.2.2.196 When considering the Guidance approach, a total of 13 - 26 (13.41 - 25.48) breeding adult mortalities are predicted due to potential distributional response effects per annum. This results in a survival rate percentage point change of 0.030 - 0.057 against the citation and 0.028 - 0.053 against the most recent count (Table 9-34).

9.2.2.197 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

9.2.2.198 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 13 to 26 breeding adult additional mortalities per annum were modelled, which allows for consideration of the Guidance approach predicted impact levels, as set out in Table 10-140 of Section 10.3.3. Even when considering a predicted impact of 26 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 0.059% against the latest colony count (PVA outputs against the citation count are presented in Application Document 14, Appendix 14-2: Caledonia South Habitats Regulations Appraisal Population Viability Assessment Technical Report as additional information).

9.2.2.199 Regardless of the colonies 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 Troup, Pennan and Lion's Heads SPA in relation to distributional response effects in the O&M phase from the Caledonia South alone can be concluded. Therefore, subject to natural change, guillemot will be maintained as a feature in the long term**.

Table 9-35: 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	2	3	5	10	20	30	40	50	60	70	80	90	101
20	2	4	6	10	20	40	60	80	101	121	141	161	181	201
30	3	6	9	15	30	60	90	121	151	181	211	241	271	302
40	4	8	12	20	40	80	121	161	201	241	282	322	362	402
50	5	10	15	25	50	101	151	201	251	302	352	402	452	503
60	6	12	18	30	60	121	181	241	302	362	422	483	543	603
70	7	14	21	35	70	141	211	282	352	422	493	563	633	704
80	8	16	24	40	80	161	241	322	402	483	563	644	724	804
90	9	18	27	45	90	181	271	362	452	543	633	724	814	905
100	10	20	30	50	101	201	302	402	503	603	704	804	905	1,006
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 Approaches 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

9.2.2.200 Razorbill have been screened into the assessment for distributional responses as they are susceptible to displacement due to their distribution and behaviours (Bradbury *et al*., 2014[76]; NatureScot 2023[78]; Furness and Wade, 2012[79]; Furness *et al*., 2013[80]).

Status

9.2.2.201 The SPA population of razorbill was cited as 4,800 breeding adults in 1995. The most recent count (2017 - 2023) is 8,801 breeding adults (SMP, 2024[87]).

9.2.2.202 When considering a breeding adult baseline mortality rate of 0.105 (1-0.895, Horswill and Robinson, 2015[83]), 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 recent 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

9.2.2.203 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

9.2.2.204 As outlined above, razorbill have been screened into the assessment for distributional responses. The level of abundance apportioned is presented in Table 9-36 (detailed methods are presented within Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note).

9.2.2.205 For razorbill, distributional responses are assessed based on the birds within the Caledonia South 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 9-36: Razorbill level of abundance apportioned to Troup, Pennan and Lion's Heads SPA.

Defined Season (Months)	Level of Apportionment (%)	Apportioned Abundance (Breeding Adults)
Breeding season (April to Mid-August)	5.93	64.54
Non-breeding season (Mid-August to March)	0.59	4.73

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

9.2.2.206 During the O&M phase, the potential level of impact apportioned to the SPA seasonally is summarised in Table 9-37 for both the Applicant and Guidance approach.

9.2.2.207 A displacement matrix is also presented for the annual apportioned abundance for the Caledonia South plus 2km buffer to Troup, Pennan and Lion's Heads SPA in Table 9-38.

Table 9-37: 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% Disp; 1% Mort	Change in Average Survival Rate (% Point Change)	60% Disp; 1-3% Mort (Non-breeding); 3-5% Mort (Breeding)	Change in Average Survival Rate (% Point Change)
Citation (4,800)	Breeding season (April to Mid-August)	0.32	0.007	1.16 - 1.94	0.024 - 0.040
	Non-breeding season (Mid-August to March)	0.02	<0.001	0.03 - 0.09	0.001 – 0.002
	Annual	0.35	0.007	1.19 - 2.02	0.025 – 0.042
Latest count (8,801)	Breeding season (April to Mid-August)	0.32	0.004	1.16 - 1.94	0.013 - 0.022
	Non-breeding season (Mid-August to March)	0.02	<0.001	0.03 - 0.09	<0.001 - 0.001
	Annual	0.35	0.004	1.19 - 2.02	0.014 – 0.023

Breeding Season

9.2.2.208 The estimated razorbill mean peak abundance during the breeding season is 1,089 (1,089.04) individuals, with an estimated 11.18% of razorbill during the breeding season deriving from Troup, Pennan and Lion's Heads SPA (Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note). Assuming that 57% of the razorbill population are adults (Furness, 2015[84])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 65 (64.54) per annum during the breeding season (Table 9-37).

9.2.2.209 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 (0.32) breeding adults per annum.

9.2.2.210 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 0.007 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 0.004 survival rate percentage point change during the breeding season per annum (see Table 9-37).

Non-breeding Season

9.2.2.211 The estimated razorbill mean peak abundance during the non-breeding season is 803 (803.0) individuals. Based on the Furness (2015[84]) 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 14, Appendix 14-1: Caledonia South Apportioning Technical Note).

9.2.2.212 When applying a displacement rate of 50% and a mortality rate of 1%, the consequent predicted distributional response mortality of adult razorbill from Troup, Pennan and Lion's Heads SPA during the non-breeding season is predicted at less than one (0.02) per annum.

9.2.2.213 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 9-37).

Annual Total

9.2.2.214 The predicted resultant mortality across all defined seasons from Caledonia South, attributed to Troup, Pennan and Lion's Heads SPA, is less than one (0.35) predicted breeding adult mortality per annum. This is predicted to result in a survival rate percentage point change against the citation and most recent counts of 0.007 and 0.004 respectively (see Table 9-37).

9.2.2.215 When considering the Guidance approach, a total of one – two (1.19 - 2.02) breeding adult mortalities are predicted due to potential distributional response effects per annum. This results in a survival rate percentage point change of 0.025 – 0.042 against the citation and 0.014 – 0.023 against the most recent count (Table 9-37).

9.2.2.216 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

9.2.2.217 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 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 10-144 of Section 10.3.3 (see Part 4). 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 0.029% against the latest colony count (PVA outputs against the citation count are presented in Application Document 14, Appendix 14-2: Caledonia South Habitats Regulations Appraisal Population Viability Assessment Technical Report as additional information).

9.2.2.218 Regardless of the colonies 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 Caledonia South alone can be concluded. Therefore, subject to natural change, razorbill will be maintained as a feature in the long term**.

Table 9-38: Razorbill 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	0	0	0	0	1	1	2	3	3	4	5	6	6	7
20	0	0	0	1	1	3	4	6	7	8	10	11	12	14
30	0	0	1	1	2	4	6	8	10	12	15	17	19	21
40	0	1	1	1	3	6	8	11	14	17	19	22	25	28
50	0	1	1	2	3	7	10	14	17	21	24	28	31	35
60	0	1	1	2	4	8	12	17	21	25	29	33	37	42
70	0	1	1	2	5	10	15	19	24	29	34	39	44	48
80	1	1	2	3	6	11	17	22	28	33	39	44	50	55
90	1	1	2	3	6	12	19	25	31	37	44	50	56	62
100	1	1	2	3	7	14	21	28	35	42	48	55	62	69

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 Approaches 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

9.2.2.219 The centroid of the Pentland Firth Islands SPA is 65.2km from the centre of the Caledonia OWF, outside the MMFR +1SD of Artic tern (25.7±14.8km) (Woodward *et al*., 2019[75]). Connectivity is therefore limited to the non-breeding season.

9.2.2.220 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

9.2.2.221 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 Caledonia South 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

9.2.2.222 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

9.2.2.223 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 Caledonia South 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

9.2.2.224 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[75]). The great black-backed gull feature of Copinsay SPA has also been screened into assessment though only for the non-breeding season, due to the Caledonia OWF being outside of the MMFR + 1SD. 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)
- Great black-backed gull
  - Collision (O&M)
- 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

9.2.2.225 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 9.2.2, beginning in paragraph 9.2.2.524. As presented in paragraph 9.2.2.524, **the potential for an AEoSI to the conservation objectives of kittiwake at Copinsay SPA in relation to both distributional responses and collision impacts from Caledonia South 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

9.2.2.226 Great black-backed 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 great black-backed gull for all SPAs, a combined assessment for all SPAs is provided in Section 9.2.2 beginning in paragraph 9.2.2.539. As presented in paragraph 9.2.2.539, **the potential for an AEoSI to the conservation objectives of great black-blacked gull at Copinsay SPA in relation to collision impacts from Caledonia South 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**.

Guillemot

9.2.2.227 Guillemot have been screened into the assessment for distributional responses as they are susceptible to displacement due to their distribution and behaviours (Bradbury *et al*., 2014[76]).

Status

9.2.2.228 The SPA population of guillemot was cited as 29,450 breeding adults in 1994 The most recent count (2015 - 2023) is 10,967 breeding adults (SMP, 2024[87]).

9.2.2.229 When considering a breeding adult baseline mortality rate of 0.061 (1- 0.939, Horswill and Robinson, 2015[83]), 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 recent 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

9.2.2.230 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

9.2.2.231 As outlined above, guillemot have been screened into the assessment for distributional responses. The level of abundance apportioned is presented in Table 9-39 (detailed methods are presented within Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note).

9.2.2.232 For guillemot, distributional responses are assessed based on the birds within the Caledonia South 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 9-39: Guillemot level of abundance apportioned to Copinsay SPA seasonally.

Defined Season (Months)	Level of Apportionment (%)	Apportioned Abundance (Breeding Adults)
Breeding season (April to Mid-August)	0.51	57.83
Non-breeding season (Mid-August to March)	0.02	89.76

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

9.2.2.233 During the O&M phase, the potential level of impact apportioned to the SPA seasonally is summarised in Table 9-40 for both the Applicant and Guidance approach.

9.2.2.234 A displacement matrix is also presented for the annual apportioned abundance for the Caledonia South plus 2km buffer to Copinsay SPA in Table 9-41.

Table 9-40: 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% Disp; 1% Mort	Change in Average Survival Rate (% Point Change)	60% Disp; 1-3% Mort (Non-breeding); 3-5% Mort (Breeding)	Change in Average Survival Rate (% Point Change)
Citation (29,450)	Breeding season (April to Mid-August)	0.29	0.001	1.04 - 1.73	0.004 - 0.006
	Non-breeding season (Mid-August to March)	0.45	0.002	0.54 - 1.62	0.002 - 0.005
	Annual	0.74	0.003	1.58 - 3.35	0.005 - 0.011
Latest count (10,967)	Breeding season (April to Mid-August)	0.29	0.003	1.04 - 1.73	0.009 - 0.016
	Non-breeding season (Mid-August to March)	0.45	0.004	0.54 - 1.62	0.005 - 0.015
	Annual	0.74	0.007	1.58 - 3.35	0.014 - 0.031

Breeding Season

9.2.2.235 The estimated guillemot mean peak abundance during the breeding season is 11,323 (11,322.93) individuals, with an estimated 0.96% of guillemot during the breeding season deriving from Copinsay SPA (Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note). Assuming that 57% of the guillemot population are adults (Furness, 2015[84]) and using an adult sabbatical rate of 7%, the total proportion of breeding adults from Copinsay SPA potentially impacted by distributional responses are 60 (57.83) per annum during the breeding season (Table 9-40).

9.2.2.236 When applying a displacement rate of 50% and a mortality rate of 1%, the consequent potential mortality is estimated to less than one (0.29) breeding adults per annum.

9.2.2.237 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 0.003 survival rate percentage point change during the breeding season per annum (Table 9-40).

Non-breeding Season

9.2.2.238 The estimated guillemot mean peak abundance during the non-breeding season is 5,788 (5,787.86) 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, 2023b[85]), based on recent geolocator studies presented in Buckingham *et al.* (2022[86]). Based on the resultant SPA proportional split during the non-breeding season, 0.02% of predicted mortalities are estimated to derive from Copinsay SPA (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 90 (89.76) per annum during the non-breeding season (Table 9-40).

9.2.2.239 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 one (0.45) per annum.

9.2.2.240 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 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 0.004

survival rate percentage point change during the non-breeding season per annum (Table 9-40).

Annual Total

9.2.2.241 The predicted resultant mortality across all defined seasons from Caledonia South, attributed to Copinsay SPA, is one (0.74) breeding adult guillemot per annum. This is predicted to result in a survival rate percentage point change against the citation and most recent counts of 0.003 and 0.007 respectively (Table 9-40).

9.2.2.242 When considering the Guidance approach, a total of two - three (1.58 - 3.35) 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 - 0.011 against the citation and 0.014 - 0.031 against the most recent count (Table 9-40).

9.2.2.243 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

9.2.2.244 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 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 10-148 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 0.034% against the latest colony count.

9.2.2.245 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 Project alone can be concluded. Therefore, subject to natural change, guillemot will be maintained as a feature in the long term**.

Table 9-41: 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	0	1	1	3	4	6	7	9	10	12	13	15
20	0	1	1	1	3	6	9	12	15	18	21	24	27	30
30	0	1	1	2	4	9	13	18	22	27	31	35	40	44
40	1	1	2	3	6	12	18	24	30	35	41	47	53	59
50	1	1	2	4	7	15	22	30	37	44	52	59	66	74
60	1	2	3	4	9	18	27	35	44	53	62	71	80	89
70	1	2	3	5	10	21	31	41	52	62	72	83	93	103
80	1	2	4	6	12	24	35	47	59	71	83	94	106	118
90	1	3	4	7	13	27	40	53	66	80	93	106	120	133
100	1	3	4	7	15	30	44	59	74	89	103	118	133	148
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 Approaches 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

9.2.2.246 The centroid of the Hoy SPA is 94.1km (around land) from the centre of the Caledonia OWF, within the MMFR +1SD of great skua (443.3±487.9km), guillemot (73.2±80.5km), puffin (137.1±128.3km), and kittiwake (156.1±144.5km) (Woodward *et al*., 2019[75]). 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 Caledonia OWF being outside of the 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

9.2.2.247 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 9.2.2, beginning in paragraph 9.2.2.524. As presented in paragraph 9.2.2.524, **the potential for an AEoSI to the conservation objectives of kittiwake at Hoy SPA in relation to both distributional responses and collision impacts from Caledonia South 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

9.2.2.248 Great black-backed 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 great black-backed gull for all SPAs, a combined assessment for all SPAs is provided in Section 9.2.2 beginning in paragraph 9.2.2.539. As presented in paragraph 9.2.2.539, **the potential for an AEoSI to the conservation objectives of great black-blacked gull at Hoy SPA in relation to collision impacts from Caledonia South 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

9.2.2.249 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 9.2.2, beginning in paragraph 9.2.2.547. As presented in paragraph 9.2.2.547, **the potential for an AEoSI to the conservation objectives of great skua at Hoy SPA in relation to collision impacts from Caledonia South 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

9.2.2.250 Guillemot have been screened into the assessment for distributional responses as they are susceptible to displacement due to their distribution and behaviours (Bradbury *et al*., 2014[76]; NatureScot 2023a[78]; Furness and Wade, 2012[79]; Furness *et al*., 2013[80]).

Status

9.2.2.251 The SPA population of guillemot was cited as 26,800 breeding adults in 2000. The most recent count (2016 - 2017) is 16,345 breeding adults (SMP, 2024[87]).

9.2.2.252 When considering a breeding adult baseline mortality rate of 0.061 (1- 0.939, Horswill and Robinson, 2015[83]), 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 recent 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

9.2.2.253 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

9.2.2.254 As outlined above, guillemot have been screened into the assessment for distributional responses. The level of abundance apportioned is presented in Table 9-42 (detailed methods are presented within Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note).

9.2.2.255 For guillemot, distributional responses are assessed based on the birds within the Caledonia South 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 9-42: Guillemot level of abundance apportioned to Hoy SPA seasonally.

Defined Season (Months)	Level of Apportionment (%)	Apportioned Abundance (Breeding Adults)
Breeding season (April to Mid-August)	0.67	76.10
Non-breeding season (Mid-August to March)	2.31	133.78

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

9.2.2.256 During the O&M phase, the potential level of impact apportioned to the SPA seasonally is summarised in Table 9-43 for both the Applicant and Guidance approach.

9.2.2.257 A displacement matrix is also presented for the annual apportioned abundance for the Caledonia South plus 2km buffer to Troup, Pennan and Lion's Heads SPA in Table 9-44.

Table 9-43: 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% Disp; 1% Mort	Change in Average Survival Rate (% Point Change)	60% Disp; 1-3% Mort (Non-breeding); 3-5% Mort (Breeding)	Change in Average Survival Rate (% Point Change)
Citation (26,800)	Breeding season (April to Mid-August)	0.38	0.001	1.37 - 2.28	0.005 - 0.009
	Non-breeding season (Mid-August to March)	0.67	0.002	0.80 - 2.41	0.003 - 0.009
	Annual	1.05	0.004	2.17 - 4.69	0.008 - 0.018
Latest count (16,345)	Breeding season (April to Mid-August)	0.38	0.002	1.37 - 2.28	0.008 - 0.014
	Non-breeding season (Mid-August to March)	0.67	0.004	0.80 - 2.41	0.005 - 0.015
	Annual	1.05	0.006	2.17 - 4.69	0.013 - 0.029

Breeding Season

9.2.2.258 The estimated guillemot mean peak abundance during the breeding season is 11,323 (11,322.93) individuals, with an estimated 1.27% of guillemot during the breeding season deriving from Hoy SPA (Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note). Assuming that 57% of the guillemot population are adults (Furness, 2015[84])and using an adult sabbatical rate of 7%, the total proportion of breeding adults from Hoy SPA potentially impacted by distributional responses are 76 (76.10) per annum during the breeding season (Table 9-43).

9.2.2.259 When applying a displacement rate of 50% and a mortality rate of 1%, the consequent potential mortality is estimated to less than one (0.38) breeding adults per annum.

9.2.2.260 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 0.001 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 0.002 survival rate percentage point change during the breeding season per annum (Table 9-43).

Non-breeding Season

9.2.2.261 The estimated guillemot mean peak abundance during the non-breeding season is 5,788 (5,787.86) 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, 2023b[85]), based on recent geolocator studies presented in Buckingham *et al.* (2022[86]). 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 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 134 (133.78) per annum during the non-breeding season (Table 9-43).

9.2.2.262 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 one (0.67) per annum.

9.2.2.263 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 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 16,345 breeding adults and an annual background mortality of 997 breeding adults, this results in a 0.004

survival rate percentage point change during the non-breeding season per annum (Table 9-43).

Annual Total

9.2.2.264 The predicted resultant mortality across all defined seasons from Caledonia South, attributed to Hoy SPA, is one (1.05) breeding adult guillemot per annum. This is predicted to result in a survival rate percentage point change against the citation and most recent counts of 0.004 and 0.006 respectively (Table 9-43).

9.2.2.265 When considering the Guidance approach, a total of two – five (2.17 - 4.69) breeding adult mortalities are predicted due to potential distributional response effects per annum. This results in a survival rate percentage point change of 0.008 - 0.018 against the citation and 0.013 - 0.029 against the most recent count (Table 9-43).

9.2.2.266 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

9.2.2.267 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 two to five breeding adult additional mortalities per annum were modelled, which allows for consideration of the Guidance approach predicted impact levels, as set out in Table 10-152 of Section 10.3.3. Even when considering a predicted impact of five 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 0.034% against the latest colony count.

9.2.2.268 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 Hoy SPA in relation to distributional response effects in the O&M phase from the Project alone can be concluded. Therefore, subject to natural change, guillemot will be maintained as a feature in the long term**.

Table 9-44: 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	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	34	38	42
30	1	1	2	3	6	13	19	25	31	38	44	50	57	63
40	1	2	3	4	8	17	25	34	42	50	59	67	76	84
50	1	2	3	5	10	21	31	42	52	63	73	84	94	105
60	1	3	4	6	13	25	38	50	63	76	88	101	113	126
70	1	3	4	7	15	29	44	59	73	88	103	118	132	147
80	2	3	5	8	17	34	50	67	84	101	118	134	151	168
90	2	4	6	9	19	38	57	76	94	113	132	151	170	189
100	2	4	6	10	21	42	63	84	105	126	147	168	189	210
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 Approaches 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

9.2.2.269 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 9.2.2, beginning in paragraph 9.2.2.535. As presented in paragraph 9.2.2.535, **the potential for an AEoSI to the conservation objectives of puffin at Hoy SPA in relation to distributional responses from Caledonia South 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

9.2.2.270 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[75]). 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

9.2.2.271 Kittiwake have been screened into the assessment for collision risk as they are susceptible to collision due to their flight height distribution and behaviours (Bradbury *et al.*, 2014[76]; JNCC *et al.*, 2024[77]; NatureScot 2023[78]; Furness and Wade, 2012[79]; Furness *et al.*, 2013[80]).

9.2.2.272 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 Caledonia South 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.

9.2.2.273 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 9-45 (detailed methods are presented within Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note).

Table 9-45: 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	50.97	1.43
Non-breeding season (September to early-April)	1.81 (Autumn %) 2.40 (Spring %)	7.74	0.14
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

9.2.2.274 The SPA population of kittiwake was cited as 60,904 breeding adults in 1998. The most recent count (2023) is 27,094 breeding adults (SMP, 2024[87]).

9.2.2.275 When considering a breeding adult baseline mortality rate of 0.146 (1- 0.854, Horswill and Robinson, 2015[83]) 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 recent count (2023) 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

9.2.2.276 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

9.2.2.277 During the O&M phase, the potential level of impact apportioned to the SPA seasonally is summarised in Table 9-46 for the Guidance approach.

9.2.2.278 A displacement matrix is also presented for the annual apportioned abundance for the Caledonia South plus 2km buffer to Buchan Ness to Collieston Coast SPA in Table 9-47.

Table 9-46: 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% Disp; 1-3% Mort	Change in Average Survival Rate (% Point Change)
Citation (60,904)	Breeding season (Mid-April to August)	0.15 - 0.46	<0.001 – 0.001
	Non-breeding season (September to early-April)	0.02 - 0.07	<0.001
	Annual	0.18 - 0.53	<0.001 – 0.001
Latest count (27,094)	Breeding season (Mid-April to August)	0.15 - 0.46	0.001 – 0.002
	Non-breeding season (September to early-April)	0.02 - 0.07	<0.001
	Annual	0.18 - 0.53	0.001 – 0.002

Breeding Season

9.2.2.279 The estimated kittiwake mean peak abundance during the breeding season is 1,530 (1,529.72) individuals, with an estimated 6.99% of all individuals during the breeding season deriving from Buchan Ness to Collieston Coast SPA (Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note). Assuming that 53% of the kittiwake population are adults (Furness, 2015[84]) 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 51 (50.97) per annum during the breeding season (Table 9-46).

9.2.2.280 When applying a displacement rate of 30% and a mortality rate of 1-3%, the consequent potential mortality is estimated to less than one – one (0.15 - 0.46) breeding adults per annum.

9.2.2.281 Using the citation colony count of 60,904 breeding adults and an annual background mortality of 8,892 (8,891.98) 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 9-46).

Non-breeding Season

9.2.2.282 The estimated kittiwake mean peak abundance during the non-breeding season is 427 (427.00) individuals. Based on the Furness (2015)[84] 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 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 eight (7.74) per annum during the non-breeding season (Table 9-46).

9.2.2.283 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 Buchan Ness to Collieston Coast SPA during the non-breeding season is predicted at significantly less than one (0.02 - 0.07) per annum.

9.2.2.284 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 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 27,094 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 9-46).

Annual Total

9.2.2.285 The predicted resultant mortality across all defined seasons from Caledonia South, attributed to Buchan Ness to Collieston Coast SPA, is less than one – one (0.18 - 0.53) breeding adult kittiwake per annum. This is predicted to result in a survival rate percentage point change against the citation and most recent counts of <0.001 – 0.001 and 0.001 – 0.002 respectively (Table 9-46).

9.2.2.286 For both citation and most recent 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 Caledonia South alone during the O&M phase. Therefore, subject to natural change, kittiwake will be maintained as a feature in the long term**.

Table 9-47: 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	1	2	2	3	4	4	5	5	6
20	0	0	0	1	1	2	4	5	6	7	8	9	11	12
30	0	0	1	1	2	4	5	7	9	11	12	14	16	18
40	0	0	1	1	2	5	7	9	12	14	16	19	21	23
50	0	1	1	1	3	6	9	12	15	18	21	23	26	29
60	0	1	1	2	4	7	11	14	18	21	25	28	32	35
70	0	1	1	2	4	8	12	16	21	25	29	33	37	41
80	0	1	1	2	5	9	14	19	23	28	33	38	42	47
90	1	1	2	3	5	11	16	21	26	32	37	42	48	53
100	1	1	2	3	6	12	18	23	29	35	41	47	53	59

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 Approaches 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

9.2.2.287 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 9-48.

Table 9-48: 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)	1.43	0.002
	Non-breeding season (September to early-April)	0.14	<0.001
	Annual	1.57	0.003
Latest count (27,094)	Breeding season (Mid-April to August)	1.43	0.005
	Non-breeding season (September to early-April)	0.14	0.001
	Annual	1.57	0.006

Breeding Season

9.2.2.288 The predicted kittiwake collision mortality during the breeding season is 43 (42.94) 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 14, Appendix 14-1: Caledonia South Apportioning Technical Note). Assuming that 53% of the population are adults (Furness, 2015[84]) 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 one (1.43) per annum during the breeding season.

9.2.2.289 Using the citation colony count of 60,904 breeding adults and an annual background mortality of 8,892 (8,891.98) 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 27,094 breeding adults and an annual background mortality of 3,956 (3,955.72) breeding adults, this results in a 0.005 survival rate percentage point change during the breeding season per annum (see Table 9-48).

Non-breeding Season

9.2.2.290 The predicted kittiwake collision mortality during the non-breeding season is 7 (6.52) individuals. Based on the Furness (2015[84]) 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 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 (0.14) per annum

9.2.2.291 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 9-48).

Annual Total

9.2.2.292 The predicted resultant mortality across all defined seasons from Caledonia South, attributed to Buchan Ness to Collieston Coast SPA, is two (1.57) breeding adults per annum. This is predicted to result in a 0.003 and 0.006 survival rate percentage point change when considering the citation count and most recent count, respectively (see Table 9-48).

9.2.2.293 For both citation and most recent 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 collision risk effects from Caledonia South 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

9.2.2.294 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 9-49.

Table 9-49: 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)	1.58 - 1.89	0.003
	Non-breeding season (October to Early-March)	0.16 - 0.21	<0.001
	Annual	1.75 - 2.10	0.003
Latest count (27,094)	Breeding season (Mid-March to September)	1.58 - 1.89	0.006 – 0.007
	Non-breeding season (October to Early-March)	0.16 - 0.21	0.001
	Annual	1.75 - 2.10	0.006 – 0.008

Breeding Season

9.2.2.295 As presented within (Table 9-49) the combined distributional response and collision risk impacts apportioned to the kittiwake feature of Buchan Ness to Collieston Coast SPA, equates to approximately two (1.58 - 1.89) 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 two 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 count of 27,094 breeding adults and an annual background mortality of 3,956 breeding adults, this results in a 0.006 – 0.007 survival rate percentage point change during the breeding season per annum (see Table 9-49).

Non-breeding Season

9.2.2.296 As presented within Table 9-49 the combined distributional response and collision risk impacts apportioned to the kittiwake feature of Buchan Ness to Collieston Coast SPA, equates to approximately less than one (0.16 - 0.21) 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 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 9-49).

Annual Total

9.2.2.297 The predicted resultant mortality across all defined seasons from Caledonia South, attributed to Buchan Ness to Collieston Coast, is two (1.75 - 2.10) kittiwake per annum. This is predicted to result in survival rate percentage point change against the citation and most recent counts of 0.003 and 0.006 - 0.008 respectively (see Table 9-49).

9.2.2.298 For both citation and most recent 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 in relation to potential combined distributional response and collision risk effects from Caledonia South alone during the O&M phase. Therefore, subject to natural change, kittiwake will be maintained as a feature in the long term**.

Auskerry SPA

9.2.2.299 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[75]). 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

9.2.2.300 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

9.2.2.301 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

9.2.2.302 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 Caledonia South 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

9.2.2.303 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[75]). 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

9.2.2.304 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 9.2.2 beginning in paragraph 9.2.2.524. As presented in paragraph 9.2.2.524, **the potential for an AEoSI to the conservation objectives of kittiwake at Rousay SPA in relation to both distributional responses and collision impacts from Caledonia South 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

9.2.2.305 Guillemot have been screened into the assessment for distributional responses as they are susceptible to displacement due to their distribution and behaviours (Bradbury *et al*., 2014[76]; NatureScot 2023[78]; Furness and Wade, 2012[79]; Furness *et al*., 2013[80]).

Status

9.2.2.306 The SPA population of guillemot was cited as 9,800 breeding adults in 2000. The most recent count (2019 - 2018) is 7,921 breeding adults (SMP, 2024[87]).

9.2.2.307 When considering a breeding adult baseline mortality rate of 0.061 (1- 0.939, Horswill and Robinson, 2015[83]), 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 recent count (2019 - 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

9.2.2.308 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

9.2.2.309 As outlined above, guillemot have been screened into the assessment for distributional responses. The level of abundance apportioned is presented in Table 9-50 (detailed methods are presented within Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note).

9.2.2.310 For guillemot, distributional responses are assessed based on the birds within the Caledonia South 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 9-50: Guillemot level of abundance apportioned to Rousay SPA seasonally.

Defined Season (Months)	Level of Apportionment (%)	Apportioned Abundance (Breeding Adults)
Breeding season (April to Mid-August)	0.15	17.01
Non-breeding season (Mid-August to March)	1.12	64.83

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

9.2.2.311 During the O&M phase, the potential level of impact apportioned to the SPA seasonally is summarised in Table 9-51 for both the Applicant and Guidance approach.

9.2.2.312 A displacement matrix is also presented for the annual apportioned abundance for the Caledonia South plus 2km buffer to Rousay SPA in Table 9-52.

Table 9-51: 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% Disp; 1% Mort	Change in Average Survival Rate (% Point Change)	60% Disp; 1-3% Mort (Non-breeding); 3-5% Mort (Breeding)	Change in Average Survival Rate (% Point Change)
Citation (9,800)	Breeding season (April to Mid-August)	0.09	0.001	0.31 - 0.51	0.003 – 0.005
	Non-breeding season (Mid-August to March)	0.32	0.003	0.39 - 1.17	0.004 – 0.012
	Annual	0.41	0.004	0.70 - 1.68	0.007 – 0.017
Latest count (7,921)	Breeding season (April to Mid-August)	0.09	0.001	0.31 - 0.51	0.004 – 0.006
	Non-breeding season (Mid-August to March)	0.32	0.004	0.39 - 1.17	0.005 – 0.015
	Annual	0.41	0.005	0.70 - 1.68	0.009 – 0.021

Breeding Season

9.2.2.313 The estimated guillemot mean peak abundance during the breeding season is 11,323 (11,322.93) individuals, with an estimated 0.28% of guillemot during the breeding season deriving from Rousay SPA (Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note). Assuming that 57% of the guillemot population are adults (Furness, 2015[84]) and using an adult sabbatical rate of 7%, the total proportion of breeding adults from Rousay SPA potentially impacted by distributional responses are 17 (17.01) per annum during the breeding season (Table 9-51).

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

9.2.2.315 Using the citation colony count of 9,800 breeding adults and an annual background mortality of 598 (597.80) 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 7,921 breeding adults and an annual background mortality of 483 (483.18) breeding adults, this results in a 0.001 survival rate percentage point change during the breeding season per annum (Table 9-51).

Non-breeding Season

9.2.2.316 The estimated guillemot mean peak abundance during the non-breeding season is 5,788 (5,787.86) 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, 2023b[85]), based on recent geolocator studies presented in Buckingham *et al.* (2022[86]). 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 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 65 (64.83) per annum during the non-breeding season (Table 9-51).

9.2.2.317 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 (0.32) per annum.

9.2.2.318 Based on the 2000 citation colony count of 9,800 breeding adults and using an annual background mortality of 598 (597.80) 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 7,921 breeding adults and an annual background mortality of 483 (483.18) breeding adults, this results in a 0.004 survival rate percentage point change during the non-breeding season per annum (Table 9-51).

Annual Total

9.2.2.319 The predicted resultant mortality across all defined seasons from Caledonia South, attributed to Rousay SPA, is less than one (0.41) breeding adult guillemot per annum. This is predicted to result in a survival rate percentage point change against the citation and most recent counts of 0.004 and 0.005 respectively (Table 9-51).

9.2.2.320 When considering the Guidance approach, a total of one - two (0.70 - 1.68) 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 – 0.017 against the citation and 0.009 – 0.021 against the most recent count (Table 9-51).

9.2.2.321 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

9.2.2.322 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 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 Application Document 14, Appendix 14-2: Caledonia South Habitats Regulations Appraisal Population Viability Assessment Technical Report. 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 0.024% against the latest colony count.

9.2.2.323 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 Project alone can be concluded. Therefore, subject to natural change, guillemot will be maintained as a feature in the long term**.

Table 9-52: 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	2	3	4	5	6	7	7	8
20	0	0	0	1	2	3	5	7	8	10	11	13	15	16
30	0	0	1	1	2	5	7	10	12	15	17	20	22	25
40	0	1	1	2	3	7	10	13	16	20	23	26	29	33
50	0	1	1	2	4	8	12	16	20	25	29	33	37	41
60	0	1	1	2	5	10	15	20	25	29	34	39	44	49
70	1	1	2	3	6	11	17	23	29	34	40	46	52	57
80	1	1	2	3	7	13	20	26	33	39	46	52	59	65
90	1	1	2	4	7	15	22	29	37	44	52	59	66	74
100	1	2	2	4	8	16	25	33	41	49	57	65	74	82
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 Approaches 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

9.2.2.324 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[75]). 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

9.2.2.325 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 9.2.2, beginning in paragraph 9.2.2.524. As presented in paragraph 9.2.2.524, **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 Caledonia South 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

9.2.2.326 Guillemot have been screened into the assessment for distributional responses as they are susceptible to displacement due to their distribution and behaviours (Bradbury *et al*., 2014[76]; NatureScot 2023a[78]; Furness and Wade, 2012[79]; Furness *et al*., 2013[80]).

Status

9.2.2.327 The SPA population of guillemot was cited as 37,700 breeding adults in 1994. The most recent count (2023) is 12,800 breeding adults (SMP, 2024[87]).

9.2.2.328 When considering a breeding adult baseline mortality rate of 0.061 (1- 0.939, Horswill and Robinson, 2015[83]), 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 recent 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

9.2.2.329 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

9.2.2.330 As outlined above, guillemot have been screened into the assessment for distributional responses. The level of abundance apportioned is presented in Table 9-53 (detailed methods are presented within Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note).

9.2.2.331 For guillemot, distributional responses are assessed based on the birds within the Caledonia South 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 9-53: Guillemot level of abundance apportioned to Marwick head SPA seasonally.

Defined Season (Months)	Level of Apportionment (%)	Apportioned Abundance (Breeding Adults)
Breeding season (April to Mid-August)	0.28	32.00
Non-breeding season (Mid-August to March)	1.81	104.76

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

9.2.2.332 During the O&M phase, the potential level of impact apportioned to the SPA seasonally is summarised in for both the Applicant and Guidance approach Table 9-54.

9.2.2.333 A displacement matrix is also presented for the annual apportioned abundance for the Caledonia South plus 2km buffer to Marwick Head SPA in Table 9-55.

Table 9-54: 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% Disp; 1% Mort	Change in Average Survival Rate (% Point Change)	60% Disp; 1-3% Mort (Non-breeding); 3-5% Mort (Breeding)	Change in Average Survival Rate (% Point Change)
Citation (37,700)	Breeding season (April to Mid-August)	0.16	<0.001	0.58 - 0.96	0.002 – 0.003
	Non-breeding season (Mid-August to March)	0.52	0.001	0.63 - 1.89	0.002 – 0.005
	Annual	0.68	0.002	1.20 - 2.85	0.003 – 0.008
Latest count (12,800)	Breeding season (April to Mid-August)	0.16	0.001	0.58 - 0.96	0.004 – 0.007
	Non-breeding season (Mid-August to March)	0.52	0.004	0.63 - 1.89	0.005 – 0.015
	Annual	0.68	0.005	1.20 - 2.85	0.009 – 0.022

Breeding Season

9.2.2.334 The estimated guillemot mean peak abundance during the breeding season is 11,323 (11,322.93) individuals, with an estimated 0.53% of guillemot during the breeding season deriving from Marwick Head SPA (Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note). Assuming that 57% of the guillemot population are adults (Furness, 2015[84]) and using an adult sabbatical rate of 7%, the total proportion of breeding adults from Marwick Head SPA potentially impacted by distributional responses are 32 (32.00) per annum during the breeding season (Table 9-54).

9.2.2.335 When applying a displacement rate of 50% and a mortality rate of 1%, the consequent potential mortality is estimated to less than one (0.16) breeding adults per annum.

9.2.2.336 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 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 (780.80) breeding adults, this results in a 0.001 survival rate percentage point change during the breeding season per annum (Table 9-54).

Non-breeding Season

9.2.2.337 The estimated guillemot mean peak abundance during the non-breeding season is 5,788 (5,787.86) 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, 2023b[85]), based on recent geolocator studies presented in Buckingham *et al.* (2022[86]). 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 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 105 (104.76) per annum during the non-breeding season (Table 9-54).

9.2.2.338 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 one (0.52) per annum.

9.2.2.339 Based on the 1994 citation colony count of 37,700 breeding adults and using an annual background mortality of 2,300 (2,299.70) 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 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 0.004

survival rate percentage point change during the non-breeding season per annum (Table 9-54).

Annual Total

9.2.2.340 The predicted resultant mortality across all defined seasons from Caledonia South, attributed to Marwick Head SPA, is one (0.68) breeding adult guillemot per annum. This is predicted to result in a survival rate percentage point change against the citation and most recent counts of 0.002 and 0.005 respectively (Table 9-54).

9.2.2.341 When considering the Guidance approach, a total of one - three (1.20 - 2.85) 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 – 0.008 against the citation and 0.009 – 0.022 against the most recent count (Table 9-54).

9.2.2.342 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

9.2.2.343 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 one 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 Application Document 14, Appendix 14-2: Caledonia South Habitats Regulations Appraisal Population Viability Assessment Technical Report. 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 0.025% against the latest colony count.

9.2.2.344 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 Project alone can be concluded. Therefore, subject to natural change, guillemot will be maintained as a feature in the long term**.

Table 9-55: 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	0	1	1	3	4	5	7	8	10	11	12	14
20	0	1	1	1	3	5	8	11	14	16	19	22	25	27
30	0	1	1	2	4	8	12	16	21	25	29	33	37	41
40	1	1	2	3	5	11	16	22	27	33	38	44	49	55
50	1	1	2	3	7	14	21	27	34	41	48	55	62	68
60	1	2	2	4	8	16	25	33	41	49	57	66	74	82
70	1	2	3	5	10	19	29	38	48	57	67	77	86	96
80	1	2	3	5	11	22	33	44	55	66	77	88	98	109
90	1	2	4	6	12	25	37	49	62	74	86	98	111	123
100	1	3	4	7	14	27	41	55	68	82	96	109	123	137
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 Approaches 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

9.2.2.345 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[75]). 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

9.2.2.346 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 9.2.2, beginning in paragraph 9.2.2.524. As presented in paragraph 9.2.2.524, **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 Caledonia South 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

9.2.2.347 Guillemot have been screened into the assessment for distributional responses as they are susceptible to displacement due to their distribution and behaviours (Bradbury *et al*., 2014[76]; NatureScot 2023[78]; Furness and Wade, 2012[79]; Furness *et al*., 2013[80]).

Status

9.2.2.348 The SPA population of guillemot was cited as 12,645 breeding adults in 1998. The most recent count (2018) is 7,402 breeding adults (SMP, 2024[87]).

9.2.2.349 When considering a breeding adult baseline mortality rate of 0.061 (1- 0.939, Horswill and Robinson, 2015[83]) 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 recent 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

9.2.2.350 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

9.2.2.351 As outlined above, guillemot have been screened into the assessment for distributional responses. The level of abundance apportioned is presented in Table 9-56 (detailed methods are presented within Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note).

9.2.2.352 For guillemot, distributional responses are assessed based on the birds within the Caledonia South 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 9-56: Guillemot level of abundance apportioned to Calf of Eday SPA seasonally.

Defined Season (Months)	Level of Apportionment (%)	Apportioned Abundance (Breeding Adults)
Breeding season (April to Mid-August)	0.15	16.82
Non-breeding season (Mid-August to March)	1.05	60.58

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

9.2.2.353 During the O&M phase, the potential level of impact apportioned to the SPA seasonally is summarised in Table 9-57 for both the Applicant and Guidance approach.

9.2.2.354 A displacement matrix is also presented for the annual apportioned abundance for the Caledonia South plus 2km buffer to Calf of Eday SPA in Table 9-58.

Table 9-57: 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% Disp; 1% Mort	Change in Average Survival Rate (% Point Change)	60% Disp; 1-3% Mort (Non-breeding); 3-5% Mort (Breeding)	Change in Average Survival Rate (% Point Change)
Citation (12,645)	Breeding season (April to Mid-August)	0.08	0.001	0.30 - 0.50	0.002 – 0.004
	Non-breeding season (Mid-August to March)	0.30	0.002	0.36 - 1.09	0.003 – 0.009
	Annual	0.39	0.003	0.67 - 1.59	0.005 – 0.013
Latest count (7,402)	Breeding season (April to Mid-August)	0.08	0.001	0.30 - 0.50	0.004 – 0.007
	Non-breeding season (Mid-August to March)	0.30	0.004	0.36 - 1.09	0.005 – 0.015
	Annual	0.39	0.005	0.67 - 1.59	0.009 – 0.022

Breeding Season

9.2.2.355 The estimated guillemot mean peak abundance during the breeding season is 11,323 (11,322.93) individuals, with an estimated 0.28% of guillemot during the breeding season deriving from Calf of Eday SPA (Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note). Assuming that 57% of the guillemot population are adults (Furness, 2015)[84] 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 17 (16.82) per annum during the breeding season (Table 9-57).

9.2.2.356 When applying a displacement rate of 50% and a mortality rate of 1%, the consequent potential mortality is estimated to less than one (0.08) breeding adults per annum.

9.2.2.357 Using the citation colony count of 12,645 breeding adults and an annual background mortality of 771 (771.35) 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 (451.52) breeding adults, this results in a 0.001 survival rate percentage point change during the breeding season per annum (Table 9-57).

Non-breeding Season

9.2.2.358 The estimated guillemot mean peak abundance during the non-breeding season is 5,788 (5,787.86) 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, 2023b[85]), based on recent geolocator studies presented in Buckingham *et al.* (2022[86]). 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 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 61 (60.58) per annum during the non-breeding season (Table 9-57).

9.2.2.359 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 (0.30) per annum.

9.2.2.360 Based on the 1998 citation colony count of 12,645 breeding adults and using an annual background mortality of 771 (771.35) 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 7,402 breeding adults and an annual background mortality of 452 (451.52) breeding adults, this results in a 0.004 survival rate percentage point change during the non-breeding season per annum (Table 9-57).

Annual Total

9.2.2.361 The predicted resultant mortality across all defined seasons from Caledonia South, attributed to Calf of Eday SPA, is less than one (0.39) breeding adult guillemot per annum. This is predicted to result in a survival rate percentage point change against the citation and most recent counts of 0.003 and 0.005 respectively (Table 9-57).

9.2.2.362 When considering the Guidance approach, a total of one – two (0.67 - 1.59) 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 – 0.013 against the citation and 0.009 – 0.022 against the most recent count (Table 9-57).

9.2.2.363 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

9.2.2.364 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 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 Application Document 14, Appendix 14-2: Caledonia South Habitats Regulations Appraisal Population Viability Assessment Technical Report. 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 0.024% against the latest colony count.

9.2.2.365 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 Calf of Eday SPA in relation to distributional response effects in the O&M phase from the Project alone can be concluded. Therefore, subject to natural change, guillemot will be maintained as a feature in the long term**.

Table 9-58: 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	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	19	21	23
40	0	1	1	2	3	6	9	12	15	19	22	25	28	31
50	0	1	1	2	4	8	12	15	19	23	27	31	35	39
60	0	1	1	2	5	9	14	19	23	28	33	37	42	46
70	1	1	2	3	5	11	16	22	27	33	38	43	49	54
80	1	1	2	3	6	12	19	25	31	37	43	50	56	62
90	1	1	2	3	7	14	21	28	35	42	49	56	63	70
100	1	2	2	4	8	15	23	31	39	46	54	62	70	77
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 Approaches 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

9.2.2.366 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

9.2.2.367 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 Caledonia South 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

9.2.2.368 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[75]). 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

9.2.2.369 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 9.2.2, beginning in paragraph 9.2.2.524. As presented in paragraph 9.2.2.524, **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 Caledonia South 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

9.2.2.370 Guillemot have been screened into the assessment for distributional responses as they are susceptible to displacement due to their distribution and behaviours (Bradbury *et al*., 2014[76]; NatureScot 2023[78]; Furness and Wade, 2012[79]; Furness *et al*., 2013[80]).

Status

9.2.2.371 The SPA population of guillemot was cited as 42,150 breeding adults in 1996. The most recent count (2017 - 2023) is 40,673 breeding adults (SMP, 2024[87]).

9.2.2.372 When considering a breeding adult baseline mortality rate of 0.061 (1- 0.939, Horswill and Robinson, 2015[83]), 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 recent 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

9.2.2.373 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

9.2.2.374 As outlined above, guillemot have been screened into the assessment for distributional responses. The level of abundance apportioned is presented in Table 9-59 (detailed methods are presented within Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note).

9.2.2.375 For guillemot, distributional responses are assessed based on the birds within the Caledonia South 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 9-59: Guillemot level of abundance apportioned to West Westray SPA seasonally.

Defined Season (Months)	Level of Apportionment (%)	Apportioned Abundance (Breeding Adults)
Breeding season (April to Mid-August)	0.67	75.71
Non-breeding season (Mid-August to March)	5.75	332.89

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

9.2.2.376 During the O&M phase, the potential level of impact apportioned to the SPA seasonally is summarised in Table 9-60 for both the Applicant and Guidance approach.

9.2.2.377 A displacement matrix is also presented for the annual apportioned abundance for the Caledonia South plus 2km buffer to West Westray SPA in Table 9-61.

Table 9-60: 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% Disp; 1% Mort	Change in Average Survival Rate (% Point Change)	60% Disp; 1-3% Mort (Non-breeding); 3-5% Mort (Breeding)	Change in Average Survival Rate (% Point Change)
Citation (42,150)	Breeding season (April to Mid-August)	0.38	0.001	1.36 - 2.27	0.003 – 0.005
	Non-breeding season (Mid-August to March)	1.66	0.004	2.00 - 5.99	0.001 – 0.014
	Annual	2.04	0.005	3.36 - 8.26	0.008 – 0.020
Latest count (40,673)	Breeding season (April to Mid-August)	0.38	0.001	1.36 - 2.27	0.003 – 0.006
	Non-breeding season (Mid-August to March)	1.66	0.004	2.00 - 5.99	0.005 – 0.015
	Annual	2.04	0.005	3.36 - 8.26	0.008 – 0.020

Breeding Season

9.2.2.378 The estimated guillemot mean peak abundance during the breeding season is 11,323 (11,322.93) individuals, with an estimated 1.26% of guillemot during the breeding season deriving from West Westray SPA (Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note). Assuming that 57% of the guillemot population are adults (Furness, 2015[84]) and using an adult sabbatical rate of 7%, the total proportion of breeding adults from West Westray SPA potentially impacted by distributional responses are 76 (75.71) per annum during the breeding season (Table 9-60).

9.2.2.379 When applying a displacement rate of 50% and a mortality rate of 1%, the consequent potential mortality is estimated to less than one (0.38) breeding adults per annum.

9.2.2.380 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 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 (2,481.05) breeding adults, this results in a 0.001 survival rate percentage point change during the breeding season per annum (Table 9-60).

Non-breeding Season

9.2.2.381 The estimated guillemot mean peak abundance during the non-breeding season is 5,788 (5,787.86) 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, 2023b[85]), based on recent geolocator studies presented in Buckingham *et al.* (2022[86]). 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 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 333 (332.89) per annum during the non-breeding season (Table 9-60).

9.2.2.382 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 (1.66) per annum.

9.2.2.383 Based on the 1996 citation colony count of 42,150 breeding adults and using an annual background mortality of 2,571 (2,571.15) breeding adults, the addition of two predicted breeding adult mortalities 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 40,673 breeding adults and an annual background mortality of 2,481 (2,481.05) breeding adults, this results in a 0.004 survival rate percentage point change during the non-breeding season per annum (Table 9-60).

Annual Total

9.2.2.384 The predicted resultant mortality across all defined seasons from Caledonia South, attributed to West Westray SPA, is two (2.04) breeding adult guillemot per annum. This is predicted to result in a survival rate percentage point change against the citation and most recent counts of 0.005 and 0.005 respectively (Table 9-60).

9.2.2.385 When considering the Guidance approach, a total of three – eight (3.36 - 8.26) breeding adult mortalities are predicted due to potential distributional response effects per annum. This results in a survival rate percentage point change of 0.008 – 0.020 (0.0080 – 0.0196) against the citation and 0.008 – 0.020 against the most recent count (Table 9-60).

9.2.2.386 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

9.2.2.387 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 three 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 Application Document 14, Appendix 14-2: Caledonia South Habitats Regulations Appraisal Population Viability Assessment Technical Report. Even when considering a predicted impact of eight 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 0.024% against the latest colony count.

9.2.2.388 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 Project alone can be concluded. Therefore, subject to natural change, guillemot will be maintained as a feature in the long term**.

Table 9-61: 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	4	8	12	16	20	25	29	33	37	41
20	1	2	2	4	8	16	25	33	41	49	57	65	74	82
30	1	2	4	6	12	25	37	49	61	74	86	98	110	123
40	2	3	5	8	16	33	49	65	82	98	114	131	147	163
50	2	4	6	10	20	41	61	82	102	123	143	163	184	204
60	2	5	7	12	25	49	74	98	123	147	172	196	221	245
70	3	6	9	14	29	57	86	114	143	172	200	229	257	286
80	3	7	10	16	33	65	98	131	163	196	229	262	294	327
90	4	7	11	18	37	74	110	147	184	221	257	294	331	368
100	4	8	12	20	41	82	123	163	204	245	286	327	368	409
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 Approaches 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

9.2.2.389 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 9.2.2 beginning in paragraph 9.2.2.531. As presented in paragraph 9.2.2.531, **the potential for an AEoSI to the conservation objectives of razorbill at West Westray SPA in relation to distributional response impacts from Caledonia South 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

9.2.2.390 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

9.2.2.391 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 Caledonia South 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

9.2.2.392 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[75]). The razorbill feature of Fowlsheugh SPA has also been screened into assessment though only for the non-breeding season, due to the Caledonia OWF 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

9.2.2.393 Kittiwake have been screened into the assessment for collision risk as they are susceptible to collision due to their flight height distribution and behaviours (Bradbury *et al*., 2014[76]; JNCC *et al*., 2024[77]; NatureScot 2023a[78]; Furness and Wade, 2012[79]; Furness *et al*., 2013[80]).

9.2.2.394 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 Caledonia South 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.

9.2.2.395 The level of predicted abundance and collision risk apportioned to the kittiwake feature of the Fowlsheugh SPA to inform assessments is presented in Table 9-62 (detailed methods are presented within Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note).

Table 9-62: 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	37.48	1.05
Non-breeding season (September to early-April)	1.35 (Autumn %) 1.78 (Spring %)	5.76	0.10
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

9.2.2.396 The SPA population of kittiwake was cited as 73,300 breeding adults in 1992. The most recent count (2018 - 2023) is 40,156 breeding adults (SMP, 2024[87]).

9.2.2.397 When considering a breeding adult baseline mortality rate of 0.146 (1- 0.854, Horswill and Robinson, 2015[83]) 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 recent 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

9.2.2.398 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

9.2.2.399 During the O&M phase, the potential level of impact apportioned to the SPA seasonally is summarised in Table 9-63 for the Guidance approach.

9.2.2.400 A displacement matrix is also presented for the annual apportioned abundance for the Caledonia South plus 2km buffer to Fowlsheugh SPA in Table 9-64.

Table 9-63: 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% Disp; 1-3% Mort	Change in Average Survival Rate (% Point Change)
Citation (73,300)	Breeding season (Mid-April to August)	0.11 - 0.34	<0.001
	Non-breeding season (September to early-April)	0.02 - 0.05	<0.001
	Annual	0.13 - 0.39	<0.001 – 0.001
Latest count (40,156)	Breeding season (Mid-April to August)	0.11 - 0.34	<0.001 – 0.001
	Non-breeding season (September to early-April)	0.02 - 0.05	<0.001
	Annual	0.13 - 0.39	<0.001 – 0.001

Breeding Season

9.2.2.401 The estimated kittiwake mean peak abundance during the breeding season is 1,530 (1,529.72) individuals, with an estimated 5.14% of all individuals during the breeding season deriving from Fowlsheugh SPA (Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note). Assuming that 53% of the kittiwake population are adults (Furness, 2015[84]) and using an adult sabbatical rate of 10%, the total proportion of breeding adults from Fowlsheugh SPA potentially impacted by distributional responses are 38 (37.48) per annum during the breeding season (Table 9-63).

9.2.2.402 When applying a displacement rate of 30% and a mortality rate of 1-3%, the consequent potential mortality is estimated to less than one (0.11 - 0.34) breeding adults per annum.

9.2.2.403 Using the citation colony count of 73,300 breeding adults and an annual background mortality of 10,702 (10,701.80) 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 40,156 breeding adults and an annual background mortality of 5,863 (5,862.78) breeding adults, this results in a <0.001 – 0.001 survival rate percentage point change during the breeding season per annum (Table 9-63).

Non-breeding Season

9.2.2.404 The estimated kittiwake mean peak abundance during the non-breeding season is 427 (427.00) individuals. Based on the Furness (2015)[84] non-breeding season BDMPS region SPA proportional split corresponding to the mean peak abundance recorded, 1.35% of predicted mortality during the non-breeding season are estimated to derive from Fowlsheugh SPA (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 six (5.76) per annum during the non-breeding season (Table 9-63).

9.2.2.405 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 - 0.05) per annum.

9.2.2.406 Based on the 1992 citation colony count of 73,300 breeding adults and using an annual background mortality of 10,702 (10,701.80) 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 40,156 breeding adults and an annual background mortality of 5,863 (5,862.78) breeding adults, this results in a <0.001 survival rate percentage point change during the non-breeding season per annum (Table 9-63).

Annual Total

9.2.2.407 The predicted resultant mortality across all defined seasons from Caledonia South, attributed to Fowlsheugh SPA, is less than one (0.13 - 0.39) breeding adult kittiwake per annum. This is predicted to result in a survival rate percentage point change against the citation and most recent counts of <0.001 – 0.001 and <0.001 – 0.001 respectively (Table 9-63).

9.2.2.408 For both citation and most recent 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 Caledonia South alone during the O&M phase. Therefore, subject to natural change, kittiwake will be maintained as a feature in the long term**.

Table 9-64: 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	0	1	1	2	2	3	3	3	4	4
20	0	0	0	0	1	2	3	3	4	5	6	7	8	9
30	0	0	0	1	1	3	4	5	6	8	9	10	12	13
40	0	0	1	1	2	3	5	7	9	10	12	14	16	17
50	0	0	1	1	2	4	6	9	11	13	15	17	19	22
60	0	1	1	1	3	5	8	10	13	16	18	21	23	26
70	0	1	1	2	3	6	9	12	15	18	21	24	27	30
80	0	1	1	2	3	7	10	14	17	21	24	28	31	35
90	0	1	1	2	4	8	12	16	19	23	27	31	35	39
100	0	1	1	2	4	9	13	17	22	26	30	35	39	43
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 Approaches 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

9.2.2.409 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 9-65.

Table 9-65: 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)	1.05	0.001
	Non-breeding season (September to early-April)	0.10	<0.001
	Annual	1.16	0.002
Latest count (40,156)	Breeding season (Mid-April to August)	1.05	0.003
	Non-breeding season (September to early-April)	0.10	<0.001
	Annual	1.16	0.003

Breeding Season

9.2.2.410 The predicted kittiwake collision mortality during the breeding season is 43 (42.94) individuals per annum, with an estimated 5.14% of all individuals during the breeding season deriving from Fowlsheugh SPA (Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note). Assuming that 53% of the population are adults (Furness, 2015[84]) 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 (1.05) per annum during the breeding season.

9.2.2.411 Using the citation colony count of 73,300 breeding adults and an annual background mortality of 10,702 (10,701.80) 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 40,156 breeding adults and an annual background mortality of 5,863 (5,862.78) breeding adults, this results in a 0.003 survival rate percentage point change during the breeding season per annum (see Table 9-65).

Non-breeding Season

9.2.2.412 The predicted kittiwake collision mortality during the non-breeding season is 7 (6.52) individuals. Based on the Furness (2015[84]) spring and autumn season BDMPS region SPA proportional split, 1.35% and 1.78% of predicted mortalities during the non-breeding season are estimated to derive from Fowlsheugh SPA (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 (0.10) per annum (see Table 9-65)

9.2.2.413 Based on the 1992 citation colony count of 73,300 breeding adults and using an annual background mortality of 10,702 (10,701.80) 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 40,156 breeding adults and an annual background mortality of 5,863 (5,862.78) 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 9-65).

Annual Total

9.2.2.414 The predicted resultant mortality across all defined seasons from Caledonia South, attributed to Fowlsheugh SPA, is one (1.16) breeding adults per annum. This is predicted to result in a 0.002 and 0.003 survival rate percentage point change when considering the citation count and most recent count, respectively (see Table 9-65).

9.2.2.415 For both citation and most recent 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 collision risk effects from Caledonia South 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

9.2.2.416 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 9-66.

Table 9-66: 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% Disp; 1-3% Mort	
		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)	1.16 - 1.39	0.002
	Non-breeding season (October to Early-March)	0.12 - 0.16	<0.001
	Annual	1.29 - 1.55	0.002
Latest count (40,156)	Breeding season (Mid-March to September)	1.16 - 1.39	0.003
	Non-breeding season (October to Early-March)	0.12 - 0.16	<0.001
	Annual	1.29 - 1.55	0.003 – 0.004

Breeding Season

9.2.2.417 As presented within (Table 9-66) the combined distributional response and collision risk impacts apportioned to the kittiwake feature of Fowlsheugh SPA, equates to approximately one (1.16 - 1.39) additional breeding adult mortality 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 (10,701.80) breeding adults, the addition of one - 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 (5,862.78) breeding adults, this results in a 0.003 survival rate percentage point change during the breeding season per annum (see Table 9-66).

Non-breeding Season

9.2.2.418 As presented within Table 9-66 the combined distributional response and collision risk impacts apportioned to the kittiwake feature of Fowlsheugh SPA, equates to approximately less than one (0.12 - 0.16) 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 (10,701.80) breeding adults, the addition of less than 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 and an annual background mortality of 5,863 (5,862.78) breeding adults, this results in a <0.001 survival rate percentage point change during the non-breeding season per annum (see Table 9-66).

Annual Total

9.2.2.419 The predicted resultant mortality across all defined seasons from Caledonia South, attributed to Fowlsheugh SPA, is one - two (1.29 - 1.55) kittiwake per annum. This is predicted to result in survival rate percentage point change against the citation and most recent counts of 0.002 and 0.003 – 0.004 respectively (see Table 9-66).

9.2.2.420 For both citation and most recent 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 combined distributional response and collision risk effects from Caledonia South alone during the O&M phase. Therefore, subject to natural change, kittiwake will be maintained as a feature in the long term.**

Razorbill

9.2.2.421 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 9.2.2 beginning in paragraph 9.2.2.531. As presented in paragraph 9.2.2.531, **the potential for an AEoSI to the conservation objectives of razorbill at Fowlsheugh SPA in relation to distributional response impacts from Caledonia South 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

9.2.2.422 The centroid of the Cape Warth SPA is 175.3km (around land) from the centre of the Caledonia OWF, within the MMFR +1SD of puffin (137.1±128.3km), and kittiwake (156.1±144.5km) (Woodward *et al*., 2019[75]). 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

9.2.2.423 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 9.2.2, beginning in paragraph 9.2.2.524. As presented in paragraph 9.2.2.524, **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 Caledonia South 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

9.2.2.424 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 9.2.2, beginning in paragraph 9.2.2.535. As presented in paragraph 9.2.2.535, **the potential for an AEoSI to the conservation objectives of puffin at Cape Wrath SPA in relation to distributional response impacts from Caledonia South 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

9.2.2.425 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[75]). 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

9.2.2.426 Puffin have been screened into the assessment for distributional responses as they are susceptible to displacement due to their distribution and behaviours (Bradbury *et al*., 2014[76]; NatureScot 2023[78]; Furness and Wade, 2012[79]; Furness *et al*., 2013[80]). The SPA population of puffin was cited as 93,800 breeding adults in 1994. The most recent count (2018) is 95,484 breeding adults (SMP, 2024[87]).

9.2.2.427 When considering a breeding adult baseline mortality rate of 0.094 (1-0.906, Horswill and Robinson, 2015[83]), 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 recent 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

9.2.2.428 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

9.2.2.429 As outlined above, puffin have been screened into the assessment for distributional responses. The level of abundance apportioned is presented in Table 9-67 (detailed methods are presented within Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note).

9.2.2.430 For puffin, distributional responses are assessed based on the birds within the Caledonia South 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 9-67: 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	152.80* / 359.16**
Non-breeding season (Mid-August to March)	0.05	0.89* / 0.39**
* 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

9.2.2.431 During the O&M phase, the potential level of impact apportioned to the SPA seasonally is summarised in Table 9-68 for both the Applicant and Guidance approach.

9.2.2.432 Displacement matrices are also presented for the annual apportioned abundance for the Caledonia South plus 2km buffer to Sule Skerry and Sule Stack SPA in Table 9-69 and Table 9-70 as per the Applicant and Guidance Approach, respectively.

Table 9-68: 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% Disp; 1% Mort	Change in Average Survival Rate (% Point Change)	60% Disp; 1-3% Mort (Non-breeding); 3-5% Mort (Breeding)	Change in Average Survival Rate (% Point Change)
Citation (93,800)	Breeding season (April to Mid-August)	0.76	0.001	6.46 - 10.77	0.007 – 0.011
	Non-breeding season (Mid-August to March)	<0.01	<0.001	<0.01 – 0.01	<0.001
	Annual	0.77	0.001	6.47 - 10.78	0.007 – 0.011
Latest count (95,484)	Breeding season (April to Mid-August)	0.76	0.001	6.46 - 10.77	0.007 – 0.011
	Non-breeding season (Mid-August to March)	<0.01	<0.001	<0.01 – 0.01	<0.001
	Annual	0.77	0.001	6.47 - 10.78	0.007 – 0.011

Breeding Season

9.2.2.433 The estimated puffin mean peak abundance during the breeding season is 514 (514.20) individuals, with an estimated 58.10% of puffin during the breeding season deriving from Sule Skerry and Sule Stack SPA (Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note). Assuming that 57% of the puffin population are adults (Furness, 2015[84]), 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 153 (152.80) per annum during the breeding season (Table 9-68).

9.2.2.434 When applying a displacement rate of 50% and a mortality rate of 1%, the consequent potential mortality is estimated to one (0.76) breeding adults per annum.

9.2.2.435 Using the citation colony count of 93,800 breeding adults and an annual background mortality of 8,817 (8,817.20) breeding adults, the 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 (8,975.50) breeding adults, this results in a 0.001 survival rate percentage point change during the breeding season per annum (Table 9-68).

Non-breeding Season

9.2.2.436 The estimated puffin mean peak abundance during the non-breeding season is 1,726 (1,725.50) individuals. Based on the Furness (2015[84]) 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 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 one (0.89) per annum during the non-breeding season (Table 9-68).

9.2.2.437 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 less than one (<0.01) per annum.

9.2.2.438 Based on the 1994 citation colony count of 93,800 breeding adults and using an annual background mortality of 8,817 (8,817.20) 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 95,484 breeding adults and an annual background mortality of 8,976 (8,975.50) breeding adults, this results in a <0.001 survival rate percentage point change during the non-breeding season per annum (Table 9-68).

Annual Total

9.2.2.439 The predicted resultant mortality across all defined seasons from Caledonia South, attributed to Sule Skerry and Sule Stack SPA, is one (0.77) breeding adult puffin per annum. This is predicted to result in a survival rate percentage point change against the citation and most recent counts of 0.001 and 0.001 respectively (Table 9-68).

9.2.2.440 When considering the Guidance approach, a total of six – eleven (6.47 - 10.78) 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 – 0.011 against the citation and 0.007 – 0.011 against the most recent count (Table 9-68).

9.2.2.441 For both citation and most recent 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 Caledonia South alone during the O&M phase. Therefore, subject to natural change, puffin will be maintained as a feature in the long term**.

Table 9-69: 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 Displacement Rate (%)	Mortality Rate (%)													
	1	2	3	5	10	20	30	40	50	60	70	80	90	100
10	0	0	0	1	2	3	5	6	8	9	11	12	14	15
20	0	1	1	2	3	6	9	12	15	18	22	25	28	31
30	0	1	1	2	5	9	14	18	23	28	32	37	41	46
40	1	1	2	3	6	12	18	25	31	37	43	49	55	61
50	1	2	2	4	8	15	23	31	38	46	54	61	69	77
60	1	2	3	5	9	18	28	37	46	55	65	74	83	92
70	1	2	3	5	11	22	32	43	54	65	75	86	97	108
80	1	2	4	6	12	25	37	49	61	74	86	98	111	123
90	1	3	4	7	14	28	41	55	69	83	97	111	124	138
100	2	3	5	8	15	31	46	61	77	92	108	123	138	154
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 Approaches 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 9-70: Puffin O&M phase disturbance annual displacement matrix for impacts apportioned to Sule Skerry and Sule Stack 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 Displacement Rate (%)	Mortality Rate (%)													
	1	2	3	5	10	20	30	40	50	60	70	80	90	100
10	0	1	1	2	4	7	11	14	18	22	25	29	32	36
20	1	1	2	4	7	14	22	29	36	43	50	58	65	72
30	1	2	3	5	11	22	32	43	54	65	76	86	97	108
40	1	3	4	7	14	29	43	58	72	86	101	115	129	144
50	2	4	5	9	18	36	54	72	90	108	126	144	162	180
60	2	4	6	11	22	43	65	86	108	129	151	173	194	216
70	3	5	8	13	25	50	76	101	126	151	176	201	227	252
80	3	6	9	14	29	58	86	115	144	173	201	230	259	288
90	3	6	10	16	32	65	97	129	162	194	227	259	291	324
100	4	7	11	18	36	72	108	144	180	216	252	288	324	360

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 Approaches 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

9.2.2.442 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 Section 9.2.2, beginning in paragraph 9.2.2.551. Due to potential connectivity being limited based on overall proportional weighting to Sule Skerry SPA, a combined assessment with other SPAs is provided in Section 9.2.2, beginning in paragraph 9.2.2.551. As presented in paragraph 9.2.2.551, **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 Caledonia South 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

9.2.2.443 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

9.2.2.444 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[75]). 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

9.2.2.445 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 Isle SPA, a combined assessment with other SPAs is provided in Section 9.2.2, beginning in paragraph 9.2.2.524. As presented in paragraph 9.2.2.524, **the potential for an AEoSI to the conservation objectives of kittiwake at Fair Isle SPA in relation to both distributional responses and collision impacts from Caledonia South 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

9.2.2.446 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 9.2.2 beginning in paragraph 9.2.2.547. As presented in paragraph 9.2.2.547, **the potential for an AEoSI to the conservation objectives of great skua at Fair Isle SPA in relation to collision impacts from Caledonia South 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

9.2.2.447 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 Isle SPA, a combined assessment with other SPAs is provided in Section 9.2.2 beginning in paragraph 9.2.2.531. As presented in paragraph 9.2.2.531, **the potential for an AEoSI to the conservation objectives of razorbill at Fair Isle SPA in relation to distributional response impacts from Caledonia South 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

9.2.2.448 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 Fair Isle SPA, a combined assessment with other SPAs is provided in Section 9.2.2, beginning in paragraph 9.2.2.535. As presented in paragraph 9.2.2.535, **the potential for an AEoSI to the conservation objectives of puffin at Fair Isle SPA in relation to distributional response impacts from Caledonia South 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

9.2.2.449 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 Section 9.2.2, beginning in paragraph 9.2.2.551. As presented in paragraph 9.2.2.551, **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 Caledonia South 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

9.2.2.450 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[75]). 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

9.2.2.451 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 9.2.2, beginning in paragraph 9.2.2.524. 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 9.2.2, beginning in paragraph 9.2.2.524. As presented in paragraph 9.2.2.524, **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 Caledonia South 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

9.2.2.452 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[75]). 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

9.2.2.453 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 9.2.2, beginning in paragraph 9.2.2.524. As presented in paragraph 9.2.2.524, **the potential for an AEoSI to the conservation objectives of kittiwake at Foula SPA in relation to both distributional responses and collision impacts from Caledonia South 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

9.2.2.454 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 9.2.2 beginning in paragraph 9.2.2.547. As presented in paragraph 9.2.2.547 **the potential for an AEoSI to the conservation objectives of great skua at Foula SPA in relation to collision impacts from Caledonia South 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

9.2.2.455 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 9.2.2 beginning in paragraph 9.2.2.535. As presented in paragraph 9.2.2.535, **the potential for an AEoSI to the conservation objectives of puffin at Foula SPA in relation to distributional response impacts from Caledonia South 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

9.2.2.456 The centroid of the North Rona and Sula Sgeir SPA is 242.6km (around land) from the centre of the 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[75]). 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

9.2.2.457 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 9.2.2, beginning in paragraph 9.2.2.524. As presented in paragraph 9.2.2.524, **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 Caledonia South 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

9.2.2.458 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 9.2.2, beginning in paragraph 9.2.2.535. As presented in paragraph 9.2.2.535, **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 Caledonia South 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

9.2.2.459 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

9.2.2.460 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 Section 9.2.2, beginning in paragraph 9.2.2.551. As presented in paragraph 9.2.2.551, **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 Caledonia South 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**.

Mousa SPA

9.2.2.461 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[75]). 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

9.2.2.462 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

9.2.2.463 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[75]). The razorbill feature of Forth Islands SPA has also been screened into assessment though only for the non-breeding season, due to the Caledonia OWF 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

9.2.2.464 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 9.2.2, beginning in paragraph 9.2.2.524. As presented in Section 9.2.2.524, **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 Caledonia South 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

9.2.2.465 Gannet have been screened into the assessment for collision risk as they are susceptible to collision due to their flight height distribution and behaviours (Bradbury *et al*., 2014[76]; JNCC *et al*., 2024[77]; NatureScot 2023[78]; Furness and Wade, 2012[79]; Furness *et al*., 2013[80]). Gannet have also been assessed for distributional responses due to their sensitivity to displacement (Bradbury *et al*., 2014[76]; NatureScot 2023[78]; Furness and Wade, 2012[79]; Furness *et al*., 2013[80]).

9.2.2.466 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 4, Chapter 6: Offshore Ornithology for further information regarding approaches). This approach has been presented as the Guidance Approach (Table 9-74). The Applicant Approach has also been presented, with the macro-avoidance rate applied to the predicted mortalities in all months (Table 9-74).

9.2.2.467 Gannet have been assessed for distributional responses based on the birds within the Caledonia South Site 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 9-72). Presentation of distributional response impacts following NatureScot Guidance Approach are also provided in Table 9-72. 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.

9.2.2.468 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 9-71 (detailed methods are presented within 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[88]; Wanless *et al*., 2023[89]). Further information regarding the level of apportionment used when considering the Forth Islands SPA updated count is presented within Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note.

Table 9-71: 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	142.75	0.63* / 2.11**
Non-breeding season (October to Early-March)	24.32 (Autumn %) 31.27 (Spring %)	44.50	0.09* / 0.09*
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

9.2.2.469 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[87]). An updated 2021 Forth Islands SPA count of 162,000 breeding adults has also been taken into account (Harris *et al*., 2023[88]; Wanless et al., 2023[89]), which is based on extrapolation of the 2014 count.

9.2.2.470 When considering a breeding adult baseline mortality rate of 0.081 (1- 919, Horswill and Robinson, 2015[83]), 3,499 (3,499.20), 12,192 (12,191.96) and 13,122 (13,122.00) 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

9.2.2.471 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

9.2.2.472 During the O&M phase, the potential level of impact apportioned to the SPA seasonally is summarised in Table 9-72 for the Applicant and Guidance approach.

9.2.2.473 A displacement matrix is also presented for the annual apportioned abundance for the Caledonia South plus 2km buffer to Forth Islands SPA in Table 9-73.

Table 9-72: 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 (Guidance approach).

Population Size (Breeding adults)	Defined Season (Months)	Applicant Approach		Guidance Approach	
		70% Disp; 1% Mort	Change in Average Survival Rate (% Point Change)	70% Disp; 1-3% Mort	Change in Average Survival Rate (% Point Change)
Citation (43,200)	Breeding season (Mid-April to August)	1.00	0.002	1.00 – 3.00	0.002 – 0.007
	Non-breeding season (September to early-April)	0.31	0.001	0.31 – 0.93	0.001 – 0.002
	Annual	1.31	0.003	1.31 – 3.93	0.003 – 0.009
Latest count (150,518)	Breeding season (Mid-April to August)	1.00	0.001	1.00 – 3.00	0.001 – 0.002
	Non-breeding season (September to early-April)	0.31	<0.001	0.31 – 0.93	<0.001 – 0.001
	Annual	1.31	0.001	1.31 – 3.93	0.001 – 0.003
Forth Islands SPA updated count (162,000) *	Breeding season (Mid-April to August)	1.05	0.001	1.05 – 3.14	0.001 – 0.002
	Non-breeding season (September to early-April)	0.59	<0.001	0.59 – 1.77	<0.001 – 0.001
	Annual	1.63	0.001	1.63 – 4.90	0.001 – 0.003

Population Size (Breeding adults)	Defined Season (Months)	Applicant Approach		Guidance Approach	
		70% Disp; 1% Mort	Change in Average Survival Rate (% Point Change)	70% Disp; 1-3% Mort	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[88]; Wanless *et al*., 2023[89]). Further information regarding this approach is outlined within Section 7.3.11 and apportionment is presented within Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note.					

Breeding Season

9.2.2.474 The estimated gannet mean peak abundance during the breeding season is 708 (707.5) individuals, with an estimated 40.76% of all individuals during the breeding season deriving from Forth Islands SPA (Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note). Assuming that 55% of the kittiwake population are adults (Furness, 2015[84]) and using an adult sabbatical rate of 10%, the total proportion of breeding adults from Forth Islands SPA potentially impacted by distributional responses are 143 (142.75) per annum during the breeding season (Table 9-72).

9.2.2.475 When applying a displacement rate of 70% and a mortality rate of 1%, the consequent potential mortality is estimated to one (1.00) breeding adult per annum and one (1.05) breeding adult per annum when considering the Forth Islands updated count. Table 9-72 presents a range of potential distributional response mortalities as per SNCB guidance (70% displacement, 1 and 3% mortality).

9.2.2.476 Using the citation colony count of 43,200 breeding adults and using an annual background mortality of 3,499 (3,499.20) 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 breeding adults and an annual background mortality of 12,192 (12,191.96) breeding adults, this results in a 0.001 survival rate percentage point change during the breeding season per annum (Table 9-72). When considering the Forth Islands SPA updated counts of 162,000 breeding adults and an annual background mortality of 13,122 (13,122.00) breeding adults, this results in a 0.001 survival rate percentage point change during the breeding season per annum (Table 9-72).

Non-breeding Season

9.2.2.477 The estimated gannet mean peak abundance during the non-breeding season is 183 (183.00) individuals. Based on the Furness (2015[84]) 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 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 45 (44.50) per annum during the non-breeding season (Table 9-72).

9.2.2.478 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 (0.31) per annum and less than one (0.59) breeding adult when considering the Forth Islands updated count.

9.2.2.479 Based on the 1990 citation colony count of 43,200 breeding adults and using an annual background mortality of 3,499 (3,499.20) 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 SMP counts of 150,518 breeding adults and an annual background mortality of 12,192 (12,191.96) breeding adults, this results in a <0.001 survival rate percentage point change during the non-breeding season per annum (Table 9-72). When considering the Forth Islands SPA updated counts of 162,000 breeding adults and an annual background mortality of 13,122 (13,122.00) breeding adults, this results in a <0.001 survival rate percentage point change during the non-breeding season per annum (Table 9-72).

Annual Total

9.2.2.480 The predicted resultant mortality across all defined seasons from Caledonia South, attributed to Forth Islands SPA, is one (1.31) breeding adult gannet per annum and two (1.63) breeding adults when considering the Forth Islands latest 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 0.003, 0.001 and 0.001 respectively (see Table 9-72).

9.2.2.481 When considering the Guidance approach, a total of one - four (1.31 – 3.93) breeding adult mortalities are predicted due to potential distributional response effects per annum and one – five (1.63 – 4.90) breeding adult mortalities when considering the Forth Islands updated count. This results in a survival rate percentage point change of 0.003 – 0.009 against the citation and 0.001 – 0.003 against the most recent SMP count and the Forth Islands SPA updated count (Table 9-72).

9.2.2.482 For the citation, the most recent SMP 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 Caledonia South alone during the O&M phase. Therefore, subject to natural change, gannet will be maintained as a feature in the long term**.

Table 9-73: 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	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	51	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	66	75	84	94
60	1	2	3	6	11	22	34	45	56	67	79	90	101	112
70	1	3	4	7	13	26	39	52	66	79	92	105	118	131
80	1	3	4	7	15	30	45	60	75	90	105	120	135	150
90	2	3	5	8	17	34	51	67	84	101	118	135	152	169
100	2	4	6	9	19	37	56	75	94	112	131	150	169	187
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 Approaches 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

9.2.2.483 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 9-74.

Table 9-74: 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)	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)
Citation (43,200)	Breeding season (Mid-March to September)	0.63	0.001	2.11	0.005
	Non-breeding season (October to Early-March)	0.09	<0.001	0.09	<0.001
	Annual	0.72	0.002	2.20	0.005
Latest count (150,518)	Breeding season (Mid-March to September)	0.63	<0.001	2.11	0.001
	Non-breeding season (October to Early-March)	0.09	<0.001	0.09	<0.001
	Annual	0.72	<0.001	2.20	0.001
Forth Islands SPA updated count (162,000) *	Breeding season (Mid-April to August)	0.66	<0.001	2.19	0.001
	Non-breeding season (September to early-April)	0.11	<0.001	0.12	<0.001
	Annual	0.77	<0.001	2.31	0.001

* The Forth Islands SPA updated count takes into account the 2021 estimated Bass Rock drone count of 81,000 AOS (Harris *et al*., 2023[88]; Wanless *et al*., 2023[89]). Further information regarding this approach is outlined within Section 7.3.11 and apportionment is presented within Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note.

Breeding Season

9.2.2.484 The predicted gannet collision mortality during the breeding season is three (3.13) individuals per annum, with an estimated 40.76% of all individuals during the breeding season deriving from Forth Islands SPA (Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note). Assuming that 55% of the population are adults (Furness, 2015[84]) 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 one (0.63) per annum during the breeding season and one (0.66) breeding adult when considering the Forth islands updated count.

9.2.2.485 Using the citation colony count of 43,200 breeding adults and using a background mortality of 3,499 (3,499.20) breeding adults, the 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 SMP counts of 150,518 breeding adults and an annual background mortality of 12,192 (12,191.96) breeding adults, this results in a <0.001 survival rate percentage point change during the breeding season per annum (see Table 9-74). When considering the Forth Islands SPA updated counts of 162,000 breeding adults and an annual background mortality of 13,122 (13,122.00) breeding adults, this results in a <0.001 survival rate percentage point change during the breeding season per annum (Table 9-74).

Non-breeding Season

9.2.2.486 The predicted gannet collision mortality during the non-breeding season is less than one (0.36) individuals. Based on the Furness (2015[84])spring and autumn season BDMPS region SPA proportional split, 24.32% and 31.27% of predicted mortalities during the non-breeding season are estimated to derive from Forth Islands SPA (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 (0.09) per annum and less than one (0.11) breeding adult when considering the Forth Islands updated count.

9.2.2.487 Based on the 1990 citation colony count of 43,200 breeding adults and using a background mortality of 3,499 (3,499.20) 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 (12,191.96) 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 9-74). When considering the Forth Islands SPA updated counts of 162,000 breeding adults and an annual background mortality of 13,122 (13,122.00) breeding adults, this results in a <0.001 survival rate percentage point change during the non-breeding season per annum (Table 9-74).

Annual Total

9.2.2.488 The predicted resultant mortality across all defined seasons from Caledonia South, attributed to Forth Islands SPA, is one (0.72) breeding adult per annum and one (0.77) 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 9-74).

9.2.2.489 When considering the Guidance approach to macro-avoidance, a total of two (2.20) breeding adult mortalities are predicted due to potential collision risk impacts per annum and two (2.31) breeding adult mortalities when considering the Forth Islands updated count. This results in a survival rate percentage point change of 0.005 against the citation and 0.001 against the most recent SMP count and the Forth Islands updated count (Table 9-74).

9.2.2.490 For the citation, the most recent SMP 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 Caledonia South 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

9.2.2.491 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 9-75.

9.2.2.492 Table 9-76 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 9-75 and Table 9-76 present a range of potential combined distributional response and collision risk impacts as per SNCB guidance regarding displacement (70% displacement, 1 and 3% mortality).

Table 9-75: 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% Disp; 1% Mort		Guidance Approach 70% Disp; 1-3% Mort	
		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)	1.63	0.004	1.63 – 3.63	0.004 – 0.008
	Non-breeding season (October to Early-March)	0.40	0.001	0.40 – 1.03	0.001
	Annual	2.03	0.005	2.03 – 4.66	0.005 – 0.011
Latest count (150,518)	Breeding season (Mid-March to September)	1.63	0.001	1.63 – 3.63	0.001 – 0.002
	Non-breeding season (October to Early-March)	0.40	<0.001	0.40 – 1.03	<0.001
	Annual	2.03	0.001	2.03 – 4.66	0.001 – 0.003
Forth Islands SPA updated count (162,000) *	Breeding season (Mid-March to September)	1.70	0.001	1.70 – 3.79	0.001 – 0.002
	Non-breeding season (October to Early-March)	0.68	<0.001	0.68 – 1.86	<0.001 – 0.001
	Annual	2.40	0.001	2.40 – 5.67	0.001 – 0.003

* The Forth Islands SPA updated count takes into account the 2021 estimated Bass Rock drone count of 81,000 AOS (Harris *et al*., 2023[88]; Wanless *et al*., 2023[89]). Further information regarding this approach is outlined within Section 7.3.11 and apportionment is presented within Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note.

Table 9-76: 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% Disp; 1% Mort		Guidance Approach 70% Disp; 1-3% Mort	
		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)	3.11	0.007	3.11 - 5.10	0.007 – 0.012
	Non-breeding season (October to Early-March)	0.40	0.001	0.40 - 1.03	0.001 – 0.002
	Annual	3.51	0.008	3.51 - 6.13	0.008 – 0.014
Latest count (150,518)	Breeding season (Mid-March to September)	3.11	0.002	3.11 - 5.10	0.002 – 0.003
	Non-breeding season (October to Early-March)	0.40	<0.001	0.40 - 1.03	<0.001 – 0.001
	Annual	3.51	0.002	3.51 - 6.13	0.002 – 0.004
Forth Islands SPA updated count (162,000) *	Breeding season (Mid-March to September)	3.23	0.002	3.23 – 5.32	0.002 – 0.003
	Non-breeding season (October to Early-March)	0.68	<0.001	0.68 – 1.86	<0.001 – 0.001
	Annual	3.94	0.002	3.94 – 7.21	0.002 – 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[88]; Wanless *et al*., 2023[89]). Further information regarding this approach is outlined within Section 7.3.11 and apportionment is presented within Application Document 14, Appendix 14-1: Caledonia South Apportioning Technical Note.

Breeding Season

9.2.2.493 As presented within (Table 9-75) the combined distributional response and collision risk impacts apportioned to the gannet feature of Forth Islands SPA, equates to approximately two (1.63) additional breeding adult mortalities during the breeding season per annum and two (1.70) 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 (3,499.20) breeding adults, the addition of two predicted breeding adult mortalities would result in a 0.004 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 (12,191.96) breeding adults, this results in a 0.001 survival rate percentage point change during the breeding season per annum (see Table 9-75). When considering the Forth Islands SPA updated counts of 162,000 breeding adults and an annual background mortality of 13,122 (13,122.00) breeding adults, this results in a 0.001 survival rate percentage point change during the breeding season per annum (Table 9-75).

Non-breeding Season

9.2.2.494 As presented within Table 9-75 the combined distributional response and collision risk impacts apportioned to the gannet feature of Forth Islands SPA, equates to approximately less than one (0.40) additional adult mortality during the non-breeding season per annum and one (0.68) 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 (3,499.20) 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 SMP counts of 150,518 and an annual background mortality of 12,192 (12,191.96) breeding adults, this results in a <0.001 survival rate percentage point change during the non-breeding season per annum (see Table 9-75). When considering the Forth Islands SPA updated counts of 162,000 breeding adults and an annual background mortality of 13,122 (13,122.00) breeding adults, this results in a <0.001 survival rate percentage point change during the non-breeding season per annum (Table 9-75).

Annual Total

9.2.2.495 The predicted resultant mortality across all defined seasons from Caledonia South, attributed to Forth Islands SPA, is two (2.03) gannet per annum and two (2.40) 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 0.005, 0.001 and 0.001 respectively (see Table 9-75).

9.2.2.496 When considering the Guidance approach to macro-avoidance, a total of four - six (3.51 - 6.13) breeding adult mortalities are predicted due to potential distributional response effects per annum and four – seven (3.94 – 7.21) breeding adult mortalities when considering the Forth Islands updated count. This results in a survival rate percentage point change of 0.008 – 0.014 against the citation and 0.002 – 0.004 against the most recent SMP count and the Forth Islands SPA updated count (Table 9-76).

9.2.2.497 For the citation, the most recent 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 combined distributional response and collision risk effects from Caledonia South alone during the O&M phase. Therefore, subject to natural change, gannet will be maintained as a feature in the long term**.

Razorbill

9.2.2.498 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 9.2.2 beginning in paragraph 9.2.2.531. As presented in paragraph 9.2.2.531, **the potential for an AEoSI to the conservation objectives of razorbill at Forth Islands SPA in relation to distributional response impacts from Caledonia South 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

9.2.2.499 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[75]). 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:
  - 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

9.2.2.500 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 9.2.2, beginning in paragraph 9.2.2.524. As presented in paragraph 9.2.2.524, **the potential for an AEoSI to the conservation objectives of kittiwake at Noss SPA in relation to both distributional responses and collision impacts from Caledonia South 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

9.2.2.501 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 9.2.2, beginning in paragraph 9.2.2.547. As presented in paragraph 9.2.2.547, **the potential for an AEoSI to the conservation objectives of great skua at Noss SPA in relation to collision impacts from Caledonia South 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

9.2.2.502 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 9.2.2 beginning in paragraph 9.2.2.535. As presented in paragraph 9.2.2.535, **the potential for an AEoSI to the conservation objectives of puffin at Noss SPA in relation to distributional response impacts from Caledonia South 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

9.2.2.503 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 Section 9.2.2, beginning in paragraph 9.2.2.551. As presented in paragraph 9.2.2.551, **the potential for an AEoSI to the conservation objectives of gannet at Noss SPA in relation to both distributional responses and collision impacts from Caledonia South 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

9.2.2.504 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[75]). 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

9.2.2.505 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 9.2.2, beginning in paragraph 9.2.2.524. As presented in paragraph 9.2.2.524, **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 Caledonia South 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

9.2.2.506 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[75]). 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

9.2.2.507 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 9.2.2, beginning in paragraph 9.2.2.547. As presented in paragraph 9.2.2.547, **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 Caledonia South 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

9.2.2.508 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[75]). 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

9.2.2.509 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 9.2.2 beginning in paragraph 9.2.2.547. As presented in paragraph 9.2.2.547, **the potential for an AEoSI to the conservation objectives of great skua at Feltlar SPA in relation to collision impacts from Caledonia South 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

9.2.2.510 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[75]). The kittiwake feature of Hermaness, Saxa Vord and Valla Field SPA has also been screened into assessment though only for the non-breeding season, due to the Caledonia OWF 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

9.2.2.511 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 9.2.2, beginning in paragraph 9.2.2.547. As presented in paragraph 9.2.2.547, **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 Caledonia South 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**.

Kittiwake

9.2.2.512 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 Hermaness, Saxa Vord and Valla Field SPA, a combined assessment with other SPAs is provided in Section 9.2.2, beginning in paragraph 9.2.2.524. As presented in paragraph 9.2.2.524, **the potential for an AEoSI to the conservation objectives of kittiwake at Hermaness, Saxa Vord and Valla Field SPA in relation to both distributional responses and collision impacts from Caledonia South 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

9.2.2.513 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 9.2.2, beginning in paragraph 9.2.2.551. As presented in paragraph 9.2.2.551, **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 Caledonia South 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

9.2.2.514 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[75]). 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

9.2.2.515 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 9.2.2, beginning in paragraph 9.2.2.524. As presented in paragraph 9.2.2.524 **the potential for an AEoSI to the conservation objectives of kittiwake at Handa SPA in relation to both distributional responses and collision impacts from Caledonia South 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

9.2.2.516 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 9.2.2, beginning in paragraph 9.2.2.547. As presented in paragraph 9.2.2.547, **the potential for an AEoSI to the conservation objectives of great skua at Handa SPA in relation to collision impacts from Caledonia South 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

9.2.2.517 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[75]). 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

9.2.2.518 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 9.2.2, beginning in paragraph 9.2.2.524. As presented in paragraph 9.2.2.524, **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 Caledonia South 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

9.2.2.519 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[75]). 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

9.2.2.520 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 9.2.2 beginning in paragraph 9.2.2.547. As presented in paragraph 9.2.2.547, **the potential for an AEoSI to the conservation objectives of great skua at St Kilda SPA in relation to collision impacts from Caledonia South 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

9.2.2.521 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

9.2.2.522 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.

9.2.2.523 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

9.2.2.524 The kittiwake feature of a number of more distant UK SPAs from Caledonia South 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).

9.2.2.525 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

9.2.2.526 Table 9-77 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 Caledonia South Site and 2km buffer.

Table 9-77: 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% Disp; 1-3% Mort	Change in Average Survival Rate (% Point Change)
Copinsay SPA	Citation (19,100)	Breeding	<0.01 – 0.01	<0.001
		Non-breeding	<0.01	<0.001
		Annual	0.01 – 0.02	<0.001
	Latest count (592)	Breeding	<0.01 – 0.01	0.001 – 0.002
		Non-breeding	<0.01	<0.001 – 0.001
		Annual	0.01 – 0.02	0.001 – 0.003
Hoy SPA	Citation (6,000)	Breeding	<0.01 – 0.01	<0.001
		Non-breeding	<0.01	<0.001
		Annual	<0.01 – 0.01	<0.001
	Latest count (608)	Breeding	<0.01 – 0.01	0.001 – 0.002
		Non-breeding	<0.01	<0.001
		Annual	<0.01 – 0.01	0.001 – 0.002
Marwick Head SPA	Citation (15,400)	Breeding	0.01 - 0.03	<0.001
		Non-breeding	<0.01	<0.001
		Annual	0.01 - 0.03	<0.001
	Latest count (2, 878)	Breeding	0.01 - 0.03	<0.001 – 0.001

SPA	Population Size (Breeding Adults)	Defined Season	Guidance Approach	
			30% Disp; 1-3% Mort	Change in Average Survival Rate (% Point Change)
		Non-breeding	<0.01	<0.001
		Annual	0.01 - 0.03	<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 – 0.001
		Annual	<0.01 – 0.01	0.001 – 0.002
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	0.01 – 0.04	<0.001
		Non-breeding	0.02 – 0.07	<0.001
		Annual	0.03 – 0.10	<0.001

SPA	Population Size (Breeding Adults)	Defined Season	Guidance Approach	
			30% Disp; 1-3% Mort	Change in Average Survival Rate (% Point Change)
	Latest count (4,838)	Breeding	0.01 – 0.04	<0.001 - 0.001
		Non-breeding	0.02 – 0.07	<0.001 - 0.001
		Annual	0.03 – 0.10	0.001 – 0.002
Cape Wrath SPA	Citation count (19,400)	Breeding	0.01 - 0.03	<0.001
		Non-breeding	<0.01	<0.001
		Annual	0.01 - 0.04	<0.001
	Latest count (6,616)	Breeding	0.01 - 0.03	<0.001 – 0.001
		Non-breeding	<0.01	<0.001
		Annual	0.01 - 0.04	<0.001 – 0.001
Fair Isle SPA	Citation count (36,320)	Breeding	<0.01	<0.001
		Non-breeding	<0.01	<0.001
		Annual	0.01 – 0.01	<0.001
	Latest count (896)	Breeding	<0.01	<0.001 – 0.001
		Non-breeding	<0.01	<0.001
		Annual	0.01 – 0.01	<0.001 – 0.001
Sumburgh Head SPA	Citation count (2,732)	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% Disp; 1-3% Mort	Change in Average Survival Rate (% Point Change)
	Latest count (636)	Breeding	<0.01	<0.001
		Non-breeding	<0.01	<0.001
		Annual	<0.01	<0.001
Handa SPA	Citation count (21,464)	Breeding	0.01 – 0.03	<0.001
		Non-breeding	<0.01	<0.001
		Annual	0.01 – 0.03	<0.001
	Latest count (9,178)	Breeding	0.01 – 0.03	<0.001
		Non-breeding	<0.01	<0.001
		Annual	0.01 – 0.03	<0.001
Foula SPA	Citation count (7,680)	Breeding	<0.01	<0.001
		Non-breeding	<0.01	<0.001
		Annual	<0.01	<0.001
	Latest count (1,021)	Breeding	<0.01	<0.001
		Non-breeding	<0.01	<0.001
		Annual	<0.01	<0.001
North Rona and Sula Sgeir SPA	Citation count (10,000)	Breeding	<0.01	<0.001
		Non-breeding	<0.01	<0.001

SPA	Population Size (Breeding Adults)	Defined Season	Guidance Approach	
			30% Disp; 1-3% Mort	Change in Average Survival Rate (% Point Change)
		Annual	<0.01	<0.001
	Latest count (1,421)	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 – 0.05	<0.001
		Non-breeding	0.01 – 0.02	<0.001
		Annual	0.02 – 0.07	<0.001
	Latest count (13,078)	Breeding	0.02 – 0.05	<0.001
		Non-breeding	0.01 – 0.02	<0.001
		Annual	0.02 – 0.07	<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
	Latest count (172)	Breeding	<0.01	<0.001
		Non-breeding	<0.01	0.001 – 0.002
		Annual	<0.01	0.001 – 0.002
	Citation count (42,340)	Breeding	0.01 – 0.03	<0.001

SPA	Population Size (Breeding Adults)	Defined Season	Guidance Approach	
			30% Disp; 1-3% Mort	Change in Average Survival Rate (% Point Change)
St Abbs Head to Fast Castle SPA		Non-breeding	0.01 – 0.02	<0.001
		Annual	0.02 – 0.05	<0.001
	Latest count (9,158)	Breeding	0.01 – 0.03	<0.001
		Non-breeding	0.01 – 0.02	<0.001
		Annual	0.02 – 0.05	<0.001 – 0.001
Shaint Isles SPA	Citation count (3,600)	Breeding	<0.01	<0.001
		Non-breeding	<0.01	<0.001
		Annual	<0.01	<0.001
	Latest count (2,318)	Breeding	<0.01	<0.001
		Non-breeding	<0.01	<0.001
		Annual	<0.01	<0.001
Farne Islands SPA	Citation count (8,241)	Breeding	-	-
		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

SPA	Population Size (Breeding Adults)	Defined Season	Guidance Approach	
			30% Disp; 1-3% Mort	Change in Average Survival Rate (% Point Change)
Hermaness, 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
		Annual	<0.01	<0.001 – 0.001

9.2.2.527 For all SPAs considered in Table 9-77, the level of predicted annual additional mortality due to Caledonia South alone distributional responses effects is less than one (0.10 at most) breeding adult. Additionally, for all assessments the survival rate percentage point changes due to the predicted Caledonia South 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 Caledonia South 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

9.2.2.528 Table 9-78 below presents predicted collision risk impacts during the O&M phase attributed to each SPA seasonally and subsequent survival rate percentage point change.

Table 9-78: 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	0.04	<0.001
		Non-breeding	0.01	<0.001
		Annual	0.05	<0.001
	Latest count (592)	Breeding	0.04	0.007
		Non-breeding	0.01	0.001
		Annual	0.05	0.008
Hoy SPA	Citation (6,000)	Breeding	0.04	0.001
		Non-breeding	<0.01	<0.001
		Annual	0.04	0.001
	Latest count (608)	Breeding	0.04	0.006
		Non-breeding	<0.01	0.001
		Annual	0.04	0.007
Marwick Head SPA	Citation (15,400)	Breeding	0.09	0.001
		Non-breeding	0.01	<0.001
		Annual	0.10	0.001
	Latest count (1,812)	Breeding	0.09	0.003

SPA	Population Size (Breeding Adults)	Defined Season	Collision Risk Impact	
			Breeding Adults Per Annum	Change in Average Survival Rate (% Point Change)
		Non-breeding	0.01	<0.001
		Annual	0.10	0.003
Calf of Eday SPA	Citation (3,434)	Breeding	0.01	<0.001
		Non-breeding	0.01	<0.001
		Annual	0.02	<0.001
	Latest count (290)	Breeding	0.01	0.003
		Non-breeding	0.01	0.003
		Annual	0.02	0.006
Rousay SPA	Citation (9,800)	Breeding	0.03	<0.001
		Non-breeding	0.02	<0.001
		Annual	0.05	<0.001
	Latest count (962)	Breeding	0.03	0.003
		Non-breeding	0.02	0.002
		Annual	0.05	0.005
West Westray SPA	Citation count (47,800)	Breeding	0.12	<0.001
		Non-breeding	0.13	<0.001
		Annual	0.25	0.001

SPA	Population Size (Breeding Adults)	Defined Season	Collision Risk Impact	
			Breeding Adults Per Annum	Change in Average Survival Rate (% Point Change)
	Latest count (4,838)	Breeding	0.12	0.002
		Non-breeding	0.13	0.003
		Annual	0.25	0.005
Cape Wrath SPA	Citation count (19,400)	Breeding	0.11	0.001
		Non-breeding	0.00	<0.001
		Annual	0.11	0.001
	Latest count (6,616)	Breeding	0.11	0.002
		Non-breeding	0.00	<0.001
		Annual	0.11	0.002
Fair Isle SPA	Citation count (36,320)	Breeding	0.01	<0.001
		Non-breeding	0.01	<0.001
		Annual	0.02	<0.001
	Latest count (896)	Breeding	0.01	0.002
		Non-breeding	0.01	0.001
		Annual	0.02	0.003
Sumburgh Head SPA	Citation count (2,732)	Breeding	0.01	<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	0.01	<0.001
	Latest count (636)	Breeding	0.01	0.001
		Non-breeding	<0.01	<0.001
		Annual	0.01	0.001
Handa SPA	Citation count (21,464)	Breeding	0.11	<0.001
		Non-breeding	<0.01	<0.001
		Annual	0.11	<0.001
	Latest count (9,178)	Breeding	0.11	0.001
		Non-breeding	<0.01	<0.001
		Annual	0.11	0.001
Foula SPA	Citation count (7,680)	Breeding	0.01	<0.001
		Non-breeding	<0.01	<0.001
		Annual	0.01	<0.001
	Latest count (1,021)	Breeding	0.01	0.001
		Non-breeding	<0.01	<0.001
		Annual	0.01	0.001
	Citation count (10,000)	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)
North Rona and Sula Sgeir SPA		Non-breeding	<0.01	<0.001
		Annual	0.01	<0.001
	Latest count (1,421)	Breeding	0.01	0.001
		Non-breeding	<0.01	<0.001
		Annual	0.01	0.001
Forth Islands SPA	Citation count (16,800)	Breeding	0.16	0.001
		Non-breeding	0.03	<0.001
		Annual	0.20	0.001
	Latest count (13,078)	Breeding	0.16	0.001
		Non-breeding	0.03	<0.001
		Annual	0.20	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	0.003
		Annual	0.01	0.004

SPA	Population Size (Breeding Adults)	Defined Season	Collision Risk Impact	
			Breeding Adults Per Annum	Change in Average Survival Rate (% Point Change)
St Abbs Head to Fast Castle SPA	Citation count (42,340)	Breeding	0.10	<0.001
		Non-breeding	0.04	<0.001
		Annual	0.14	<0.001
	Latest count (11,204)	Breeding	0.10	0.001
		Non-breeding	0.04	<0.001
		Annual	0.14	0.002
Shaint Isles SPA	Citation count (3,600)	Breeding	0.01	<0.001
		Non-breeding	<0.01	<0.001
		Annual	0.01	<0.001
	Latest count (1,718)	Breeding	0.01	0.001
		Non-breeding	<0.01	<0.001
		Annual	0.01	0.001
Farne Islands SPA	Citation count (8,241)	Breeding	-	-
		Non-breeding	0.04	<0.001
		Annual	0.04	<0.001
	Latest count (7,166)	Breeding	-	-
		Non-breeding	0.04	0.001

SPA	Population Size (Breeding Adults)	Defined Season	Collision Risk Impact	
			Breeding Adults Per Annum	Change in Average Survival Rate (% Point Change)
		Annual	0.04	0.001
Hermaness, 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	0.003
		Annual	<0.01	0.003

9.2.2.529 For all SPAs considered in Table 9-78, the level of predicted annual additional mortality due to Caledonia South alone collision risk impacts is less than one (0.25 at most) breeding adult per annum to any SPA. Additionally, for all assessments the survival rate percentage point changes due to the predicted Caledonia South 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 Caledonia South 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

9.2.2.530 For all SPAs considered the level of predicted annual additional mortality due to combined Caledonia South alone distributional responses and collision risk is at most one (0.36) breeding adult 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 South alone impacts. 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 Caledonia South 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

9.2.2.531 The razorbill feature of a number of UK SPAs for Caledonia South 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:

- 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).

9.2.2.532 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

9.2.2.533 Table 9-79 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 Caledonia South site and 2km buffer.

Table 9-79: 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	
			50% Disp; 1% Mort	Change in Average Survival Rate (% Point Change)	60% Disp; 1-3% Mort (Non-breeding); 3-5% Mort (Breeding)	Change in Average Survival Rate (% Point Change)
West Westray SPA	Citation (1,946)	Breeding	0.01	0.001	0.05 – 0.09	0.003 – 0.005
		Non-breeding	0.01	<0.001	0.01 – 0.03	<0.001 – 0.001
		Annual	0.02	0.001	0.06 – 0.11	0.003 – 0.006
	Latest count (2,857)	Breeding	0.01	0.001	0.05 – 0.09	0.002 – 0.003
		Non-breeding	0.01	<0.001	0.01 – 0.03	<0.001 – 0.001
		Annual	0.02	0.001	0.06 – 0.11	0.002 – 0.004
Fair Isle SPA	Citation (3,400)	Breeding	0.01	<0.001	0.03 – 0.05	0.001
		Non-breeding	0.01	<0.001	0.01 – 0.04	<0.001 – 0.001
		Annual	0.02	0.001	0.04 – 0.09	0.001 -0.003
	Latest count (2,580)	Breeding	0.01	<0.001	0.03 – 0.05	0.001 -0.002
		Non-breeding	0.01	<0.001	0.01 – 0.04	0.001 -0.002
		Annual	0.02	0.001	0.04 – 0.09	0.002 – 0.004
Fowlsheugh SPA	Citation (5,800)	Breeding	-	-	-	-
		Non-breeding	0.05	0.001	0.06 – 0.17	0.001 – 0.003

SPA	Population Size (Breeding adults)	Defined Season	Applicant Approach		Guidance Approach	
			50% Disp; 1% Mort	Change in Average Survival Rate (% Point Change)	60% Disp; 1-3% Mort (Non-breeding); 3-5% Mort (Breeding)	Change in Average Survival Rate (% Point Change)
		Annual	0.05	0.001	0.06 – 0.17	0.001 – 0.003
	Latest count (17,770)	Breeding	-	-	-	-
		Non-breeding	0.05	<0.001	0.06 – 0.17	<0.001 – 0.001
		Annual	0.05	<0.001	0.06 – 0.17	<0.001 – 0.001
Forth Islands SPA	Citation (1,400)	Breeding	-	-	-	-
		Non-breeding	0.04	0.001	0.04 – 0.13	0.002 – 0.005
		Annual	0.04	0.001	0.04 – 0.13	0.002 – 0.005
	Latest count (8,186)	Breeding	-	-	-	-
		Non-breeding	0.04	<0.001	0.04 – 0.13	0.001 – 0.002
		Annual	0.04	<0.001	0.04 – 0.13	0.001 – 0.002

9.2.2.534 For all SPAs considered in Table 9-79, the level of predicted annual additional mortality due to Caledonia South alone distributional responses effects is at less than one (0.05 at most) breeding adult per annum to any SPA. Additionally, the survival rate percentage point changes due to the predicted Caledonia South alone impact pathway do not exceed an increase of 0.02% annually when considering both 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 Caledonia South 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

9.2.2.535 The puffin feature of a number of UK SPAs from Caledonia South 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:

- North Caithness Cliffs SPA (breeding and non-breeding);
- Hoy SPA (breeding and non-breeding season);
- Cape Wrath SPA (breeding and non-breeding season);
- Fair Isle 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).

9.2.2.536 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

9.2.2.537 Table 9-80 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 Caledonia South site and 2km buffer.

Table 9-80: 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	
			50% Disp; 1% Mort	Change in Average Survival Rate (% Point Change)	60% Disp; 1-3% Mort (Non-breeding); 3-5% Mort (Breeding)	Change in Average Survival Rate (% Point Change)
North Caithness Cliffs SPA	Citation (4,160)	Breeding	0.07	0.002	0.57 - 0.95	0.014 – 0.023
		Non-breeding	0.01	<0.001	0.01 – 0.02	<0.001
		Annual	0.08	0.002	0.58 - 0.97	0.014 – 0.023
	Latest count (3,011)	Breeding	0.07	0.002	0.57 - 0.95	0.019 – 0.032
		Non-breeding	0.01	<0.001	0.01 – 0.02	<0.001 – 0.001
		Annual	0.08	0.003	0.58 - 0.97	0.019 – 0.032
Hoy SPA	Citation (7,000)	Breeding	0.01	<0.001	0.07 – 0.12	0.001 – 0.002
		Non-breeding	0.04	0.001	0.02 – 0.06	<0.001 – 0.001
		Annual	0.05	0.001	0.10 – 0.19	0.001 – 0.003
	Latest count (361)	Breeding	0.01	0.002	0.07 – 0.12	0.021 – 0.034
		Non-breeding	0.04	0.011	0.02 – 0.06	0.006 – 0.017
		Annual	0.05	0.013	0.10 – 0.19	0.026 – 0.052
Cape Wrath SPA	Citation (11,800)	Breeding	<0.01	<0.001	0.01 – 0.02	<0.001

SPA	Population Size (Breeding adults)	Defined Season	Applicant Approach		Guidance Approach	
			50% Disp; 1% Mort	Change in Average Survival Rate (% Point Change)	60% Disp; 1-3% Mort (Non-breeding); 3-5% Mort (Breeding)	Change in Average Survival Rate (% Point Change)
		Non-breeding	<0.01	<0.001	<0.01	<0.001
		Annual	<0.01	<0.001	0.01 – 0.02	<0.001
	Latest count (214)	Breeding	<0.01	0.001	0.01 – 0.02	0.006 – 0.009
		Non-breeding	<0.01	<0.001	<0.01	<0.001
		Annual	<0.01	0.001	0.01 – 0.02	0.006 – 0.010
Fair Isle SPA	Citation (23,000)	Breeding	0.04	<0.001	0.37 – 0.61	0.002 – 0.003
		Non-breeding	0.12	0.001	0.06 – 0.19	<0.001 – 0.001
		Annual	0.16	0.001	0.43 – 0.80	0.002 – 0.003
	Latest count (6,666)	Breeding	0.04	0.001	0.37 – 0.61	0.006 – 0.009
		Non-breeding	0.12	0.002	0.06 – 0.19	0.001 – 0.003
		Annual	0.16	0.002	0.43 – 0.80	0.006 – 0.012
Foula SPA	Citation (96,000)	Breeding	0.02	<0.001	0.18 – 0.29	<0.001
		Non-breeding	0.25	<0.001	0.13 – 0.40	<0.001
		Annual	0.27	<0.001	0.31 – 0.70	<0.001 – 0.001

SPA	Population Size (Breeding adults)	Defined Season	Applicant Approach		Guidance Approach	
			50% Disp; 1% Mort	Change in Average Survival Rate (% Point Change)	60% Disp; 1-3% Mort (Non-breeding); 3-5% Mort (Breeding)	Change in Average Survival Rate (% Point Change)
	Latest count (6,351)	Breeding	0.02	<0.001	0.18 – 0.29	0.003 – 0.005
		Non-breeding	0.25	0.004	0.13 – 0.40	0.002 – 0.006
		Annual	0.27	0.004	0.31 – 0.70	0.005 – 0.011
North Rona and Sula Sgeir SPA	Citation (10,600)	Breeding	0.01	<0.001	0.08 – 0.13	0.001
		Non-breeding	<0.01	<0.001	<0.01	<0.001
		Annual	0.01	<0.001	0.08 – 0.13	0.001
	Latest count (2,834)	Breeding	0.01	<0.001	0.08 – 0.13	0.003 – 0.005
		Non-breeding	<0.01	<0.001	<0.01	<0.001
		Annual	0.01	<0.001	0.08 – 0.13	0.003 – 0.005
Noss SPA	Citation (2,348)	Breeding	<0.01	<0.001	0.01 – 0.02	0.001
		Non-breeding	0.01	<0.001	<0.01 – 0.01	<0.001 - 0.001
		Annual	0.01	<0.001	0.02 – 0.04	0.001 – 0.002
	Latest count (545)	Breeding	<0.01	<0.001	0.01 – 0.02	0.002 – 0.004
		Non-breeding	0.01	0.002	<0.01 – 0.01	0.001 – 0.003
		Annual	0.01	0.002	0.02 – 0.04	0.003 – 0.007

9.2.2.538 For all SPAs considered in Table 9-80, the level of predicted annual additional mortality due to Caledonia South alone distributional responses effects is at most less than one (0.27) breeding adult per annum to any SPA. Additionally, for all assessments, with the exception of North Caithness Cliffs SPA and Hoy SPA (when considering the Guidance Approach), the survival rate percentage point changes due to the predicted Caledonia South 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 North Caithness Cliffs SPA and Hoy SPA and presented for further information within Application Document 14, Appendix 14-2: Caledonia South Habitats Regulations Appraisal Population Viability Assessment Technical Report. **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 Caledonia South 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

9.2.2.539 The great black-backed gull feature of a number of more distant UK SPAs from Caledonia South 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).

9.2.2.540 Connectivity between the above SPAs and Caledonia South 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

9.2.2.541 Table 9-81 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 14, Appendix 14-1: Caledonia South Apportioning Technical Note.

Table 9-81: 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)	0.03	0.002
	Latest Count (532)		0.006
Copinsay SPA	Citation (980)	0.04	0.004
	Latest Count (98)		0.038
Hoy SPA	Citation (1,140)	0.01	0.001
	Latest Count (10)		0.101

9.2.2.542 For all SPAs considered in Table 9-81, the level of predicted annual additional mortality due to Caledonia South alone collision risk is less than one (<0.1) 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 Caledonia South 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

9.2.2.543 The herring gull feature of a number of more distant UK SPAs from Caledonia South 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).

9.2.2.544 Connectivity between the above SPAs and Caledonia South 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

9.2.2.545 Table 9-82 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 14, Appendix 14-1: Caledonia South Apportioning Technical Note.

Table 9-82: 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 (6,569)		0.001
Troup, Pennan and Lion's Head SPA	Citation (8,400)	0.02	<0.001
	Latest Count (1,108)		0.002

9.2.2.546 For all SPAs considered in Table 9-82, the level of predicted annual additional mortality due to Caledonia South alone collision risk is less than one (<0.1) breeding adult. Additionally, for all assessments the survival rate percentage point changes due to the predicted Caledonia South 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 Caledonia South 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

9.2.2.547 The great skua feature of a number of more distant UK SPAs from Caledonia South 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 Tingon 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).

9.2.2.548 Connectivity between the above SPAs and Caledonia South 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

9.2.2.549 Table 9-83 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 14, Appendix 14-1: Caledonia South Apportioning Technical Note.

Table 9-83: 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)	0.01	<0.001
	Latest Count (994)		0.001
Fair Isle SPA	Citation (220)	<0.01	0.001
	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

SPA	Population Size (Breeding Adults)	Collision Risk Impact	
		Breeding Adults Per Annum	Change in Average Survival Rate (% Point Change)
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

9.2.2.550 For all SPAs considered in Table 9-83, the level of predicted annual additional mortality due to Caledonia South alone collision risk is less than one (<0.1) breeding adult. Additionally, for all assessments the survival rate percentage point changes due to the predicted Caledonia South 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 Caledonia South 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

9.2.2.551 The gannet feature of a number of more distant UK SPAs from Caledonia South 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).

9.2.2.552 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

9.2.2.553 Table 9-84 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 approaches. Distributional response is assessed based on the number of breeding adults within the Caledonia South site and 2km buffer.

Table 9-84: 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% Disp; 1% Mort	Change in Average Survival Rate (% Point Change)	70% Disp; 1-3% Mort	Change in Average Survival Rate (% Point Change)
Fair Isle SPA	Citation (2,332)	Breeding	0.09	0.004	0.09 - 0.27	0.004 – 0.012
		Non-breeding	0.02	0.01	0.02 - 0.05	0.001 – 0.002
		Annual	0.11	0.005	0.11 - 0.32	0.005 – 0.014
	Latest count (9,654)	Breeding	0.06	0.001	0.09 - 0.27	0.001 – 0.003
		Non-breeding	0.01	<0.001	0.02 - 0.05	<0.001 – 0.001
		Annual	0.06	0.001	0.11 - 0.32	0.001 – 0.003
Hermaness, Saxa Vord and Valla Field SPA	Citation (32,800)	Breeding	0.08	<0.001	0.08 - 0.24	<0.001 – 0.001
		Non-breeding	0.11	<0.001	0.11 - 0.33	<0.001 – 0.001
		Annual	0.19	0.001	0.19 - 0.57	0.001 – 0.002
	Latest count (37,478)	Breeding	0.08	<0.001	0.08 - 0.24	<0.001 – 0.001
		Non-breeding	0.11	<0.001	0.11 - 0.33	<0.001 – 0.001
		Annual	0.19	0.001	0.19 - 0.57	0.001 – 0.002
Noss SPA	Citation (13,720)	Breeding	0.10	0.001	0.10 - 0.31	0.001 – 0.002
		Non-breeding	0.04	<0.001	0.04 - 0.13	<0.001 - 0.001

SPA	Population Size (Breeding adults)	Defined Season	Applicant Approach		Guidance Approach	
			70% Disp; 1% Mort	Change in Average Survival Rate (% Point Change)	70% Disp; 1-3% Mort	Change in Average Survival Rate (% Point Change)
		Annual	0.15	0.001	0.15 - 0.44	0.001 – 0.003
	Latest count (24,670)	Breeding	0.10	<0.001	0.10 - 0.31	<0.001 - 0.001
		Non-breeding	0.04	<0.001	0.04 - 0.13	<0.001 - 0.001
		Annual	0.15	0.001	0.15 - 0.44	0.001 – 0.002
North Rona and Sula Sgeir SPA	Citation (20,800)	Breeding	0.11	0.001	0.11 - 0.33	0.001 – 0.002
		Non-breeding	0.01	<0.001	0.01 - 0.02	<0.001
		Annual	0.12	0.001	0.12 - 0.35	0.001 – 0.002
	Latest count (28,495)	Breeding	0.11	<0.001	0.11 - 0.33	<0.001 - 0.001
		Non-breeding	0.01	<0.001	0.01 - 0.02	<0.001
		Annual	0.12	<0.001	0.12 - 0.35	<0.001 - 0.001
Sule Skerry and Sule Stack SPA	Citation (11,800)	Breeding	0.19	0.002	0.19 - 0.56	0.002 – 0.005
		Non-breeding	<0.01	<0.001	<0.01 - 0.01	<0.001
		Annual	0.19	0.002	0.19 - 0.57	0.002 – 0.005
	Latest count (18,130)	Breeding	0.19	0.001	0.19 - 0.56	0.001 – 0.003
		Non-breeding	<0.01	<0.001	<0.01 - 0.01	<0.001

SPA	Population Size (Breeding adults)	Defined Season	Applicant Approach		Guidance Approach	
			70% Disp; 1% Mort	Change in Average Survival Rate (% Point Change)	70% Disp; 1-3% Mort	Change in Average Survival Rate (% Point Change)
		Annual	0.19	0.001	0.19 - 0.57	0.001 – 0.003
Flamborough and Filey Coast SPA	Citation count (16,938)	Breeding	-	-	-	-
		Non-breeding	0.06	<0.001	0.06 - 0.19	<0.001 - 0.001
		Annual	0.06	<0.001	0.06 - 0.19	<0.001 - 0.001
	Latest count (30,466)	Breeding	-	-	-	-
		Non-breeding	0.06	<0.001	0.06 - 0.19	<0.001 - 0.001
		Annual	0.06	<0.001	0.06 - 0.19	<0.001 - 0.001

9.2.2.554 For all SPAs considered in Table 9-84, the level of predicted annual additional mortality due to Caledonia South alone distributional responses effects is less than one (0.19 at most) breeding adult per annum to any SPA. Additionally, for all assessments the survival rate percentage point changes due to the predicted Caledonia South alone impacts for this impact pathway do not exceed an increase of 0.02% annually when considering both 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 Caledonia South 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

9.2.2.555 Table 9-85 below presents predicted collision risk impacts during the O&M phase attributed to each SPA seasonally and subsequent survival rate percentage point change.

Table 9-85: 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	0.06	0.002	0.19	0.008
		Non-breeding	0.01	<0.001	0.01	<0.001
		Annual	0.06	0.003	0.20	0.008
	Latest count (9,654)	Breeding	0.06	0.001	0.19	0.002
		Non-breeding	0.01	<0.001	0.01	<0.001
		Annual	0.06	0.001	0.20	0.002
Hermaness, Saxa Vord and Valla Field SPA	Citation (32,800)	Breeding	0.05	<0.001	0.17	0.001
		Non-breeding	0.03	<0.001	0.03	<0.001
		Annual	0.09	<0.001	0.21	0.001
	Latest count (37,478)	Breeding	0.05	<0.001	0.17	<0.001
		Non-breeding	0.03	<0.001	0.03	<0.001
		Annual	0.09	<0.001	0.21	0.001
Noss SPA	Citation (13,720)	Breeding	0.06	<0.001	0.22	0.002
		Non-breeding	0.01	<0.001	0.01	<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	0.08	0.001	0.23	0.002
	Latest count (24,670)	Breeding	0.06	<0.001	0.22	0.001
		Non-breeding	0.01	<0.001	0.01	<0.001
		Annual	0.08	<0.001	0.23	0.001
North Rona and Sula Sgeir SPA	Citation (20,800)	Breeding	0.07	<0.001	0.23	0.001
		Non-breeding	<0.01	<0.001	<0.01	<0.001
		Annual	0.07	<0.001	0.24	0.001
	Latest count (28,495)	Breeding	0.07	<0.001	0.23	0.001
		Non-breeding	<0.01	<0.001	<0.01	<0.001
		Annual	0.07	<0.001	0.24	0.001
Sule Skerry and Sule Stack SPA	Citation (11,800)	Breeding	0.12	0.001	0.40	0.003
		Non-breeding	<0.01	<0.001	<0.01	<0.001
		Annual	0.12	0.001	0.40	0.003
	Latest count (18,130)	Breeding	0.12	0.001	0.40	0.002
		Non-breeding	<0.01	<0.001	<0.01	<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	0.12	0.001	0.40	0.002
Flamborough and Filey Coast SPA	Citation count (16,938)	Breeding	-	-		-
		Non-breeding	0.02	<0.001	0.02	<0.001
		Annual	0.02	<0.001	0.02	<0.001
	Latest count (30,466)	Breeding	-	-	-	-
		Non-breeding	0.02	<0.001	0.02	<0.001
		Annual	0.02	<0.001	0.02	<0.001

9.2.2.556 For all SPAs considered in Table 9-85, the level of predicted annual additional mortality due to Caledonia South alone collision risk impacts is less than a single (0.12 at most) breeding adult per annum to any SPA. Additionally, for all assessments the survival rate percentage point changes due to the predicted Caledonia South alone impacts for this impact pathway do not exceed an increase of 0.02% annually when considering both 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 Caledonia South 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

9.2.2.557 For all SPAs considered the level of predicted annual additional mortality due to Caledonia South alone combined distributional responses and collision risk is at most one (0.69) breeding adult per annum to any SPA when considering the Applicant Approach and one (0.97) breeding adult per annum when considering the Guidance Approach. Additionally, for all assessments 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 South alone impacts. **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 Caledonia South 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 Caledonia South Alone

9.2.2.558 40 designated sites were identified to have a potential for LSE from Caledonia South, covering 36 species, Section 9.1.1. Assessments were undertaken for several effects including collision risk, distributional responses and migratory collision risk.

9.2.2.559 For all identified sites, a conclusion of no AEoSI was drawn for all designated features from Caledonia South 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 (Section 10.3.2).

9.2.3 Migratory Fish

Assessment Criteria

9.2.3.1 The approach taken to the assessment of migratory fish is based upon the following:

- The distance between the Caledonia South Site/Caledonia South OECC and the relevant designated 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.

9.2.3.2 For the RIAA, the assessment of potential for adverse effect draws on the conclusions of Volume 4, 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

9.2.3.3 Table 9-86 below provides the WCS(s) considered for migratory fish, as described in Table 4-12 within Volume 4, 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 presented is tailored as such for the underwater noise impact.

Table 9-86: Worst Case Scenario for Migratory Fish for Caledonia South.

Potential Impact	Assessment Parameter	Explanation
Construction		
Mortality, injury and behavioural changes resulting from UWN	**Spatial worst-case scenario:** *Cumulative Sound Exposure Level* Concurrent piling 8 pin pile foundations at two locations within a 24-hour period represents the WCS 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) for each receptor group) (both stationary and fleeing). This is comprised of: o 78 WTGs on pin pile foundations (4m diameter pin piles per jacket) = 312 pin piles; o 2 OSPs on pin pile foundations (4m diameter pin piles) = 8 pin piles; and o Maximum hammer energy 4,400 kJ (186 dB SEL_{cum} produces a maximum impact range of 13,000km^2). *Peak Sound Pressure Level* Additionally, the concurrent sequential installation of two monopile foundations within a 24 hour 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}) as well as the cumulative sound exposure level (SEL_{cum}) for recoverable injury for fleeing receptors (203 dB SEL_{cum}). This is comprised of: ▪ 78 WTGs on monopile foundations (5m diameter monopiles) = 78 monopiles;	In a 24-hour period, it is expected that two monopile foundations, two anchor pile foundations 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 simultaneously across the Caledonia South Site. 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 the piling and any associated effects on TTS and TTS-induced changes in fitness. The spatial worst-case scenario is represented by the sequential piling 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 CAL04 concurrently with four pin piles at UWN modelling location CAL08. Full details are presented in Volume 7, Appendix 6: Underwater Noise Assessment. The temporal worst-case scenario represents the longest duration of effects from subsea noise and is from the piling of a up to four pin piles or two anchor piles in a 24-hour period.

Potential Impact	Assessment Parameter	Explanation
	▪ Two OSPs on monopile foundations (5m diameter monopiles) = two monopiles; and ▪ 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: ▪ 39 WTGs and two OSPs on jacket with pin pile foundations (4m diameter pin piles per jacket) = 164 pin piles (four pin piles per jacket); o Maximum hammer energy 4,400 kJ (186 dB SEL_{cum} (St) 14,000km2); o Four pin piles per day; o 41 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) ▪ 451 piling days (over an approximate 15 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.	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 clearances (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.

Potential Impact	Assessment Parameter	Explanation
	UXO clearance: ▪ Two clearance events within 24 hours. ▪ Undertaken over a 12-month period.	
O&M		
EMF	▪ 78 inter-array cables: o 365km combined length, operating at up to 132kV; o Minimum cable burial depth: 1m; ▪ One interconnector cable: o 30km in length, operating at up to 275kV; o Minimum cable burial depth: 1m; ▪ Two offshore export cables: o 150km combined length, operating at up to 275kV; o Minimum cable burial depth: 1m; and ▪ Operational lifetime of Caledonia South: 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. Refer to construction impact.	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.

9.2.3.4 Each WCS is assessed against the conservation objectives for each site, which are considered in turn below.

River Spey SAC

9.2.3.5 The River Spey SAC is screened into the assessment for Atlantic salmon, FWPM, and sea lamprey. This site is 54.6km away from the Caledonia South Site and 27.0km away from the Caledonia South OECC.

Conservation Objectives

9.2.3.6 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 makes an appropriate contribution to achieving favourable conservation status;
- To ensure that the integrity of the River Spey SAC is restored by:
  - Restore the population of the features, including range of genetic types, as a viable component of the site;
  - Restore the distribution of the features throughout the site;
  - Restore the habitats supporting the features within the site and availability of food; and
  - Restoring the distribution and viability of freshwater pearl mussel host species and their supporting habitats (Freshwater pearl mussel only).

Site Status

9.2.3.7 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

9.2.3.8 Atlantic salmon are a priority fish species in the UK Biodiversity Action Plan (BAP), are classified by the International Union for Conservation of Nature (IUCN) as "endangered" within the UK, and "near threatened" internationally (IUCN, 2023), and are an Annex II species under the Habitats Directive and Habitats Regulations 2017. They are anadromous fish, spawning in rivers 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[90]). Many salmon die after spawning, though some return to sea and regain condition to be able to spawn again (Mills, 1989). 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).

9.2.3.9 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[91]).

Sea lamprey

9.2.3.10 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[92]). Sea lamprey are 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 Caledonia South is low, with no records in site specific eDNA data.

9.2.3.11 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[91]).

9.2.3.12 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, 2024[69]).

Freshwater Pearl Mussel (FWPM)

9.2.3.13 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.

9.2.3.14 FWPM mussel populations are vulnerable to changes to water quality, habitat degradation of the riverbanks 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[91]).

9.2.3.15 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[69]).

Assessment of AEoSI

Construction and Decommissioning

Atlantic salmon

Underwater noise

9.2.3.16 This section addresses the potential for AEoSI from effects associated with underwater noise impacts arising during the construction and decommissioning phases of Caledonia South on the Atlantic salmon feature of the River Spey SAC.

9.2.3.17 The Screening Report (Application Report 12) determined that the potential for LSE in relation to underwater noise during decommissioning would be similar to, and potentially 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 Caledonia South only.

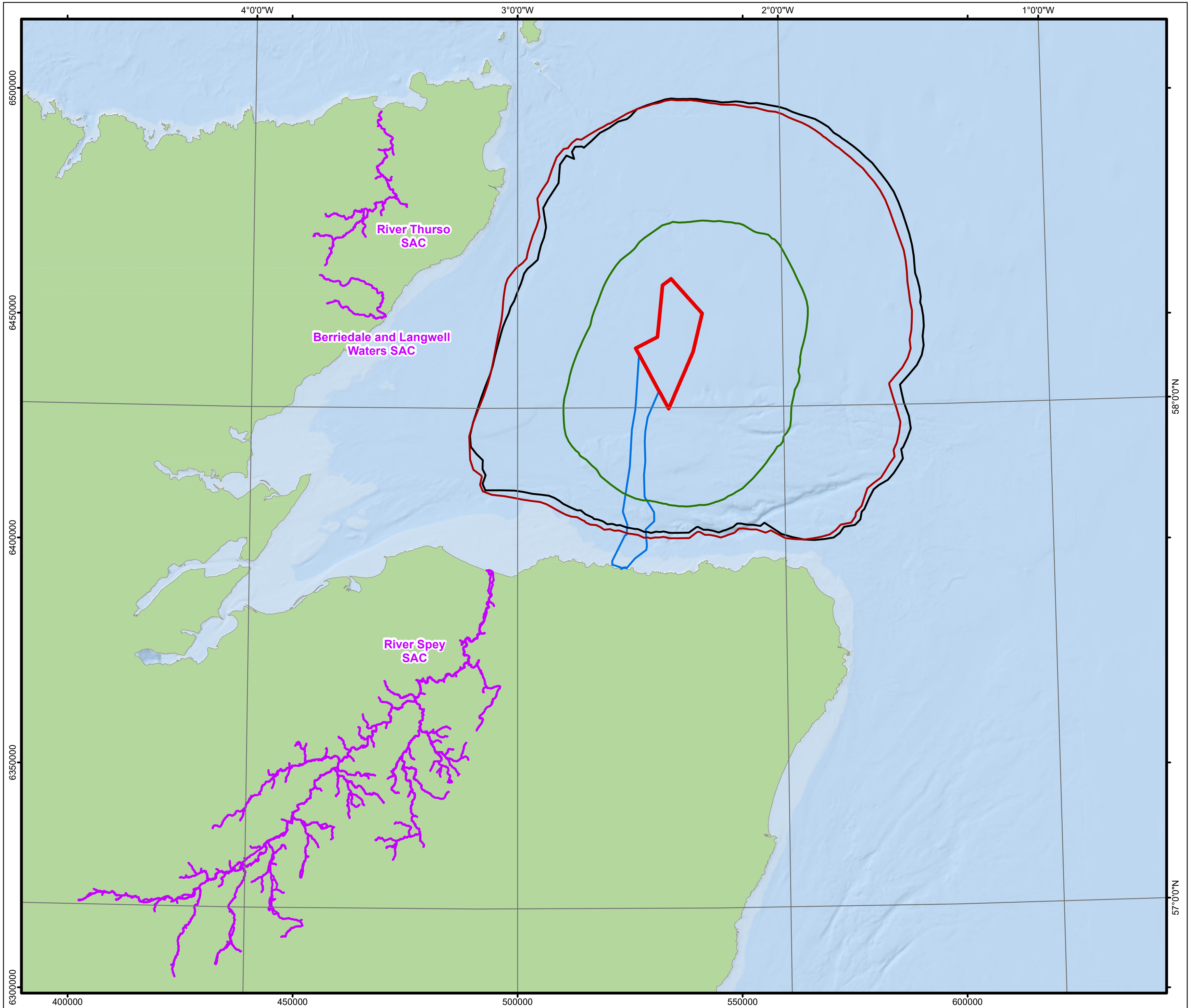
9.2.3.18 Atlantic salmon are a group 2 species (as defined in Section 6.4), as their hearing does not involve the swim bladder or other gas volume and are more sensitive to particle motion than sound pressure (Popper *et al*., 2014[93]).

Underwater Noise from Piling within the Caledonia South Site

9.2.3.19 Being a Group 2 species, Atlantic salmon are considered to be moderately sensitive to underwater noise effects, but particularly particle motion effects. 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 Caledonia South 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.

9.2.3.20 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.

9.2.3.21 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 1.5 ms-1 (Lepper *et al*., 2019[94]).Based on the worst-case scenarios for underwater noise from piling of foundations within the Caledonia South Site, 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 SEL_{cum}) from the sequential piling of pin-pile foundations and up to 380m (>207dB SPL_{peak}) from the sequential piling of monopiles). The worst-case recoverable injury impact ranges (203dB SEL_{cum}), will occur from the simultaneous sequential pilling of 4 pin piles in a 24-hour period at both the NW (CAL03) and SE locations (CAL08) of the Caledonia South Site, resulting in an in-combination area of effect of 190km^2 for fleeing receptors. The worst case TTS (>186 SEL_{cum}) impact ranges result from will occur from the simultaneous sequential pilling of pin pile foundations, at both the NW (CAL03) and SE locations (CAL08) of the Caledonia South Site, resulting in an in-combination area of effect of 7,700km^2 for fleeing receptors (Figure 9-4). Taking into consideration the distance of the Caledonia South Site from the River Spey SAC (54.6km), 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.



Caledonia South Site
Caledonia South 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

REV	DATE	DOC STATUS	ORIGIN	REVIEW	APP
01	05/11/2024	Approved	EV	BB	DH

CONTRACTOR DRAWING NO: UKCAL1_GO_WNF_HRA_MAP_00175
CONTRACTOR REV: 01

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

DRAWING TITLE: Figure 9-4: 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 South Site

STATUS: Approved
SCALE: 1:1,150,000

DRAWING NUMBER: N/A
SHEET NO: 01 of 01
REV: N/A

9.2.3.22 As defined above, there are no quantitative thresholds advised to be used to assess behavioural impacts, however, Popper *et al*. (2014[93]) 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.

9.2.3.23 Considering the ZoI for piling within the Caledonia South Site, 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 Caledonia South that may be attributed as features of the designated site will be of localised nature, with no population level effects anticipated.

9.2.3.24 **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 Caledonia South**.

Underwater Noise from UXO Clearance

9.2.3.25 Consideration of impacts from UXO is made on a risk of injury basis and a disturbance element. Volume 4, 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[95]), 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 10’s of kilometres from the UXO location.

9.2.3.26 For the purpose of UXO clearance, low order deflagration is considered as the primary clearance method to be used. Volume 4, 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.

9.2.3.27 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.

9.2.3.28 **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 Caledonia South 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**.

Conclusion on AEoSI from Underwater Noise

9.2.3.29 **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 Caledonia South 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 Caledonia South**.

O&M

EMF

9.2.3.30 Atlantic salmon are known to have magneto-receptors, with this thought to primarily be for the purposes of navigation (Walker *et al*., 2007[96]). There have been suggestions (Gill and Kimber, 2005[97]) that the presence of magnetic fields generated by cables may interrupt navigation and consequently migration.

9.2.3.31 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[98]). 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.

9.2.3.32 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 Caledonia South 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 Caledonia South.

Conclusion on AEoSI from EMF

9.2.3.33 **Therefore, due to the highly mobile and transient nature of Atlantic salmon, the comparatively localised impact ranges from EMF effects (<10 m) compared to the available habitat and the distance to the site (27.0km from the Caledonia South OECC), it is considered that there is no AEoSI to the Atlantic salmon feature of the River Spey SAC from Caledonia South 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 Caledonia South**.

FWPM

All Phases and Effects

9.2.3.34 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[99], 1984b[100]; Bauer and Vogel, 1987[101]; Ziuganov *et al*., 1994[102]; Hastie and Young, 2000[103]; Denic *et al*., 2015[104]). 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[99]; Bauer, 1987[105]; Ziuganov *et al*., 1994[102]; Rogers-Lowery and Dimock, 2006[106]). There they stay for approximately 11 months while they metamorphose into juvenile mussels (Bauer and Vogel, 1987[101]; Denic *et al*., 2015[104]) 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[100]; Bauer, 1991[107], 1997[108]; Ziuganov *et al*., 1994[102]; Hastie and Young, 2000[103]).

9.2.3.35 Given this life history, the only potential time where Caledonia South 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

9.2.3.36 **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 Caledonia South 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 Caledonia South.**

Sea Lamprey

Construction and Decommissioning

Underwater Noise

9.2.3.37 This section addresses the potential for AEoSI from effects associated with underwater noise impacts arising during the construction and decommissioning phases of Caledonia South on the sea lamprey feature of the River Spey SAC.

9.2.3.38 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 Caledonia South.

9.2.3.39 Sea lamprey are 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[93]).

Underwater Noise from Piling within the Caledonia South Site

9.2.3.40 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 Caledonia South 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[92]). Sea lamprey are not thought to specifically migrate back to their natal rivers (Bergstedt and Seelye, 1995[109]; Waldman *et al*., 2008[110]); 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[111]). 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.

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 repopulate areas shortly after disturbance.

9.2.3.41 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 1.5 ms-1 (Lepper *et al*., 2019[94]).

9.2.3.42 Based on the WCS for underwater noise from piling of foundations within the Caledonia South Site, mortal injury effects on fleeing fish receptors will only occur in the immediate vicinity (<100 m) of the piling activity from the sequential piling of pin pile or monopile foundations, <100m (219dB SEL_{cum}) from the sequential piling of pin-pile foundations and up to 140m (>213dB SPL_{peak}) from the sequential piling of monopiles). The worst-case recoverable injury impact ranges will occur from the sequential pilling of pin pile or monopile foundations, <100m (>216dB SEL_{cum}) for the sequential piling of pin-pile foundations and up to 140m for (>213dB $SPL_{peak)}$ from the sequential piling of monopiles foundations. The worst case TTS (> 186 SEL_{cum}) impact ranges result from will occur from the simultaneous sequential pilling of pin pile foundations, at both the NW (CAL03) and SE locations (CAL08) of the Caledonia South Site, resulting in an in-combination area of effect of 7,7000km^2 for fleeing receptors.

9.2.3.43 Taking into consideration the distance of the Caledonia South Site from the River Spey SAC (54.6km), there are no anticipated effects from underwater noise on the sea lamprey feature 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.

9.2.3.44 As defined above, there are no quantitative thresholds advised to be used to assess behavioural impacts, however, Popper *et al*. (2014[93]) 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.

9.2.3.45 **Considering the localised nature of underwater noise from piling within the Caledonia South 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 Caledonia South that may be attributed as features of the designated site will be of localised nature, with no population level effects anticipated.

9.2.3.46 **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 sea lamprey feature of the River Spey SAC anticipated to occur during the decommissioning phase of Caledonia South**.

Underwater Noise from UXO Clearance

9.2.3.47 Consideration of impacts from UXO is made on a risk of injury basis and a disturbance element. Volume 4, 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[95]), 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 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).

9.2.3.48 For the purpose of UXO clearance, low order is considered as the primary clearance method to be used. Volume 4, 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 (54.6km), there are no anticipated effects from underwater noise from UXO clearance on the sea lamprey features within the designated site.

9.2.3.49 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.

9.2.3.50 **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 Caledonia South 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

9.2.3.51 **Due to the transient nature and low sensitivity of sea lamprey, and the potential 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 Caledonia South 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 Caledonia South**.

O&M

EMF

9.2.3.52 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[96]). 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[98]).There have been suggestions (Gill and Kimber, 2005[97]) that the presence of magnetic fields generated by cables may interrupt navigation and consequently migration.

9.2.3.53 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[98]). 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.

9.2.3.54 Sea lampreys have ampullary organs located on their heads and bodies, which, as shown by Bodznick and Preston (1983[112]), are sensitive to weak, low-frequency electric fields. However, there is no evidence that sea lampreys can detect magnetic (B) fields (Gill and Bartlett, 2010[113]). 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[114]) and no direct tests have been conducted on lamprey behavioural responses to EMFs from cables or simulations of such fields.

9.2.3.55 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[115]). Sea lamprey are highly mobile and are therefore considered to be fleeing receptors. They are considered to be transient across Caledonia South 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 Caledonia South.

Conclusion on AEoSI from EMF

9.2.3.56 **Therefore, due to the highly mobile and transient nature of sea lamprey, the comparatively localised impact ranges from EMF effects (<10 m) compared to the available habitat and the distance to the site (27.0km from the Caledonia South OECC), it is considered that there is no AEoSI to the sea lamprey feature of the River Spey SAC from Caledonia South 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 Caledonia South**.

Berriedale and Langwell Waters SAC

9.2.3.57 The Berriedale and Langwell Waters SAC is screened into the assessment for Atlantic salmon. No other qualifying interest features have been screened in for this site for assessment. This site is 55.6km away from Caledonia South Site and 56.9km from the Caledonia South OECC.

Conservation Objectives

9.2.3.58 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:
  - Maintain the population of Atlantic salmon, including range of genetic types, as a viable component of the site;
  - Maintain the distribution of Atlantic salmon throughout the site; and
  - Maintain the habitats supporting Atlantic salmon within the site and availability of food.

Site Status

9.2.3.59 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

9.2.3.60 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 Caledonia South during their migratory phases, which within the Moray Firth is recorded to occur principally between April and June (Malcolm *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[116]).

9.2.3.61 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 Caledonia South with site specific eDNA surveys recording the presence of two Operational Taxonomic Units of salmonids within the Study area, (a 70km radius from the Caledonia South Site and OECC) as defined in the Volume 4, Chapter 5: Fish and Shellfish Ecology. 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[69]).

9.2.3.62 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[117]).

Assessment of AEoSI

Atlantic Salmon

All Phases and Effects

9.2.3.63 As the only feature being considered for the Berriedale and Langwell Waters SAC is the same as for the River Thurso (Atlantic salmon) and the high level of similarity in conservation objectives, it is considered that the assessment presented above for the River Thurso 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 Thurso as the features are in a better condition at this site.

9.2.3.64 Given that the distance between the Berriedale and Langwell Waters SAC and Caledonia South is greater than that of the River Thurso SAC which concluded no AEoSI on Atlantic salmon from any effect from Caledonia South, it is also considered that there is no AEoSI on the Berriedale and Langwell Waters SAC.

Conclusion on AEoSI from All Phases and Effects

9.2.3.65 **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 Caledonia South 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 Caledonia South**.

River Thurso SAC

9.2.3.66 The River Thurso SAC is screened into the assessment for Atlantic salmon. No other qualifying interest features have been screened in for this site for assessment. This site is 88.2km from the Caledonia South Site and 98.7km from the Caledonia South OECC.

Conservation Objectives

9.2.3.67 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:
  - Restore 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

9.2.3.68 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

9.2.3.69 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[69]).

9.2.3.70 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[118]).

Assessment of AEoSI

Atlantic Salmon

All Phases and Effects

9.2.3.71 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.

9.2.3.72 Given that the distance between the River Thurso SAC and Caledonia South is greater than that of the River Spey SAC which concluded no AEoSI on Atlantic salmon from any effect from Caledonia South, it is also considered that there is no AEoSI on the River Thurso SAC.

Conclusion on AEoSI from All Phases and Effects

9.2.3.73 **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 Caledonia South 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 Caledonia South**.

Conclusion of Assessment of Migratory Fish from Caledonia South Alone

9.2.3.74 Three designated sites were identified to have a potential for AEoSI from Caledonia South, covering three Annex II migratory fish species, Atlantic salmon, sea lamprey and FWPM. Assessments were undertaken for several effects including underwater noise and EMF.

9.2.3.75 **For all identified sites, a conclusion of no AEoSI was drawn for all designated features from Caledonia South alone**.

9.2.3.76 In-combination effects for migratory fish are presented in Section 10.3.3.

9.3 Conclusion for Caledonia South

9.3.1.1 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 Caledonia South alone.

9.3.1.2 This RIAA has been prepared to inform and to enable the competent authority to determine if Caledonia South will have AEoSI on any European site when they are undertaking an AA.

9.3.1.3 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 Caledonia South which may affect European Sites have been considered.

9.3.1.4 This RIAA contains information which the relevant competent authority must consider in making its own complete, precise and definitive findings and conclusions in relation to the effects from Caledonia South on the integrity of the relevant European sites.

9.3.1.5 **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 Caledonia South will result in no AEoSI alone. The assessment for the Proposed Development (Offshore) in-combination with other plans and projects can be seen in Part 4 of the RIAA, Section 10.3**.

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