The Sizewell C Project

6.3 Volume 2 Main Development Site

Chapter 24 Marine Navigation

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24. Navigation

24.1 Introduction

24.1.1 This chapter of **Volume 2** of the **Environmental Statement (ES)** presents an assessment of the marine navigation effects arising from the construction and operation of the Sizewell C power station at the main development site (referred to throughout this volume as the 'proposed development'). This includes an assessment of potential risks, their significance, the requirements for mitigation and the residual risks.

24.1.2 Detailed descriptions of the main development site (referred to throughout this volume as the 'site'), the proposed development and the different phases of development are provided in **Chapters 1** to **4** of this volume of the ES. A description of the anticipated activities for the decommissioning of the Sizewell C power station, including a summary of the types of environmental effects likely to occur is provided in **Chapter 5** of this volume. A glossary of terms and list of abbreviations used in this chapter is provided in **Volume 1, Appendix 1A** of the **ES.**

24.1.3 This assessment has been informed by data presented in the following technical appendix:

- Navigational Risk Assessment, August 2019, included in **Appendix 24A: Navigational Risk Assessment** of this volume**.**

24.1.4 It is noted that works above the Mean High Water Mark (MHWM) are not considered to impact on marine navigation and are, therefore, not referred to in this chapter. These include (but are not limited to) works associated with the Sizewell B relocated facilities proposals and the off-site developments considered in this volume.

24.2 Legislation, policy and guidance

24.2.1 This section lists the specific legislation, policy and guidance of relevance to the marine navigation assessment that is further described in **Volume 1, Appendix 6T** of the **ES**.

a) International

24.2.2 The following international legislation has been considered, as described in **Volume 1, Appendix 6T** of the **ES**:

- United Nations Convention on the Law of the Sea (Ref 24.1).

- IMO International Regulations for Preventing Collisions at Sea (Ref 24.2).
- Chapter V, Safety of Navigation, of the Annex to the International Convention for the Safety of Life at Sea (Ref 24.3).

b) National

i. Legislation

24.2.3 The following national legislation has been considered, as described in **Volume 1, Appendix 6T** of the **ES**:

- The Merchant Shipping Notices (Ref 24.4) which transpose International Regulations for the Prevention of Collision at Sea 1972/78 (Ref 24.2) into United Kingdom (UK) legislation.
- The Merchant Shipping (Safety of Navigation) Regulations 2002 (Ref 24.5) which transpose Chapter V of Safety of Life at Sea (Ref 24.3) into UK legislation.

ii. Policy

24.2.4 As stated in **Volume 1, Chapter 3** of the **ES**, whilst other matters may constitute important and relevant considerations in the decision making process under section 105(2)(c) of the Planning Act 2008, significant weight should be given to the policies contained within the Overarching National Policy Statement (NPS) for Energy (NPS EN-1) (Ref 24.6) and the NPS for Nuclear Power Generation (NPS EN-6) (Ref 24.7). A summary of the relevant policy requirements for navigation, together with consideration of these have been taken into account in this assessment is provided in **Volume 1, Appendix 6T** of the **ES**.

24.2.5 In addition, the UK Marine Policy Statement (Ref 24.8) provides a framework for preparing marine plans and taking decisions affecting the marine environment. The requirements of the UK Marine Policy Statement, as relevant to the assessment of navigation are described in **Volume 1, Appendix 6T** of the **ES**.

c) Regional

24.2.6 The East Inshore and Offshore marine plans (Ref 24.9) inform and guide regulation, management, use and protection of the area of sea stretching from Flamborough Head to Felixstowe.

d) Local

24.2.7 No local policy is deemed relevant to the assessment for this site.

e) Guidance

24.2.8 This assessment has been undertaken in accordance with the following guidance documents:

- International Maritime Organisation (IMO) Guidelines for Formal Safety Assessment – MSC/Circ. 1023 (Ref 24.10).
- MGN (Marine Guidance Note) 543 (MCA, 2016) Offshore Renewable Energy Installations (OREIs) – Guidance on Navigational Practice, Safety and Emergency Response Issues (Ref 24.11).

24.3 Methodology

a) Scope of the assessment

24.3.2 The generic Environmental Impact Assessment (EIA) methodology is detailed in **Volume 1**, **Chapter 6** of the **ES**. This section presents a summary of the assessment methodology for marine navigation. The full method of assessment for marine navigation that has been applied for the Sizewell C Project is included in **Volume 1**, **Appendix 6T** of the **ES** .

24.3.3 The scope of this assessment has been established through a formal EIA scoping process undertaken with the Planning Inspectorate. A request for an EIA Scoping Opinion was initially issued to the Planning Inspectorate in 2014, with an updated request issued in 2019 as provided in **Volume 1, Appendix 6A** of the **ES** .

24.3.4 Comments raised in the EIA Scoping Opinions received in 2014 and 2019 have been taken into account in the development of the assessment methodology. These are detailed in **Volume 1, Appendices 6A** to **6C** of this volume.

b) Consultation

24.3.5 The assessment has been informed by ongoing consultation and engagement with statutory consultees and key stakeholders throughout the design and assessment process, including Trinity House, Maritime & Coastguard Agency, Royal Yachting Association, Cruising Association, East Anglia Wind Farm Operator, Eastern Inshore Fisheries and Conservation Authority, Royal National Lifeboat Institution, local fishermen, Orford & District Fishing Association, CEMEX UK Marine Ltd and Hanson

Aggregates Marine Ltd. In particular, "Hazard Workshops" were held in 2015 and 2019. Further information on consultation, including a summary of comments received, is provided in **Volume 1**, **Appendix 6T** and **Appendix 24A** of this volume.

c) Study area

24.3.6 The study area is defined as a 12 nautical mile (nm) radius around the main platform (as shown in in **Figures 24.2** and **24.3**). This is considered sufficient to provide an overview of marine navigation activity in proximity to the marine aspects of the Sizewell C Project.

d) Assessment scenarios

24.3.7 Assessment is undertaken for the construction and operational phases of the marine aspects of the proposed development. Relevant aspects of the construction and operational phases are described in **Volume 1**, **Appendix 6T** of the **ES**.

e) Assessment criteria

24.3.8 As described in **Volume 1**, **Chapter 6** of the **ES**, the EIA methodology considers whether impacts of the proposed development would have an effect on any resources or receptors. However, for the marine navigation assessment, the risk to navigation posed by the proposed development is considered. The IMO Formal Safety Assessment process approved by the IMO in 2002 under SC/Circ.1023/MEPC/Circ392 has been applied.

24.3.9 The Formal Safety Assessment assigns each risk a "severity of consequence" and a "frequency of occurrence" to evaluate the significance of each risk.

24.3.10 A summary of the assessment criteria used in the marine navigation assessment is presented in the following sub-sections.

i. Severity of consequence

24.3.11 The severity of consequences is assessed on a five-point scale. The defined consequence bands are presented in **Table** 24.1.

Table 24.1: Assessment of the severity of consequence for marine navigation.

Severity	People	Property	Environment	Business
Negligible	Zero injury	Minimal damage (<£10k)	Zero effect	Zero impact (<£10k)
Minor	Minor injury	Minor damage (£10k-£100k)	Minor effect (Local assistance	Minor impact (£10k-£100k)

Severity	People	Property	Environment	Business
			required)	
Moderate	Major injury	Moderate damage (£100k-£1M)	Moderate effect (Limited external assistance required)	Considerable impact (£100k-£1M) Local publicity
Serious	Single fatality	Major damage (£1M-£10M)	Major effect (Regional assistance required)	Major national impact (£1M-£10M) National publicity
Major	Multiple fatalities	Extensive damage (>£10M)	Extensive effect (National assistance required)	Major international impact (>£10M) International publicity

ii. Frequency of occurrence

24.3.12 The frequency of occurrence is also assessed on a five-point scale, as presented in **Table** 24.2.

Table 24.2: Assessment of frequency of occurrence for marine navigation.

Frequency	Criteria
Negligible	< 1 occurrence per 10,000 years
Extremely Unlikely	1 per 100 to 10,000 years
Remote	1 per 10 to 100 years
Reasonably Probable	1 per 1 to 10 years
Frequent	Yearly

iii. Risk Matrix

24.3.13 The severity of consequence and frequency of occurrence rankings are then used to determine the level of risk for each impact. Levels of risk are described as “Unacceptable”, “Tolerable” or “Broadly Acceptable” using the risk matrix shown in **Table** 24.3.

Table 24.3: Risk Matrix.

		Frequency of occurrence				
		Negligible	**Extremely Unlikely**	**Remote**	**Reasonably Probable**	**Frequent**
Severity of Consequen	**Negligible**	Broadly Acceptable	Broadly Acceptable	Broadly Acceptable	Broadly Acceptable	Broadly Acceptable
	Minor	Broadly Acceptable	Broadly Acceptable	Broadly Acceptable	Tolerable	Tolerable

		Frequency of occurrence				
	Moderate	Broadly Acceptable	Tolerable	Tolerable	Tolerable	Unacceptable
	Serious	Tolerable	Tolerable	Tolerable	Unacceptable	Unacceptable
	Major	Tolerable	Tolerable	Unacceptable	Unacceptable	Unacceptable

24.3.14 The language used by the Formal Safety Assessment method ("Unacceptable", "Tolerable" or "Broadly Acceptable") differs from that used in the standard EIA methodology ("Negligible", "Minor", "Moderate" and "Major") because the assessment is made against risk as opposed to impact. Definitions for risk categories are provided in **Table** 24.4.

Table 24.4: Risk Definitions.

Risk	Definition
Unacceptable	Generally regarded as unacceptable regardless of the level of benefit associated with the activity. Under EIA terms unacceptable is considered to be significant and would require risk mitigation or design modification to reduce to tolerable As Low As Reasonably Practicable (ALARP).
Tolerable	Under EIA terms tolerable is considered to be not significant, however there is an expectation that such risks are properly assessed, appropriate control measures are in place, residual risks are ALARP and that risks are periodically reviewed to monitor if further controls are appropriate.
Broadly Acceptable	Under EIA terms broadly acceptable is considered to be not significant and impacts are regarded as acceptable and adequately controlled.

f) Assessment methodology

24.3.15 A detailed description of the assessment methodology used to assess the potential effects on marine navigation arising from the proposed development is provided in **Volume 1, Appendix 6T** of the **ES**. A summary is provided below.

24.3.16 The existing baseline environment was established by identifying navigational features and shipping activity using various data sources provided in **Appendix 24A** of this volume.

24.3.17 Baseline data have been obtained from the collation of existing information using recent data sets. The majority of vessels likely to be affected by the Sizewell C Project are fishing and recreational vessels. Trends in fishing and recreational activity are difficult to predict. Fishing activity can depend on various influencing factors such as fish stocks, quotas, Brexit, etc., while recreational activity can be impacted by factors such as weather and the economy. Climate change, including increased number of storm events,

could reduce recreational activity, whilst increase in temperatures could increase recreational activity. Overall, there is not anticipated to be any significant increase in the shipping activity presented in the baseline assessment. For the purposes of this assessment, changes to baseline conditions in the future have also been reviewed with respect to marine developments currently under construction.

24.3.18 The assessments of navigational risks during the construction and operational phases are reported separately, however in both cases, the findings of the baseline assessment were reviewed and, in consultation with local stakeholders, potential risks relevant to marine navigation were identified. The full navigational risk assessment is included in **Appendix 24A** of this volume and the findings from the hazard consultation presented in **Appendix 24B, Hazard Log**. On the basis of the risk assessment, requirement for additional mitigation was reviewed so that no significant risks would remain.

g) Assumptions and limitations

24.3.19 Assumptions and limitations are detailed in **Volume 1, Appendix 6T** of the **ES**.

24.4 Baseline environment

24.4.1 This section presents a description of the baseline environmental characteristics within the offshore works area of the proposed development and in the surrounding area.

24.4.2 Further detail can be found in **Appendix 24A** of this volume**.**

a) Current baseline

i. Navigational features

24.4.3 The closest major port to the Sizewell C Project is the Port of Lowestoft, located approximately 16nm to the north (see **Figure 24.1**). This is a commercial and fishing port which also acts as a base for vessels servicing the offshore oil and gas and offshore windfarm industries. It also offers fabrication and repair facilities. The port is home to the operations and maintenance base for Greater Gabbard Offshore Wind Farm.

24.4.4 Felixstowe and Ipswich are the closest ports to the south; however, these are located in excess of 20nm away, as is Great Yarmouth to the north. Great Yarmouth and Harwich, as well as Rotterdam, are the three ports being considered as the transhipment port for the Sizewell C Project. Southwold Harbour, located approximately 6nm north of the Sizewell C

Project, is a small harbour which accommodates small fishing boats and recreational craft.

24.4.5 There is an oil transhipment area located approximately 11nm north-east of the Sizewell C Project, where tankers may transfer oil from one vessel to another.

24.4.6 The closest anchorage area to the Sizewell C Project is Southwold, approximately 5nm to the north. Charted depths around this area range from approximately 10-12m. Hollesley Bay, located approximately 11nm south of Sizewell C, provides anchorage in depths between 6m and 10m. The seabed is made up of mud and clay; however, sand is found close to Whiting Bank where the greatest depths are found. There is also available anchorage at Sledway in depths of around 11m further south.

24.4.7 The closest aggregate dredging production areas include area number 430 (located approximately 12nm east of the site) operated by Tarmac Marine Ltd and area numbers 507/2 and 507/5 (located approximately 11–12nm SE of the site) operated by CEMEX UK Marine Ltd.

24.4.8 The Sunk Traffic Separation Scheme (TSS) is located approximately 17nm south of the site. Traffic Separation Schemes are used to separate traffic travelling in opposite directions in busy (or sensitive) areas of shipping. In addition, a Deep Water Route is located approximately 33nm east of the site.

24.4.9 Export cables associated with Galloper and Greater Gabbard Offshore Wind Farms , in addition to the Concerto 1 North telecommunication cable, all lie within 1nm south of the site. The Galloper export cables intersect the site boundary and lie closest to the proposed intake/outfall positions, at approximately 0.2nm south at their closest point.

24.4.10 There are no military practice areas within 10nm of the Sizewell C Project. The closest area lies approximately 16.5nm to the south-east.

24.4.11 The closest operational wind farms relative to the proposed development are the Greater Gabbard and Galloper Offshore Wind Farms, located approximately 17nm to the south-east.

24.4.12 The proposed development lies within a general boating area, with a Royal Yachting Association (RYA) club and training centre located approximately 4.5nm south of the site. The highest density of recreational traffic in the area is around the ports of Harwich and Felixstowe to the south of the proposed development, and the ports of Great Yarmouth and Lowestoft to the north.

ii. Incident data

24.4.13 Incident data recorded by the Marine Accident Investigation Branch and the Royal National Lifeboat Institution between 2005 and 2014 were reviewed. A total of 28 incidents were recorded by the Marine Accident Investigation Branch, and 263 by the Royal National Lifeboat Institution, within 12nm of the proposed development.

24.4.14 Machinery failure was the most frequently recorded incident type within the data sets. Fishing vessels and other commercial vessels were the most frequently involved in the Marine Accident Investigation Branch data set whilst recreational vessels were the most frequently involved in the Royal National Lifeboat Institution data set.

24.4.15 The two closest incidents to the proposed development recorded in the Marine Accident Investigation Branch data were machinery failures which both occurred within 2nm of the site. In the Royal National Lifeboat Institution data set, two persons in danger and one machinery failure incident involving a fishing vessel were recorded within the site.

iii. Marine traffic

24.4.16 A total of 28 days of Automatic Identification System (AIS) and radar data were used to inform the baseline shipping analysis provided in **Appendix 24A** of this volume. These were taken from shore-based surveys undertaken in June 2019 (14 days summer) and November 2018 (14 days winter). A study area was defined as a 12nm buffer around the proposed development.

24.4.17 This data was used to provide good coverage of the study area as well as account for any seasonal trends. It is noted radar data was included to provide coverage of fishing vessels less than 15m in length and recreational craft not obligated to carry AIS.

24.4.18 Throughout the summer survey period (see **Figure 24.2**), there was an average of 66 unique vessels recorded per day within the study area. Throughout the winter survey period (see **Figure 24.3**), there was an average of 27 unique vessels recorded per day within the study area.

24.4.19 In summer, the most frequently recorded vessel types in the study area were recreational craft (comprising 24% of all traffic) and cargo vessels (24%), followed by wind farm support vessels (22%). In winter, the most frequently recorded vessels were cargo (51%) followed by dredgers (12%). Other frequently recorded types include fishing vessels and tankers. Recreational activity was significantly lower in the winter survey period than in summer.

24.4.20 The average vessel lengths recorded in the summer and winter survey periods were 70m and 110m, respectively. The average vessel draughts were 4m and 5m in the summer and winter studies, respectively. These are consistent with the reduction in small craft activity (e.g. recreational) recorded in the area during the winter months.

24.4.21 During the summer months, the proposed cooling water intake/outfall positions would be located within an area of higher vessel density due to the abundance of small craft activity close to shore. In contrast, lower density is recorded in the same location during the winter months due to the significantly reduced level of small craft activity. Other high density areas can be attributed to the north/south route, approximately 4nm east of the proposed development, for transient traffic identified in the study area. This main route is utilised by commercial vessels transitting to various ports within the Humber Estuary and Thames Estuary. High traffic levels (commercial ferries and cargo, in particular) are also associated with the Sunk TSS located south of the study area.

24.4.22 Anchoring activity was relatively low within the study area with only three unique vessels, each recorded on one occasion within the combined survey period (28 days). The closest anchored vessel was a sailing vessel approximately 5nm north of the site boundary. The largest vessel at anchor was a 143m oil tanker with a Dead Weight Tonnage (DWT) of 19,000. All anchoring activity was recorded in June 2019. It is noted that anchoring will likely vary based on trade as well as weather and may not be fully represented by 28 days of survey data.

24.4.23 The majority of recreational vessels were recorded in the summer survey period. An average of 16 unique vessels per day was recorded within the study area in summer, in comparison to an average of one unique vessel every five days in winter.

24.4.24 Throughout the summer survey period, there was an average of three unique fishing vessels per day recorded in the study area. Throughout the winter survey period, there was an average of one unique fishing vessel every three to four days in the study area.

24.4.25 Three unique fishing vessels were recorded operating regularly within the study area (see **Figure 24.4**). One vessel was recorded regularly operating inshore of the Sizewell Bank, within the site boundary.

24.4.26 It was noted that fishing activity around the site may have been reduced by the presence of a jack-up barge and associated vessels working at the site during the summer survey. Earlier surveys undertaken in 2015 and 2016 showed greater coastal fishing activity.

b) Future baseline

24.4.27 The annual number of vessels arriving at the main ports in the area has reduced since 2009, with 2017 receiving approximately 22% fewer vessels than 2009, although the number of arrivals did increase slightly from 2016 to 2017.

24.4.28 Although the general trend in port arrivals was a reduction in shipping, the new offshore wind farm developments (both consented and planned) suggest that shipping activity may increase in the future. It is noted that growth in UK shipping in particular is uncertain due to the many unknowns surrounding the decision to leave the European Union (EU) and therefore, this may affect traffic transitting between UK and foreign ports.

24.4.29 Trends in fishing and recreational activity are particularly difficult to predict. Fishing activity can depend on various influencing factors such as fish stocks, quotas, Brexit, etc., while recreational activity can be impacted by factors such as weather and economy.

24.4.30 The East Anglia One offshore wind farm has now successfully generated power and is scheduled to be fully operational in 2020. The wind farm will include 102 turbines each with a 7 Megawatt (MW) capacity resulting in a total project capacity of 714MW. The operations and maintenance base will be constructed at Hamilton Dock, Lowestoft, so there is not anticipated to be any significant increase in traffic in proximity to the Sizewell C Project once this offshore wind farm is operational.

24.4.31 Construction of an Operations and Maintenance facility at Harwich for the Galloper offshore wind farm was consented in September 2018, with work beginning onsite in November 2018 and completion set for early 2020. However, the wind farm has been operational since 2017 and vessels currently servicing Galloper offshore wind farm have been using temporary facilities at Harwich. Therefore, there is not anticipated to be any significant change in baseline associated with the Operations and Maintenance facility.

24.4.32 Overall, there is not anticipated to be any significant change in the shipping activity presented in the baseline assessment.

24.5 Environmental design and mitigation

24.5.1 As detailed in **Volume 1**, **Chapter 6** of the **ES**, a number of primary mitigation measures have been identified through the iterative EIA process and have been incorporated into the design and construction planning of the proposed development. Tertiary mitigation measures are legal requirements or are standard practices that would be implemented as part of the proposed development.

24.5.2 The assessment of likely significant effects of the proposed development assumes that primary and tertiary mitigation measures are in place. For marine navigation, these measures are identified below, with a summary provided on how the measures contribute to the mitigation and management of potentially significant environmental effects.

24.5.3 For marine navigation the following primary and tertiary mitigation measures have been embedded into the design and construction management of the proposed development.

a) Primary mitigation

24.5.4 The proposed development incorporates a Beach Landing Facility (BLF) for the delivery of certain construction materials by sea, as opposed to a jetty as provided in **Chapter 6** of **Volume 1** of the **ES**. The BLF is considered to have a smaller impact on marine navigation activities due to the smaller marine footprint covered by the BLF, reduced disruption associated with construction and no dismantling as the BLF will be retained for use during the operation of the Sizewell C nuclear power station.

24.5.5 The following primary mitigation measures will also be in place during the operational phase:

- Intake/outfall structures will be marked with buoys or beacons.
- Offshore pilings for the BLF will be marked with buoys.

b) Tertiary mitigation

i. Construction phase

24.5.6 The following mitigation measures are proposed to be in place prior to the construction phase:

- Circulation of information via Notice to Mariners, Radio Navigational Warnings, Navigational Telex, and/or broadcast warnings in advance of and during the offshore works. The notices will include a description of the work being carried out.
- Communication between the Sizewell C Project and the Operators of the Galloper and Greater Gabbard Offshore Wind Farms.
- Vessels would be required to comply with International Regulations for the Prevention of Collision at Sea (Ref 24.2) and the International Regulations for SOLAS (Safety of Life at Sea) (Ref 24.3). .

- A delivery and logistics plan will be developed for Abnormal Indivisible Load (AIL) deliveries.
- A Fisheries Liaison Officer will be in place.

24.5.7 The above measures are secured by Deemed Marine Licence Conditions included within the Draft Order (Doc Ref. 3.1). A Competent Harbour Authority will be established for the construction phase of the the Sizewell C Project (see **Chapter 3** of this volume). The Competent Harbour Authority will deploy temporary safety zones, potentially monitored by guard vessels, around sensitive areas of construction to safely manage navigation.

24.5.8 Circulation of information about any construction works is a key mitigation measure that will help to reduce the risk of collision of passing vessels with installation vessels, dredgers and AIL delivery vessels, and risk of disruption to fishing and recreational activities. Compliance with International Regulations for the Prevention of Collision at Sea and temporary exclusion zones around the construction activity will also reduce the risk of collision.

24.5.9 A delivery and logistics plan for AIL deliveries will reduce the risk from delivery vessels grounding and disruption to fishing and recreational activities. Disruption to fishing activities would also be mitigated by the appointment of a Fisheries Liaison Officer.

ii. Operational phase

24.5.10 The following mitigation measures is proposed to be in place during the operational phase (including maintenance):

- During AIL deliveries, a temporary safety zone or minimum safe passing distances will apply, thereby restricting access to beachfront recreational and fishing activities in immediate area.
- A delivery and logistics plan will be developed for AIL deliveries.
- Sizewell C cooling water intake/outfall headwork positions will be marked on Admiralty charts.
- Details of the Sizewell C cooling water intake/outfall headwork positions will be included in fishermen's awareness charts issued by Kingfisher.
- Notice to Mariners to identify presence of infrastructure.

24.5.11 Marking of the Sizewell C intake/outfall structures on Admiralty charts and with physical markers such as buoys or beacons, as well as inclusion of information in Notice to Mariners and fishermen's awareness charts, will reduce the risk to the structures from vessel anchors, fishing gear or vessels grounding over the structure due to reduced under keel clearance.

24.5.12 A temporary exclusion zone and delivery and logistics plan during AIL deliveries will reduce the collision risk from passing vessels. The delivery and logistics plan will also reduce the risk from AIL delivery vessels grounding.

24.6 Assessment

a) Introduction

24.6.1 This section presents the findings of the marine navigation assessment for the construction and operation of the proposed development.

24.6.2 This section describes the impacts that have been considered during the construction and operational phases, as part of the Formal Safety Assessment process provided in **Appendix 24A** of this volume, and then highlights any secondary mitigation and monitoring measures that are proposed to minimise any impacts (if required).

b) Construction

i. Increased collision risk with installation vessels

24.6.3 An increased collision risk is created during the construction phase for all passing traffic, the majority of which is fishing and recreational, due to the presence of vessels associated with the construction of the infrastructure (BLF, intake/outfall headworks, and Combined Drainage Outall (CDO) and Fish Recovery and Return (FRR) headworks). In addition, vessels actively engaged in fishing activities (both commercial and recreational) also present an increased collision risk.

24.6.4 Vessels likely to be involved in the construction of the headworks include crane vessels, a jack-up barge and support vessels. Vessels will have restricted manoeuvrability and therefore may have limited capability for taking avoidance action from a passing vessel on a collision course, should such a situation arise. Marine piling for the BLF will be constructed from a jack-up barge or from the advancing BLF as construction progresses seawards. The intake/outfall tunnels will be excavated by tunnel boring machines from landward and are not expected to present a risk to marine navigation. Similarly, the FRR and CDO tunnels are likely to be directional drilled and are not expected to present a risk to marine navigation.

24.6.5 Each phase of offshore construction (i.e. BLF, intake/outfall headworks, CDO or FRR) is intended to be completed within one calendar year.

24.6.6 It is expected that the majority of vessels in the area will be aware of the construction work before encountering the project vessel(s) through embedded mitigation (circulation of information such as Notices to Mariners, Radio Navigation Warnings and Navigational Telex. In addition, a safety zone will be created around sensitive areas of construction activity (i.e. cooling water intake and outfall head structures, BLF and CDO and FRR head structures), and monitored by a guard vessel(s). This will minimise any risk to recreational craft (including recreational fishing boats) that may not have been previously aware of the works.

24.6.7 The frequency of this effect is considered to be extremely unlikely, and the overall severity moderate, resulting in a risk ranking of tolerable **(not significant).**

ii. Increased collision risk with dredgers

24.6.8 There is also an increased collision risk associated with dredging activity required for the construction of the BLF and the intake/outfall headworks, from passing vessels and vessels actively fishing. Dredging will also be required prior to installation of the CDO and FRR outfalls. This mainly impacts fishing and recreational vessels close to the coast, as well as small wind farm support vessels and tugs that were noted to transit close to the proposed locations of the intake/outfall structures.

24.6.9 The duration of dredging works required for the BLF and installation of headworks is estimated to be 12 weeks each.

24.6.10 It is expected that the majority of vessels in the area will be aware of the dredging works before encountering the project vessel(s) through embedded mitigation (circulation of information such as Notices to Mariners, Radio Navigation Warnings and Navigational Telex). In addition, a safety zone will be created within the vicinity of the BLF to allow preparation and/or maintenance of the navigational channel for AIL deliveries, and monitored by a guard vessel(s).

24.6.11 The frequency of this effect is considered to be extremely unlikely, and the overall severity moderate, resulting in a ranking of tolerable **(not significant)**.

iii. Increased collision risk with abnormal indivisible load vessels

24.6.12 An increased collision risk with vessels carrying out AIL deliveries during the construction phase is also created.

24.6.13 Accounting for weather downtime, there is expected to be a total of 200 beach landings over a 4-year campaign period during construction. This equates to an estimated 50 AIL landings during each annual campaign (31st March to 31st October). Therefore, these campaigns are expected to increase the risk for passing vessels.

24.6.14 Three ports are being considered as transhipment facilities for the AIL deliveries including Great Yarmouth, Harwich and the Netherlands (Rotterdam/Vlissingen). Therefore, there is potential for three different routes to be taken during the life of the Sizewell C Project.

24.6.15 The collision risk is likely to be greater in higher density shipping areas. This includes coastal areas where a higher level of fishing and recreational activity is carried out. In addition, the north/south route utilised by transitting traffic in the study area is also an area of higher collision risk.

24.6.16 Due to the low number of vessels involved in AIL deliveries relative to the number of vessels transitting within the area between each of the potential transhipment options, the increased risk of collision is not considered to be significant.

24.6.17 It is expected that the majority of vessels in the area will be aware of the construction work before encountering the project vessel(s) through embedded mitigation (circulation of information such as Notices to Mariners, Radio Navigation Warnings and Navigational Telex). In addition, a delivery and logistics plan will be developed for AIL deliveries.

24.6.18 The frequency of this effect is considered to be extremely unlikely, and the overall severity moderate, resulting in a ranking of tolerable **(not significant).**

iv. Increased risk of abnormal indivisible load delivery vessel grounding

24.6.19 Vessels involved in the periodic AIL deliveries may have an increased risk of grounding due to the shallow water depths of the surrounding area. This risk may be increased through avoidance of fishing and recreational activities at the beachfront during AIL deliveries.

24.6.20 Damage may occur to the vessel, as well as having an environmental impact on the beach due to the close proximity. Mitigation such as temporary safety zones around the BLF will limit risk, as well as dredging of the approach channel for the BLF and a delivery and logistics plan for delivery vessels. In addition, the Development Consent Order (DCO) application includes an application for a Competent Harbour Authority, and so deliveries would be under control of the Harbour Master, thereby requiring appropriate risk assessment.

24.6.21 The frequency of this effect is considered to be extremely unlikely, and the severity moderate resulting in a ranking of tolerable **(not significant).**

v. Disruption to fishing and recreational activities

24.6.22 Fishing and recreational activity is observed in the vicinity of the proposed development. One fishing vessel in particular was recorded operating regularly within close proximity to the proposed BLF, CDO, FRR and cooling water intake/outfall head positions, with another three recorded operating within 1nm of the proposed cooling water intake/outfall head positions. A high level of recreational activity was also observed within the site, passing over the locations of the proposed intake/outfall heads and approximately 0.3nm from the CDO and FRR structures.

24.6.23 Fishing activity was observed during both winter and summer periods, whilst the majority of recreational activity was observed in summer. Therefore, as the construction period will span several years and works may be undertaken during both summer and winter periods , the presence of vessels associated with the construction of the proposed development, may cause a disruption to local fishermen and recreational users.

24.6.24 It was also noted during the 2019 Hazard Workshop (**Volume 1**, **Appendix 6T**) that lobster and crab fishing grounds could be impacted by dredging works associated with construction. Impact to fishing grounds is assessed further in **Chapter 22** of this volume, however any impact to fishing grounds could have a subsequent impact on fishermen using pots and traps to target lobster and crab.

24.6.25 The impact is likely to be greatest in the higher density areas of fishing and recreational activity, i.e. within waters close to shore. It is expected that embedded mitigation measures such as promulgation of information (including Kingfisher and Notice to Mariners), and consultation with local fisheries through a Fisheries Liaison Officer would help reduce this disruption.

24.6.26 The frequency of this effect is considered to be reasonably probable, and the severity minor, resulting in a ranking of tolerable **(not significant).**

vi. Disruption to maintenance works on Galloper and Greater Gabbard offshore wind farm cables

24.6.27 Due to the distance between the proposed cooling water intake/outfall headworks and the export cables for the Galloper offshore wind farm (approximately 0.2nm south at its closest point) and Greater Gabbard offshore wind farm (approximately 0.4nm at its closest point), there may be some disruption to maintenance works on the cables, if they are required while construction works on the cooling water infrastructure is in progress.

24.6.28 This impact would be mitigated by good communication between the Sizewell C Project and the Operators of the Galloper and Greater Gabbard offshore wind farms and circulation of information about construction works. This would be controlled as part of the Deemed Marine Licence.

24.6.29 Assuming this is the case, the frequency of this effect is considered to be extremely unlikely and the severity minor, resulting in a ranking of broadly acceptable **(not significant).**

vii. Inter-relationship effects

24.6.30 This section provides a description of the potential inter-relationship effects on marine navigation receptors between the individual environmental effects arising from construction of the proposed development.

24.6.31 **Chapter 15** and **Appendix 15G** of this volume consider effects on offshore amenity and recreation receptors, including recreational craft, due to disturbance of nearshore recreational activities. Craft travelling close to the coast within the site may have to divert their course to avoid temporary safety areas. Craft travelling within the study area may also, occasionally, need to slow down or divert their course to avoid construction vessels. However, there would be a wide expanse of sea available for alternative routes. These effects are therefore assessed as minor adverse **(not significant)** within **Chapter 15**.

24.6.32 **Chapter 22** of this volume identifies effects on fisheries receptors due to restrictions for access to fishing grounds. These effects are considered to be minor adverse in **Chapter 22** and **not significant** due to the limited fishing activity within the impacted area and alternative fishing grounds available. These effects are not considered likely to combine with navigational risks, as fishing vessels are likely to avoid the impacted area during the construction activities.

24.6.33 No other potential inter-relationship effects have been identified.

c) Operation

i. Increased collision risk with dredgers

24.6.34 There is an increased collision risk associated with any maintenance dredging required for the BLF during the operational phase, from passing vessels and vessels actively fishing.

24.6.35 It is expected that the majority of vessels in the area will be aware of the dredging works before encountering the project vessel(s) through embedded mitigation (circulation of information such as Notices to Mariners, Radio Navigation Warnings and Navigational Telex). In addition,

a safety zone will be created within the vicinity of the BLF to allow preparation and/or maintenance of the navigational channel for AIL deliveries, and monitored by a guard vessel(s).

24.6.36 The frequency of this effect is considered to be extremely unlikely, and the overall severity moderate, resulting in a ranking of tolerable **(not significant).**

ii. Increased collision risk with abnormal indivisible load delivery vessels

24.6.37 During operation, there will be periodic AIL deliveries scheduled over the lifetime of the Sizewell C nuclear power station. It is estimated that AILs would occur once every five years and comprise very few individual deliveries.

24.6.38 Mitigation measures include circulation of information such as Notices to Mariners, Radio Navigation Warnings and NAVTEX. In addition, a delivery and logistics plan will be developed for AIL deliveries.

24.6.39 The frequency of this effect is considered to be extremely unlikely, and the severity moderate, resulting in a ranking of tolerable **(not significant).**

iii. Increased risk of abnormal indivisible load delivery vessel grounding

24.6.40 Vessels involved in the periodic AIL deliveries may have an increased risk of grounding due to the shallow water depths of the surrounding area. This risk may be increased through avoidance of fishing and recreational activities at the beachfront during AIL deliveries.

24.6.41 Damage may occur to the vessel, as well as having an environmental impact on the beach due to the close proximity. Mitigation such as temporary safety zones around BLF will limit risk, as well as dredging of the approach channel for the BLF and a delivery and logistics plan for AIL delivery vessels. In addition, the DCO application includes an application for a Competent Harbour Authority, and so AIL deliveries would be under control of the Harbour Master, thereby requiring appropriate risk assessment.

24.6.42 The frequency of this effect is considered to be extremely unlikely, and the severity moderate resulting in a ranking of tolerable **(not significant).**

iv. Disruption to fishing and recreational activities

24.6.43 There may also be disruption to fishing and recreational activities during the operational phase, associated with use of the BLF and any requirements for dredging activities.

24.6.44 Disruption is likely to be less during the operational phase due to fewer anticipated AIL deliveries and no construction work associated with the cooling water infrastructure, CDO or FRR systems. It is expected that embedded mitigation measures such as promulgation of information (including Kingfisher and Notice to Mariners), and consultation with local fisheries through a Fisheries Liaison Officer would help reduce this disruption.

24.6.45 The frequency of this effect is considered to be remote, and the severity minor, resulting in a ranking of broadly acceptable **(not significant)**.

v. Passing vessel grounding

24.6.46 Passing vessels may also have an increased risk of grounding on the proposed cooling water intake/outfall subsea infrastructure, due to the shallow water depths of the surrounding area and reduced under keel clearance. Passing vessels are mainly comprised of fishing and recreational vessels, although some dredgers and wind farm support vessels were also noted to pass close to the structure locations.

24.6.47 The minimum clearance of the outfall structures is expected to be 7.09m relative to Lowest Astronomical Tide . The intake structures are anticipated to have a minimum clearance of at least 6.89m. This impact is therefore most likely to affect vessels with larger draughts.

24.6.48 Damage may occur to the vessel and intake/outfall structures, as well as having an environmental impact on the beach due to the close proximity. Mitigation includes marking of the structures on navigational charts and in fishermen's awareness charts, marking the structures with buoys or beacons, and Notices to Mariners to identify the presence of the infrastructure.

24.6.49 The frequency of this effect is considered to be extremely unlikely, and the severity moderate resulting in a ranking of tolerable **(not significant)**.

vi. Fishing gear snagging

24.6.50 Fishing vessels carrying demersal gear that interacts with the seabed when deployed pose a snagging risk to subsea infrastructure such as the proposed cooling water intake/outfall heads. If a snagging incident occurs, damage may occur to the infrastructure and/or the gear. Should snagging occur, it is safest for the gear to be abandoned; however, some vessels have been known to attempt to free their gear. This can result in a loss of stability and potential risk to crew members.

24.6.51 The baseline fishing analysis identified at least two demersal trawlers operating within proximity to the proposed subsea infrastructure in the

2015/2016 data provided in **Appendix 24A** of this volume, however, it is again noted vessels under 15m in length are likely under-represented in the area.

24.6.52 The proposed cooling water headwork structures cover a relatively small area of seabed (maximum length of 50m) and thus can easily be avoided by vessels actively fishing if locations are known. Embedded mitigation measures such as circulation of information (e.g. Notice to Mariners) as well as details provided in fishermen's awareness charts issued by Kingfisher, and the locations being marked on nautical charts, will notify fishermen of positions and therefore avoid fishing in close proximity. Embedded mitigation measures also include marking of the structures with buoys to provide a physical mark for small fishing vessels.

24.6.53 The frequency of this impact is considered to be remote, and the severity serious, resulting in a ranking of tolerable **(not significant)**.

vii. Risk from vessel anchors

24.6.54 During the operation of the proposed subsea cooling water intake/outfall heads, there is a risk that an anchored vessel will lose its holding ground, and subsequently drag anchor towards the infrastructure. It is also possible that a vessel suffers engine failure, and thus may drop anchor to avoid drifting into an emergency situation such as collision or grounding. This may occur in the vicinity of the proposed cooling water intake/outfall positions and thus the anchor may come into contact with the subsea infrastructure.

24.6.55 Anchoring activity was observed to be generally low in the baseline analysis, and therefore an anchor dragging event is considered to be low frequency. It is noted anchoring from smaller craft may be under-represented in the baseline analysis; however these vessels carry smaller anchors which typically present less risk to subsea structures than larger vessel anchors.

24.6.56 A vessel suffering engine failure is only likely to drop anchor if there is immediate danger nearby. This is likely to occur in shallower, coastal waters and thus within proximity to the subsea infrastructure. Review of maritime incidents between 2005 and 2014 (Ref. 24.12, Ref. 24.13) revealed machinery failure was the most frequently recorded incident type within the area, particularly within coastal waters.

24.6.57 Review of baseline shipping in the area shows the majority of vessels transitting within proximity of the headwork positions are small craft such as fishing and recreational vessels. The main commercial route is located approximately 4nm east of the headwork positions however some cargo

vessels and tankers were also recorded on a quieter route within 1nm, with the closest vessel passing approximately 0.2nm from the headworks.

24.6.58 Mitigation such as circulation of information, up to date nautical charts detailing the location of the subsea structures, and the physical presence of marker buoys or beacons would prevent vessels anchoring directly over the headworks.

24.6.59 The frequency of either of these impacts is considered to be extremely unlikely, and the severity estimated to be serious, resulting in a ranking of tolerable **(not significant).**

viii. Passing vessel foundering

24.6.60 Foundering refers to a vessel losing structural integrity, and subsequently sinking over the proposed cooling water intake/outfall head positions. Areas where fishing and recreational levels are higher generally correspond to areas of higher foundering risk. Higher density of traffic is seen over the proposed cooling water intake/outfall infrastructure in the summer period in particular.

24.6.61 Historically, fishing vessels have been seen to have the greatest risk of foundering, particularly in bad weather. From the baseline analysis, fishing accounted for 10% of traffic in both summer and winter periods. Recreational craft also have a higher risk of foundering compared to larger vessels, and accounted for 34% of traffic in summer. These vessels are the most frequently recorded transitting within proximity of the headwork structures.

24.6.62 Review of maritime incident data (Ref. 24.12, Ref. 24.13) over ten years between 2005 and 2014 revealed foundering was a low frequency event within the study area.

24.6.63 The frequency of this effect is considered to be extremely unlikely, and the severity moderate, resulting in a ranking of tolerable **(not significant).**

ix. Inter-relationship effects

24.6.64 This section provides a description of the identified inter-relationship effects that are anticipated to occur on marine navigation receptors between the individual environmental effects arising from operation of the proposed development.

24.6.65 **Chapter 15** and **Appendix 15G** of this volume consider effects on offshore amenity and recreation receptors, including recreational craft, due to disturbance of nearshore recreational activities during the very occasional AIL deliveries to the proposed development. Craft travelling close to the

coast within the site may have to divert their course slightly to avoid vessels using the BLF. However, there would be a wide expanse of sea available for alternative routes. These effects are therefore assessed as negligible neutral **(not significant)** in **Chapter 15**.

24.6.66 **Chapter 22** of this volume identifies effects on fisheries receptors due to restrictions for access to fishing grounds during AIL deliveries and changes to the availability of target species. These effects are considered to be minor adverse and **not significant** in **Chapter 22** due to the limited fishing activity within the impacted area and alternative fishing grounds available. These effects are not considered likely to combine with navigational risks, as fishing vessels are likely to avoid the impacted area during the very occasional AIL deliveries to the site.

24.6.67 No other potential inter-relationship effects have been identified.

24.7 Mitigation and monitoring

a) Introduction

24.7.1 Primary and tertiary mitigation measures which have already been incorporated within the design or management of the proposed development are detailed in **section 24.5** of this **chapter**.

24.7.2 Where other mitigation is required to reduce or avoid a significant effect, this is referred to as secondary mitigation. Whilst all effects associated with marine navigation have been assessed as not significant, further mitigation is proposed to reduce marine navigation risks to ALARP. This section describes the proposed secondary mitigation measures for marine navigation.

b) Mitigation

24.7.3 The following additional mitigation measures are proposed to bring impacts assessed as tolerable to ALARP:

- Buoyed construction zone around the construction works for the intake/outfall structures.
- Patrol launch to assist vessels in difficulty.

24.8 Residual effects

24.8.1 The additional mitigation measures presented above would reduce the risk of collision with installation vessels, and reduce the severity of consequence associated with vessel grounding and fishing gear snagging,

ensuring that these impacts are ALARP, however the overall rankings remain tolerable **(not significant)**.

24.8.2 The following tables (**Table** 24.5 and **Table** 24.6) present a summary of the marine navigation assessment. They identify the receptor/s likely to be impacted, the level of effect and, where the effect is deemed to be significant, the tables include the mitigation proposed and the resulting residual effect.

Table 24.5: Summary of effects for the construction phase.

Receptor	Impact	Primary or tertiary mitigation	Assessment of effects	Additional mitigation	Residual effects
Passing vessels.	Increased collision risk with installation vessels.	Circulation of information.	Tolerable (**not significant**).	Buoyed construction zone.	Tolerable (**not significant**).
Passing vessels.	Increased collision risk with dredgers.	Circulation of information.	Tolerable (**not significant**).	Buoyed construction zone.	Tolerable (**not significant**).
Passing vessels.	Increased collision risk with AIL vessels.	Circulation of information; Temporary safety zones (if applicable); Delivery and logistics plan.	Tolerable (**not significant**).	None required.	Tolerable (**not significant**).
AIL delivery vessels.	Increased risk of vessel grounding.	Delivery and logistics plan; Temporary safety zones (if applicable).	Tolerable (**not significant**).	Patrol launch.	Tolerable (**not significant**).
Fishing & recreational vessels.	Disruption to activities.	Circulation of information; Fisheries Liaison Officer.	Tolerable (**not significant**).	None required.	Tolerable (**not significant**).
Galloper cables.	Disruption to maintenance work.	Circulation of information.	Broadly Acceptable (**not significant**).	None required.	Broadly Acceptable (**not significant**).

Table 24.6: Summary of effects for the operational phase.

Receptor	Impact	Primary or tertiary mitigation	Assessment of effects	Additional mitigation	Residual effects
Passing	Increased	Circulation of	Tolerable	None	Tolerable

Receptor	Impact	Primary or tertiary mitigation	Assessment of effects	Additional mitigation	Residual effects
vessels.	collision risk with dredgers.	information.	(**not significant**).	required.	(**not significant**).
Passing vessels.	Increased collision risk with AIL vessels.	Circulation of information; Temporary safety zones (if applicable); Delivery and logistics plan.	Tolerable (**not significant**).	None required.	Tolerable (**not significant**).
AIL delivery vessels.	Increased risk of vessel grounding.	Delivery and logistics plan; Temporary safety zones (if applicable).	Tolerable (**not significant**).	Patrol launch.	Tolerable (**not significant**).
Fishing & recreational vessels.	Disruption to activities.	Circulation of information; Fisheries Liaison Officer.	Broadly Acceptable (**not significant**).	None required.	Broadly Acceptable (**not significant**).
Passing vessels.	Vessel grounding on intake/outfall structures.	Marking of structures on charts; marking of structures with buoys / beacons.	Tolerable (**not significant**).	Patrol launch.	Tolerable (**not significant**).
Fishing vessels.	Fishing gear snagging on intake/outfall structures.	Circulation of information; marking of structures on charts; marking of structure with buoys / beacons; Fisheries Liaison Officer.	Tolerable (**not significant**).	Patrol launch.	Tolerable (**not significant**).
Passing vessels.	Risk from anchors snagging on intake/outfall structures.	Marking of structures on charts; marking of structures with buoys / beacons.	Tolerable (**not significant**).	None required.	Tolerable (**not significant**).
Passing vessels.	Risk of foundering onto intake/outfall structures.	Marking of structures on charts; marking of structures with buoys / beacons.	Tolerable (**not significant**).	None required.	Tolerable (**not significant**).

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