FIVE ESTUARIES
OFFSHORE WIND FARM

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10.75 SUPPLEMENTARY OPERATIONS AND MAINTENANCE ASSESSMENT

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DEFINITION OF ACRONYMS

Term	Definition
AIS	Automatic Identification System
BDMPS	Biologically Defined Minimum Population Scale
CEA	Cumulative Effects Assessment
COLREGS	Convention on the International Regulations for Preventing Collisions at Sea
CTVs	Crew Transfer Vessels
DCO	Development Consent Order
ECC	Export Cable Corridor
EIA	Environmental Impact Assessment
ES	Environmental Statement
FSA	Formal Safety Assessment
HRA	Habitats Regulations Assessment
IHLS	International Herring Larvae Survey
JUVs	Jack-up vessels
MCA	Maritime and Coastguard Agency
MDS	Maximum Design Scenario
MMO	Marine Management Organisation
MW	Megawatt
NSIP	Nationally Significant Infrastructure Project
O&M	Operations and Maintenance
OTE	Outer Thames Estuary
OWF	Offshore Wind Farm
TTS	Temporary Threshold Shift
RIAA	Report to Inform Appropriate Assessment
RTD	Red-Throated Diver
S&N	Shipping and Navigation
SNCB	Statutory Nature Conservation Body
SoS	Secretary of State
SOV	Service operations vessels
SPA	Special Protection Area
TTS	Temporary Threshold Shift
VE	Five Estuaries

Term	Definition
WCS	Worst Case Scenario
WIPtW	Working in Proximity to Wildlife
WTG	Wind Turbine Generator

1. INTRODUCTION

1.1 BACKGROUND

1.1.1 Five Estuaries Offshore Wind Farm Ltd (the Applicant) has submitted a Development Consent Order (DCO) application (the Application) to the Planning Inspectorate on behalf of the Secretary of State, for a DCO for the Five Estuaries Offshore Wind Farm (hereafter referred to as VE).

1.1.2 VE is the proposed extension to the operational Galloper Offshore Wind Farm located 37 km off the coast of Suffolk and comprises both offshore and onshore infrastructure within the administrative area of Essex County Council. VE will have an overall capacity of greater than 100 Megawatts (MW) and therefore constitutes a Nationally Significant Infrastructure Project (NSIP) under Section 15 (3) of the Planning Act 2008. Such projects require a DCO to be granted by the relevant UK Secretary of State (SoS).

1.1.3 This Supplementary Operations and Maintenance (O&M) Port Assessment has been produced in response to a specific request from SoS on the 11th July. For completeness the request is copied below:

"…The Applicant, therefore, is requested to revise all relevant EIA and HRA documents to include an assessment of the reasonable worst-case scenario of the impacts from operation and maintenance port activities on the environment. If the Applicant has yet to make a final decision on the location of the operation and maintenance port facilities, the Applicant is requested to include an assessment of the reasonable worst-case scenarios of the different ports under consideration."

1.1.4 As demonstrated in this document, due consideration to O&M port activities on the environment, pertaining to the VE DCO application, were adequately and appropriately assessed. However, this document provides supplementary information where information on the potential O&M port bases can now be further refined to provide location specific assessments where appropriate.

1.2 PURPOSE

1.2.1 Within the original Environmental Statement (ES), and in accordance with the Maximum Design Scenario (MDS) outlined in Table 1.1 below and within 6.2.1 Offshore Project Description [APP-069], O&M vessels and their associated potential impacts were assessed across all relevant offshore topics. For example, in 6.2.6 Fish and Shellfish Ecology [APP-075], the impact of "underwater noise resulting from operational Wind Turbine Generators (WTGs) and maintenance vessel traffic, potentially affecting fish and shellfish receptors" was assessed in detail. The Applicant wishes to emphasise that movements of O&M vessels were scoped-in and assessed, where relevant, in line with the project description and formed an integral part of the assessment of the O&M phase across a number of offshore chapters.

1.2.2 This supplementary O&M Assessment is therefore intended to provide the SoS with further clarity and detail on the relevant potential impacts on receptors arising from Operations and Maintenance (O&M) from potential O&M port options, see paragraph 1.3.6.

1.2.3 It is important to emphasise that the Applicant has not yet selected a final O&M port for the VE project. Depending on the O&M base eventually selected, there may be requirements for offices, warehouses, jetties, and quaysides – these facilities may already exist at the final selected O&M port or be provided by the final port selected.

1.2.4 Any new infrastructure to be delivered in a Port will be consented under a separate planning regime once further details are available. At that stage, the environmental impacts of constructing and operating any new Port facilities, including any associated road traffic movements, would be assessed. As a result, this supplementary assessment focuses on the impacts of O&M vessels transiting from port locations.

1.2.5 As requested by the SoS, 5.4 Report to Inform Appropriate Assessment (RIAA) – Revision E has also been updated, to reflect the current information provided in Section 1.3, furthermore an additional note has been appended to this document highlighting marine coordination in the vicinity of Special Protection Areas (SPAs) from a shipping and navigation perspective, see Section 5.

1.3 CURRENT MDS ASSUMPTIONS AND 'WORST CASE SCENARIO'

1.3.1 The overall MDS for O&M vessels is set out in 6.2.1 Offshore Project Description [APP-069] and is repeated in Table 1.1 below.

1.3.2 As highlighted above, the Applicant has not yet selected an O&M port. However, this section provides further refinement since the time of writing the EIA to specify worst case O&M port options as Harwich, Lowestoft and Great Yarmouth. The final approach to O&M will be approved via the final Operations and Maintenance Plan (an outline plan was submitted with the application [APP-248]).

1.3.3 With respect to the MDS for O&M vessels set out in Table 1.1, Jack-up Vessels (JUVs), lift vessels, cable maintenance, and auxiliary vessels would be used only for specific, infrequent maintenance activities, such as component replacement or cable repair. Mobilisation of such vessels may only occur once every few years, or not at all (for example if there are no cable repairs required). These vessels may route directly to the site or mobilise from the O&M port.

1.3.4 Crew Transfer Vessels (CTVs) are specialized boats designed to transport technicians, tools, and small equipment to and from offshore wind farms. They are capable of performing daily transfers, ensuring regular access to the array area for preventive and corrective maintenance. CTV operation is typically limited by weather and sea conditions (e.g. wave height) and their use becomes less practical for sites located far from shore as it takes too long to get to site (limiting the time operatives have on the turbine). As such, the current realistic worst case for CTV operations would be from Harwich.

1.3.5 Service operations vessels (SOV) stay on site for an extended period (usually around two weeks, subject to weather and crew schedules). Therefore, they require infrequent returns to port, making them suitable for operating at a greater distance from O&M port. For Lowestoft and Greater Yarmouth the current realistic worst case would be SOV operation.

1.3.6 Accordingly, the realistic worst case scenario, is vessels transiting from three ports, as follows:

- Harwich: 1,642 annual round trips (based on CTV movements);
- Lowestoft: 52 annual round trips (based on SOV movements); and
- Great Yarmouth: 52 annual round trips (based on SOV movements).

1.3.7 Therefore, this supplementary assessment considers two scenarios:

- CTVs transiting from Harwich; and

- SOVs transiting from Lowestoft and Great Yarmouth.

Table 1.1 MDS O&M Vessel Requirements (taken from [APP-069])

Vessels	Design Envelope	
	Peak vessels	Annual Round trips
Vessel description		
JUVs	3	9
SOVs	2	52
CTVs	9	1,642
Lift vessels	3	8
Cable maintenance	2	1
Auxiliary vessels	8	64
Total O&M vessels		
Total O&M vessels	**27**	**1,776**
Indicative peak vessels on-site simultaneously	**27**	**N/A**

INDICATIVE PORT APPROACH AREAS

1.3.8 O&M vessel route/passage planning will take place when the project is approaching the O&M phase and will be informed by constraints to routing at that time and characteristics of other vessel traffic. Therefore, whilst it is not possible define specific O&M routes from specific ports with certainty at this time, indicative port approach areas have been identified in Figure 1.1 below. These approach areas, indicated by the coloured boxes in Figure 1.1, highlight the area in which the vessels are likely to transit through from the potential O&M ports, they are not exact routes. As can be seen in Figure 1.2 and from the vessel tracking data, there are already well established shipping routes in these areas. Figure 1.3 highlights the navigational channels on approach to Harwich in relation to the Outer Thames Estuary (OTE) SPA.

1.3.9 Again, it should be stressed that these are indicative approach areas that are likely to be refined, and any final routeing measures will be discussed with the relevant statutory authorities, including Statutory Nature Conservation Bodies (SNCBs) and Shipping and Navigation (S&N) stakeholders. In every case, Convention on the International Regulations for Preventing Collisions at Sea (COLREGS) will be followed by all vessels ensuring safe navigation at sea, whilst noting that vessels do have the freedom of navigation.

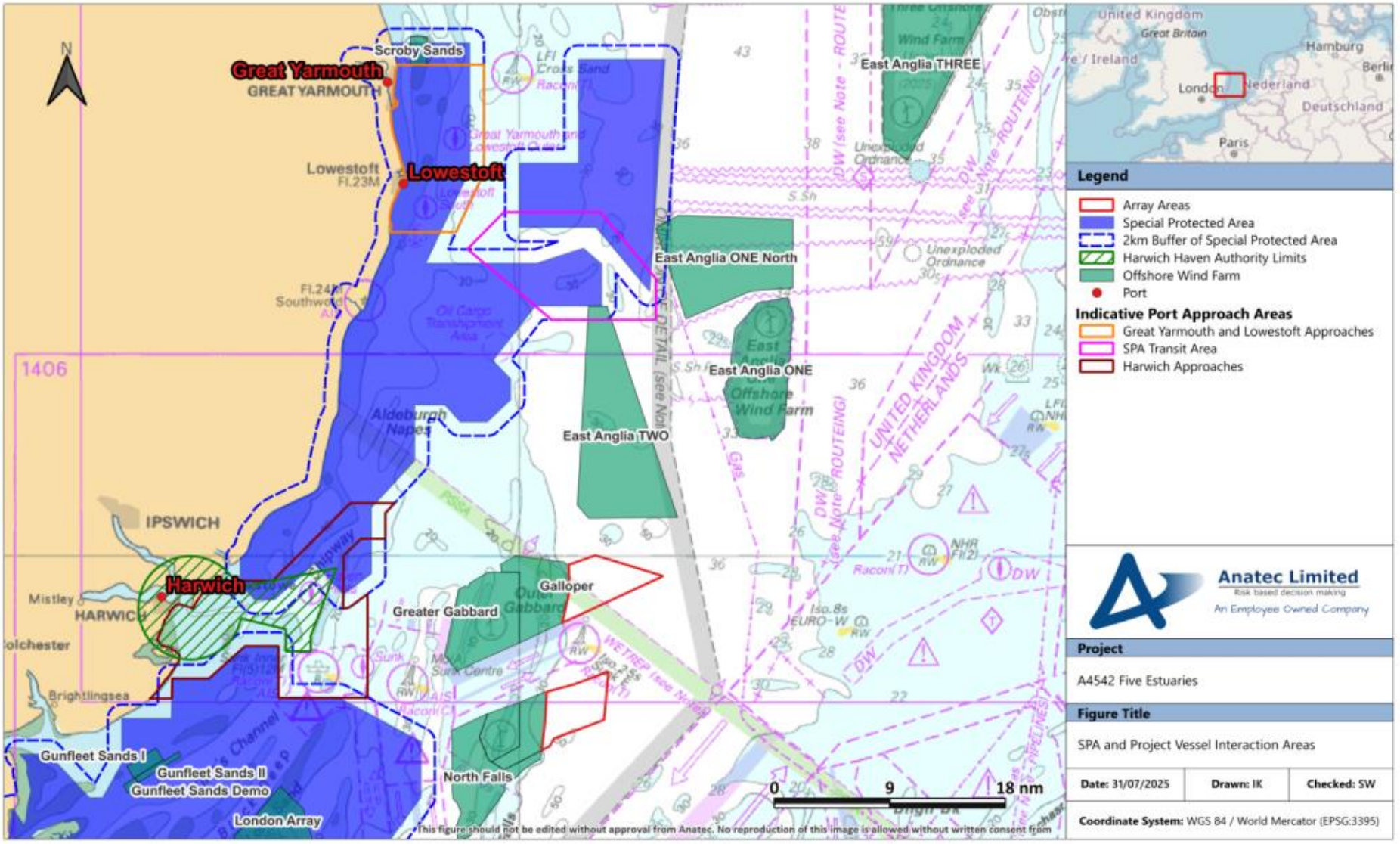

Figure 1.1 Indicative port approach areas in relation to the OTE SPA

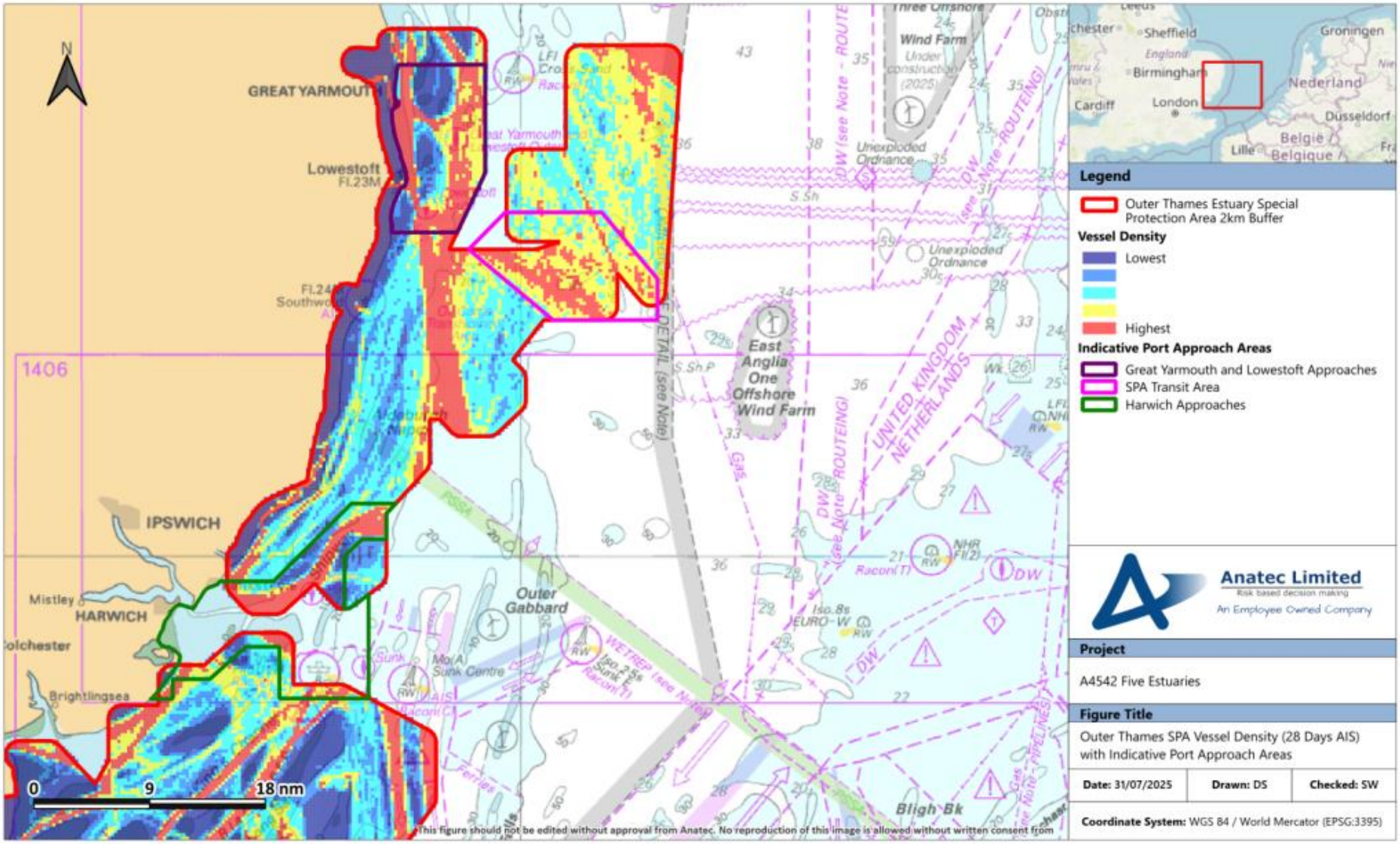

Figure 1.2 Indicative port approach areas with AIS vessel density within the OTE SPA

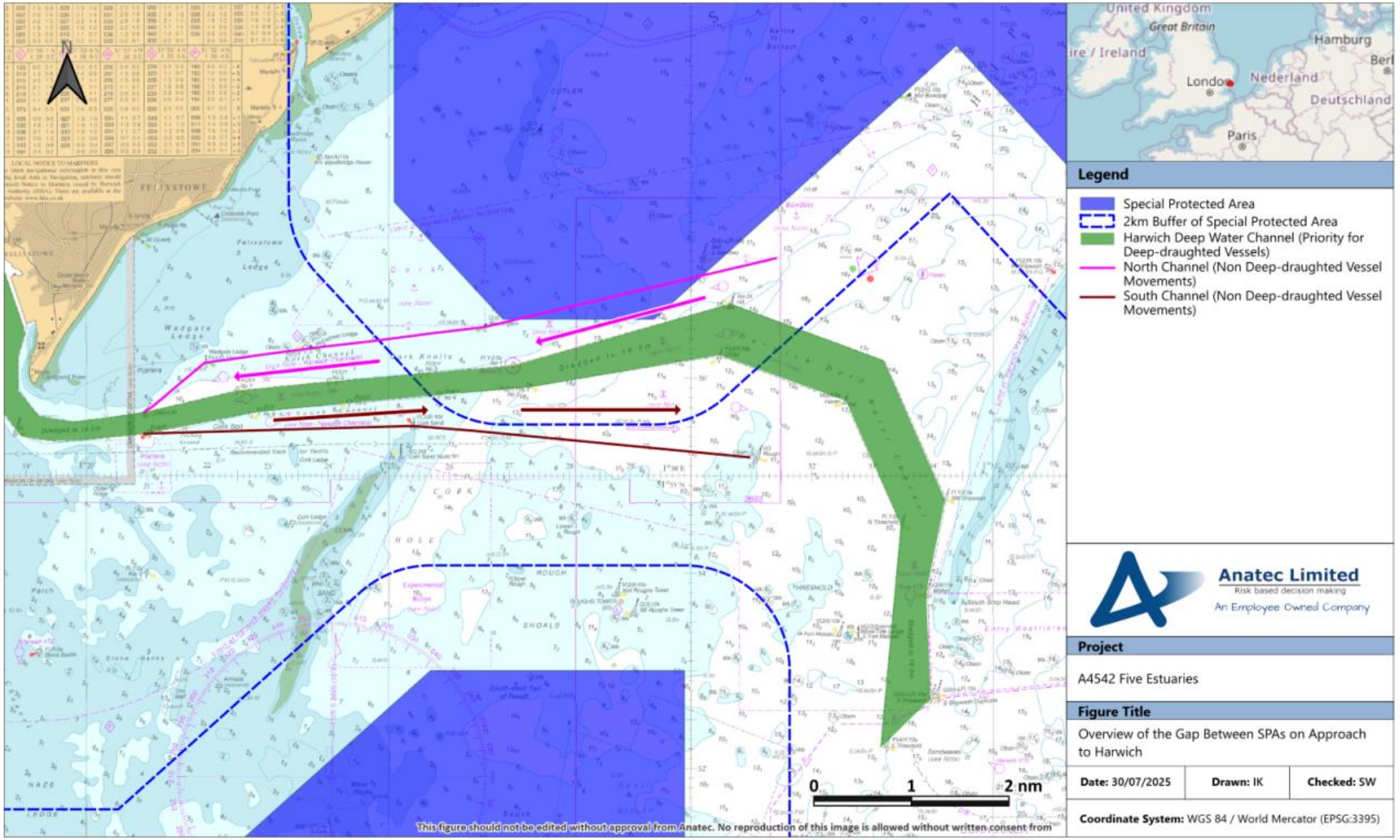

Figure 1.3 Overview of navigational channels in relation to the OTE SPA on approach to Harwich

2. SCOPE AND METHODOLOGY

2.1 ASSESSMENT APPROACH

2.1.1 The approach to this supplementary O&M assessment has been undertaken in line with the methodology outlined within 6.1.3 Environmental Impact Assessment Methodology [APP-063] and 6.1.3.1 Cumulative Effects Assessment Methodology [APP-064].

2.1.2 As highlighted in 6.1.3 Environmental Impact Assessment Methodology [APP-063], the criteria for determining the significance of effects is a two-stage process that involves defining the magnitude of the impacts and the sensitivity of the receptors. Any perceived effects are described in terms of their 'significance,' which takes into account the 'magnitude' of an impact, combined with the 'sensitivity' of the relevant receptors to the impact.

2.1.3 A matrix approach is used throughout the VE EIA, and subsequently this assessment, to ensure a consistent and comparable approach. The terms assigned to categorise the significance of effects are described in Table 2.1 below, which also illustrates the assessment matrix for determining effect significance. The impact magnitude is combined with the receptor sensitivity to determine the significance of effect.

2.1.4 For this specific assessment, an assessment has been undertaken using the realistic worst case scenario as described in paragraph 1.3.6 above, with any relevant mitigation measures stated and applied. Where appropriate, cross references and links have been made to assessment previously undertaken within the main Environmental Statement.

2.1.5 Where no source-receptor-pathway is identified the impact has not been taken forward to the assessment. Section 3.1 outlines further reasoning regarding the relevant topics.

2.1.6 A cumulative effects assessment (CEA) has been undertaken in Section 3.4 for the relevant topics. Following a review of the projects included within the CEA longlist it is considered that the projects included in the original CEA within the ES are still valid. Therefore, the topics which have considered cumulative impacts have based it on those projects included in the original longlist.

2.1.7 Following a review of the projects included within the CEA for each of the topics assessed, it is considered that the short-listed projects identified in the ES chapters remain valid.

Table 2.1 Deriving the level of significance of an effect (taken from [APP-063])

			Sensitivity			
			High	Medium	Low	Negligible
Magnitude	Adverse	High	Major	Major	Moderate	Minor
		Medium	Major	Moderate	Minor	Negligible
		Low	Moderate	Minor	Minor	Negligible
	Neutral	Negligible	Minor	Minor	Negligible	Negligible
	Beneficial	Low	Moderate	Minor	Minor	Negligible
		Medium	Major	Moderate	Minor	Negligible
		High	Major	Major	Moderate	Minor

3. UPDATED ASSESSMENT

3.1 ELEMENTS NOT TAKEN FORWARD FOR SUPPLEMENTARY ASSESSMENT

BENTHIC ECOLOGY

3.1.1 The introduction of O&M port options does not alter the assessment presented in Section 5.12 of 6.2.5 Benthic and Intertidal Ecology [APP-074]. Introducing further details regarding the O&M ports does not change the impacts scoped into the assessment, namely permanent habitat loss or alteration, temporary habitat disturbance, colonisation of hard substrates, introduction or spread of marine INNS, or EMF effects from cables, nor does it affect the outcome of those assessments.

3.1.2 The scope of the assessment, as defined in Section 5.12 of the original ES, also remains unchanged. Based on the baseline environment (Section 5.7) and the current assumptions (Section 1.3), the conclusions set out in Section 5.17 of 6.2.5 Benthic and Intertidal Ecology [APP-074] continue to apply. Therefore, effects on benthic ecology arising from specific O&M ports are not discussed further in this report as the original ES remains valid.

PHYSICAL PROCESSES

3.1.3 The introduction of the O&M port options does not alter the assessment presented in Section 2.11 of 6.2.2 Marine Geology, Oceanography and Physical Processes [APP-071]. Introducing further details regarding the O&M ports does not change the impacts scoped into the assessment, namely potential changes to the tidal and wave regimes and any impacts associated with the seabed and sediment transport, nor does it affect the outcome of those assessments.

3.1.4 The scope of the assessment, as defined in Section 2.11, also remains unchanged. Based on the baseline environment (Section 2.7) and the current assumptions (Section 1.3), the conclusions set out in Section 2.17 of 6.2.2 Marine Geology, Oceanography and Physical Processes [APP-071] continue to apply. Therefore, impacts on physical processes arising from specific O&M ports are not discussed further in this report as the original ES remains valid.

MARINE WATER AND SEDIMENT QUALITY

3.1.5 The introduction of the O&M port options does not alter the assessment presented in Section 3.10 of 6.2.3 Marine Water and Sediment Quality [APP-072]. Introducing further details regarding the O&M ports does not change the impacts scoped into the assessment, namely accidental releases or spills of materials or chemicals, nor does it affect the outcome of those assessments.

3.1.6 The scope of the assessment, as defined in Section 3.10, also remains unchanged. Based on the baseline environment (Section 3.6) and the current assumptions (Section 1.3), the conclusions set out in Section 3.16 of 6.2.3 Marine Water and Sediment Quality [APP-072] continue to apply. Therefore, impacts on marine water and sediment quality arising from specific O&M ports are not discussed further in this report as the original ES remains valid.

MARINE MAMMALS

3.1.7 Harwich and Great Yarmouth port were already considered as a potential option during the O&M phase in the assessment set out in Section 7.11 of 6.2.7: Marine Mammal Ecology [APP-076]. Although Lowestoft was not assessed directly, Great Yarmouth is considered a suitable proxy for its potential impacts, therefore there is no change to the impacts scoped into the assessment namely collision risk from vessels, disturbance from vessels or disturbance to haul out sites, nor does it affect the outcome of those assessments.

3.1.8 The scope of the assessment, as defined in Section 7.11 of 6.2.7 Marine Mammal Ecology [APP-076] also remains unchanged. Based on the baseline environment (Section 7.7) and the current assumptions (Section 1.3), the conclusions set out in in Section 7.17 of 6.2.7 Marine Mammal Ecology [APP-067] continue to apply. Therefore, effects on marine mammals from the selected ports are not discussed further in this report.

SHIPPING AND NAVIGATION

3.1.9 Under Marine Guidance Note 654 (Maritime and Coastguard Agency (MCA), 2021), impacts on shipping and navigation receptors are required to be assessed using the Formal Safety Assessment (FSA) guidance (IMO, 2018). Further details on this guidance, and how it differs from assessment of other receptors, is provided in 6.2.9 Shipping and Navigation [APP-078].

3.1.10 6.2.9 Shipping and Navigation [APP-078] assessed impacts relating to the construction and O&M phase including increased collision risk and reduced access to local ports and harbours. This assessment assumed worst case temporal periods and vessel numbers, and that SOV or CTV traffic could operate from any port including Great Yarmouth, Harwich or Lowestoft. Embedded mitigations were assessed to be sufficient to ensure that risk were Broadly Acceptable or Tolerable with Mitigation, which are not significant in EIA terms. Therefore, this assessment remains valid.

3.1.11 Mitigation included ensuring defined transit corridors, and entry/ exit points to and from the array areas, will be observed post consent once construction/ decommissioning and O&M ports have been confirmed.

3.1.12 A key factor in this supplementary O&M assessment, as set out in Section 3.2, is interactions between O&M vessels and red throated diver (*Gavia stellata)* (RTD). When considering requirements of avoidance of the SPAs for overwintering of RTDs, alongside ensuring safety of navigation, the primary mitigation is outlined and secured in 9.18.1 Working in Proximity to Wildlife – Revision C but is clarified below:

- Marine coordination will be implemented to manage project vessels including in communication with cumulative project marine coordinators as required. The Applicant also commits to use of entry/ exit points and defined routes to and from construction/ decommissioning and O&M ports to mitigate interaction with third parties and where practicable avoidance of SPAs and associated 2km buffers. At all times navigational safety, compliance with COLREGS and adherence to port authority control will take precedence.

3.1.13 An explanatory note demonstrating how SPAs can be avoided where practicable whilst maintaining navigational safety has been developed and is appended to this document, see Section 5. This note will be used to help define O&M navigation transit corridors post consent as part of the O&M plan. Given the presence of Greater Gabbard and Galloper Offshore Wind Farm (OWF), whose O&M vessels are operated out of Harwich Haven and Port of Lowestoft, respectively, there is relevant experience and precedent for managing project vessel movements in and out of local ports which will be drawn upon including the RTD protocol which is part of 9.18.1 Working in Proximity to Wildlife – Revision C which will required to be submitted and approved by the Marine Management Organisation (MMO) (in consultation with the relevant SNCB). This is secured within the DCO.

OFFSHORE ARCHAEOLOGY AND CULTURAL HERITAGE

3.1.14 The introduction of the O&M port options does not alter the assessment presented in Section 11.3 of 6.2.11 Offshore Archaeology and Cultural Heritage [APP-080]. Introducing further details regarding the O&M ports does not change the impacts scoped into the assessment, namely direct impact by penetration, compression, and disturbance effects of jack-up barges and anchoring of operation and maintenance vessels during the operation and maintenance phase leading to total or partial loss of marine heritage receptors; and indirect impacts causing changes to the Historic Seascape Character as a result of operation and maintenance vessel activities and the presence of the completed wind farm indirectly leading to changes to the perceived historic use of the seascape during the operation phase, nor does it affect the outcome of those assessments.

3.1.15 The scope of the assessment, as defined in Section 11.13, also remains unchanged. Based on the baseline environment (Section 11.7) and the current assumptions (Section 1.3), the conclusions set out in Section 11.19 of 6.2.11 Offshore Archaeology and Cultural Heritage [APP-080] continue to apply. Therefore, impacts on Offshore Archaeology and Cultural Heritage arising from specific O&M ports are not discussed further in this report as the original ES remains valid.

COMMERCIAL FISHERIES

3.1.16 6.2.8 Commercial Fisheries [APP-077] provided in the original ES, assessed “Impact 9: Increased vessel traffic associated with VE within fishing grounds leading to interference with fishing activity”.

3.1.17 O&M vessels transiting from port to the array area will avoid fishing vessels actively deploying demersal and pelagic gear, and static gear and therefore interactions will be minimal and fishing can continue. Furthermore, the COLREGS specifically states that power-driven vessels i.e. O&M vessels, must give way to vessels actively fishing, particularly those that are restricted in their ability to manoeuvre. Therefore, impacts on commercial fisheries arising from specific O&M ports are not discussed further in this report as the original ES remains valid.

INFRASTRUCTURE AND OTHER MARINE USERS

3.1.18 The introduction of the O&M port options does not alter the assessment presented in Section 12.11 of 6.2.12 Infrastructure and Other Marine Users [APP-081]. Introducing further details regarding the O&M ports does not change the impacts scoped into the assessment, namely, activity or access displacement associated with increased vessel movements and the use of safety zones during operational and maintenance activities, nor does it affect the outcome of those assessments.

3.1.19 The scope of the assessment, as defined in Section 12.11, also remains unchanged. Based on the baseline environment (Section 12.7) and the current assumptions (Section 1.3), the conclusions set out in Section 12.17 of 6.2.12 Infrastructure and Other Marine Users [APP-081] continue to apply. Therefore, impacts on infrastructure and other marine users arising from specific O&M ports are not discussed further in this report as the original ES remains valid.

3.2 SUPPLEMENTARY ENVIRONMENTAL ASSESSMENT: OPERATION AND MAINTENANCE PHASE – HARWICH

3.2.1 This environmental assessment addresses the potential effects of vessel activity in the O&M phase of VE originating from the port of Harwich. A review of environmental topics and associated receptors has been undertaken in line with the information provided in Section 1.3. Based on this review, the assessment has focussed on those pathways where the potential for significant adverse effects may exist and therefore presents a realistic 'worst-case' assessment of impacts arising from O&M related CTVs from the port of Harwich.

OFFSHORE ORNITHOLOGY

IMPACT 1 – RED THROATED DIVER DISTURBANCE AND DISPLACEMENT FROM O&M VESSELS

3.2.2 This assessment evaluates the potential for disturbance to offshore ornithological receptors, particularly RTDs, as detailed in the EIA (6.2.4 Offshore Ornithology [APP-073]), from vessel activity associated with the O&M phase of Five Estuaries OWF from the port of Harwich. The RTD is an Annex 1 species and a feature of the OTE SPA (Natural England and JNCC 2010). Common tern (*Sterna Hirundo*) and little tern (*Sternula albifrons*) were scoped out due to the low numbers recorded within the site and not being susceptible to displacement (Table 4.18 within 6.2.4 Offshore Ornithology [APP-073]) and this conclusion remains valid when considering the relevant O&M ports.

3.2.3 In the original Environmental Statement, vessel disturbance from presence within the Export Cable Corridor (ECC) and on-site during construction was assessed under Impact 3, and the conclusions of that assessment remain valid. This supplementary information provides additional consideration of potential disturbance impacts arising from vessel activity associated with the three port options during the O&M phase. Alongside the Environmental Statement the Red Throated Diver Note submitted during the examination is relevant to this impact pathway and summarises the Applicant's position on impacts to RTDs within the ECC during construction (10.48 Red Throated Diver Note [REP6-052]).

3.2.4 Any proposed O&M vessel routes will, where practicable, avoid the OTE SPA or use existing vessel routes out of Harwich. If O&M traffic were to transit the SPA or the 2km buffer they will adhere to measures outlined in 9.18.1 Working in Proximity to Wildlife – Revision C, an update of which has been provided with this submission alongside a new deemed Marine Licence condition which secures the operational measures.

3.2.5 It should be noted that the deep-water shipping lane in this area is the designated priority route for larger vessels, with charted entry and exit routes to Harwich on either side of it for smaller vessels, crossing both the SPA and the 2 km buffer zone. Smaller O&M vessels will have to follow these routes and any diversions as suggested by the Port Authority that may result in CTVs using entry and exit routes through the SPA and/or 2km buffer (Figure 1.3). Where this occurs the RTD best practice protocol will be adhered to and the vessel will leave the SPA as soon as is feasible (9.18.1 Working in Proximity to Wildlife in the Marine Environment – Revision C).

3.2.6 Figure 1.2 highlights these routes within the SPA, in particular in the northern section of the green 'Harwich Approaches' box. Figure 1.3 highlights the routes that vessels have to take coming out of Harwich.

3.2.7 The ECC study area is one of the busiest areas of marine traffic in the UK. Section 10.2.1 in 6.9.10 Navigational Risk Assessment [APP-240] found that on average there were 75 unique vessels during summer in the ECC study area, which includes the deep water shipping route. In winter on average there were 46 unique vessels in the study area.

3.2.8 RTDs are known to be sensitive to vessel disturbance. This assessment considers the potential for displacement, behavioural disruption, and habitat exclusion resulting from O&M vessel activity, and outlines mitigation measures to minimise these risks. It should be noted that these measures are already committed to within an updated version 9.18.1 Working in Proximity to Wildlife in the Marine Environment – Revision C.

MAGNITUDE OF IMPACT

3.2.9 This assessment takes into account the mitigation already agreed in the form of the best practice protocol for minimising vessel disturbance of RTDs within the OTE SPA (Table 4.16, 6.2.4 Offshore Ornithology [APP-073]) and the associated 9.18.1 Working in Proximity to Wildlife in the Marine Environment – Revision C).

3.2.10 The MDS for vessel requirements for the O&M phase is outlined in Table 1.1 and the indicative port approach areas are found in Figure 1.1. These areas have been selected with the aim to minimise any overlap with the OTE SPA where practicable when also taking into account the need to ensure safety of navigation and avoid unnecessary emissions.

3.2.11 In 6.2.9 Shipping and Navigation [APP-078] highlights in greater detail that the area where the proposed transit routes (and ECC) is, is a busy shipping area – see Figure 1.2.

3.2.12 The realistic Worst Case Scenario (WCS) for traffic from Harwich is 1,642 annual round trips, based on CTV movements. The CTV movements are expected to be limited to existing vessel routes and will avoid the SPA where practicable. The entry and exit routes into Harwich (Figure 1.3) are either side of the deep water route and therefore RTDs densities in the area are likely to be low and the best practice protocol will be followed where the routes cross over the SPA and the 2km buffer.

3.2.13 The MDS of 1,642 annual O&M vessel round trips would on average increase the vessel traffic by 4.5 vessel trips per day. O&M vessel movements would transit the SPA and/or buffer zone only briefly, resulting in a minimal daily increase in vessel presence within the SPA (an average increase of less than one additional vessel in the study area at any point in time).

3.2.14 It is considered reasonable to assume that disturbance impacts are temporary, and birds will reoccupy areas following passage of the vessel. However, disturbance from offshore wind farm O&M vessel traffic could impact RTDs in several key ways:

- Disturbance and Displacement: Vessel activity can disturb feeding and resting divers, potentially displacing them from preferred habitats.
- Reduced Habitat Use: Increased traffic may lead to avoidance of areas reducing available foraging grounds.

- Energetic Costs: Repeated disturbance can increase energy expenditure due to flight responses and reduced feeding efficiency.
- Population-Level Effects: If disturbance is frequent and widespread, it may affect breeding success and survival rates over time.

3.2.15 According to Horswill and Robinson (2015), annual mortality rates are estimated at 16% for adult RTDs (aged three years and older) and 38–40% for juveniles, based on population studies conducted in Sweden (2002) and Alaska (2014). These mortality figures encompass both breeding and non-breeding seasons and include deaths from natural causes such as weather and predation, as well as any anthropogenic sources, including disturbance and displacement by vessels. Since ships are mobile and RTDs typically fly away from approaching vessels (e.g., Schwemmer et al. 2011; Jarrett et al. 2018), the energetic cost of avoiding moving ships may be significantly higher than avoiding stationary structures. However, any impacts from such disturbances are assumed to be already reflected in the current survival rate estimates, therefore a small increase in disturbance from the VE O&M vessel traffic is unlikely to impact survival rates given the high density of baseline vessels.

3.2.16 There is strong evidence that RTD populations are constrained by competition for secure breeding sites located near suitable foraging areas (Merrie 1978; Nummi *et al*. 2013; Rizzolo *et al*. 2014; Dahlen and Eriksson 2016). In contrast, they are unlikely to face significant competition for resources during the non-breeding season (Dierschke *et al*. 2012, 2017) (which is when they are present in this area – i.e. they over winter in UK waters). This suggests that population size is primarily regulated by the availability and quality of breeding habitat, rather than wintering habitat (Newton 1998). As these activities are limited to temporary disturbance from vessel movements, occur in areas already subject to vessel disturbance, and do not affect the underlying habitat, any disturbance from vessel transits is expected to have minimal impact on overall population numbers.

3.2.17 This magnitude of the projected increase in mortality is likely to be too small to noticeably affect background mortality and would be undetectable. Accordingly, the magnitude of impact on RTD is considered **negligible**.

SENSITIVITY OF RECEPTOR

3.2.18 The RTD is regarded to have a high sensitivity to human activity in marine areas, particularly disturbance from ship and helicopter traffic (Garthe & Hüppop 2004; Bellebaum et al. 2006; Schwemmer et al. 2011; Furness & Wade 2012; Furness et al. 2013; Bradbury et al. 2014; Mendell et al. 2019). Aerial surveys in the German North Sea showed significantly fewer divers (species not reliably distinguished) in shipping lanes, though flush distances could not be estimated (Schwemmer et al. 2011). Observations in Orkney found similar flushing behaviour near ferries, with 75% of red-throated (n=88) and 62% of black-throated divers (n=21) reacting within 300 m. RTD more often flew, while black-throated divers tended to swim away—possibly due to differences in moult timing and flight ability (Jarett et al. 2018).

3.2.19 Research shows that most RTDs tend to flush when vessels approach within 1 km or less (Bellebaum et al., 2006; Jarrett et al., 2018; Topping and Petersen, 2011). According to Fliessbach et al. (2019), 95% of RTDs in their study exhibited an escape response to approaching vessels, with an average flushing distance of 750 m (±437 m) and a maximum recorded distance of 1,700 m. Based on this evidence, applying a 2 km displacement buffer around the SPA is considered a precautionary approach.

3.2.20 The sensitivity of RTD to disturbance by O&M vessel traffic is therefore classified as **high**.

SIGNIFICANCE OF EFFECTS

3.2.21 The significance of effect from disturbance from vessel activity associated with the O&M phase of Five Estuaries OWF from the port of Harwich is considered to be lower than the impacts from the construction of the ECC. This is due to the short duration of time O&M vessels will likely be in the SPA or buffer zone for a matter of minutes during each trip. This coupled with the use of the best practice protocol when in the SPA and 2km buffer zone will mitigate the risk of significant effects occurring.

3.2.22 The O&M vessel activities will have a minimal contribution to the overall baseline of vessel traffic from the port of Harwich.

3.2.23 As the species is of high sensitivity to disturbance and negligible magnitude of impact, the effect significance is **minor adverse**, which is not significant in EIA terms.

FISH AND SHELLFISH ECOLOGY

IMPACT 1: UNDERWATER NOISE DISTURBANCE FROM O&M VESSELS

3.2.24 This assessment evaluates the potential for impacts arising from underwater noise on fish and shellfish ecology receptors as detailed in 6.2.6 Fish and Shellfish Ecology [APP-075]) from vessel activity associated with the O&M phase of VE. The assessment in 6.2.6 Fish and Shellfish Ecology [APP-075] remains valid, however this assessment considers vessels specifically transiting from the port of Harwich to the Five Estuaries OWF.

MAGNITUDE OF IMPACT

3.2.25 Underwater noise will arise from vessel activity associated with the O&M phase of Five Estuaries OWF transiting the site from the port of Harwich to the development. The realistic worst-case scenario for the port of Harwich is 1,642 annual round trips (based on CTV movements) during the O&M phase.

3.2.26 Noise levels reported by Malme *et al.* (1989) and Richardson *et al*. (1995) for large surface vessels indicate that physiological damage to fish and shellfish is unlikely, although the levels could be sufficient to cause local disturbance of sensitive marine fauna (e.g., herring) in the immediate vicinity of the vessel. Popper *et al.,* 2014 also suggests that there is minimal risk of any mortality, injury or Temporary Threshold Shift (TTS) arising from vessel noise on fishes. However, continuous noise (including that arising from vessels) of any level that is detectable by fishes may mask signal detection and thus may have a pervasive effect on fish behaviour, although the consequences of this masking and any attendant behavioural changes for the survival of fishes are unknown (Popper *et al.,* 2014).

3.2.27 As detailed in Table 1.67 of 6.5.6.2 Underwater Noise Technical Report [APP-122], the impact ranges from vessel noise are minimal (<50m). It should be noted that this range for a stationary receptor (such as spawning herring), is expected to be over-conservative as the assumption is for the animal to remain stationary in respect to the noise source, when the source itself will be also moving in most cases.

3.2.28 The Southern North Sea is exposed to high levels of vessel traffic (as detailed in 6.2.9 Shipping and Navigation [APP-078]) which results in high ambient noise levels. It is anticipated that the noise generated by O&M vessels serving the Five Estuaries OWF from the port of Harwich will not result in a significant increase to the ambient noise levels of the Southern North Sea.

3.2.29 The impact is predicted to be of a highly localised spatial extent, long-term duration, and irreversible (during the lifetime of the project). Therefore, the magnitude of impact is considered to be **negligible**.

SENSITIVITY OF RECEPTOR

3.2.30 The fish and shellfish receptors within the fish and shellfish ecology study area are detailed in 6.2.6 Fish and Shellfish Ecology [APP-075] and 6.5.6.1: Fish and Shellfish Ecology Technical Baseline Report [APP-121].

3.2.31 As previously mentioned, it is unlikely that any mortality, injury or TTS effects will arise as a result of continuous noise from increased vessel traffic during the O&M phase of the Project. In addition, fish receptors in the Southern North Sea are already exposed to high levels of vessel traffic (as detailed in 6.2.9 Shipping and Navigation [APP-078]) and therefore will likely have a reduced sensitivity to ambient noise sources, such as those associated with vessels.

3.2.32 Popper et al., (2014) categorises fishes based on their hearing systems:

- Group 1 species lack a swim bladder and are therefore considered less sensitive to underwater noise (than other species).
- Group 2 species have a swim bladder and are therefore considered more sensitive to underwater noise than Group 1 species (i.e., the species have an internal air sac which can be affected by sound pressure effects), however, the swim bladder is not involved in hearing (e.g. not linked to the inner ear) and as such they are less sensitive than Group 3 receptors.
- Group 3 species have a swim bladder which is linked to the inner ear and so is directly involved in hearing. These species are considered to be the most sensitive to underwater noise, with direct detection of sound pressure, rather than just particle motion.

3.2.33 All Group 1 and Group 2 receptors identified in 6.2.6 Fish and Shellfish Ecology [APP-075] are considered to be of **low** sensitivity to the impacts of O&M vessel noise.

3.2.34 Group 3 receptors are the most sensitive of the groups categorised by Popper et al., 2014. Whilst there are several Group 3 receptors present in the vicinity of the Five Estuaries OWF as detailed in 6.5.6.1 Fish and Shellfish Ecology Technical Baseline Report [APP-121], they are considered of a low sensitivity largely due to their ability to flee from the impact. However, due to herring and seahorse being considered as stationary receptors, these species are considered further in the assessment.

3.2.35 Herring are a Group 3 species and are demersal spawners requiring specific substrates and therefore are considered as stationary receptors during the spawning season (November to January), increasing their theoretical exposure to underwater noise during this period. As detailed in 6.5.6.1: Fish and Shellfish Ecology Technical Baseline Report [APP-121], as defined by Coull *et al*. (1998) a large portion of the southern array area overlaps a historic herring spawning ground (Downs) as well as the Blackwater Estuary spawning ground being located to the south of the port of Harwich. The confidence of these data is however lower than the annual International Herring Larvae Survey (IHLS) survey data (MarineSpace Ltd et al., 2013). IHLS Surveys conducted from 2007-2020, used to inform the assessment in 6.2.6: Fish and Shellfish Ecology [APP-075], indicates that areas of high intensity spawning are consistently present at a significant distance from the Five Estuaries OWF (and the anticipated O&M vessel routes between the development and port of Harwich) within the eastern English Channel, whilst low to moderate spawning intensity is apparent to the east of the VE array areas. This also aligns with the sediment analysis, with large areas of 'Preferred' spawning substrates occurring south of the array areas, within the eastern English Channel, and Dover Strait. Taking this into account, herring are considered to be of high vulnerability, with medium recoverability and of regional importance (Section 41 priority species), therefore the sensitivity of spawning herring to noise impacts is considered to be **medium**.

3.2.36 Seahorses are also considered as a Group 3 species as they also possess a swim bladder that is involved in hearing. Seahorses can be found in a wide variety of habitats, including ports (Woodall *et al.,* 2018). Seahorses have low swimming speeds, with very inefficient fins for conventional swimming (Ashley-Ross, 2002) and therefore may have limited capacity to flee the area. However, seahorses are not expected in significant numbers in the O&M vessel area, as there are no records or data that suggest that the Five Estuaries OWF, port of Harwich or the anticipated O&M vessel routes are an area of particular importance for seahorse. Seahorse are considered to be of high vulnerability, with medium recoverability and of national importance (Priority Species under the UK Post-2010 Biodiversity Framework and protected under the Wildlife and Countryside Act 1981), therefore the sensitivity of seahorse to noise impacts is considered to be **high**.

SIGNIFICANCE OF EFFECT

3.2.37 The significance of effect from O&M vessel noise from vessel activity associated with the O&M phase of Five Estuaries OWF from the port of Harwich is considered to be in line with the assessment for all operational subsea noise within 6.2.6 Fish and Shellfish Ecology [APP-075] and therefore the conclusions of the ES remain valid.

3.2.38 The impact of subsea noise on O&M vessel noise from vessel activity associated with the O&M phase of Five Estuaries OWF from the port of Harwich on fish and shellfish receptors is of negligible magnitude, and the maximum sensitivity of receptors is high (seahorse). The significance of the residual effect is therefore concluded to be at worst **minor adverse**, which is not significant in EIA terms.

3.3 SUPPLEMENTARY ENVIRONMENTAL ASSESSMENT: OPERATIONAL AND MAINTENANCE PHASE – LOWESTOFT AND GREAT YARMOUTH

3.3.1 This environmental assessment addresses the potential effects of vessel activity in the O&M phase of VE originating from the ports of Lowestoft and Great Yarmouth. A review of environmental topics and associated receptors has been undertaken in line with the information provided in Section 1.3. Based on this review, the assessment has focussed on those pathways where the potential for significant adverse effects may exist and therefore presents a realistic 'worst-case' assessment of impacts arising from O&M related vessel activity from the ports of Lowestoft and Great Yarmouth.

OFFSHORE ORNITHOLOGY

IMPACT 1 – RED THROATED DIVER DISTURBANCE AND DISPLACEMENT FROM O&M VESSELS

3.3.2 This assessment evaluates the potential for disturbance to offshore ornithological receptors, particularly RTDs, as detailed in the EIA (6.2.4 Offshore Ornithology [APP-073]), from vessel activity associated with the O&M phase of Five Estuaries OWF from the ports of Lowestoft and Great Yarmouth. The RTD is an Annex 1 species and a feature of the OTE SPA (Natural England and JNCC 2010). Common tern (*Sterna Hirundo*) and little tern (*Sternula albifrons*) were scoped out due to the low numbers recorded within the site and not being susceptible to displacement (Table 4.18 within 6.2.4 Offshore Ornithology [APP-073]) and this conclusion remains valid when considering the relevant O&M ports.

3.3.3 In the original Environmental Statement, vessel disturbance from presence within the ECC and on-site during construction was assessed under Impact 3, and the conclusions of that assessment remain valid. This supplementary information provides additional consideration of potential disturbance impacts arising from vessel activity associated with the port options during the O&M phase. Alongside the Environmental Statement the Red Throated Diver Note submitted during the examination is relevant to this impact pathway and summarises the Applicant's position on impacts to RTDs within the ECC during construction (10.48 Red Throated Diver Note [REP6-052]).

3.3.4 Any proposed O&M vessel routes will, where practicable, avoid impacting RTD in the OTE SPA by using existing vessel routes. Where O&M does transit the SPA or the 2km buffer they will adhere to measures outlined in 9.18.1 Working in Proximity to Wildlife – Revision C, an update of which has been provided with this submission alongside a new deemed Marine Licence condition which secures the operational measures.

3.3.5 The MDS for O&M vessel requirements of 52 annual round trips from each port, Lowestoft and Great Yarmouth would, on average increase the vessel traffic by 2 vessel trips per week. The O&M traffic would be in the SPA and/or buffer for very brief periods of time and therefore the weekly increase in vessel traffic would be indistinguishable compared to the baseline impact on the SPA.

MAGNITUDE OF IMPACT

3.3.6 This assessment takes into account the mitigation already agreed in the form of the best practice protocol for minimising vessel disturbance of RTDs within the OTE SPA (Table 4.16 within 6.2.4 Offshore Ornithology [APP-073]) and the 9.18.1 Working in Proximity to Wildlife in the Marine Environment – Revision C.

3.3.7 The MDS for vessel requirements for the O&M phase is outlined in Table 1.1 and the indicative port approach areas are found in Figure 1.1. Any proposed O&M vessel route will minimise any overlap with the OTE SPA and use existing vessel routes, where practicable.

3.3.8 Figure 1.2 shows that the vessel density in the Great Yarmouth and Lowestoft approaches and the SPA transit area are very high and the addition of two vessel per week will have little effect on the RTDs in the area.

3.3.9 The potential magnitude of impact on RTD are discussed in detail in paragraphs 3.2.13 to 3.2.17. The number of return trips is extremely low (2 per week) and therefore will not add significantly to the current baseline.

3.3.10 The magnitude of the projected increase in mortality is likely to be too small to noticeably affect background mortality and would be undetectable. Accordingly, the impact magnitude is considered **negligible**.

SENSITIVITY OF RECEPTOR

3.3.11 The sensitivity of receptor (RTD) has been discussed in detail in paragraphs 3.2.18 to 3.2.19. In the paragraphs it details that RTDs are sensitive to human activities in marine areas.

3.3.12 The sensitivity of RTD to disturbance by O&M vessel traffic is therefore classified as **high**.

SIGNIFICANCE OF EFFECTS

3.3.13 The significance of effect from disturbance from vessel activity associated with the O&M phase of Five Estuaries OWF from the ports of Lowestoft and Great Yarmouth are considered to be lower than the impacts from the construction of the ECC. This is due to the short term nature of each trip and vessels will likely be in the SPA or buffer zone for a matter of minutes during each trip. This coupled with the use of the best practice protocol when in the SPA and 2km buffer zone will minimise the effects.

3.3.14 The O&M vessel activities will have a minimal contribution to the overall baseline of vessel traffic in the area.

3.3.15 As the species is of high sensitivity to disturbance and negligible magnitude of impact, the effect significance is **minor adverse**, which is not significant in EIA terms.

FISH AND SHELLFISH ECOLOGY

IMPACT 1: UNDERWATER NOISE DISTURBANCE FROM O&M VESSELS

3.3.16 This assessment evaluates the potential for impacts arising from underwater noise on fish and shellfish ecology receptors, particularly herring, as detailed in 6.2.6 Fish and Shellfish Ecology [APP-075] from vessel activity associated with the O&M phase of Five Estuaries OWF. The assessment in the 6.2.6 Fish and Shellfish Ecology [APP-075] remains valid, however this assessment considers vessels specifically transiting from the ports of Lowestoft and Great Yarmouth.

MAGNITUDE OF IMPACT

3.3.17 Underwater noise will arise from vessels activity associated with the O&M phase of Five Estuaries OWF transiting the site from the ports of Lowestoft and Great Yarmouth to the development. The realistic worst-case scenario for the port of Lowestoft is 52 annual round trips (based on SOV movements) and Great Yarmouth is 52 annual round trips (based on SOV movements) during O&M.

3.3.18 As previously mentioned, there is minimal risk of any mortality, injury or TTS arising from vessel noise on fishes. However, there may be behavioural effects as a result of exposure to vessel noise (Popper *et al.,* 2014).

3.3.19 As detailed in Table 1.67 of 6.5.6.2 Underwater Noise Technical Report – Revision B [REP2-018], the impact ranges from vessel noise are minimal (<50m). The Southern North Sea is exposed to high levels of vessel traffic (as detailed in 6.2.9 Shipping and Navigation [APP-078]) which results in high ambient noise levels. It is anticipated that the noise generated by O&M vessels serving the Five Estuaries OWF from the ports of Lowestoft and Great Yarmouth will not result in a significant increase to the ambient noise levels of the Southern North Sea.

3.3.20 The impact is predicted to be of a highly localised spatial extent, long-term duration, continuous and irreversible (during the lifetime of the project). It is predicted that the impact will affect the fish and shellfish receptors indirectly. Due to the extremely localised spatial extent, the magnitude is therefore, considered to be **negligible**.

SENSITIVITY OF RECEPTOR

3.3.21 All Group 1 and Group 2 receptors identified in 6.2.6 Fish and Shellfish Ecology [APP-075] are considered to be of **low** sensitivity to the impacts of O&M vessel noise.

3.3.22 Group 3 receptors are the most sensitive of the groups categorised by Popper *et al*., 2014. Whilst there are several Group 3 receptors present in the vicinity of the Five Estuaries OWF as detailed in 6.5.6.1 Fish and Shellfish Ecology Technical Baseline Report, they are considered of a low sensitivity largely due to their ability to flee from the impact. However, due to herring and seahorse being considered as stationary receptors, these species are considered further in the assessment.

3.3.23 Seahorses are not expected in significant numbers in the area, as there are no records or data that suggest that the Five Estuaries OWF, ports of Lowestoft and Great Yarmouth, or the anticipated O&M vessel routes are an area of particular importance for seahorse.

3.3.24 The sensitivity of spawning herring is detailed in Paragraph 3.2.35. The Blackwater Estuary spawning ground is much closer to the port of Harwich and the anticipated O&M vessel routes to the development in comparison to the O&M vessel routes between the ports of Lowestoft/Great Yarmouth and the development. Therefore, the impact from O&M vessel activity to the Blackwater Estuary Spawning Ground is reduced when considering this transit route.

3.3.25 The sensitivity of fish and shellfish ecology receptors are detailed in Paragraph 3.2.30 *et seq* and were assessed as having a maximum sensitivity of **high** (for seahorse).

SIGNIFICANCE OF EFFECT

3.3.26 The significance of effect from O&M vessel noise from vessel activity associated with the O&M phase of Five Estuaries OWF from the ports of Lowestoft and Great Yarmouth is considered to be in line with the assessment for all operational subsea noise within 6.2.6 Fish and Shellfish Ecology [APP-075]. Therefore, the conclusions of the ES remain valid.

3.3.27 The impact of subsea noise on O&M vessel noise from vessel activity associated with the O&M phase of Five Estuaries OWF from the ports of Lowestoft and Great Yarmouth on fish and shellfish receptors is of **negligible** magnitude, and the maximum sensitivity of receptors is **high** (seahorse). The significance of the residual effect is therefore concluded to be **minor adverse**, which is not significant in EIA terms.

3.4 CUMULATIVE EFFECTS

3.4.1 The cumulative effects assessment presented below has been undertaken in accordance with the Cumulative Effects Assessment (CEA) methodology set out in 6.1.3.1 Cumulative Effects Assessment Methodology - Revision B [REP4-009]. Following a review of the projects included within the CEA for each of the topics assessed, it is considered that the short-listed projects identified in the ES chapters remain valid.

3.4.2 In addition, this assessment draws upon the findings of the relevant ES chapters to determine whether any impacts warrant further consideration within the cumulative assessment.

OFFSHORE ORNITHOLOGY

IMPACT 1 – RED THROATED DIVER DISTURBANCE AND DISPLACEMENT FROM O&M VESSELS

3.4.3 A comprehensive cumulative assessment of the potential impacts of displacement on RTD has already been undertaken in 6.2.4 Offshore Ornithology [APP-073], see paragraph 4.13.26, with further information provided in 10.48 Red Throated Diver Note [REP6-052].

3.4.4 The potential magnitude of impact from VE on RTD are discussed in detail in paragraphs 3.2.13 to 3.2.17, and the sensitivity of RTD has been discussed in detail in paragraphs 3.2.18 to 3.2.19. In the paragraphs it details that RTDs are sensitive to human activities in marine areas.

3.4.5 Cumulative displacement-related mortality of RTDs in the south-west North Sea Biologically Defined Minimum Population Scale (BDMPS) has been estimated for offshore windfarms with potential cumulative effects (Furness 2015). These assessments used both the precautionary displacement and mortality rates recommended by the SNCBs (2017; updated 2022), 100% displacement and up to 10% mortality within 4 km, and more evidence-based rates (90% displacement and up to 1% mortality (MacArthur Green 2019a)). A full assessment of cumulative effects on RTDs during O&M has been undertaken in 6.2.4 Offshore Ornithology [APP-073] and concluded that impacts across the entire North Sea BDMPS would be **minor adverse**, which is not significant in EIA terms.

The cumulative mortality estimates are highly precautionary due to:

- Lack of quantified mitigation, despite commitments to best-practice protocols and compensation measures (e.g., East Anglia ONE North);
- Use of conservative displacement/mortality rates (100% and 10%), though evidence supports lower rates (90% displacement, ≤1% mortality, possibly zero);
- Uniform impact assumptions within 4 km of windfarms, despite displacement declining with distance and often negligible beyond 2 km;
- Potential double counting across seasons and overlapping buffers (e.g., Norfolk Boreas, Vanguard East, and East Anglia THREE—approx. 15% overlap);
- Conservative treatment of Norfolk Vanguard East/West as separate, fully developed sites;
- Most predicted mortality (two-thirds) occurs during short migration periods, when birds' exposure—and thus risk—is lower.

3.4.6 Taking into account the negligible magnitude of impact from the project alone , there is no additional contribution to the conclusions already presented for RTD in the EIA. This is particularly the case given the embedded conservatisms in the assessment, the mitigation provided through the RTD protocol and the Working in Proximity to Wildlife (WIPtW) Plan, and the fact that baseline mortality rates already account for a substantial portion of cumulative disturbance impacts within the wintering habitat. Therefore, the cumulative displacement impact is assessed as **low magnitude**, resulting in a **minor adverse effect**, which is **not significant** in EIA terms.

FISH AND SHELLFISH ECOLOGY

3.4.7 As per Section 6.14 (Cumulative Effects) of 6.2.6 Fish and Shellfish Ecology [APP-075] underwater noise during the O&M phase of the Project was not assessed due to the low noise levels and highly localised nature of the impact.

3.4.8 Based on the current Project Design, no further cumulative effects assessment on fish and shellfish ecology receptors is required.

4. SUMMARY OF EFFECTS

4.1 ASSESSMENT SUMMARY

4.1.1 This supplementary O&M assessment has assessed the potential effect of vessels transiting from Harwich, Lowestoft and Great Yarmouth Ports on a number of receptors. The range of potential impacts and associated effects has been informed by the relevant environmental statement chapters and the information currently available to VE. Any environmental effects associated with any potential development O&M facilities would be consented and assessed under a separate planning regime once further details are available and may be consented by the relevant port.

4.1.2 As highlighted in Section 1.2, the Applicant has not yet selected a final O&M port for the VE project but has defined and assessed the 'worst-case' scenario in terms of potential vessel movements from the O&M ports currently under consideration by the Applicant.

4.1.3 As O&M impacts were previously assessed in the ES, the Applicant has drawn on the previously presented information and has provided supplementary information and assessment. Where the ES remains valid and no further assessment is necessary of possible this has been detailed in Section 3.1. No significant effects in EIA terms are predicted to result from the transiting of the O&M vessels. Overall, the effects on all relevant receptors have been assessed and found to be either negligible or minor adverse for the project alone and cumulatively, and therefore not significant in EIA terms.

Table 4.1 Summary of effects across topics taken forward to assessment

RECEPTOR	DESCRIPTION OF IMPACT	CONCLUSION
OFFSHORE ORNITHOLOGY		
Red-throated diver	Disturbance and displacement from O&M vessels	Minor adverse, not significant in EIA terms.
FISH AND SHELLFISH ECOLOGY		
Spawning herring	Underwater noise disturbance from O&M vessels	Minor adverse, not significant in EIA terms.
Seahorse	Underwater noise disturbance from O&M vessels	Minor adverse, not significant in EIA terms.
All other fish and shellfish receptors	Underwater noise disturbance from O&M vessels	Minor adverse, not significant in EIA terms.
CUMULATIVE EFFECTS		
OFFSHORE ORNITHOLOGY		
Red-throated diver	Disturbance and displacement from O&M vessels	Minor adverse, not significant in EIA terms.
FISH AND SHELLFISH ECOLOGY		
Cumulative effects from underwater noise disturbance from O&M vessels were not considered further, see paragraph 3.4.7.		

5. ANNEX 1 – MARINE COORDINATION IN VICINITY OF SPAS NOTE

1 Purpose

This document has been produced for the purpose of minimising disturbance impacts on the red-throated diver (*Gavia stellata*) as a feature of the Outer Thames Estuary (OTE) Special Protection Area (SPA). To minimise the disturbance risk to red-throated divers during the over-wintering period, this document presents the areas where project vessels will either avoid transiting through the SPA or take the shortest route through that retains compliance with charted features, legislation and good practice to always maintain navigation safety.

It is noted that, at all times, vessels must prioritise ensuring compliance with the Convention on International Regulations for Preventing Collisions at Sea (COLREGs) or port/harbour control requirements. Nothing within this commitment will remove from the Master's ability to make independent decisions to ensure the safety of the vessel and crew.

Given that the final construction and operation and maintenance strategy is to be determined, final transit corridors to/from ports or harbours have not yet been defined. This document instead makes a commitment to manage disturbance risk in the areas where vessel transits may overlap with SPAs and associated 2-kilometre (km) buffers. Based on the use of Great Yarmouth or Lowestoft for Service Operation Vessels (SOVs), and Harwich Harbour as a base for Crew Transfer Vessels (CTV), the following three areas have been identified:

- Great Yarmouth and Lowestoft Approaches;
- SPA Transit Area; and
- Harwich Approaches.

These areas are presented alongside the proximal SPAs and associated 2km buffers, Harwich Haven authority and pilot limits, offshore wind developments and planned bases of operation in Figure 1.

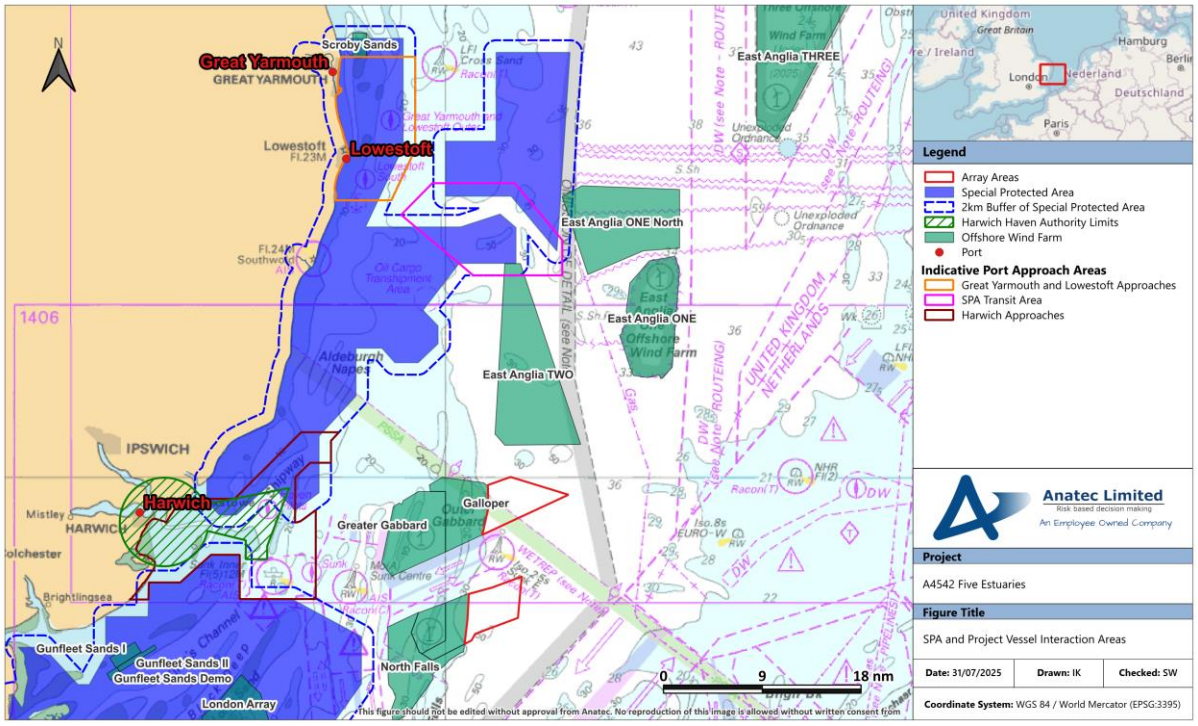

Figure 1 SPA and Project Vessel Interaction Areas

2 Great Yarmouth and Lowestoft Approaches

Navigation within the **'Great Yarmouth and Lowestoft Approaches'** is heavily constrained due to the shallow water depths, tidal conditions and port services/requirements. Compliance with the COLREGs or port direction (where relevant) is expected by project vessels at all times.

Vessels using the **'Great Yarmouth and Lowestoft Approaches'** area should take account of:

- Navigational safety, COLREGS and other users of the area;
- Areas of known third party anchoring activity;
- Sandbanks and areas with shallow depths;
- Port requirements - in particular, those associated with port limits, pilot boarding areas and associated activities; and
- Use of existing routes (used by all vessels) which will minimise disturbance to red-throated divers.

3 SPA Transit Areas

With consideration of navigational safety, COLREGS and other users of the area vessels should aim to avoid the SPAs and transit through the 2km buffers on the shortest, or on the most direct route possibles. Vessels requiring access to/from the south and to the west of East Anglia Two (once construction commences) may transit through the SPA on the most direct route possible taking account of COLREGs and other navigational features. Use of existing routes in this area (used by all vessels) will minimise disturbance to red-throated divers.

4 Harwich Approaches

Navigation within the **'Harwich Approaches'** is heavily constrained due to the volume of traffic, International Maritime Organization (IMO) routeing measures, harbour authority channels and the charted features surrounding areas of navigation. Compliance with COLREGs and harbour direction/Vessel Traffic Service (VTS) advice (where relevant) is expected by project vessels at all times. With consideration of navigational safety and routeing guidance vessels should aim to avoid SPAs and their associated 2km buffers. Where essential (due to navigational safety and compliance with the charted North and South channels leading to Harwich) vessels should take the shortest possible route to transit through any area of SPA or 2km buffer. Project vessels may be required on occasion to use the 'Shipway' channel, which is a route frequently used by smaller vessels to exit Harwich avoid the Sunk routeing measures.

Vessels using the **'Harwich Approaches'** should take account (but not limited to) of:

- Navigational safety and COLREGs;
- Compliance with chartered routeing measures;
- Areas of known third party activity including deep-draughted and pilotage vessels. Project vessel should stay clear of pilot boarding operations;
- Sandbanks and areas with shallow depths; and
- Harwich Haven Authority requirements (in particular those associated with deep water channels, North/South channels).

Operations and Maintenance vessels (CTVs) transiting to/from Harwich will also take account of existing protocols used by the Galloper Offshore Windfarm in relation to red throated divers within the OTE SPA.

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FIVE ESTUARIES
OFFSHORE WIND FARM

PHONE 0333 880 5306
EMAIL fiveestuaries@rwe.com
WEBSITE www.fiveestuaries.co.uk
ADDRESS Five Estuaries Offshore Wind Farm Ltd
Windmill Hill Business Park
Whitehill Way, Swindon, SN5 6PB
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