Code: UKCAL-CWF-CON-EIA-RPT-00008-1020

Volume 8 Additional Information

Appendix 20: Moray Firth SPA Assessment (Disturbance/Displacement) for Vessel Traffic (Construction)

Caledonia Offshore Wind Farm Ltd

5th Floor Atria One, 144 Morrison Street, Edinburgh, EH3 8EX

OCEAN WINDS

Volume 8 Appendix 20: Moray Firth SPA Assessment (Disturbance/Displacement) for Vessel Traffic (Construction)

Code	UKCAL-CWF-CON-EIA-RPT-00008-1020
Revision	Issued
Date	30 September 2025

Table of Contents

List of Figures

List of Tables

Acronyms and Abbreviations

AEoSI	Adverse Effect on Site Integrity
AIS	Automatic Identification System
DAS	Digital Aerial Survey
EIA	Environmental Impact Assessment
OWF	Offshore Wind Farm
SPA	Special Protection Area

1 Introduction

1.1.1.1 This appendix considers the potential for an Adverse Effect on Site Integrity (AEoSI) of the following non-breeding qualifying features of the Moray Firth Special Protection Area (SPA) due to disturbance and displacement by vessel traffic during the construction phase of the Proposed Development (Offshore):

- Common scoter;
- Eider;
- Goldeneye;
- Great northern diver;
- Long-tailed duck;
- Red-breasted merganser;
- Red-throated diver;
- Scaup;
- Slavonian grebe;
- Velvet scoter; and
- Shag.

1.1.1.2 During the construction phase of the Proposed Development (Offshore), there will be vessel traffic between the construction port(s) and the Proposed Development (Offshore) which could lead to the disturbance, and possibly displacement, of Moray Firth SPA qualifying features during the non-breeding season (defined as September to March inclusive).

1.1.1.3 The effect of distributional responses from the presence of vessels will be limited spatially to the areas that construction vessels operate within which overlap the Moray Firth SPA. Effects will also be temporally limited, with impacts occurring when vessels approach an area and pass through it, and for a period following the passage of vessels, after which it is expected that birds would move back into disturbed areas. The construction vessels associated with the Proposed Development (Offshore) will be active in an area of sea which is already in use by a range of other vessels not associated with the Proposed Development (Offshore). This is an important consideration when attempting to predict potential impacts of this nature and has been incorporated into the assessment through consideration of Automatic Identification System (AIS) data.

1.1.1.4 Volume 2, Chapter 6: Offshore Ornithology states that a maximum of 3,992 trips of construction vessels through the Moray Firth are anticipated between the construction port(s) and the Proposed Development (Offshore), which may last for up to eight years (assuming sequential construction of Caledonia North and Caledonia South, in either order). This maximum scenario is the focus of this assessment.

2 Methodology

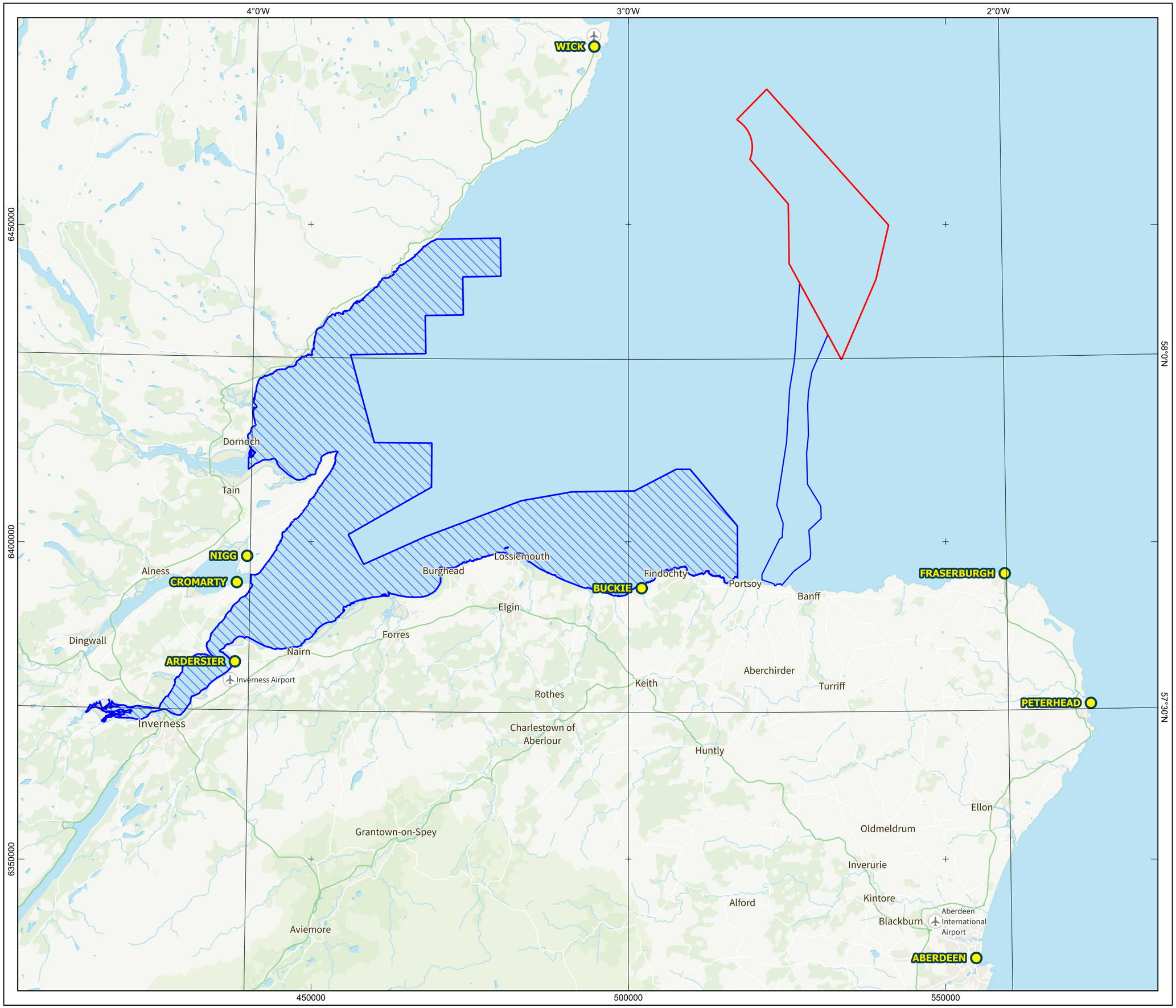
2.1 Definition of Area of Interest

2.1.1.1 The location of the construction base(s), and therefore the specific vessel transit routes that construction vessels may use, are yet to be determined. The locations under consideration for construction ports are Aberdeen city, Aberdeenshire (Peterhead, Fraserburgh), Moray (Buckie) and Highland (Cromarty, Nigg, Wick, Ardersier). These are shown on Figure 2–1, along with the location of the Proposed Development (Offshore) and the Moray Firth SPA.

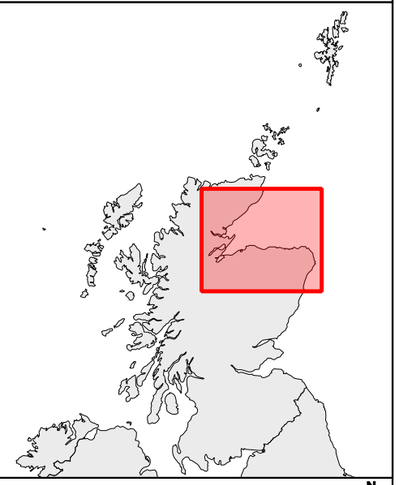
2.1.1.2 Ports relevant to this potential impact pathway were identified by assessing which potential construction base locations would require vessels to cross the Moray Firth SPA to reach the Proposed Development (Offshore) (Figure 2–1). The ports of Aberdeen City, Fraserburgh, and Peterhead are situated to the east of the Moray Firth SPA, and Wick to the north of it. The Moray Firth SPA is not situated between these ports and the Proposed Development (Offshore), and therefore no construction vessel traffic, or AEoSI due to this impact, would occur within the Moray Firth SPA if any of these locations were selected as a construction port for the Proposed Development (Offshore).

2.1.1.3 The Offshore Export Cable Corridor (OECC) is located approximately 3.5km from the boundary of the Moray Firth SPA at its nearest point. All construction activities within the OECC will therefore occur outside the boundary of Moray Firth SPA (Figure 2–1). It is considered that due to the lack of spatial overlap between the OECC and the Moray Firth SPA, plus an adequate distance between the two, no construction activities scheduled to occur within the OECC could result in AEoSI on any qualifying feature of the Moray Firth SPA. The potential effects of disturbance and displacement on qualifying features of the Moray Firth SPA due to OECC construction vessels crossing the Moray Firth SPA whilst in transit are captured in the wider assessment of this impact pathway.

2.1.1.4 The primary focus of the remainder of this assessment is therefore the areas overlapping the Moray Firth SPA between the ports of Buckie, Cromarty, Nigg and Ardersier and the Proposed Development (Offshore), which is where the majority of construction vessel traffic associated with the Proposed Development (Offshore) is expected to occur.



Caledonia Array Area
Caledonia Offshore Export Cable Corridor
Port Location
Moray Firth Special Protection Area (SPA)



0 5 10 15 20 25 km

N

REV	DATE	DOC STATUS	ORIGIN	REVIEW	APP
01	02/10/2025	Information	TG	RI	AS

CALEDONIA Offshore Wind Farm

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

DRAWING TITLE
Figure 2-1: Location of potential construction ports relative to the Proposed Development (Offshore) and the Moray Firth SPA

STATUS	SCALE	
Information	1:550,000 @ A3	
DRAWING NUMBER	SHEET NO	REV
UKCAL-CWF-CON-ENV-MAP-00033	01 of 01	01

2.2 Establishing Ornithological Baseline

2.2.1.1 The ornithological baseline for this assessment was principally informed by Scott *et al*. (2023[1]), which reports the outputs of two Digital Aerial Surveys (DAS) carried out in January 2020 and March 2020. This is the most recently collected ornithological data at the Moray Firth SPA level and therefore represents the best available evidence to inform this assessment.

2.2.1.2 The outputs of the 2020 DAS were used to provide modelled density and abundance estimates for the Moray Firth SPA for all qualifying features, and insight into population distributions throughout the Moray Firth SPA. This enabled comment to be made on the relative importance of particular areas to each qualifying feature, including areas between the potential construction ports and the Proposed Development (Offshore) where construction vessel traffic may be likely to occur.

2.2.1.3 To supplement the findings of the 2020 DAS, Conservation Advice for the Moray Firth SPA was used (NatureScot, 2022[2]), along with the findings of previous surveys of the Moray Firth SPA (Lawson *et al*., 2015[3]). Figures showing modelled distributions predicted by other surveys which were presented by MacArthur Green (2024[4]) were also referred to.

2.3 Potential Disturbance and Displacement Sensitivity

2.3.1.1 To estimate the extent to which each qualifying feature of the Moray Firth SPA could be sensitive to disturbance and displacement due to construction vessel traffic associated with the Proposed Development (Offshore), a summary of published information is provided in the species accounts.

2.4 Establishing Vessel Activity Baseline

2.4.1.1 The Moray Firth is an area within which relatively high shipping activity occurs, with a broad mixture of commercial and recreational vessels utilising the multiple ports located across its coastline and the waters across the wider area. To ensure that the potential impacts occurring as a result of construction vessel activity due to the Proposed Development (Offshore) are appropriately placed in the context of existing shipping activities, an assessment of existing shipping activity across the Moray Firth has been carried out.

2.4.1.2 AIS data within the Moray Firth Special Protected Area (SPA) was collated (Volume 8, Appendix 31: Moray Firth Special Protected Area Long-Term Vessel Traffic Assessment). The sections of this assessment discussing vessel activity should be read in conjunction with this report. In particular, it should be noted that that AIS data is not comprehensive, with fishing vessels less than 15m in length, and recreational vessels, are not required to use it. It is therefore considered that the vessel activity estimates presented in this report are an underestimate of true vessel activity in the Moray Firth SPA.

2.4.1.3 Two AIS datasets comprising of different date ranges were evaluated to provide context to the impact assessment.

2.4.1.4 The first dataset comprised all AIS data collected within the Moray Firth SPA plus a 2km buffer for a 12-month period, collected between 1st October 2023 and 30th September 2024. This dataset was used to define the recent baseline levels of shipping activity present in the Moray Firth SPA during the non-breeding season (September to March inclusive), which is when the qualifying features of the Moray Firth SPA are expected to be present in their highest numbers, and the time that effects at the site level are the most likely to occur. It is to be noted that the Moray West OWF was in construction phase at this time, and the piling campaign had begun. Vessel traffic associated with these activities will have been captured by this AIS dataset.

2.4.1.5 The second AIS dataset comprised of vessel tracks collected across the Moray Firth SPA in the week prior to each of the DAS detailed within Scott *et al*. (2023[1]), which is a key source of ornithological distribution and abundance data for this assessment. The date ranges considered were 05 to 19 January 2020, and 23 February to 08 March 2020. This dataset was qualitatively compared with the 2023/24 dataset to enable comment to be made on whether vessel activity in the week leading up to each of the 2020 DAS was similar in distribution and intensity to the activity recorded in 2023/24. It is to be noted that Moray East OWF was in early construction phase at this time, and some preliminary works had begun. Vessel traffic associated with these activities will have been captured by this AIS dataset.

2.5 Assessment of Potential Effects

2.5.1 Conservation Objectives

2.5.1.1 Potential impacts by disturbance and displacement due to construction vessel traffic associated with the Proposed Development (Offshore) have been separately assessed for each qualifying feature of the Moray Firth SPA against the conservation objectives:

- 1. To ensure that the qualifying features of the Moray Firth SPA are in favourable condition and make an appropriate contribution to achieving Favourable Conservation Status.
- 2. To ensure that the integrity of the Moray Firth SPA is restored in the context of environmental changes by meeting objectives 2a, 2b and 2c for each qualifying feature:
  - 2a. The populations of qualifying features are viable components of the site.
  - 2b. The distribution of the qualifying features is maintained throughout the site by avoiding significant disturbance of the species.
  - 2c. The supporting habitats and processes relevant to qualifying features and their prey resources are maintained, or where appropriate restored, at the Moray Firth SPA.

2.5.1.2 Conclusions relating to each conservation objective have been made with reference to the latest published Conservation Advice document for the Moray Firth SPA (NatureScot, 2022[2]). The site condition for all qualifying species was assessed by this review as "Favourable".

2.5.2 Assessment Approach

2.5.2.1 There is currently a degree of uncertainty relating to the construction vessels that will be used by the Proposed Development (Offshore), the construction port(s) that will be used, the routes taken by vessels from these ports through the Moray Firth SPA, and a wide range of other factors which makes it challenging to confidently assess the predicted impacts. For this reason, this assessment focuses on qualitative comparisons of modelled distributions of Moray Firth SPA qualifying features based on the 2020 DAS (Scott *et al*., 2023[1]) with the areas within the SPA where disturbance and displacement due to construction vessel traffic is likely to occur, based on the location of the ports under consideration (Buckie, Nigg, Cromarty and Ardersier) which may introduce additional vessel traffic into the Moray Firth SPA should they be used as construction ports for the Proposed Development (Offshore). The presence of existing vessel is also considered by the assessment as a key factor in predicting potential impacts. Other literature was also used to identify areas of the Moray Firth

favoured by particular species. A qualitative assessment of the availability of habitats for birds to occupy within the SPA as an alternative to areas that could be impacted by disturbance and displacement due to construction vessel activity was also performed where possible.

2.5.2.2 For many of the qualifying features of the Moray Firth SPA, these comparisons were sufficient to demonstrate that AEoSI could be ruled out due to disturbance and displacement by construction vessel traffic by virtue of a low number of birds being present in areas likely to be impacted by construction vessel traffic during the 2020 DAS, and other data sources corroborating that the observations were consistent with previous observations.

2.5.2.3 For qualifying features for which AEoSI could not be ruled out using the above approach, a second level of assessment was undertaken using other evidence to further examine the magnitude of potential impacts. These were:

- AIS data describing vessel activity in the run up to the 2020 DAS was used to assess whether birds were occupying habitats where vessel activity was high in the run up to the DAS (Volume 8, Appendix 31: Moray Firth Special Protected Area Long-Term Vessel Traffic Assessment). This provided a basis for inferring the level of potential vessel-related impacts occurring prior to these surveys. These findings were used to refine conclusions on potential effects that might occur as a result of additional vessel traffic.
- Qualitative assessment of potential direct effects of displacement on impacted individuals, and indirect effects of displacement on birds using receiving habitats.

3 Baseline Assessment of Vessel Activity

3.1 Non-breeding Season – Moray Firth SPA 2023/24

3.1.1.1 A summary of the number of tracks and vessel type (by month) recorded in the Moray Firth SPA and 2km buffer between October 2023 to March 2024, and in September 2024 is presented in Table 3-1, and the distribution of vessel tracks by type across the Moray Firth SPA is presented in Figure 3–1. Totals and average tracks per day with and without Moray West vessels (which will have predominantly been construction vessels during this time period) are presented.

3.1.1.2 In total, 28,820 vessel tracks were recorded across the Moray Firth SPA plus 2km buffer during this time period; an average of 135 unique vessel tracks daily, with the minimum and maximum monthly mean values varying between 120 and 166. If Moray West Offshore Wind Farm (OWF) vessel activity is excluded, 25,299 vessel tracks were recorded across the Moray Firth SPA plus 2km buffer; an average of 119 unique vessel tracks daily, with the minimum and maximum monthly mean values varying between 107 and 134.

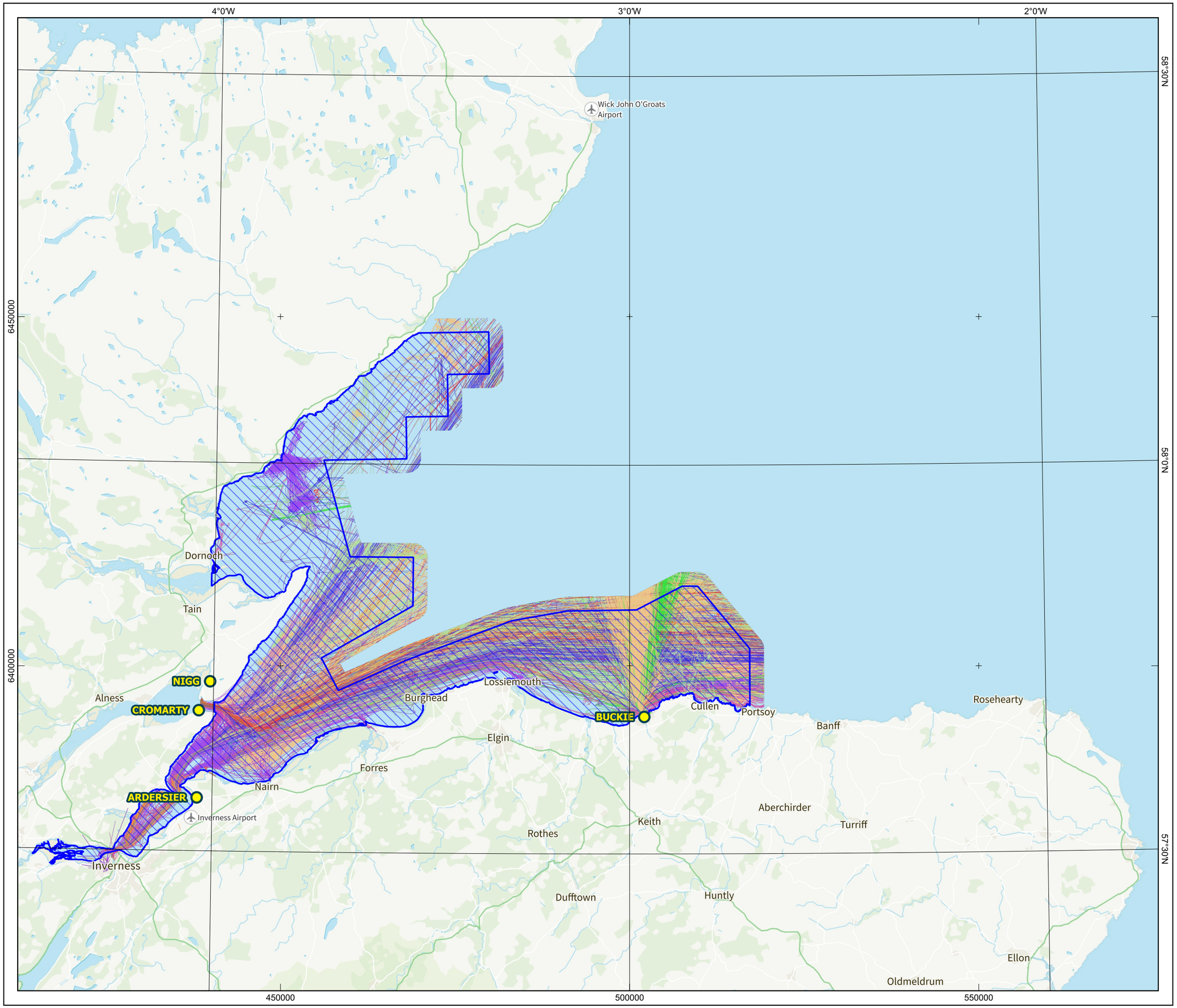
3.1.1.3 The distribution of vessel tracks (Figure 3–1) was strongly correlated with the locations of the busy ports and harbours throughout the Moray Firth, with areas of high vessel usage located (from southeast to northwest) near Cullen, Buckie, Lossiemouth, Burghead, Nairn, the inner Moray Firth, Cromarty and Brora. With the exception of the Brora area, the southern portion of the Moray Firth SPA saw a much greater level of vessel activity than the area between the Dornoch Firth and the Helmsdale coast, which reflects the distribution of ports across the area.

3.1.1.4 Much of the recorded vessel traffic around the wider Buckie area was categorised as being associated with OWFs. This consisted of vessels predominantly travelling in an approximate north/south direction between Buckie and the OWFs situated in the Moray Firth, and also vessels associated with construction activities within the Moray West OWF export cable corridor to the north and east of Buckie.

3.1.1.5 Whilst OWF-associated vessel tracks were also commonly recorded in other areas within the Moray Firth, a greater proportion of traffic within the Nairn, Cromarty and inner Moray Firth areas was categorised as cargo or passenger vessels, with the Brora area also supporting relatively high levels of vessel activity. Fishing vessel activity was also widespread across the Moray Firth SPA.

Table 3-1: Summary of number and type of vessel tracks across the Moray Firth SPA plus 2km buffer between October 2023 and March 2024, plus September 2024, based on AIS data.

Vessel Type	Oct 23	Nov 23	Dec 23	Jan 24	Feb 24	Mar 24	Sep 24	Total
Cargo	245	193	238	294	285	383	219	1857
Dredging / Underwater Ops	143	104	37	105	121	229	228	967
Fishing	312	277	229	316	263	92	427	1916
Military	17	65					7	89
Moray West	201	188	394	404	524	850	960	3521
Oil and Gas	82	48	39	60	66	42	42	379
Other	240	301	204	232	287	495	405	2164
Passenger	111	48	42	47	45	119	326	738
Recreational	1642	1437	1294	1144	1179	1384	1303	9383
Survey	47	25	26	65	25	35	4	227
Tanker	76	78	59	82	75	43	39	452
Tug	38	40	143	98	62	78	722	1181
Wind Farm	793	905	1017	1130	1291	510	300	5946
Total (with Moray West)	**3947**	**3709**	**3722**	**3977**	**4223**	**4260**	**4982**	**28820**
Movements per day (with Moray West)	**127**	**124**	**120**	**128**	**146**	**137**	**166**	**135**
Total (without Moray West)	**3746**	**3521**	**3328**	**3573**	**3699**	**3410**	**4022**	**25299**
Movements per day (without Moray West)	**121**	**117**	**107**	**115**	**128**	**110**	**134**	**119**

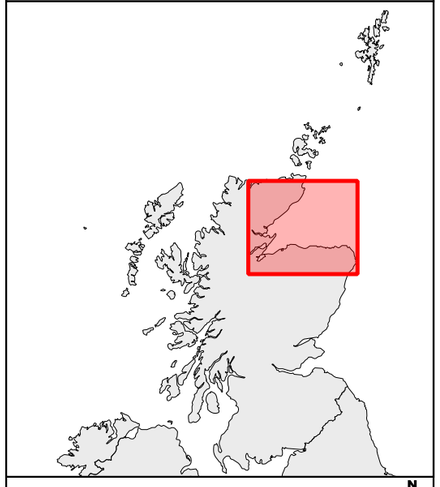


Port Location

Moray Firth Special Protection Area (SPA)

AIS (Oct-23 to Mar-24 and Sep-24)

- Cargo
- Dredging/Underwater Ops
- Fishing
- Military
- Moray West
- Oil and Gas
- Other
- Passenger
- Recreational
- Survey
- Tanker
- Tug
- Wind Farm



0 5 10 15 20 25 km

N

REV	DATE	DOC STATUS	ORIGIN	REVIEW	APP
01	02/10/2025	Information	TG	RI	AS

CALEDONIA Offshore Wind Farm

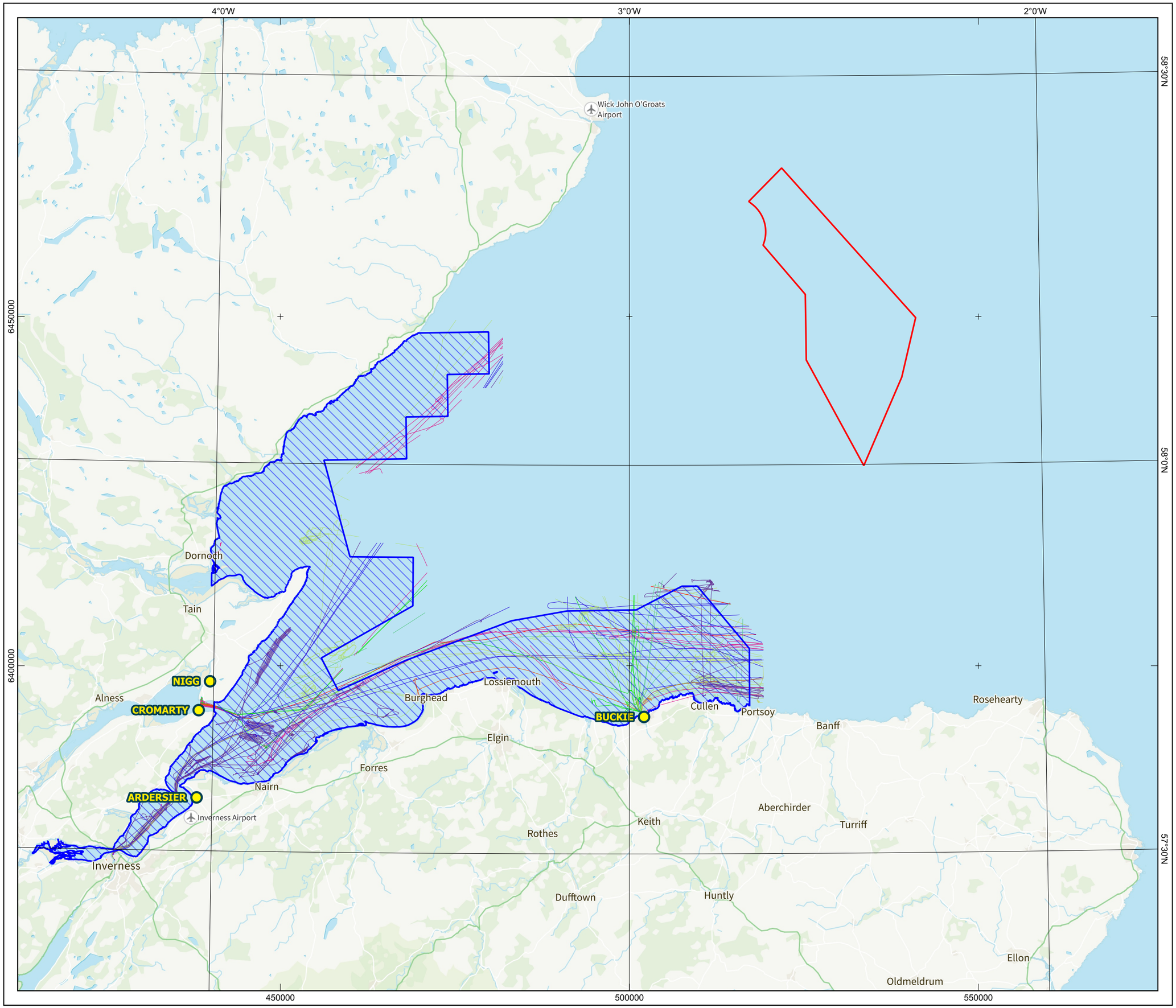
GEODETIC PARAMETERS
WGS 84 / UTM zone 30N (EPSG:32630)

DRAWING TITLE
Figure 3-1: AIS data showing vessel traffic across the Moray Firth SPA between October 2023 to March 2024, and September 2024, by vessel type

STATUS	SCALE	
Information	1:500,000 @ A3	
DRAWING NUMBER	SHEET NO	REV
UKCAL-CWF-CON-ENV-MAP-00034	01 of 01	01

3.2 Non-breeding Season – Lead up to 2020 DAS

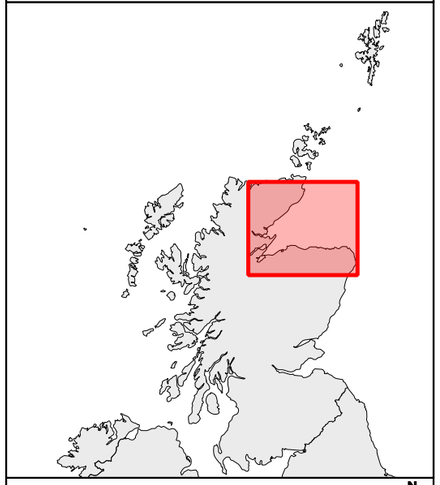
3.2.1.1 During the day on which each 2020 DAS was conducted, and the preceding week, 648 (13 to 19 January) and 724 (02 to 08 March) vessel tracks were recorded across the Moray Firth SPA and 2km buffer; an average of 93 and 103 unique vessel tracks per day. This is a lower level of activity than was recorded in the 2023/24 non-breeding season, when a daily average of 135 vessel movements was recorded (Table 3-1). The differences in vessel activity may be explained by the more recent AIS dataset coinciding with the ”peak” construction phase of the Moray West OWF. The 2020 AIS data coincided with some preliminary construction activity for the Moray East OWF, but this was not during the “peak “ construction period. The distributions of vessel tracks by type and time period across the Moray Firth SPA are presented in Figure 3–2 and Figure 3–3.



Caledonia Array Area
Port Location
Moray Firth Special Protection Area (SPA)

AIS (13 Jan-20 to 19 Jan-20)

- Cargo
- Dredging/Underwater Ops
- Fishing
- Oil and Gas
- Other
- Passenger
- Recreational
- Survey
- Tanker
- Tug
- Wind Farm



0 5 10 15 20 25 km

N

REV	DATE	DOC STATUS	ORIGIN	REVIEW	APP
01	02/10/2025	Information	TG	RI	AS

CALEDONIA Offshore Wind Farm

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

DRAWING TITLE
Figure 3-2: AIS data showing vessel traffic across the Moray Firth SPA between 13th to 19th January 2020, by vessel type

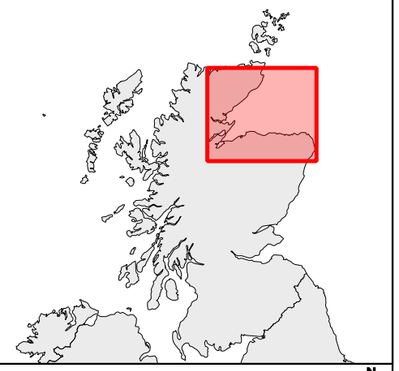
STATUS	SCALE	
Information	1:500,000 @ A3	
DRAWING NUMBER	SHEET NO	REV
UKCAL-CWF-CON-ENV-MAP-00035	01 of 01	01

4°0'W
3°0'W
2°0'W
58°30'N
58°0'N
57°30'N
6450000
6400000
450000
500000
550000
WICK
NIGG
CROMARTY
ARDERSIER
BUCKIE
Inverness Airport
Dornoch
Tain
Alness
Inverness
Nairn
Forres
Elgin
Burghead
Lossiemouth
Cullen
Portsoy
Macduff
Fraserburgh
Aberchirder
Turriff
Keith
Rothes
Dufftown
Huntly
Ellon
Oldmeldrum

Caledonia Array Area
Port Location
Moray Firth Special Protection Area (SPA)

AIS (02 Mar-20 to 08 Mar-20)

Cargo
Dredging/Underwater Ops
Fishing
Military
Oil and Gas
Other
Passenger
Recreational
Survey
Tanker
Tug
Wind Farm



0 5 10 15 20 25 km

N

REV	DATE	DOC STATUS	ORIGIN	REVIEW	APP
01	02/10/2025	Information	TG	RI	AS

CALEDONIA Offshore Wind Farm

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

DRAWING TITLE
Figure 3-3: AIS data showing vessel traffic across the Moray Firth SPA between 2nd to 8th March 2020, by vessel type

STATUS	SCALE	
Information	1:500,000 @ A3	
DRAWING NUMBER	SHEET NO	REV
UKCAL-CWF-CON-ENV-MAP-00036	01 of 01	01

3.3 Summary and Discussion

3.3.1.1 During the non-breeding season, it is estimated that around 120 daily unique vessel movements occur across the Moray Firth SPA depending on the month, when a nearby OWF is not in its "peak" construction period. This estimate will under report the true levels of vessel activity, since vessels that do not use AIS are not included in the dataset.

3.3.1.2 Examination of vessel traffic in the lead up to the 2020 DAS indicates that the frequency of vessel traffic across the Moray Firth SPA was lower than, yet still relatively comparable to that reported in 2023/24. The assessment of potential impacts therefore assumes that since no substantial changes to vessel activity have occurred between the 2020 DAS and the time at which the assessment has been performed, the distribution of birds will have also remained comparable, all other factors being equal.

3.3.1.3 It is concluded that the Moray Firth SPA is a relatively busy area with respect to vessel traffic, and that modelled distributions of birds used to perform the assessments presented in the assessment of potential impacts are reflective of this vessel activity. The predicted increase in overall vessel traffic within the Moray Firth SPA due to construction vessel activities as a result of the Proposed Development (Offshore) is relatively modest, with a typical likely maximum of several additional daily vessel movements anticipated beyond the 120+ unique movements that occur daily across the wider Moray Firth SPA. Whilst there may be periods of time where higher numbers of vessel activity occurs, this activity will be limited in both spatial and temporal extent, meaning that only relatively small parts of the Moray Firth SPA would be impacted at any particular time. It is likely that during the middle of the non-breeding season in particular, increases in existing vessel activity will generally be small due to weather constraints. Given the existing levels of vessel activity across the wider Moray Firth SPA, it is considered to be unlikely that the predicted overall increases in vessel activity due to the construction of the Caledonia OWF would meet the threshold of "significant disturbance" referred to by Conservation Objective 2b. More detailed consideration is provided in the following sections.

4 Assessment of Potential Impacts

4.1 Common Scoter

4.1.1 Evidence for Sensitivity to Vessel Disturbance

4.1.1.1 Common scoter is known to be sensitive to disturbance and displacement by vessel traffic with high certainty (Wade *et al*., 2016[5]). During the non-breeding season, Schwemmer *et al*. (2011[6]) reported a median flight initiation distance of 804m (sample size of 210 events) for common scoter, whilst flight initiation distances of between 0m to 1,000m were observed by Larsen and Laube (2005[7]). The mean escape distance (and sample size) reported by Fliessbach *et al*. (2019[8]) was considerably higher than the other data sources for both individuals and groups (Table 4-1). In addition, common scoter was assessed to have a high sensitivity to human disturbance by Goodship and Furness (2019[9]) in the context of hand-harvesting of seaweed.

Table 4-1: Mean escape distances, standard deviations, and sample sizes of observations for common scoter (individuals and flocks), reproduced from Fliessbach *et al*. (2019[8]).

Species	Published Escape Distance for Individual Birds (m)	Published Escape Distance for Flocks of Birds (m)
Common scoter	1,600 (+/- 777) (n=9,417)	1,015 (+/- 727) (n=591)

4.1.2 Moray Firth SPA Population Estimates

4.1.2.1 Key Moray Firth SPA population estimates and densities for this species are summarised in Table 4-2.

Table 4-2: Key population estimates and densities for common scoter within the Moray Firth SPA.

Source	Date(s)	Method	Population Estimate
Moray Firth SPA citation	2001/02 to 2005/06	Shore-based count	5,479 (mean peak)
Lawson *et al*. (2015[3])	2001/02 to 2006/07	Visual aerial surveys, distance analysis	2,544 (mean peak)
Scott *et al*. (2023[1])	19/01/2020	DAS, block bootstrap estimation method; abundance	10,336 (95% CIs 200 – 25,284)
		DAS, block bootstrap estimation method; density	5.69 (95% CIs 0.00 – 60.28)
	08/03/2020	DAS, block bootstrap estimation method; abundance	2,607 (95% CIs 511 – 5,726)
		DAS, block bootstrap estimation method; density	1.30 (95% CIs 0.00 – 12.81)

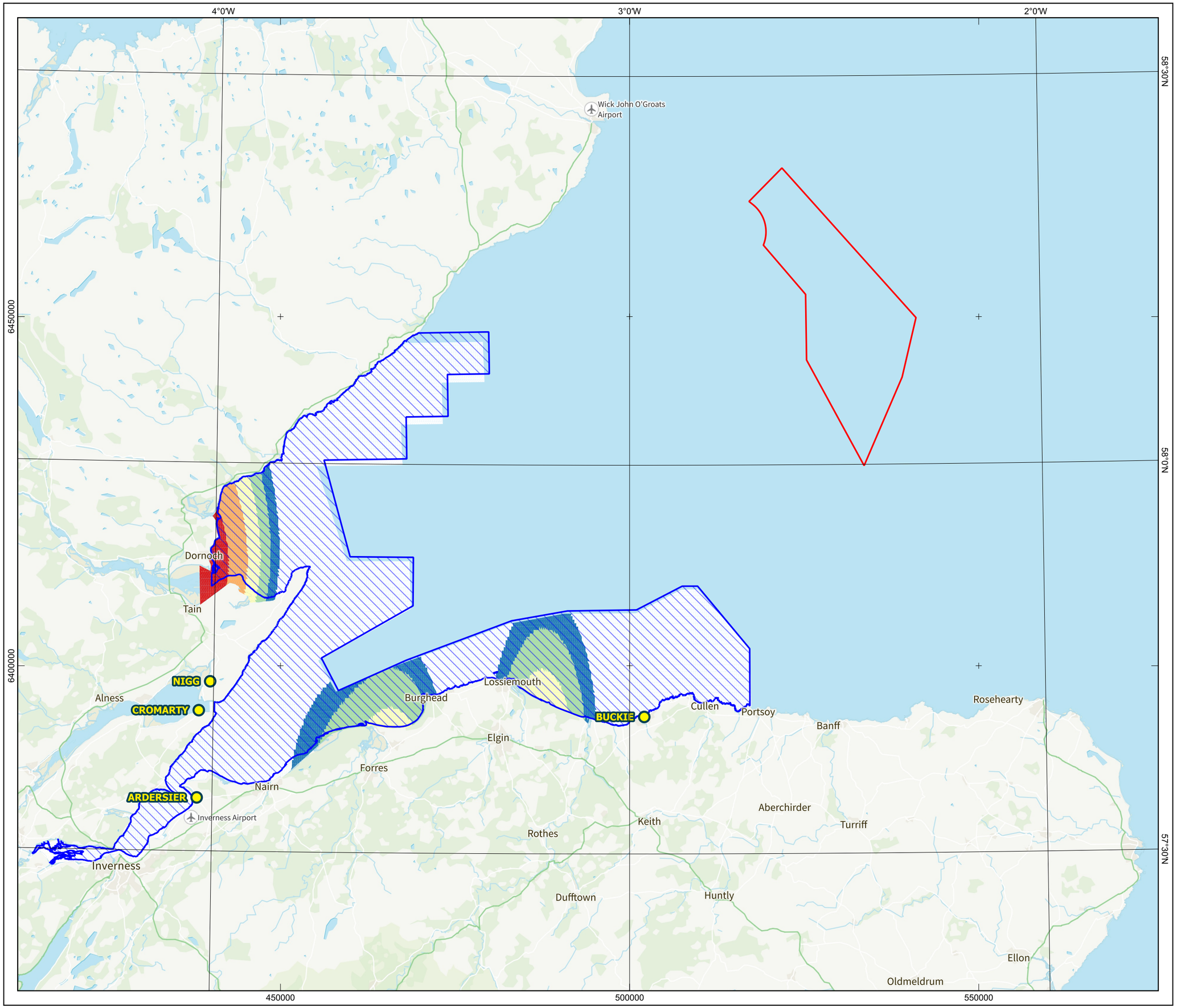
4.1.3 Moray Firth SPA Population Distribution

4.1.3.1 Conservation Advice for the Moray Firth SPA (NatureScot, 2022[2]) states that within the SPA, common scoters have been recorded most frequently close inshore between Burghead and Nairn, around the mouth of the inner Dornoch Firth, at Spey Bay and on the Riff Bank. Observations in 2019 and 2020 indicate that the inshore shallow sandy coast of Golspie to Embo also has importance as a foraging zone. The key supporting processes for common scoter in the Moray Firth SPA are not well known, but may include water quality (nutrients), tidal cycles and water flow (NatureScot, 2022[2]). In general, birds tend to be found in shallow (<20m depth) waters at distances of around 500m to 2km of coastlines.

4.1.3.2 Based on the 2020 DAS data, common scoter are not especially widely distributed within the Moray Firth SPA, tending instead to occur in particular areas in large aggregations. This is reflected in the large confidence intervals around the mean abundance and density estimates for the Moray Firth SPA presented in Table 4-2.

4.1.3.3 Aggregations of birds were recorded in the 2020 DAS around the mouth of the inner Dornoch Firth between Burghead and Nairn, Culbin Bar, and in Spey Bay (Figure 4–1 and Figure 4–2). The highest modelled densities of birds were predicted to occur in nearshore locations. Scott *et al*. (2023[1]) noted that similar patterns of distribution were evident from previous surveys, which was confirmed by figures presented in MacArthur Green (2024[4]). Together, this suggests a longstanding preference for coastal, inshore areas by this species.

4.1.3.4 It is noted that this species may have a different distribution across the Moray Firth SPA at night, due to its known tendency to move into offshore roosting areas during this time.



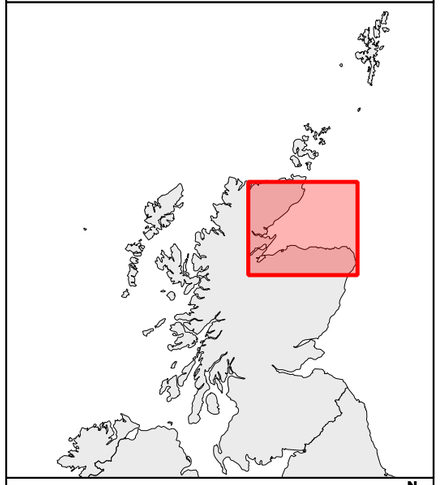
Caledonia Array Area

Port Location

Moray Firth Special Protection Area (SPA)

Modelled density of Common Scoter (birds/km2)

- 0 - 1
- 1 - 2
- 2 - 4
- 4 - 8
- 8 - 16
- 16 - 25



0 5 10 15 20 25 km

N

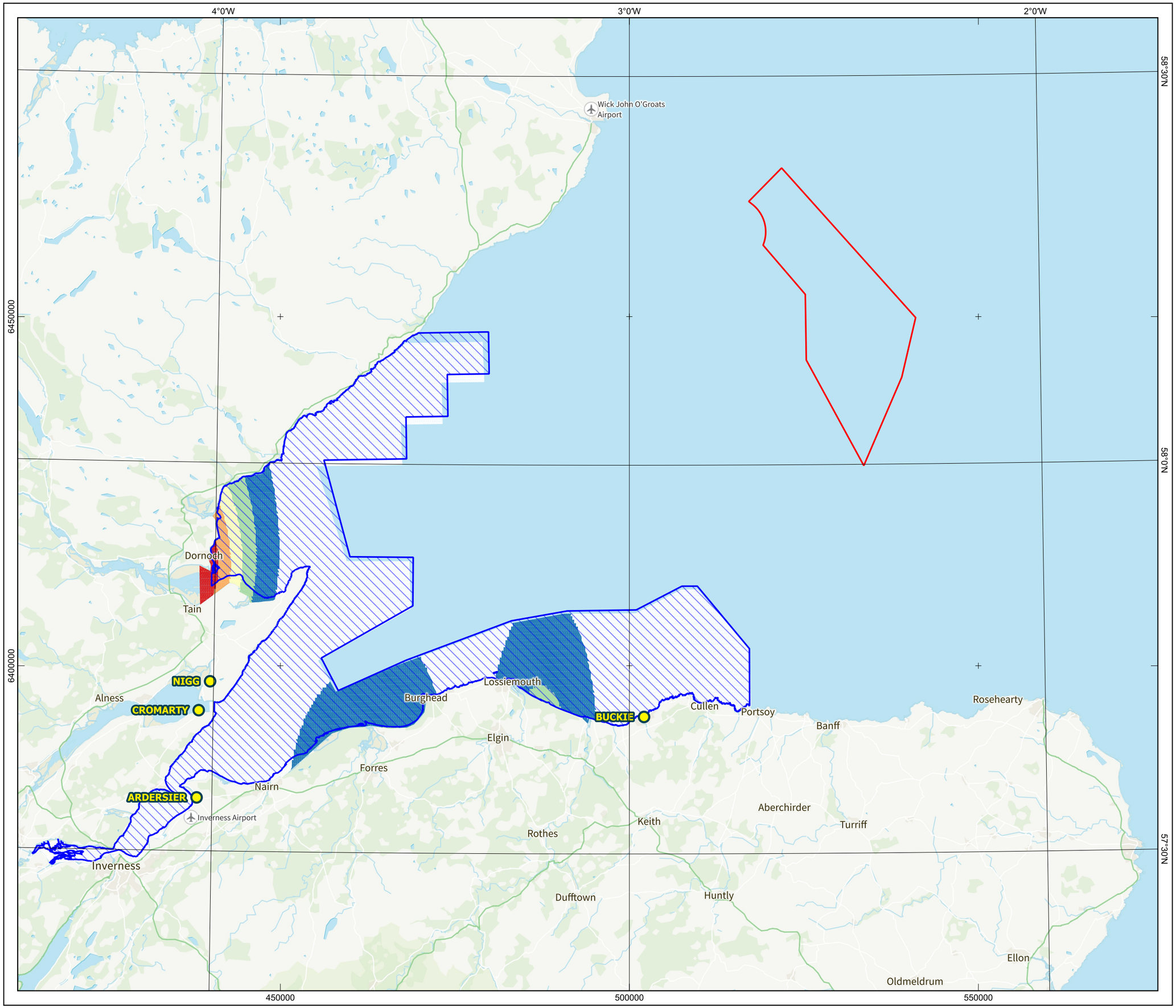
REV	DATE	DOC STATUS	ORIGIN	REVIEW	APP
01	02/10/2025	Information	TG	RI	AS

CALEDONIA Offshore Wind Farm

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

DRAWING TITLE
Figure 4-1: Modelled distribution of common scoter based on digital aerial survey data collected on 19th January 2020

STATUS	SCALE	
Information	1:500,000 @ A3	
DRAWING NUMBER	SHEET NO	REV
UKCAL-CWF-CON-ENV-MAP-00037	01 of 01	01



Caledonia Array Area

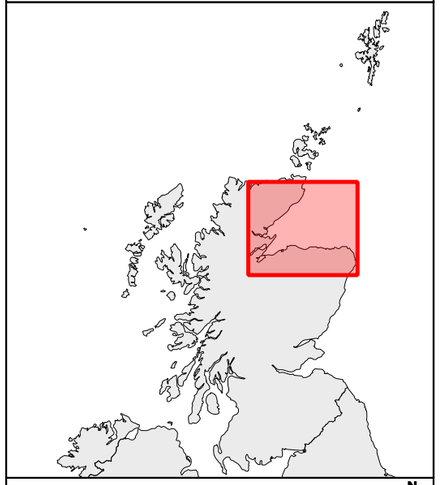
Port Location

Moray Firth Special Protection Area (SPA)

Modelled density of Common Scoter (birds/km2)

- 0 - 1
- 1 - 5
- 5 - 10
- 10 -15
- 15 - 20
- 20 - 25

Inshore Wintering Waterfowl in Moray Firth Special Protection Area - 2019/20 Digital Aerial Surveys and Comparative Analyses of Aerial and Shore-Based Surveys'. NatureScot Research Report, 2023.



0 5 10 15 20 25 km

N

REV	DATE	DOC STATUS	ORIGIN	REVIEW	APP
01	02/10/2025	Information	TG	RI	AS

CALEDONIA Offshore Wind Farm

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

DRAWING TITLE
Figure 4-2: Modelled distribution of common scoter based on digital aerial survey data collected on 8th March 2020

STATUS	SCALE	
Information	1:500,000 @ A3	
DRAWING NUMBER	SHEET NO	REV
UKCAL-CWF-CON-ENV-MAP-00038	01 of 01	01

4.1.4 Assessment of Potential Impacts

4.1.4.1 Modelled distributions from the 2020 DAS data (Figure 4–1 and Figure 4–2) and other sources of information indicate that in general, this species displays a strong preference for nearshore waters within the Moray Firth SPA. It is therefore anticipated that birds are unlikely to be present in substantial numbers between the Proposed Development (Offshore), and any of the construction ports under consideration (Buckie, Cromarty/Nigg, and Ardersier).

4.1.4.2 Direct impacts due to construction vessels associated with the Proposed Development (Offshore) occurring on the habitats within coastal areas, or the birds using them, are considered to be unlikely as construction vessels are not expected to operate routinely in nearshore locations except when entering and exiting port locations. Since common scoter distributions are heavily associated with coastal, shallow waters, the areas in which construction vessels will routinely operate are unlikely to represent key habitat for this species, irrespective of which ports are used for construction of the Proposed Development (Offshore).

4.1.4.3 Distributions of this species may differ at night, which could result in a greater possibility of direct impacts due to disturbance of this species by construction vessels. Given that roosting areas are typically reached by birds swimming from their preferred daytime habitats (NatureScot, 2022[2]), the locations of these roosting areas are likely to still be relatively coastal, meaning that the possibility of frequent disturbance and displacement of substantial numbers of birds by construction vessels remains low.

4.1.4.4 The available data and other information indicates that disturbance of common scoter by construction vessel traffic, if it occurs, would be infrequent, spatiotemporally restricted, and involve low numbers of birds relative to the wider population of the Moray Firth SPA. Of any birds disturbed, it is likely that only a proportion would actually be displaced. The predicted impact of low levels of displacement of this nature is predicted to be negligible at the level of the Moray Firth SPA population.

4.1.4.5 Away from coastal locations, the high levels of existing vessel activity within much of the Moray Firth SPA (Figure 3–1) suggest that disturbance of habitats used by Moray Firth SPA qualifying features by vessel traffic, and therefore potential disturbance and displacement of SPA qualifying features, is likely to be part of the existing nature of the SPA. It is considered that modest increases in vessel traffic in areas where vessels already frequently operate are unlikely to result in increases in mortality to any disturbed/displaced birds that would be detectable. In addition, the supporting habitats and processes relevant to this qualifying feature and its prey resources are not anticipated to be impacted for the same reason.

4.1.4.6 It is anticipated that the birds that could be displaced would be able to relocate to appropriate habitats within the Moray Firth SPA and could also return to the area from which they were displaced relatively quickly due to the transient nature of vessel disturbance. Because of the low numbers of birds that can be potentially displaced by construction vessel traffic relative to the population of the SPA, indirect effects on birds in other areas as a result of this impact can be ruled out.

4.1.4.7 In summary, it is not considered that the anticipated construction vessel traffic associated with the Proposed Development (Offshore) would materially impact the abundance or distribution of common scoter in the Moray Firth SPA. Assessment against Conservation Objectives 2a, 2b and 2c indicates that they will all be met despite the potential for minor disturbance impacts (Table 4-3). It is therefore concluded that the construction vessel traffic associated with the Proposed Development (Offshore) will not result in an AEoSI on the common scoter qualifying feature of the Moray Firth SPA either alone, or in-combination with other existing activities.

Table 4-3: Assessment of predicted impacts on common scoter qualifying feature of the Moray Firth SPA.

Conservation Objective	Conclusion
1. To ensure that the qualifying features of the Moray Firth SPA are in favourable condition and make an appropriate contribution to achieving Favourable Conservation Status.	The predicted impacts will not prevent the Moray Firth SPA common scoter population from being maintained on a long-term basis as a viable component of its natural habitats, reduce its natural range, or reduce the habitats available to it.
2. To ensure that the integrity of the Moray Firth SPA is restored in the context of environmental changes by meeting objectives 2a, 2b and 2c for each qualifying feature:	See points 2a, 2b and 2c below.
2a. The populations of qualifying features are viable components of the site.	No mortality, injury or removal that would lead to a long-term decline of common scoter within the Moray Firth SPA is anticipated as a result of the predicted impacts.
2b. The distribution of the qualifying features is maintained throughout the site by avoiding significant disturbance of the species.	Key areas within the Moray Firth SPA for this species do not overlap with the areas expected to be affected, and so no direct impacts on the birds within them are predicted. Whilst small numbers of birds may be disturbed and/or displaced, this will be insignificant at the level of the Moray Firth SPA population. It is therefore anticipated that despite the predicted impacts, common scoter will continue to have access to and utilise all optimal habitats suitable for all relevant aspects of their life cycle associated within the Moray Firth SPA.
2c. The supporting habitats and processes relevant to qualifying features and their prey resources are maintained, or where appropriate restored, at the Moray Firth SPA.	The key supporting processes for common scoter in the Moray Firth SPA are not well known, but may include water quality (nutrients), tidal cycles and water flow. Relatively modest increases in the number of vessel movements across the Moray Firth SPA, with adherence to best practice procedures detailed by the Vessel Management Plan (VMP) to minimise disturbance, mean that no impacts on Moray Firth SPA common scoter are anticipated that would interfere with the supporting habitats and processes relevant to them.

4.2 Eider

4.2.1 Evidence for Sensitivity to Vessel Disturbance

4.2.1.1 Furness (2013[10]) indicated that this species was moderately sensitive to disturbance by vessel traffic relative to others, being allocated a score of three (out of five, where five was the most sensitive). More recently, the certainty regarding the understanding of disturbance and displacement impacts of this species due to vessels was classified as moderate (Wade *et al*., 2016[5]).

4.2.1.2 Eider was assessed to have a medium/high sensitivity to human disturbance by Goodship and Furness (2019[9]) in the context of hand-harvesting of seaweed, with vessel-mediated disturbance cited by the authors as being understood to be relatively strong for this species.

4.2.1.3 During the non-breeding season, identified literature indicated a median flight initiation distance of 208m (sample size of 154 events) (Schwemmer *et al*., 2011[6]), between 0m to 1,000m in the case of Larsen and Laube (2005[7]), and 30m to 400m, with a mean of 177m in a Norwegian study based on a sample size of 48 flocks (Dehnhard *et al*., 2020[11]). The mean escape distance reported by Fliessbach *et al*. (2019[8]) was similar for both individuals and groups, with this study reporting a large sample size (Table 4-4).

Table 4-4: Mean escape distances, standard deviations, and sample sizes of observations for eider (individuals and flocks), reproduced from Fliessbach *et al*. (2019[8]).

Species	Published escape distance for individual birds (m)	Published escape distance for flocks of birds (m)
Eider	277 (+/- 218) (n=1496)	255 (+/- 195) (n=290)

4.2.2 Moray Firth SPA Population Estimates

4.2.2.1 Key Moray Firth SPA population estimates and densities for this species are summarised in Table 4-5.

Table 4-5: Key population estimates and densities for eider within the Moray Firth SPA.

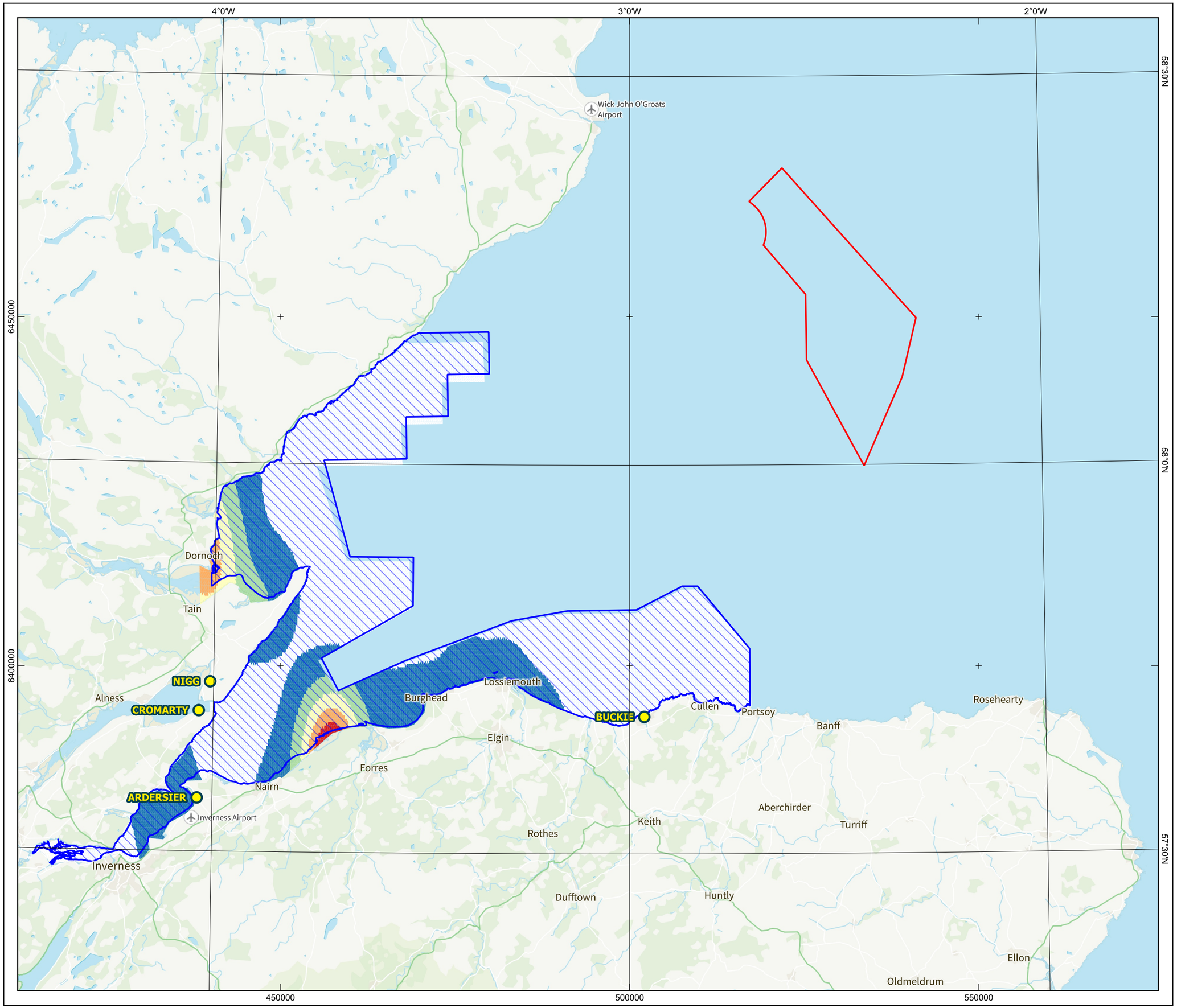
Source	Date(s)	Method	Population Estimate
Moray Firth SPA citation, Lawson *et al*. (2015[3])	2001/02 to 2005/06	Visual aerial surveys, distance analysis	1,733 (mean peak)
Scott *et al*. (2023[1])	19/01/2020	DAS, block bootstrap estimation method; abundance	4,091 (95% CIs 612 – 12,182)
		DAS, block bootstrap estimation method; density	No data (model did not produce density surface)
	08/03/2020	DAS, block bootstrap estimation method; abundance	3,316 (95% CIs 1,105 – 6,148)
		DAS, block bootstrap estimation method; density	1.65 (0.00 – 14.03)

4.2.3 Moray Firth SPA Population Distribution

4.2.3.1 Conservation Advice for the Moray Firth SPA (NatureScot, 2022[2]) does not provide specific information with regard to eider distribution. However, in Scotland, the advice notes that they can be found in sheltered bays with rocky, stony or hard substrates associated with their main prey items. Foraging in these habitats occurs on the seabed. Open waters are also used for loafing, moulting and roosting. The key supporting processes for eiders in the Moray Firth SPA are water quality (nutrients and turbidity), tidal cycles, and water flow (NatureScot, 2022[2]).

4.2.3.2 Eider were recorded in the 2020 DAS in the Nairn and Culbin Bar areas in the January 2020 survey, with the model failing to produce a density surface. In the March survey, modelled distributions indicated higher numbers of birds distributed around the outer Dornoch Firth and Loch Fleet and the Nairn coast (Figure 4–3). The highest modelled densities of birds were predicted to occur in nearshore locations. Modelled distributions based on data from 2001 to 2007 indicated a preference for coastal waters between Burghead and Lossiemouth, with waters off the Nairn coast also predicted to support higher numbers of birds (MacArthur Green, 2024[4]).

4.2.3.3 The distribution of birds in both the most recent data, and also older sources, reflects the species strong preference for nearshore waters, and suggests relatively consistent habitat selection over an extended period of time. It is noted that this species may have a different distribution across the Moray Firth SPA at night, due to its known tendency to move into offshore roosting areas during this time.



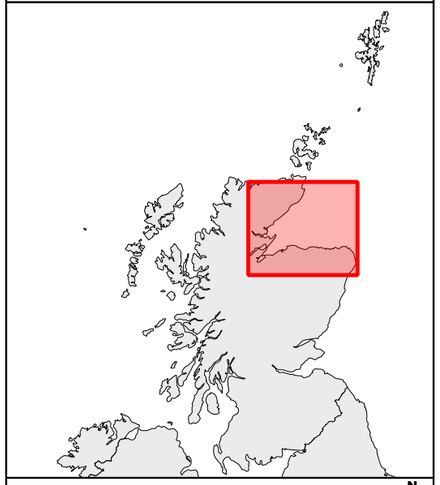
Caledonia Array Area

Port Location

Moray Firth Special Protection Area (SPA)

Modelled density of Eider (birds/km2)

- 0 - 1
- 1 - 5
- 5 - 10
- 10 - 15
- 15 - 20
- 20 - 25



0 5 10 15 20 25 km

N

REV	DATE	DOC STATUS	ORIGIN	REVIEW	APP
01	02/10/2025	Information	TG	RI	AS

CALEDONIA Offshore Wind Farm

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

DRAWING TITLE

Figure 4-3: Modelled distribution of eider based on digital aerial survey data collected on 8th March 2020

STATUS	SCALE	
Information	1:500,000 @ A3	
DRAWING NUMBER	SHEET NO	REV
UKCAL-CWF-CON-ENV-MAP-00039	01 of 01	01

4.2.4 Assessment of Potential Impacts

4.2.4.1 Modelled distributions from the 2020 DAS data (Figure 4–3) and other sources of information indicate that this species displays a strong preference for nearshore waters within the Moray Firth SPA. It is therefore anticipated that birds are unlikely to be present in substantial numbers between the Proposed Development (Offshore), and any of the construction ports under consideration (Buckie, Cromarty/Nigg, and Ardersier).

4.2.4.2 Direct impacts due to construction vessels associated with the Proposed Development (Offshore) occurring on the habitats within coastal areas, or the birds using them, are considered to be unlikely as construction vessels are not expected to operate routinely in nearshore locations except when entering and exiting port locations. Since eider distributions are highly associated with coastal, shallow waters, the areas in which construction vessels will routinely operate are unlikely to represent key habitat for this species, irrespective of which ports are used for construction of the Proposed Development (Offshore).

4.2.4.3 Distributions of this species may differ at night, which could result in a greater possibility of direct impacts due to disturbance of this species by construction vessels. Given that roosting areas are typically reached by birds swimming from their preferred daytime habitats (NatureScot, 2022[2]), the locations of these roosting areas are likely to still be relatively coastal, meaning that the possibility of frequent disturbance and displacement of substantial numbers of birds by construction vessels remains low.

4.2.4.4 The available data and other information indicates that disturbance of eider by construction vessel traffic, if it occurs, would be infrequent, spatiotemporally restricted, and involve low numbers of birds relative to the wider population of the Moray Firth SPA. Of any birds disturbed, it is likely that only a proportion would actually be displaced. The predicted impact of low levels of displacement of this nature is predicted to be negligible at the level of the Moray Firth SPA population.

4.2.4.5 Away from coastal locations, the high levels of existing vessel activity within much of the Moray Firth SPA (Figure 3–1) suggest that disturbance of habitats used by Moray Firth SPA qualifying features by vessel traffic, and therefore potential disturbance and displacement of SPA qualifying features, is likely to be part of the existing nature of the SPA. It is considered that modest increases in vessel traffic in areas where vessels already frequently operate are unlikely to result in increases in mortality to any disturbed/displaced birds that would be detectable. In addition, the supporting habitats and processes relevant to this qualifying feature and its prey resources are not anticipated to be impacted for the same reason.

4.2.4.6 It is anticipated that the birds that could be displaced would be able to relocate to appropriate habitats within the Moray Firth SPA and could also return to the area from which they were displaced relatively quickly due to the transient nature of vessel disturbance. Because of the low numbers of birds that can be potentially displaced by construction vessel traffic relative to the population of the SPA, indirect effects on birds in other areas as a result of this impact can be ruled out.

4.2.4.7 In summary, it is not considered that the anticipated construction vessel traffic associated with the Proposed Development (Offshore) would materially impact the abundance or distribution of eider in the Moray Firth SPA. Assessment against Conservation Objectives 2a, 2b and 2c indicates that they will all be met despite the potential for minor disturbance impacts (Table 4-6). It is therefore concluded that the construction vessel traffic associated with the Proposed Development (Offshore) will not result in an AEoSI on the eider qualifying feature of the Moray Firth SPA either alone, or in-combination with other existing activities.

Table 4-6: Assessment of predicted impacts on eider qualifying feature of the Moray Firth SPA.

Conservation Objective	Conclusion
1. To ensure that the qualifying features of the Moray Firth SPA are in favourable condition and make an appropriate contribution to achieving Favourable Conservation Status.	The predicted impacts will not prevent the Moray Firth SPA eider population from being maintained on a long-term basis as a viable component of its natural habitats, reduce its natural range, or reduce the habitats available to it.
2. To ensure that the integrity of the Moray Firth SPA is restored in the context of environmental changes by meeting objectives 2a, 2b and 2c for each qualifying feature:	See points 2a, 2b and 2c below.
2a. The populations of qualifying features are viable components of the site.	No mortality, injury or removal that would lead to a long-term decline of eider within the Moray Firth SPA is anticipated as a result of the predicted impacts.
2b. The distribution of the qualifying features is maintained throughout the site by avoiding significant disturbance of the species.	Key areas within the Moray Firth SPA for this species do not overlap with the areas expected to be affected, and so no direct impacts on the birds within them are predicted. Whilst small numbers of birds may be disturbed and/or displaced, this will be insignificant at the level of the Moray Firth SPA population. It is therefore anticipated that despite the predicted impacts, eider will continue to have access to and can utilise all optimal habitats suitable for all relevant aspects of their life cycle within the Moray Firth SPA.
2c. The supporting habitats and processes relevant to qualifying features and their prey resources are maintained, or where appropriate restored, at the Moray Firth SPA.	The key supporting processes for eiders at the Moray Firth SPA are water quality (nutrients and turbidity), tidal cycles, and water flow. Relatively modest increases in the number of vessel movements across the Moray Firth SPA, with adherence to best practice procedures detailed by the VMP to minimise disturbance, mean that no impacts on Moray Firth SPA eider are anticipated that would interfere with the supporting habitats and processes relevant to them.

4.3 Goldeneye

4.3.1 Evidence for Sensitivity to Vessel Disturbance

4.3.1.1 Goldeneye was assessed to have a high sensitivity to human disturbance by Goodship and Furness (2019[9]) in the context of hand-harvesting of seaweed, with a suggested buffer zone during the non-breeding season of 150m to 800m. A variety of data sources were included by this study as evidence for non-breeding season disturbance; motorized watercraft disturbance was identified as causing mean flight initiation distances of 640m and 765m in a Danish study, whilst a UK source recorded flight initiation distances of between 550m to 700m due to disturbance by a motorboat. This species was not included in Fliessbach *et al*. (2019[8]). The certainty regarding the understanding of disturbance and displacement impacts of this species due to vessels was classified as high by Wade *et al*. (2016[5]).

4.3.2 Moray Firth SPA Population Estimates

4.3.2.1 Key Moray Firth SPA population estimates and densities for this species are summarised in Table 4-7.

Table 4-7: Key population estimates and densities for goldeneye within the Moray Firth SPA.

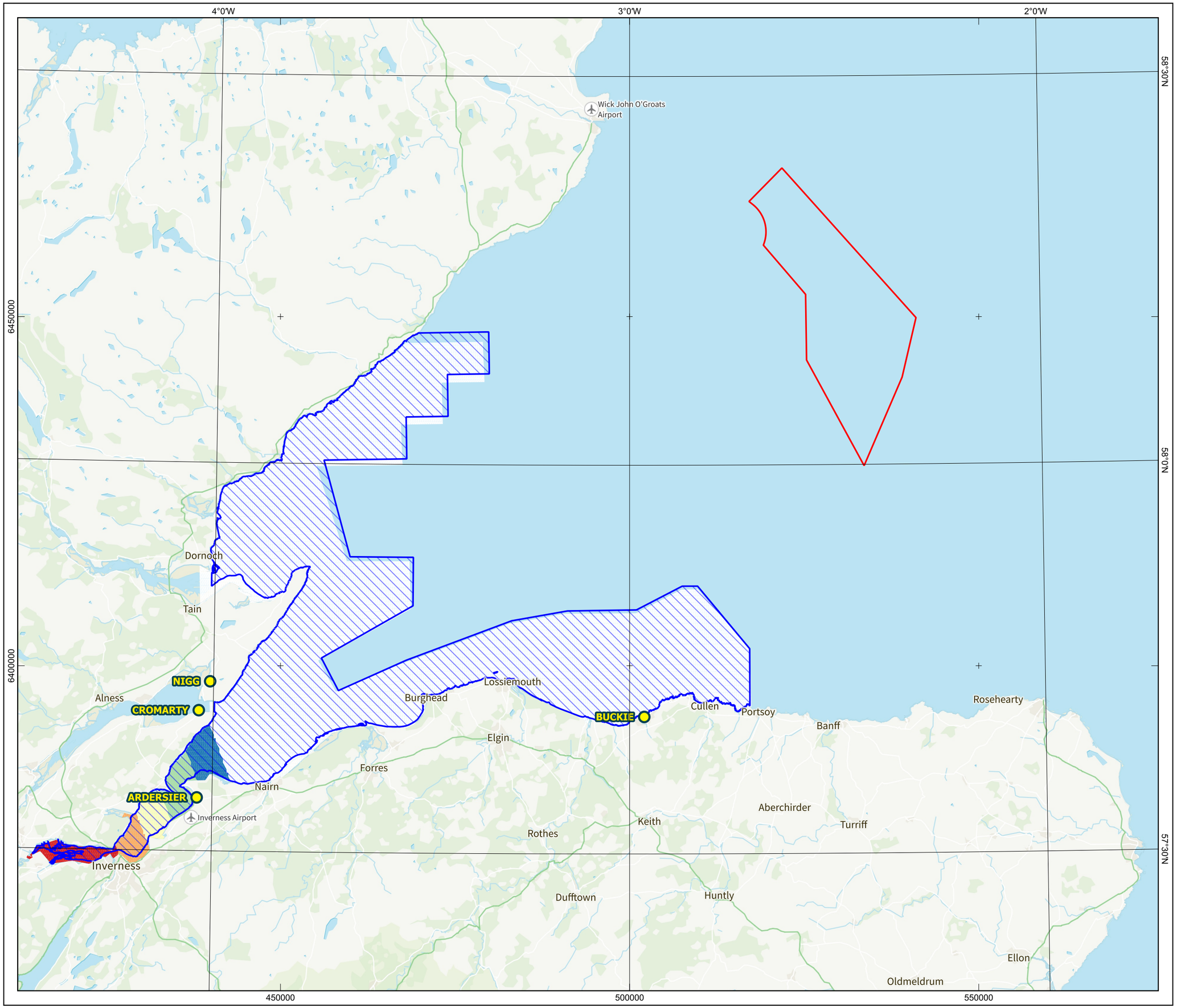
Source	Date(s)	Method	Population Estimate
Moray Firth SPA citation	2001/02 to 2005/06	Shore-based count	907 (mean peak)
Lawson *et al*. (2015[3])	2001/02 to 2006/07	Visual aerial surveys, distance analysis	74 (mean peak)
Scott *et al*. (2023[1])	19/01/2020	DAS, block bootstrap estimation method; abundance	55 (95% CIs 12 – 107)
		DAS, block bootstrap estimation method; density	No data (model did not produce a meaningful density surface)
	08/03/2020	DAS, block bootstrap estimation method; abundance	109 (95% CIs 6 – 285)
		DAS, block bootstrap estimation method; density	0.05 (0.00 – 0.64)

4.3.3 Moray Firth SPA Population Distribution

4.3.3.1 Goldeneye use a range of shallow freshwater, brackish and marine waters in the non-breeding season and are commonly associated with estuaries (NatureScot, 2022[2]). The key supporting processes for goldeneye in the Moray Firth SPA are not well known, but may include water quality (nutrients), tidal cycles and water flow (NatureScot, 2022[2]).

4.3.3.2 Goldeneye were recorded in coastal locations during the 2020 DAS, with the model failing to produce a density surface for the January 2020 survey. In the March 2020 survey, modelled distributions indicated higher numbers of birds distributed around the inner Moray Firth compared with the rest of the Moray Firth SPA (Figure 4–4). The highest modelled density of birds was predicted to occur to the west of Inverness. Distributions of birds recorded in both DAS is reflective of the known preference that this species has for inshore waters during the non-breeding season.

4.3.3.3 The distribution of observations from 2001 to 2006 indicated a preference for coastal locations, with the inner Moray Firth being the locations where the highest numbers of birds were recorded. Birds were restricted to inshore areas, reflecting their preference for shallow waters (MacArthur Green, 2024[4]).



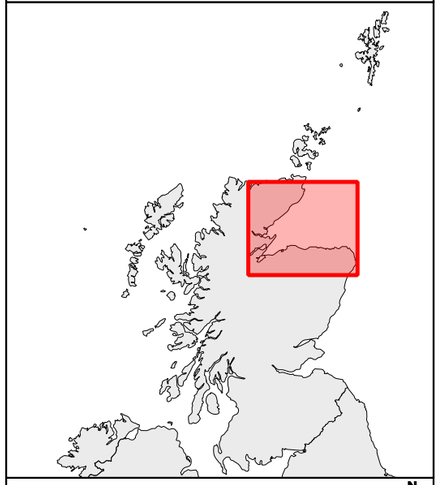
Caledonia Array Area

Port Location

Moray Firth Special Protection Area (SPA)

Modelled density of Goldeneye (birds/km2)

- 0 - 0.1
- 0 - 0.2
- 0.2 - 0.4
- 0.4 - 0.6
- 0.6 - 0.8
- 0.8 - 1



0 5 10 15 20 25 km

N

REV	DATE	DOC STATUS	ORIGIN	REVIEW	APP
01	02/10/2025	Information	TG	RI	AS

CALEDONIA Offshore Wind Farm

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

DRAWING TITLE

Figure 4-4: Modelled distribution of goldeneye based on digital aerial survey data collected on 8th March 2020

STATUS	SCALE	
Information	1:500,000 @ A3	
DRAWING NUMBER	SHEET NO	REV
UKCAL-CWF-CON-ENV-MAP-00040	01 of 01	01

4.3.4 Assessment of Potential Impacts

4.3.4.1 Modelled distributions from the 2020 DAS data (Figure 4–4) and other sources of information indicate that this species displays a strong preference for nearshore waters within the Moray Firth SPA. It is therefore anticipated that birds are unlikely to be present in substantial numbers between the Proposed Development (Offshore), and any of the construction ports under consideration (Buckie, Cromarty/Nigg, and Ardersier).

4.3.4.2 Direct impacts due to construction vessels associated with the Proposed Development (Offshore) occurring on the habitats within coastal areas, or the birds using them, are considered to be unlikely as construction vessels are not expected to operate routinely in nearshore locations except when entering and exiting port locations. Since goldeneye distributions are heavily associated with coastal, shallow waters, the areas in which construction vessels will routinely operate are unlikely to represent key habitat for this species, irrespective of which ports are used for construction of the Proposed Development (Offshore).

4.3.4.3 The available data and other information indicates that disturbance of goldeneye by construction vessel traffic, if it occurs, would be infrequent, spatiotemporally restricted, and involve low numbers of birds relative to the wider population of the Moray Firth SPA. Of any birds disturbed, it is likely that only a proportion would actually be displaced. The predicted impact of low levels of displacement of this nature is predicted to be negligible at the level of the Moray Firth SPA population.

4.3.4.4 Away from coastal locations, the high levels of existing vessel activity within much of the Moray Firth SPA (Figure 4–4) suggest that disturbance of habitats used by Moray Firth SPA qualifying features by vessel traffic, and therefore potential disturbance and displacement of SPA qualifying features, is likely to be part of the existing nature of the SPA. It is considered that modest increases in vessel traffic in areas where vessels already frequently operate are unlikely to result in increases in mortality to any disturbed/displaced birds that would be detectable. In addition, the supporting habitats and processes relevant to this qualifying feature and its prey resources are not anticipated to be impacted for the same reason.

4.3.4.5 It is anticipated that the birds that could be displaced would be able to relocate to appropriate habitats within the Moray Firth SPA and could also return to the area from which they were displaced relatively quickly due to the transient nature of vessel disturbance. Because of the low numbers of birds that can be potentially displaced by construction vessel traffic relative to the population of the SPA, indirect effects on birds in other areas as a result of this impact can be ruled out.

4.3.4.6 In summary, it is not considered that the anticipated construction vessel traffic associated with the Proposed Development (Offshore) would materially impact the abundance or distribution of goldeneye in the Moray Firth SPA. Assessment against Conservation Objectives 2a, 2b and 2c indicates that they will all be met despite the potential for minor disturbance impacts (Table 4-8). It is therefore concluded that the construction vessel traffic associated with the Proposed Development (Offshore) will not result in an AEoSI on the goldeneye qualifying feature of the Moray Firth SPA either alone, or in-combination with other existing activities.

Table 4-8: Assessment of predicted impacts on goldeneye qualifying feature of the Moray Firth SPA.

Conservation Objective	Conclusion
1. To ensure that the qualifying features of the Moray Firth SPA are in favourable condition and make an appropriate contribution to achieving Favourable Conservation Status.	The predicted impacts will not prevent the Moray Firth SPA goldeneye population from being maintained on a long-term basis as a viable component of its natural habitats, reduce its natural range, or reduce the habitats available to it.
2. To ensure that the integrity of the Moray Firth SPA is restored in the context of environmental changes by meeting objectives 2a, 2b and 2c for each qualifying feature:	See points 2a, 2b and 2c below.
2a. The populations of qualifying features are viable components of the site.	No mortality, injury or removal that would lead to a long-term decline of goldeneye within the Moray Firth SPA is anticipated as a result of the predicted impacts.
2b. The distribution of the qualifying features is maintained throughout the site by avoiding significant disturbance of the species.	Key areas within the Moray Firth SPA for this species do not overlap with the areas expected to be affected, and so no direct impacts on the birds within them are predicted. Whilst small numbers of birds may be disturbed and/or displaced, this will be insignificant at the level of the Moray Firth SPA population. It is therefore anticipated that despite the predicted impacts, goldeneye will continue to have access to and can utilise all optimal habitats suitable for all relevant aspects of their life cycle associated within the Moray Firth SPA.
2c. The supporting habitats and processes relevant to qualifying features and their prey resources are maintained, or where appropriate restored, at the Moray Firth SPA.	The key supporting processes for goldeneye in the Moray Firth SPA are not well known, but may include water quality (nutrients), tidal cycles and water flow. Relatively modest increases in the number of vessel movements across the Moray Firth SPA, with adherence to best practice procedures detailed by the VMP to minimise disturbance, mean that no impacts on Moray Firth SPA goldeneye are anticipated that would interfere with the supporting habitats and processes relevant to them.

4.4 Great Northern Diver

4.4.1 Evidence for Sensitivity to Vessel Disturbance

4.4.1.1 Compared to other diver species, less published information on disturbance and displacement distances is available; this species was not included in Fliessbach *et al*. (2019[8]), and the certainty regarding the understanding of disturbance and displacement impacts of this species due to vessels was classified as very high by Wade *et al*. (2016[5]).

4.4.1.2 Jarrett *et al*. (2018[12]) noted diving in response to the presence of a passing ferry at 200m to 300m, and swimming responses at several kilometres, but categorised the sensitivity of this species to disturbance as high (rather than very high for red-throated diver). During their experimental work, it was noted that great northern divers were not observed flying in response to nearby marine activity, instead swimming or diving in its presence. Gittings *et al*. (2015[13]) suggested that in Galway Harbour, great northern diver responses to vessel activity occurred at lower distances than for red-throated diver.

4.4.1.3 Great northern diver was assessed to have a high sensitivity to human disturbance by Goodship and Furness (2019[9]) in the context of hand-harvesting of seaweed, with similar conclusions reached by Furness *et al*. (2013[10]).

4.4.2 Moray Firth SPA Population Estimates

4.4.2.1 Key Moray Firth SPA population estimates and densities for this species are summarised in Table 4-9.

Table 4-9: Key population estimates and densities for great northern diver within the Moray Firth SPA.

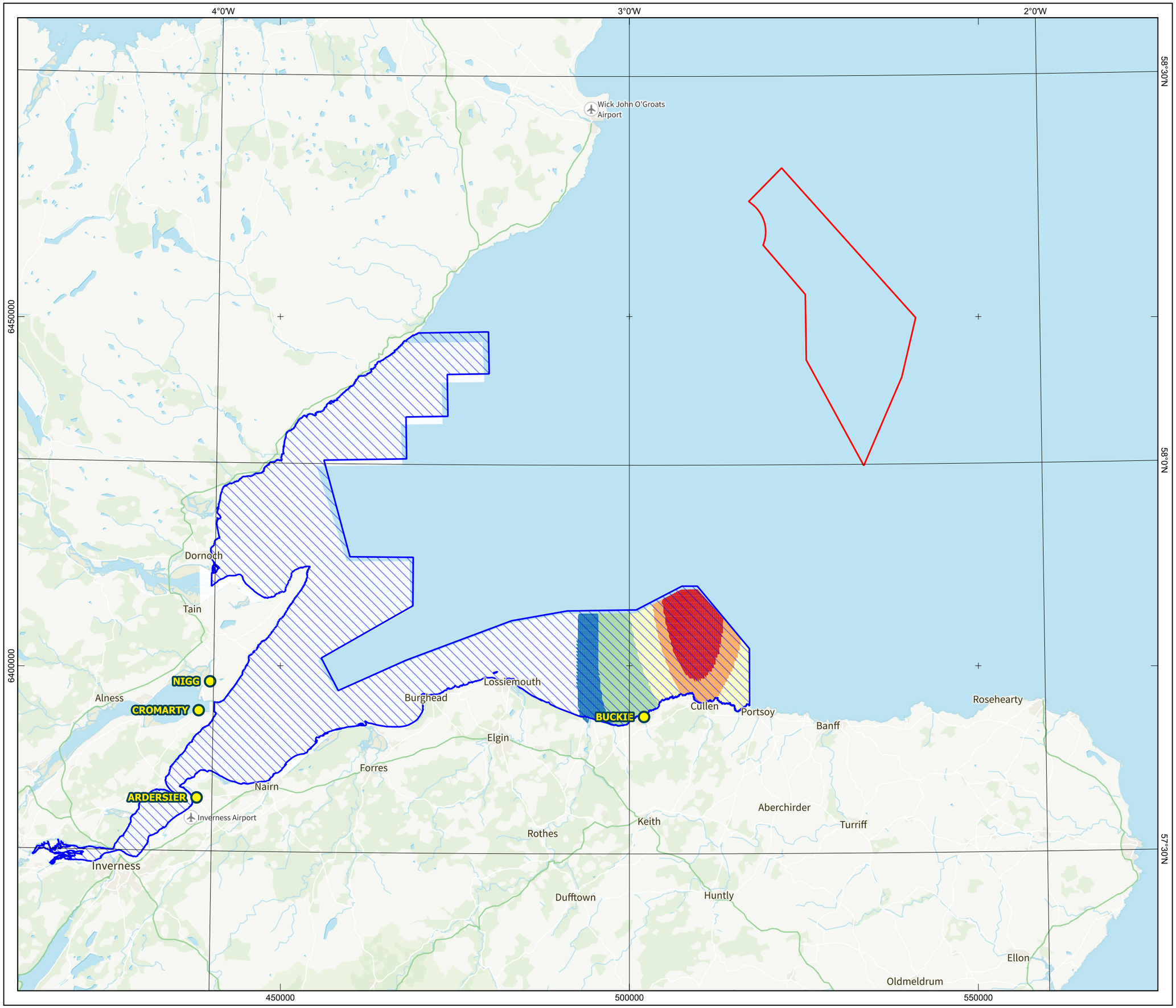
Source	Date(s)	Method	Population Estimate
Moray Firth SPA citation, Lawson *et al*. (2015[3])	2001/02 to 2006/07	Shore-based count	144 (mean peak)
Scott *et al*. (2023[1])	19/01/2020	DAS, block bootstrap estimation method; abundance	187 (95% CIs 59 – 360)
		DAS, block bootstrap estimation method; density	0.10 (0.00 – 0.78)
	08/03/2020	DAS, block bootstrap estimation method; abundance	747 (95% CIs 440 – 1,090)
		DAS, block bootstrap estimation method; density	0.42 (0.00 – 2.25)

4.4.3 Moray Firth SPA Population Distribution

4.4.3.1 Conservation Advice for the Moray Firth SPA (NatureScot, 2022[2]) states that great northern diver are widely distributed throughout the Moray Firth SPA, with open coastal waters and more sheltered marine waters used for foraging, roosting, and maintenance activities. The key supporting processes for great northern divers at the Moray Firth SPA are not well known but may include water quality (nutrients and turbidity), tidal cycles, and water flow (NatureScot, 2022[2]).

4.4.3.2 The highest densities of great northern diver were recorded in the 2020 DAS to the east of Spey Bay (Figure 4–5 and Figure 4–6). Scott *et al*. (2023[1]) noted quite large differences in modelled distribution in the wider Moray Firth SPA between the two surveys. In the January 2020 DAS, the areas to the east of Spey Bay were predicted to hold over half of the total SPA population (Figure 4–5). In the March 2020 DAS, the same area was predicted to hold a high proportion of the population, though the modelled distribution of great northern diver within the Moray Firth SPA was considerably more widespread (Figure 4–6). Modelled distributions of birds from the 2020 DAS indicated a preference for habitats several kilometres from the coast. Other areas also supporting high numbers of birds included Spey Bay itself, areas off Tarbert Ness, the mouth of the Dornoch Firth and coastal waters to the north.

4.4.3.3 The distributions of birds reported by Scott *et al*. (2023[1]) were noted by the author of that study to be relatively similar to those previously reported by Lawson *et al*. (2015[3]). Modelled distributions based on data collected between 2001 and 2007 indicate that in addition to the area in Spey Bay and the coastal waters around the Dornoch Firth, other areas of high predicted great northern/red-throated density were located at the mouth of the Cromarty Firth and the inner Moray Firth (MacArthur Green, 2024[4]).



Caledonia Array Area

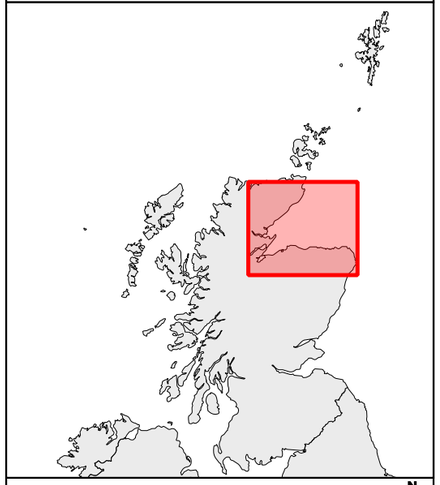
Port Location

Moray Firth Special Protection Area (SPA)

Modelled density of Great Northern Diver (birds/km2)

- 0 - 0.1
- 0.1 - 0.2
- 0.2 - 0.4
- 0.4 - 0.6
- 0.6 - 0.7
- 0.7 - 0.9

Inshore Wintering Waterfowl in Moray Firth Special Protection Area - 2019/20 Digital Aerial Surveys and Comparative Analyses of Aerial and Shore-Based Surveys'. NatureScot Research Report, 2023.



0 5 10 15 20 25 km

N

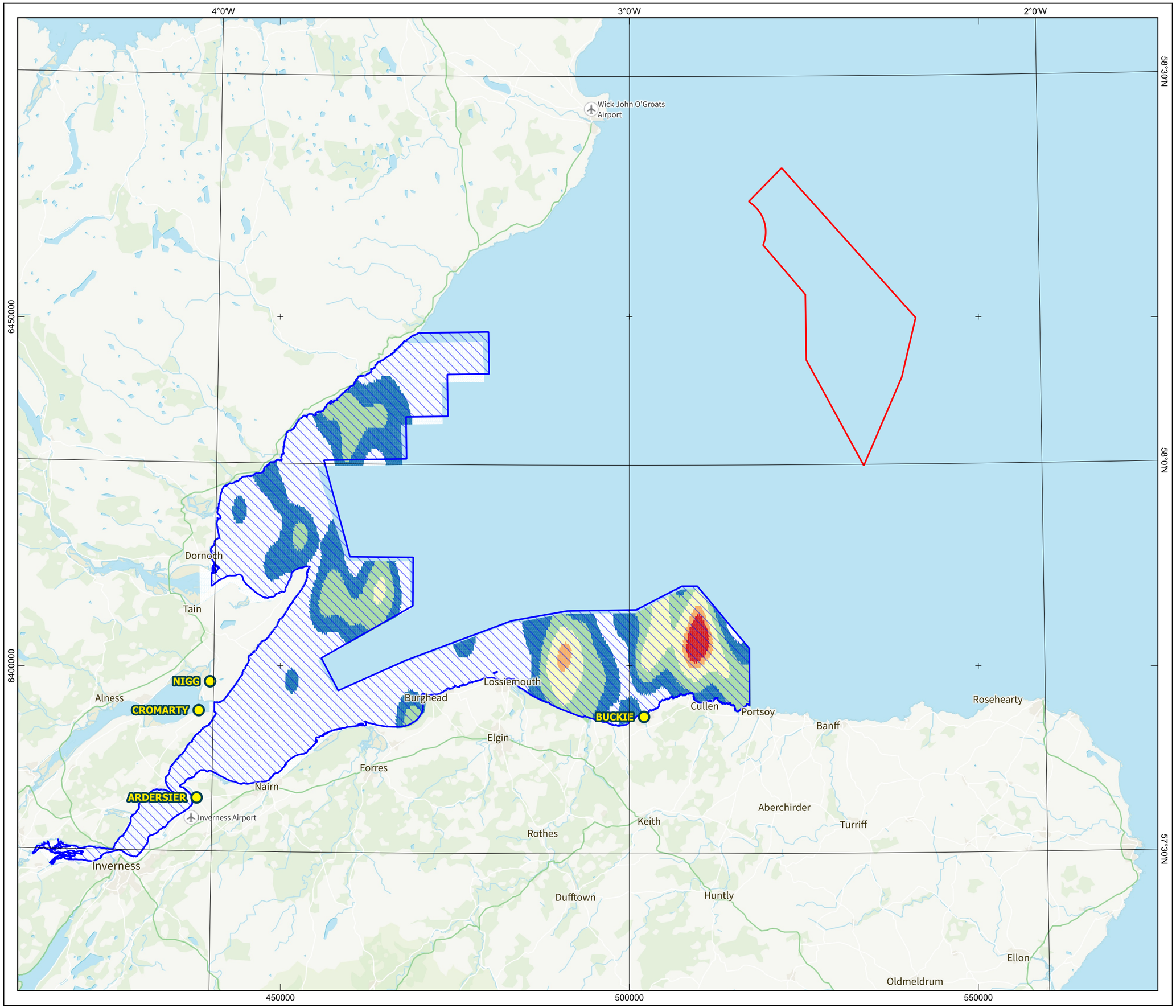
REV	DATE	DOC STATUS	ORIGIN	REVIEW	APP
01	02/10/2025	Information	TG	RI	AS

CALEDONIA Offshore Wind Farm

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

DRAWING TITLE
Figure 4-5: Modelled distribution of great northern diver based on digital aerial survey data collected on 19th January 2020

STATUS	SCALE	
Information	1:500,000 @ A3	
DRAWING NUMBER	SHEET NO	REV
UKCAL-CWF-CON-ENV-MAP-00041	01 of 01	01



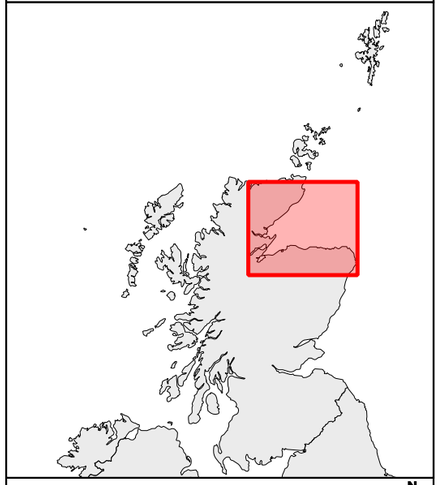
Caledonia Array Area

Port Location

Moray Firth Special Protection Area (SPA)

Modelled density of Great Northern Diver (birds/km2)

- 0 - 0.25
- 0.25 - 0.75
- 0.75 - 1.5
- 1.5 - 2.5
- 2.5 - 3
- 3 - 4



0 5 10 15 20 25 km

N

REV	DATE	DOC STATUS	ORIGIN	REVIEW	APP
01	02/10/2025	Information	TG	RI	AS

CALEDONIA Offshore Wind Farm

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

DRAWING TITLE

Figure 4-6: Modelled distribution of great northern diver based on digital aerial survey data collected on 8th March 2020

STATUS	SCALE	
Information	1:500,000 @ A3	
DRAWING NUMBER	SHEET NO	REV
UKCAL-CWF-CON-ENV-MAP-00042	01 of 01	01

4.4.4 Assessment of Potential Impacts

4.4.4.1 Modelled distributions from the 2020 DAS data (Figure 4–5 and Figure 4–6) and other sources of information indicate that this species is expected to be distributed throughout many areas of the Moray Firth SPA, with an apparent preference for waters located several kilometres from coastal areas. It is therefore anticipated that birds are at times likely to be present in substantial numbers between the Proposed Development (Offshore), and any of the construction ports under consideration (Buckie, Cromarty/Nigg, and Ardersier). Direct impacts due to construction vessels associated with the Proposed Development (Offshore) occurring on the habitats frequently utilised by this species, and the qualifying feature itself, are therefore considered to be possible as construction vessels are expected to operate routinely in these locations.

4.4.4.2 There is considerable overlap between areas where high levels of existing vessel activity occurs (i.e., within much of the Moray Firth SPA (Figure 3–1)), and the distribution of this qualifying feature (both from the 2020 DAS (Figure 4–5 and Figure 4–6), and other information sources). This suggests that disturbance of habitats used by this Moray Firth SPA qualifying features by vessel traffic, and therefore potential disturbance and displacement of the SPA qualifying feature itself, is likely to be part of the existing nature of the SPA. Birds are present in these habitats despite high levels of vessel traffic, which in the southern portion of the Moray Firth SPA consists of multiple unique vessel crossings per day during the non-breeding season (Figure 3–1 and Table 3-1). It is presumed that vessels crossing the habitats used by this SPA qualifying feature at the present rate does not materially impact the ability of birds present to either use the area to carry out their normal activities, or to relocate to other areas of the Moray Firth SPA, which are in many cases subject to similar levels of vessel disturbance (Figure 3–1 and Table 3-1).

4.4.4.3 It is considered that modest increases in vessel traffic in areas where vessels already frequently operate are unlikely to result in increases in either displacement or mortality to any disturbed/displaced birds that would be detectable. In addition, the supporting habitats and processes relevant to this qualifying feature and its prey resources are not anticipated to be impacted for the same reason.

4.4.4.4 Disturbance of great northern diver by construction vessel traffic would be spatiotemporally restricted to areas in which construction vessels are operating. Such events would involve low numbers of birds relative to the wider population of the Moray Firth SPA. Of any birds disturbed, it is likely that only a proportion would actually be displaced. The predicted impact of low levels of displacement of this nature is predicted to be negligible at the level of the Moray Firth SPA population.

4.4.4.5 Because of the relatively flexible habitat requirements for this species (based on the widespread distribution of the species throughout the Moray Firth SPA (NatureScot, 2022[2])), it is anticipated that alternative habitats for birds to relocate to in the event of displacement by vessel traffic within the Moray Firth SPA are available. Birds could also return to the area from which they were displaced relatively quickly due to the transient nature of vessel disturbance. This habitat flexibility, combined with the low numbers of birds expected to be impacted at a single time, mean that indirect effects on birds in other areas as a result of this impact can also be ruled out.

4.4.4.6 In summary, it is not considered that the anticipated construction vessel traffic associated with the Proposed Development (Offshore) would materially impact the abundance or distribution of great northern diver in the Moray Firth SPA. Assessment against Conservation Objectives 2a, 2b and 2c indicates that they will all be met despite the potential for minor disturbance impacts (Table 4-10). It is therefore concluded that the construction vessel traffic associated with the Proposed Development (Offshore) will not result in an AEoSI on the great northern diver qualifying feature of the Moray Firth SPA either alone, or in-combination with other existing activities.

Table 4-10: Assessment of predicted impacts on great northern diver qualifying feature of the Moray Firth SPA.

Conservation Objective	Conclusion
1. To ensure that the qualifying features of the Moray Firth SPA are in favourable condition and make an appropriate contribution to achieving Favourable Conservation Status.	The predicted impacts will not prevent the Moray Firth SPA great northern diver population from being maintained on a long-term basis as a viable component of its natural habitats, reduce its natural range, or reduce the habitats available to it.
2. To ensure that the integrity of the Moray Firth SPA is restored in the context of environmental changes by meeting objectives 2a, 2b and 2c for each qualifying feature:	See points 2a, 2b and 2c below.
2a. The populations of qualifying features are viable components of the site.	No mortality, injury or removal that would lead to a long-term decline of great northern diver within the Moray Firth SPA is anticipated as a result of the predicted impacts.
2b. The distribution of the qualifying features is maintained throughout the site by avoiding significant disturbance of the species.	The wider literature indicates that great northern divers are distributed throughout the Moray Firth SPA. According to the 2020 DAS, key areas within the Moray Firth SPA for this species overlap with areas which may be used by construction vessels. Whilst direct impacts on the birds within them are likely to occur, these areas are already subject to disturbance by vessel traffic. This extra vessel traffic would not result in significant disturbance of great northern diver within the Moray Firth SPA beyond the level that already exists, and it is expected that distribution of the qualifying feature would be maintained. It is therefore anticipated that despite the predicted impacts, great northern diver will continue to have access to and can utilise all optimal habitats suitable for all relevant aspects of their life cycle associated within the Moray Firth SPA.
2c. The supporting habitats and processes relevant to qualifying features and their prey resources are maintained, or where appropriate restored, at the Moray Firth SPA.	The key supporting processes for great northern divers at the Moray Firth SPA are not well known but may include water quality (nutrients and turbidity), tidal cycles, and water flow. Relatively modest increases in the number of vessel movements across the Moray Firth SPA, with adherence to best practice procedures detailed by the VMP to minimise disturbance, mean that no impacts on Moray Firth SPA great northern diver are anticipated that would interfere with the supporting habitats and processes relevant to them.

4.5 Long-tailed Duck

4.5.1 Evidence for Sensitivity to Vessel Disturbance

4.5.1.1 Long-tailed duck was assessed to have a low sensitivity to human disturbance by Goodship and Furness (2019[9]) in the context of hand-harvesting of seaweed. However, Jarrett *et al*. (2018[12]) reported a high sensitivity of this species to boat disturbance, with a particularly high likelihood of flight responses to disturbance noted. The mean escape distance (and sample size) reported by Fliessbach *et al*. (2019[8]) was relatively low when compared with other species thought to be sensitive to disturbance by vessels and was similar for both individuals and groups (Table 4-11). The certainty regarding the understanding of disturbance and displacement impacts of this species due to vessels was classified as high by Wade *et al*. (2016[5]).

Table 4-11: Mean escape distances, standard deviations, and sample sizes of observations for long-tailed duck (individuals and flocks), reproduced from Fliessbach *et al*. (2019[8]).

Species	Published escape distance for individual birds (m)	Published escape distance for flocks of birds (m)
Long-tailed duck	389 (+/- 227) (n=8,274)	325 (+/- 235) (n=604)

4.5.2 Moray Firth SPA Population Estimates

4.5.2.1 Key Moray Firth SPA population estimates and densities for this species are summarised in Table 4-12.

Table 4-12: Key population estimates and densities for long-tailed duck within the Moray Firth SPA.

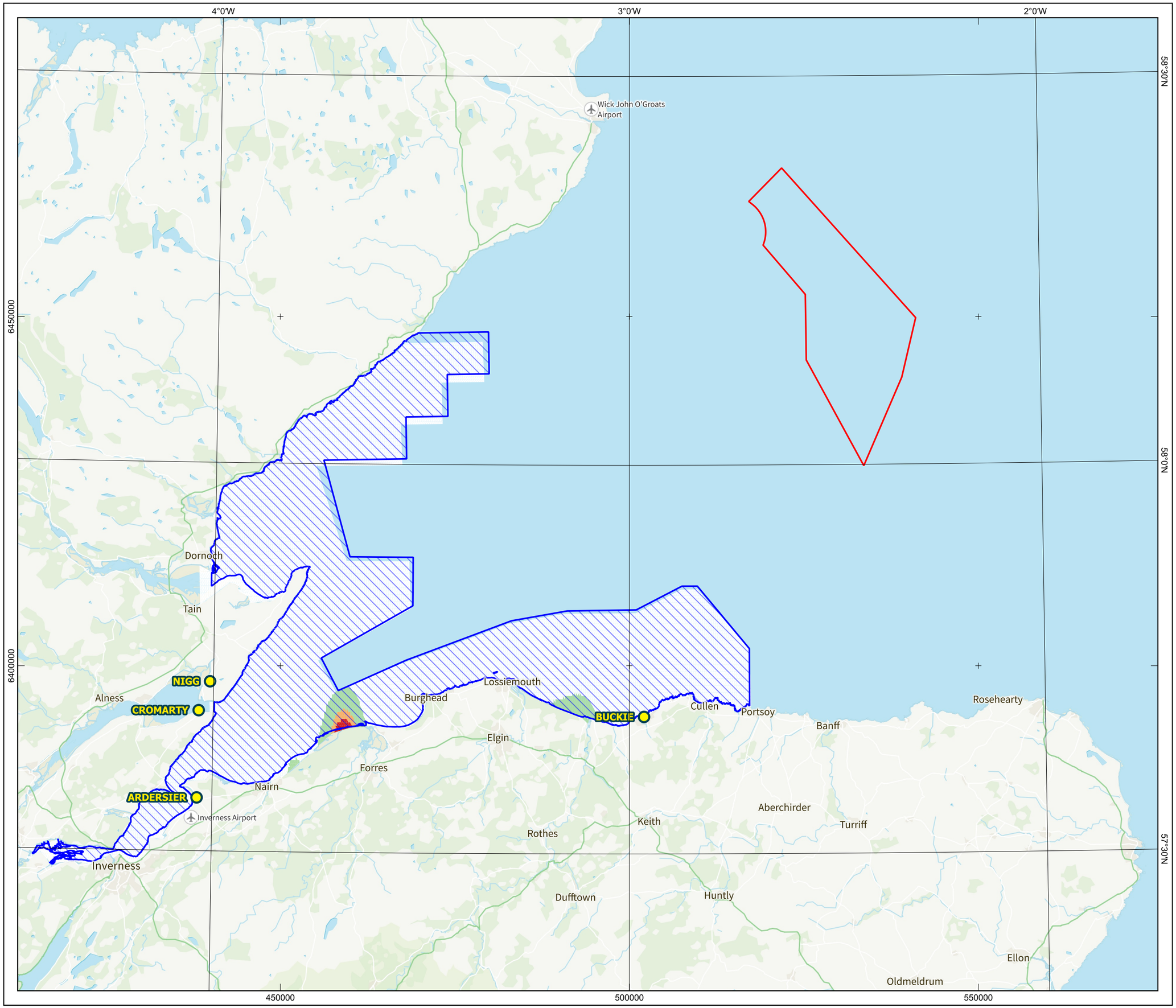
Source	Date(s)	Method	Population Estimate
Moray Firth SPA citation	2001/02 to 2005/06	Shore-based count	5,001 (mean peak)
Lawson *et al*. (2015[3])	2001/02 to 2006/07	Visual aerial surveys, distance analysis	3,167 (mean peak)
Scott *et al*. (2023[1])	19/01/2020	DAS, block bootstrap estimation method; abundance	1,671 (95% CIs 876 – 2,658)
		DAS, block bootstrap estimation method; density	0.79 (0.00 – 5.21)
	08/03/2020	DAS, block bootstrap estimation method; abundance	4,328 (95% CIs 1,985 – 7,412)
		DAS, block bootstrap estimation method; density	2.35 (0.00 – 19.26)

4.5.3 Moray Firth SPA Population Distribution

4.5.3.1 Conservation Advice for the Moray Firth SPA (NatureScot, 2022[2]) states that long-tailed duck are widely distributed throughout the Moray Firth SPA, with high concentrations often being recorded off Golspie, Embo, Dornoch, Portmahomack, Spey Bay and along the south coast of the Moray Firth. Inshore waters are normally used for foraging, socialising, roosting and maintenance activities. The key supporting processes for long-tailed duck at the Moray Firth SPA are water quality (nutrients and turbidity), tidal cycles, and water flow (NatureScot, 2022[2]).

4.5.3.2 Long-tailed duck occurred in the 2020 DAS throughout much of the Moray Firth SPA, in line with information presented by NatureScot (2022[2]). Higher densities of birds were predicted to occur in the Nairn and Culbin Bar areas, Spey Bay, the inner Moray Firth, and the Dornoch Firth (Figure 4–7 and Figure 4–8, Figure 12). In all cases, the highest modelled densities of birds were strongly associated with coastal locations. It is noted that this species may have a different distribution across the Moray Firth SPA at night, due to its known tendency to move into offshore roosting areas during this time.

4.5.3.3 Modelled distributions based on data from 2001 to 2007 indicated that birds are predicted to occur throughout the Moray Firth SPA, with particularly high densities predicted to occur off Burghead (MacArthur Green, 2024[4]).



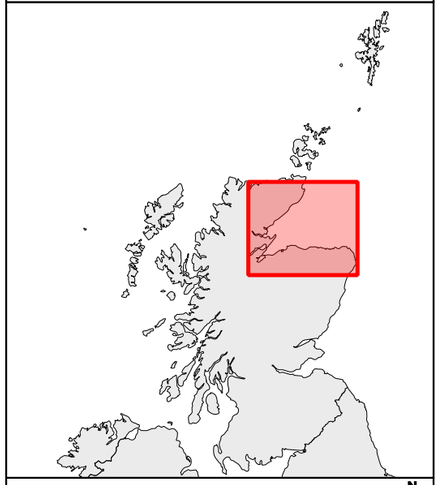
Caledonia Array Area

Port Location

Moray Firth Special Protection Area (SPA)

Modelled density of Long-Tailed Duck (birds/km2)

- 0 - 5
- 5 - 10
- 10 - 12
- 12 - 15



0 5 10 15 20 25 km

N

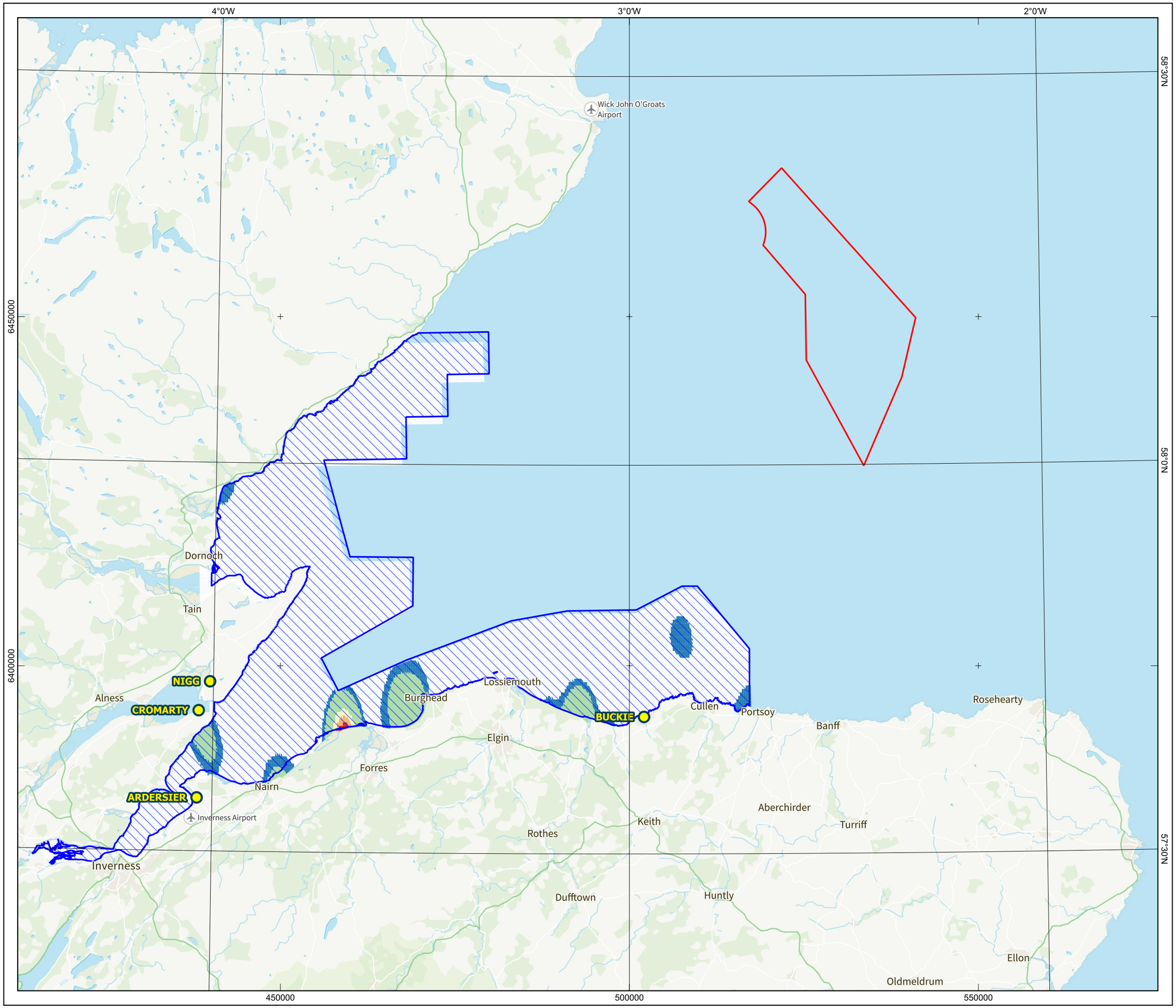
REV	DATE	DOC STATUS	ORIGIN	REVIEW	APP
01	02/10/2025	Information	TG	RI	AS

CALEDONIA Offshore Wind Farm

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

DRAWING TITLE
Figure 4-7: Modelled distribution of long-tailed duck based on digital aerial survey data collected on 19th January 2020

STATUS	SCALE	
Information	1:500,000 @ A3	
DRAWING NUMBER	SHEET NO	REV
UKCAL-CWF-CON-ENV-MAP-00043	01 of 01	01



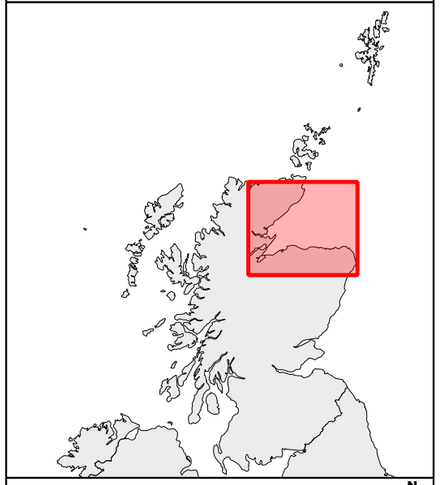
Caledonia Array Area

Port Location

Moray Firth Special Protection Area (SPA)

Modelled density of Long-Tailed Duck (birds/km2)

- 0 - 5
- 5 - 10
- 10 - 50
- 50 - 75
- 75 - 100
- 100 - 125



0 5 10 15 20 25 km

N

REV	DATE	DOC STATUS	ORIGIN	REVIEW	APP
01	02/10/2025	Information	TG	RI	AS

CALEDONIA Offshore Wind Farm

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

DRAWING TITLE

Figure 4-8: Modelled distribution of long-tailed duck based on digital aerial survey data collected on 8th March 2020

STATUS	SCALE	
Information	1:500,000 @ A3	
DRAWING NUMBER	SHEET NO	REV
UKCAL-CWF-CON-ENV-MAP-00044	01 of 01	01

4.5.4 Assessment of Potential Impacts

4.5.4.1 Modelled distributions from the 2020 DAS data (Figure 4–7 and Figure 4–8) and other sources of information indicate that this species displays a strong preference for nearshore waters within the Moray Firth SPA. It is therefore anticipated that birds are unlikely to be present in substantial numbers between the Proposed Development (Offshore), and any of the construction ports under consideration (Buckie, Cromarty/Nigg, and Ardersier).

4.5.4.2 Direct impacts due to construction vessels associated with the Proposed Development (Offshore) occurring on the habitats within coastal areas, or the birds using them, are considered to be unlikely as construction vessels are not expected to operate routinely in nearshore locations except when entering and exiting port locations. Since long-tailed duck distributions are heavily associated with coastal, shallow waters, the areas in which construction vessels will routinely operate are unlikely to represent key habitat for this species, irrespective of which ports are used for construction of the Proposed Development (Offshore).

4.5.4.3 Distributions of this species may differ at night, which could result in a greater possibility of direct impacts due to disturbance of this species by construction vessels. Given that roosting areas are typically reached by birds swimming from their preferred daytime habitats (NatureScot, 2022[2]), the locations of these roosting areas are likely to still be relatively coastal, meaning that the possibility of frequent disturbance and displacement of substantial numbers of birds by construction vessels remains low.

4.5.4.4 The available data and other information indicates that disturbance of long-tailed duck by construction vessel traffic, if it occurs, would be infrequent, spatiotemporally restricted, and involve low numbers of birds relative to the wider population of the Moray Firth SPA. Of any birds disturbed, it is likely that only a proportion would actually be displaced.

4.5.4.5 Away from coastal locations, the high levels of existing vessel activity within much of the Moray Firth SPA (Figure 3–1) suggest that disturbance of habitats used by Moray Firth SPA qualifying features by vessel traffic, and therefore potential disturbance and displacement of SPA qualifying features, is likely to be part of the existing nature of the SPA. It is considered that modest increases in vessel traffic in areas where vessels already frequently operate are unlikely to result in increases in mortality to any disturbed/displaced birds that would be detectable. In addition, the supporting habitats and processes relevant to this qualifying feature and its prey resources are not anticipated to be impacted for the same reason.

4.5.4.6 It is anticipated that the birds that could be displaced would be able to relocate to appropriate habitats within the Moray Firth SPA and could also return to the area from which they were displaced relatively quickly due to

the transient nature of vessel disturbance. Because of the low numbers of birds that can be potentially displaced by construction vessel traffic relative to the population of the SPA, indirect effects on birds in other areas as a result of this impact can be ruled out.

4.5.4.7 In summary, it is not considered that the anticipated construction vessel traffic associated with the Proposed Development (Offshore) would materially impact the abundance or distribution of long-tailed duck in the Moray Firth SPA. Assessment against Conservation Objectives 2a, 2b and 2c indicates that they will all be met despite the potential for minor disturbance impacts (Table 4-6). It is therefore concluded that the construction vessel traffic associated with the Proposed Development (Offshore) will not result in an AEoSI on the long-tailed duck qualifying feature of the Moray Firth SPA either alone, or in-combination with other existing activities.

Table 4-13: Assessment of predicted impacts on long-tailed duck qualifying feature of the Moray Firth SPA.

Conservation Objective	Conclusion
1. To ensure that the qualifying features of the Moray Firth SPA are in favourable condition and make an appropriate contribution to achieving Favourable Conservation Status.	The predicted impacts will not prevent the Moray Firth SPA long-tailed duck population from being maintained on a long-term basis as a viable component of its natural habitats, reduce its natural range, or reduce the habitats available to it.
2. To ensure that the integrity of the Moray Firth SPA is restored in the context of environmental changes by meeting objectives 2a, 2b and 2c for each qualifying feature:	See points 2a, 2b and 2c below.
2a. The populations of qualifying features are viable components of the site.	No mortality, injury or removal that would lead to a long-term decline of long-tailed duck within the Moray Firth SPA is anticipated as a result of the predicted impacts.
2b. The distribution of the qualifying features is maintained throughout the site by avoiding significant disturbance of the species.	Key areas within the Moray Firth SPA for this species do not overlap with the areas expected to be affected, and so no direct impacts on the birds within them are predicted. Whilst small numbers of birds may be disturbed and/or displaced, this will be insignificant at the level of the Moray Firth SPA population. It is therefore anticipated that despite the predicted impacts, long-tailed duck will continue to have access to and can utilise all optimal habitats suitable for all relevant aspects of their life cycle associated within the Moray Firth SPA.
2c. The supporting habitats and processes relevant to qualifying features and their prey resources are maintained, or where appropriate restored, at the Moray Firth SPA.	The key supporting processes for long-tailed duck at the Moray Firth SPA are water quality (nutrients and turbidity), tidal cycles, and water flow. Relatively modest increases in the number of vessel movements across the Moray Firth SPA, with adherence to best practice procedures detailed by the VMP to minimise disturbance, mean that no impacts on Moray Firth SPA long-tailed duck are anticipated that would interfere with the supporting habitats and processes relevant to them.

4.6 Red-breasted Merganser

4.6.1 Evidence for Sensitivity to Vessel Disturbance

4.6.1.1 Jarrett *et al*. (2018[12]) reported a very high sensitivity of red-breasted merganser to vessel disturbance at sea. The mean escape distance (and sample size) reported by Fliessbach *et al*. (2019[8]) was relatively high when compared with other species thought to be sensitive to disturbance by vessels and was considerably larger for individuals than groups of birds (Table 4-14). Red-breasted merganser was assessed to have a medium sensitivity to human disturbance by Goodship and Furness (2019[9]) in the context of hand-harvesting of seaweed.

Table 4-14: Mean escape distances, standard deviations, and sample sizes of observations for red-breasted merganser (individuals and flocks), reproduced from Fliessbach *et al*. (2019[8]).

Species	Published escape distance for individual birds (m)	Published escape distance for flocks of birds (m)
Red-breasted merganser	1,178 (+/- 617) (n=193)	681 (+/- 485) (n=41)

4.6.2 Moray Firth SPA Population Estimates

4.6.2.1 Key Moray Firth SPA population estimates and densities for this species are summarised in Table 4-15.

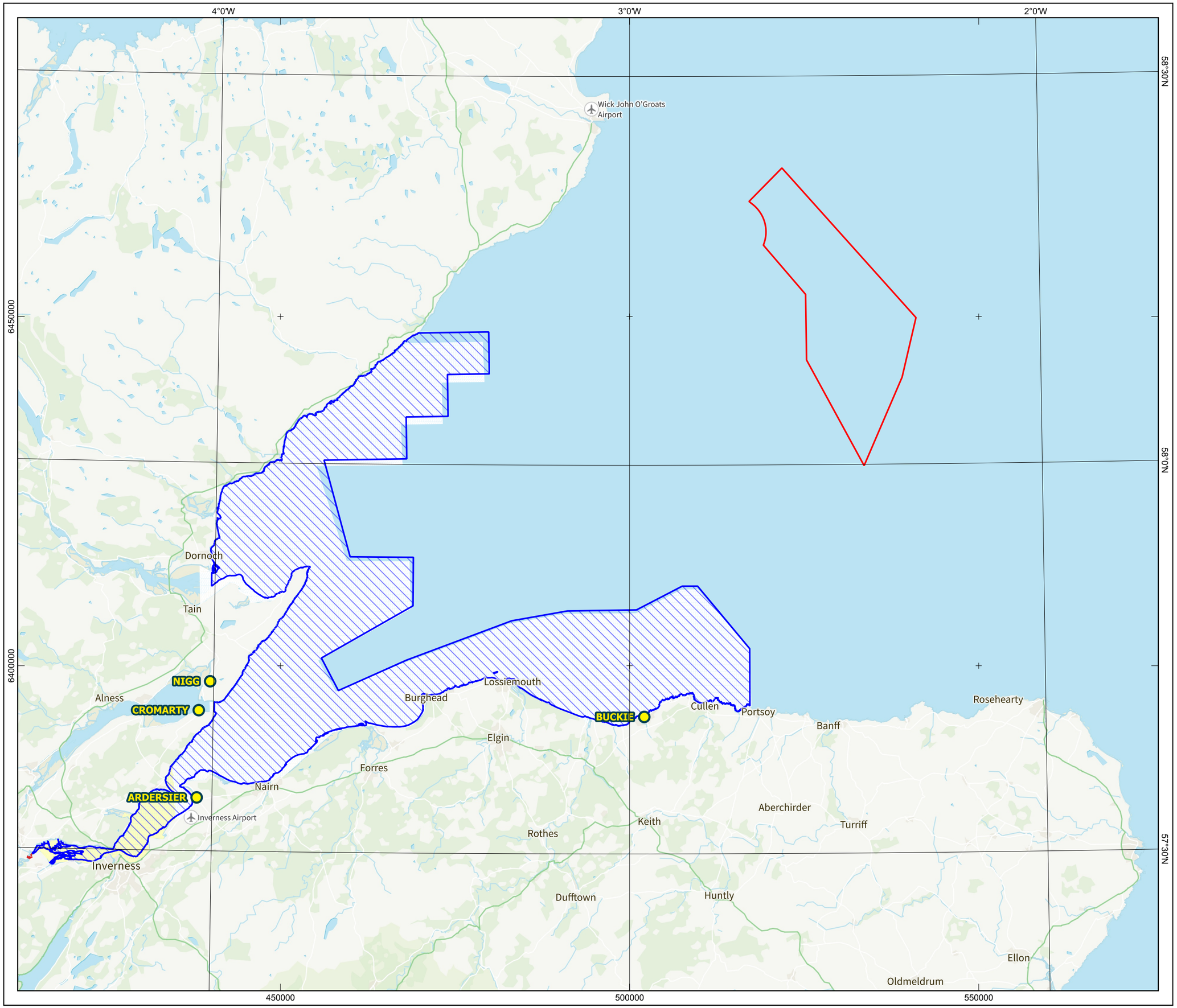
Table 4-15: Key population estimates and densities for red-breasted merganser within the Moray Firth SPA.

Source	Date(s)	Method	Population Estimate
Moray Firth SPA citation	2001/02 to 2005/06	Shore-based count	151 (mean peak)
Lawson *et al*. (2015)	2001/02 to 2006/07	Visual aerial surveys, distance analysis	80 (mean peak)
Scott *et al*. (2023)	19/01/2020	DAS, block bootstrap estimation method; abundance	49 (95% CIs 6 – 108)
		DAS, block bootstrap estimation method; density	0.02 (0.00 – 0.06)
	08/03/2020	DAS, block bootstrap estimation method; abundance	362 (95% CIs 134 – 655)
		DAS, block bootstrap estimation method; density	0.17 (0.00 – 1.75)

4.6.3 Moray Firth SPA Population Distribution

4.6.3.1 Conservation Advice for the Moray Firth SPA (NatureScot, 2022[2]) does not contain site-specific information regarding the distribution of red-breasted merganser. The advice does note that in Scotland, red-breasted mergansers occur in open coastal habitats with clear, shallow waters and have been associated with both rocky and sandy substrates. Open, deeper waters are also used potentially for loafing, moulting and roosting. The key supporting processes for red-breasted merganser at the Moray Firth SPA are water quality (nutrients and turbidity), tidal cycles, and water flow (NatureScot, 2022[2]).

4.6.3.2 The modelled density surfaces produced from the 2020 DAS data (Figure 4–9 and Figure 4–10) indicate that red-breasted merganser were strongly associated with coastal waters at the western extent of the Moray Firth SPA, with all areas of predicted higher modelled density strongly associated with coastal locations. Key areas for this species were the Dornoch Firth and Loch Fleet to the north, the inner Moray Firth, and the Nairn coast. The March 2020 DAS also revealed a small modelled hotspot of birds in Spey Bay. These observations were similar to the distribution of records of this species made between 2001 and 2006; all records were made in coastal areas, with a higher proportion located towards the western extent of the Moray Firth SPA (MacArthur Green, 2024[4]).



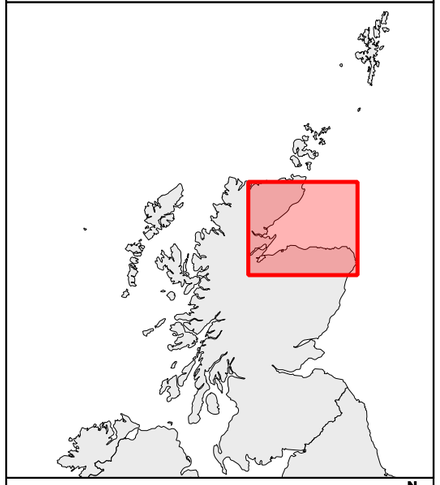
Caledonia Array Area

Port Location

Moray Firth Special Protection Area (SPA)

Modelled density of Red-breasted Merganser (birds/km2)

- 0 - 0.05
- 0.05 - 0.1
- 0.1 - 0.12



0 5 10 15 20 25 km

N

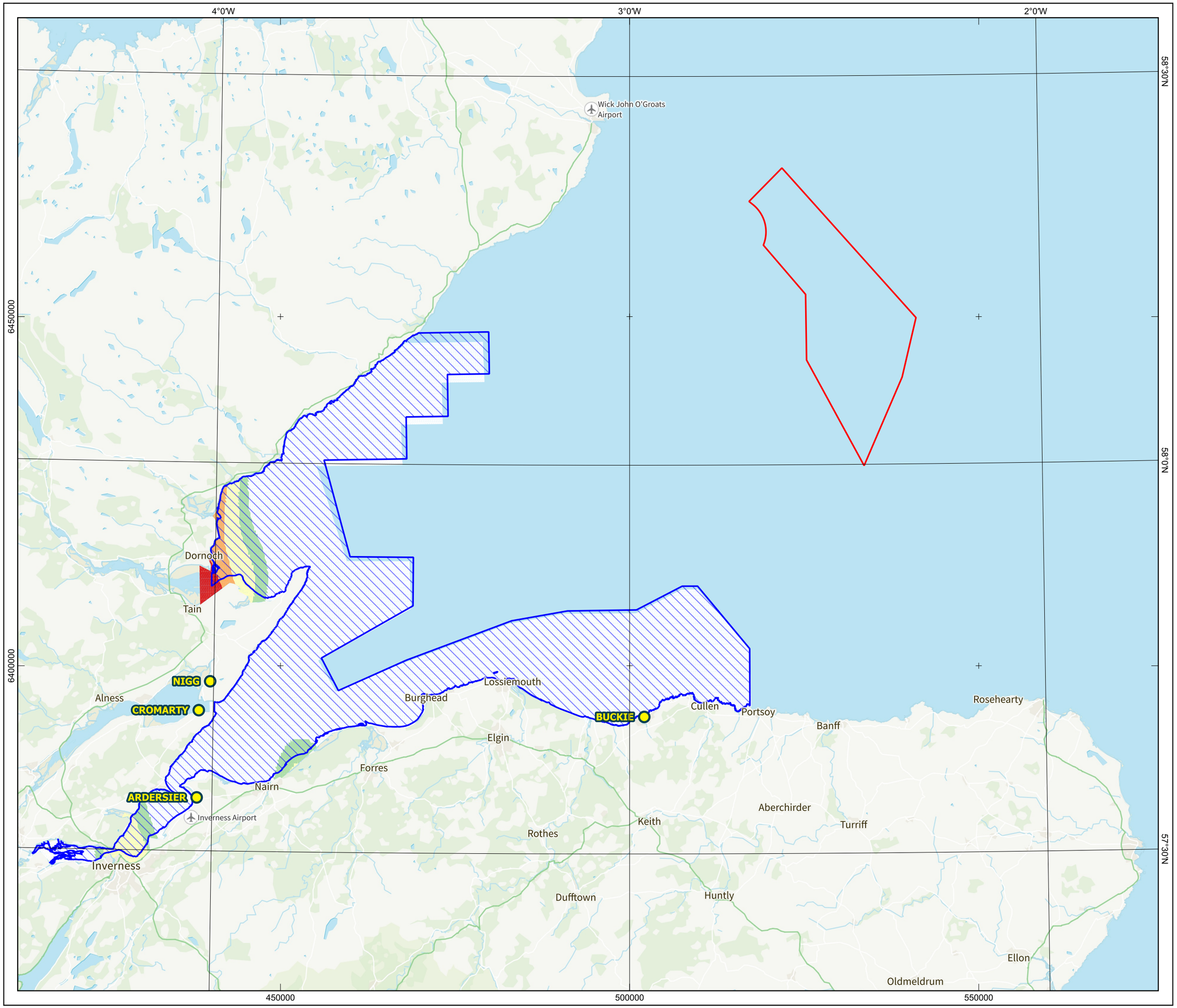
REV	DATE	DOC STATUS	ORIGIN	REVIEW	APP
01	02/10/2025	Information	TG	RI	AS

CALEDONIA Offshore Wind Farm

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

DRAWING TITLE
Figure 4-9: Modelled distribution of red-breasted merganser based on digital aerial survey data collected on 19th January 2020

STATUS	SCALE	
Information	1:500,000 @ A3	
DRAWING NUMBER	SHEET NO	REV
UKCAL-CWF-CON-ENV-MAP-00045	01 of 01	01



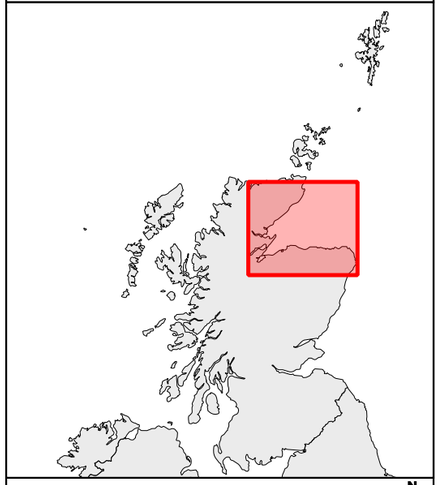
Caledonia Array Area

Port Location

Moray Firth Special Protection Area (SPA)

Modelled density of Red-Breasted Merganser (birds/km2)

- 0 - 0.5
- 0.5 - 1
- 1 - 2
- 2 - 3
- 3 - 4.5



0 5 10 15 20 25 km

N

REV	DATE	DOC STATUS	ORIGIN	REVIEW	APP
01	02/10/2025	Information	TG	RI	AS

CALEDONIA Offshore Wind Farm

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

DRAWING TITLE
Figure 4-10: Modelled distribution of red-breasted merganser based on digital aerial survey data collected on 8th March 2020

STATUS	SCALE	
Information	1:500,000 @ A3	
DRAWING NUMBER	SHEET NO	REV
UKCAL-CWF-CON-ENV-MAP-00046	01 of 01	01

4.6.4 Assessment of Potential Impacts

4.6.4.1 Modelled distributions from the 2020 DAS data (Figure 4–9 and Figure 4–10) and other sources of information indicate that this species displays a strong preference for nearshore waters within the Moray Firth SPA. It is therefore anticipated that birds are unlikely to be present in substantial numbers between the Proposed Development (Offshore), and any of the construction ports under consideration (Buckie, Cromarty/Nigg, and Ardersier).

4.6.4.2 Direct impacts due to construction vessels associated with the Proposed Development (Offshore) occurring on the habitats within coastal areas, or the birds using them, are considered to be unlikely as construction vessels are not expected to operate routinely in nearshore locations except when entering and exiting port locations. Since red-breasted merganser distributions are heavily associated with coastal, shallow waters, the areas in which construction vessels will routinely operate are unlikely to represent key habitat for this species, irrespective of which ports are used for construction of the Proposed Development (Offshore).

4.6.4.3 The available data and other information indicates that disturbance of red-breasted merganser by construction vessel traffic, if it occurs, would be infrequent, spatiotemporally restricted, and involve low numbers of birds relative to the wider population of the Moray Firth SPA. Of any birds disturbed, it is likely that only a proportion would actually be displaced. The predicted impact of low levels of displacement of this nature is predicted to be negligible at the level of the Moray Firth SPA population.

4.6.4.4 Away from coastal locations, the high levels of existing vessel activity within much of the Moray Firth SPA (Figure 3–1) suggest that disturbance of habitats used by Moray Firth SPA qualifying features by vessel traffic, and therefore potential disturbance and displacement of SPA qualifying features, is likely to be part of the existing nature of the SPA.. It is considered that modest increases in vessel traffic in areas where vessels already frequently operate are unlikely to result in increases in mortality to any disturbed/displaced birds that would be detectable. In addition, the supporting habitats and processes relevant to this qualifying feature and its prey resources are not anticipated to be impacted for the same reason.

4.6.4.5 It is anticipated that the birds that could be displaced would be able to relocate to appropriate habitats within the Moray Firth SPA and could also return to the area from which they were displaced relatively quickly due to the transient nature of vessel disturbance. Because of the low numbers of birds that can be potentially displaced by construction vessel traffic relative to the population of the SPA, indirect effects on birds in other areas as a result of this impact can be ruled out.

4.6.4.6 In summary, it is not considered that the anticipated construction vessel traffic associated with the Proposed Development (Offshore) would materially impact the abundance or distribution of red-breasted merganser in the Moray Firth SPA. Assessment against Conservation Objectives 2a, 2b and 2c indicates that they will all be met despite the potential for minor disturbance impacts (Table 4-16). It is therefore concluded that the construction vessel traffic associated with the Proposed Development (Offshore) will not result in an AEoSI on the red-breasted merganser qualifying feature of the Moray Firth SPA either alone, or in-combination with other existing activities.

Table 4-16: Assessment of predicted impacts on red-breasted merganser qualifying feature of the Moray Firth SPA.

Conservation Objective	Conclusion
1. To ensure that the qualifying features of the Moray Firth SPA are in favourable condition and make an appropriate contribution to achieving Favourable Conservation Status.	The predicted impacts will not prevent the Moray Firth SPA red-breasted merganser population from being maintained on a long-term basis as a viable component of its natural habitats, reduce its natural range, or reduce the habitats available to it.
2. To ensure that the integrity of the Moray Firth SPA is restored in the context of environmental changes by meeting objectives 2a, 2b and 2c for each qualifying feature:	See points 2a, 2b and 2c below.
2a. The populations of qualifying features are viable components of the site.	No mortality, injury or removal that would lead to a long-term decline of red-breasted merganser within the Moray Firth SPA is anticipated as a result of the predicted impacts.
2b. The distribution of the qualifying features is maintained throughout the site by avoiding significant disturbance of the species.	Key areas within the Moray Firth SPA for this species do not overlap with the areas expected to be affected, and so no direct impacts on the birds within them are predicted. Whilst small numbers of birds may be disturbed and/or displaced, this will be insignificant at the level of the Moray Firth SPA population. It is therefore anticipated that despite the predicted impacts, red-breasted merganser will continue to have access to and utilise all optimal habitats suitable for all relevant aspects of their life cycle associated within the Moray Firth SPA.
2c. The supporting habitats and processes relevant to qualifying features and their prey resources are maintained, or where appropriate restored, at the Moray Firth SPA.	The key supporting processes for red-breasted merganser at the Moray Firth SPA are water quality (nutrients and turbidity), tidal cycles, and water flow. Relatively modest increases in the number of vessel movements across the Moray Firth SPA, with adherence to best practice procedures detailed by the VMP to minimise disturbance, mean that no impacts on Moray Firth SPA red-breasted merganser are anticipated that would interfere with the supporting habitats and processes relevant to them.

4.7 Red-throated Diver

4.7.1 Evidence for Sensitivity to Vessel Disturbance

4.7.1.1 Red-throated diver is widely regarded as being of very high sensitivity to vessel disturbance (Furness *et al*., 2013[10]; Jarrett *et al*., 2018[12]; Schwemmer *et al*., 2011[6]). However, the certainty regarding the understanding of disturbance and displacement impacts of this species due to vessels was classified as high by Wade *et al*. (2016[5]).

4.7.1.2 The mean escape distance reported by Fliessbach *et al*. (2019[8]) was similar for both individuals and groups of birds. The sample size of the study was relatively small, and observations of escape distances for unidentified divers, which were probably in the main red-throated divers that could not be identified due to the distance between the observer and the bird, were considerably greater (Table 4-17).

Table 4-17: Mean escape distances, standard deviations, and sample sizes of observations for unidentified diver and red-throated diver (individuals and flocks), reproduced from Fliessbach *et al*. (2019[8]).

Species	Published escape distance for individual birds (m)	Published escape distance for flocks of birds (m)
Unidentified diver	1,374 (+/- 416) (n=64)	1,281 (+/-424) (n=40)
Red-throated diver	750 (+/- 437) (n=31)	702 (+/- 348) (n=21)

4.7.2 Moray Firth SPA Population Estimates

4.7.2.1 Key Moray Firth SPA population estimates and densities for this species are summarised in Table 4-18.

Table 4-18: Key population estimates and densities for red-throated diver within the Moray Firth SPA.

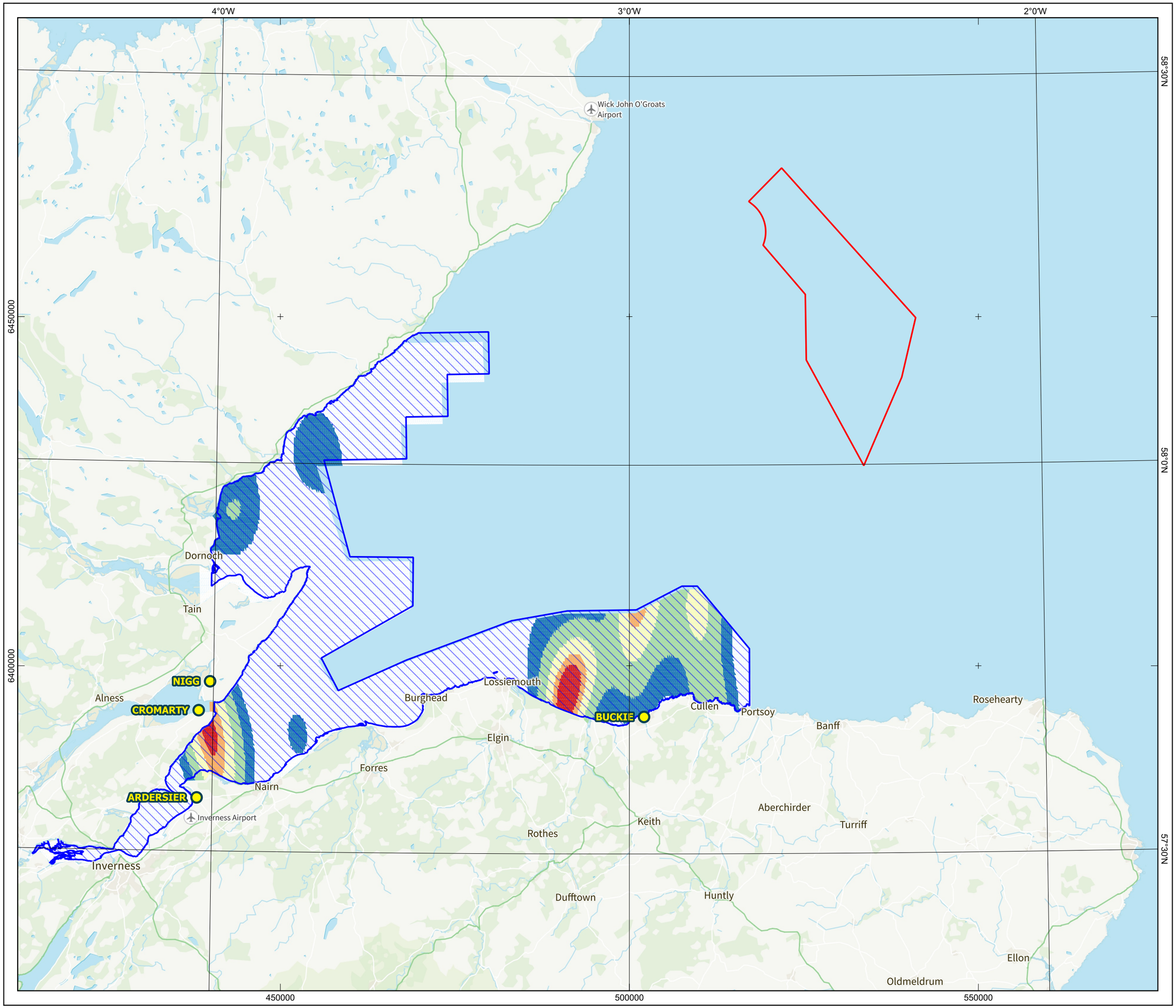
Source	Date(s)	Method	Population Estimate
Moray Firth SPA citation, Lawson *et al*. (2015[3])	2001/02 to 2005/07	Visual aerial surveys, distance analysis	324 (mean peak)
Scott *et al*. (2023[1])	19/01/2020	DAS, block bootstrap estimation method; abundance	259 (95% CIs 139 – 386)
		DAS, block bootstrap estimation method; density	0.14 (0.00 – 0.80)
	08/03/2020	DAS, block bootstrap estimation method; abundance	880 (95% CIs 552 – 1,315)
		DAS, block bootstrap estimation method; density	0.50 (0.00 – 2.62)

4.7.3 Moray Firth SPA Population Distribution

4.7.3.1 Red-throated diver use habitats within the Moray Firth SPA for foraging, resting, and other maintenance activities. The key supporting processes for red-throated divers in the Moray Firth SPA are water quality (nutrients and turbidity), tidal cycles, and water flow (NatureScot, 2022[2]). Conservation Advice for the Moray Firth SPA (NatureScot, 2022[2]) states that red-throated divers are widely distributed throughout the Moray Firth SPA. Birds have been recorded in higher densities in the Outer Dornoch Firth, the Inverness Firth, around Spey Bay and between Cromarty Firth and Tarbet Ness along the coast of Easter Ross. Modelled distributions based on data collected between 2001 and 2007 indicate that in addition to the area in Spey Bay and the coastal waters around the Dornoch Firth, other areas of high predicted great northern/red-throated density were located at the mouth of the Cromarty Firth and the inner Moray Firth (MacArthur Green, 2024[4]).

4.7.3.2 In the January 2020 DAS (Figure 4–11), the highest modelled densities of red-throated divers were located in Spey Bay and the eastern edge of the Moray Firth SPA. Another area of high modelled density was the habitat area to the northwest of Nairn, stretching north to the mouth of the Cromarty Firth. Other hotspots in modelled density occurred at Culbin Bar, the mouth of Loch Fleet, and off the coast of Brora.

4.7.3.3 Modelled distribution and density data from the March 2020 DAS indicates a more westerly predicted distribution of the population compared with the January 2020 DAS (Figure 4–12). The highest densities of birds were predicted off Inver and at the mouth of the Dornoch Firth. Culbin Bar and Nairn, the Spey Bay area and the East Caithness coast were also predicted to support higher densities of birds relative to the surrounding habitats.



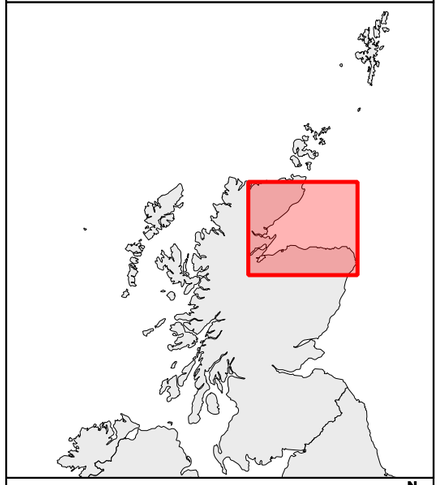
Caledonia Array Area

Port Location

Moray Firth Special Protection Area (SPA)

Modelled density of Red-Throated Diver (birds/km2)

- 0 - 0.1
- 0.1 - 0.25
- 0.25 - 0.5
- 0.5 - 0.75
- 0.75 - 0.9
- 0.9 - 1.1



0 5 10 15 20 25 km

N

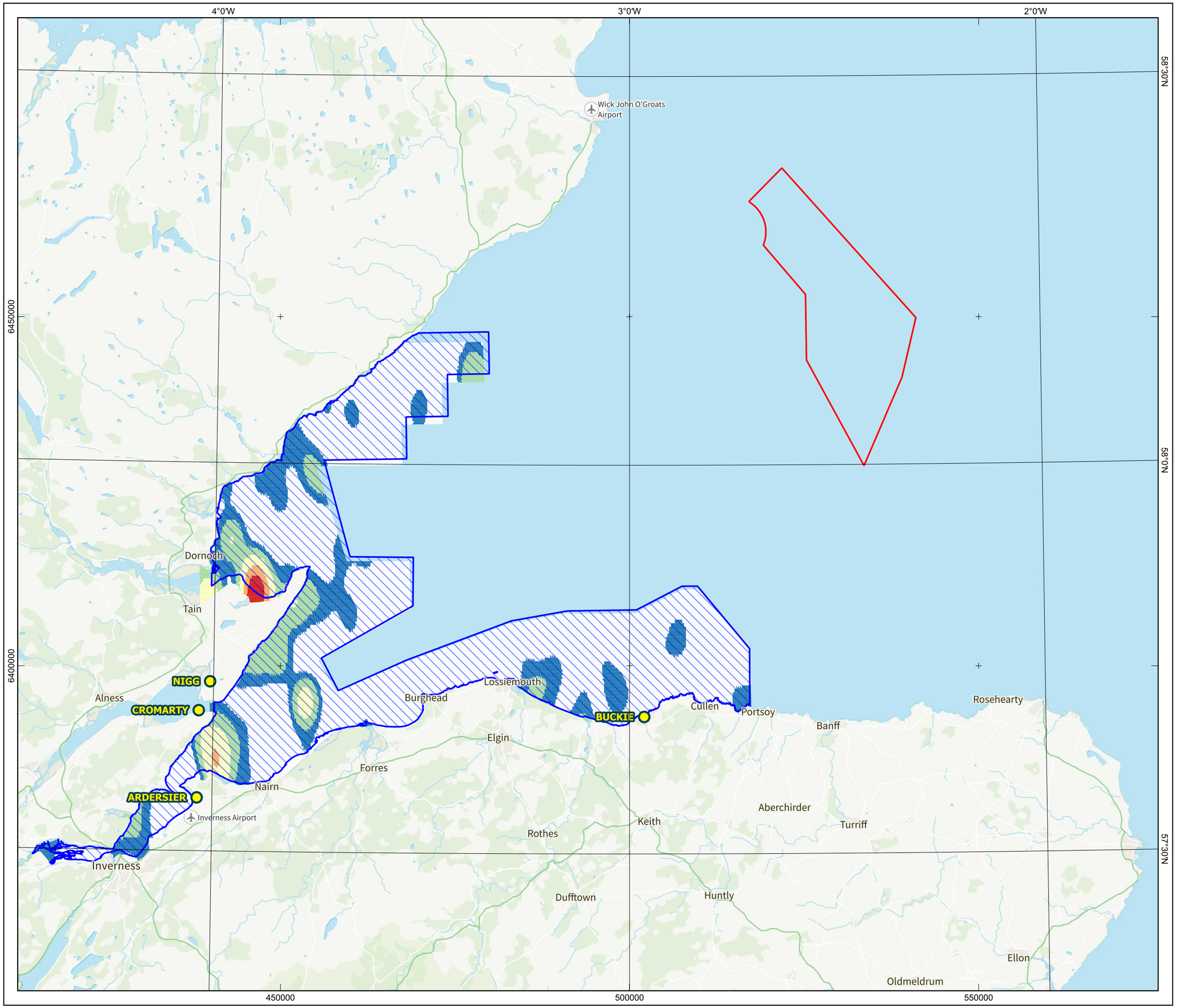
REV	DATE	DOC STATUS	ORIGIN	REVIEW	APP
01	02/10/2025	Information	TG	RI	AS

CALEDONIA Offshore Wind Farm

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

DRAWING TITLE
Figure 4-11: Modelled distribution of red-throated diver based on digital aerial survey data collected on 19th January 2020

STATUS	SCALE	
Information	1:500,000 @ A3	
DRAWING NUMBER	SHEET NO	REV
UKCAL-CWF-CON-ENV-MAP-00047	01 of 01	01



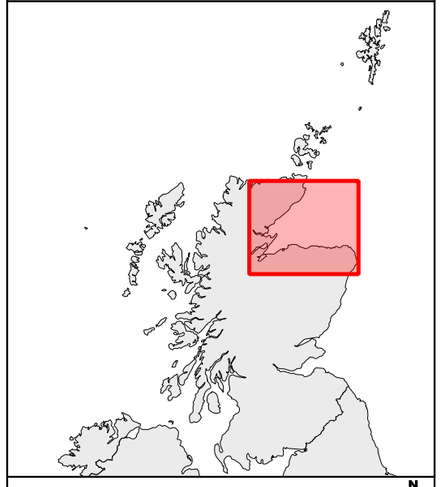
Caledonia Array Area

Port Location

Moray Firth Special Protection Area (SPA)

Modelled density of Red-Throated Diver (birds/km2)

- 0 - 0.5
- 0.5 - 1
- 1 - 2
- 2 - 4
- 4 - 6
- 6 - 8



REV	DATE	DOC STATUS	ORIGIN	REVIEW	APP
01	02/10/2025	Information	TG	RI	AS

CALEDONIA Offshore Wind Farm

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

DRAWING TITLE

Figure 4-12: Modelled distribution of red-throated diver based on digital aerial survey data collected on 8th March 2020

STATUS	SCALE	
Information	1:500,000 @ A3	
DRAWING NUMBER	SHEET NO	REV
UKCAL-CWF-CON-ENV-MAP-00048	01 of 01	01

4.7.4 Assessment of Potential Impacts

4.7.4.1 Modelled distributions from the 2020 DAS data (Figure 4–11 and Figure 4–12) and other sources of information indicate that this species is expected to be distributed throughout many areas of the Moray Firth SPA, with an apparent preference for waters located several kilometres from coastal areas. It is therefore anticipated that birds are at times likely to be present in substantial numbers between the Proposed Development (Offshore), and any of the construction ports under consideration (Buckie, Cromarty/Nigg, and Ardersier). Direct impacts due to construction vessels associated with the Proposed Development (Offshore) occurring on the habitats frequently utilised by this species, and the qualifying feature itself, are therefore considered to be possible as construction vessels are expected to operate routinely in these locations.

4.7.4.2 There is considerable overlap between areas where high levels of existing vessel activity occurs (i.e., within much of the Moray Firth SPA (Figure 3–1)), and the distribution of this qualifying feature (both from the 2020 DAS (Figure 4–11 and Figure 4–12), and other information sources). This suggests that disturbance of habitats used by this Moray Firth SPA qualifying features by vessel traffic, and therefore potential disturbance and displacement of the SPA qualifying feature itself, is likely to be part of the existing nature of the SPA. Birds are present in these habitats despite existing levels of vessel traffic, which in the southern portion of the Moray Firth SPA consists of multiple unique vessel crossings per day during the non-breeding season (Figure 3–1 and Table 3-1). It is presumed that vessels crossing the habitats used by this SPA qualifying feature at the present rate does not materially impact the ability of birds present to either use the area to carry out their normal activities, or to relocate to other areas of the Moray Firth SPA, which are in many cases subject to similar levels of vessel disturbance (Figure 3–1 and Table 3-1).

4.7.4.3 It is considered that modest increases in vessel traffic in areas where vessels already frequently operate are unlikely to result in increases in either displacement or mortality to any disturbed/displaced birds that would be detectable. In addition, the supporting habitats and processes relevant to this qualifying feature and its prey resources are not anticipated to be impacted for the same reason.

4.7.4.4 Disturbance events of red-throated diver by construction vessel traffic would be spatiotemporally restricted to areas in which construction vessels are operating. Such events would involve low numbers of birds relative to the wider population of the Moray Firth SPA. Of any birds disturbed, it is likely that only a proportion would actually be displaced. The predicted impact of low levels of displacement of this nature is predicted to be negligible at the level of the Moray Firth SPA population.

4.7.4.5 Because of the relatively flexible habitat requirements for this species (based on the widespread distribution of the species throughout the Moray Firth SPA (NatureScot, 2022[2])), it is anticipated that alternative habitats for birds to relocate to in the event of displacement by vessel traffic within the Moray Firth SPA are available. Birds could also return to the area from which they were displaced relatively quickly due to the transient nature of vessel disturbance. This habitat flexibility, combined with the low numbers of birds expected to be impacted at a single time, mean that indirect effects on birds in other areas as a result of this impact can also be ruled out.

4.7.4.6 In summary, it is not considered that the anticipated construction vessel traffic associated with the Proposed Development (Offshore) would materially impact the abundance or distribution of red-throated diver in the Moray Firth SPA. Assessment against Conservation Objectives 2a, 2b and 2c indicates that they will all be met despite the potential for minor disturbance impacts (Table 4-19). It is therefore concluded that the construction vessel traffic associated with the Proposed Development (Offshore) will not result in an AEoSI on the red-throated diver qualifying feature of the Moray Firth SPA either alone, or in-combination with other existing activities.

Table 4-19: Assessment of predicted impacts on red-throated diver qualifying feature of the Moray Firth SPA.

Conservation Objective	Conclusion
1. To ensure that the qualifying features of the Moray Firth SPA are in favourable condition and make an appropriate contribution to achieving Favourable Conservation Status.	The predicted impacts will not prevent the Moray Firth SPA red-throated diver population from being maintained on a long-term basis as a viable component of its natural habitats, reduce its natural range, or reduce the habitats available to it.
2. To ensure that the integrity of the Moray Firth SPA is restored in the context of environmental changes by meeting objectives 2a, 2b and 2c for each qualifying feature:	See points 2a, 2b and 2c below.
2a. The populations of qualifying features are viable components of the site.	No mortality, injury or removal that would lead to a long-term decline of red-throated diver within the Moray Firth SPA is anticipated as a result of the predicted impacts.
2b. The distribution of the qualifying features is maintained throughout the site by avoiding significant disturbance of the species.	The wider literature indicates that red-throated divers are distributed throughout the Moray Firth SPA. According to the 2020 DAS, key areas within the Moray Firth SPA for this species overlap with areas which may be used by construction vessels. Whilst direct impacts on the birds within them are likely to occur, these areas are already subject to disturbance by vessel traffic. This extra vessel traffic would not result in significant disturbance of red-throated diver within the Moray Firth SPA beyond the level that already exists, and it is expected that distribution of the qualifying feature would be maintained. It is therefore anticipated that despite the predicted impacts, red-throated diver will continue to have access to and can utilise all optimal habitats suitable for all relevant aspects of their life cycle associated within the Moray Firth SPA.
2c. The supporting habitats and processes relevant to qualifying features and their prey resources are maintained, or where appropriate restored, at the Moray Firth SPA.	The key supporting processes for red-throated divers at the Moray Firth SPA are not well known but may include water quality (nutrients and turbidity), tidal cycles, and water flow. Relatively modest increases in the number of vessel movements across the Moray Firth SPA, with adherence to best practice procedures detailed by the VMP to minimise disturbance, mean that no impacts on Moray Firth SPA red-throated diver are anticipated that would interfere with the supporting habitats and processes relevant to them.

4.8 Scaup

4.8.1 Evidence for Sensitivity to Vessel Disturbance

4.8.1.1 No published information on vessel disturbance for scaup was identified, though Furness (2013[10]) identified scaup as having a high vulnerability to disturbance by boats. The certainty regarding the understanding of disturbance and displacement impacts of this species due to vessels was classified as high by Wade *et al*. (2016[5]). Scaup was assessed to have a high sensitivity to human disturbance by Goodship and Furness (2019[9]) in the context of hand-harvesting of seaweed.

4.8.2 Moray Firth SPA Population Estimates

4.8.2.1 Key Moray Firth SPA population estimates and densities for this species are summarised in Table 4-20.

Table 4-20: Key population estimates and densities for scaup within the Moray Firth SPA.

Source	Date(s)	Method	Population Estimate
Moray Firth SPA citation	2001/02 to 2005/06	Shore-based count	930 (mean peak)
Lawson *et al*. (2015[3])	2001/02 to 2006/07	Visual aerial surveys, distance analysis	0
Scott *et al*. (2023[1])	19/01/2020	DAS, block bootstrap estimation method; abundance	6 (95% CIs 0 – 18)
		DAS, block bootstrap estimation method; density	0.00 (0.00 – 0.01)
	08/03/2020	DAS, block bootstrap estimation method; abundance	0
		DAS, block bootstrap estimation method; density	0

4.8.3 Moray Firth SPA Population Distribution

4.8.3.1 Scaup require suitable habitat within the SPA for foraging, loafing and roosting, and have a preference for shallow waters. They have been previously recorded as being associated with sandy substrates and over the Zostera zone or over blue mussel beds, although it is not known if they have the same preferences within the Moray Firth SPA (NatureScot, 2022[2]). The key supporting processes for scaup in the Moray Firth SPA are not well known, but may include water quality (nutrients), tidal cycles and water flow (NatureScot, 2022[2]).

4.8.3.2 Scaup were recorded in very low numbers during the 2020 DAS, with no birds at all recorded during the March 2020 survey (Table 4-20). The only location in which birds were recorded in the January 2020 survey was the inner Moray Firth. The low number of observations meant that a modelled distribution surface could not be produced. However, the location of the observation made during the 2020 DAS does tally with observations made between 2001 and 2006, which indicate a westerly distribution of birds strongly associated with coastal waters (MacArthur Green, 2024[4]).

4.8.4 Assessment of Potential Impacts

4.8.4.1 The locations of sightings of this species from the 2020 DAS data and other sources of information indicate that this species displays a strong preference for shallow, nearshore waters within the Moray Firth SPA. It is therefore anticipated that birds are unlikely to be present in substantial numbers between the Proposed Development (Offshore), and any of the construction ports under consideration (Buckie, Cromarty/Nigg, and Ardersier).

4.8.4.2 Direct impacts due to construction vessels associated with the Proposed Development (Offshore) occurring on the habitats within coastal areas, or the birds using them, are considered to be unlikely as construction vessels are not expected to operate routinely in nearshore locations except when entering and exiting port locations. Since scaup distributions are heavily associated with coastal, shallow waters, the areas in which construction vessels will routinely operate are unlikely to represent key habitat for this species, irrespective of which ports are used for construction of the Proposed Development (Offshore).

4.8.4.3 The available data and other information indicates that disturbance of scaup by construction vessel traffic, if it occurs, would be infrequent, spatiotemporally restricted, and involve low numbers of birds relative to the wider population of the Moray Firth SPA. Of any birds disturbed, it is likely that only a proportion would actually be displaced. The predicted impact of low levels of displacement of this nature is predicted to be negligible at the level of the Moray Firth SPA population.

4.8.4.4 Away from coastal locations, the high levels of existing vessel activity within much of the Moray Firth SPA (Figure 3–1) suggest that disturbance of habitats used by Moray Firth SPA qualifying features by vessel traffic, and therefore potential disturbance and displacement of SPA qualifying features, is likely to be part of the existing nature of the SPA. It is considered that modest increases in vessel traffic in areas where vessels already frequently operate are unlikely to result in increases in mortality to any disturbed/displaced birds that would be detectable. In addition, the supporting habitats and processes relevant to this qualifying feature and its prey resources are not anticipated to be impacted for the same reason.

4.8.4.5 It is anticipated that the birds that could be displaced would be able to relocate to appropriate habitats within the Moray Firth SPA and could also return to the area from which they were displaced relatively quickly due to the transient nature of vessel disturbance. Because of the low numbers of birds that can be potentially displaced by construction vessel traffic relative to the population of the SPA, indirect effects on birds in other areas as a result of this impact can be ruled out.

4.8.4.6 In summary, it is not considered that the anticipated construction vessel traffic associated with the Proposed Development (Offshore) would materially impact the abundance or distribution of scaup in the Moray Firth SPA. Assessment against Conservation Objectives 2a, 2b and 2c indicates that they will all be met despite the potential for minor disturbance impacts (Table 4-21). It is therefore concluded that the construction vessel traffic associated with the Proposed Development (Offshore) will not result in an AEoSI on the scaup qualifying feature of the Moray Firth SPA either alone, or in-combination with other existing activities.

Table 4-21: Assessment of predicted impacts on scaup qualifying feature of the Moray Firth SPA.

Conservation Objective	Conclusion
1. To ensure that the qualifying features of the Moray Firth SPA are in favourable condition and make an appropriate contribution to achieving Favourable Conservation Status.	The predicted impacts will not prevent the Moray Firth SPA scaup population from being maintained on a long-term basis as a viable component of its natural habitats, reduce its natural range, or reduce the habitats available to it.
2. To ensure that the integrity of the Moray Firth SPA is restored in the context of environmental changes by meeting objectives 2a, 2b and 2c for each qualifying feature:	See points 2a, 2b and 2c below.
2a. The populations of qualifying features are viable components of the site.	No mortality, injury or removal that would lead to a long-term decline of scaup within the Moray Firth SPA is anticipated as a result of the predicted impacts.
2b. The distribution of the qualifying features is maintained throughout the site by avoiding significant disturbance of the species.	Key areas within the Moray Firth SPA for this species do not overlap with the areas expected to be affected, and so no direct impacts on the birds within them are predicted. Whilst small numbers of birds may be disturbed and/or displaced, this will be insignificant at the level of the Moray Firth SPA population. It is therefore anticipated that despite the predicted impacts, scaup will continue to have access to and can utilise all optimal habitats suitable for all relevant aspects of their life cycle associated within the Moray Firth SPA.
2c. The supporting habitats and processes relevant to qualifying features and their prey resources are maintained, or where appropriate restored, at the Moray Firth SPA.	The key supporting processes for scaup in the Moray Firth SPA are not well known, but may include water quality (nutrients), tidal cycles and water flow. Relatively modest increases in the number of vessel movements across the Moray Firth SPA, with adherence to best practice procedures detailed by the VMP to minimise disturbance, mean that no impacts on Moray Firth SPA scaup are anticipated that would interfere with the supporting habitats and processes relevant to them.

4.9 Slavonian Grebe

4.9.1 Evidence for Sensitivity to Vessel Disturbance

4.9.1.1 Jarrett *et al*. (2018[12]) reported a very high sensitivity of Slavonian grebe to vessel disturbance at sea, noting that evasive flights for this species can be longer than for other species. This can result in the species appearing to be absent from areas where marine activity occurs. Furness (2013[10]) indicated that this species was moderately sensitive to disturbance by vessel traffic relative to others, being allocated a score of three (out of five, where five was the most sensitive). Slavonian grebe was assessed to have a low/medium sensitivity to human disturbance by Goodship and Furness (2019[9]) in the context of hand-harvesting of seaweed. The certainty regarding the understanding of disturbance and displacement impacts of this species due to vessels was classified as high by Wade *et al*. (2016[5]).

4.9.1.2 The mean escape distance (and sample size) reported by Fliessbach *et al*. (2019[8]) was relatively low when compared with other species thought to be sensitive to disturbance by vessels and was similar for individuals and groups of birds (Table 4-22).

Table 4-22: Mean escape distances, standard deviations, and sample sizes of observations for Slavonian grebe (individuals and flocks), reproduced from Fliessbach *et al*. (2019[8]).

Species	Published escape distance for individual birds (m)	Published escape distance for flocks of birds (m)
Slavonian grebe	343 (+/- 255) (n=33)	325 (+/- 268) (n=24)

4.9.2 Moray Firth SPA Population Estimates

4.9.2.1 Key Moray Firth SPA population estimates and densities for this species are summarised in Table 4-23.

Table 4-23: Key population estimates and densities for Slavonian grebe within the Moray Firth SPA.

Source	Date(s)	Method	Population Estimate
Moray Firth SPA citation	2001/02 to 2005/06	Shore-based count	151 (mean peak)
Lawson *et al*. (2015[3])	2001/02 to 2006/07	Visual aerial surveys, distance analysis	80 (mean peak)
Scott *et al*. (2023[1])	19/01/2020	DAS, block bootstrap estimation method; abundance	49 (95% CIs 6 – 108)
		DAS, block bootstrap estimation method; density	No data (model did not produce density surface)
	08/03/2020	DAS, block bootstrap estimation method; abundance	362 (95% CIs 134 – 655)
		DAS, block bootstrap estimation method; density	No data (model did not produce density surface)

4.9.3 Moray Firth SPA Population Distribution

4.9.3.1 Conservation Advice for the Moray Firth SPA (NatureScot, 2022[2]) states that within the SPA, Slavonian grebe require suitable habitat within the SPA for foraging, loafing, and roosting, with birds widely distributed along the coast of the Moray Firth SPA. Slavonian grebes occur in sheltered inshore marine areas with sandy substrates associated with their main prey items. The key supporting processes for Slavonian grebe in the Moray Firth SPA are not well known, but may include water quality (nutrients), tidal cycles and water flow (NatureScot, 2022[2]).

4.9.3.2 During the January 2020 DAS, low numbers of birds were recorded around Brora/Golspie, and in Spey Bay. A similar distribution was recorded during the March 2020 DAS, with the addition of a record from the inner Moray Firth.

4.9.3.3 Based on the 2020 DAS data, Slavonian grebe generally display a preference for coastal waters within the Moray Firth SPA. A very similar distributional pattern (along with birds more commonly being recorded towards to the western boundary of the Moray Firth SPA) was observed from data collected between 2006 and 2011 (MacArthur Green, 2024[4]).

4.9.4 Assessment of Potential Impacts

4.9.4.1 The 2020 DAS detected too few observations of Slavonian grebe to generate meaningful density surface maps. However, based on the literature and data sources examined this species displays a strong preference for nearshore waters within the Moray Firth SPA. It is therefore anticipated that birds are unlikely to be present in substantial numbers between the Proposed Development (Offshore), and any of the construction ports under consideration (Buckie, Cromarty/Nigg, and Ardersier).

4.9.4.2 Direct impacts due to construction vessels associated with the Proposed Development (Offshore) occurring on the habitats within coastal areas, or the birds using them, are considered to be unlikely as construction vessels are not expected to operate routinely in nearshore locations except when entering and exiting port locations. Since Slavonian grebe distributions are heavily associated with coastal, shallow waters, the areas in which construction vessels will routinely operate are unlikely to represent key habitat for this species, irrespective of which ports are used for construction of the Proposed Development (Offshore).

4.9.4.3 The available data and other information indicates that disturbance of Slavonian grebe by construction vessel traffic, if it occurs, would be infrequent, spatiotemporally restricted, and involve low numbers of birds relative to the wider population of the Moray Firth SPA. Of any birds disturbed, it is likely that only a proportion would actually be displaced. The predicted impact of low levels of displacement of this nature is predicted to be negligible at the level of the Moray Firth SPA population.

4.9.4.4 Away from coastal locations, the high levels of existing vessel activity within much of the Moray Firth SPA (Figure 3–1) suggest that disturbance of habitats used by Moray Firth SPA qualifying features by vessel traffic, and therefore potential disturbance and displacement of SPA qualifying features, is likely to be part of the existing nature of the SPA. It is considered that modest increases in vessel traffic in areas where vessels already frequently operate are unlikely to result in increases in mortality to any disturbed/displaced birds that would be detectable. In addition, the supporting habitats and processes relevant to this qualifying feature and its prey resources are not anticipated to be impacted for the same reason.

4.9.4.5 It is anticipated that the birds that could be displaced would be able to relocate to appropriate habitats within the Moray Firth SPA and could also return to the area from which they were displaced relatively quickly due to the transient nature of vessel disturbance. Because of the low numbers of birds that can be potentially displaced by construction vessel traffic relative to the population of the SPA, indirect effects on birds in other areas as a result of this impact can be ruled out.

4.9.4.6 In summary, it is not considered that the anticipated construction vessel traffic associated with the Proposed Development (Offshore) would materially impact the abundance or distribution of Slavonian grebe in the Moray Firth SPA. Assessment against Conservation Objectives 2a, 2b and 2c indicates that they will all be met despite the potential for minor disturbance impacts (Table 4-24). It is therefore concluded that the construction vessel traffic associated with the Proposed Development (Offshore) will not result in an AEoSI on the Slavonian grebe qualifying feature of the Moray Firth SPA either alone, or in-combination with other existing activities.

Table 4-24: Assessment of predicted impacts on Slavonian grebe qualifying feature of the Moray Firth SPA.

Conservation Objective	Conclusion
1. To ensure that the qualifying features of the Moray Firth SPA are in favourable condition and make an appropriate contribution to achieving Favourable Conservation Status.	The predicted impacts will not prevent the Moray Firth SPA Slavonian grebe population from being maintained on a long-term basis as a viable component of its natural habitats, reduce its natural range, or reduce the habitats available to it.
2. To ensure that the integrity of the Moray Firth SPA is restored in the context of environmental changes by meeting objectives 2a, 2b and 2c for each qualifying feature:	See points 2a, 2b and 2c below.
2a. The populations of qualifying features are viable components of the site.	No mortality, injury or removal that would lead to a long-term decline of Slavonian grebe within the Moray Firth SPA is anticipated as a result of the predicted impacts.
2b. The distribution of the qualifying features is maintained throughout the site by avoiding significant disturbance of the species.	Key areas within the Moray Firth SPA for this species do not overlap with the areas expected to be affected, and so no direct impacts on the birds within them are predicted. Whilst small numbers of birds may be disturbed and/or displaced, this will be insignificant at the level of the Moray Firth SPA population. It is therefore anticipated that despite the predicted impacts, Slavonian grebe will continue to have access to and utilise all optimal habitats suitable for all relevant aspects of their life cycle associated within the Moray Firth SPA.
2c. The supporting habitats and processes relevant to qualifying features and their prey resources are maintained, or where appropriate restored, at the Moray Firth SPA.	The key supporting processes for Slavonian grebe in the Moray Firth SPA are not well known, but may include water quality (nutrients), tidal cycles and water flow. Relatively modest increases in the number of vessel movements across the Moray Firth SPA, with adherence to best practice procedures detailed by the VMP to minimise disturbance, mean that no impacts on Moray Firth SPA Slavonian grebe are anticipated that would interfere with the supporting habitats and processes relevant to them.

4.10 Velvet Scoter

4.10.1 Evidence for Sensitivity to Vessel Disturbance

4.10.1.1 Jarrett *et al*. (2018[12]) reported a high flight response of velvet scoter to vessel disturbance at sea, though given few records were made, sensitivity could not be fully assessed. Schwemmer *et al*. (2011[6]) reported a median flight initiation distance of 404m (sample size of 59 events). Furness (2013[10]) indicated that this species was highly sensitive to disturbance by vessel traffic relative to others. The certainty regarding the understanding of disturbance and displacement impacts of this species due to vessels was classified as moderate by Wade *et al*. (2016[5]).

4.10.1.2 The mean escape distance (and sample size) reported by Fliessbach *et al*. (2019[8]) was relatively low when compared with other species thought to be sensitive to disturbance by vessels and was similar for individuals and groups of birds (Table 4-25).

4.10.1.3 Velvet scoter was assessed to have a high sensitivity to human disturbance by Goodship and Furness (2019[9]) in the context of hand-harvesting of seaweed.

Table 4-25: Mean escape distances, standard deviations, and sample sizes of observations for velvet scoter (individuals and flocks), reproduced from Fliessbach *et al*. (2019[8]).

Species	Published escape distance for individual birds (m)	Published escape distance for flocks of birds (m)
Velvet scoter	474 (+/- 304) (n=1,062)	444 (+/- 307) (n=241)

4.10.2 Moray Firth SPA Population Estimates

4.10.2.1 Key Moray Firth SPA population estimates and densities for this species are summarised in Table 4-26.

Table 4-26: Key population estimates and densities for velvet scoter within the Moray Firth SPA.

Source	Date(s)	Method	Population Estimate
Moray Firth SPA citation	2001/02 to 2005/06	Shore-based count	1,488 (mean peak)
Lawson *et al*. (2015[3])	2001/02 to 2006/07	Visual aerial surveys, distance analysis	249 (mean peak)
Scott *et al*. (2023[1])	19/01/2020	DAS, block bootstrap estimation method; abundance	79 (95% CIs 0 – 234)
		DAS, block bootstrap estimation method; density	No data (model did not produce density surface)
	08/03/2020	DAS, block bootstrap estimation method; abundance	12 (95% CIs 0 – 36)
		DAS, block bootstrap estimation method; density	No data (model did not produce density surface)

4.10.3 Moray Firth SPA Population Distribution

4.10.3.1 Conservation Advice for the Moray Firth SPA (NatureScot, 2022[2]) states that the distribution of velvet scoter overlaps considerably to that of common scoter. Velvet scoters were recorded most frequently close inshore between Burghead and Nairn, at Spey Bay and on the Riff Bank. Smaller numbers also occur around the mouth of the Inner Dornoch Firth, normally in association with common scoter. The species displays a preference for open coast habitats in shallow waters, which are used for foraging, loafing, and roosting., with birds widely distributed along the coast of the Moray Firth SPA. Velvet scocter occur in sheltered inshore marine areas with sandy substrates associated with their main prey items. The key supporting processes for velvet scoter at the Moray Firth SPA are poorly understand but may be linked to water quality (nutrients and turbidity), tidal cycles, and water flow (NatureScot, 2022[2]).

4.10.3.2 During the January 2020 and March 2020 DAS, low numbers of birds were recorded, with the highest abundances reported off the coast of Loch Fleet and Nairn. The latter area has historically been associated with observations of this species (MacArthur Green, 2024[4]).

4.10.3.3 It is noted that this species may have a different distribution across the Moray Firth SPA at night, due to its known tendency to move into offshore roosting areas during this time.

4.10.4 Assessment of Potential Impacts

4.10.4.1 The 2020 DAS detected too few observations of velvet scoter to generate meaningful density surface maps. However, based on the literature and data sources examined this species displays a strong preference for nearshore waters within the Moray Firth SPA. It is therefore anticipated that birds are unlikely to be present in substantial numbers between the Proposed Development (Offshore), and any of the construction ports under consideration (Buckie, Cromarty/Nigg, and Ardersier).

4.10.4.2 Direct impacts due to construction vessels associated with the Proposed Development (Offshore) occurring on the habitats within coastal areas, or the birds using them, are considered to be unlikely as construction vessels are not expected to operate routinely in nearshore locations except when entering and exiting port locations. Since velvet scoter distributions are heavily associated with coastal, shallow waters, the areas in which construction vessels will routinely operate are unlikely to represent key habitat for this species, irrespective of which ports are used for construction of the Proposed Development (Offshore).

4.10.4.3 Distributions of this species may differ at night, which could result in a greater possibility of direct impacts due to disturbance of this species by construction vessels. Given that roosting areas are typically reached by birds swimming from their preferred daytime habitats (NatureScot, 2022[2]), the locations of these roosting areas are likely to still be relatively coastal, meaning that the possibility of frequent disturbance and displacement of substantial numbers of birds by construction vessels remains low.

4.10.4.4 The available data and other information indicates that disturbance of velvet scoter by construction vessel traffic, if it occurs, would be infrequent, spatiotemporally restricted, and involve very low numbers of birds relative to the wider population of the Moray Firth SPA. Of any birds disturbed, it is likely that only a proportion would actually be displaced. The predicted impact of low levels of displacement of this nature is predicted to be negligible at the level of the Moray Firth SPA population.

4.10.4.5 Away from coastal locations, the high levels of existing vessel activity within much of the Moray Firth SPA (Figure 3–1) suggest that disturbance of habitats used by Moray Firth SPA qualifying features by vessel traffic, and therefore potential disturbance and displacement of SPA qualifying features, is likely to be part of the existing nature of the SPA. It is considered that modest increases in vessel traffic in areas where vessels already frequently operate are unlikely to result in increases in mortality to any disturbed/displaced birds that would be detectable. In addition, the supporting habitats and processes relevant to this qualifying feature and its prey resources are not anticipated to be impacted for the same reason.

4.10.4.6 It is anticipated that the birds that could be displaced would be able to relocate to appropriate habitats within the Moray Firth SPA and could also

return to the area from which they were displaced relatively quickly due to the transient nature of vessel disturbance. Because of the low numbers of birds that can be potentially displaced by construction vessel traffic relative to the population of the SPA, indirect effects on birds in other areas as a result of this impact can be ruled out.

4.10.4.7 In summary, it is not considered that the anticipated construction vessel traffic associated with the Proposed Development (Offshore) would materially impact the abundance or distribution of velvet scoter in the Moray Firth SPA. Assessment against Conservation Objectives 2a, 2b and 2c indicates that they will all be met despite the potential for minor disturbance impacts (Table 4-27). It is therefore concluded that the construction vessel traffic associated with the Proposed Development (Offshore) will not result in an AEoSI on the velvet scoter qualifying feature of the Moray Firth SPA either alone, or in-combination with other existing activities.

Table 4-27: Assessment of predicted impacts on velvet scoter qualifying feature of the Moray Firth SPA.

Conservation Objective	Conclusion
1. To ensure that the qualifying features of the Moray Firth SPA are in favourable condition and make an appropriate contribution to achieving Favourable Conservation Status.	The predicted impacts will not prevent the Moray Firth SPA velvet scoter population from being maintained on a long-term basis as a viable component of its natural habitats, reduce its natural range, or reduce the habitats available to it.
2. To ensure that the integrity of the Moray Firth SPA is restored in the context of environmental changes by meeting objectives 2a, 2b and 2c for each qualifying feature:	See points 2a, 2b and 2c below.
2a. The populations of qualifying features are viable components of the site.	No mortality, injury or removal that would lead to a long-term decline of velvet scoter within the Moray Firth SPA is anticipated as a result of the predicted impacts.
2b. The distribution of the qualifying features is maintained throughout the site by avoiding significant disturbance of the species.	Key areas within the Moray Firth SPA for this species do not overlap with the areas expected to be affected, and so no direct impacts on the birds within them are predicted. Whilst small numbers of birds may be disturbed and/or displaced, this will be insignificant at the level of the Moray Firth SPA population. It is therefore anticipated that despite the predicted impacts, velvet scoter will continue to have access to and utilise all optimal habitats suitable for all relevant aspects of their life cycle associated within the Moray Firth SPA.
2c. The supporting habitats and processes relevant to qualifying features and their prey resources are maintained, or where appropriate restored, at the Moray Firth SPA.	The key supporting processes for velvet scoter in the Moray Firth SPA are not well known, but may include water quality (nutrients and turbidity), tidal cycles and water flow. Relatively modest increases in the number of vessel movements across the Moray Firth SPA, with adherence to best practice procedures detailed by the VMP to minimise disturbance, mean that no impacts on Moray Firth SPA velvet scoter are anticipated that would interfere with the supporting habitats and processes relevant to them.

4.11 Shag

4.11.1 Evidence for Sensitivity to Vessel Disturbance

4.11.1.1 Jarrett *et al*. (2018[12]) categorised the sensitivity of shag to vessel disturbance as medium. Furness (2013[10]) indicated that this species was moderately sensitive to disturbance by vessel traffic relative to others, being allocated a score of three (out of five, where five was the most sensitive). The certainty regarding the understanding of disturbance and displacement impacts of this species due to vessels was classified as high by Wade *et al*. (2016[5]). This species was not included in Fliessbach *et al*. (2019[8]). Shag was assessed to have a medium sensitivity to human disturbance by Goodship and Furness (2019[9]) in the context of hand-harvesting of seaweed.

4.11.2 Moray Firth SPA Population Estimates

4.11.2.1 Key Moray Firth SPA population estimates and densities for this species are summarised in Table 4-28.

Table 4-28: Key population estimates and densities for shag within the Moray Firth SPA.

Source	Date(s)	Method	Population Estimate
Moray Firth SPA citation, Lawson *et al*. (2015[3])	2001/02 to 2005/07	Visual boat surveys, analysis method unknown	6,462 (mean peak)
Scott *et al*. (2023[1])	19/01/2020	DAS, block bootstrap estimation method; abundance	0
		DAS, block bootstrap estimation method; density	0
	08/03/2020	DAS, block bootstrap estimation method; abundance	1,762 (95% CIs 76 – 4,607)
		DAS, block bootstrap estimation method; density	No data (model did not produce density surface)

4.11.3 Moray Firth SPA Population Distribution

4.11.3.1 Shags require suitable habitat for foraging, loafing, bathing, and other maintenance activities within the Moray Firth SPA. Conservation Advice for the Moray Firth SPA (NatureScot, 2022[2]) states that shags are benthic feeding piscivores with a preference for rocky coasts with deep, clear water. Their foraging areas tend to coincide with areas of sandy benthic sediment in depths up to 80m, but they also forage over rocky seabeds. Shags forage in sheltered bays and channels, but will generally avoid estuaries, shallow or muddy inlets and fresh or brackish waters. During the non-breeding season, shags are widely distributed throughout the Moray Firth SPA, with higher concentrations of birds being previously recorded around Portsoy and between Brora and Berriedale.

4.11.3.2 The key supporting processes for shags in the Moray Firth SPA are water quality (nutrients and turbidity), tidal cycles, and water flow.(NatureScot, 2022[2]).

4.11.3.3 During the January 2020 DAS shag was not recorded. In the March 2020 DAS, low numbers of birds were recorded across mainly coastal areas, with the highest abundances reported off the coast of Helmsdale, and a scattering of records in coastal areas to the north and south of the Cromarty Firth.

4.11.4 Assessment of Potential Impacts

4.11.4.1 The 2020 DAS detected too few observations of shag to generate meaningful density surface maps. However, based on the literature and data sources examined this species displays a strong preference for nearshore waters within the Moray Firth SPA. It is therefore anticipated that birds are unlikely to be present in substantial numbers between the Proposed Development (Offshore), and any of the construction ports under consideration (Buckie, Cromarty/Nigg, and Ardersier).

4.11.4.2 Direct impacts due to construction vessels associated with the Proposed Development (Offshore) occurring on the habitats within coastal areas, or the birds using them, are considered to be unlikely as construction vessels are not expected to operate routinely in nearshore locations except when entering and exiting port locations. Since shag distributions are heavily associated with coastal, shallow waters, the areas in which construction vessels will routinely operate are unlikely to represent key habitat for this species, irrespective of which ports are used for construction of the Proposed Development (Offshore).

4.11.4.3 The available data and other information indicates that disturbance of shag by construction vessel traffic, if it occurs, would be infrequent, spatiotemporally restricted, and involve low numbers of birds relative to the wider population of the Moray Firth SPA. Of any birds disturbed, it is

likely that only a proportion would actually be displaced. The predicted impact of low levels of displacement of this nature is predicted to be negligible at the level of the Moray Firth SPA population.

4.11.4.4 Away from coastal locations, the high levels of existing vessel activity within much of the Moray Firth SPA (Figure 3–1) suggest that disturbance of habitats used by Moray Firth SPA qualifying features by vessel traffic, and therefore potential disturbance and displacement of SPA qualifying features, is likely to be part of the existing nature of the SPA. It is considered that modest increases in vessel traffic in areas where vessels already frequently operate are unlikely to result in increases in mortality to any disturbed/displaced birds that would be detectable. In addition, the supporting habitats and processes relevant to this qualifying feature and its prey resources are not anticipated to be impacted for the same reason.

4.11.4.5 It is anticipated that the birds that could be displaced would be able to relocate to appropriate habitats within the Moray Firth SPA and could also return to the area from which they were displaced relatively quickly due to the transient nature of vessel disturbance. Because of the low numbers of birds that can be potentially displaced by construction vessel traffic relative to the population of the SPA, indirect effects on birds in other areas as a result of this impact can be ruled out.

4.11.4.6 In summary, it is not considered that the anticipated construction vessel traffic associated with the Proposed Development (Offshore) would materially impact the abundance or distribution of shag in the Moray Firth SPA. Assessment against Conservation Objectives 2a, 2b and 2c indicates that they will all be met despite the potential for minor disturbance impacts (Table 4-29). It is therefore concluded that the construction vessel traffic associated with the Proposed Development (Offshore) will not result in an AEoSI on the shag qualifying feature of the Moray Firth SPA either alone, or in-combination with other existing activities.

Table 4-29: Assessment of predicted impacts on shag qualifying feature of the Moray Firth SPA.

Conservation Objective	Conclusion
1. To ensure that the qualifying features of the Moray Firth SPA are in favourable condition and make an appropriate contribution to achieving Favourable Conservation Status.	The predicted impacts will not prevent the Moray Firth SPA shag population from being maintained on a long-term basis as a viable component of its natural habitats, reduce its natural range, or reduce the habitats available to it.
2. To ensure that the integrity of the Moray Firth SPA is restored in the context of environmental changes by meeting objectives 2a, 2b and 2c for each qualifying feature:	See points 2a, 2b and 2c below.
2a. The populations of qualifying features are viable components of the site.	No mortality, injury or removal that would lead to a long-term decline of shag within the Moray Firth SPA is anticipated as a result of the predicted impacts.
2b. The distribution of the qualifying features is maintained throughout the site by avoiding significant disturbance of the species.	Key areas within the Moray Firth SPA for this species do not overlap with the areas expected to be affected, and so no direct impacts on the birds within them are predicted. Whilst small numbers of birds may be disturbed and/or displaced, this will be insignificant at the level of the Moray Firth SPA population. It is therefore anticipated that despite the predicted impacts, shag will continue to have access to and utilise all optimal habitats suitable for all relevant aspects of their life cycle associated within the Moray Firth SPA,
2c. The supporting habitats and processes relevant to qualifying features and their prey resources are maintained, or where appropriate restored, at the Moray Firth SPA.	The key supporting processes for shags at the Moray Firth SPA are water quality (nutrients and turbidity), tidal cycles, and water flow. Relatively modest increases in the number of vessel movements across the Moray Firth SPA, with adherence to best practice procedures detailed by the VMP to minimise disturbance, mean that no impacts on Moray Firth SPA shag are anticipated that would interfere with the supporting habitats and processes relevant to them.

4.12 Embedded Mitigation

4.12.1.1 No AEoSI has been concluded for all qualifying features of the Moray Firth SPA due to construction vessel activity associated with the Proposed Development (Offshore). Irrespective of this, a range of best practice procedures will be adhered to by construction vessel traffic associated with the Proposed Development (Offshore), which will be detailed in the Vessel Management Plan (VMP). The VMP will be produced post-consent, once the construction base location has been confirmed.

4.12.1.2 The VMP will include information such as:

- Preferred transit routes between the construction base and the Proposed Development (Offshore) to, where possible, avoid areas of the Moray Firth SPA anticipated to support higher abundances of birds;
- Details of vessel transit speed limits within the Moray Firth SPA, to minimise disturbance and displacement of birds within its boundaries;
- Procedures for avoiding unnecessary disturbance to aggregations of birds identified in the path of a construction vessel; and
- Clear instructions for construction vessels not to loiter within the Moray Firth SPA

4.12.1.3 Implementation of and adherence to the VMP will minimise disturbance to birds, their habitats, and the prey species and other processes supported by them.

References

[1] Scott, M.S., Humphries, G., Irwin, C., Peters-Grundy, R., Vilela, R., Southward, B., Thompson, K., 2023. Inshore Wintering Waterfowl in Moray Firth Special Protection Area - 2019/20 digital aerial surveys and comparative analyses of aerial and shore-based surveys (NatureScot Research Report No. 1280).

[2] NatureScot, 2022. Conservation and Management Advice - Moray Firth SPA (UK Site: 9020313).

[3] Lawson, J., Kober, K., Win, I., Bingham, C., Buxton, N.E., Mudge, G., Webb, A., Reid, J.B., Black, J., Way, L., O'Brien, S., 2015. An assessment of numbers of wintering divers, seaduck and grebes in inshore marine areas of Scotland (Revised 2018)

[4] MacArthur Green, 2024. West of Orkney Windfarm Offshore Ornithology Additional Information: Addendum to the Report to Inform Appropriate Assessment: HRA Stage 2 - SPA Appropriate Assessment.

[5] Wade, H.M., Masden, E.A., Jackson, A.C., Furness, R.W., 2016. Incorporating data uncertainty when estimating potential vulnerability of Scottish seabirds to marine renewable energy developments. Mar. Policy 70, 108–113. https://doi.org/10.1016/j.marpol.2016.04.045

[6] Schwemmer, P., Mendel, B., Sonntag, N., Dierschke, V., Garthe, S., 2011. Effects of ship traffic on seabirds in offshore waters: implications for marine conservation and spatial planning. Ecol. Appl. 21, 1851–1860. https://doi.org/10.1890/10-0615.1

[7] Larsen, J.K., Laubek, B., 2005. Disturbance effects of high-speed ferries on wintering sea ducks. Wildfowl 55, 101–118.

[8] Fliessbach, K.L., Borkenhagen, K., Guse, N., Markones, N., Schwemmer, P., Garthe, S., 2019. A Ship Traffic Disturbance Vulnerability Index for Northwest European Seabirds as a Tool for Marine Spatial Planning. Front. Mar. Sci. 6, 192. https://doi.org/10.3389/fmars.2019.00192

[9] Goodship, N., Furness, R.W., 2019. Seaweed hand-harvesting: literature review of disturbance distances and vulnerabilities of marine and coastal birds (No. Scottish Natural Heritage Research Report No. 1096).

[10] Furness, R.W., Wade, H.M., Masden, E.A., 2013. Assessing vulnerability of marine bird populations to offshore wind farms. J. Environ. Manage. 119, 56–66. https://doi.org/10.1016/j.jenvman.2013.01.025

[11] Dehnhard, N., Skei, J., Christensen-Dalsgaard, S., May, R., Halley, D., Ringsby, T.H., Lorentsen, S.H., 2020. Boat disturbance effects on moulting common eiders Somateria

mollissima. Mar. Biol. 167, undefined-undefined. https://doi.org/10.1007/s00227-019-3624-z

[12] Jarrett, D., Cook, A.S.C.P., Woodward, I., Ross, K., Horswill, C., Dadam, D., Humphreys, E.M., 2018. Short-Term Behavioural Responses of Wintering Waterbirds to Marine Activity (No. Vol. 9 No. 7), Scottish Marine and Freshwater Science. Marine Scotland.

[13] Gittings, T., Troake, P., Peppiatt, C., 2015. Disturbance response of Great Northern Divers Gavia immer to boat traffic in Inner Galway Bay. Ir. Birds 10, 133–136.

Caledonia Offshore Wind Farm
5th Floor, Atria One
144 Morrison Street
Edinburgh
EH3 8EX

www.caledoniaoffshorewind.com

OCEAN WINDS