Liverpool Bay CCS Ltd
HYNET CARBON DIOXIDE TRANSPORTATION AND STORAGE PROJECT - OFFSHORE

Environmental Statement Report
Volume 3, Appendix K1: Offshore Ornithology Baseline Technical Report

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Offshore Ornithology
Baseline Technical Report

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Glossary

Term	Meaning
Ornithology	The study of birds
Special Protection Area (SPA)	An area of land that has been designated as part of the UK site network and is set aside for the protection of the bird populations that reside there
Nearshore waters	Coastal waters adjacent to the coast
Joint Nature Conservation Committee (JNCC)	The JNCC are the only statutory nature advisor to all four countries of the UK.
Waterbird	The Ramsar Convention defines 'waterfowl' as species of birds that are "ecologically dependent upon wetlands"
Seabird	Birds that are fully dependant upon the sea for at least part of their life cycle
Auks	Birds from the family *Alcidae*
Gulls	Birds from the family *Lariidae*
Terns	Birds from the family *Sterniidae*
Foraging	Actively seeking food. For the purposes of the analysis carried out in this report no distinction was made between foraging (seeking food) and feeding (actively eating)
Density	For the purposes of this report – the number of individuals contained within a set area (i.e. 250m x 250m grid squares.
Abundance	For the purposes of this report – the number of birds
Bio-season	A bio-season is part of a birds' life cycle when it has different habits, often in different places according to the stage of its life cycle, e.g. breeding and non-breeding seasons
Breeding season	This is dependent upon the species and for this report is taken on a species by species basis as taken from Furness (2015). See Table 1.3
Non-breeding season	This is dependent upon the species and for this report is taken on a species by species basis as taken from Furness (2015). See Table 1.3
Winter season	The core wintering season runs from Nov – Mar (Stroud, *et. al*., 2013)
Passage seasons	The spring passage (also known as the return migration period) season runs from Apr – Jun and the autumn passage (also known as the post-breeding migration period) runs from Jul – Oct (Stroud, *et. al*., 2013).

Acronyms

Acronym	Description
JNCC	Joint Nature Conservation Council
SMP	Seabird Monitoring Programme
SPA	Special Protection Area
MHWS	Mean High Water Spring
MLWS	Mean Low Water Spring
PoA	Point of Ayr
GIS	Geographic Information System
OPRED	Offshore Petroleum Regulator for Environment and Decommissioning
OWF	Offshore Wind Farm

Units

Units	Description
Km	Kilometre
Km^2	Square kilometre
AONs	Apparently Occupied Nests
Pair	A breeding pair of seabirds

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1 OFFSHORE ORNITHOLOGY BASELINE TECHNICAL REPORT

1.1 Introduction

This Offshore Ornithology Baseline Technical Report provides a detailed baseline characterisation of offshore ornithology (which includes only marine species) for the Hynet Carbon Dioxide Transportation and Storage Project - Offshore (hereafter referred to as "the Project"). Data has been collated through a detailed desktop review of relevant material within the region.

1.1.1 The Project

As part of the offshore components of the Project (hereafter referred to as the 'Proposed Development'), the existing offshore natural gas import pipeline from Point of Ayr (PoA) gas terminal will be re-purposed to become a CO_2 export pipeline and will transport the CO_2 to the repurposed Douglas platform. From the Douglas platform, CO_2 will be transported along re-purposed natural gas pipelines to the Hamilton main platform for injection into the Hamilton main reservoir, to the Hamilton north platform for injection into the Hamilton north reservoir, and to the Lennox platform for injection into the Lennox reservoir. The Proposed Development will also require new electrical and fibre optic infrastructure seawards of Mean High-Water Spring (MHWS), connecting the PoA Terminal to the offshore infrastructures.

1.2 Study area

The offshore ornithology study area is defined as the area encompassing the Proposed Development area, which includes the offshore structures, offshore cables and subsea cables (including intertidal habitats up to MHWS), plus an additional 10 km buffer, or up to Mean Low Water Spring (MLWS) where this is less than 10 km (Figure 1.1). 10 km was applied to account for the displacement of sensitive divers and seaducks which are highly sensitive to vessel movements (Schwemmer *et al*., 2011; Burger *et al*., 2019) and are present in the Liverpool Bay in internationally important numbers.

Additionally, there are several protected sites designated for marine birds with connectivity to the Proposed Development. Figure 1.2 Shows the designated sites with relevant ornithology features that are within 315 km of the Eni Proposed Development Area. 315 km is the mean max foraging range for northern gannet (as taken from Woodward, *et. al*., 2016) and was the range used to assess connectivity with the Proposed Development.

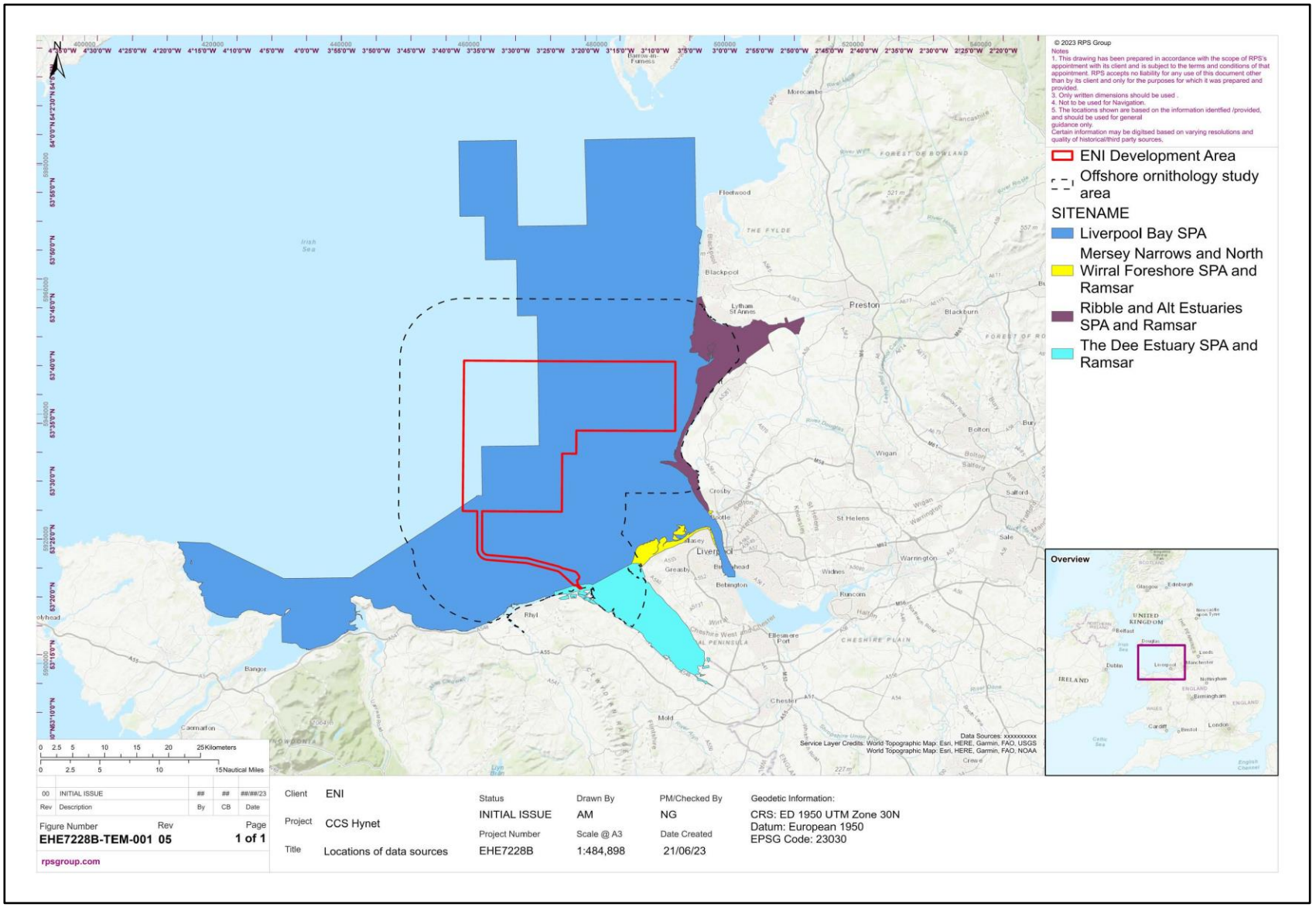


Figure 1.1: Offshore Ornithology Study Area

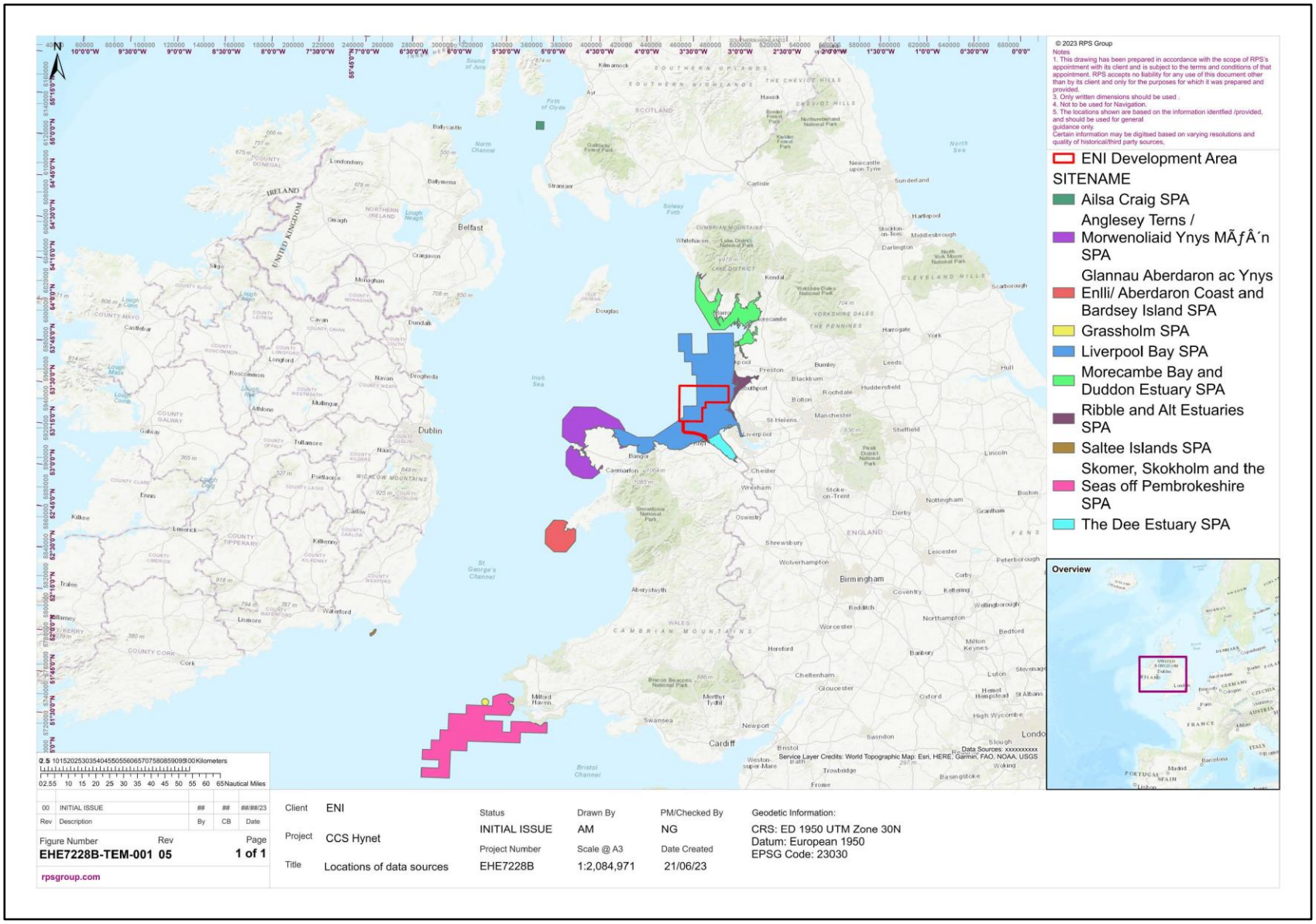


Figure 1.2: SPAs With Connectivity To The Proposed Development Within 315 km

1.3 Consultation

A summary of the key issues raised during consultation activities undertaken to date specific to offshore ornithology is presented in Table 1.1 below.

Table 1.1: Summary of Key Consultation Issues Raised During Consultation Activities Undertaken For The Project Relevant To Offshore Ornithology

Date	Consultee and type of response	Issue raised	Response to issue raised and/or where considered in this chapter
27/01/2023	OPRED	Table 7.20: Mean max foraging ranges with standard deviation (SD) for seabird species. The use of Woodward *et al.* (2019) mean max plus 1 standard deviation foraging ranges is welcomed. It is advised that breeding season foraging ranges for razorbill and guillemot are those within appendix 1 of Woodward *et al*. (2019) which excludes data from Fair Isle where the foraging range may have been unusually high due to reduced prey availability during the study year. Therefore, the foraging range to use for razorbill is 73.8 km + 48.4 km and for guillemot is 55.5 km + 39.7 km. It is advised that records of protected species are sought from the appropriate local biological record centres, nature conservation organisations and NBN Atlas (https://nbnatlas.org/). It is also advised that consideration should be given to the wider context of the location of the Project, in terms of habitat linkages and protected species populations in the wider area to assist the impact assessment.	This has been noted and used where appropriate. Records were sought for waterbirds from the BTO and the JNCC on breeding, wintering, and passage birds that utilise the habitats within the study areas.
27/01/2023	OPRED	Section 7.5.3 and Section 7.5.4. Consideration should be given as to whether seabird surveys of the platform will be required to ascertain if nesting and/or roosting seabirds are (or have been) using the structures. JNCC have generated an advice note on Seabird Survey Methods for Offshore Installations: Black-legged kittiwakes including example offshore installation seabird survey recording forms and a black-legged kittiwakes information and resources signposting document which may be useful for seabird surveys of	Nesting bird surveys of the offshore platforms have already been undertaken by RSK Biocensus (RSK) between 8th and 13th June 2022. Nesting black-legged kittiwake were present on four of the six platforms and a nesting bird strategy (also authored by (RSK) in December 2022) was created off of the back of these surveys. The effects of

Date	Consultee and type of response	Issue raised	Response to issue raised and/or where considered in this chapter
		offshore platforms. Consideration should also be given to the anthropogenic disturbance and displacement of Red-Throated Diver and Common Scoter which are features of Liverpool Bay SPA, and which are also included as a priority species in Section 7 of the Environment (Wales) Act 2016. Both species are sensitive to anthropogenic disturbance and displacement. Details of where further information can be found on this is provided in Annex 2. Table 7.20: Mean max foraging ranges with standard deviation (SD) for seabird species. The use of Woodward I 2019 mean max plus 1 standard deviation foraging ranges is welcomed. It is advised that breeding season foraging ranges for razorbill and guillemot are those within appendix 1 of Woodward *et al.* (2019) which excludes data from Fair Isle where the foraging range may have been unusually high due to reduced prey availability during the study year. Therefore, the foraging range to use for razorbill is 73.8 km + 48.4 km and for guillemot is 55.5 km + 39.7 km.	anthropogenic disturbance and displacement on red-throated diver and common scoter have also been considered.
27/01/2023	OPRED	Should work be undertaken during the non-breeding season, this would be likely to coincide with the presence of red-throated diver and common scoter in the Liverpool Bay SPA. The number of boat movements associated with the works should therefore be included within the ES. The significance of any increase in vessel movements, in particular those that transit the Liverpool Bay SPA should be presented in relation to the disturbance to the red-throated diver and common scoter, covering any vessel transit routes taken. Interim advice of the treatment of displacement for red-throated diver is available at Joint SNCB Interim Displacement Advice Note | JNCC Resource Hub (https://hub.jncc.gov.uk/assets/9aecb87c-80c5-4cfb-9102-39f0228dcc9a).Section 7.5.7: Potential Mitigation. In relation to	

Date	Consultee and type of response	Issue raised	Response to issue raised and/or where considered in this chapter
		the proposed mitigation measures outlined for offshore ornithology, the Developer is advised to ensure that the proposed Vessel Management Plan (VMP) is agreed in writing with NRW. Several features of the Liverpool Bay SPA are known to be sensitive to anthropogenic disturbance (as noted above) and so further consideration of any potential additional vessel movements from the operational and maintenance phases is advised.	

1.4 Methodology

1.4.1 Desktop study

Ornithological data within in the offshore ornithology study area (Figure 1.1) has been collated through a detailed and comprehensive review of currently accessible studies and datasets. Both scientific and grey literature were reviewed. These are summarised at Table 1.2 below.

Table 1.2: Summary Of Key Desktop Reports

Title	Source	Year	Author
Densities of qualifying species within Liverpool Bay/Bae Lerpwl SPA: 2015 to 2020 (NECR440)	Natural England	2023	HiDef Aerial Surveying Limited
Awel Y Môr OWF Offshore Ornithology Baseline Characterisation Report	APEM Ltd.	2022	Boa, *et al.*
LBA CCS Transport and Storage Project Feasibility Study Pre-EN	Eni Progetti	2021	ENI
Seabird Monitoring Programme Report 1986-2019	JNCC	2021	JNCC
Distribution maps of cetacean and seabird populations in the North-East Atlantic	Journal of Applied Ecology	2020	Waggitt *et al.*
Desk-based revision of seabird foraging ranges used for HRA screening	BTO Research Report	2019	Woodward *et al*.
Gwynt Y Môr OWF Post-construction Aerial Surveys 2016 to 2019	APEM Ltd.	2017 - 2019	Goddard *et al.,* 2017, 2018, Goulding *et al.,* 2019
UK Offshore Energy Strategic Environmental Assessment OESEA3	DECC	2016	DECC
An Assessment of the Numbers and Distributions of Wintering Waterbirds and Seabirds in Liverpool Bay	JNCC	2016	Lawson *et al*.
Mapping Seabird Sensitivity to Offshore Wind Farms	PlosOne	2014	Bradbury *et al.*
SEA678 Data Report for Offshore Seabird Populations	University College Cork	2006	Mackey and Giménez
North Hoyle Offshore Wind Farm, Annual FEPA	Npower	2005	RWE Group

Proposed Development Area

1.4.2 Mapping datasets

Supplementary material from HiDef Aerial Surveying Limited (2023), Waggitt et *al.* (2020), and Bradbury *et al.* (2014) was used to produce maps showing the spatial variation in densities across seasons in the offshore ornithology study area.

HiDef Aerial Surveying Limited (2023) flew eight aerial surveys over the original boundary of the Liverpool Bay/Bae Lerpwl SPA between 2015 and 2020. Despite only flying the original SPA boundary (the Liverpool Bay/Bae Lerpwl was extended in 2017) the report revises SPA population estimates for common scoter and red-throated diver plus the assemblage. Although this is the most current survey data available it is based on a relatively low survey effort carried out over the core wintering period only (surveys were all conducted between January and March), and over a reduced spatial area when compared to the other datasets. The surveys were also tailored to provide condition assessments for the SPA features (namely common scoter and red-throated diver) that use the nearshore waters, as such data has only been mapped for common scoter, red-throated diver, little gull and cormorant.

Waggitt *et al*. (2020) have developed an approach to produce distribution maps for 12 seabird species at 10 km and monthly resolution in the northeast Atlantic.

Bradbury *et al*. (2014) analysed offshore boat and aerial observer surveys spanning from 1979 to 2012 to produce predicted bird densities across a grid covering English territorial waters at a resolution of 3×3 km.

Monthly relative densities were available in raster and shapefile format, for HiDef Aerial Surveys (2023), Waggitt *et al.* (2020) and Bradbury *et al*. (2014) respectively. Using the raster files from Waggitt *et al*. (2020), monthly raster displaying number of individuals per km^2 were aggregated into biological season (breeding and non-breeding) as defined by Furness (2015). The seasonal split for each species (breeding and non-breeding) is shown in Table 1.3. Average density per season was mapped in Geographic Information System (GIS).

To display the HiDef Aerial Surveying Limited (2023) data densities were plotted using kernel density estimation, the data were averaged over all eight surveys and the zone of influence upscaled to reflect the missed coverage of the aerial survey transects.

Seasonal predicted densities were already available in a shapefile format in Bradbury *et al.* (2014) and were mapped using GIS. The seasonal split in Bradbury *et al*. (2014) differed to the approach that was followed for visualising the Waggitt *et al*. (2020) data. Bradbury *et al.* (2014) split seasons as followed: summer (April to September) and winter (October to March). Therefore, there must be a degree of caution when interpreting and comparing seasonal variation findings between Bradbury *et al.* (2014) and Waggitt *et al*. (2020).

In addition to the seasonal split, the Waggitt *et al*. (2020) study is based on data collected from 1980 to 2018, whilst Bradbury *et al.* (2014) included data collected from 1979 to 2012. Furthermore, the spatial resolution differed between the two studies – ranging from 3×3 km in Bradbury *et al.* (2014) to 10×10 km in Waggitt *et al*. (2020).

Table 1.3: Annual Life Cycle Across Months For Key Species From Waggit, Et. Al. (2014)

Species	J	F	M	A	M	J	J	A	S	O	N	D
Herring gull *Larus argentatus*												
Lesser black-backed gull *Larus fuscus*												
Northern fulmar *Fulmarus glacialis*												
Black-legged kittiwake *Rissa tridactyla*												

Species	J	F	M	A	M	J	J	A	S	O	N	D
Common guillemot *Uria aalge*												
Razorbill *Alca torda*												
Atlantic puffin *Fratercula arctica*												
Manx shearwater *Puffinus puffinus*												
Northern gannet *Morus bassanus*												
Key:	Breeding					Non-breeding						

1.4.3 Data Limitations

The desktop data used are the most up to date publicly available information which can be obtained from the applicable data sources as cited. Data that has been collected is based on existing literature, consultation with stakeholders and identification of habitats to inform likely ornithological species.

No offshore site-specific surveys have been carried out to inform the baseline characterisation, therefore, it is possible that ornithological features may have not been identified. Given the detailed desktop study completed however, it is unlikely that key species have been omitted from the baseline characterisation within the Proposed Development and wider area.

1.5 Baseline Environment

1.5.1 Designated Sites

There are three designated sites that directly overlap with the Offshore Ornithology Study Area; Liverpool Bay/Bae Lerpwl Special Protection Area (SPA), Dee Estuary SPA and Ribble and Alt Estuaries SPA (Figure 1.1). In addition, the potential for offshore interaction of birds from breeding colonies with the Proposed Development Area has been assessed based on the most extensive and prevalent seabird foraging ranges. Manx shearwater (*Puffinus puffinus*) and northern gannet (*Morus bassanus*) are known to be among the most abundant species within the Irish Sea (Mackey and Giménez., 2006). In order to identify designated sites that could potentially be connected to the Proposed Development, a foraging range distance of 315 km was used. The foraging range of Manx shearwater is particularly large, at 1,346.8 km, which provides a larger area and thus reduces the potential for impact. Therefore, designated sites have been identified based on the foraging distance of northern gannet. The list of SPAs within range of the Proposed Development Area are shown in Table 1.4 and presented in Figure 1.4. The mean max foraging ranges from Woodward, *et. al.* (2016) which were used to determine connectivity are found in : Appendix A.

Table 1.4: SPA Colonies (Qualifying As An Individual Species And/Or Assemblage Of Species) Within Individual Species Range (Mean-Max Foraging Range) From The Proposed Development Area

Site Name and Code	Distance to Proposed Development Area (km)	Relevant Qualifying Feature
Liverpool Bay / Bae Lerpwl SPA (UK9020294A)	0.00	• Red-throated diver *Gavia stellata* (Non-breeding) • Little gull *Hydrocoloeus minutus* (Non-breeding) • Common scoter *Melanitta nigra* (Non-breeding) • Little tern *Sternula albifrons* (Breeding) • Common tern *Sterna*

Site Name and Code	Distance to Proposed Development Area (km)	Relevant Qualifying Feature
		hirundo (Breeding)
Dee Estuary SPA (UK9013011)	0.00	• Sandwich tern *Sterna sandvicensis* (Non-breeding) • Common tern *Sterna hirundo* (Breeding) • Little tern *Sternula albifrons* (Breeding) • Cormorant *Phalacrocorax carbo* • Great crested grebe *Podiceps cristatus*
Ribble and Alt Estuaries SPA (UK9005103)	1.00	• Lesser black-backed gull *Larus fuscus* (Breeding) • Common tern (Breeding)
Anglesey Terns/Morwenoliaid Ynys Môn SPA (UK9013061)	30.0	• Sandwich Tern *Sterna sandvicesis* (Breeding)
Morecambe Bay and Duddon Estuary SPA (UK9020326)	22.0	• Lesser black-backed gull (Breeding and Non-breeding)
Aberdaron Coast and Bardsey Island/Glannau Aberdaron ac Ynys Enlli SPA (UK9013121)	98.0	• Manx Shearwater (Breeding)
Ailsa Craig SPA (UK9003091)	196.0	• Gannet (Breeding)
Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA (UK9014051)	213.0	• Storm Petrel *Hydrobates pelagicus* (Breeding) • Manx Shearwater (Breeding)
Grassholm SPA (UK9014041)	224.0	• Gannet (Breeding)
Saltee Islands SPA (IE0004002)	246.0	• Fulmar *Fulmarus glacialis* (Breeding) • Gannet (Breeding)

1.5.1 Literature Review

1.5.1.1 General synopsis

Irish Sea

Ship-based seabird surveys undertaken in the Irish Sea, Cardigan Bay, North Channel, and eastern section of the St. George Channel (collectively referred to as Sea 6) from 1980-2003 have been utilised to gain a better understanding of seasonal distribution and abundance of seabirds in proximity to the Proposed Development (Mackey and Giménez, 2006).The surveys found that Manx shearwater were recorded in high densities (up to eight individuals/km^2) during the breeding and post breeding seasons. Additionally, northern gannet was also recorded in high densities (up to 2.5 individuals/km^2) during the post breeding season. Herring gull (*Larus argentatus*) and black-legged kittiwake (*Rissa tridactyla*) were recorded in high densities (up to five individuals/km^2 and two individuals/km^2) respectively within Sea 6.

Further species that were identified from survey findings as being present within the Irish Sea include great cormorant, northern fulmar, arctic skua (*Stercorarius parasiticus*), European shag (*Phalacrocorax aristotelis*), great skua (*Stercorarius skua*), black-headed gull (*Chroicocephalus ridibundus*), common gull (*Larus canus*), lesser black-backed gull, great black-backed gull (*Larus marinus*), common tern, arctic tern (*Sterna*

paradisaea), black guillemot (*Cepphus grylle*), common guillemot (*Uria aalge*), razorbill (*Alca torda*), and Atlantic puffin (*Fratercula arctica*).

The European storm petrel, Leach's storm petrel (*Oceanodroma leucorhoa*), pomarine skua (*Stercorarius pomarinus*), and long-tailed skua (*Stercorarius longicaudus*) were additionally identified from as being present within the Irish Sea. These species have been found to have lower concentrations within the Irish Sea than the aforementioned species, typically recorded as passage migrants, and more frequently observed in offshore waters, as opposed to coastal or nearshore waters (Mackey and Giménez, 2006).

Similar to findings from Mackey and Giménez (2006), the predominant breeding species of seabird in the Irish Sea were found to be the Manx shearwater, northern gannet, lesser black-backed gull, guillemot, and herring gull (DECC, 2016).

There are seasonal variations in the distribution and abundance of seabird species in the Irish Sea. In the breeding season species congregate at their breeding colonies and make regular foraging trips between their colonies and offshore foraging areas. Seabirds have species-specific foraging distances from their colonies/breeding sites (Woodward *et al*., 2019), these foraging ranges are shown in Table 1.3. In winter, most seabirds have a fully pelagic existence and are therefore present in lower densities across the Irish Sea.

1.5.1.2 Site specific reports

Offshore ornithological data has been collected for multiple purposes within Liverpool Bay and wider UK waters that provide regional and national generic and species-specific information on the distribution, abundance, biological seasons, behaviour and characteristics of birds in the offshore environment. These data give a detailed insight into species abundance and behaviour within the Offshore Ornithology Study Area and help to provide extra detail for the baseline characterisation.

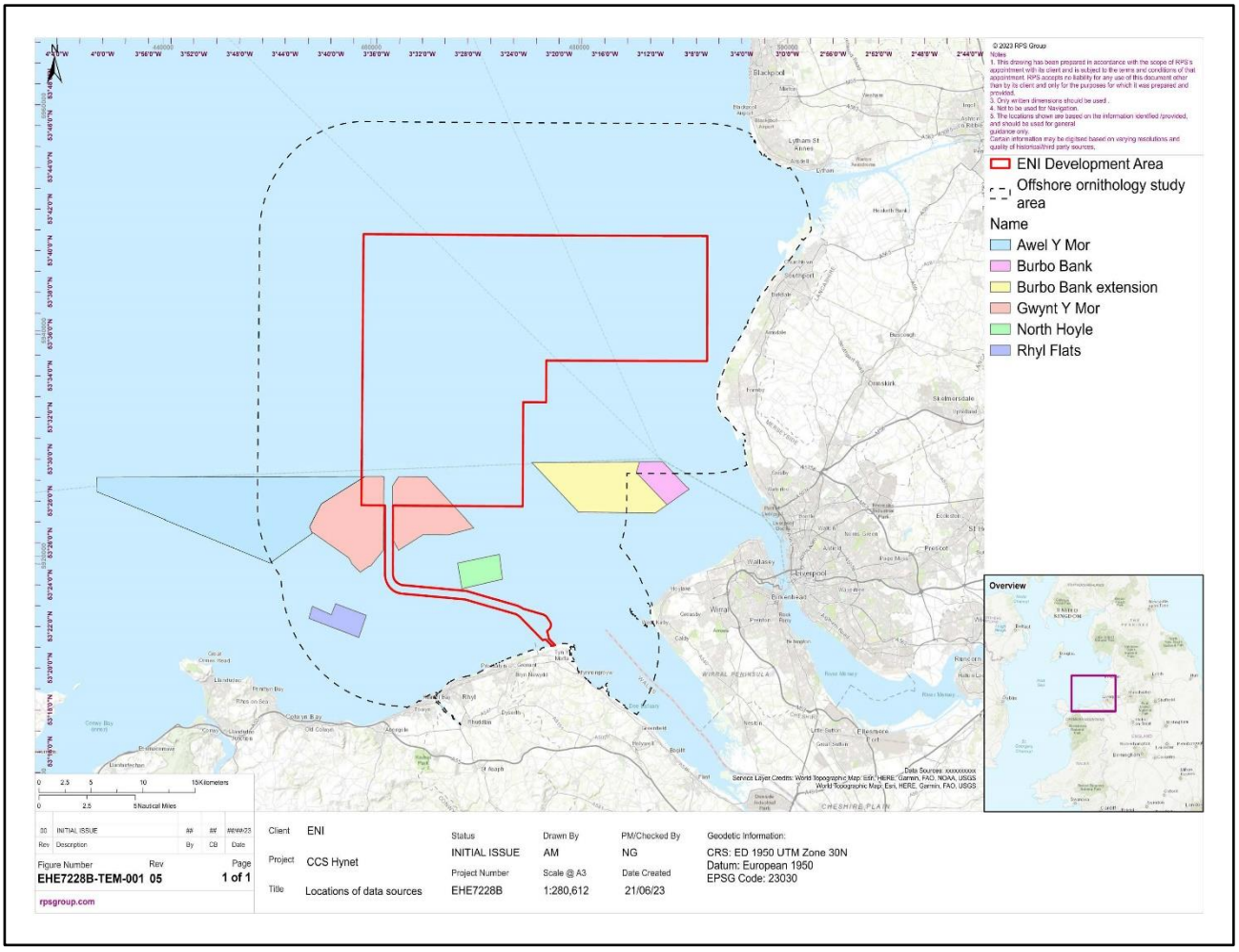


Figure 1.3: Location Of Study Areas With Existing Data Sources That Overlap With The Offshore Ornithology Study Area

North Hoyle Post-construction Monitoring

Post–construction, monthly seabird surveys were completed continually between 2004 and 2005. Findings of the aerial surveys showed that red-throated diver were predominantly found in the shallow inshore waters of Liverpool Bay during the winter and passage months and that they were largely absent during the summer. The majority of the records of red-throated diver from the aerial surveys were recorded in or over waters inshore of the North Hoyle Offshore Wind Farm and further east off the Lancashire coastline.

Common scoter were the most abundant species recorded with concentrations around Llandulas, Conwy Bay, Shell Flat and off the mouth of the River Ribble, and off Formby. The concentrations off Formby are the area that overlaps most with the Proposed Development. Other species present were: northern fulmar, northern gannet, great cormorant , lesser black-backed gull, black-legged kittiwake, sandwich tern and common/arctic tern, and auk spp.

Rhyl Flats post-construction monitoring

Post-construction monitoring of Rhyl Flats Offshore Wind Farm (RFOWF) was undertaken across three years, between October 2009 and July 2012 (APEM, 2011; APEM, 2012b).

Of the non-breeding designated species associated with the Liverpool Bay SPA, both common scoter and red-throated diver were recorded widely in the winter period, with neither species recorded in July. Of the

breeding designated species associated with the Liverpool Bay SPA there were three records of tern species recorded during the July 2012 survey, two inshore of RFOWF and one to the north-east.

Up to 16,300 common scoter were recorded in the wider survey area during the third year of surveys, with birds recorded in all months between October 2011 and March 2012. Red-throated diver (and diver species not identified to species level) were recorded between October and February during the 2011/12 surveys. A peak count of 143 birds was estimated for the wider survey area in November 2011, which was earlier than the peak of 153 in December 2010.

Gwynt y Môr Post-consent Monitoring

Post-construction digital aerial surveys were conducted to assess the presence and abundance of seabirds within the wind farm area and its surroundings. The surveys comprised of the wind farm area and 2 km buffer, plus across a wider region that surrounded the wind farm.

The surveys showed that red-throated diver were estimated to be present in low densities across Gwynt y Mor (GyM) plus a 2 km buffer, with higher predicted densities observed in the south-east of the wider survey area. The peak estimated abundance of red-throated diver present within the GyM array area was 22 individuals.

Black-legged kittiwake were widespread and abundant across the GyM array area and wider region. The peak predicted estimated abundance of black-legged kittiwake was 1,923 birds in the October 2018 surveys. Common gull were also widespread and abundant across the GyM wind farm area and wider survey area.

Great black-backed gulls were observed in low numbers. Herring gull were recorded throughout the aerial digital surveys. Lesser black-backed gull peaked in July 2018.

Guillemot/razorbill were the most abundant species, after common scoter, across the survey areas. Northern fulmar were recorded during the February and March 2019 wider area surveys. The peak estimated abundance of birds recorded as cormorant/shag within the wider survey area varied between survey years.

Awel Y Môr Offshore Ornithology Baseline Characterisation

Aerial digital surveys of the Awel Y Môr (AyM) study area were undertaken by APEM between March 2019 and February 2021 inclusive, a total of 24 surveys. A total of 21 separate species were noted, including three that could not be identified to species level.

Common scoter were not recorded within the AyM array area however, they were noted within a 4 km buffer in three of the 24 surveys: October 2019, January 2020 and April 2020. The highest density was 0.24 individuals/km^2, with an estimated abundance of 61 individuals in January 2020. Common scoter were only recorded between September and April.

Within a 5km to 8 km buffer only area, red-throated diver were recorded in 11 of the 24 surveys with a peak estimated abundance of 77 in January 2020 with a peak density of 0.57 individuals/km^2. Red-throated diver were most abundant within the array area during February to April.

Arctic and common terns could not be identified to species level during surveys so were recorded under the term “commic tern”. They were recorded in two of the 24 surveys within the AyM array area with an estimated peak abundance of 8 and density of 0.10 individuals/km^2.

The additional species recorded within the AyM array area and associated buffer only areas were: black-legged kittiwake, common gull, great black-backed gull, herring gull, guillemot, razorbill, northern fulmar, Manx shearwater, northern gannet, great cormorant, lesser black-backed gull, sandwich tern, puffin, black guillemot, great crested grebe and red-breasted merganser. Within the AyM array area the most abundant of these species were common guillemot with an estimated peak abundance of 1,243 individuals recorded in February 2021.

1.5.2 Species Accounts

1.5.2.1 SPA seabirds

In this section, species accounts and maps of predicted densities within the Proposed Development are provided for all SPA seabird features that are known to have connectivity with the Proposed Development. These species are of high conservation importance as they are present in internationally important numbers, have connectivity with the Proposed Development, and impacts upon them may affect the integrity of the SPAs.

Common scoter

Common scoter are diving ducks which feed on molluscs below the water surface. They can be seen around much of Britain and Ireland's coastlines all year round, but larger flocks are found in the winter months, typically between October and March before they leave for their breeding grounds. The UK winter population of common scoter is estimated at 135,000 (2011-2015). Common scoter is red listed on the UK Birds of Conservation Concern and is a Priority Species under the UK Post-2010 Biodiversity Framework. Research suggests that these seaducks are particularly susceptible to disturbance from anthropogenic activity and may avoid potential feeding and resting sites if there are disturbances such as man-made structures or boats present (Garthe and Hüppop 2004).

Bradbury, *et. al*. (2014) found that common scoter reside farther from the shore on the Blackpool coast than the North Welsh coastline. This is likely due to differences in optimum foraging depths, as found by Kaiser *et al*. (2006) which recorded peak prey biomass at different depths on the North Wales coast (peak biomass at 7.88m) and Lancashire coast (peak biomass at 13.96m). The same study also noted that common scoter in these areas typically occurred in waters less than 20m deep and rarely in waters of 25m depth.

During the winter period, densities of common scoter off the coast of Blackpool can reach 870.96 birds per km^2, however this density is just outside the offshore ornithology study area (Figure 1.4). The highest density of common scoter within the buffer was 311.47 birds to 637.35 birds per km^2 (winter), which is confined to a small area on the north-east edge and throughout most of the Proposed Development area densities are significantly lower, though there are patches of higher densities closer to the shore. Densities of common scoter differ significantly in the summer period. Data from Bradbury *et al*. (2014) shows there are no birds present within much of the Proposed Development Area within the summer months, this is due to them breeding much further north on terrestrial habitats. The maximum density of birds in the buffer is up to 57.92 per km^2, restricted to patches in the north-east and south-west, while the highest density within the Proposed Development is up to 28.98 birds per km^2 where the Lennox platform is situated. Common scoter can also be found in low densities near the proposed landfall. Note that due to the way Bradbury *et al*. (2014) split the seasons, summer birds will be composed of late spring migrants, moulting autumn migrants, and non-breeding birds.

The HiDef Aerial Surveying Limited (2023) data revised the Liverpool Bay population estimate to 141,801 common scoter within the Liverpool Bay/Bae Lerpwl SPA (four year mean). The averaged data shows a spatial pattern of common scoter concentraions off Blackpool, Formby, and Conwy Bay (Figure 1.5). However the HiDef data found greater densities of common scoter of off Formby, at the Menai Straits, and of off the northeastern coast of Anglesey than were found by Bradbury *et al*. (2014). The greatest densties of common scoter found within the ENI development area were approx 645.48 birds per km^2.

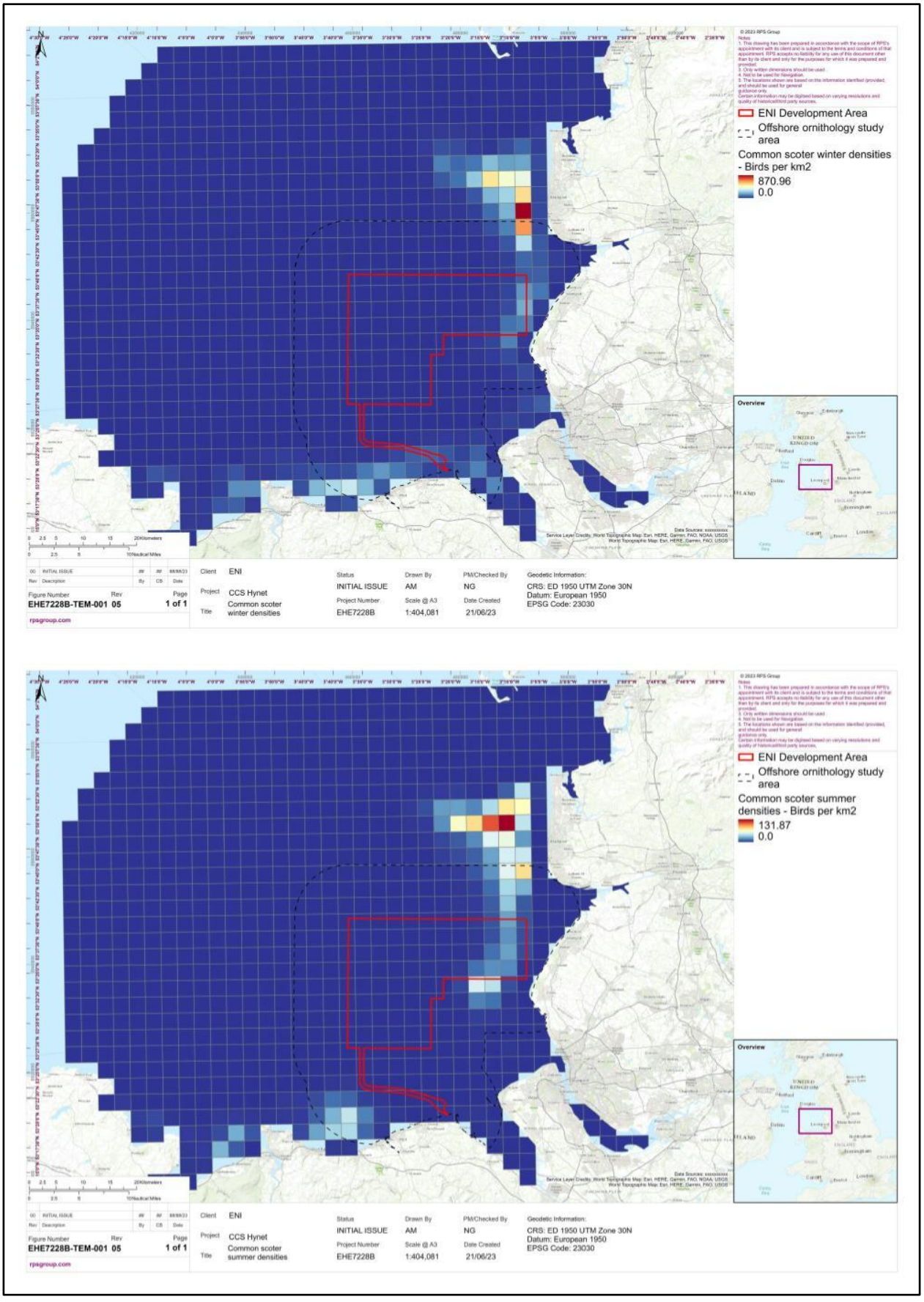


Figure 1.4: Common Scoter Densities In Liverpool Bay/Bae Lerpwl SPA From Bradbury *et al*. (2014)

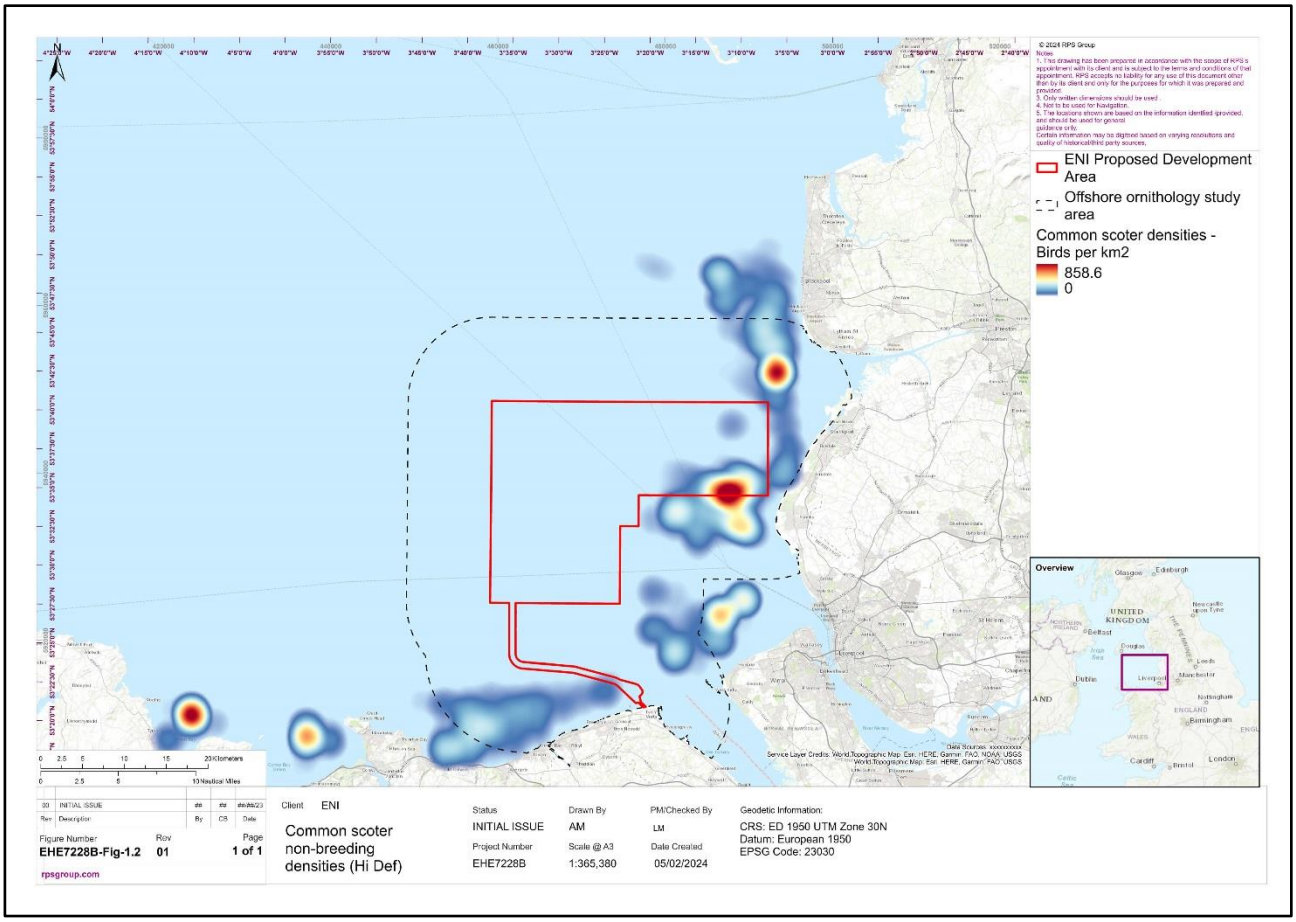


Figure 1.5: Common Scoter Non-Breeding Densities In Liverpool Bay/Bae Lerpwl SPA From HiDef Aerial Surveying Limited (2023)

Red-throated diver

The UK winter population of red-throated diver is 22,000 individuals (2011-2015). The species is listed on Annex I of the European Commission Birds Directive and is subject to special conservation measures such as protection within SPAs. Wintering birds can be seen along the entire UK coastline, with the highest numbers present along the east coast. Population threats include fishing net entanglement, pollution including oil spills, and habitat degradation. Like common scoter, red-throated diver are highly vulnerable to anthropogenic disturbance.

Records of red-throated diver in the Liverpool Bay/Bae Lerpwl SPA from Bradbury *et al*. (2014) show that density varies between zero and 0.821 birds per km^2 during winter months, with consistent high densities occurring along the shoreline, with presence decreasing further ashore (Figure 1.6). Studies show that red-throated diver typically forage in waters of less than 20m depth (Duckworth *et al.,* 2021).The highest densities of birds were found near the coasts of Dee Estuary. Within the Proposed Development area, peak density was up to 0.821 birds per km^2 and 0.099 birds per km^2 during the winter and summer periods respectively (, Bradbury *et al*., 2014). In the winter, red-throated divers were distributed across much of the Eni development and study area, while in the summer, the birds were restricted to an area near the Lennox platform (east side of development) (peak density 0.099 birds per km^2) and along the shoreline at Point of Ayr (peak density 0.084 per km^2; Figure 1.6). Note that due to the way Bradbury *et al*. (2014) split the seasons, summer birds will be composed of late spring migrants, early autumn migrants and non-breeding birds.

The HiDef Aerial Surveying Limited (2023) data revised the Liverpool Bay population estimate to 1,800 red-throated diver within the Liverpool Bay/Bae Lerpwl SPA (four year mean). The averaged data shows a

spatial pattern of birds being well distributed within the nearshore waters along the north Wales and northwest England coasts with peak densities of 3.81 birds per km^2 at the northern edge of the ENI development area (Figure 1.7). There were relatively low densities of birds found within the ENI development area close to where it makes landfall, and the densities of birds further out to sea was also low.

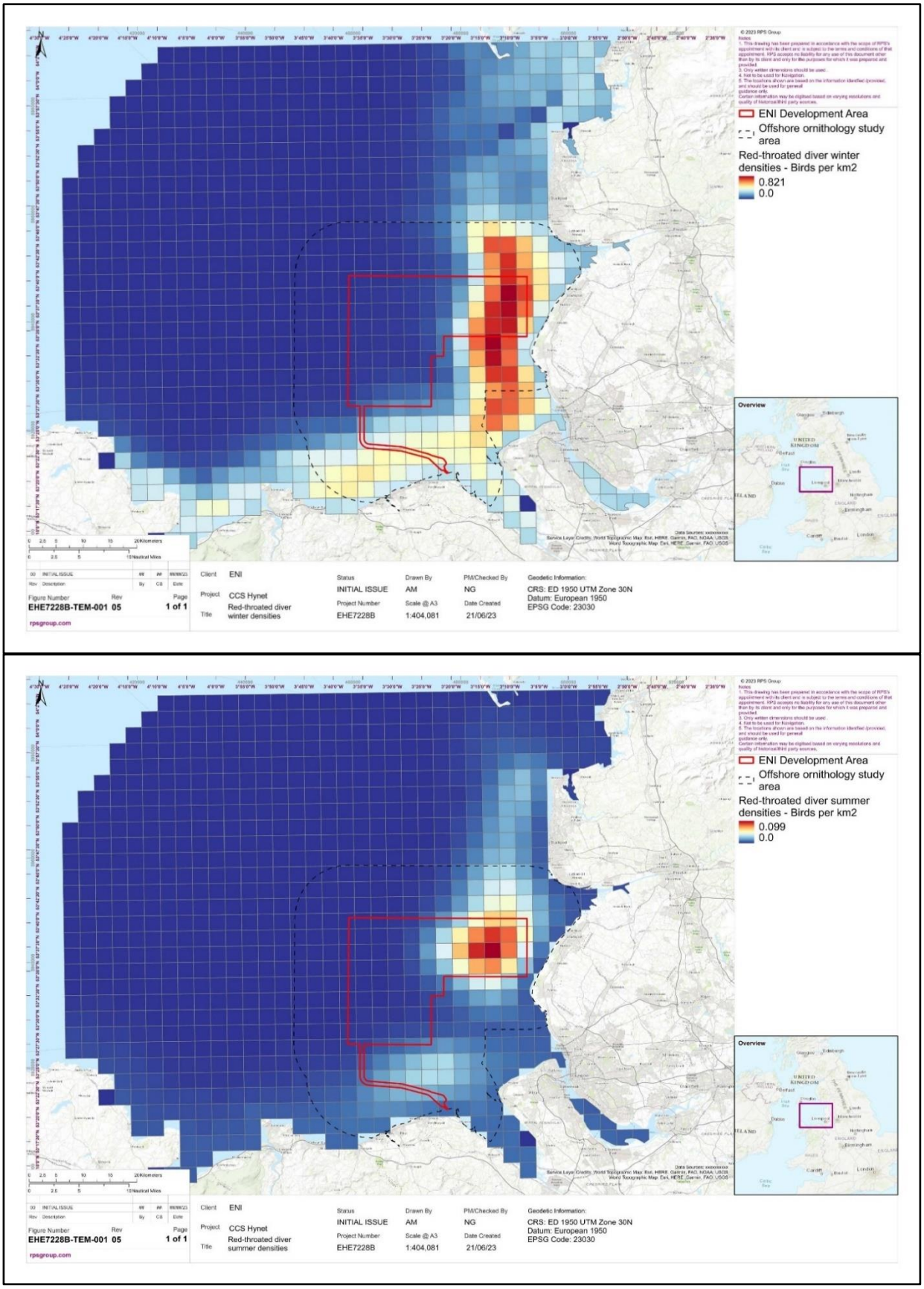


Figure 1.6: Red-Throated Diver Densities In Liverpool Bay/Bae Lerpwl SPA From Bradbury *et al.* (2014)

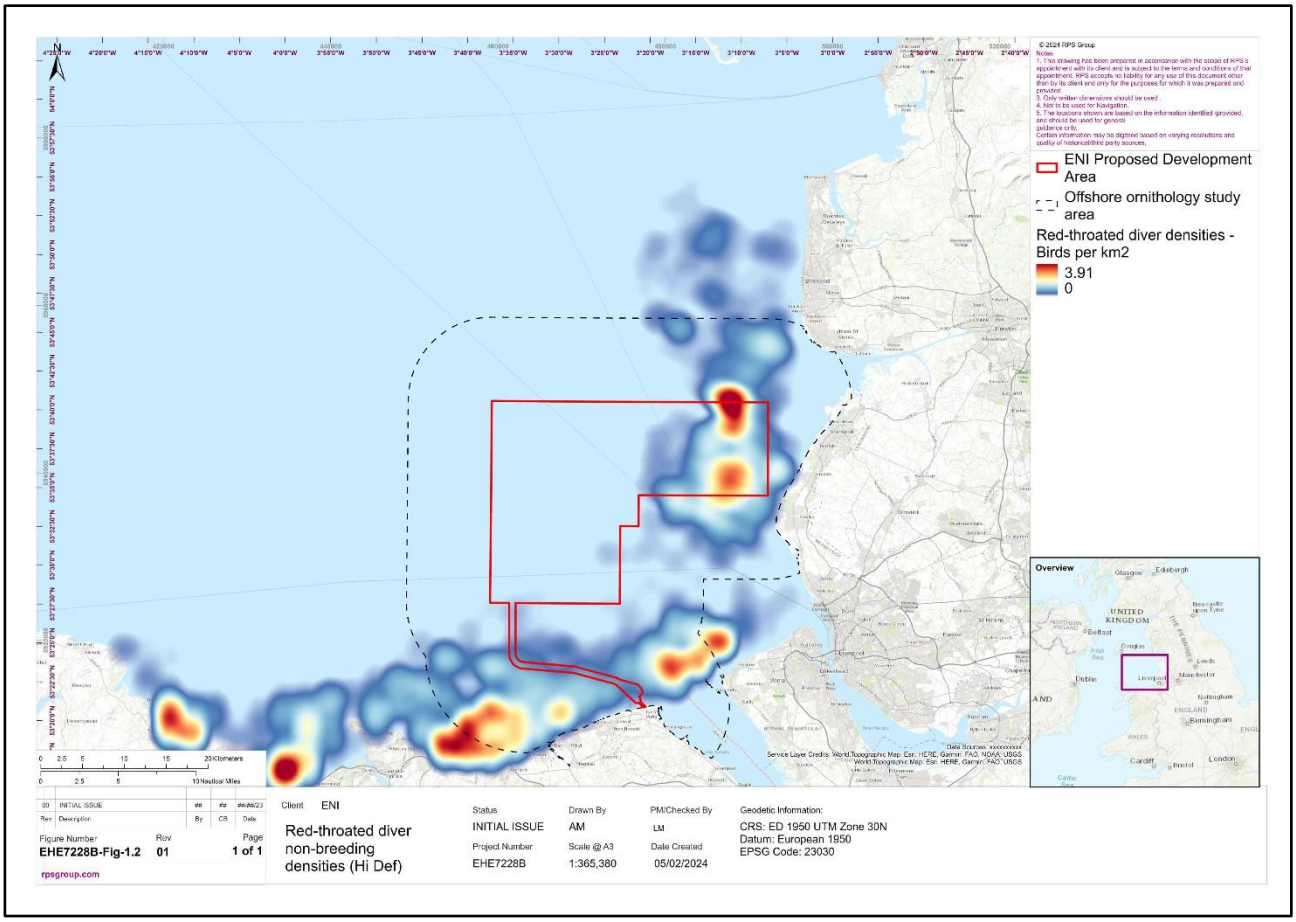


Figure 1.7: Red-Throated Diver Non-Breeding Densities In Liverpool Bay/Bae Lerpwl SPA From HiDef Aerial Surveying Limited (2023)

Great cormorant

Great cormorant are widespread in the UK and present on all coastlines, where they nest on rocky islands and cliffs, and are increasingly found inland. Breeding pairs will return to the same nesting site every year. Cormorant are large diving birds that feed on fish, which in the past led them to become persecuted due to their effects on fishing industries. Numbers have since increased and stabilised, with the UK population estimated at 8,884 breeding pairs (JNCC, 2021). The wintering population is over 64,500. Data published in 2015 estimated the average peak numbers of great cormorants in the Liverpool Bay/Bae Lerpwl SPA between 2004 to 2011 to be 732 individuals (Lawson *et al.,* 2015). However, this was likely to be an underestimate since data was collected from aerial surveys of water while cormorants spend much of their time below water diving for fish or resting on land, and data from Austin, *et. al*. (2023) suggests the current Dee Estuary popularion alone is 1,361 (taken as a five year mean of peak) and the recent HiDef Aerial Surveying Limited (2023) data estimates the population at 1217 (4 year average), although the actual numbers of birds seen during survey were generally low. However the HiDef data was collected over winter when many of the birds may be found within the estuaries which weren't covered by the surveys.

Data collected from Bradbury *et al.* (2014) (Figure 1.8) shows great cormorants are present during the wintering period in much of the Proposed Development in densities of up to 7.703 birds per km^2. Densities are highest along the shoreline and in the River Mersey estuary and in the Ribble and Dee estuaries and decrease further ashore, with great cormorants being absent in the west and north west of the Proposed Development area. During the summer period great cormorant were further restricted to the shoreline and found in densities of up to 2.4 birds per km^2, predominantly in the east and south of the Proposed Development area. Peak densities of were present along the North Welsh coast, at the Point of Ayr and within the Dee estuary.

Figure 1.9 shows the distribution of great cormorant as found by HiDef Aearial Surveying Limited (2023) whilst this shows higher densities of birds further offshore than Bradbury, although the densities found within the ENI development area are generally low. These data were only collected during the core wintering period and surveys were not flown within the estuaries. For these reasons the Bradbury *et al*. (2014) data may give a better picture of the spatial distribution and seasonal spread of great cormorant as this species is tied to intertidal habitat as well as subtidal. The densities found within the ENI development area at the mouth of the Dee Estuary in summer (Bradbury *et al*., 2014 Figure 1.8) represent the highest densities of great cormorant that may be impacted.

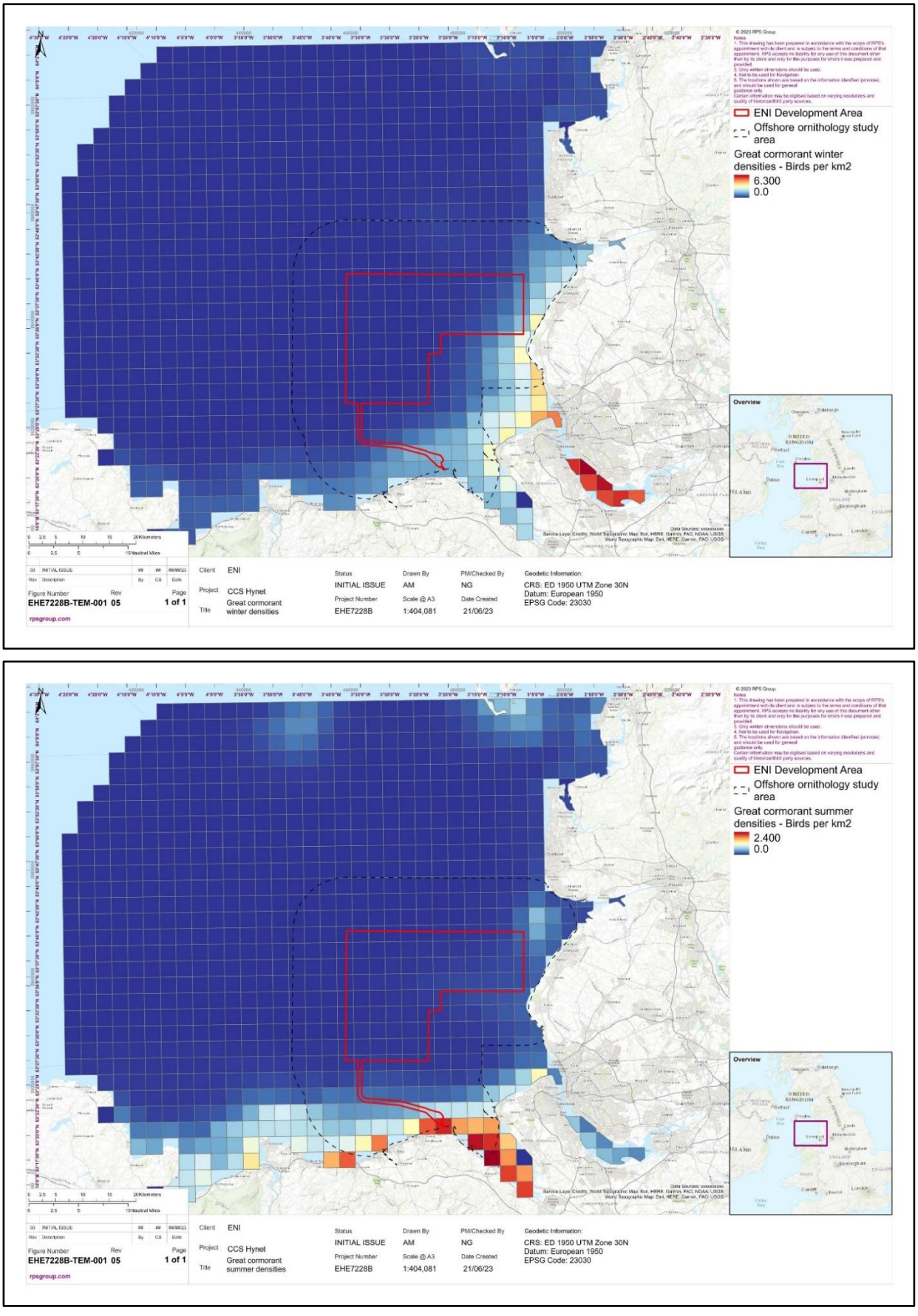


Figure 1.8: Great Cormorant Densities In Liverpool Bay/Bae Lerpwl SPA From Bradbury *et al.* (2014)

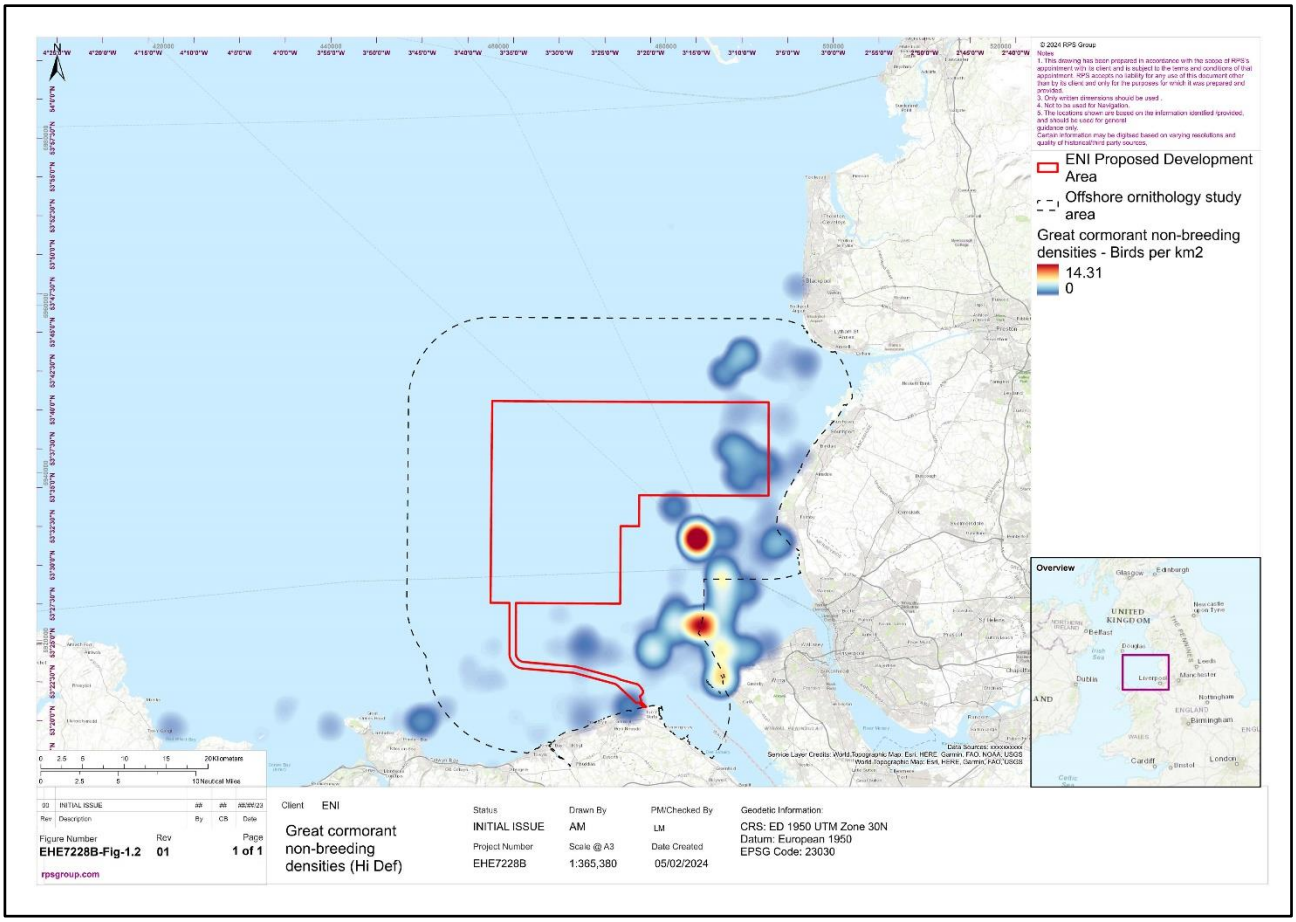


Figure 1.9: Great Cormorant Non-Breeding Densities In Liverpool Bay/Bae Lerpwl SPA From HiDef Aerial Surveying Limited (2023)

Northern fulmar

Northern fulmar are a member of the Procellariidae family and are true seabirds, spending much of their lives over water and only coming ashore to breed. Northern fulmar are long lived birds with an average lifespan of 30 years. They do not reach sexual maturity for 6 to 12 years and will spend the first 5 years of their life solely at sea, feeding on fish, zooplankton, jellyfish, and other marine invertebrates. Northern fulmar breed on cliffs along much of the UK's coastline. There are over 330,000 breeding pairs in the UK, however 1.6 to 1.8 million can be found in the surrounding seas during the winter (JNCC 2021). The breeding season, as taken from Furness (2015), runs from January to September. Northern fulmer are amber listed in the UK.

Records from Waggitt *et al.* (2020) show that northern fulmer densities increase further from the shore. The densities of breeding and non-breeding birds peak at 0.424 per km^2 and 0.396 per km^2, respectiviely, both in areas north-west from the Proposed Development (Figure 1.10). Northern fulmer were recorded within the Proposed Development area, with densities peaking at 0.274 per km^2. There are breeding colonies on the North Welsh coast and it's likely individuals will pass through the Proposed Development when travelling between nesting and foraging grounds.

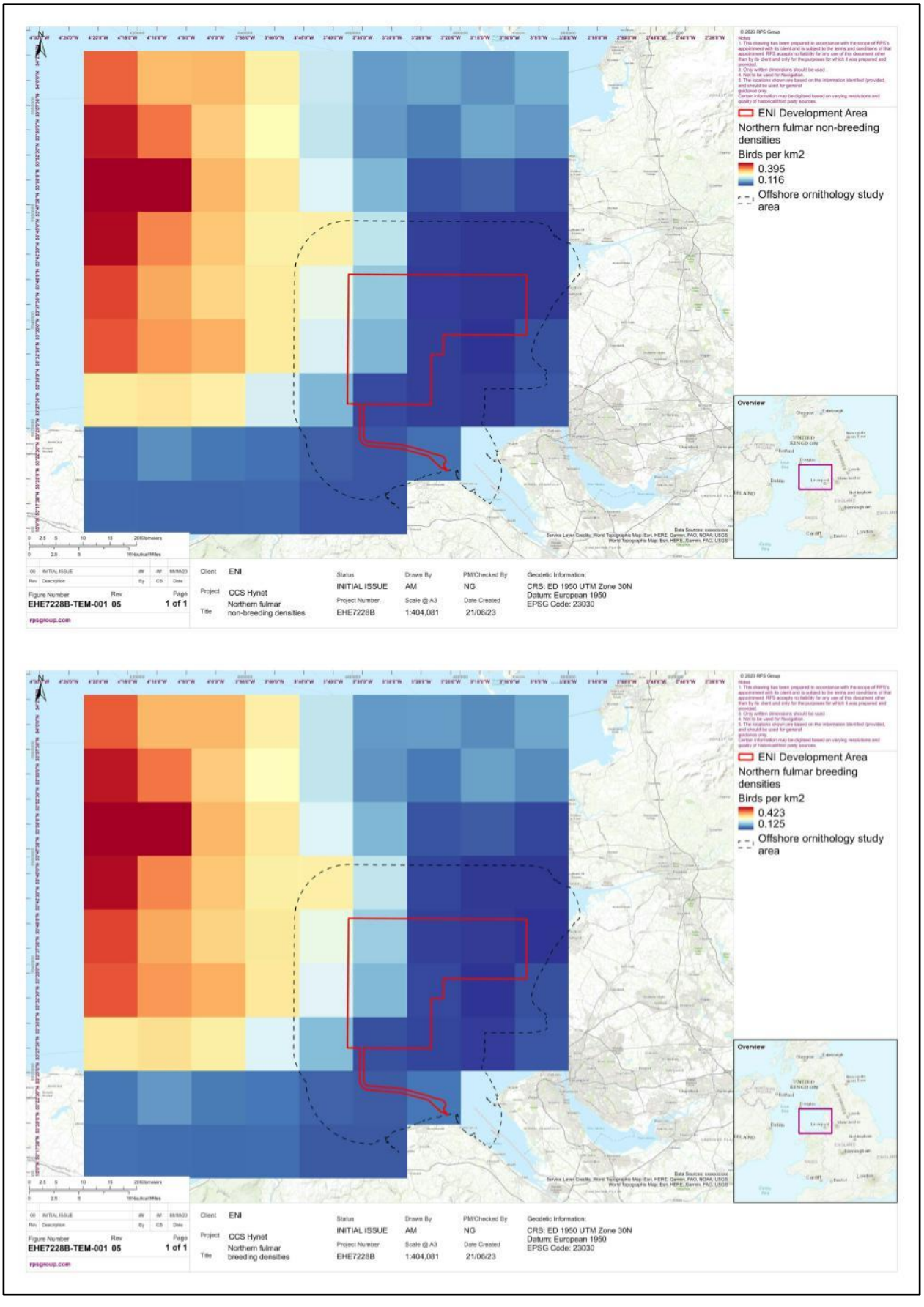


Figure 1.10: Northern Fulmar Densities In Liverpool Bay/Bae Lerpwl SPA From Waggitt *et al*. (2020)

Manx shearwater

Manx shearwater is a medium-sized, long-lived (typical lifespan = 15, maximum = 55, Clark *et al.,* 2003) seabird that glides low over the sea surface, feeding on fish such as herring, sardine and sprat. There are around 50 breeding colonies of Manx shearwater in the UK and there are an estimated 600,000 breeding pairs overall (JNCC 2021). Nesting occurs in burrows on steep, grassy slopes of offshore islands on the west coasts of mainland Britain and Ireland. During the breeding season, adults can commute up to 1,346 km (mean maximum + 1 SD, Woodward *et al.,* 2019) between nesting sites and foraging grounds, and only return to their burrows at night. From July onwards, Manx shearwaters migrate to the South Atlantic and spend their winters mainly off the coasts of Brazil and Argentina.

Data from Waggitt *et al.* (2020) showed the highest densities of Manx shearwaters were found further from the shore, west of the Proposed Development, with peak densities of 0.102 birds per km^2 and 0.103 birds per km^2 in the winter and summer months, respectively (Figure 1.11). The peak within the offshore ornithology study area was 0.062 birds per km^2.

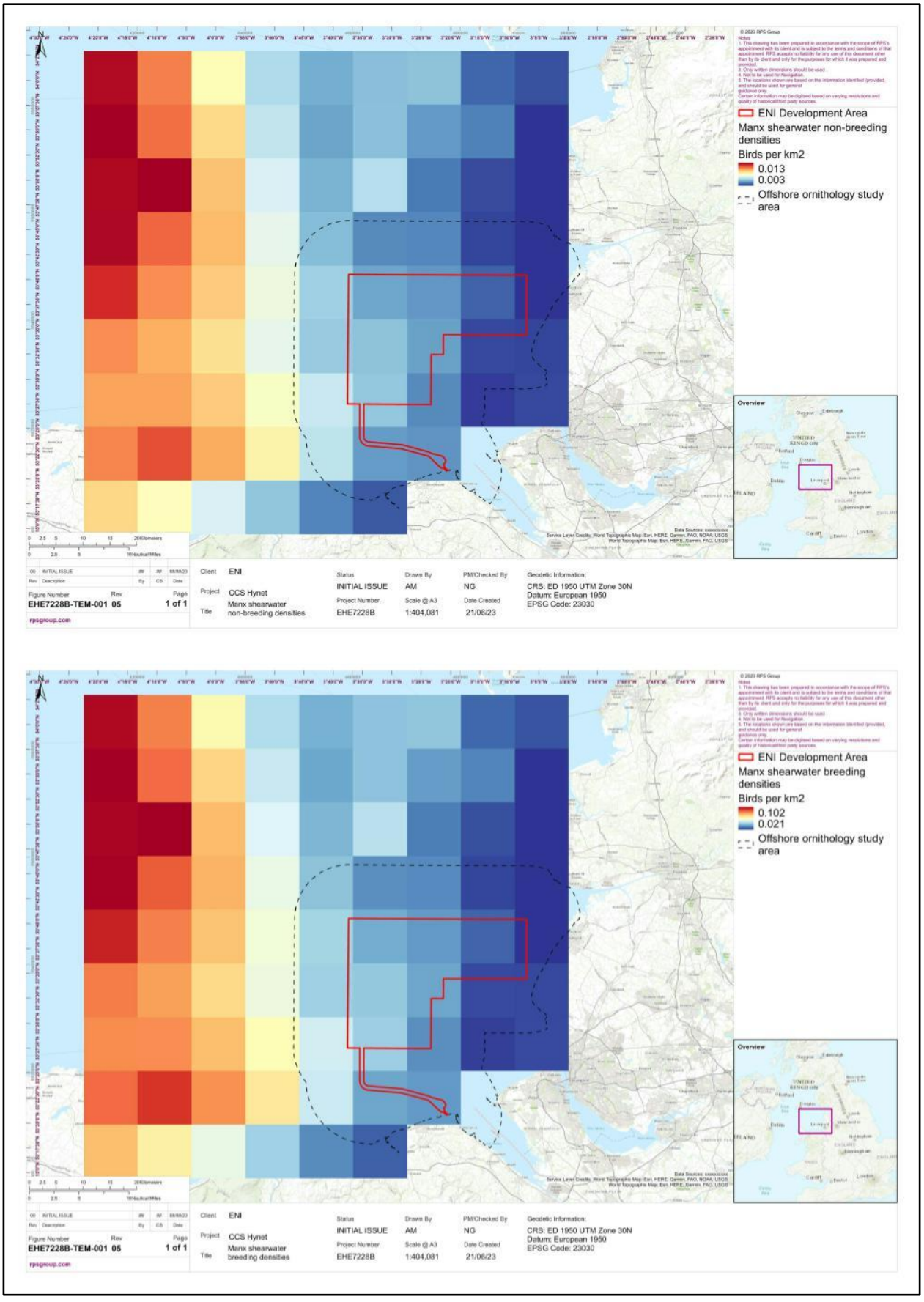


Figure 1.11: Manx Shearwater Densities In Liverpool Bay/Bae Lerpwl SPA From Waggitt *et al*. (2020)

European storm petrel

European storm petrel are small seabirds which only come to land to breed and do so on offshore islands, where they typically nest in crevices or burrows, and occasionally in walls or under buildings. Burrows are sometimes shared with rabbits or other birds such as puffin and Manx shearwater. Like the Manx shearwater, storm petrel only visit their nests at night and can spend 3 days foraging up to 336 km away (Woodward *et. al.* 2019). In the UK the European storm petrel is amber listed with 25,650 apparently occupied sites recorded between 1998-2002 (JNCC 2021). Nesting occurs on the west and north coasts of Britain and Ireland, but the wintering population also extends along parts of the east coast. They feed by flying within 10m of the sea surface, picking up prey such as fish, plankton, squid, jellyfish and crustaceans, and they will often follow fishing boats in flocks and wait on the discards.

Figure 1.12 shows that the densities of European storm petrels are relatively low with the highest densities recorded as 0.001 birds per km^2 during the non-breeding season and 0.006 per km^2 during the breeding season (Waggitt *et al.,* 2020). These peak densities for both seasons were recorded west of the Proposed Development, far offshore. European storm petrels appear to be absent in much of the Proposed Development all year round with the exception of low densities (0.003 birds per km^2) being found in the west and north-west of the areas.

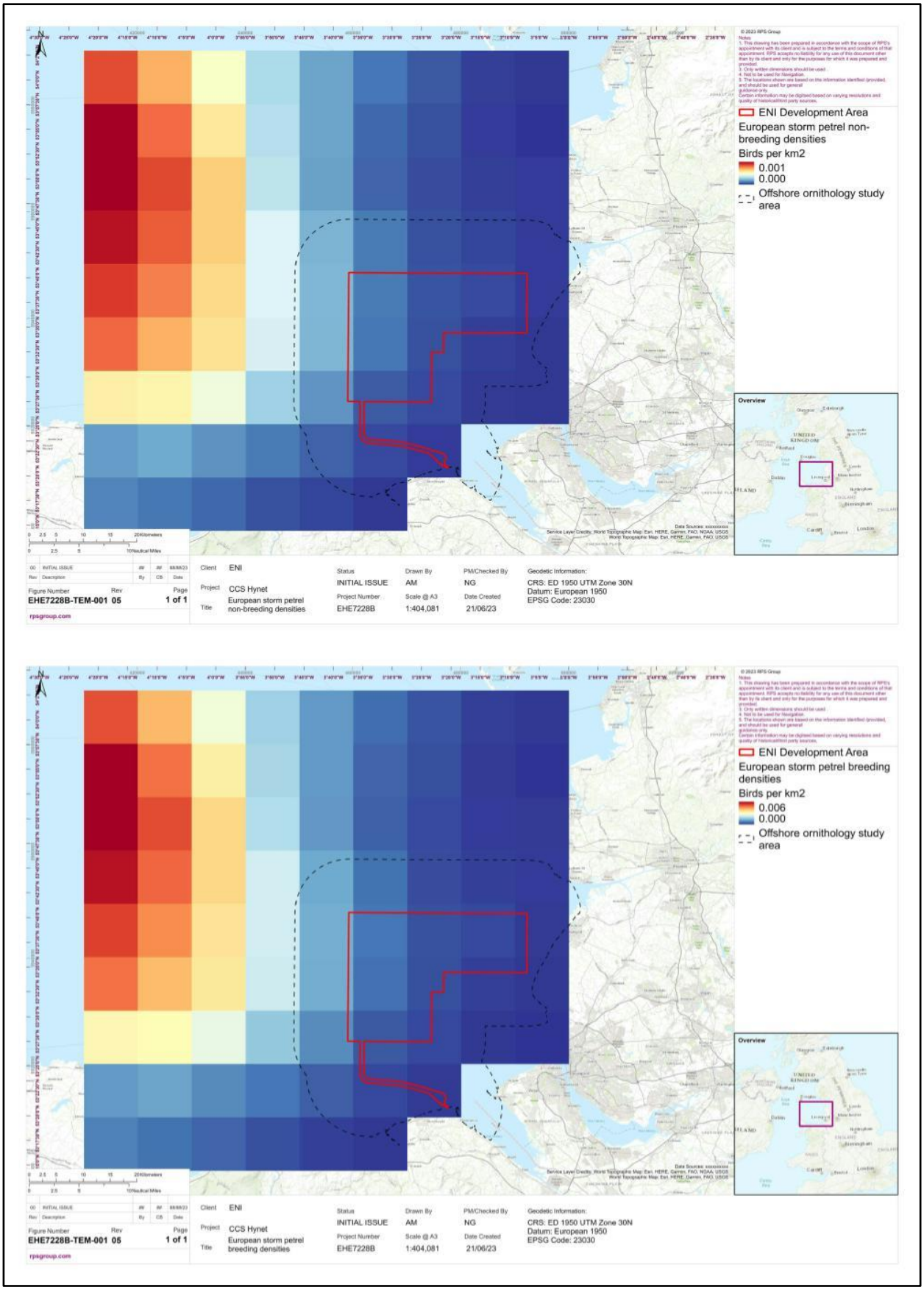


Figure 1.12: European Storm Petrel Densities In Liverpool Bay/Bae Lerpwl SPA From Waggitt *et al*. (2020)

Northern gannet

The northern gannet is the largest species of sea bird in the North Atlantic. They often travel in small groups, circling over fish (mackeral and herring) before diving up to 20m below the surface to catch them. Although skilled at catching live fish, gannets will also follow fishing vessels and compete with other scavenging species for the discards. The species breed on offshore islands and cliffs, in large, dense colonies where there can be, on average, 2.3 nests per square metre (Nelson 2005). The northern gannet is amber listed in the UK and is listed as a migratory species on the EC Birds Directive. There are 21 northern gannet colonies found in the UK, containing a total breeding population of 293,161 Apparently Occupied Nests (AONs) between 2013-2015, which accounts for 55.6% of the world population (JNCC 2021). The breeding season of northern gannet occurs from March-September. Northern gannets have a mean maximum foraging range of 315 km (data from 21 colonies from Woodward *et al.,* 2019) and there are large breeding colonies of northern gannets with connectivity to the Proposed Development. These are in Ailsa Craig, Scotland (23,000 breeding pairs, JNCC 2021); Grassholm Island, Wales (36,000, JNCC 2021) and Saltee Islands, Ireland (2,446, 2004, Saltee Islands SPA Site Synopsis). During the winter months, most northern gannets in the UK migrate south to the Bay of Biscay or further to West Africa.

Figure 1.13 shows that non-breeding northern gannets were found throughout much of the Proposed Development and study area at a minimum density of 0.063 birds per km^2, while the peak density was 0.153 birds per km^2 far to the west of the Proposed Development (Waggitt *et al.,* 2020). Breeding gannets show a similar distribution but at higher densities, peaking at 0.229 birds per km^2. The peak density within the Proposed Development was 0.163 birds per km^2.

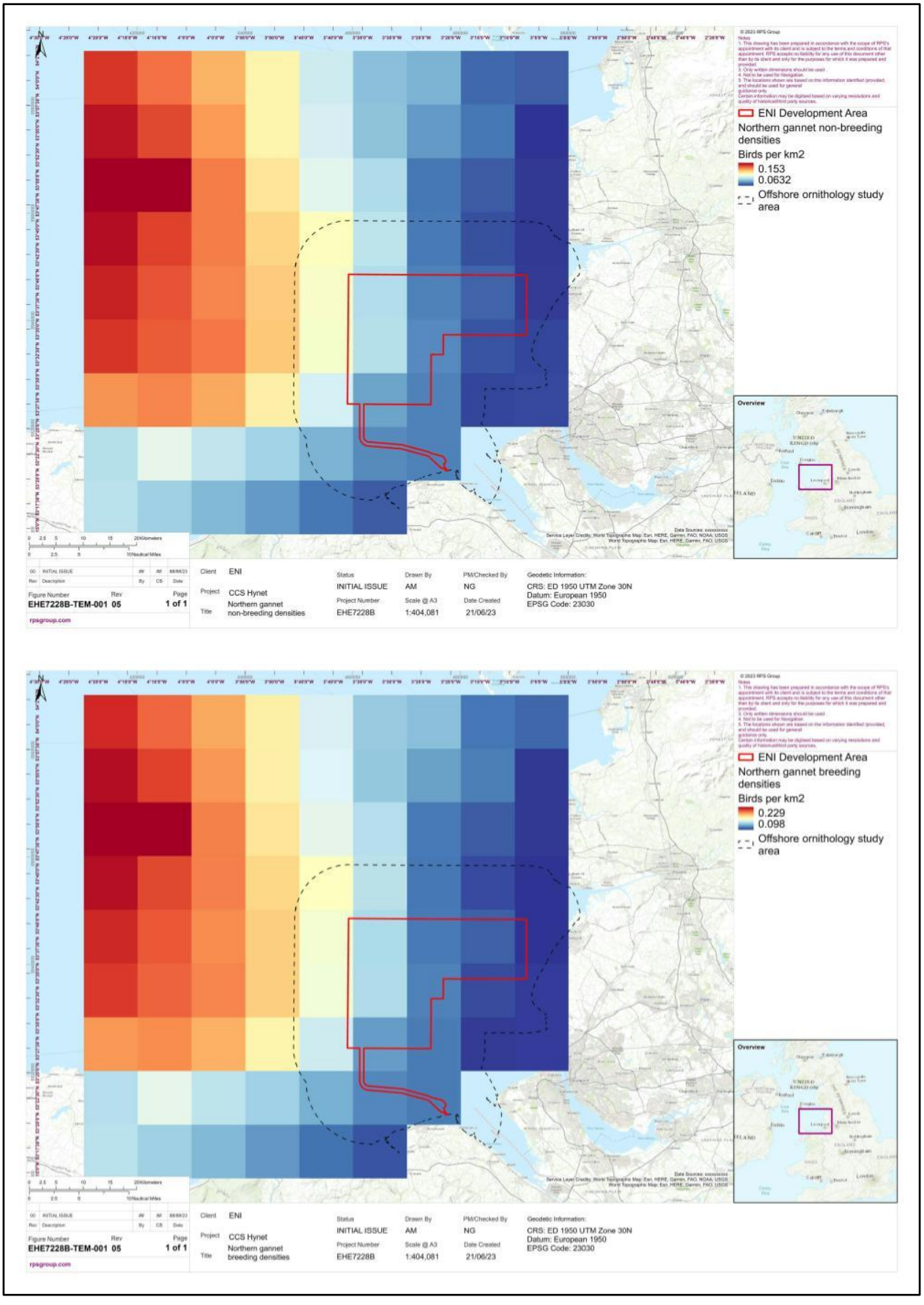


Figure 1.13: Northern Gannet Densities In Liverpool Bay/Bae Lerpwl SPA From Waggitt *et al*. (2020)

Little gull

Little gull (*Hydrocoleus minutus*) are the smallest species of gull. They breed in northern Europe, forming colonies on freshwater marsh habitat where they nest on the ground and produce two to six eggs, and many spend their winters north of Africa, in the Mediterranean or Atlantic Ocean. Some little gulls overwinter in the UK and can be seen along coasts here from July to April. Little gulls feed on small fish and will also pick up invertebrates near the water surface or catch them in flight. The Liverpool Bay SPA is of international importance for non-breeding little gull.

Figure 1.14 (Bradbury *et al.,* 2014) shows that winter little gull densities were concentrated within the offshore ornithology study area, just north of the Proposed Development, reaching 0.773 birds per km^2 in some parts. Densities of little gull within the Proposed Development reach a maximum of 0.494 birds per km^2 and never fall below 0.001 birds per km^2. No little gulls were recorded in the study area during the summer months.

Figure 1.15 shows the distribution of little gull densities as found by HiDef Aerial Surveying Limited (2023). However, the HiDef surveys only recorded little gull during four of the surveys (half of the time). This suggests that little gull spend much of their time beyond the original Liverpool Bay/Bae Lerpwl SPA boundary and that the Bradbury *et al*. (2014) data, although older, gives a more accurate picture of little gull distribution.

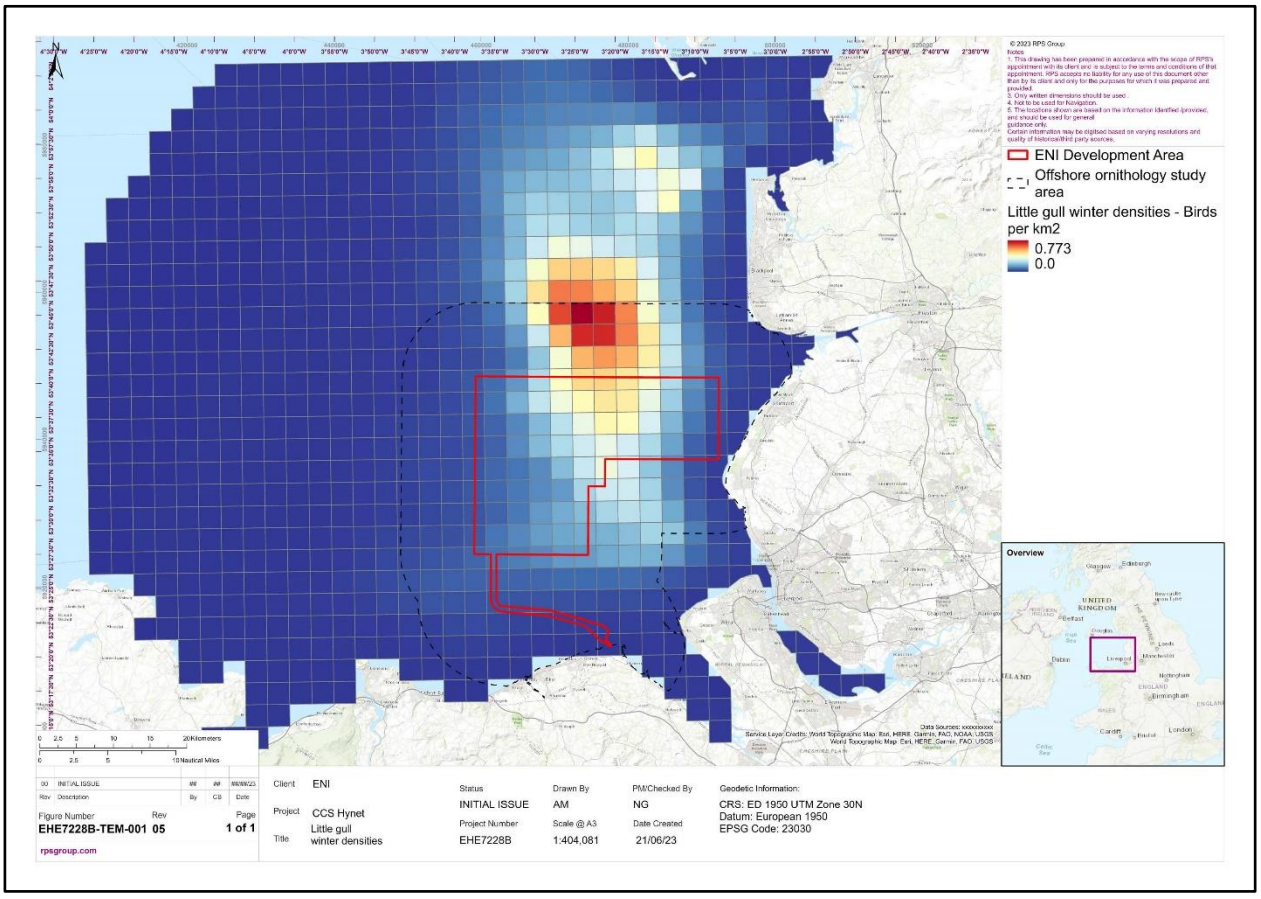


Figure 1.14: Little Gull Densities In Liverpool Bay/Bae Lerpwl SPA From Bradbury *et al.* (2014)

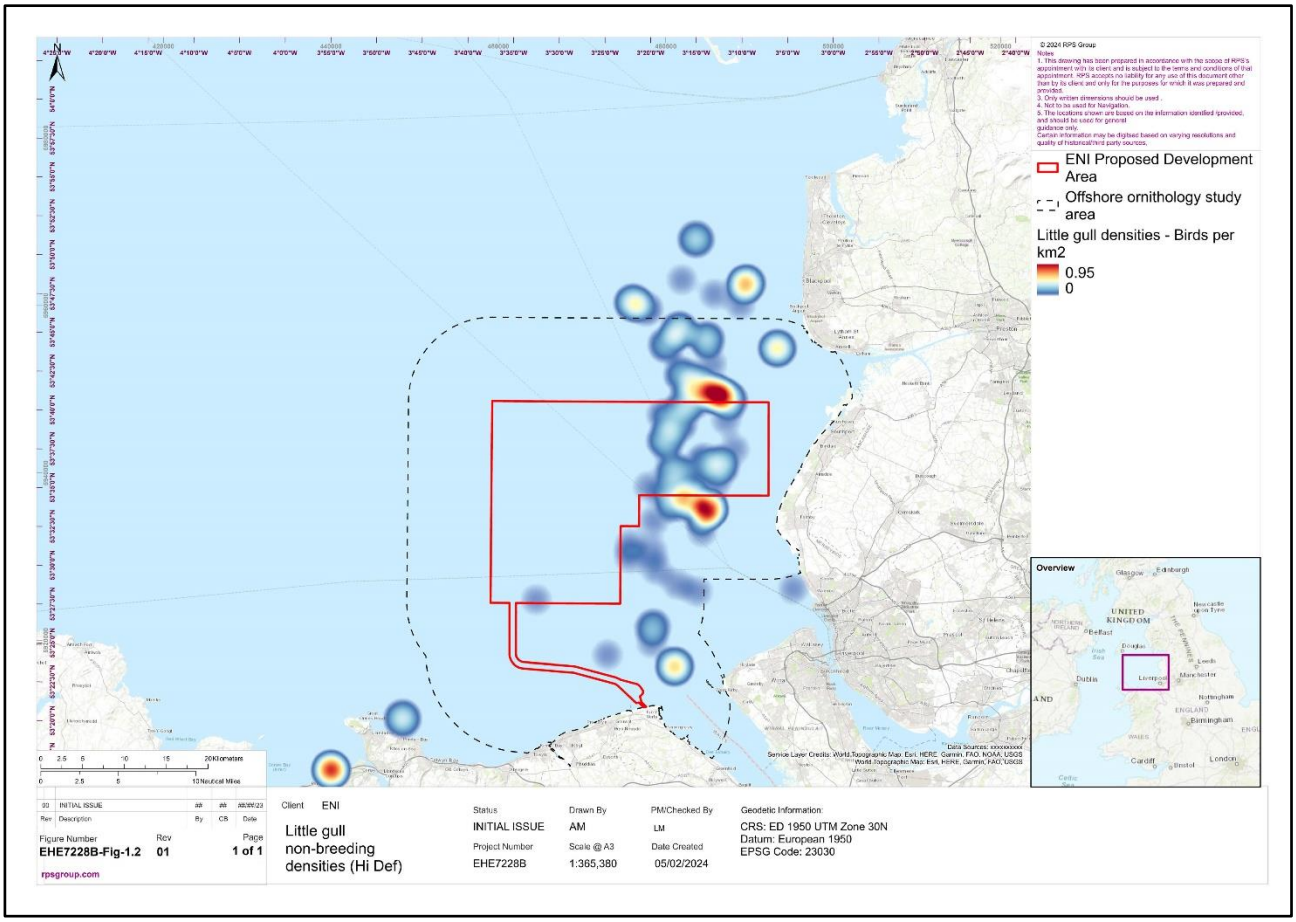


Figure 1.15: Little Gull Non-Breeding Densities In Liverpool Bay/Bae Lerpwl SPA From HiDef Aerial Surveying Limited (2023)

Lesser black-backed gull

Lesser black-backed gulls are only found in Europe. Persecution in the 19th century caused a decline in the population but the species have since expanded their home range and increased in numbers, however there is still concern as some populations are in decline once again. The lesser black-backed gull is amber listed in the UK. Here, there are 130,000 wintering individuals and 111,960 breeding pairs, accounting for 38.4% of the European population (JNCC 2021). Lesser black-backed gulls can be seen all year round on all British and Irish coastlines, but more than half of the UK population are found at fewer than 10 sites, one of which is the colony of Walney Island, Cumbria, where a third of the population reside with other large colonies situated in Lancashire and within connectivity of the Proposed Development. They are predominantly marine species, nesting on cliffs of coastal islands, but are increasingly found inland nesting on high, flat roofs. The breeding season runs from April to September. As omnivores they exploit a range of food sources including fish, crustaceans, fruit, mammals, birds, eggs and food waste produced by humans. Their mean maximum foraging range is 127 km (data from 18 colonies, Woodward *et al*., 2019).

Data from Waggitt *et al*. (2020) shows that lesser black-backed gulls were present in the offshore ornithology study area all year (Figure 1.16), but densities were higher during the breeding season than the non-breeding season.

In the breeding season there was a maximum density of 0.903 birds per km^2 recorded in the Proposed Development Area, while in the winter, there was a maximum of 0.062 birds per km^2. In both seasons, the density of the gulls was highest close to the Lancashire coast.

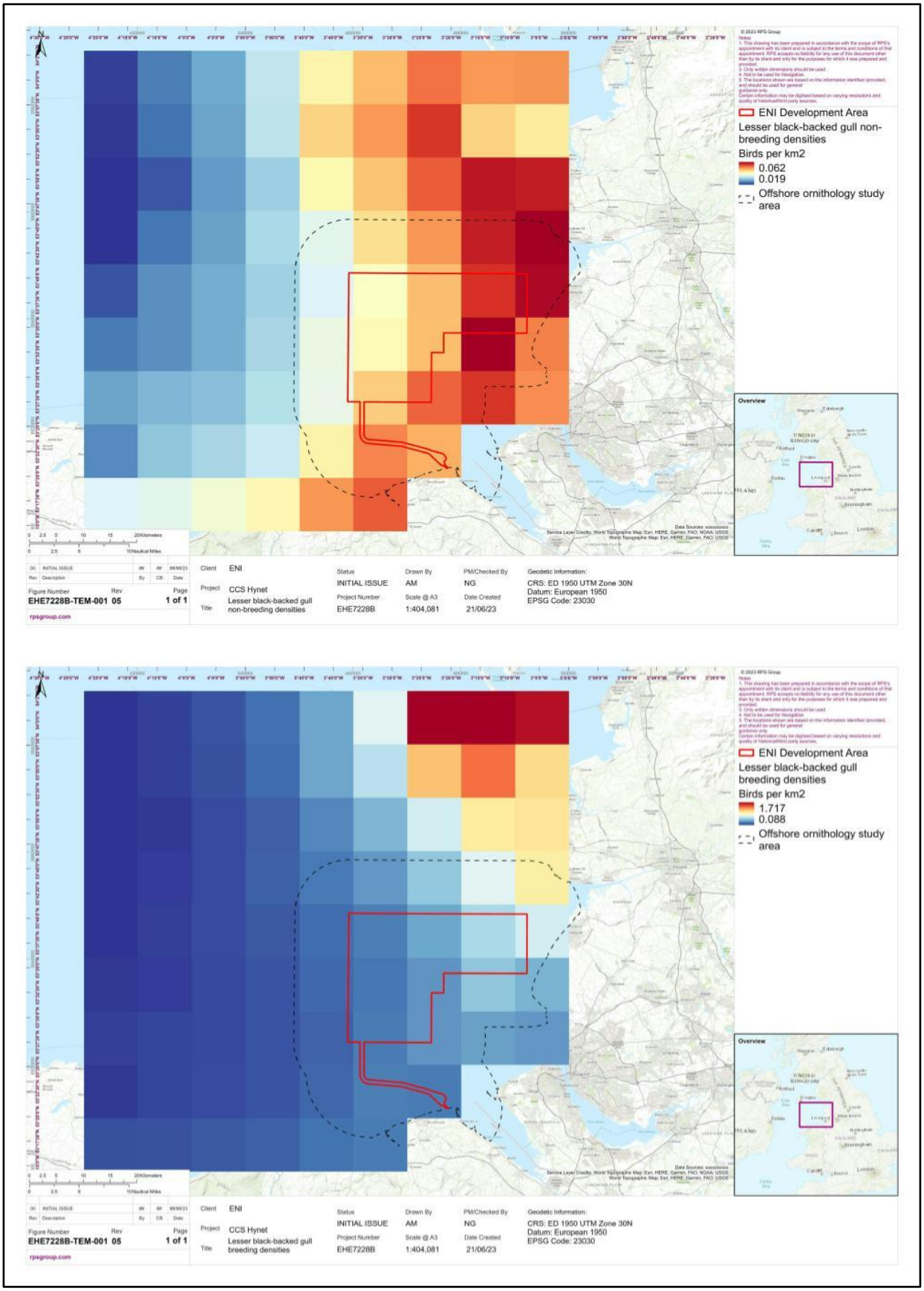


Figure 1.16: Lesser Black-Backed Gull Densities In Liverpool Bay/Bae Lerpwl SPA From Waggitt *et al*. (2020)

Sandwich tern

Sandwich terns are medium-large seabirds that predominantly feed on fish such as sand eels, sprats and whiting. These terns breed in the Palearctic, from Europe to the Caspian Sea, and overwinter in India, South Africa and Sri Lanka. The UK breeding population is 14,000 pairs, and just 65 individuals remain here in the winter months (2015) (JNCC 2021). The species is amber listed in the UK. Sandwich terns breed on coasts and islands, from March to October, laying one to three eggs in ground scrape nests. In the UK, sandwich tern breeding colonies are scattered across the coastline.

During the summer period, the densities of sandwich terns around the SPA varied from zero to 0.650 birds per km^2 (Figure 1.17), with clusters of high densities to the north of the SPA. Within the Proposed Development at the Point of Ayr landfall there was a peak of 0.583 birds per km^2. These clusters are found relatively close to the shore since sandwich terns prefer to feed in shallow waters with sandy bottoms (Cabot & Nisbet 2013; Perrow *et al.,* 2011). No sandwich tern were present during the winter period.

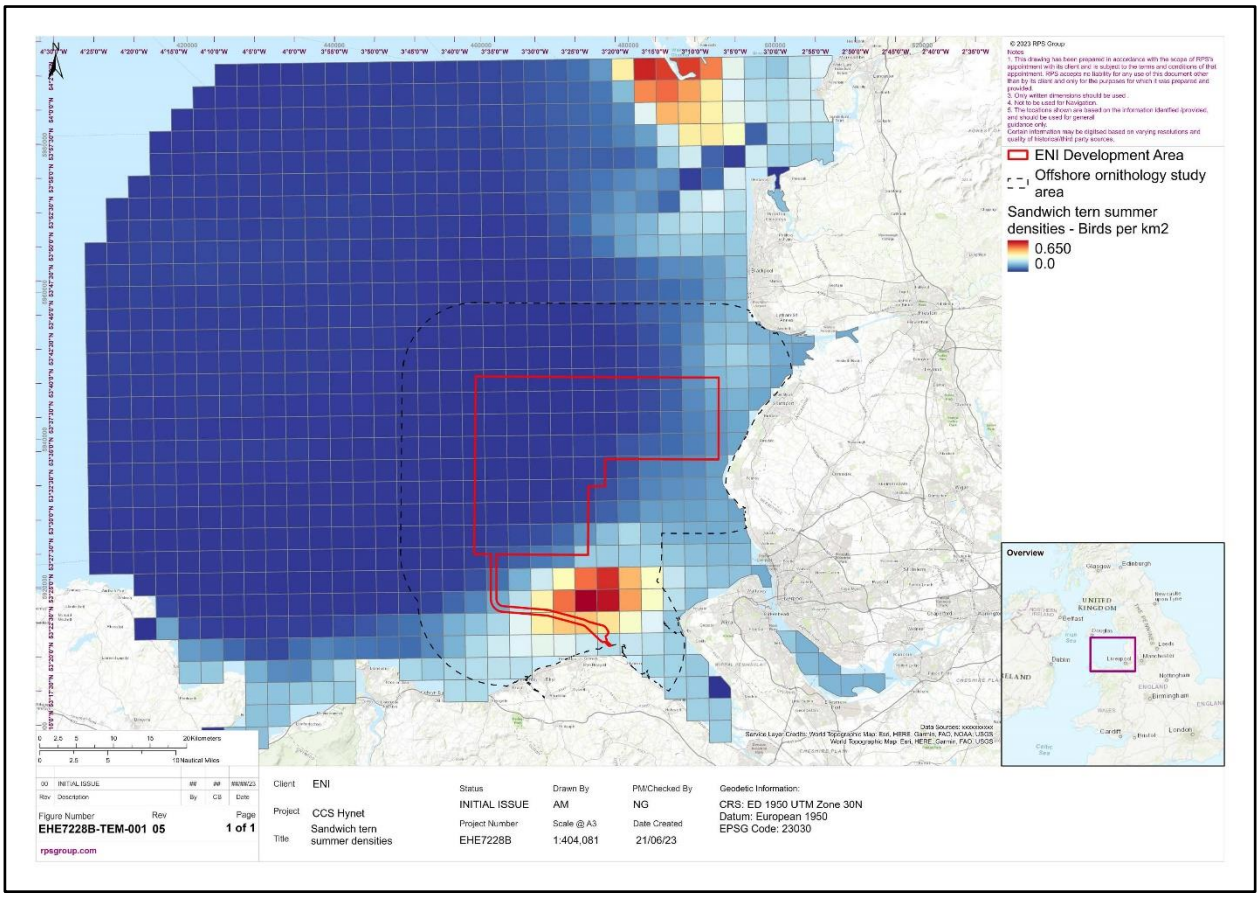


Figure 1.17: Sandwich Tern Densities In Liverpool Bay/Bae Lerpwl SPA From Bradbury *et al.* (2014)

Little tern

Little tern breed in Europe and Asia and migrate south for the winter, sometimes as far as South Africa and Australia. The UK breeding population is 1,450 pairs, with colonies scattered across the UK coastline where suitable habitat exists, e.g. gravel, sand and shingle beaches (JNCC 2021). They are a Schedule 1 species and are amber listed. Their diet consists of fish (e.g. herring, sand eels, sprat), and invertebrates, for which they will travel up to 5 km for (Woodward *et al.,* 2020). Foraging ranges are highest during incubation (April-May = 1.6 - 2 km) but considerably lower while rearing chicks (June-July = 1 - 1.2 km) (Paiva *et al*., 2008).

Neither Waggitt *et al*. (2020) nor Bradbury, *et. al*. (2014) have reliable data for little tern, this may be due to their tendency to forage close to shore. However, both the Dee Estuary and Liverpool Bay SPAs are designated in part for supporting breeding little tern, and as there is a main colony at Gronant Dunes (211 pairs in 2022 - Denbighshire County Council) with a satellite colony at Point of Ayr (39 nests in 2022 - RSPB). Therefore, the approach taken for characterising little tern utilisation of the Proposed Development is based upon their foraging ranges. A 5 km mean max foraging range was used from Woodward, *et. al*., (2014), 8.6% of the little tern foraging range is located within the Proposed Development area (see Table 1.5 and Figure 1.18).

Table 1.5: The Proportion Of Little Tern Foraging Range Within The Proposed Development

Little tern foraging range	%
Total	100
Within the Proposed Development	8.6
Outside the Proposed Development	91.4

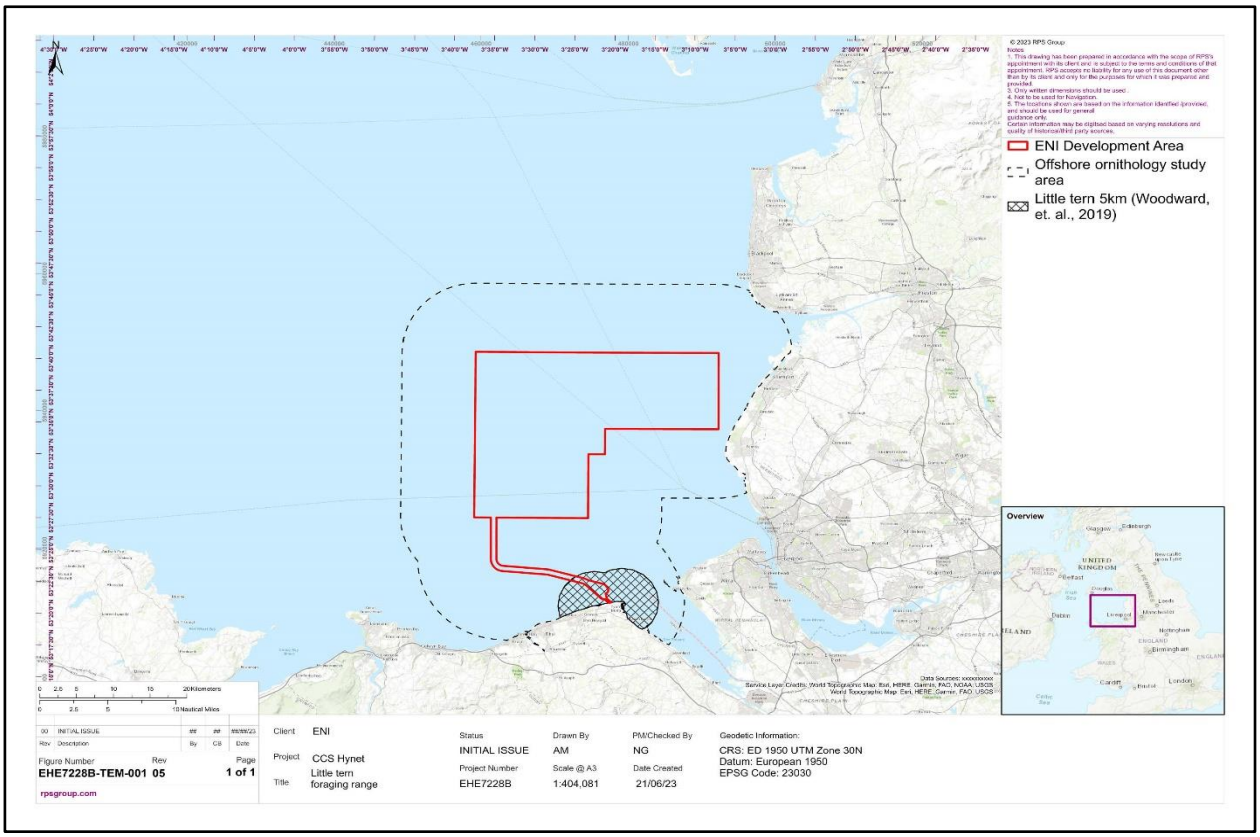


Figure 1.18: Little Tern Foraging Range (Mean Max As Taken From Woodward, *et. al*. 2019) In Relation To The Proposed Development

Common tern

Common tern breed in the temperate and subarctic areas of Europe, Asia and North America and migrate south to tropical and subtropical regions, such as the coasts of Spain and Africa, to spend the winter. Common terns are present along much of the British and Irish coastlines. There are 11,000 breeding pairs (2015) in the UK, which arrive from mid-April and nest on rocky islands, shingle beaches, saltmarshes and

industrial areas (JNCC 2021). They feed on fish and invertebrates, and they will also steal food from other seabirds (known as kleptoparasitism). These terns forage in a range of habitats such as open sea, lagoons, estuaries. Inland they will feed over freshwater bodies and along rivers.

Similar to the little tern, the approach taken for characterising common tern utilisation of the Proposed Development is based upon the foraging ranges from known colonies adjacent to the Liverpool Bay SPA (SMP 2023). An 18 km mean max foraging range was used from Woodward, *et. al*., (2014). 2.5% of the common tern available foraging range is located within the Proposed Development area (see Table 1.6 and Figure 1.19).

Table 1.6: The Proportion Of Little Tern Foraging Range Within The Proposed Development

Common tern foraging range	%
Total	100
Within	2.5
Outside	97.5

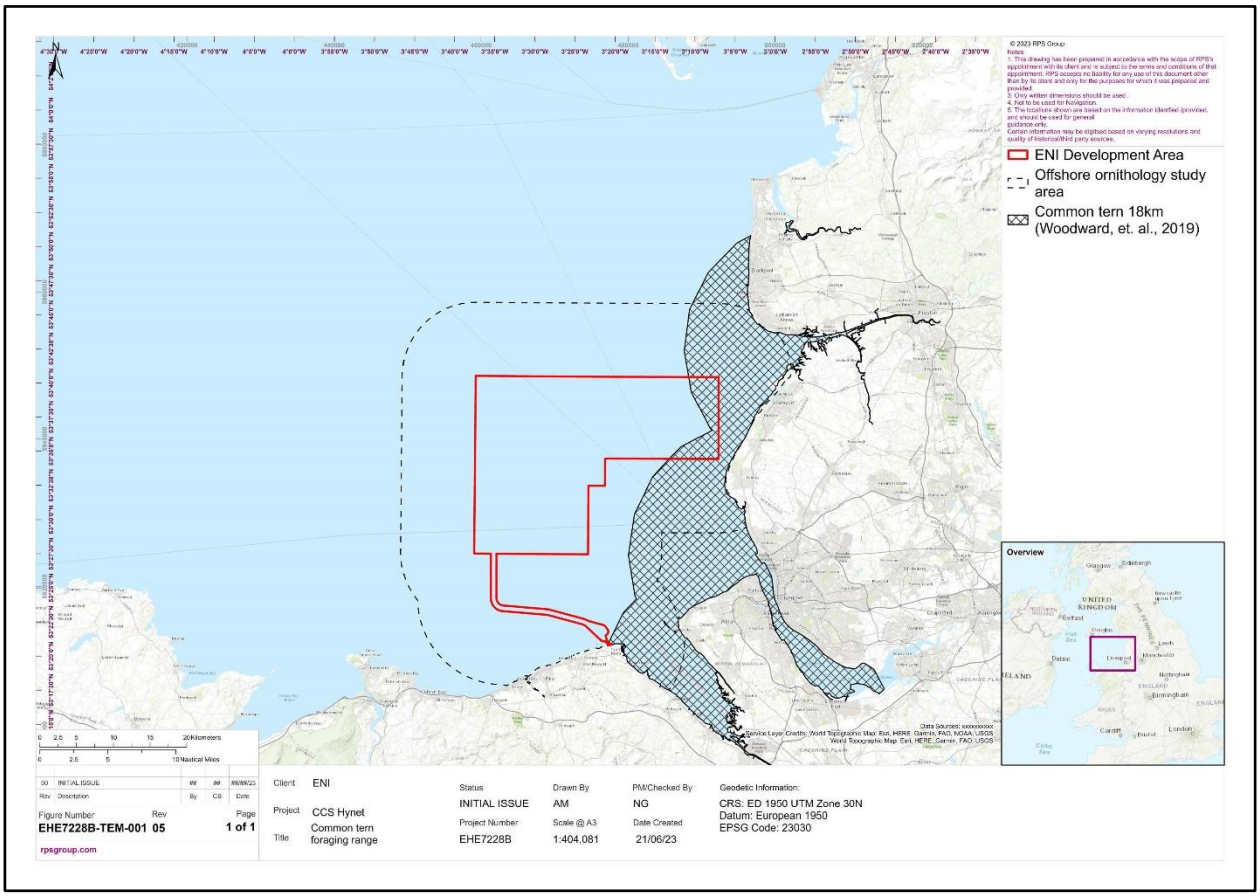


Figure 1.19: Common Tern Foraging Range (Mean Max As Taken From Woodward, et. al. 2019) In Relation To The Proposed Development

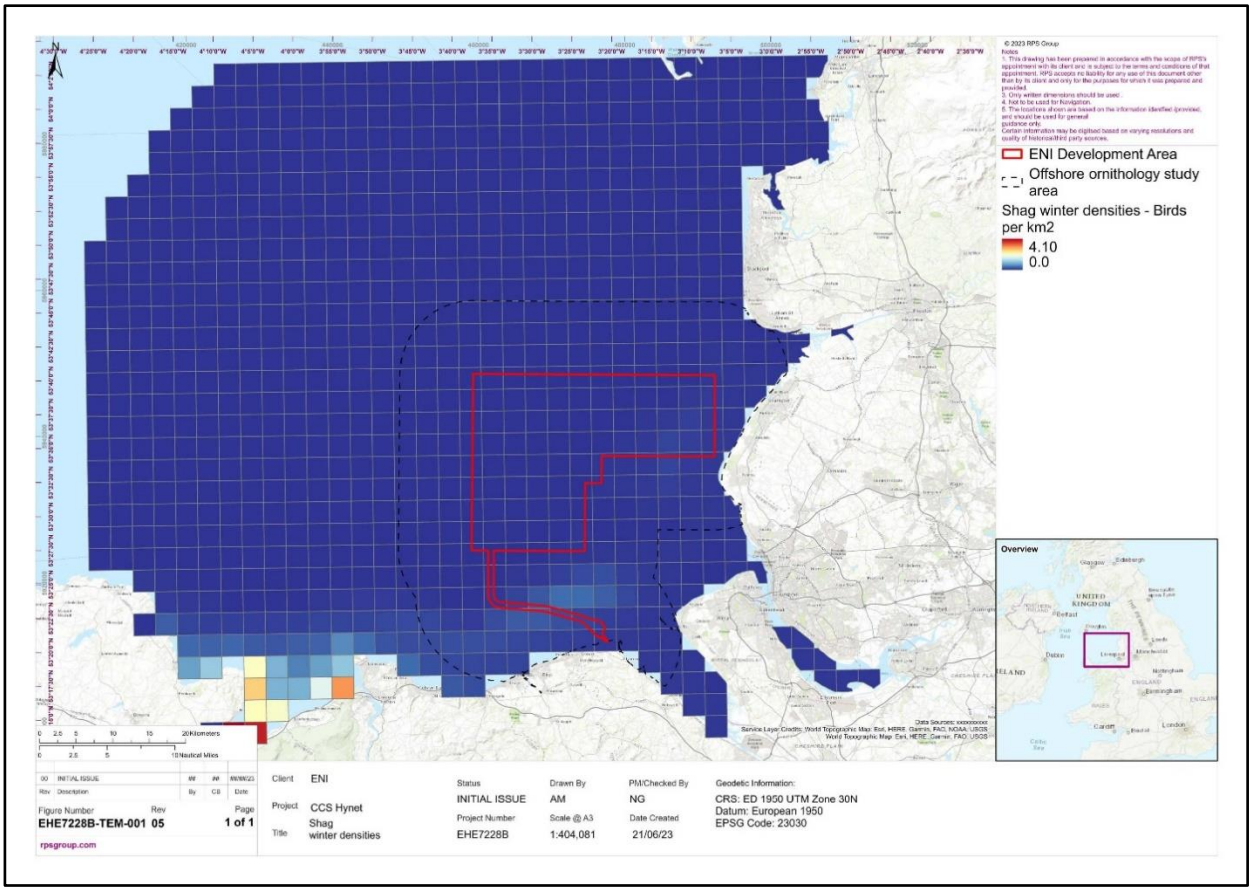
Non-SPA seabirds

Also present within the Irish Sea are seabirds including, but not limited to, arctic skua, European shag, great skua, black-headed gull, black-legged kittiwake, common gull, herring gull, great black-backed gull, arctic tern, black guillemot, common guillemot, razorbill, and Atlantic puffin. These species are of lower conservation importance as they do not have internationally important breeding or non-breeding populations with connectivity to the Proposed Development. These species are briefly summarised below:

European shag

The European shag is a predominantly coastal sea bird species that is primarily found in inshore waters. It is largely restricted to certain regions and has a limited distribution. In the UK, the European shag is considered a red-listed species in the UK Birds of Conservation Concern 5 (Stanbury *et al*., 2021). The breeding population of European shag consists of approximately 18,000 pairs, making up around 10% of the global breeding population (about 80%, of these are located in Scotland), and an estimated 110,000 spend their winters in the UK (BTO, 2015).

Figure 1.20 shows the distribution of non-breeding European shag, their presence within the offshore ornithology study area was generally sparse with a peak of 0.725 birds per km^2. Slightly higher concentrations of birds were observed in the southern part of the Liverpool Bay SPA. During the summer period they expanded their distribution within the offshore ornithology study area, although the densities were comparatively lower.



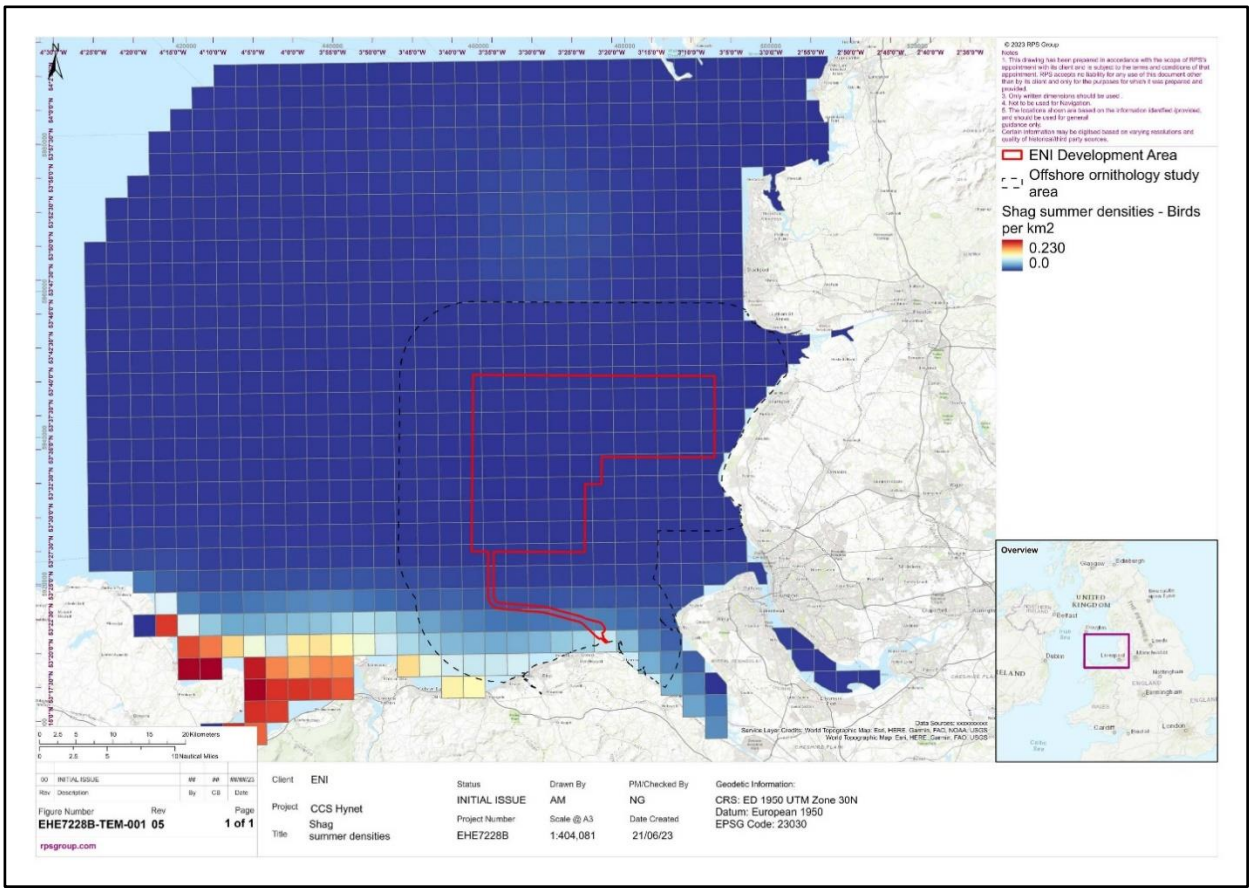
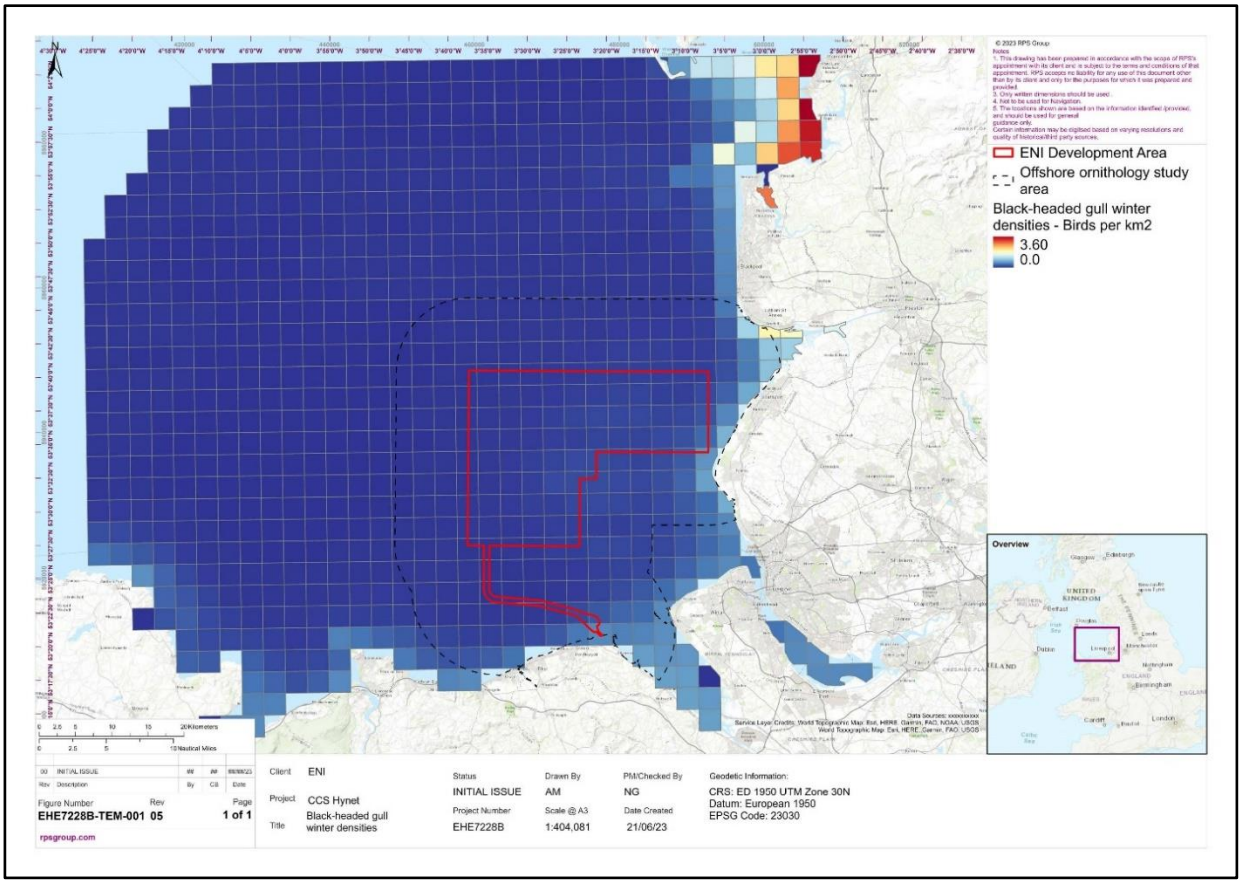


Figure 1.20: European Shag Densities In Liverpool Bay/Bae Lerpwl SPA From Bradbury *et al*. (2014)

Black-headed gull

Black-headed gull are present in Britain and Ireland throughout the year. They exhibit colonial breeding behavior and can be found nesting in open grounds near both coastal and inland water bodies. Black-headed gull are amber listed on the Birds of Conservation Concern 5 (Stanbury *et al*., 2021). The breeding population is estimated to be around 140,000 pairs based on data from the British Trust for Ornithology (BTO) collected between 1998 and 2002. During the winter, the population increases with the arrival of continetal birds and the UK can hold up to 2,2 milion of birds.

Figure 1.21 shows that during the winter black-headed gulls maintained consistently low densities both within the offshore ornithology study area. Relatively higher densities were observed in proximity to the coast, reaching peak densities of 0.692 birds per km². The northern region of the Liverpool Bay SPA, exhibited the highest densities, with a peak density of 2.239 birds per km². During the summer, breeding black-headed gulls were further restricted to coastal areas and were largely absent from the Proposed Development. Within the offshore study study area, peak densities increased to 0.334 birds per km², but were confined to a small and specific area encompassing the Ribble and Alt estuaries (Bradbury *et al*., 2014). where there is a breeding colony (JNCC, 2021).



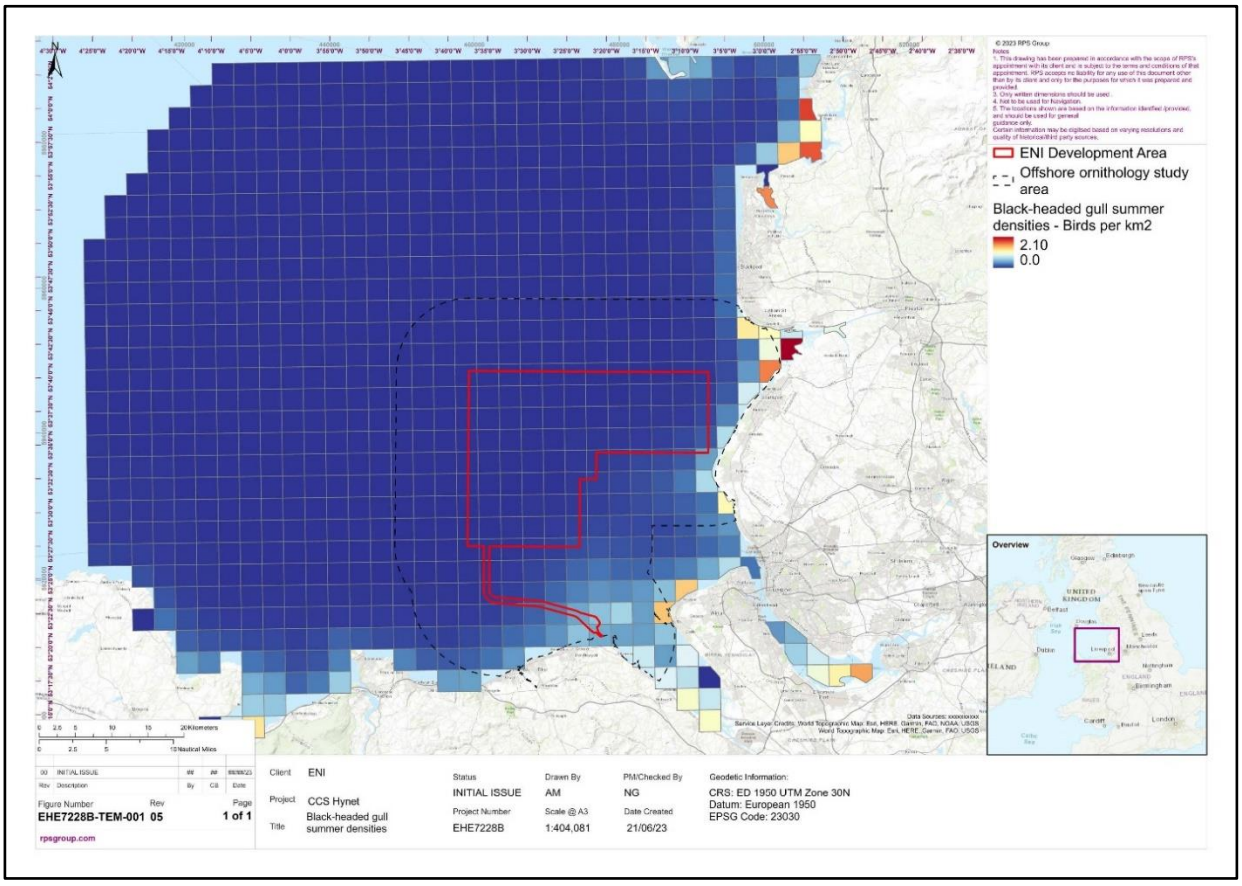


Figure 1.21: Black-Headed Gull Densities In Liverpool Bay From Bradbury *et al.* (2014)

Black-legged kittiwake

Black-legged kittiwake belong to the group of small gulls in Britain and Ireland. Kittiwakes are the most oceanic species of gulls and are mainly present far offshore during non-breeding periods. During the breeding season, this species nest on sheer cliffs but can also be found in man-made structures such as buildings, bridges, or offshore oil installations. Although black-legged kittiwakes are the most abundant gull species with approximately 205,000 pairs, they are included in the red list in the Birds of Conservation concern 5 (Stanbury *et al*., 2021).

Figure 1.22 illustrates the distribution of non-breeding black-legged kittiwakes, with higher densities observed in the north-west of the Proposed Development. The peak density of 0.484 birds per km² was recorded in the outermost region of the study area, while lower densities of 0.409 birds per km² were found closer to the coast and within the Proposed Development area. Breeding season black-legged kittiwakes displayed lower densities compared to non-breeding season birds. The highest densities, reaching 0.284 birds per km², were concentrated in the southwestern outermost part of the offshore ornithology study area, while lower densities of 0.147 birds per km² were observed throughout most of the Proposed Development (Waggitt *et al*. 2020).

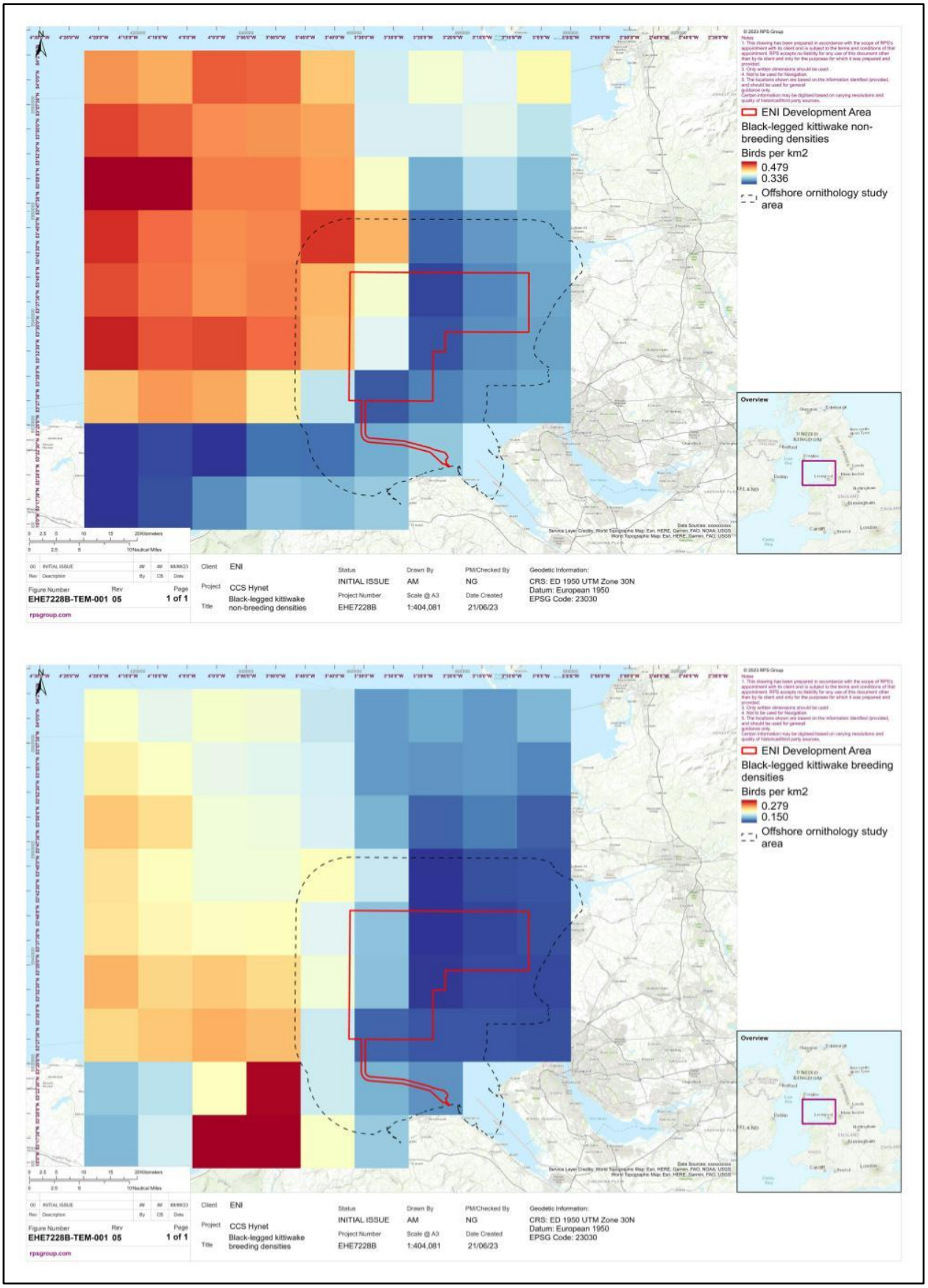
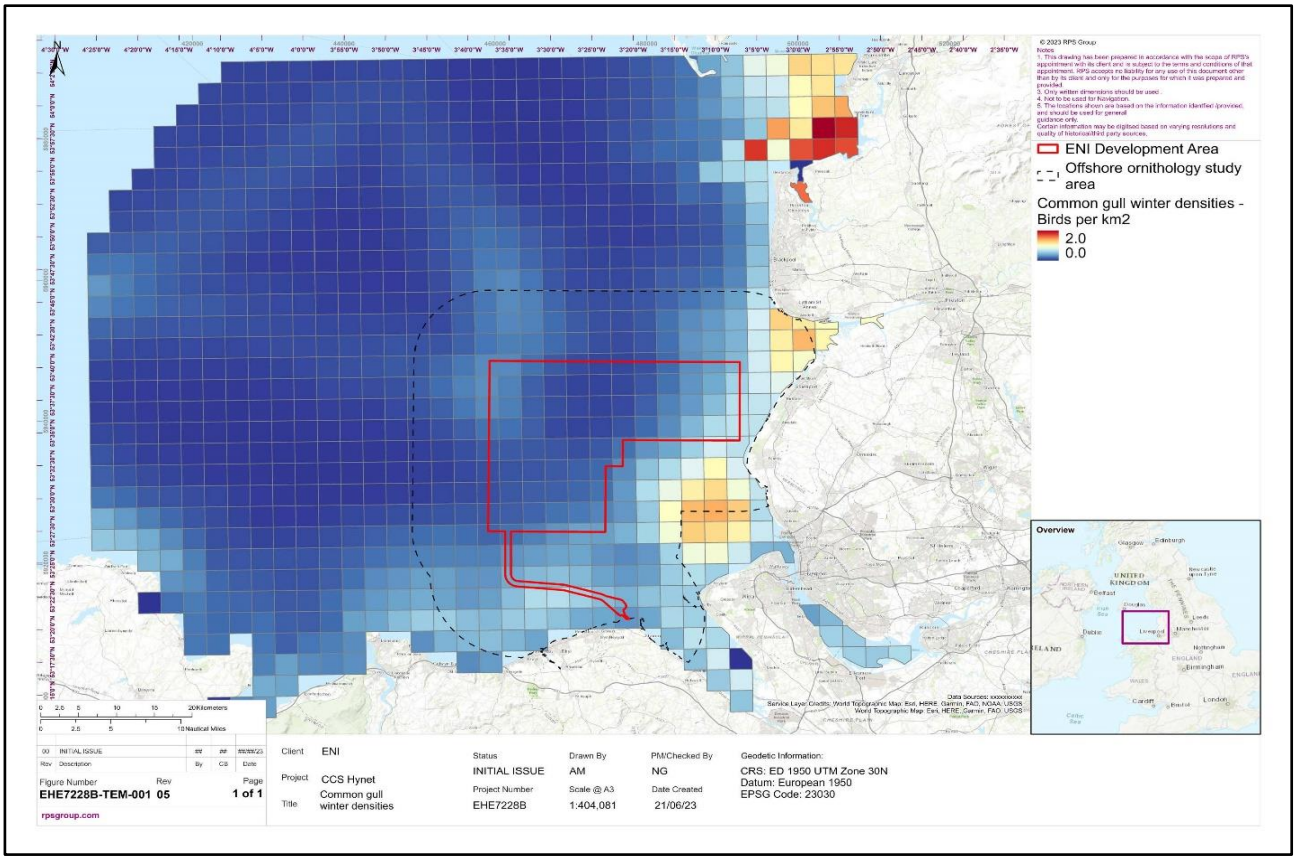


Figure 1.22: Black-Legged Kittiwake Densities In Liverpool Bay/Bae Lerpwl SPA From Waggitt *et al*. (2020)

Common gull

Common gull are widely distributed across Britain during the non-breeding season. However, during the breeding season, these birds are confined to the northern and western regions of Scotland and Ireland. According to the last census conducted between 1998 and 2002, it is estimated that Britain and Ireland host approximately 49,000 breeding pairs, with 50% of them suggested to be inland breeders (JNCC, 2021). The arrival of a large influx of continental birds in the autumn increases the wintering population to up to 710,000 individuals. Common gull are amber listed in the Birds of Conservation Concern 5 (Stanbury *et al*., 2021).

Figure 1.23 shows the density of wintering common gull is generally relatively low. A notable hot spot of common gulls was identified in the northern area of Liverpool Bay SPA, which falls outside the offshore ornithology study area. During the summer, the population of common gull is concentrated along the coast and inland areas, with the highest densities of 2.01 birds per km² found within the offshore ornithology study area at the Ribble and Alt Estuaries. Note, summer common gull are not breeding but composed of either late spring passage, early autumn passage, or non-breeding birds.



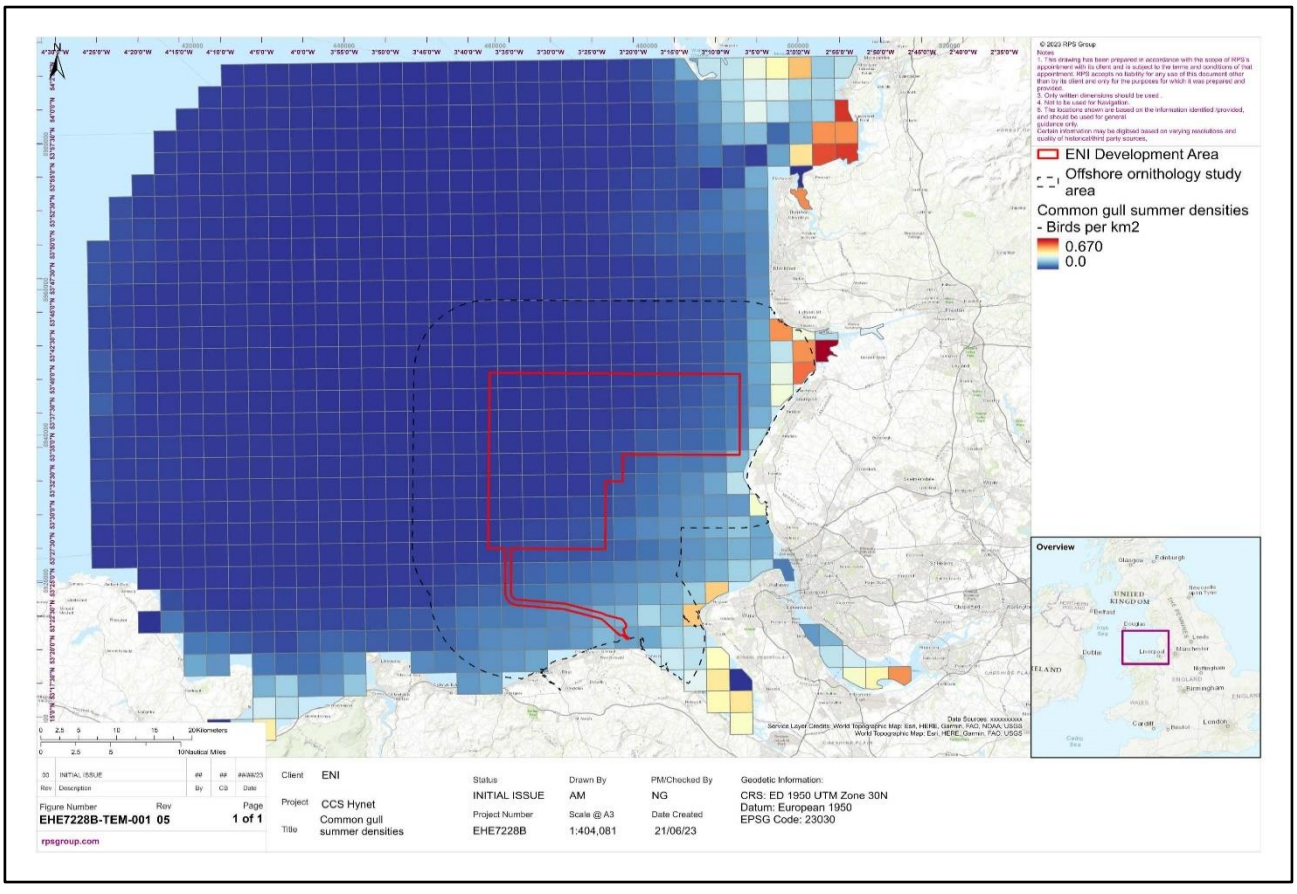


Figure 1.23: Common Gull Densities In Liverpool Bay/Bae Lerpwl SPA From Bradbury *et al*. (2014)

Herring gull

Herring gulls are distributed extensively across Britain. While they have a wide range of breeding grounds, herring gulls show a preference for coastal sites such as cliffs, islets, and offshore islands. However, they can also be found in various other habitats, including sand dunes, shingle banks, and increasingly, rooftops of buildings in urban areas. Herring gulls are colonial species, especially when breeding in natural habitats, and they often form mixed colonies with lesser black-backed gulls. The estimated total number of breeding pairs in the UK is 130,000. In the winter, the total population of herring gulls can reach up to 749,000 (Seabird 2000, 1998-2002).

Figure 1.24 shows that the non-breeding distribution of herring gulls closely resembles that of common gulls. During both the summer and winter periods herring gull are generally concentrated close to shore with greater numbers and a wider distribution during the winter period. The peak density within the offshore ornithology study area is 0.894 birds per km^2.

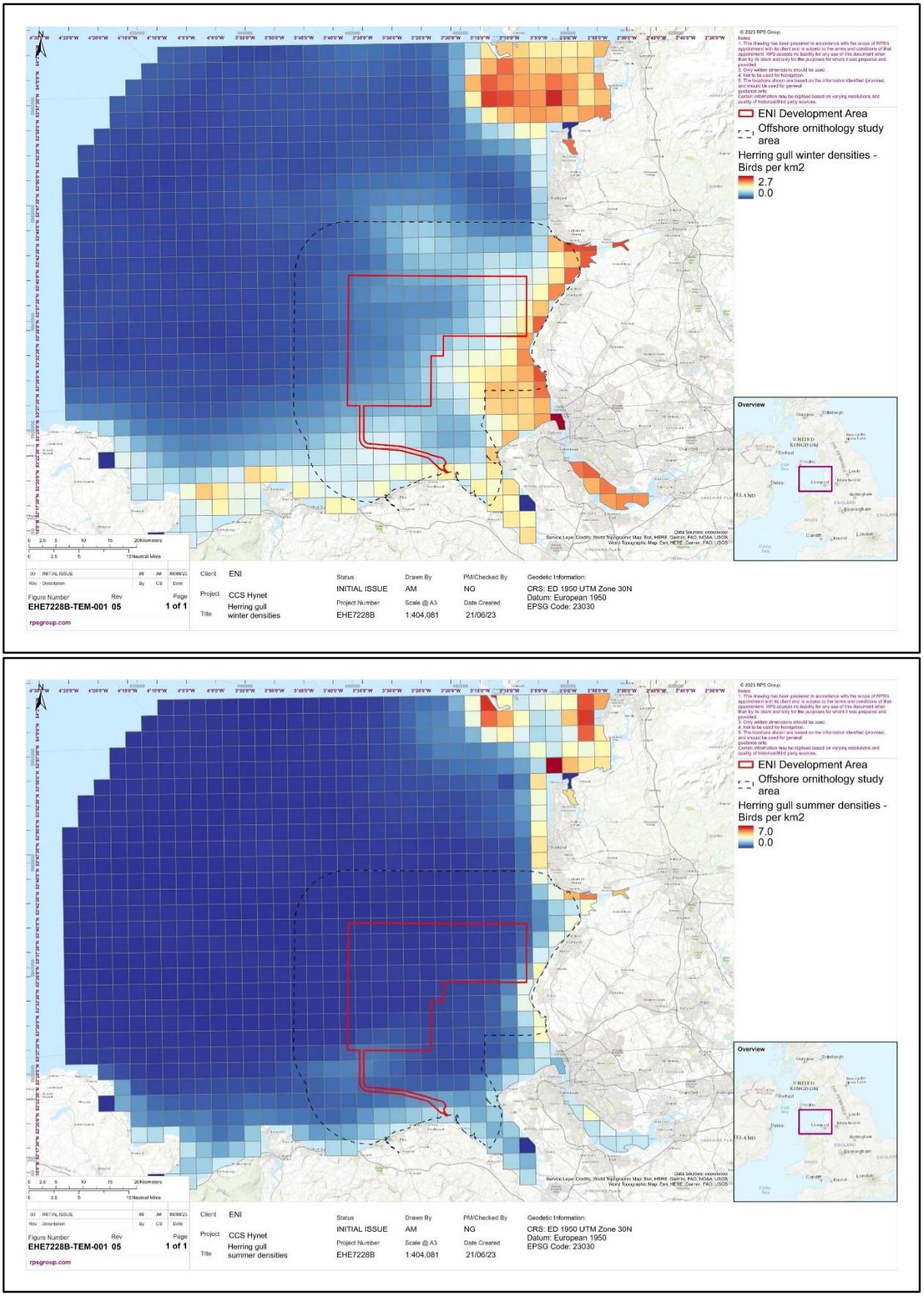


Figure 1.24: Herring Gull Densities In Liverpool Bay/Bae Lerpwl SPA From Bradbury *et al*. (2014)

Great black-backed gull

The great black-backed gull breeding range is more limited compared to other gull species, mainly concentrated in the western half of Britain, scattered across the southern coast of England, Welsh coast, Outer and Inner Hebrides, and the Northern Isles of Scotland. Great black-backed gulls primarily nest in coastal habitats, although they occasionally nest inland at freshwater sites and even on the roofs of buildings. The estimated number of nesting pairs in Britain and Ireland is around 15,000, which increases to 77,000 individuals during the winter when they are more widely distributed aroun Britains coastline. The population remains relatively stable but is listed as amber in the Birds of Conservation Concern 5 (Stanbury *et al*., 2021).

Figure 1.25 shows that in the winter, the higher density of great black-backed gulls was observed north of Connah's Quay, with peak densities up to 0.77 birds per km^2. Within the offshore ornithology study area densities were generally low peaking at 0.151 birds per km^2. During the summer, the density of great black-backed gulls decreased, with concentrations found near Morecambe Bay, where densities of up to 0.24 birds per km^2 were detected. However, the densities were lower within the Proposed Development.

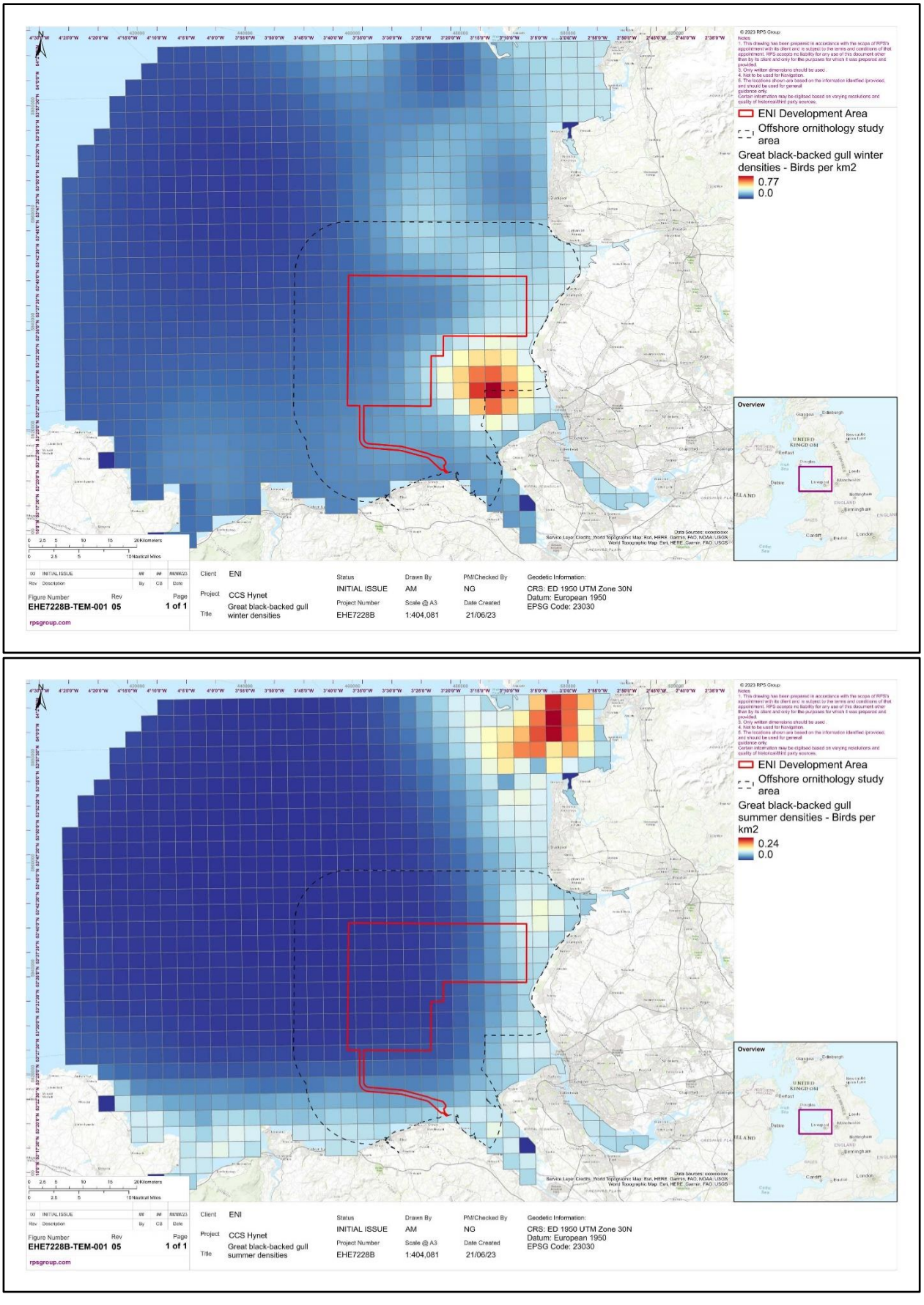


Figure 1.25: Great Black-Backed Gull Densities In Liverpool Bay SPA From Bradbury *et al*. (2014)

Arctic tern

Arctic terns are the most oceanic and have the longest migration of all the genus Sterna. Migration is mostly offshore or coastal; however, hundreds cross Britain every year and can be seen resting in lakes and reservoirs. Arctic tern remain on the amber list of Birds of Conservation Concern (Stanbury *et al*., 2021). Arctic terns lay one to two eggs once a year and don't reach breeding age until they are four years old. Like most seabirds, Arctic terns are long-lived, with an average lifespan of 13 years. During the surveys carried out by Waggitt *et al*. in 2000, Arctic terns were not observed in any of the seasons. Arctic tern will likely only occur within the Proposed Development during short periods during the year whilst undergoing migration between the breeding and wintering grounds.

Great skua

Great skuas are large seabirds, outside of the breeding season, great skuas can be seen near the coast throughout the UK. However, during the breeding season, their distribution becomes highly restricted, particularly in Scotland, where they are concentrated in Shetland and Orkney. The great skua is an offshore opportunistic omnivorous predator that often feeds on fisheries, particularly outside of the breeding season. It can also be specialist feeder that primarily preys on seabirds near the breeding colony. Due to the fact that there is no connectivity between important breeding and wintering areas, this species is unlikely to be a receptor species.

Arctic skua

Similar to other species of skuas, arctic skuas are highly migratory, and they can be seen offshore throughout the coast of Britain, although they are less common in Ireland. Breeding arctic skuas have an even more restricted distribution compared to great skuas. The UK represents the southwestern end of their breeding range, with concentrations in Scotland, particularly in the Northern Isles, Caithness and Sutherland, the Outer Hebrides, St Kilda, and a few southern Inner Hebridean islands.

Arctic skuas are present on the site in limited numbers, primarily during passage, particularly in August and September.

Black guillemot

Black guillemots are a medium-sized seabird with a wing length no longer than 174mm. These are a circumpolar species occupying northern areas of the UK and mostly sedentary, meaning that they will be found in a similar range in both breeding and winter distribution. They are not considered to have connectivity to the Proposed Development.

Common guillemot

Common guillemots are one of the most abundant seabird species in colder parts of the northern hemisphere. The UK holds a population of almost a million pairs (950,000), representing 12.9% of the world's entire population. These birds are included in the amber list of Birds of Conservation Concern 5 (Stanbury *et al*., 2021).

Within the offshore ornithology study area the density of common guillemots per km² is generally lower for birds in the breeding season in comparison to the non-breeding season (Figure 1.26). Breeding guillemots are found in densities of 0.742 birds per km² in the southernmost area of the Liverpool Bay SPA, near Anglesey. The number of birds per km² reduces within the Proposed Development, with lower densities standing at 0.341 birds per km². Non-breeding season common guillemots show slightly higher densities, reaching a peak density of 1.229 birds per km² in the northern border of Liverpool Bay SPA. Lower densities are found within the Proposed Development, with 1.024 birds per km² as the lower end (Waggitt *et al*., 2020).

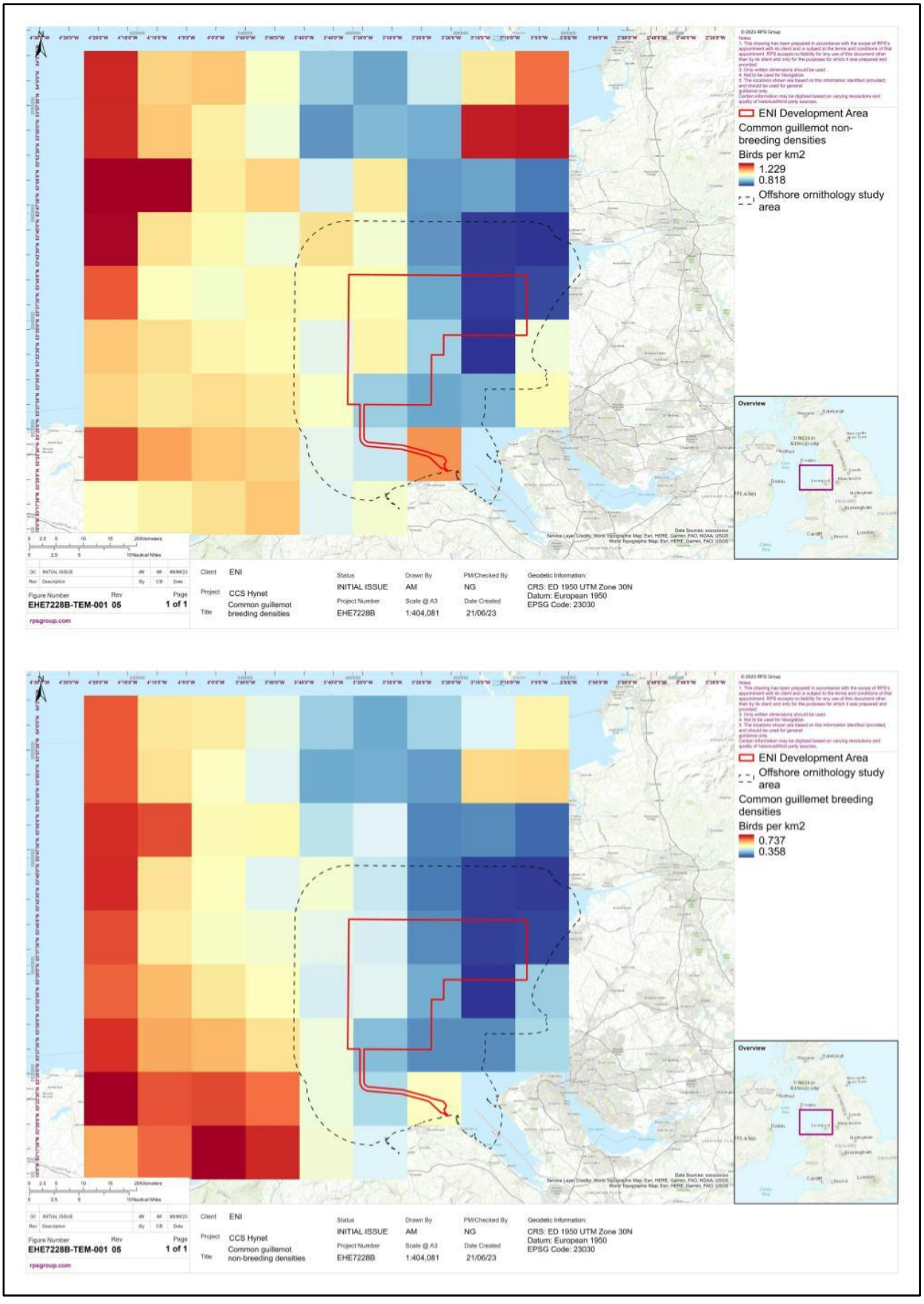


Figure 1.26: Common Guillemot Densities In Liverpool Bay/Bae Lerpwl SPA From Waggitt *et al.* (2020)

Atlantic puffin

Puffin are the second most abundant breeding seabird in Britain and Ireland. Their winter distribution is largely offshore. During the summer, the highest densities of breeding puffins can be found in the Northern Isles, St Kilda, along the North Sea coast south to Yorkshire, in southwest Wales, and in western Ireland. There are 580,000 pairs of puffins in the UK, representing 10% of the world's entire population.

Figure 1.27 illustrates that the density of puffins within the offshore ornithology study area, both breeding and non-breeding, is generally low. The highest density of non-breeding season puffin is 0.017 birds per km², but this is found outside of the offshore ornithology study area. The lowest density of birds, at 0.022 birds per km², can be found within the Proposed Development. A similar situation is found for breeding season birds, but with slightly higher peak densities for both the maximum and minimum number of birds seen per km² (0.038 birds and 0.006 birds respectively) (Waggitt *et al*., 2020).

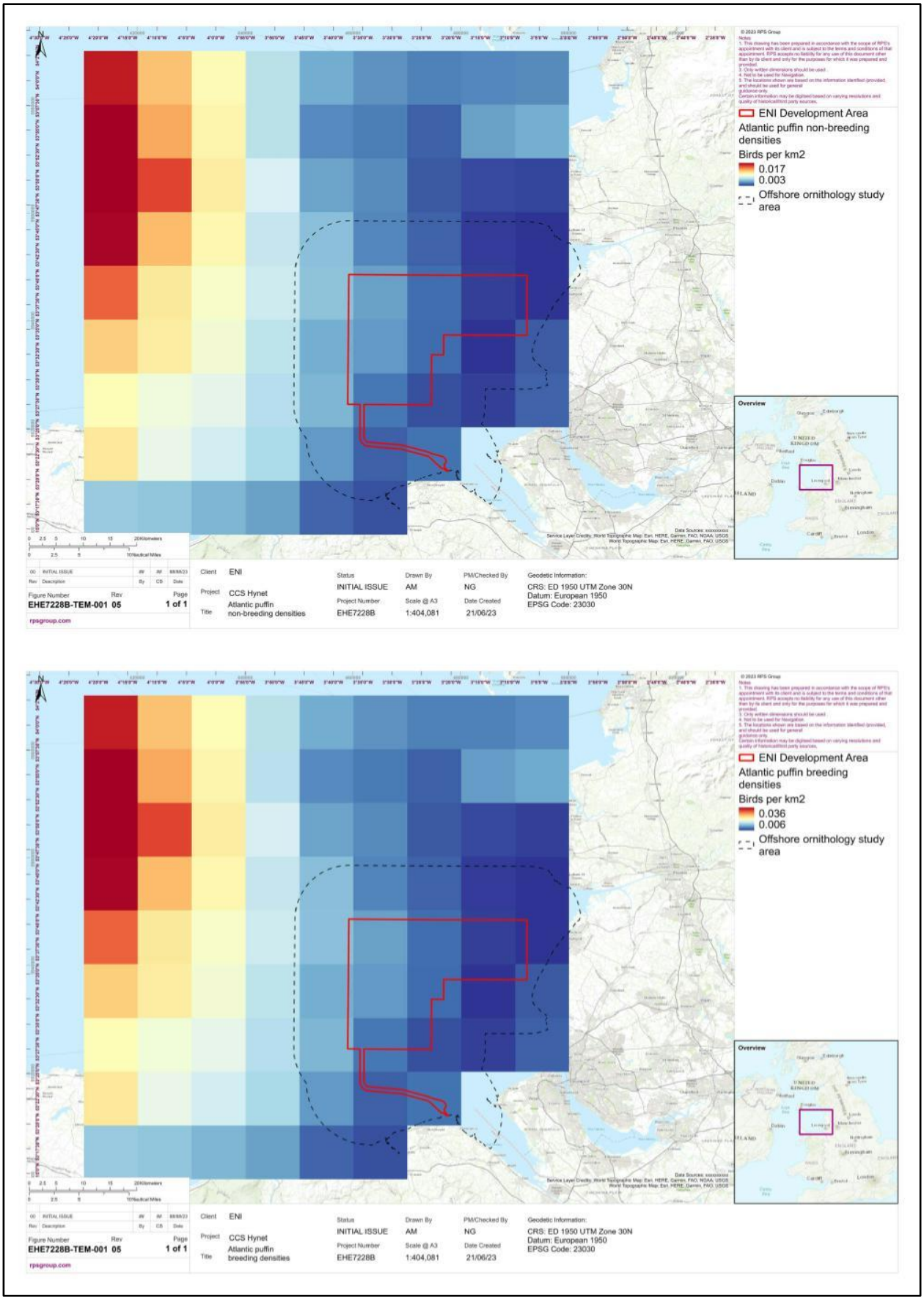


Figure 1.27: Atlantic Puffin Densities In Liverpool Bay/Bae Lerpwl SPA From Waggitt *et al*. (2020)

Razorbill

Razorbill are primarily pelagic but have a distribution that spans the entire perimeter of Britain and Ireland during the winter months. Their breeding distribution is similar to guillemots. In the UK, there are approximately 165,000 pairs of razorbills, accounting for more than 20% of the global population (Mitchell *et al*., 2004). The species is included in the amber list of Birds of Conservation Concern 5 (Stanbury *et al*., 2021).

Figure 1.28 shows the density of non-breeding season razorbills in the Liverpool Bay area never exceeded 0.251 birds per km². Within the Proposed Development densities remained even lower, with a maximum density of 0.186 birds per km². Breeding season razorbill were found in even lower densities. Higher densities of 0.103 birds per km² were observed near Anglesey, while densities throughout the Proposed Development remained consistently lower, with the lower peak densities of 0.04 birds per km² (Waggitt *et al*., 2020).

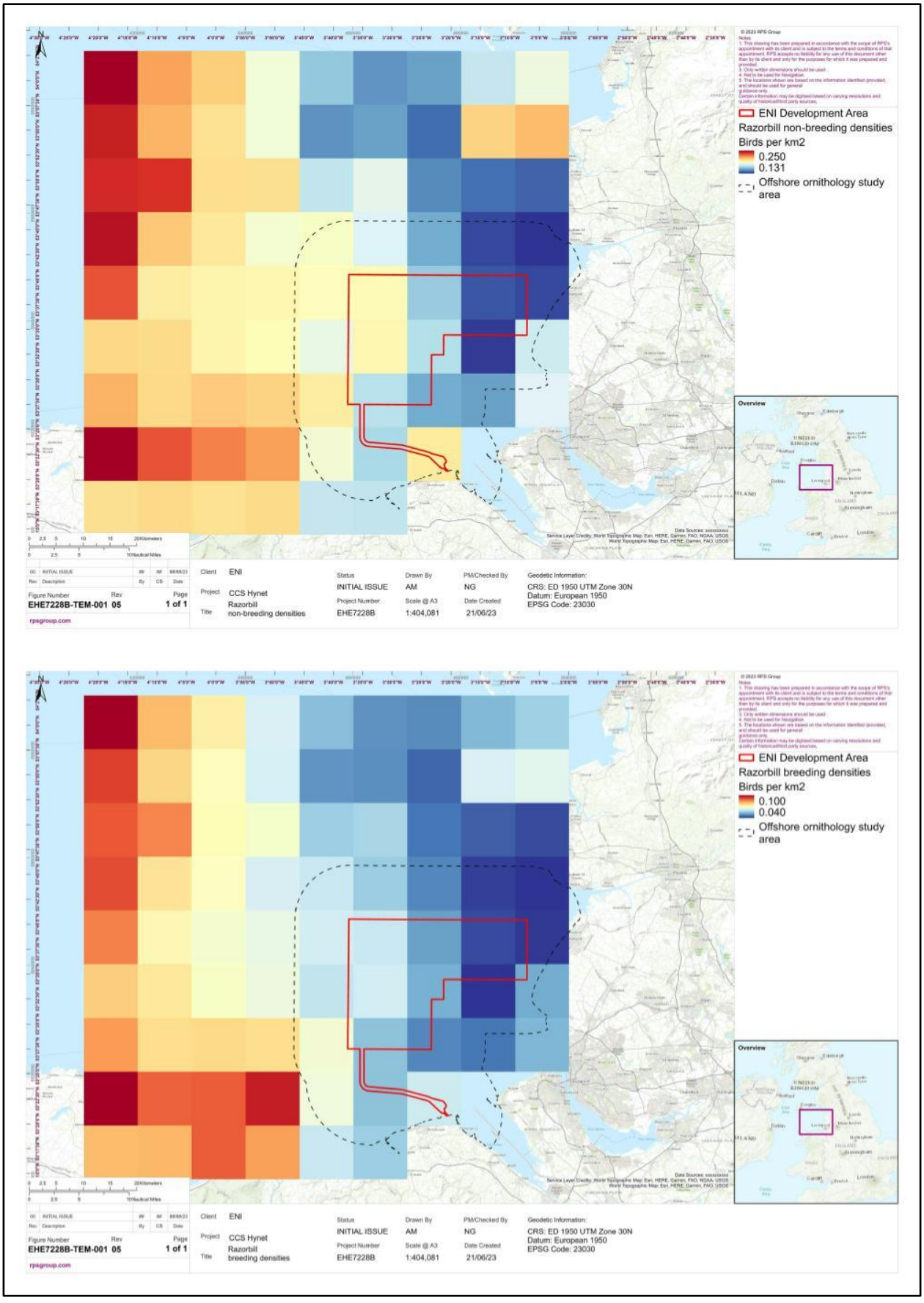


Figure 1.28: Razorbill Densities In Liverpool Bay/Bae Lerpwl SPA From Waggitt *et al*. (2020)

1.6 Summary

- Part of the Proposed Development sits within the Liverpool Bay SPA which is designated for its internationally important populations of non-breeding common scoter, red-throated diver, and little gull. It also supports internationally important breeding populations of common tern (colonies are found in the Dee Estuary, Mersey Estuary and Ribble Estuary) and little tern (the Gronant Dunes and Point of Ayr colony is the only Welsh colony of little tern).
- Non-breeding common scoter are found in greater densities outside of the Proposed Development. However, there are moderate concentrations in the north-eastern part of the Proposed Development.
- Non-breeding red-throated diver are also found in high concentrations in the north-eastern section of the Proposed Development and where the cable and pipelines make landfall at Point of Ayr.
- Both of these species are sensitive to disturbance.
- Non-breeding little gull densities are higher at the northern section of the Proposed Development.
- There are two SPA common tern colonies with connectivity to the Proposed Development. Although common tern are not represented in the aerial data, the Proposed Development covers 2.5% of their available foraging habitat.
- Wales's only little tern colony is situated at the Gronant Dunes and Point of Ayr, approx. 1.5 km from the cable corridor landfall. Little terns have a limited foraging range (5 km), and the Proposed Development covers approx. 8.6% of their available foraging habitat.
- Other species with important populations that have connectivity to the Proposed Development are great cormorant, northern fulmar, Manx shearwater, European storm petrel, northern gannet, lesser black-backed gull, and sandwich tern. These are mostly found in low densities with the exception of great cormorant (higher during the breeding season), lesser black-backed gull (breeding), and sandwich tern (passage).
- Many other species of seabird are found within the study area however these are present in the area in low numbers (relative to the species' population) and are therefore of lower vulnerability to impacts from the Proposed Development.

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Appendix A: Appendix A

Table A 1: Mean Max Foraging Ranges for Seabird Species (Woodward *et al*., 2019). Sample Sizes are Shown in Parentheses (i.e. Number of Individuals Tracked).

Species	Mean Max foraging range
Northern gannet	315.2 (21)
Manx shearwater (*Puffinus puffinus*)	1,346.8 (6)
Great skua (*Stercorarius skua*)	443.3 (3)
Lesser black-backed gull (*Larus fuscus*)	127 (18)
European shag (*Phalacrocorax aristotelis*)	13.2 (17)
Razorbill (*Alca torda*)	88.7 (16)
Herring gull (*Larus argentatus*)	58.8 (10)
Black-legged kittiwake (*Rissa tridactyla*)	156.1 (37)
Great cormorant (*Phalacrocorax carbo*)	25.6 (4)
Northern fulmar (*Fulmarus glacialis*)	542.3 (16)
Arctic skua (*Stercorarius longicaudus*)	N/A
Black-headed gull (*Chroicocephalus ridibundus*)	18.5 (1)
Common gull (*Larus canus*)	50 (1)
Great black-backed gull (*Larus marinus*)	73 (1)
Common tern (*Sterna hirundo*)	18.0 (16)
Arctic tern (*Sterna paradisaea*)	25.7 (9)
Black guillemot (*Cepphus grylle*)	4.8 (2)
Common guillemot (*Uria aalge*)	3.2 (16)
Atlantic puffin (*Fratercula arctica*)	137.1 (7)
Storm Petrel (*Hydrobates pelagicus*)	336 (1)
Leach's Storm Petrel (*Oceanodroma leucorhoa*)	N/A
Pomarine skua (*Stercorarius pomarinus*)	-
Long-tailed skua (*Stercorarius longicaudus*)	-