6.4.4.73 Based on the information within the literature, disturbance from dredging would be limited to a maximum of 5 km impact radius and any animals that are potentially displaced would be expected to return once the dredging works had ceased (McQueen *et al.*, 2020) with the same deterrence range assumed for trenching due to the lack of data available.

6.4.4.74 The closest distance between dredging and trenching activities during the operational and maintenance phase and the boundary of the Slaney River Valley SAC is approximately 47.55 km. This distance substantially exceeds the maximum predicted ranges for auditory injury (PTS), TTS, and behavioural disturbance associated with dredging and trenching activities.

6.4.4.75 In relation to the site-specific COs for Slaney River Valley SAC (Table 5.1), dredging and trenching during the operational and maintenance phase will not result in permanent or long-term restriction of access to suitable habitat within the SAC, nor introduce underwater noise at levels capable of causing injury or sustained disturbance to the harbour seal population. Breeding, moulting and resting haul-out sites within the SAC will not be affected due to the distance of the activities from the site.

6.4.4.76 **With consideration of the limited, infrequent and localised nature of dredging and trenching during the operational and maintenance phase, the very limited spatial extent of predicted auditory injury and disturbance ranges, and the absence of any overlap with the Slaney River Valley SAC, it is therefore concluded there will be no AEoI of the harbour seal QI of the Slaney River Valley SAC, as defined by its COs, as a result of underwater noise arising from dredging and trenching activities associated with the operational and maintenance phase for Project Design Options 1 and 2.**

INJURY AND/ OR DISTURBANCE FROM VESSEL MOVEMENTS

INJURY FROM VESSEL ACTIVITIES

6.4.4.77 Harbour seals are relatively small, agile and highly mobile animals and, given observed behavioural responses to anthropogenic noise, are expected to detect vessels in close proximity and actively avoid collision.

6.4.4.78 Vessel collision risk for seals is less well understood than for cetaceans; however, injury attributed to vessel activities has been identified in a small proportion of both live-stranded (Goldstein *et al.*, 1999) and dead-stranded seals in the USA (Swails, 2005). In these studies, fewer than 2% of all necropsied seals had vessel collision identified as the cause of death. A study in the Moray Firth, Scotland showed that seals frequently use the same areas as vessels during trips between haul-out and foraging sites, but typically remained at distances greater than 20 m from vessels, with only three recorded instances of passes within 20 m over 2,241 seal tracking days (Onoufriou *et al.*, 2016), suggesting that the likelihood of collision is very low.

CONSTRUCTION AND DECOMMISSIONING PHASE ASSESSMENT

6.4.4.79 During the construction phase, up to 69 installation vessels may be present within the Proposed Development at any one time, resulting in a maximum of 4,150 vessel return trips over the four-year construction period, and a maximum of 1,797 vessel return trips per year. A similar number of vessels are anticipated for the decommissioning phase.

6.4.4.80 The majority of vessels used during the construction and decommissioning phases are likely to be large installation vessels that will operate at relatively low speeds or remain stationary for extended periods of time. The key collision risk threshold for large vessels is generally associated with speeds exceeding 7 m/s; however, such speeds are not anticipated to be routinely exceeded during construction or decommissioning activities. Consequently, increases in vessel traffic within the Proposed Development and along transit routes will be intermittent and largely confined to discrete periods of offshore activity.

6.4.4.81 Smaller vessels associated with construction and decommissioning activities (i.e. tug/anchor handlers, guard vessels, survey vessels, and crew transfer vessels) are more manoeuvrable than larger installation vessels and are therefore better able to avoid marine mammals when detected, even when an animal is close and the vessel is going at higher operating speed (Schoeman *et al.*, 2020). In contrast, larger vessels, such as jack-up vessels, have reduced manoeuvrability and may require larger distances to avoid an animal, but travel at slower speeds, reducing collision risk.

6.4.4.82 In addition, the mitigation measures (see Table 6.7) which includes an Environmental VMP (NIS Volume III, Appendix 25.10: Environmental Vessel Management Plan), will ensure that vessel traffic will move along predictable routes, which is known to be a key aspect in minimising the potential risk of injury imposed by vessel traffic (Nowacek *et al.*, 2001; Lusseau, 2003; 2006).

6.4.4.83 Noise generated by construction and decommissioning vessels is expected to be detectable by marine mammals and is therefore likely to facilitate avoidance behaviour in harbour seals. Although construction will result in a temporary increase in vessel activity, vessel movements will be largely restricted to the Array Area, Cable Corridor and Working Area, and will generally follow existing shipping routes to and from port. Given the high levels of baseline vessel traffic in the Irish Sea, the introduction of construction and decommissioning vessels is not considered to represent a novel or atypical pressure for harbour seals in the region. Accordingly, vessel activity associated with the Proposed Development is not expected to materially increase the risk of injury from vessel activities.

6.4.4.84 Furthermore, the SAC boundary is located approximately 47.55 km from the Proposed Development. Given this substantial separation distance, the likelihood of overlap between project-specific vessel activity and the SAC is very low. Whilst harbour seals may be present outside the boundary of the SAC and within areas used by vessel traffic; however, the proportion of the population likely to be present within the Project area at any one time is expected to be very small given the distance from key SAC habitats. Therefore, vessel movements associated with the Proposed Development will not result in permanent or long-term restriction of access to suitable habitat within the SAC, as vessel activity is temporary, transitory, and does not constitute a fixed or continuous pressure capable of causing sustained displacement.

6.4.4.85 Overall, there is a high likelihood that harbour seals will avoid vessels, and the probability of injury risk from vessel activities is considered negligible. While the consequence of a vessel injury event could be severe at an individual level, the likelihood of such an event occurring is very low.

6.4.4.86 With consideration of the mobility of harbour seals, the nature of construction and decommissioning vessel traffic, distance from the SAC (47.55 km) and the implementation of Environmental VMP, vessel movements are not expected to not result in permanent exclusion from suitable habitat, injury or population-level effects**. It is therefore concluded there will be no AEoI of the harbour seal QI of the Slaney River Valley SAC, as defined by its COs, as a result of injury from vessel activities associated with the construction and decommissioning phases for Project Design Options 1 and 2.**

OPERARTION AND MAINTENANCE PHASE ASSESSMENT

6.4.4.87 During the operational and maintenance phase, a maximum of 30 vessels will be present within the Proposed Development at any one time, resulting in a maximum of 1,359 vessel return trips per year. Vessels that will be used during the operational and maintenance phase (up to 36.5 years) include crew transfer vessels, jack-up vessels, cable repair vessels.

6.4.4.88 As with construction activities, vessels operating during the operational and maintenance phase are expected to travel at relatively low speeds within the Proposed Development, with

larger vessels either stationary or operating at slow speeds during maintenance activities. Smaller, more manoeuvrable vessels (e.g. crew transfer vessels) are able to alter course to avoid marine mammals when detected. Harbour seals are therefore expected to detect and avoid vessels, resulting in a low likelihood of collision.

6.4.4.89 The continued implementation of mitigation measures, including the Environmental VMP (Table 6.7; NIS Volume III, Appendix 25.10: Environmental Vessel Management Plan), will ensure predictable vessel routing and adherence to appropriate vessel management procedures, further reducing collision risk. Given the lower vessel numbers relative to construction, the absence of novel vessel activity, and the high baseline levels of vessel traffic in the Irish Sea, vessel movements during operation and maintenance are not expected to materially increase collision risk for harbour seals.

6.4.4.90 In relation to the site-specific COs for Slaney River Valley SAC (Table 5.1), vessel movements during the operational and maintenance phase will not result in permanent or long-term restriction of access to suitable habitat within the SAC, as vessel activity will be intermittent, transitory, and of lower intensity than during construction.

6.4.4.91 Given the relatively low vessel numbers, the intermittent and localised nature of any operational and maintenance activities, expected slow vessel speeds and continued application of Environmental VMP, vessel movements during operational and maintenance phase will not result in permanent habitat exclusion, injury or population-level effects. **It is therefore concluded there will be no AEoI of the harbour seal QI of the Slaney River Valley SAC, as defined by its COs, as a result of injury from vessel activities associated with the operational and maintenance phase for Project Design Options 1 and 2.**

VESSEL DISTURBANCE

6.4.4.92 With regards to vessel disturbance, harbour seals are known to exhibit sensitivity to disturbance in areas where vessel traffic overlaps with productive coastal waters (Robards *et al.*, 2016). Vessel disturbance may be particularly relevant if it alters haul-out behaviour or reduces time spent resting, moulting, or nursing pups during the breeding season. When disturbed, hauled-out seals typically 'flush' (enter) into the water, which may be energetically costly, particularly during the pupping season (Johnson and Acevedo-Gutiérrez, 2007).

6.4.4.93 Noise generated by vessels associated with the Proposed Development will primarily comprise non-impulsive, continuous underwater noise from propellers, thrusters, and various rotating machinery (e.g., power generation, pumps). The main drivers influencing the potential impact with respect to noise disturbance from vessels are vessel type, speed and prevailing ambient noise levels (Wilson *et al.*, 2007). Disturbance is therefore most likely to occur where vessel noise exceeds background ambient noise levels.

CONSTRUCTION AND DECOMMISSIONING PHASE ASSESSMENT

6.4.4.94 During the construction phase, up to 69 installation vessels may be present within the Proposed Development at any one time, resulting in a maximum of 4,150 vessel return trips over the four-year construction period, and a maximum of 1,797 vessel return trips per year. A similar number of vessels are anticipated for the decommissioning phase.

6.4.4.95 With consideration of disturbance and displacement, the coastal areas and immediate surrounding waters of the Proposed Development are already subject to high levels of vessel traffic (see EIAR Volume II, Chapter 15: Shipping and Navigation (Revised March 2026)). With consideration of this, the introduction of construction and decommissioning vessels is not considered to represent a novel or significant change in the level of disturbance that harbour seals are currently subject to.

6.4.4.96 Avoidance behaviour or alert reactions have been observed in harbour seal when vessels approach within approximately 100 m of haul-out sites (Richardson *et al.*, 1995). A study in

which 37 harbour seals were telemetry tagged on the east coast of Scotland, did not show any apparent behavioural response of seals at sea to close passing vessels, with seals neither consistently approaching nor avoiding vessels (Onoufriou *et al.*, 2016). Given the distance between the Proposed Development and the haul-outs within the SAC (>47.55 km), it is considered highly unlikely that vessel traffic associated with the Proposed Development would pass the haul-outs close enough to lead to a disturbance or flushing response.

6.4.4.97 A further telemetry study involving 28 harbour seals in UK waters identified frequent spatial overlap between seals and vessel traffic, with some individuals potentially experiencing TTS based on cumulative sound SEL exceeding the continuous TTS-onset threshold for pinnipeds (183 dB re 1 μPa^2s; Jones *et al.*, 2017). However, the study found no evidence of reduced seal presence or long-term displacement in response to vessel activity, despite repeated exposure and spatial overlap, most frequently within 50 km of the coast and in proximity to haul-out sites (Jones *et al.*, 2017).

6.4.4.98 Mitigation measures, including implementation of the Environmental VMP (NIS Volume III, Appendix 25.10: Environmental Vessel Management Plan), will ensure that vessels operate along predictable routes and at controlled speeds (Table 6.7). Predictable vessel movements and reduced speeds are recognised as key factors in minimising disturbance to marine mammals. Vessel simulation modelling indicates that reducing vessels speeds by 20-50% can reduce source noise by approximately 5 - 18 dB and reduce the number of animals exposed, thereby decreasing the likelihood and severity of disturbance (Findlay *et al.*, 2023).

6.4.4.99 With consideration of the temporary and reversible nature of vessel-related behavioural responses, the existing high baseline of vessel activity, the absence of evidence for population-level effects, and the implementation of Environmental VMP to reduce risk, vessels movements during the construction and decommissioning phase are not expected to result in long-term displacement, sustained disturbance, or interference with key life-history behaviours of harbour seals associated with the SAC**. It is therefore concluded that there will be no AEoI of the harbour seal QI of the Slaney River Valley SAC, as defined by its COs, as a result of disturbance from vessel activities associated with the construction and decommissioning phase for Project Design Options 1 and 2.**

OPERATIONAL AND MAINTENANCE PHASE ASSESSMENT

6.4.4.100 During the operational and maintenance phase, a maximum of 30 vessels will be present within the Proposed Development at any one time, resulting in a maximum of 1,359 vessel return trips per year.

6.4.4.101 Vessel activity during the operational and maintenance phase represents a reduction in both vessel numbers and intensity compared to the construction and decommissioning phases. As during construction, vessel movements will be subject to the Environmental VMP (NIS Volume III, Appendix 25.10: Environmental Vessel Management Plan; Table 6.7), ensuring predictable routing, controlled speeds and adherence to mitigation measures designed to minimise disturbance to marine mammals.

6.4.4.102 In relation to the site-specific COs for Slaney River Valley SAC (Table 5.1), any behavioural responses remain temporary and localised, with animals expected to return following any displacement, long-term displacement or interference with key life-history behaviours of harbour seals associated with the site not being expected**. It is therefore concluded that there will be no AEoI of the harbour seal QI of the Slaney River Valley SAC, as defined by its COs, as a result of disturbance from vessel activities associated with the operational and maintenance phase for Project Design Options 1 and 2.**

CHANGES IN FISH AND SHELLFISH COMMUNITY AFFECTING PREY RESOURCES

6.4.4.103 Potential impacts to prey resources arising from the Proposed Development are expected to be largely restricted to the boundaries of the Proposed Development due to the localised footprint of seabed disturbance, the temporary nature of construction activities, and the limited spatial extent of predicted underwater noise and sediment dispersion effects. As such, any indirect effects on harbour seals via changes in prey availability would be limited to individuals foraging within, or close proximity to the Proposed Development.

6.4.4.104 Harbour seals feed on a wide range of fish and invertebrate species, including sandeel (*Ammodytes* spp.), sole (*Solea* spp.), poor cod, dragonet (*Callionymidae*), whiting, rockling (*Gaidropsarus mediterraneus*), Atlantic horse mackerel (*Trachurus trachurus*), crustaceans (*Crustacea*), pelagic squid (*Loligo* spp.), and octopus (*Octopus* spp.) for food (Kavangah *et al.*, 2010). This broad dietary composition demonstrates a generalist food strategy and an ability to adapt to localised or temporary changes in availability of prey types. On this basis, harbour seals are considered to have a low sensitivity to changes in prey resources.

CONSTRUCTION AND DECOMMISSIONING PHASE ASSESSMENT

6.4.4.105 Harbour seal have a generalist diet, similar to other Annex II marine mammal species including harbour porpoise. The assessment of the impact from changes in prey to the harbour porpoise QI of Blackwater Bank SAC has been considered at a high-level across changes to the prey community, rather than reflecting species-specific prey preferences. It is also highlighted that the diet of harbour porpoise (predominantly whiting, Atlantic herring, and poor cod) has overlap with that of harbour seal. Accordingly, the assessment of changes in the fish and shellfish community affecting prey resources for the Blackwater Bank SAC are considered applicable to SACs for harbour seal, including Slaney River Valley SAC.

6.4.4.106 This approach has been undertaken as there is significant overlap between potential impacts on the community of prey species associated with construction and decommissioning activities that have been comprehensively assessed for harbour porpoise within Blackwater Bank SAC (Section 6.4.1). Blackwater Bank SAC is located approximately 19.13 km from the Proposed Development, substantially closer than the Slaney River Valley SAC (approximately 47.55 km), and that assessment is therefore considered precautionary when applied to the harbour seal QI associated with Slaney River Valley SAC.

6.4.4.107 As detailed in Section 6.4.1 and EIAR Volume II, Chapter 10: Fish, Shellfish and Sea Turtle Ecology (Revised March 2026), potential effects on prey species include temporary habitat disturbance, increased SSC and associated deposition, injury and/or disturbance as a result of underwater noise and vibration, and accidental pollution. These effects are predicted to be highly localised, temporary and recoverable, affecting only a very small proportion of available prey habitat.

6.4.4.108 Harbour seals are considered to be opportunistic predators with a broad and flexible diet and are therefore considered to have a low sensitivity to localised or short-term changes in prey availability. The scale and duration of predicted prey impacts are not expected to result in any meaningful reduction in prey availability or accessibility at a scale relevant to the harbour seal population associated with Slaney River Valley SAC.

6.4.4.109 **With consideration of the highly localised and temporary nature of the impacts described above, the implementation of mitigation measures and resulting limited spatial extent of potential effects on prey species, and the generalist foraging strategy of harbour seals, it is therefore concluded there will be no AEoI of the harbour seal QI of the Slaney River Valley SAC, as defined by its COs of the site, as a result of changes in prey resources associated with the construction and decommissioning phases for Project Design Option 1.**

6.4.4.110 **Based on the representative risk of effect of Project Design Option 1, it is concluded that no AEoI would also apply to Project Design Option 2.**

OPERATIONAL AND MAINTENANCE PHASE ASSESSMENT

6.4.4.111 During the operational and maintenance phase, potential effects on prey species would be limited to intermittent and localised activities such as maintenance dredging or trenching associated with cable or foundation repair. These activities would be infrequent, short-term and spatially restricted when compared to construction and decommissioning works.

6.4.4.112 Any potential effects on prey species during operation and maintenance would be of the same nature as those assessed for the construction phase (including temporary habitat disturbance, localised increases in SSC and accidental pollution), but would occur at a reduced intensity, extent and frequency.

6.4.4.113 As detailed within the construction phase assessment for Blackwater Bank SAC (Section 6.4.1), predicted impacts on prey species are highly localised, temporary and recoverable, and affect only a very small proportion of available foraging habitat. Given the generalist foraging strategy of harbour seals, any short-term or localised changes in prey availability during operation and maintenance would not meaningfully affect foraging success or energetic balance.

6.4.4.114 **With consideration that of the limited spatial extent of any prey-related effects during operation and maintenance and the distance of the Proposed Development to the SAC (47.55 km), no interaction with prey resources supporting the harbour seal population associated with the SAC is predicted. It is therefore concluded there will be no AEoI of the harbour seal QI of the Slaney River Valley SAC, as defined by its COs, as a result of changes in prey resources associated with the operational and maintenance phase for Project Design Option 1.**

6.4.4.115 **Based on the representative risk of effect of Project Design Option 1, it is concluded that no AEoI would also apply to Project Design Option 2.**

ACCIDENTAL POLLUTION

6.4.4.116 There is potential for accidental release of pollutants from vessels and equipment associated with the construction, operational and maintenance, and decommissioning phases of the Proposed Development. Pollutants may include diesel fuel, bentonite (from drilling activities), lubricants, grease and oils, anti-fouling biocides, and grout.

6.4.4.117 In the event of an accidental spill, harbour seals could be exposed to contaminants through either direct or indirect pathways. Harbour seals are reliant on terrestrial haul-out sites for resting, moulting, and breeding which makes them particularly vulnerable to the effects of pollution. Seals have been shown to develop conjunctivitis, corneal abrasion, and swollen eyelid membranes in response to exposure to crude oil (Geraci and St. Aubin, 1980). While external oiling is not expected to significantly impact the ability of adult seals to maintain their core body temperature as they rely on blubber for insulation, seal pups entering the water could be vulnerable as oil residues can reduce the thermal properties of neonate animals, increasing their susceptibility to hypothermia (Helm *et al.*, 2015).

CONSTRUCTION AND DECOMMISSIONING PHASE ASSESSMENT

6.4.4.118 The installation and removal of offshore infrastructure for the Proposed Development may lead to the accidental release of pollutants through spills and leaks from vessels and equipment (Table 6.8). Potential impacts during the decommissioning phase are expected to be similar to, or less than, those during the construction phase.

6.4.4.119 The magnitude of any accidental pollution event would depend on the type and quantity of material released, with the release of fuel from a construction vessel considered to represent the largest credible spill scenario from installation activities. In the event of an accidental spill from vessels, equipment or from construction activities, pollutants would be subject to immediate dilution and rapid dispersion within the marine environment (Marappan *et al.,* 2022).

6.4.4.120 The likelihood of accidental pollution is considered extremely low due to avoidance through design and management measures (Table 6.7). These include the secure storage and handling of chemicals and hazardous material, double-skinned tanks and pipework where appropriate, chemical risk assessments, and the implementation of an EMP (NIS Volume III, Appendix 25.1: Environmental Management Plan) and MPCP. The MPCP sets out emergency response procedures to minimise the scale and duration of any spill should one occur.

6.4.4.121 **Given the inherent low likelihood of an accidental pollution event from vessel activity and equipment used during construction and decommissioning, the highly localised nature of any potential exposure, and the mitigation measures (as set out in Table 6.7), it is therefore concluded there will be no AEoI of the harbour seal QI of the Slaney River Valley SAC, as defined by its COs, as a result of accidental pollution associated with the construction and decommissioning phase for Project Design Option 1.**

6.4.4.122 **Based on the representative risk of effect of Project Design Option 1, it is concluded that no AEoI would also apply to Project Design Option 2.**

OPERATIONAL AND MAINTENANCE PHASE ASSESSMENT

6.4.4.123 During the operational and maintenance phase, there remains a potential for accidental release of pollutants as a result of the presence of offshore infrastructure, associated equipment, and vessel movements (Table 6.8).

6.4.4.124 The pathways, likelihood and consequences of accidental pollution during this phase are consistent with those assessed for the construction phase. The same avoidance through design and management measures, including the EMP and MPCP (Table 6.7), will be implemented throughout operation and maintenance.

6.4.4.125 **On this basis, it is concluded that there will be no AEoI of the harbour seal QI of the Slaney River Valley SAC, as defined by its COs, as a result of accidental pollution associated with the operational and maintenance phase for Project Design Option 1.**

6.4.4.126 **Based on the representative risk of effect of Project Design Option 1, it is concluded that no AEoI would also apply to Project Design Option 2.**

6.4.5 Carnsore Point SAC

Harbour porpoise

6.4.5.1 The relevant Annex II marine mammal QI site-specific COs at Carnsore Point SAC is to maintain the favourable conservation condition of the harbour porpoise QI, as defined by the list of attributes and targets set out in Table 5.1 (NPWS, 2024c).

6.4.5.2 Eight potential impacts pathways relevant to harbour porpoise have been identified in relation to the construction, operation and maintenance, and decommissioning of the Proposed Development (Table 6.8). These pathways have been assessed in detail for Blackwater Bank SAC which is also designated for the same Annex II marine mammal QI and is located approximately 19.13 km from the Proposed Development, compared to approximately 50.08 km for Carnsore Point SAC.

6.4.5.3 As the severity and likelihood of all relevant impact pathways are intrinsically distance-dependent, Blackwater Bank SAC represents the closest designated site for harbour porpoise

from the Proposed Development. The assessment presented in Section 6.4.1 therefore provides a conservative basis for evaluation and concluded that none of the identified impact pathways would result in an AEoI of Blackwater Bank SAC, with respect to the harbour porpoise QI.

6.4.5.4 Given that the Carnsore Point SAC supports the same Annex II marine mammal QI and lies substantially further from the Proposed Development, the magnitude of effects at Carnsore Point SAC is concluded to be no greater than, and in practice less than, those associated for Blackwater Bank SAC. **It is therefore concluded that there will be no AEoI of the harbour porpoise QI of the Carnsore Point SAC, as defined by its COs, as a result of any of the impacts considered for Project Design Option 1 across any phase.**

6.4.5.5 **Based on the representative risk of effect of Project Design Option 1, it is concluded that no AEoI would also apply to Project Design Option 2.**

6.4.6 Lambay Island SAC

Grey seal

6.4.6.1 The relevant Annex II marine mammal QI site-specific COs at Lambay Island SAC is to maintain the favourable conservation condition of the grey seal, as defined by the following list of attributes and targets (NPWS, 2013b):

- *Access to suitable habitat*: Species range within the site should not be restricted by artificial barriers to site use;
  - This target may be considered relevant to proposed activities or operations that will result in the permanent exclusion of grey seal from part of its range within the site, or will permanently prevent access for the species to suitable habitat therein; and
  - It does not refer to short-term or temporary restriction of access or range.
- *Breeding behaviour:* The breeding sites should be maintained in a natural condition;
  - This target is relevant to proposed activities or operations that will result in significant interference with or disturbance of (a) breeding behaviour by grey seal within the site and/or (b) aquatic/terrestrial/intertidal habitat used during the annual breeding season.
  - Operations or activities that cause displacement of individuals from a breeding site or alteration of natural breeding behaviour, and that may result in higher mortality or reduced reproductive success, would be regarded as significant and should therefore be avoided.
- *Moulting behaviour:* The moult haul-out sites should be maintained in a natural condition;
  - This target is relevant to proposed activities or operations that will result in significant interference with or disturbance of (a) moulting behaviour by grey seal within the site and/or (b) aquatic/terrestrial/intertidal habitat used during the annual moult.
  - Operations or activities that cause displacement of individuals from a moult haul-out site or alteration of natural moulting behaviour to an extent that may ultimately interfere with key ecological functions would be regarded as significant and should therefore be avoided.
- *Resting behaviour*: The resting haul-out sites should be maintained in a natural condition;
  - This target is to proposed activities or operations that will result in significant interference with or disturbance of (a) resting behaviour by grey seal within the site and/or (b) aquatic/terrestrial/intertidal habitat used for resting.

  - Operations or activities that cause displacement of individuals from a resting haul-out site to an extent that may ultimately interfere with key ecological functions would be regarded as significant and should therefore be avoided.

- *Disturbance:* Human activities should occur at levels that do not adversely affect the grey seal population at the site:
  - Proposed activities or operations should not introduce man-made energy (e.g. aerial or underwater noise, light or thermal energy) at levels that could result in a significant negative impact on individuals and/or the population of grey seal within the site. This refers to the aquatic habitats used by the species in addition to important natural behaviours during the species' annual cycle;
  - This target also relates to proposed activities or operations that may result in the deterioration of key resources (e.g. water quality, feeding, etc.) upon which grey seals depend. In the absence of complete knowledge on the species ecological requirements at this site, such considerations should be assessed where appropriate on a case-by-case basis.

6.4.6.2 There are seven potential impact pathways relevant to grey seal associated with the construction, operational and maintenance, and decommissioning of the Proposed Development, which are identified in Table 6.8 and are assessed below for each phase of the Proposed Development.

INJURY AND/ OR DISTURBANCE FROM UNDERWATER NOISE FROM PILING

6.4.6.3 With consideration of grey seals, they are within the same FHG as harbour seals (PCW) with a hearing range of 50 Hz to 86 kHz (Southall *et al.*, 2019). Underwater noise-generating activities associated with the Proposed Development therefore have the potential to result in auditory injury, behavioural disturbance or temporary displacement, depending on noise level, duration and proximity.

6.4.6.4 For each mitigated piling scenario (see Section 6.4.1.12), predicted impacts to grey seals were informed by a single modelled average at-sea density estimate across the Array Area and Cable Corridor and Working Area (0.08 animals/km^2; Table 6.6) and using the thresholds for impulsive noise outlined in Table 6.9. Full details of the underwater noise modelling methodology and the resulting impact areas and ranges are detailed in the Underwater Noise Assessment (NIS Volume III, Appendix 11.1: Underwater Noise Assessment (Revised March 2026)).

CONSTRUCTION PHASE ASSESSMENT

AUDITORY INJURY (PTS)

6.4.6.5 Predicted impact areas and maximum ranges for auditory injury (PTS-onset) to grey seals from pile driving during construction from the Proposed Development, across both mitigated piling scenarios (ramp-up mitigation scenario and extended ramp-up mitigation scenario), are presented in Table 6.19: Predicted impact range of PTS-onset from pile driving at the SW WTG array location with harbour seal density estimates. For further information on densities used; see

6.4.6.6 For the ramp-up mitigation scenario, the maximum instantaneous PTS-onset impact range was 60 m for the installation of a 11 m monopile at the N WTG location, which represents the piling location closest to Lambay Island SAC (Table 6.24). This equates to a maximum of one individual potentially experiencing auditory injury, representing <0.01% of the reference population of 1,662 within the East region of RoI (Morris and Duck, 2019).

6.4.6.7 Using the cumulative PTS-onset thresholds, the maximum impact range at all piling locations was predicted to be <50 m, equating to a maximum of one individual (<0.01% of the reference population; Table 6.24).

6.4.6.8 With the implementation of the extended ramp-up mitigation scenario, the maximum instantaneous PTS-onset impact range remained at 60 m at the N WTG location, corresponding to a maximum of one individual (<0.01% of the reference population; Table 6.24). Predicted cumulative PTS-onset impact ranges also remained at <50 m at all piling locations, equating to a maximum of one individual experiencing auditory injury (<0.01% of the reference population; Table 6.24).

6.4.6.9 Overall, predicted auditory injury to grey seals from pile driving during construction is extremely limited in spatial extent and scale, with the N WTG location representing the most precautionary scenario and most relevant piling location in relation to Lambay Island SAC.

Table 6.24: Predicted impact range of PTS-onset from pile driving at N WTG array location with grey seal densities estimates. For further information on densities used; see Table 6.6.

Piling Scenario	Piling location and Monopile diameter (m)		Density (animals/km²)	Area (km²)	Maximum range (m)	Number of animals[1,2]	Percentage of reference population[2] (%)
Instantaneous PTS-onset (unweighted SPL_{peak})							
Ramp-up mitigation scenario	N WTG	11 m	0.08	<0.01	60	<1	<0.01
Extended ramp-up mitigation scenario	N WTG	11 m	0.08	0.01	60	<1	<0.01
Cumulative PTS-onset (weighted SEL_{cum})							
Ramp-up mitigation scenario	N WTG	11 m	0.08	<0.01	<50	<1	<0.01
Extended ramp-up mitigation scenario	N WTG	11 m	0.08	<0.01	<50	<1	<0.01

Piling Scenario	Piling location and Monopile diameter (m)	Density (animals/km²)	Area (km²)	Maximum range (m)	Number of animals[1,2]	Percentage of reference population[2] (%)

[1]The predicted number of individuals exposed to PTS-onset (both instantaneous and cumulative) from pile driving is fewer than one animal across all density scenarios. Importantly, the maximum PTS-onset impact range falls entirely within the 1,000 m Rsafe mitigation distance. With the implementation of the extended ramp-up mitigation procedure and associated MMMP measures (monitoring and soft-start procedures), marine mammals are expected to be displaced from the impact area prior to the onset of full hammer energy. Consequently, no animals are expected to be exposed to sound levels capable of causing auditory injury (PTS).

[2]The number of animals disturbed and the reference population are representative of the scaled East region of RoI population (Morris and Duck, 2019). The number of animals disturbed is not representative of the numbers disturbed within the Lambay Island SAC.

6.4.6.10 Any threshold shifts in hearing caused by pile driving would manifest in the range of 2 – 10 kHz (Kastelein *et al.*, 2017). At a UK BEIS-funded export elicitation workshop in 2018, experts concluded that the probability of PTS significantly affecting the survival and reproduction of grey and harbour seals was very low, assuming a 6 dB PTS in the 2 – 10 kHz range (Booth *et al.*, 2019). This was further supported by conclusions found in studies of tagged seals during the construction of the Lincs offshore windfarm in the UK which concluded that neither the survival or fitness of individuals of the harbour seal population in the Wash and North Norfolk Coast SAC is affected or that seals are not developing PTS despite predictions of exposure that indicate that they should be (Hastie *et a*l., 2016; Russell *et al.,* 2016; Whyte *et al.*, 2020).

6.4.6.11 In addition, the Developer has committed to the implementation of project-specific mitigation measures during piling activities, as set out within the MMMP (NIS Volume III, Appendix 25.2: Marine Mammal Mitigation Plan (Revised March 2026)), which are applicable to both cetacean and pinniped receptors. These measures are designed to minimise the risk of auditory injury (PTS) to seals arising from piling-related underwater noise and will, as a minimum, adhere to relevant international best practice, including DAHG (2014) guidance (Table 6.7). Implementation of the MMMP will ensure that the risk of injury to seal receptors is appropriately controlled and reduced to a negligible level.

6.4.6.12 In relation to the site-specific COs for Lambay Island SAC (Table 5.1), the potential effects of underwater noise associated with pile driving on grey seals have been assessed with respect to the attributes of access to suitable habitat and disturbance. The breeding, moulting and resting behaviour attributes relate specifically to disturbance or physical alteration of haul-out sites within the SAC boundary. As the Proposed Development is located approximately 61.89 km from the Lambay SAC and it will not result in any direct or indirect effects on haul-out habitats within the site, these attributes are not considered further within this assessment.

6.4.6.13 Regarding access to suitable habitat attribute, pile driving activities and the associated underwater noise (which could potentially cause auditory injury) will be short-term and temporary in nature and will not result in permanent habitat exclusion. Predicted PTS-onset impact ranges (maximum of 60 m) are substantially smaller than the distance to Lambay Island SAC, which is approximately 62.80 km from the Array Area (with the closest piling location), and therefore do not overlap the SAC boundary. As such, grey seals within the SAC will not be exposed to levels of underwater noise capable of resulting in auditory injury. Any highly unlikely auditory injury to individuals occurring outside the SAC would not impede access to suitable habitat within the site.

6.4.6.14 Regarding the disturbance attribute, even in the highly unlikely event that an individual experienced PTS-onset, available evidence indicates that would be unlikely to significantly affect individual fitness (i.e. its ability to survive and reproduce; Kastelein *et al.*, 2017). Therefore, pile driving activities are not expected to introduce man-made energy at levels capable of causing significant negative effects on individual grey seals or the wider population associated within, or connected to, Lambay Island SAC, nor is it expected to cause injury or mortality at levels capable of affecting site integrity.

6.4.6.15 **With consideration of the implementation of the extended ramp-up scenario and project-specific MMMP measures ensuring that no animals are within the area of predicted auditory injury (PTS-onset) ranges, the absence of overlap with the SAC (with the greatest predicted impact range of up to 60 m), and the negligible proportion of the wider population potentially affected (<0.01%), it is concluded there will be no AEoI of the grey seal QI of the Lambay Island SAC, as defined by its COs, as a result of auditory injury due to underwater noise associated with piling for Project Design Option 1.**

6.4.6.16 **Based on the representative risk of effect of Project Design Option 1, it is concluded that no AEoI would also apply to Project Design Option 2.**

6.4.6.17 The number of grey seals predicted to experience behavioural disturbance as a result of pile driving during construction is presented in Table 6.25. Disturbance was quantified using the dose-response relationship for impulsive noise for seals developed by Whyte *et al.* (2020) and expressed as a proportion of the relevant reference population (Table 6.6).

6.4.6.18 There are no corresponding data for grey seals and, as such, the harbour seal dose-response function is applied to the grey seal disturbance assessment. This is considered an appropriate proxy for grey seal as both species are categorised within the same functional hearing group. However, it is likely to result in an over-estimation of grey seal response as this assessment has concluded that grey seals are less sensitive to behavioural disturbance than harbour seals, therefore the application of the harbour seal dose-response function to grey seal is considered conservative.

6.4.6.19 For both the ramp-up mitigation and extended ramp-up mitigation scenarios, using the uniform density estimate of 0.08 animals/km^2 extracted from Carter *et al.* (2020), it is estimated that 89 grey seals (5.35% of the reference population of 1,662 within the East region of RoI (Morris and Duck, 2019)) may experience behavioural disturbance as a result of pile driving at the N WTG location (Table 6.25).

6.4.6.20 At its maximum extent, the 145 dB SEL$_{ss}$ re 1 µPa^{2}s disturbance contour does not intersect the boundary of Lambay Island SAC (Figure 6.15). The closest point of the SAC is located approximately 39.65 km beyond the outer edge of the disturbance contour generated by piling at the N WTG location.

Table 6.25: Predicted impact of disturbance to grey seal from pile driving at SW WTG location using dose-response curves. For further information on densities used; see Table 6.6

Piling Scenario	Piling location and Monopile diameter (m)		Density (animals/km^2)	Number of animals disturbed[1]	Percentage of reference population[1] (%)
Ramp-up and extended ramp-up mitigation scenarios	N WTG	11 m	0.08	89	5.35

[1]The number of animals disturbed and the reference population are representative of the scaled East region of RoI population (Morris and Duck, 2019). The number of animals disturbed is not representative of the numbers disturbed within the Lambay Island SAC.

6.4.6.21 The impact on grey seal is considered to result in a small number and proportion of the population affected with change expected to be recoverable, occur frequently throughout the construction phase, is reasonably expected to occur, and have intermittent and temporary consequences but is very unlikely to affect the population trajectory.

6.4.6.22 Furthermore, the results of the iPCoD modelling show that there is no significant effect of disturbance resulting from pile driving at the Proposed Development to grey seal, with the impacted population predicted to continue at a stable trajectory at exactly the same size (100%) as the un-impacted population up to 24 years after piling has ceased.

6.4.6.23 With consideration of disturbance and displacement caused by activities such as piling, there is limited information on the behavioural responses of grey seals to underwater noise. Telemetry studies conducted during construction of the Luchterduinen and Gemini offshore windfarms in the Netherlands recorded behavioural changes in grey seals, most commonly a temporal shift from foraging to horizontal movement, alongside other responses including altered surfacing and diving behaviour, changes in swim direction, or no observable responses (Aarts *et al.*, 2018). Importantly, individuals from this study were observed to return to the affected area on subsequent trips, despite receiving repeated exposure, indicating an absence of long-term displacement.

6.4.6.24 Grey seals are highly adaptable and resilient to short-term disturbance due to their generalist foraging strategy, mobility, and capacity to compensate for lost foraging opportunities (Smout *et al.*, 2014; Stansbury *et al.*, 2015). Their ability to tolerate periods of reduced feeding and to utilise alternative foraging areas supports a high capacity for recovery following disturbance due to their large body size and thick layer of blubber (i.e. more energy reserve) (Pomeroy *et al.*, 1999). In addition, they are wide ranging and can travel large distances (up to 488 km; Carter *et al.*, 2022) between different haul out and foraging regions, although on average, distances tend to be approximately 65 km (McConnell *et al.*, 1999). Therefore, behavioural responses to piling are expected to be temporary and reversible, with no lasting implications for individual fitness or population-level processes.

6.4.6.25 For grey seals, the project-specific mitigation measures set out within the MMMP (NIS Volume III, Appendix 25.2: Marine Mammal Mitigation Plan (Revised March 2026)), although primarily designed to minimise the risk of auditory injury (PTS) arising from piling-related underwater noise, will also act to reduce the magnitude and spatial extent of behavioural disturbance. Measures including pre-activity monitoring and controlled initiation of piling will reduce the likelihood of seals being exposed to the highest sound levels, thereby limiting the potential for strong avoidance or displacement responses. As a result, any behavioural disturbance experienced by seals is expected to be temporary and reversible and not of a scale or duration that would undermine the relevant COs.

6.4.6.26 In relation to the site-specific COs for Lambay Island SAC (Table 5.1), the potential effects of underwater noise associated with pile driving on grey seals have been assessed with respect to the attributes of access to suitable habitat and maintain human activities below levels which would adversely affect the grey seal population at the site (disturbance). The COs relating to breeding, moulting, and resting behaviour are not considered further in this assessment, as pile driving activities will occur entirely outside the SAC and will not affect haul-out sites or habitats used for these behaviours.

6.4.6.27 While underwater noise generated from piling may result in temporary displacement of grey seals, any behavioural response is expected to be limited to the period of piling. In line with NPWS guidance (2013b), such temporary disturbance does not constitute a permanent barrier to habitat use of the site (due to the temporary nature of the activity) and will not permanently prevent grey seals accessing suitable habitat within the SAC.

6.4.6.28 Some individuals associated with the Lambay Island SAC (but none within the Lambay Island SAC itself) may experience temporary behavioural disturbance as a result of pile driving; however, this is not predicted to result in mortality, injury, or significant negative effects on individual fitness or reproductive success for any life stage, nor is it expected to ultimately affect the grey seal population at the site.

6.4.6.29 **With consideration of the precautionary nature of the assessment, the low proportion of the population predicted to be exhibit a behavioural response, and the recoverable and temporary (although repeated) nature of behavioural disturbance, the implementation of mitigation measures, it is therefore concluded there will be no AEoI of the grey seal QI of the Lambay Island SAC, as defined by its COs, as a result of**

behavioural disturbance due to underwater noise during pile driving from Project Design Option 1.

6.4.6.30 **Based on the representative risk of effect of Project Design Option 1, it is concluded that no AEoI would also apply to Project Design Option 2.**

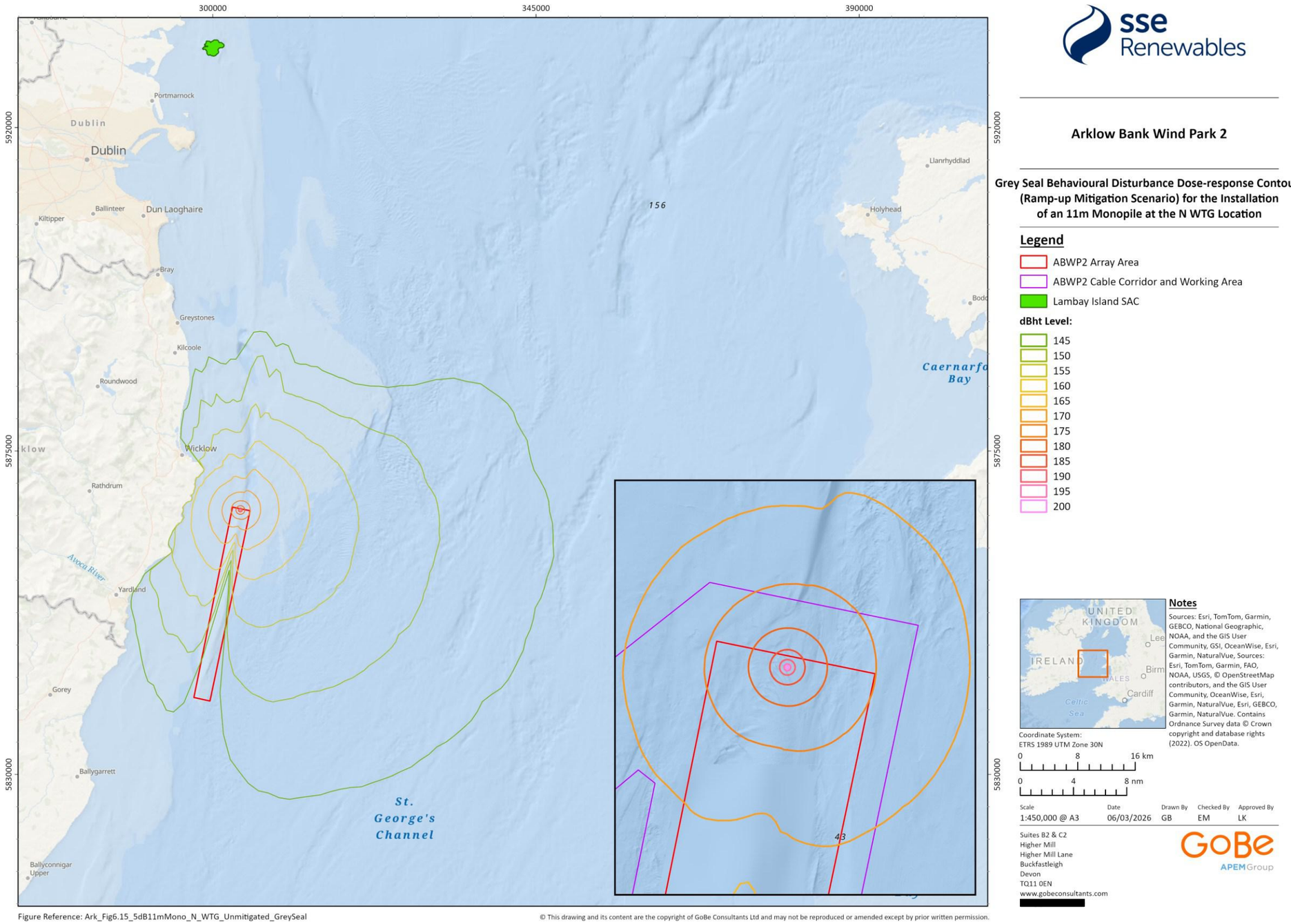

Figure Reference: Ark_Fig6.15_5dB11mMono_N_WTG_Unmitigated_GreySeal

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Figure 6.15: Behavioural disturbance dose-response contours (ramp-up mitigation scenario) for the installation of an 11 m monopile at the N WTG location and Lambay Island SAC for grey seal QI

CONSTRUCTION PHASE ASSESSMENT

AUDITORY INJURY (PTS)

6.4.6.31 Based on the modelling results presented in Table 6.26, the maximum PTS-onset range for grey seals resulting from high order UXO clearance is 2.8 km, based on the unweighted SPL_{peak} criterion and the largest charge weight modelled (800 kg plus donor). Using the average density estimate scaled from count data (Carter *et al.,* 2020), this would result in up to two grey seals, representing 0.12% of the reference population of 1,662 within the East region of RoI (Morris and Duck, 2019), being within PTS-onset range under the most precautionary scenario.

6.4.6.32 For low order clearance, the predicted PTS-onset ranges are smaller, with a maximum range of 0.24 km (Table 6.26). At this range, less than one grey seal is predicted to experience PTS, representing <0.01% of the reference population.

Table 6.26: PTS-onset ranges and numbers of grey seal modelled to be within range for all potential charge weights

Charge Weight (kg)	Maximum range (km)	Density (animals/km²)	Number of animals[1]	Percentage of reference population[1] (%)
PTS-onset (unweighted SPL_{peak})				
0.5 (low order)	0.24	0.08	<1	<0.01
25 + donor	0.91	0.08	1	0.01
55 + donor	1.1	0.08	1	0.02
120 +donor	1.5	0.08	1	0.03
240 + donor	1.9	0.08	1	0.05

Charge Weight (kg)	Maximum range (km)	Density (animals/km²)	Number of animals[1]	Percentage of reference population[1] (%)
525 + donor	2.5	0.08	2	0.09
700 + donor	2.7	0.08	2	0.11
800 + donor	2.8	0.08	2	0.12
PTS-onset (weighted SELss)				
0.5 (low order)	0.06	0.08	0	0.00
25 + donor	0.39	0.08	<1	<0.01
55 + donor	0.57	0.08	<1	<0.01
120 +donor	0.83	0.08	1	0.01
240 + donor	1.1	0.08	1	0.02

Charge Weight (kg)	Maximum range (km)	Density (animals/km²)	Number of animals[1]	Percentage of reference population[1] (%)
525 + donor	1.6	0.08	1	0.04
700 + donor	1.9	0.08	1	0.05
800 + donor	2.0	0.08	2	0.06

[1]The number of animals disturbed and the reference population are representative of the scaled East region of RoI population (Morris and Duck, 2019). The number of animals disturbed is not representative of the numbers disturbed within the Lambay Island SAC.

6.4.6.33 The nearest boundary of the Lambay Island SAC approximately 61.89 km from the Proposed Development. As such, even under the largest charge weight modelled, the predicted PTS-onset ranges for both high-order and low-order UXO clearance do not overlap with the SAC. Therefore, no grey seals within the SAC are predicted to experience auditory injury as a result of UXO clearance activities associated with the Proposed Development.

6.4.6.34 Interpretation of the modelling results should take account of the frequency characteristics of high-order UXO detonation. The main underwater noise produced by high-order detonation is outside of the region of greatest sensitivity for seal species (Southall *et al.,* 2019), with a pronounced reduction in energy levels above approximately 5-10 kHz (von Benda-Beckmann *et al.,* 2015; Salomons *et al.,* 2021). On this basis, grey seals are considered to have a relatively low sensitivity to PTS-onset from UXO clearance in species with greater sensitivities at lower frequencies.

6.4.6.35 Furthermore, the Developer has committed to the implementation of project-specific mitigation measures for UXO clearance activities, as set out within the MMMP (NIS Volume III, Appendix 25.2: Marine Mammal Mitigation Plan (Revised March 2026)). These measures are designed to minimise the risk of auditory injury (PTS) to marine mammals arising from UXO-related noise. The mitigation strategy will, as a minimum, adhere to relevant international best practice, including DAHG (2014) guidance (Table 6.7).

6.4.6.36 In relation to the site-specific COs for Lambay Island SAC (Table 5.1), the potential effects of underwater noise associated with UXO clearance on grey seals have been assessed with respect to the attributes of access to suitable habitat and disturbance. The breeding, moulting and resting behaviour attributes are not considered relevant to the assessment of UXO clearance. Any UXO clearance activities will occur offshore, at distances far from any haul-out or breeding sites within the Lambay Island SAC and will not result in any direct or indirect effects on haul-out habitats within the site, these attributes are not considered further within this assessment.

6.4.6.37 UXO clearance and the associated underwater noise capable of causing auditory injury would be short-term and highly localised, typically comprising a single, one-off detonation at any given location. As such, UXO clearance would not create a permanent or long-term barrier to the use of suitable habitat within or connected to the SAC, nor would it result in any sustained exclusion of grey seals from the wider area.

6.4.6.38 Regarding the disturbance attribute, even in the highly unlikely event that an individual experienced PTS-onset, available evidence indicates that would be unlikely to significantly affect individual fitness (i.e. its ability to survive and reproduce; Kastelein *et al.*, 2017). Therefore, any UXO clearance activities are not expected to introduce man-made energy at levels capable of causing significant negative effects on individual grey seals or the wider population associated within, or connected to, Lambay Island SAC, nor is it expected to cause injury or mortality at levels capable of affecting site integrity.

6.4.6.39 **With consideration of the limited spatial extent of predicted auditory injury (PTS-onset) ranges, the absence of overlap with the SAC (with the greatest predicted impact range predicted of 2.8 km), the implementation of mitigation measures, and the negligible proportion of the wider population potentially affected (≤0.12%) even under the most precautionary scenario, it is concluded there will be no AEoI of the grey seal QI of the Lambay Island SAC, as defined by its COs, as a result of auditory injury due to underwater noise associated with UXO clearance for Project Design Options 1 and 2.**

BEHAVIOURAL DISTURBANCE

6.4.6.40 The number of grey seals predicted to experience behavioural disturbance as a result of high order UXO detonation, based on the application of an adapted 20 km EDR, is presented in Table 6.27. Using the density estimate of 0.08 animals/km^2, it is estimated that up to 93 animals (5.58% of the East region of the RoI reference population of 1,662 individuals; Morris and Duck, 2019) could be disturbed under this highly precautionary scenario.

6.4.6.41 For low order clearance, application of the 5 km EDR results estimated up to seven animals potentially disturbed, representing 0.42% of the MU reference population (Table 6.27). It should be noted that this estimate is illustrative only, as there is only limited empirical evidence to support a defined disturbance range for low order UXO clearance.

Table 6.27: Predicted impact of disturbance to harbour seals from UXO for both high order (20 km) and low order clearance (5 km) EDRs. For further information on densities used, see Table 6.6.

UXO Scenario	EDR	Density (animals/km^2)	Number of animals disturbed[1]	Percentage of the reference population[1] (%)
High Order Clearance	20 km^2	0.08	93	5.58
Low Order Clearance	5 km	0.08	7	0.42

[1]The number of animals disturbed and the reference population represents the scaled East region of RoI population (Morris and Duck, 2019). The number of animals disturbed is not representative of the numbers disturbed within the Lambay Island SAC.

[2]Reduced EDR to account for land overlap within the nominal 20 km radius (effective area 1,159.98 km^2 rather than 1,256.31 km^2)

6.4.6.42 The nearest boundary of Lambay Island SAC is located approximately 61.89 km from the Proposed Development. As such, the EDRs for UXO clearance do not overlap with the SAC. Therefore, no grey seals within the SAC are predicted to experience auditory injury as a result of UXO clearance activities associated with the Proposed Development.

6.4.6.43 Potential behavioural disturbance to marine mammals arising from UXO clearance activities has been considered through the implementation of the project-specific MMMP (NIS Volume III, Appendix 25.2: Marine Mammal Mitigation Plan (Revised March 2026)). The application of mitigation measures, informed by international best practice including DAHG (2014), will reduce the likelihood, spatial extent and duration of any behavioural responses, such that any disturbance would be temporary, localised and not of a nature that could affect population-level processes (Table 6.7).

6.4.6.44 Any behavioural disturbance associated with UXO clearance is therefore expected to affect a small proportion of the population (≤6.08%), be highly localised in time, recoverable, and infrequent during the construction phase. Given the single-pulse nature of the activity, it is concluded that grey seals are not sensitive to UXO clearance behavioural disturbance effects when considering the integrity of the designated site.

6.4.6.45 In relation to the site-specific COs for Lambay Island SAC (Table 5.1), the potential effects of underwater noise associated with UXO clearance on grey seals have been assessed with respect to the attributes of access to suitable habitat and maintain human activities below levels which would adversely affect the grey seal community at the site (disturbance). Breeding, moulting, and resting haul-out targets are not relevant as these occur outside the SAC and would not be impacted by UXO clearance.

6.4.6.46 Whilst underwater noise generated from UXO clearance may result in a short-term startle response and temporary displacement of some individuals outside of, but associated with the SAC, such disturbance would be brief in duration and would not constitute a permanent barrier to habitat use of the site.

6.4.6.47 Any individuals disturbed by UXO clearance are not predicted to experience significant negative effects on fitness, survival, or reproductive success for any life stage, nor is the activity expected to result in injury or mortality at a scale capable of affecting the grey seal community associated with Lambay Island SAC.

6.4.6.48 **With consideration of the precautionary nature of the assessment, the absence of overlap with the SAC, the low proportion of the population predicted to be affected, the extremely short-term and recoverable nature of behavioural disturbance, the implementation of mitigation measures, and the limited frequency of UXO clearance events, it is therefore concluded there will be no AEoI of the grey seal QI of the Lambay Island SAC, as defined by its COs, as a result of behavioural disturbance due to underwater noise associated with UXO clearance impacting grey seals for Project Design Options 1 and 2.**

INJURY AND/OR DISTURBANCE FROM UNDERWATER NOISE DURING SITE SURVEYS

CONSTRUCTION PHASE ASSESSMENT

6.4.6.49 The Subsea Noise Assessment (Seiche Ltd., 2022) concluded that PTS-onset ranges from confirmatory site surveys are limited to relatively small distances from the sound source and vary by survey type and marine mammal FHG, with grey seals considered under Phocid pinnipeds (PW), together with harbour seals.

6.4.6.50 Like the other underwater noise assessments, whilst the TTS impact ranges are presented here, the implications of TTS are considered alongside behavioural disturbance, reflecting its temporary and recoverable nature and its relevance to short-term changes in behaviour rather than long-term population level effects.

6.4.6.51 Predicted impact ranges for auditory (PTS-onset) and TTS-onset to grey seals from site surveys are therefore the same as those for harbour seals and summarised within Table 6.23 (Section 6.4.2). The largest distances are summarised in Table 6.17 in section 6.4.1. The largest cumulative PTS-onset range is 71 m for SBP surveys, while the largest cumulative TTS-onset range is 255 m. Other survey activities have smaller ranges, typically tens of metres or less (Table 6.23; Seiche Ltd., 2022).

6.4.6.52 The nearest boundary of the Lambay Island SAC is approximately 61.89 km from the survey area, substantially greater than the maximum predicted PTS- or TTS-onset ranges for all survey activities (Table 6.23Table 6.17). As such, no grey seals within the SAC are predicted to experience auditory injury (PTS) or TTS as a result of these site surveys.

6.4.6.53 With consideration that grey seals have a lower sensitivity to underwater noise compared to harbour porpoise, the predicted impact ranges for grey seal presented in Table 6.23 are smaller compared to those outlined in Table 6.17. The implementation of a project-specific MMMP (NIS Volume III, Appendix 25.2: Marine Mammal Mitigation Plan (Revised March 2026); Table 6.7) during the geophysical surveys and adherence to DAHG (2014) guidance, is designed to address the most precautionary scenario exposure for harbour porpoise, the most noise-sensitive species, to negligible levels. As such, these measures provide a precautionary buffer, and the actual likelihood and spatial extent of PTS-onset for grey seals will be further reduced.

6.4.6.54 Predicted behavioural disturbance ranges are greater than PTS/TTS distances, with maximum distances up to 4.95 km for non-impulsive geophysical survey sound sources (SBP), 700 m for sparker, 1.32 km for seismic refraction, 10 km for vibrocore and 1.5 km for seismic CPT for all marine mammal FHGs (Seiche Ltd., 2022). USBL were not included in the Subsea Noise Assessment (Seiche Ltd., 2022) however, CSA Ocean Sciences Inc. (2020) estimated that the maximum distance to the Level B threshold (disturbance) is 50 m for all marine mammal hearing groups.

6.4.6.55 While some predicted disturbance ranges extend beyond the survey area, the closest distance to the Lambay Island SAC (61.89 km away) remains substantially greater than the predicted disturbance ranges, and any behavioural responses are expected to be short-term and reversible in nature.

6.4.6.56 In relation to the site-specific COs for Lambay Island SAC (Table 5.1), site survey activities are temporary, intermittent and spatially limited, and are not expected to result in sustained displacement, long-term habitat exclusion from the site. Any behavioural responses would be brief and limited to very few individuals outside of the SAC, without causing significant effects on individual fitness or population integrity. Furthermore, breeding, moulting and resting haul-out targets are not relevant for this impact because survey activities occur outside of the SAC.

6.4.6.57 **With consideration of the limited spatial extent of predicted impact ranges, the absence of overlap with the SAC (with the greatest predicted impact range predicted of up to 10 km), and the implementation of mitigation measures, it is therefore concluded there will be no AEoI of the grey seal QI of the Lambay Island SAC, as defined by its COs, as a result of auditory injury and behavioural disturbance due to underwater noise associated with site surveys associated with the construction phase for Project Design Options 1 and 2.**

OPERATIONAL AND MAINTENANCE PHASE ASSESSMENT

6.4.6.58 Routine geophysical surveys of inter-array, inter-connector, and export cables will occur every six months during the first two years and annually thereafter throughout the operational and maintenance phase of the Proposed Development (Table 6.8).

6.4.6.59 As the exact equipment is not yet confirmed, an assessment has been undertaken assuming the same survey equipment and source levels as that proposed in the pre-construction

surveys (Table 6.15 and Table 6.16). Therefore, the impact ranges of auditory injury (PTS), TTS and behavioural disturbance from site surveys during the operational and maintenance phase are expected to be similar to the results of the Subsea Noise Assessment (Seiche Ltd., 2022; CSA Ocean Sciences Inc, 2020) conducted for site surveys during the pre-construction phase.

6.4.6.60 **With consideration of the limited spatial extent of predicted impact ranges, the absence of overlap with the SAC (with the greatest predicted impact range predicted of up to 10 km), and the implementation of mitigation measures, it is therefore concluded there will be no AEoI of the grey seal QI of the Lambay Island SAC, as defined by its COs, as a result of auditory injury and behavioural disturbance due to underwater noise associated with site surveys associated with the operational and maintenance phase for Project Design Options 1 and 2.**

INJURY AND/OR DISTURBANCE FROM UNDERWATER NOISE DURING DREDGING AND TRENCHING

CONSTRUCTION PHASE ASSESSMENT

6.4.6.61 The Underwater Noise Assessment (NIS Volume III, Appendix 11.1: Underwater Noise Assessment (Revised March 2026)) concluded that for non-impulsive construction activities, including dredging and trenching, cumulative PTS could only occur at very short distances from the sound source. For trenching, backhoe dredging and suction dredging, predicted cumulative PTS- and TTS-onset ranges for grey seal (PCW FHG; Southall *et al.*, 2019) are <50 m.

6.4.6.62 Dredging and trenching activities produce continuous, non-impulsive underwater noise and are not expected to result in auditory injury (PTS) in marine mammals. The dominant energy from these activities typically occurs below 1 kHz (Todd *et al.*, 2015), which lies outside the peak hearing sensitivity range of grey seals (PCW FHG). As a result, the potential for PTS (or TTS) to occur from these construction activities is expected to have little relevance to individual fitness, survival or reproductive success, as the hearing sensitivity of these receptors is relatively poor below 1 kHz (Southall *et al.,* 2019).

6.4.6.63 Although PTS is a permanent effect, the very limited spatial extent of predicted PTS-onset ranges, together with the low sensitivity of grey seals to low-frequency noise, indicates that dredging and trenching are unlikely to result in auditory at levels that would affect population-level parameters.

6.4.6.64 Information on marine mammal sensitivity to dredging and trenching noise is limited, with available studies focusing primarily on the impact of behavioural disturbance from dredging. These studies have confirmed that dredging activities can result in short-term displacement and avoidance behaviour in marine mammals (e.g. Culloch *et al.*, 2016; Pirotta *et al.*, 2013). However, it is often difficult to distinguish the effects of underwater noise from disturbance associated with vessel presence required to undertake the activity (Todd *et al.*, 2015).

6.4.6.65 There are currently no empirical data describing grey seal responses specifically to dredging or trenching activities. In the absence of such data, it is assumed that behavioural responses and deterrence distances would be similar to those associated with dredging for harbour porpoise, and therefore limited to within 5 km, which is considered a precautionary upper bound for behavioural disturbance (McQueen *et al.*, 2020). Should behavioural disturbance occur, it is expected to be short-term and reversible, with animals returning to the area following cessation of activities.

6.4.6.66 The closest distance between dredging and trenching activities and the boundary of the Lambay Island SAC is approximately 61.89 km. This distance substantially exceeds the

maximum predicted ranges for PTS-onset, TTS-onset and behavioural disturbance (5 km) associated with dredging and trenching.

6.4.6.67 In relation to the site-specific COs for Lambay Island SAC (Table 5.1), dredging and trenching during construction will not result in permanent or long-term restriction of access to suitable habitat within the SAC, nor introduce underwater noise at levels that would cause injury or sustained disturbance to the grey seal community associated with the site. Given the location of the activities well beyond the SAC boundary, breeding, moulting and resting haul-out sites within the SAC will not be affected.

6.4.6.68 **With consideration of the very limited spatial extent of predicted auditory injury (PTS-onset) ranges associated with dredging and trenching activities, the absence of overlap with the Lambay Island SAC (with the greatest predicted disturbance impact range of up to 5 km), and the temporary, localised and reversible nature of any behavioural disturbance, it is therefore concluded there will be no adverse effect of the grey seal QI of the Lambay Island SAC, as defined by its COs, as a result of underwater noise arising from dredging and trenching activities associated with the construction phase for Project Design Options 1 and 2.**

OPERATIONAL AND MAINTENANCE PHASE ASSESSMENT

6.4.6.69 During the operational and maintenance phase, dredging and trenching may be required intermittently for scour protection repair and maintenance of foundations and cables. These activities are expected to be localised, short-term and less frequent than those undertaken during the construction phase.

6.4.6.70 Based on the predicted underwater noise modelling presented in the Underwater Noise Assessment (NIS Volume III, Appendix 11.1: Underwater Noise Assessment (Revised March 2026)), the precited ranges for PTS-onset, TTS-onset and behavioural disturbance during operation and maintenance are expected to be comparable to those assessed for the construction phase, assuming similar equipment and methods are anticipated to used.

6.4.6.71 The closest distance between dredging and trenching activities during the operation and maintenance phase and the boundary of the Lambay Island SAC is approximately 61.89 km. This distance substantially exceeds the maximum predicted ranges for auditory injury (PTS), TTS, and behavioural disturbance associated with dredging and trenching activities.

6.4.6.72 In relation to the Lambay Island SAC site-specific COs (Table 5.1), dredging and trenching during the operational and maintenance phase will not result in permanent or long-term restriction of access to suitable habitat within the SAC, nor introduce underwater noise at levels that would cause injury or sustained disturbance to the grey seal population. Breeding, moulting and resting haul-out sites within the SAC will not be affected due to the distance of the activities from the site.

6.4.6.73 **With consideration of the very limited spatial extent of predicted auditory injury (PTS-onset) ranges associated with dredging and trenching activities, the absence of overlap with the Lambay Island SAC (with the greatest predicted disturbance impact range of up to 5 km), and the temporary, localised and reversible nature of any behavioural disturbance, it is therefore concluded there will be no adverse effect of the grey seal QI of the Lambay Island SAC, as defined by its COs, as a result of underwater noise arising from dredging and trenching activities associated with the operational and maintenance phase for Project Design Options 1 and 2.**

INJURY FROM VESSEL ACTIVITIES

6.4.6.74 Grey seals are highly mobile pinnipeds with well-developed sensory abilities, and given observed responses to noise, are expected to detect vessels in close proximity and largely avoid collision. Evidence on collision risk for seals is limited and typically reported across all species, rather than on a species-specific basis; however, studies indicate that vessel collision accounts for only a small proportion of seal injuries and mortalities (Goldstein *et al.*, 1999; Swails, 2005).

6.4.6.75 Telemetry studies demonstrate that seals frequently co-occur spatially with vessel traffic but generally maintain separation distances that substantially reduce collision risk (Onoufriou *et al.*, 2016). On this basis, and consistent with the assessment presented for harbour seals (see Section 6.4.2), the likelihood of injury from vessel activities involving grey seals is considered to be very low.

CONSTRUCTION AND DECOMMISSIONING PHASE ASSESSMENT

6.4.6.76 During the construction phase, up to 69 installation vessels may be present within the Proposed Development at any one time, resulting in a maximum of 4,150 vessel return trips over the four-year construction period, and a maximum of 1,797 vessel return trips per year. A similar number of vessels are anticipated for the decommissioning phase.

6.4.6.77 The majority of vessels used during the construction and decommissioning phase are likely to be large vessels that will operate at relatively low speeds or remain stationary for extended periods of time. The key collision risk threshold for larger vessels is generally associated with speeds exceeding approximately 7 m/s; however, such speeds are not anticipated to be routinely exceeded during construction and decommissioning activities, and they will be stationary for significant periods of time. Consequently, increases in vessel traffic moving within the Proposed Development Array Area and Cable Corridor and Working Area along distinct transit routes and to/from port will be intermittent and largely confined to discrete periods of offshore activity.

6.4.6.78 Smaller vessels associated with construction and decommissioning activities (i.e. tug/anchor handlers, guard vessels, survey vessels, and crew transfer vessels) are more manoeuvrable than larger installation vessels and are therefore able to avoid marine mammals when detected, even when an animal is close and the vessel is going at high speed (Schoeman *et al.*, 2020). In contrast, larger vessels, such as jack-up vessels, have low manoeuvrability and may require larger distances to avoid an animal, but travel at slower speeds, reducing collision risk.

6.4.6.79 In addition, the mitigation measures (see Table 6.7) which includes an Environmental VMP (NIS Volume III, Appendix 25.10: Environmental Vessel Management Plan), will ensure that vessel traffic will move along predictable routes, which is known to be a key aspect in minimising the potential risks imposed by vessel traffic (Nowacek *et al.*, 2001; Lusseau, 2003; 2006). The Environmental VMP also sets out a Code of Conduct to minimise interactions with marine mammals and to define how vessels should behave in the presence of them.

6.4.6.80 Furthermore, the SAC boundary is located approximately 61.89 km from the Proposed Development. Whilst the vessel routes are not yet known, the likelihood of overlap between project-specific vessel traffic and the SAC is very low. Whilst grey seals may be present outside the boundary of the SAC and within areas used by vessel traffic; however, the proportion of the population likely to be within the Project area is also very small given the distance from key SAC habitats. Therefore, vessel movements associated with the Proposed Development will not result in permanent or long-term restriction of access to suitable habitat

within the SAC, as vessel activity is temporary, transitory, and does not constitute a fixed or continuous pressure capable of causing sustained displacement.

6.4.6.81 Considering the mobility of grey seals, the nature of construction vessel traffic, distance from the SAC boundary (61.89 km), and the implementation of Environmental VMP measures, vessel movements are not expected to result in permanent exclusion from suitable habitat, injury or population-level effects. **It is therefore concluded there will be no AEoI of the grey seal QI of the Lambay Island SAC, as defined by its COs, as a result of injury from vessel activities associated with the construction and decommissioning phases for Project Design Options 1 and 2.**

OPERARTION AND MAINTENANCE PHASE ASSESSMENT

6.4.6.82 During the operational and maintenance phase, a maximum of 30 vessels will be present within the Proposed Development at any one time, resulting in a maximum of 1,359 vessel return trips per year. Vessels that will be used during the operational and maintenance phase (up to 36.5 years) include crew transfer vessels, jack-up vessels, cable repair vessels.

6.4.6.83 As with construction activities, vessels operating during the operational and maintenance phase are expected to travel at relatively low speeds within the Proposed Development, with larger vessels either stationary or operating at slow speeds during maintenance activities. Smaller, more manoeuvrable vessels (e.g. crew transfer vessels) are able to alter course to avoid marine mammals when detected. Grey seals are therefore expected to detect and avoid vessels, resulting in a low likelihood of collision.

6.4.6.84 The continued implementation of mitigation measures, including the Environmental VMP (NIS Volume III, Appendix 25.10: Environmental Vessel Management Plan; Table 6.7), will ensure predictable vessel routing and adherence to appropriate vessel management procedures, further reducing collision risk. Given the lower vessel numbers relative to construction, the absence of novel vessel activity, and the high baseline levels of vessel traffic in the Irish Sea, vessel movements during operation and maintenance are not expected to materially increase collision risk for grey seals.

6.4.6.85 In relation to the site-specific COs for Lambay Island SAC (Table 5.1), vessel movements during the operational and maintenance phase will not result in permanent or long-term restriction of access to suitable habitat within the SAC, as vessel activity will be intermittent, transitory, and of lower intensity than during construction.

6.4.6.86 Given the relatively low vessel numbers, the intermittent and localised nature of any operation and maintenance activities, slow expected vessel speeds and continued application of Environmental VMP measures, vessel movements during operational and maintenance phase will not result in permanent habitat exclusion, injury or population-level effects. **It is therefore concluded there will be no AEoI of the grey seal QI of the Lambay Island SAC, as defined by its COs, as a result of injury from vessel activities associated with the operational and maintenance phase for Project Design Options 1 and 2.**

VESSEL DISTURBANCE

6.4.6.87 With regards to behavioural disturbance caused by noise from presence of vessels and their movements, grey seals are particularly sensitive to disturbance in regions where vessel traffic overlaps with productive coastal waters (Robards *et al.*, 2016). Vessel disturbance may be particularly detrimental to grey seal if it changes their haul-out patterns or reduces the time they are able to spend resting or nursing pups during the breeding season. When disturbed, seals that are hauled-out typically ‘flush’ (enter) into the water which could be detrimental during pupping season (Johnson and Acevedo-Gutiérrez, 2007).

6.4.6.88 Underwater noise levels from introduced vessels will result in an increase in non-impulsive, continuous sounds primarily from propellers, thrusters, and various rotating machinery (e.g.,

power generation, pumps) in the vicinity of the Proposed Development. The main drivers influencing the magnitude of potential impact with respect to underwater noise disturbance from vessels are vessel type, speed and prevailing ambient noise levels (Wilson *et al.*, 2007). Disturbance from vessel noise is likely to occur only when vessel noise associated with the construction of the Proposed Development exceeds the background ambient underwater noise level.

CONSTRUCTION AND DECOMMISSIONING PHASE ASSESSMENT

6.4.6.89 During the construction phase, up to 69 installation vessels may be present within the Proposed Development at any one time, resulting in a maximum of 4,150 vessel return trips over the four-year construction period, and a maximum of 1,797 vessel return trips per year. A similar number of vessels are anticipated for the decommissioning phase.

6.4.6.90 With consideration of disturbance and displacement, the coastal areas and immediate surrounding waters of the Proposed Development are already subject to high levels of vessel traffic (see EIAR Volume II, Chapter 15: Shipping and Navigation (Revised March 2026)). As such, the introduction of construction and decommissioning activities is not considered to represent a novel or significant change in the level of disturbance that grey seals naturally present are subject to.

6.4.6.91 Evidence indicates that grey seal responses to vessels are primarily behavioural and context-specific. Studies have shown that hauled-out grey seals may exhibit alert or flushing responses in relation to vessel proximity, speed and duration of interaction (Britton, 2012). Given the distance between the Proposed Development and the haul-outs within the SAC (>61.89 km), it is considered highly unlikely that vessel traffic associated with the Proposed Development would pass the haul-outs close enough to lead to a disturbance or flushing response. However, any disturbance responses would be short-term and reversible, and there is limited evidence to suggest that vessel traffic results in sustained displacement or long-term behavioural change.

6.4.6.92 At-sea exposure studies further indicate limited sensitivity of grey seals to vessel noise. Trigg *et al.* (2020) found that grey seals in the Celtic Sea and English Channel were not exposed to cumulative shipping noise levels exceeding TTS thresholds. While some studies have reported reduced local sightings in areas of increased vessel activity, these effects were small and weaker than relationships with environmental variables such as sea state (Anderwald *et al.,* 2013). More broadly, high levels of spatial overlap between grey seals and vessels have not been associated with population decline, with some of the highest grey seal population growth rates occurring in areas of high vessel co-occurrence (southeast England; Jones *et al.,* 2017).

6.4.6.93 The implementation of mitigation measures, including the Environmental VMP (NIS Volume III, Appendix 25.10: Environmental Vessel Management Plan; Table 6.7), will further reduce the likelihood and magnitude of disturbance by ensuring predictable vessel routes, controlled speeds and clear procedures for minimising interactions with marine mammals. Vessel simulation modelling indicates that reductions in vessel speeds of 20-50% can reduce underwater source noise (by 5 dB for 20% and 18 dB for 50%) and the number of animals exposed (Findlay *et al.*, 2023).

6.4.6.94 **With consideration of the low likelihood, temporary, localised and reversible nature of vessel-related behavioural responses, the existing high baseline of vessel activity, the absence of evidence for population-level effects, and the implementation of Environmental VMP measures to reduce risk, vessels movements during construction and decommissioning phase are not expected to result in long-term displacement or interference with key behaviours associated with the SAC. It is therefore concluded that there will be no AEoI of the grey seal QI of the Lambay Island SAC, as defined by its**

COs, as a result of disturbance from vessel activities associated with the construction and decommissioning phase for Project Design Options 1 and 2.

OPERATIONAL AND MAINTENANCE PHASE ASSESSMENT

6.4.6.95 During the operational and maintenance phase, a maximum of 30 vessels will be present within the Proposed Development at any one time, resulting in a maximum of 1,359 vessel return trips per year.

6.4.6.96 Vessel activity during the operational and maintenance phase represents a reduction in both vessel numbers and intensity compared to the construction and decommissioning phases. As during construction, vessel movements will be subject to the Environmental VMP (NIS Volume III, Appendix 25.10: Environmental Vessel Management Plan; Table 6.7), ensuring predictable routing, controlled speeds and adherence to mitigation measures designed to minimise disturbance to marine mammals

6.4.6.97 In relation to the site-specific COs for Lambay Island SAC (Table 5.1), any behavioural responses remain temporary and localised, with animals expected to return following any displacement, there is no mechanism by which vessel disturbance could result in long-term displacement or interference with key life-history behaviours of grey seals associated with the site**. It is therefore concluded that there will be no AEoI of the grey seal QI of the Lambay Island SAC, as defined by its COs, as a result of disturbance from vessel activities associated with the operational and maintenance phase for Project Design Options 1 and 2.**

CHANGES IN FISH AND SHELLFISH COMMUNITY AFFECTING PREY RESOURCES

6.4.6.98 Potential impacts to prey resources arising from the Proposed Development are expected to be largely restricted to the boundaries of the Proposed Development due to the localised footprint of seabed disturbance, the temporary nature of construction activities, and the limited spatial extent of predicted underwater noise and sediment dispersion effects. As such, any indirect effects on grey seals via changes in prey availability would be limited to individuals foraging within, or close proximity to the Proposed Development.

6.4.6.99 Grey seal exploit a wide range of prey species, including poor cod, salmonids, sandeel, dragonet, whiting, bib (*Trisopterus luscus*), blue whiting (*Micromesistius poutassou*), haddock (*Melanogrammus aeglefinus*), pollock (*Pollachius pollachius*), saithe (*Pollachius virens*), herring, rockling, Norway pout (*Trisopterus esmarkii*), Atlantic mackerel, hake (*Merluccius merluccius*), eels (*Anguilla* spp.), wrasse (*Labridae* spp.), perch (*Perca fluviatilis*), sole, halibut (*Hippoglossus* spp.), dab (*Limanda limanda*), a range of flatfish species (*Pleuronectiformes* spp.), as well as cephalopods including squid and octopus species (Gosch *et al.,* 2014; Wilson and Hammond, 2019).

6.4.6.100 This broad spectrum demonstrates a high degree of dietary flexibility, with grey seals able to switch between prey types in response to local availability. Grey seals are therefore considered generalist feeders with a high capacity to adapt to localised and temporary changes in prey resources.

CONSTRUCTION AND DECOMMISSIONING PHASE ASSESSMENT

6.4.6.101 Grey seals have a generalist diet, as can also be said for other Annex II marine mammal species including harbour porpoise. The assessment of the impact from changes in prey to the harbour porpoise QI of Blackwater Bank SAC has been undertaken at a high-level across changes to the prey community, rather than reflecting species-specific prey preferences. It is also highlighted that the diet of harbour porpoise (predominantly whiting, Atlantic herring, and poor cod) has overlap with that of grey seal. Accordingly, the assessment of changes in the

fish and shellfish community affecting prey resources for the Blackwater Bank SAC are considered applicable to SACs for grey seal, including Lambay Island SAC.

6.4.6.102 Potential impacts on prey species associated with construction and decommissioning activities are not specific to grey seal QIs and have been comprehensively assessed for other Annex II marine mammal receptors, notably harbour porpoise within Blackwater Bank SAC (Section 6.4.1). Blackwater Bank SAC is located approximately 19.13 km from the Proposed Development, substantially closer than the Lambay Island SAC (approximately 61.89 km), and that assessment is therefore considered precautionary when applied to the grey seal QI of Lambay Island SAC.

6.4.6.103 As detailed in Section 6.4.1 and EIAR Volume II, Chapter 10: Fish, Shellfish and Sea Turtle Ecology (Revised March 2026), potential effects on prey species include temporary habitat disturbance, increased SSC and associated deposition, injury and/or disturbance as a result of underwater noise and vibration, and accidental pollution. These effects are predicted to be highly localised, temporary and recoverable, affecting only a very small proportion of available prey habitat.

6.4.6.104 Grey seals are considered to be opportunistic predators with a broad and flexible diet and are therefore considered to have a low sensitivity to localised or short-term changes in prey availability. The scale and duration of predicted prey impacts are not expected to result in any meaningful reduction in prey availability or accessibility at a scale relevant to the grey seal population associated with Lambay Island SAC.

6.4.6.105 **With consideration of the highly localised and temporary nature of the impacts described above, the generalist foraging strategy of grey seals and wide available foraging habitat, and the distance of the Proposed Development to the SAC (61.89 km), it is therefore concluded there will be no AEoI of the grey seal QI of the Lambay Island SAC, as defined by its COs, as a result of changes in prey resources associated with the construction and decommissioning phases for Project Design Option 1.**

6.4.6.106 **Based on the representative risk of effect of Project Design Option 1, it is concluded that no AEoI would also apply to Project Design Option 2.**

OPERATIONAL AND MAINTENANCE PHASE ASSESSMENT

6.4.6.107 During the operational and maintenance phase, potential effects on prey species would be limited to intermittent and localised activities such as maintenance dredging or trenching associated with cable or foundation repair. These activities would be infrequent, short-term and spatially restricted when compared to construction and decommissioning works.

6.4.6.108 Any potential effects on prey species during operational and maintenance would be of the same nature as those assessed for the construction phase (including temporary habitat disturbance, localised increases in SSC and accidental pollution), but would occur at a reduced intensity, extent and frequency.

6.4.6.109 As detailed within the construction phase assessment for Blackwater Bank SAC (Section 6.4.1), predicted impacts on prey species are highly localised, temporary and recoverable, and affect only a very small proportion of available foraging habitat. Given the generalist foraging strategy of grey seals, any short-term or localised changes in prey availability during operation and maintenance would not meaningfully affect foraging success or energetic balance.

6.4.6.110 **With consideration of the highly localised and temporary nature of the impacts described above, the generalist foraging strategy of grey seals and wide available foraging habitat, and the distance of the Proposed Development to the SAC (61.89 km), it is therefore concluded there will be no AEoI of the grey seal QI of the Lambay Island**

SAC, as defined by its COs, as a result of changes in prey resources associated with the operational and maintenance phases for Project Design Option 1.

6.4.6.111 **Based on the representative risk of effect of Project Design Option 1, it is concluded that no AEoI would also apply to Project Design Option 2.**

ACCIDENTAL POLLUTION

6.4.6.112 There is potential for an accidental release of pollutants from vessels and equipment associated with the construction, operational and maintenance, and decommissioning phases of the Proposed Development. Pollutants may include diesel fuel, bentonite (from drilling activities), lubricants, grease and oils, anti-fouling biocides, and grout.

6.4.6.113 In the event of an accidental spill, grey seals could be exposed to contaminants through either direct or indirect pathways. Grey seals are reliant on terrestrial haul-out sites for resting, moulting, and breeding which makes them particularly vulnerable to the effects of pollution should pollution reach their coastal habitats. Seals have been shown to develop conjunctivitis, corneal abrasion, and swollen eyelid membranes in response to exposure to crude oil (Geraci and St. Aubin, 1980). While external oiling is not expected to significantly impact the ability of adult seals to maintain their core body temperature as they rely on blubber for insulation, seal pups entering the water could be vulnerable as oil residues can reduce the thermal properties of neonate animals, increasing their susceptibility to hypothermia (Helm *et al.,* 2015).

CONSTRUCTION AND DECOMMISSIONING PHASE ASSESSMENT

6.4.6.114 The installation and removal of offshore infrastructure for the Proposed Development may lead to the accidental release of pollutants through spills and leaks from vessels and equipment, as outlined in Table 6.8. Potential impacts during the decommissioning phase are expected to be similar to, or less than, those during the construction phase.

6.4.6.115 The magnitude of any accidental pollution event would depend on the type and quantity of material released, with the release of fuel from a construction vessel considered to represent the largest credible spill scenario from installation activities. In the event of an accidental spill from vessels, equipment or from construction activities, pollutants would be subject to immediate dilution and rapid dispersion within the marine environment (Marappan *et al.,* 2022).

6.4.6.116 The likelihood of accidental pollution is considered extremely low due to avoidance through design and management measures (Table 6.7). These include the secure storage and handling of chemicals and hazardous material, double-skinned tanks and pipework where appropriate, chemical risk assessments, and the implementation of an EMP and MPCP. The MPCP sets out emergency response procedures to minimise the scale and duration of any spill should one occur.

6.4.6.117 **Given the inherent low likelihood of an accidental pollution event from vessel activity and other activities, the highly localised nature of any potential exposure, and the mitigation measures (as set out in Table 6.7), it is therefore concluded there will be no AEoI of the grey seal QI of the Lambay Island SAC, as defined by its COs, as a result of accidental pollution associated with the construction and decommissioning phase for Project Design Option 1.**

6.4.6.118 **Based on the representative risk of effect of Project Design Option 1, it is concluded that no AEoI would also apply to Project Design Option 2.**

6.4.6.119 During the operational and maintenance phase, there remains a potential for accidental release of pollutants as a result of the presence of offshore infrastructure, associated equipment, and vessel movements (Table 6.8).

6.4.6.120 The potential pathways, likelihood and consequences of accidental pollution during this phase are consistent with those assessed for the construction phase. The same avoidance through design and management measures, including the EMP and MPCP (Table 6.7), will be implemented throughout operation and maintenance of the Proposed Development.

6.4.6.121 **It is therefore concluded that there will be no AEoI of the grey seal QI of the Lambay Island SAC, as defined by its COs, as a result of accidental pollution associated with the operational and maintenance phase for Project Design Option 1.**

6.4.6.122 **Based on the representative risk of effect of Project Design Option 1, it is concluded that no AEoI would also apply to Project Design Option 2.**

Harbour porpoise

6.4.6.123 The relevant Annex II marine mammal QI site-specific COs at Lambay Island SAC is to is to maintain the favourable conservation condition of the harbour porpoise QI, as defined by the list of attributes and targets set out in Table 5.1 (NPWS, 2024b).

6.4.6.124 There are eight potential impact pathways relevant to harbour porpoise associated with the construction, operational and maintenance, and decommissioning of the Proposed Development (Table 6.8). These pathways have been assessed in detail for Blackwater Bank SAC which is also designated for the same Annex II marine mammal QI and is located approximately 19.13 km from the Proposed Development, compared to approximately 61.89 km for Lambay Island SAC.

6.4.6.125 As the severity and likelihood of all relevant impact pathways are intrinsically distance-dependent, with the spatial extent of predicted effects of the proposed activities decreasing within increasing distance from the Proposed Development. Therefore, as Blackwater Bank SAC represents the closest designated site for harbour porpoise from the Proposed Development, the assessment presented in Section 6.4.1 provides a conservative proxy for the assessment against Lambay Island SAC. This assessment concluded that none of the identified impact pathways would result in an AEoI of Blackwater Bank SAC, with respect to the harbour porpoise QI.

6.4.6.126 Given that Lambay Island SAC supports the same Annex II marine mammal QI and lies substantially further from the Proposed Development, the magnitude of effects at Lambay Island SAC is concluded to be no greater than, and in practice less than, those assessed for Blackwater Bank SAC**. It is therefore concluded that there will be no AEoI of the harbour porpoise QI of the Lambay Island SAC, as defined by its COs, as a result of any of the impacts considered for Project Design Option 1 across any phase.**

6.4.6.127 **Based on the representative risk of effect of Project Design Option 1, it is concluded that no AEoI would also apply to Project Design Option 2.**

6.4.7 Saltee Islands SAC

Grey seal

6.4.7.1 The relevant Annex II marine mammal QI site-specific COs at Saltee Islands SAC is to maintain the favourable conservation condition of the grey seal, as defined by the list of attributes and targets set out in Table 5.1 (NPWS, 2011b).

6.4.7.2 Seven potential impact pathways relevant to grey seal have been identified in relation to the construction, operation and maintenance, and decommissioning of the Proposed Development (Table 6.8). These pathways have been assessed in detail for Lambay Island

SAC, which is designated for the same Annex II marine mammal QI, and is located approximately 61.89 km from the Proposed Development, compared to approximately 93.38 km for Saltee Islands SAC.

6.4.7.3 As the severity and likelihood of all relevant impact pathways are intrinsically distance-dependent, Lambay Island SAC represents the closest designated site for grey seal from the Proposed Development. The assessment presented in Section 6.4.5 therefore provides a conservative basis for evaluation and concluded that none of the identified impact pathways would result in an AEoI of Lambay Island SAC, with respect to the grey seal QI.

6.4.7.4 Given that the Saltee Islands SAC supports the same Annex II marine mammal QI and lies further from the Proposed Development, the magnitude of effects at Saltee Islands SAC is concluded to be no greater than, and in practice less than, those assessed for Lambay Island SAC. **It is therefore concluded that there will be no AEoI of the grey seal QI of the Saltee Islands SAC, as defined by its COs, as a result of any of the impacts considered for Project Design Option 1 across any phase.**

6.4.7.5 **Based on the representative risk of effect of Project Design Option 1, it is concluded that no AEoI would also apply to Project Design Option 2.**

6.4.8 Hook Head SAC

Harbour porpoise

6.4.8.1 The relevant Annex II marine mammal QI site-specific COs at Hook Head SAC is to maintain the favourable conservation condition of the harbour porpoise QI, as defined by the list of attributes and targets set out in Table 5.1 (NPWS, 2025c).

6.4.8.2 Eight potential impact pathways relevant to harbour porpoise have been identified in relation to the construction, operation and maintenance, and decommissioning of the Proposed Development (Table 6.8). These pathways have been assessed in detail for Blackwater Bank SAC which is also designated for the same Annex II marine mammal QI and is located approximately 19.13 km from the Proposed Development, compared to approximately 112.61 km for Hook Head SAC.

6.4.8.3 As the severity and likelihood of all relevant impact pathways are intrinsically distance-dependent, Blackwater Bank SAC represents the closest designated site for harbour porpoise from the Proposed Development. The assessment presented in Section 6.4.1 therefore provides a conservative basis for evaluation and concluded that none of the identified impact pathways would result in an AEoI of Blackwater Bank SAC, with respect to the harbour porpoise QI.

6.4.8.4 Given that Hook Head SAC supports the same Annex II marine mammal QI and lies substantially further from the Proposed Development, the magnitude of effects at Hook Head SAC is concluded to be no greater than, and in practice less than, those assessed for Blackwater Bank SAC. **It is therefore concluded that there will be no AEoI of the harbour porpoise QI of the Hook Head SAC, as defined by its COs, as a result of any of the impacts considered for Project Design Option 1 across any phase.**

6.4.8.5 **Based on the representative risk of effect of Project Design Option 1, it is concluded that no AEoI would also apply to Project Design Option 2.**

Bottlenose dolphin

6.4.8.6 The relevant Annex II marine mammal QI site-specific COs at Hook Head SAC is to maintain the favourable conservation condition of the bottlenose dolphin, as defined by the list of attributes and targets set out in Table 5.1 (NPWS, 2025c).

6.4.8.7 Eight potential impact pathways relevant to bottlenose dolphin have been identified in relation to the construction, operation and maintenance, and decommissioning of the Proposed

Development (Table 6.8). These pathways have been assessed in detail for Lleyn Peninsula and the Sarnau SAC, which is also designated for the same Annex II marine mammal QI and is located approximately 71.35 km from the Proposed Development, compared to approximately 112.61 km for Hook Head SAC.

6.4.8.8 Whilst the detailed assessment has been undertaken for the Lleyn Peninsula and the Sarnau SAC, the assessment is applicable to the Hook Head SAC due to the overlap between the COs. The COs for Lleyn Peninsula and the Sarnau SAC (Table 5.1) include Target 2a under Objective 2 that aligns with Target 1 of Hook Head SAC, that the species range within the site should not be restricted by artificial barriers to site use. The COs for Lleyn Peninsula and the Sarnau SAC also comprise several attributes and targets (under Objectives 1 and 2) that align with Target 2 of Hook Head SAC, that human activities should occur at levels that do not adversely affect the bottlenose dolphin population at the site.

6.4.8.9 As the severity and likelihood of all relevant impact pathways are intrinsically distance-dependent, Lleyn Peninsula and the Sarnau SAC represents the closest designated site for bottlenose dolphin from the Proposed Development. The assessment presented in Section 6.4.18 therefore provides a conservative basis for evaluation and concluded that none of the identified impact pathways would result in an AEoI of Lleyn Peninsula and the Sarnau SAC with respect to the bottlenose dolphin QI.

6.4.8.10 Given that the Lleyn Peninsula and the Sarnau SAC supports the same Annex II marine mammal QI and lies further from the Proposed Development, the magnitude of effects at Lleyn Peninsula and the Sarnau SAC is concluded to no greater than, and in practice less than, those associated for Lleyn Peninsula and the Sarnau SAC**. It is therefore concluded that there will be no AEoI of the bottlenose dolphin QI of the Hook Head SAC, as defined by its COs, as a result of any of the impacts considered for Project Design Option 1 across any phase.**

6.4.8.11 **Based on the representative risk of effect of Project Design Option 1, it is concluded that no AEoI would also apply to Project Design Option 2.**

6.4.9 Roaringwater Bay and Islands SAC

Harbour porpoise

6.4.9.1 The relevant Annex II marine mammal QI site-specific COs at Roaringwater Bay and Islands SAC is to maintain the favourable conservation condition of the harbour porpoise QI, as defined by the list of attributes and targets set out in Table 5.1 (NPWS, 2011d).

6.4.9.2 Eight potential impact pathways relevant to harbour porpoise have been identified in relation to the construction, operation and maintenance, and decommissioning of the Proposed Development (Table 6.8). These pathways have been assessed in detail for Blackwater Bank SAC which is also designated for the same Annex II marine mammal QI and is located approximately 19.13 km from the Proposed Development, compared to approximately 317.71 km for Roaringwater Bay and Islands SAC.

6.4.9.3 As the severity and likelihood of all relevant impact pathways are intrinsically distance-dependent, Blackwater Bank SAC represents the closest designated site for harbour porpoise in relation to the Proposed Development. The assessment presented in Section 6.4.1 therefore provides a conservative basis for evaluation and concluded that none of the identified impact pathways would result in an AEoI of Blackwater Bank SAC, with respect to the harbour porpoise QI.

6.4.9.4 Given that Roaringwater Bay and Islands SAC supports the same Annex II marine mammal QI and lies substantially further from the Proposed Development, the magnitude of effects at Roaringwater Bay and Islands SAC is concluded to be no greater than, and in practice less than, those assessed for Blackwater Bank SAC. **It is therefore concluded that there will be**

no AEoI of the harbour porpoise QI of the Roaringwater Bay and Islands SAC, as defined by its COs, as a result of any of the impacts considered for Project Design Option 1 across any phase.

6.4.9.5 **Based on the representative risk of effect of Project Design Option 1, it is concluded that no AEoI would also apply to Project Design Option 2.**

6.4.10 Kenmare River SAC

Harbour porpoise

6.4.10.1 The relevant Annex II marine mammal QI site-specific COs at Kenmare River SAC is to maintain the favourable conservation condition of the harbour porpoise QI, as defined by the list of attributes and targets set out in Table 5.1 (NPWS, 2026a).

6.4.10.2 Eight potential impact pathways relevant to harbour porpoise have been identified in relation to the construction, operation and maintenance, and decommissioning of the Proposed Development (Table 6.8). These pathways have been assessed in detail for Blackwater Bank SAC which is also designated for the same Annex II marine mammal QI and is located approximately 19.13 km from the Proposed Development, compared to approximately 374.31 km for Kenmare River SAC.

6.4.10.3 As the severity and likelihood of all relevant impact pathways are intrinsically distance-dependent, Blackwater Bank SAC represents the closest designated site for harbour porpoise from the Proposed Development. The assessment presented in Section 6.4.1 therefore provides a conservative basis for evaluation and concluded that none of the identified impact pathways would result in an AEoI of Blackwater Bank SAC, with respect to the harbour porpoise QI.

6.4.10.4 Given that the Kenmare River SAC supports the same Annex II marine mammal QI and lies substantially further from the Proposed Development, the magnitude of any potential effects at Kenmare River SAC is concluded to be no greater than, and in practice less than, those assessed for Blackwater Bank SAC. **It is therefore concluded that there will be no AEoI of the harbour porpoise QI of the Kenmare River SAC, as defined by its COs, as a result of any of the impacts considered for Project Design Option 1 across any phase.**

6.4.10.5 **Based on the representative risk of effect of Project Design Option 1, it is concluded that no AEoI would also apply to Project Design Option 2.**

6.4.11 Blasket Islands SAC

Harbour porpoise

6.4.11.1 The relevant Annex II marine mammal QI site-specific COs at Blasket Island SAC is to maintain the favourable conservation condition of the harbour porpoise QI, as defined by the list of attributes and targets set out in Table 5.1 (NPWS, 2014).

6.4.11.2 Eight potential impact pathways relevant to harbour porpoise have been identified in relation to the construction, operation and maintenance, and decommissioning of the Proposed Development (Table 6.8). These pathways have been assessed in detail for Blackwater Bank SAC which is also designated for the same Annex II marine mammal QI and is located approximately 19.13 km from the Proposed Development, compared to approximately 428.43 km for Blasket Islands SAC.

6.4.11.3 As the severity and likelihood of all relevant impact pathways are intrinsically distance-dependent, Blackwater Bank SAC represents the closest designated site for harbour porpoise from the Proposed Development. The assessment presented in Section 6.4.1 provides a therefore conservative basis for evaluation and concluded that none of the identified impact

pathways would result in an AEoI of Blackwater Bank SAC, with respect to the harbour porpoise QI.

6.4.11.4 Given that the Blasket Islands SAC supports the same Annex II marine mammal QI and lies substantially further from the Proposed Development, the magnitude of effects at the Blasket Islands SAC is concluded to be no greater than, and in practice less than, those associated for Blackwater Bank SAC. **It is therefore concluded that there will be no AEoI of the harbour porpoise QI of the Blasket Islands SAC, as defined by its COs, as a result of any of the impacts considered for Project Design Option 1 across any phase.**

6.4.11.5 **Based on the representative risk of effect of Project Design Option 1, it is concluded that no AEoI would also apply to Project Design Option 2.**

6.4.12 Belgica Mound Province SAC

Harbour porpoise

6.4.12.1 The relevant Annex II marine mammal QI site-specific COs at Belgica Mound Province SAC is to maintain the favourable conservation condition of the harbour porpoise QI, as defined by the list of attributes and targets set out in Table 5.1 (NPWS, 2025d).

6.4.12.2 Eight potential impact pathways relevant to harbour porpoise have been identified in relation to the construction, operation and maintenance, and decommissioning of the Proposed Development (Table 6.8). These pathways have been assessed in detail for Blackwater Bank SAC which is also designated for the same Annex II marine mammal QI and is located approximately 19.13 km from the Proposed Development, compared to approximately 468.39 km for the Belgica Mound Province SAC.

6.4.12.3 As the severity and likelihood of all relevant impact pathways are intrinsically distance-dependent, Blackwater Bank SAC represents the closest designated site for harbour porpoise from the Proposed Development. The assessment presented in Section 6.4.1 therefore provides a conservative basis for evaluation and concluded that none of the identified impact pathways would result in an AEoI of Blackwater Bank SAC, with respect to the harbour porpoise QI.

6.4.12.4 Given the Belgica Mound Province SAC supports the same Annex II marine mammal QI and lies substantially further from the Proposed Development, the magnitude of effects at the Belgica Mound Province SAC is concluded to be no greater than, and in practice less than, those associated for Blackwater Bank SAC. **It is therefore concluded that there will be no AEoI of the harbour porpoise QI of the Belgica Mound Province SAC, as defined by its COs, as a result of any of the impacts considered for Project Design Option 1 across any phase.**

6.4.12.5 **Based on the representative risk of effect of Project Design Option 1, it is concluded that no AEoI would also apply to Project Design Option 2.**

6.4.13 Bunduff Lough and Machair / Trawalua / Mullaghmore SAC

Harbour porpoise

6.4.13.1 The site-specific COs for the Annex II harbour porpoise QI at Bunduff Lough and Machair / Trawalua / Mullaghmore SAC have not yet been published, as this feature was only recently added to the site designation in 2024. In the absence of formal site-specific CO attributes and targets, this assessment adopts a precautionary approach, informed by all available documentation relevant to the Bunduff Lough and Machair / Trawalua / Mullaghmore SAC and its Annex II harbour porpoise QI. This includes NPWS site documentation (NPWS, 2015; NPWS, 2024k), the Standard Data Form for the site (EEA, 2025s), and wider scientific and survey information on harbour porpoise occurrence in the surrounding region. Understanding

of likely COs is further informed by the consistent method applied by NPWS in defining COs for harbour porpoise SACs in Ireland.

6.4.13.2 For all harbour porpoise QI SACs for which NPWS has published COs, the overarching objective is to maintain the favourable conservation condition of the species by ensuring continued access to suitable habitat and avoiding disturbance at levels that could adversely affect the harbour porpoise community at the site (Table 5.1; see full detail in Section 6.4.1.1) In the absence of published site-specific COs for the harbour porpoise QI at Bunduff Lough and Machair / Trawalua / Mullaghmore SAC, these attributes and objectives are considered to provide useful context on the potential sensitivities of the harbour porpoise QI. . It is highlighted that these COs are in place for multiple nearby SACs that support the same QI, including Inishmore Island SAC (NPWS, 2024d; Section 6.4.14), West Connact Coast SAC (NPWS, 2025e; Section 6.4.16) and Belgica Mound Province SAC (NPWS, 2025d; Section 6.4.12).

6.4.13.3 Supporting information on harbour porpoise occurrence, distribution and habitat use within the wider regional near to Bunduff Lough and Machair / Trawalua / Mullaghmore SAC has also been included in the assessment. This comprises targeted cetaceans surveys undertaken at nearby SACs, namely West Connacht Coast SAC (Berrow *et al.*, 2021) and Roaringwater Bay and Islands SAC (O'Brien and Berrow, 2015), which provide baseline data on species presence, relative abundance or density, spatial distribution, and indirectly, habitat associations. The Standard Data Form for Bunduff Lough and Machair / Trawalua / Mullaghmore SAC (EEA, 2025s) confirms that harbour porpoise have a permanent presence within the SAC and surrounding waters across all seasons, with groups regularly observed in the SAC and adjacent areas, demonstrating functional use of the site by the species.

6.4.13.4 When considered alongside the wider scientific literature (see Section 6.3.2), these data provide additional context on harbour porpoise habitat use and informs the identification of relevant ecological sensitivities. Key considerations include disturbance from human activities, degradation or loss of suitable habitat, barriers to movement or access to foraging areas, and other pressures documented for the site such as fishing, shipping, pollution, invasive species, and climate related impacts (EEA, 2025s). This combined information supports the assessment of potential impact pathways for Bunduff Lough and Machair / Trawalua / Mullaghmore SAC.

6.4.13.5 Eight potential impact pathways relevant to harbour porpoise have been identified in relation to the construction, operation and maintenance, and decommissioning of the Proposed Development (Table 6.8). These pathways have been assessed in detail for Blackwater Bank SAC which is also designated for the same Annex II marine mammal QI and is located approximately 19.13 km from the Proposed Development, compared to approximately 537.75 km for Bunduff Lough and Machair / Trawalua / Mullaghmore SAC.

6.4.13.6 As the severity and likelihood of all relevant impact pathways are intrinsically distance-dependent, Blackwater Bank SAC represents the closest designated site for harbour porpoise from the Proposed Development. The assessment presented in Section 6.4.1 therefore provides a conservative basis for evaluation and concluded that none of the identified impact pathways would result in an AEoI of Blackwater Bank SAC, with respect to the harbour porpoise QI.

6.4.13.7 Given that Bunduff Lough and Machair / Trawalua / Mullaghmore SAC supports the same Annex II marine mammal QI and lies substantially further from the Proposed Development, the magnitude of effects at Bunduff Lough and Machair / Trawalua / Mullaghmore SAC is concluded to be no greater, and in practice less than, those assumed for Blackwater Bank SAC. There is therefore no pathway by which the Proposed Development could restrict access to suitable habitat within the Bunduff Lough and Machair / Trawalua / Mullaghmore SAC or result in disturbance at levels capable of adversely affecting harbour porpoise using the SAC. **It is therefore concluded that there will be no AEoI of the harbour porpoise QI of the**

Bunduff Lough and Machair / Trawalua / Mullaghmore SAC, as a result of any of the impacts considered for Project Design Option 1 across any phase.

6.4.13.8 **Based on the representative risk of effect of Project Design Option 1, it is concluded that no AEoI would also apply to Project Design Option 2.**

6.4.14 Inishmore Island SAC

Harbour porpoise

6.4.14.1 The relevant Annex II marine mammal QI site-specific COs at Inishmore Island SAC is to maintain the favourable conservation condition of the harbour porpoise QI, as defined by the list of attributes and targets set out in Table 5.1 (NPWS, 2024d).

6.4.14.2 Eight potential impact pathways relevant to harbour porpoise have been identified in relation to the construction, operation and maintenance, and decommissioning of the Proposed Development (Table 6.8). These pathways have been assessed in detail for Blackwater Bank SAC which is also designated for the same Annex II marine mammal QI and is located approximately 19.13 km from the Proposed Development, compared to approximately 552.21 km for Inishmore Island SAC.

6.4.14.3 As the severity and likelihood of all relevant impact pathways are intrinsically distance-dependent, Blackwater Bank SAC represents the closest designated site for harbour porpoise from the Proposed Development. The assessment presented in Section 6.4.1 therefore provides a conservative basis for evaluation and concluded that none of the identified impact pathways would result in an AEoI of Blackwater Bank SAC, with respect to the harbour porpoise QI.

6.4.14.4 Given that Inishmore Island SAC supports the same Annex II marine mammal QI and lies substantially further from the Proposed Development, the magnitude of effects at Inishmore Island SAC is concluded to be no greater than, and in practice less than, those assessed for Blackwater Bank SAC. **It is therefore concluded that there will be no AEoI of the harbour porpoise QI of the Inishmore Island SAC, as defined by its COs, as a result of any of the impacts considered for Project Design Option 1 across any phase.**

6.4.14.5 **Based on the representative risk of effect of Project Design Option 1, it is concluded that no AEoI would also apply to Project Design Option 2.**

6.4.15 Kilkieran Bay and Islands SAC

Harbour porpoise

6.4.15.1 The relevant Annex II marine mammal QI site-specific COs at Kilkieran Bay and Islands SAC is to maintain the favourable conservation condition of the harbour porpoise QI, as defined by the list of attributes and targets set out in Table 5.1 (NPWS, 2026b).

6.4.15.2 Eight potential impact pathways relevant to harbour porpoise have been identified in relation to the construction, operation and maintenance, and decommissioning of the Proposed Development (Table 6.8). These pathways have been assessed in detail for Blackwater Bank SAC which is also designated for the same Annex II marine mammal QI and is located approximately 19.13 km from the Proposed Development, compared to approximately 565.64 km from Kilkieran Bay and Islands SAC.

6.4.15.3 As the severity and likelihood of all relevant impact pathways are intrinsically distance-dependent, Blackwater Bank SAC represents the closest designated site for harbour porpoise from the Proposed Development. The assessment presented in Section 6.4.1 therefore provides a conservative basis for evaluation and concluded that none of the identified impact pathways would result in an AEoI of Blackwater Bank SAC, with respect to the harbour porpoise QI.

6.4.15.4 Given that Kilkieran Bay and Islands SAC supports the same Annex II marine mammal QI and lies substantially further from the Proposed Development, the magnitude of effects at Kilkieran Bay and Islands SAC is concluded to be no greater than, and in practice less than, those assessed for Blackwater Bank SAC. **It is therefore concluded that there will be no AEoI of the harbour porpoise QI of the Kilkieran Bay and Islands SAC, as defined by its COs, as a result of any of the impacts considered for Project Design Option 1 across any phase.**

6.4.15.5 **Based on the representative risk of effect of Project Design Option 1, it is concluded that no AEoI would also apply to Project Design Option 2.**

6.4.16 West Connacht Coast SAC

Harbour porpoise

6.4.16.1 The relevant Annex II marine mammal QI site-specific CO at West Connacht Coast SAC is to maintain the favourable conservation condition of the harbour porpoise QI, as defined by the list of attributes and targets set out in Table 5.1 (NPWS, 2025e).

6.4.16.2 Eight potential impact pathways relevant to harbour porpoise have been identified in relation to the construction, operation and maintenance, and decommissioning of the Proposed Development (Table 6.8). These pathways have been assessed in detail for Blackwater Bank SAC which is also designated for the same Annex II marine mammal QI and is located approximately 19.13 km from the Proposed Development, compared to approximately 608.16 km for West Connacht Coast SAC.

6.4.16.3 As the severity and likelihood of all relevant impact pathways are intrinsically distance-dependent, Blackwater Bank SAC represents the closest designated site for harbour porpoise from the Proposed Development. The assessment presented in Section 6.4.1 provides a conservative basis for evaluation and concluded that none of the identified impact pathways would result in an AEoI of Blackwater Bank SAC, with respect to the harbour porpoise QI.

6.4.16.4 Given that West Connacht Coast SAC supports the same Annex II marine mammal QI and lies substantially further from the Proposed Development, the magnitude of effects at West Connacht Coast SAC is concluded to be no greater than, and in practice less than, those assessed for Blackwater Bank SAC. **It is therefore concluded that there will be no AEoI of the harbour porpoise QI of the West Connacht Coast SAC, as defined by its COs, as a result of any of the impacts considered for Project Design Option 1 across any phase.**

6.4.16.5 **Based on the representative risk of effect of Project Design Option 1, it is concluded that no AEoI would also apply to Project Design Option 2.**

Transboundary sites within the UK

6.4.17 West Wales Marine / Gorllewin Cymru Forol SAC

Harbour porpoise

6.4.17.1 The relevant Annex II marine mammal QI site-specific CO at West Wales Marine SAC is to ensure that the integrity of the site is maintained and that it makes the best possible contribution to maintaining FCS for harbour porpoise in UK waters, as defined by the list of attributes and targets set out in Table 5.1 (NRW, 2019a).

6.4.17.2 Eight potential impact pathways relevant to harbour porpoise have been identified in relation to the construction, operation and maintenance, and decommissioning of the Proposed Development (Table 6.8). These pathways have been assessed in detail for Blackwater Bank SAC which is also designated for the same Annex II marine mammal QI and is located

approximately 19.13 km from the Proposed Development, compared to approximately 49.75 km from West Wales Marine SAC.

6.4.17.3 As the severity and likelihood of all relevant impact pathways are intrinsically distance-dependent, Blackwater Bank SAC represents the closest designated site for harbour porpoise from the Proposed Development. The assessment presented in Section 6.4.1 therefore provides a conservative basis for evaluation and concluded that none of the identified impact pathways would result in an AEoI of Blackwater Bank SAC, with respect to the harbour porpoise QI.

6.4.17.4 Given that West Wales Marine SAC supports the same Annex II marine mammal QI and lies substantially further away from the Proposed Development, the magnitude of effects at West Wales Marine SAC is concluded to be no greater than, and in practice less than, those assessed for Blackwater Bank SAC. **It is therefore concluded that there will be no AEoI of the harbour porpoise QI of the West Wales Marine / Gorllewin Cymru Forol SAC, as defined by its COs, as a result of any of the impacts considered for Project Design Option 1 across any phase.**

6.4.17.5 **Based on the representative risk of effect of Project Design Option 1, it is concluded that no AEoI would also apply to Project Design Option 2.**

6.4.18 North Anglesey Marine / Gogledd Môn Forol SAC

Harbour porpoise

6.4.18.1 The relevant Annex II marine mammal QI site-specific COs at North Anglesey Marine SAC is to ensure that the integrity of the site is maintained and that it makes the best possible contribution to maintaining FCS for harbour porpoise in UK waters, as defined by the list of attributes and targets set out in Table 5.1 (NRW, 2019b).

6.4.18.2 Eight potential impact pathways relevant to harbour porpoise have been identified in relation to the construction, operation and maintenance, and decommissioning of the Proposed Development (Table 6.8). These pathways have been assessed in detail for Blackwater Bank SAC which is also designated for the same Annex II marine mammal QI and is located approximately 19.13 km from the Proposed Development, compared to approximately 61.61 km from North Anglesey Marine SAC.

6.4.18.3 As the severity and likelihood of all relevant impact pathways are intrinsically distance-dependent, Blackwater Bank SAC represents the closest designated site for harbour porpoise from the Proposed Development. The assessment presented in Section 6.4.1 therefore provides a conservative basis for evaluation and concluded that none of the identified impact pathways would result in an AEoI of Blackwater Bank SAC, with respect to the harbour porpoise QI.

6.4.18.4 Given that North Anglesey Marine SAC supports the same Annex II marine mammal QI and lies substantially further away from the Proposed Development, the magnitude of effects at North Anglesey Marine SAC is concluded to be no greater than, and in practice less than, those assessed for Blackwater Bank SAC. **It is therefore concluded that there will be no AEoI of the harbour porpoise QI of the North Anglesey Marine / Gogledd Môn Forol SAC, as defined by its COs, as a result of any of the impacts considered for Project Design Option 1 across any phase.**

6.4.18.5 **Based on the representative risk of effect of Project Design Option 1, it is concluded that no AEoI would also apply to Project Design Option 2.**

6.4.19 Lleyn Peninsula and the Sarnau / Pen Llyn a'r Sarnau SAC

Bottlenose dolphin

6.4.19.1 The relevant Annex II marine mammal QI site-specific COs at Lleyn Peninsula and the Sarnau SAC for bottlenose dolphin at this designated site is to maintain the FCS of the bottlenose dolphin QI, as defined by the following list of objectives, attributes and targets (NRW, 2025a; Table 5.1).

- *Objective 1:* The bottlenose dolphin population that use the SAC is maintained in favourable condition and stable or increasing over the medium and long term:
  - Population using the SAC: Population demographics such as reproductive success and survival rates are at levels needed for the population to be maintained in favourable condition; and
  - SAC residency: Maintain bottlenose dolphin residency in the SAC over the medium and long term.
- *Objective 2:* The bottlenose dolphin population that use the SAC continue to have access to, and be able to utilise habitats necessary to maintain the population in favourable condition:
  - Accessibility to habitat used by bottlenose dolphin: Bottlenose dolphins that use the SAC should not be significantly constrained from accessing necessary habitats within or outside of the site; and
  - Anthropogenic disturbance: Bottlenose dolphin that use the SAC should not be subject to significant anthropogenic disturbance within or outside of the site.
- *Objective 3:* The bottlenose dolphin population that use the SAC have high quality habitat and sufficient food supply to support and maintain the population in favourable condition:
  - Habitat quality and function: Maintain the quality and function to support the bottlenose dolphin population that use the SAC in favourable condition;
  - Prey availability: Maintain the quality, abundance and diversity of prey needed for the bottlenose dolphin population that use the SAC in favourable condition; and
  - Water, sediment and prey contaminants: Contaminants are at levels not detrimental to the bottlenose dolphin population that use the SAC.

6.4.19.2 There are eight potential impacts on bottlenose dolphin associated with the construction, operational and maintenance, and decommissioning of the Proposed Development, which are presented in Table 6.8 and are assessed below for each phase of the Proposed Development.

INJURY AND/ OR DISTURBANCE FROM UNDERWATER NOISE FROM PILING

6.4.19.3 As covered in previous site assessment for other Annex II marine mammal receptors (Sections 6.4.1, 6.4.2, and 6.4.5), underwater noise has the potential to impact marine mammals where the sound frequencies fall within their hearing range and sound levels exceed relevant injury or disturbance thresholds.

6.4.19.4 With consideration of bottlenose dolphin, they are classified within the High Frequency (HF) cetacean FHG and have an estimated hearing range of 150 Hz to 160 kHz (Southall *et al.*, 2019). Underwater noise generated by piling activities associated with the Proposed Development falls within this hearing range and exceeds noise impact thresholds. Therefore, this activity has the potential to result in auditory injury, behavioural disturbance or temporary displacement, depending on sound level, duration of exposure and proximity to the source.

6.4.19.5 For each mitigated piling scenario (see Section 6.4.1.12), predicted impacts to bottlenose dolphin were informed by three regional density estimates (see Table 6.6) and using the thresholds for impulsive noise outlined in Table 6.9. Full details of the underwater noise modelling methodology and the resulting impact areas and ranges are detailed in the

Underwater Noise Assessment (NIS Volume III, Appendix 11.1: Underwater Noise Assessment (Revised March 2026)).

CONSTRUCTION PHASE ASSESSMENT

AUDITORY INJURY (PTS)

6.4.19.6 Predicted impact areas and maximum ranges for auditory injury (PTS-onset) to bottlenose dolphins from pile driving during construction from the Proposed Development, across both mitigated piling scenarios (ramp-up mitigation scenario and extended ramp-up mitigation scenario), are presented in Table 6.28Table 6.19: Predicted impact range of PTS-onset from pile driving at the SW WTG array location with harbour seal density estimates. For further information on densities used; see .

6.4.19.7 For the ramp-up mitigation scenario, the maximum instantaneous PTS-onset impact range was predicted to be less than 50 m for the installation of a 11 m monopile at all piling locations (Table 6.28Table 6.19: Predicted impact range of PTS-onset from pile driving at the SW WTG array location with harbour seal density estimates. For further information on densities used; see). Based on the highest regional density estimate, the SCANS-IV density estimate (Gilles *et al.,* 2023), this equates to a maximum of one individual potentially experiencing auditory injury, representing less than 0.01% of the reference population of 293 within the Irish Sea MU (IAMMWG, 2023). Using the cumulative PTS-onset thresholds, the maximum impact range at all piling locations also remained below 50 m, corresponding to a maximum of one individual (<0.01% of the MU reference population; Table 6.28).

6.4.19.8 With the implementation of the extended ramp-up mitigation scenario, the maximum instantaneous PTS-onset impact range remained at below 50 m at all piling locations, again equating to a maximum of one individual (<0.01% of the MU reference population; Table 6.28). Predicted cumulative PTS-onset impact ranges likewise remained below 50 m at all piling locations, equating to a maximum of one individual experiencing auditory injury (<0.01% of the MU reference population; Table 6.28).

6.4.19.9 Overall, predicted auditory injury to bottlenose dolphins from pile driving during construction is extremely limited in spatial extent and scale at all piling locations. The C WTG location represents the most relevant piling location in relation to Lleyn Peninsula and the Sarnau SAC and also corresponds to the location where the largest predicted impact ranges occur; however, even at this location, the scale of predicted impacts remains minimal and highly localised.

Table 6.28: Predicted impact range of PTS-onset from pile driving at the C WTG array location with bottlenose dolphin density estimates. For further information on densities used; see Table 6.6.

Piling Scenario	Piling location and Monopile diameter (m)		Density (animals/km²)	Area (km²)	Maximum range (m)	Number of animals[1,2]	Percentage of reference population[2] (%)
Instantaneous PTS-onset (unweighted SPL_{peak})							
Ramp-up mitigation scenario	C WTG	11 m	0.0201	<0.01	<50	<1	<0.01
			0.2352			<1	<0.01
			0.198099			<1	<0.01
Extended ramp-up mitigation scenario	C WTG	11 m	0.0201	<0.01	<50	<1	<0.01
			0.2352			<1	<0.01
			0.116527			<1	<0.01
Cumulative PTS-onset (weighted SEL_{cum})							
Ramp-up mitigation scenario	C WTG	11 m	0.0201	<0.01	<50	<1	<0.01
			0.2352			<1	<0.01

Piling Scenario	Piling location and Monopile diameter (m)		Density (animals/km²)	Area (km²)	Maximum range (m)	Number of animals[1,2]	Percentage of reference population[2] (%)
			0.116527			<1	<0.01
Extended ramp-up mitigation scenario	C WTG	11 m	0.0201	<0.01	<50	<1	<0.01
			0.2352			<1	<0.01
			0.116527			<1	<0.01

[1]*The predicted number of individuals exposed to PTS-onset (both instantaneous and cumulative) from pile driving is fewer than one animal across all density scenarios. Importantly, the maximum PTS-onset impact range falls entirely within the 1,000 m Rsafe mitigation distance. With the implementation of the extended ramp-up mitigation procedure and associated MMMP measures (monitoring and soft-start procedures), marine mammals are expected to be displaced from the impact area prior to the onset of full hammer energy. Consequently, no animals are expected to be exposed to sound levels capable of causing auditory injury (PTS).*

[2]*The number of animals disturbed and the reference population are representative of the Irish Sea MU population (IAMMWG, 2023). The number of animals disturbed is not representative of the numbers disturbed within the Lleyn Peninsula and the Sarnau SAC.*

6.4.19.10 As considered within the harbour porpoise underwater noise assessment in Section 6.4.1, evidence indicates that there are frequency-specific differences in the onset and progression of noise-induced threshold shifts, depending on the characteristics of the noise source and hearing sensitivity of the receiving species. At a UK BEIS-funded export elicitation workshop in 2018, it was concluded that the probability of PTS significantly affecting the survival and reproduction of bottlenose dolphins was very low, assuming an impact a 6 dB PTS in the 2 – 10 kHz frequency range (Booth *et al.,* 2019).

6.4.19.11 Although PTS represents a permanent auditory effect, the most likely response of marine mammals to noise levels capable of inducing TTS is behavioural avoidance of the noise source (Southall *et al.,* 2007). As such, individuals exposed to increasing noise levels are expected to move away from the source before experiencing more severe auditory effects.

6.4.19.12 Available evidence does not indicate that bottlenose dolphins are likely to experience population-level effects as a result of PTS at the very small spatial scales predicted for the Proposed Development (Kastelein *et al.*, 2017). The likelihood of auditory injury occurring, and of such an injury resulting in meaningful effects on individual fitness, is considered very low.

6.4.19.13 In addition, the Developer has committed to the implementation of project-specific mitigation measures during piling activities, as set out within the MMMP (NIS Volume III, Appendix 25.2: Marine Mammal Mitigation Plan (Revised March 2026)), which are applicable to both cetacean and pinniped receptors. These measures are designed to minimise the risk of auditory injury (PTS) to bottlenose dolphins arising from piling-related underwater noise to a negligible level and will, as a minimum, adhere to relevant international best practice, including DAHG (2014) guidance (Table 6.7).

6.4.19.14 In relation to the site-specific COs for Lleyn Peninsula and the Sarnau SAC (Table 5.1), the potential effects of underwater noise associated with pile driving on the bottlenose dolphin QI have been assessed with respect to the attributes relating to maintaining the population in favourable condition, residency, continued accessibility to supporting habitats and anthropogenic disturbance.

6.4.19.15 With regarding accessibility to suitable habitat and anthropogenic disturbance, pile driving activities and associated underwater noise capable of resulting in auditory injury (PTS) that would be short-term and temporary in nature and would not result in permanent habitat exclusion or create a barrier to site use. Predicted PTS-onset impact ranges (maximum of less than 50 m) are limited in spatial extent and substantially smaller than the distance to Lleyn Peninsula and the Sarnau SAC (approximately 71.91 km from the closest piling location) and do not overlap the SAC boundary. As such, bottlenose dolphins within the SAC will not be exposed to levels of underwater noise capable of causing in auditory injury. Any highly unlikely auditory injury to individuals occurring outside the SAC would not constrain access to habitats within the site.

6.4.19.16 Regarding the population and residency attributes, even in the highly unlikely event that an individual experienced PTS-onset, available evidence indicates that such injury would be unlikely to result in significantly effects on individual survival or reproductive success (Kastelein *et al.*, 2017), particularly at the very small numbers predicted (maximum one individual, or <0.01% of the reference population). Therefore, pile driving activities are not expected to introduce anthropogenic noise at levels that could affect the population using the site or their residency in the site, and therefore they will not affect the condition of, or the contribution to FCS by, bottlenose dolphins associated with the Lleyn Peninsula and the Sarnau SAC.

6.4.19.17 **With consideration of the implementation of the extended ramp-up scenario and project-specific MMMP measures ensuring that no animals are within the area of predicted auditory injury (PTS-onset) ranges, the absence of overlap with the SAC (with the greatest predicted impact range of up to 50 m), and the negligible number and proportion of the wider MU potentially affected (<1 and <0.01%, respectively), it is therefore concluded there**

will be no AEoI of the bottlenose dolphin feature of the Lleyn Peninsula and the Sarnau SAC / Pen Llyn a'r Sarnau SAC, as defined by its COs, as a result of auditory injury due to underwater noise associated with piling for Project Design Option 1.

6.4.19.18 **Based on the representative risk of effect of Project Design Option 1, it is considered that the same conclusion of no AEoI would also apply to Project Design Option 2.**

BEHAVIOURAL DISTURBANCE

6.4.19.19 The predicted number of bottlenose dolphins that may experience behavioural disturbance as a result of pile driving during construction is presented in Table 6.29. Disturbance has been assessed using two approaches and expressed as a proportion of the relevant reference population (Table 6.6):

- Application of dose-response relationship for impulsive noise developed for harbour porpoise (Graham *et al.*, 2019); and
- Comparison against the United States (US) National Marine Fisheries Service (NMFS) Level B harassment threshold for strong behavioural disturbance (NOAA, 2023), to provide additional context on the likely extent of disturbance.

6.4.19.20 In the absence of species-specific dose-response data for bottlenose dolphins, the harbour porpoise dose-response relationship has been applied on a precautionary basis. This approach is considered highly conservative, as harbour porpoises are well documented as being the most behaviourally sensitive cetacean to anthropogenic noise, frequently exhibiting avoidance and reduced vocalisation in response to a range of noise sources (e.g. Benhemma-Le Gall *et al.*, 2021; Brandt *et al.*, 2013; 2018; Thompson *et al.*, 2013a; 2020; Sarnocińska *et al.*, 2020). In contrast, bottlenose dolphins have generally shown to exhibit weaker or more context-dependent behavioural response to impulsive noise (Fernandez-Betelu *et al.*, 2021; Kastelein *et al.*, 2006; Stone *et al.*, 2017).

6.4.19.21 For the ramp-up mitigation scenario, using the dose-response curve and uniform density estimate of 0.0201 animals/km^2 from the ObSERVE surveys (Rogan *et al.*, 2018), it was estimated that a maximum of 101 animals (34.47% of the Irish Sea MU reference population of 293 animals; IAMMWG, 2023) will experience behavioural disturbance as a result of pile driving of the 11 m monopile at the C WTG location (Table 6.29). This approach is considered to be conservative because it assumes that the density within the relevant survey stratum (Stratum 5; western Irish Sea) is the same across the wider extent of the Irish Sea of which the noise contours extend across.

6.4.19.1 Whereas, using the higher uniform density estimate of 0.2352 animals/km^2 from the wider SCANS-IV surveys (Gilles *et al.*, 2023), it was estimated that a maximum of 1,181 animals (403.07% of the Irish Sea MU reference population) will experience behavioural disturbance as a result of pile driving of the 11 m monopile at the C WTG location (Table 6.29). This output is also not considered to be a robust indicator of population-level exposure as it assumes a uniform density and does not capture the variability in coastal and offshore population bottlenose dolphin densities and distributions within the Irish Sea.

6.4.19.2 Therefore, in order to account for this non-uniform density of bottlenose dolphin across the Irish Sea, further modelled density surfaces derived from SCANS-IV were also used to calculate the number of individuals disturbed. Using this approach, it was estimated that a maximum of 995 individuals (339.59% of the reference Irish Sea MU reference population) will experience behavioural disturbance as a result of pile driving of the 11 m monopile at the C WTG location (Table 6.29).

6.4.19.3 The approach of using the dose-response curve resulted in predicted numbers that in some cases exceed the Irish Sea MU reference population size of 293 animals (IAMMWG, 2023). Therefore, these calculations are not considered to be robust indicators of population-level exposure.

6.4.19.4 This apparent overestimation reflects recognised limitations in the MU population estimate, which is based on broad-scale surveys, such as SCANS data, and does not fully capture localised coastal or semi-resident bottlenose dolphin populations in the Irish Sea. For example, the most recent abundance estimate for the semi-resident bottlenose dolphin population at Cardigan Bay in West Wales (which is in the Irish Sea MU) alone were 232 individuals (95% CI: 119 to 451; Cuthbertson *et al.*, 2025). In addition, telemetry and photo-identification studies demonstrate large scale movement of bottlenose dolphins across the Irish Sea, the west coast of Ireland and the wider northeast Atlantic (O'Brien *et al.*, 2009; Robinson *et al.*, 2012), indicating that the Irish Sea MU reference population size is likely to be an under-representation of the number of bottlenose dolphins that may be present in the MU.

6.4.19.5 Furthermore, it is important to highlight the significant difference between the SCANS-III and SCANS-IV abundance estimates of bottlenose dolphins in the Irish Sea. The SCANS-IV abundance estimate for the Irish Sea (blocks CS-D and CS-E) is 8,326 animals (Gilles *et al.*, 2023) whereas the Irish Sea MU population is derived from the lower SCANS-III abundance estimates, resulting in a population size of 293 (IAMMWG, 2023). As a result, the number of animals predicted to be disturbed using the density estimate from SCANS-IV is not compatible with the MU population size, resulting in a highly unrealistic proportion of the MU population estimated as impacted given that the population size is under-estimated. If the population size is taken to be 8,326 animals, the percentage of the population predicted to be disturbed reduces to 14.18%, when assuming 1,181 animals are disturbed using the dose-response curve.

6.4.19.6 The modelled disturbance contours are predicted to overlap with the Lleyn Peninsula and the Sarnau SAC. However, only the contours below 140 dB overlap, at which point the probability of a disturbance response in individuals exposed to noise is 1.2-18.5%, indicating that most animals in the site will not experience disturbance as a result of exposure to the noise. These contours represent sound levels associated with temporary and reversible behavioural responses rather than injury, and do not imply displacement from the site (Figure 6.16).

Table 6.29: Predicted impact of disturbance to bottlenose dolphin from pile driving at C WTG location using dose-response curves. For further information on densities used; see Table 6.6

Piling Scenario	Piling location and Monopile diameter (m)		Density (animals/km^2)	Number of animals disturbed[1]	Percentage of reference population[1] (%)
Ramp-up and extended ramp-up mitigation scenarios	C WTG	11 m	0.0201	101	34.47
			0.2352	1,181	403.07
			0.198099	995	339.59

[1]*The number of animals disturbed and the reference population are representative of the Irish Sea MU population (IAMMWG, 2023). The number of animals disturbed is not representative of the numbers disturbed within the Lleyn Peninsula and the Sarnau SAC.*

6.4.19.7 Overall, it is expected that the probability of bottlenose dolphin behavioural response to underwater noise from pile driving would be lower than predicted above.

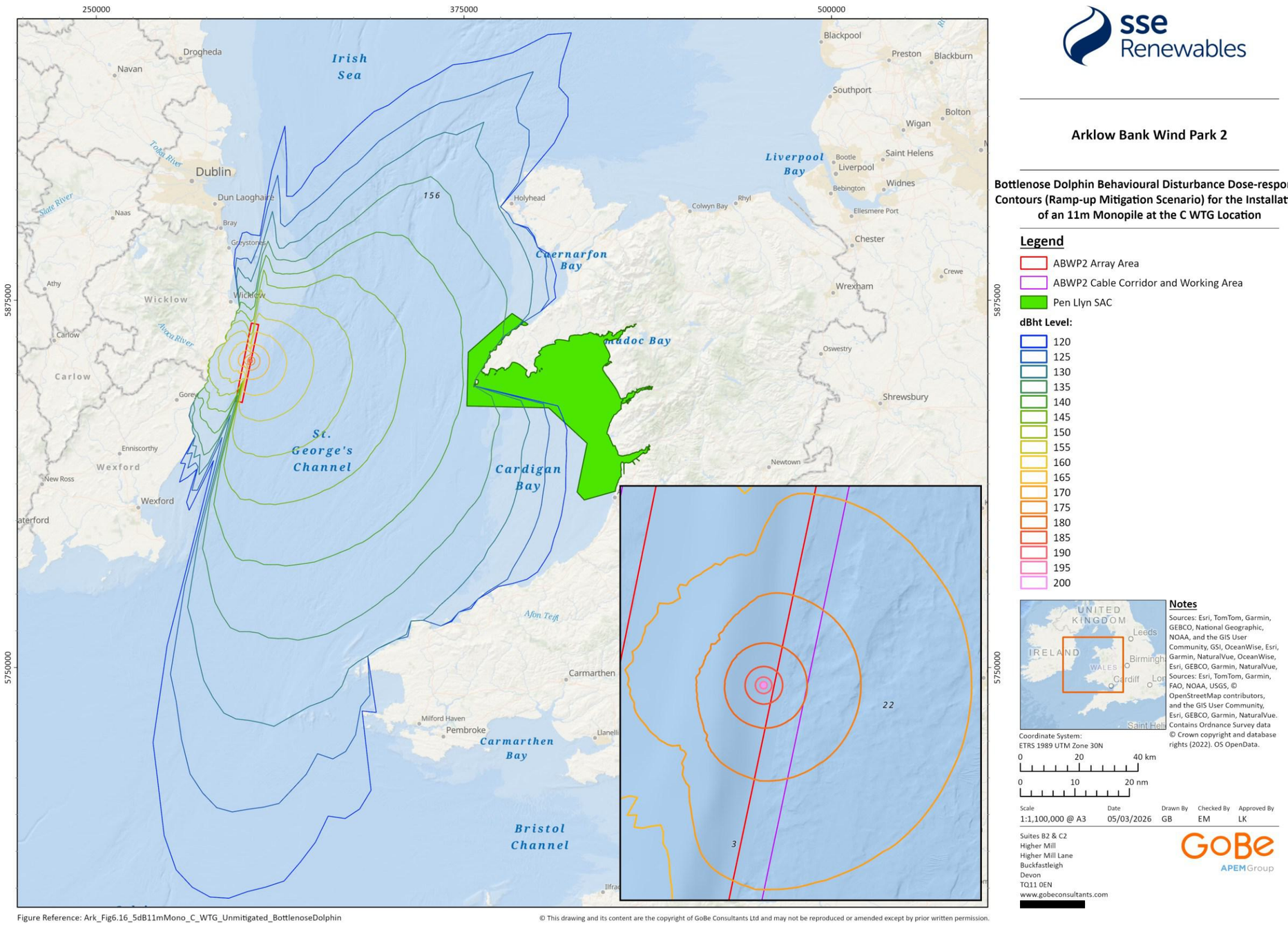

Figure Reference: Ark_Fig6.16_5dB11mMono_C_WTG_Unmitigated_BottlenoseDolphin

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Figure 6.16: Behavioural disturbance dose-response contours (ramp-up mitigation scenario) for the installation of an 11 m monopile at C WTG location and Pen Llyn SAC for bottlenose dolphin QI

6.4.19.8 Given this uncertainty with the harbour porpoise dose-response assessment, NMFS Level B harassment thresholds have also been applied to calculate the number and proportion of bottlenose dolphin disturbed during pile diving. Under the US Marine Mammal Protection Act, Level B harassment is defined as disturbance that disrupts behavioural patterns (e.g. migration, breathing, nursing, breeding, feeding, or sheltering) without injury (NOAA, 2023). For non-explosive impulsive noise sources such as impact pile driving, this threshold predicts that Level B harassment will occur when an animal is exposed to received sound levels exceeding 160 dB re 1 µPa (rms) (Guan and Brookens, 2021; NMFS, 2024; Malme *et al.*, 1984). Behavioural responses at or beyond this threshold are generally expected to be less severe and reversible, such as short-term changes in movement, dive profile, and/or modification of vocal behaviour (Southall *et al.*, 2007), and may vary according to individual experience and previous noise exposure.

6.4.19.9 When comparing these predicted numbers against those calculated using the dose-response curve, they are considerably lower (Table 6.30). For example, under the ramp-up mitigation and extended ramp-up mitigation scenarios and using the SCANS-IV uniform density estimate, a maximum of 259 individuals are predicted to experience behavioural disturbance as a result of pile driving of the 11 m monopile at the C WTG location (Table 6.29) compared to 1,181 individuals using the dose-response approach (Table 6.29). If the population size is taken to be 8,326 animals, the percentage of the population predicted to be disturbed reduces to 3.11%, when assuming 259 individuals are disturbed. This further demonstrates that the dose-response method results in a highly conservative assessment of disturbance for bottlenose dolphins.

Table 6.30: Predicted impact of disturbance to bottlenose dolphin from pile driving at C WTG location using level B harassment thresholds. For further information on densities used; see Table 6.6

Piling Scenario	Piling location and Monopile diameter (m)		Density (animals/km^2)	Number of animals disturbed[1]	Percentage of reference population[1] (%)
Ramp-up and extended ramp-up mitigation scenarios	C WTG	11 m	0.0201	23	7.85
			0.2352	259	88.40
			0.198099	218	74.40

[1]*The number of animals disturbed and the reference population are representative of the Irish Sea MU population (IAMMWG, 2023). The number of animals disturbed is not representative of the numbers disturbed within the Lleyn Peninsula and the Sarnau SAC.*

6.4.19.10 Evidence from comparable offshore wind farm piling activities indicates that bottlenose dolphins are not excluded from affected areas and may continue to use habitats during periods of impulsive noise, albeit with short-term changes in behaviour or space use (Fernandez-Betelu *et al.*, 2021; Graham *et al.*, 2017a). Furthermore, the results of the iPCoD modelling show that there is no significant effect of disturbance resulting from pile driving at the Proposed Development to bottlenose dolphin populations, with the impacted population predicted to continue at a stable trajectory at the same size (99.9%) as the un-impacted population up to 24 years after piling has ceased.

6.4.19.11 While behavioural disturbance may result in short-term disruption to activities such as foraging or resting, and a temporary increase in energetic expenditure (Marley *et al.*, 2017a; Pirotta *et al.*, 2015), although available evidence suggests bottlenose dolphins are capable of compensating for such effects over short temporal and spatial scales (New *et al.*, 2013). These responses are not expected to translate into measurable effects on survival or reproductive success.

6.4.19.12 For bottlenose dolphins, the project-specific mitigation measures set out within the MMMP (NIS Volume III, Appendix 25.2: Marine Mammal Mitigation Plan (Revised March 2026)), although primarily designed to minimise the risk of auditory injury (PTS) arising from piling-related underwater noise, will also act to reduce the magnitude and spatial extent of behavioural disturbance. Measures including pre-activity monitoring and controlled initiation of piling will reduce the likelihood of cetaceans being exposed to the highest sound levels, thereby limiting the potential for strong avoidance or displacement responses. As a result, any behavioural disturbance experienced by cetaceans is expected to be temporary and reversible and not of a scale or duration that would undermine the relevant COs.

6.4.19.13 In relation to the site-specific COs for Lleyn Peninsula and the Sarnau SAC (Table 5.1), the potential effects of behavioural disturbance arising from underwater noise associated with pile driving on bottlenose dolphins have been assessed with respect to anthropogenic disturbance, accessibility to and continued use of supporting habitats, and maintaining the population in favourable condition.

6.4.19.14 While underwater noise generated from piling may result in temporary behavioural responses and localised displacement in a small proportion of individuals, such effects are short-term, reversible, and restricted to the duration of piling activity. Piling will not create a persistent barrier to movement, nor will it significantly constrain bottlenose dolphins from accessing habitats within or outside the SAC that are necessary to maintain the population in favourable condition.

6.4.19.15 The assessment indicates that any disturbance experienced by bottlenose dolphins associated with the Lleyn Peninsula and the Sarnau SAC would not result in significant anthropogenic disturbance at a level capable of affecting residency, survival or reproductive success. Consequently, the population using the SAC is expected to remain stable and able to utilise supporting habitats over the medium and long term.

6.4.19.16 **With consideration of the precautionary nature of the assessment, the recoverable and temporary (although repeated) nature of behavioural disturbance, the inclusion of mitigation measures, and the absence of effects on population viability, it is therefore concluded there will be no AEoI of the bottlenose dolphin feature of the Lleyn Peninsula and the Sarnau SAC / Pen Llyn a'r Sarnau SAC, as defined by its COs, as a result of behavioural disturbance due to underwater noise during pile driving for Project Design Option 1.**

6.4.19.17 **Based on the representative risk of effect of Project Design Option 1, it is concluded that no AEoI would also apply to Project Design Option 2.**

INJURY AND/OR DISTURBANCE FROM UNDERWATER NOISE FROM UXO CLEARANCE

CONSTRUCTION PHASE ASSESSMENT

AUDITORY INJURY (PTS)

6.4.19.18 Based on the modelling results presented in Table 6.34: the maximum PTS-onset range for bottlenose dolphins resulting from high order UXO clearance is 840 m, based on the unweighted SPL_{peak} criterion and the largest charge weight modelled (800 kg plus donor). Using the wider SCANS-IV density estimate of 0.2352 animals/km^2, this would result in a maximum of one bottlenose dolphin, representing 0.18% of the reference population of 293 within the Irish Sea

MU (IAMMWG, 2023), potentially occurring within the PTS-onset range under a highly precautionary scenario.

6.4.19.19 For low order clearance, the predicted PTS-onset ranges are substantially smaller, with a maximum range of 70 m (Table 6.31). At this range, a maximum of one bottlenose dolphin is predicted to experience PTS (in practice, less than 0.001 of an individual).

Table 6.31: PTS-onset ranges and numbers of bottlenose dolphins modelled to be within range for all potential charge weights

Charge Weight (kg)	Maximum range (km)	Density (animals/km²)	Number of animals[1]	Percentage of reference population[1] (%)
PTS-onset (unweighted SPL_{peak})				
0.5 (low order)	0.07	0.0201	<1	<0.01
		0.2352	<1	<0.01
		0.198099	<1	<0.01
25 + donor	0.26	0.0201	<1	<0.01
		0.2352	<1	0.02
		0.198099	<1	0.01
55 + donor	0.34	0.0201	<1	<0.01
		0.2352	<1	0.03
		0.198099	<1	0.02
120 +donor	0.45	0.0201	<1	<0.01
		0.2352	<1	0.05
		0.198099	<1	0.04
240 + donor	0.56	0.0201	<1	0.01
		0.2352	<1	0.08

Charge Weight (kg)	Maximum range (km)	Density (animals/km²)	Number of animals[1]	Percentage of reference population[1] (%)
		0.116527	<1	0.04
525 + donor	0.73	0.0201	<1	0.01
		0.2352	1	0.13
		0.116527	1	0.11
700 + donor	0.81	0.0201	<1	0.01
		0.2352	1	0.17
		0.116527	1	0.14
800 + donor	0.84	0.0201	<1	0.02
		0.2352	1	0.18
		0.116527	1	0.15
PTS-onset (weighted SELss)				
0.5 (low order)	<0.05	0.0201	<1	<0.01
		0.2352	<1	<0.01
		0.116527	<1	<0.01
25 + donor	<0.05	0.0201	<1	<0.01
		0.2352	<1	<0.01
		0.116527	<1	<0.01
55 + donor	<0.05	0.0201	<1	<0.01

Charge Weight (kg)	Maximum range (km)	Density (animals/km²)	Number of animals[1]	Percentage of reference population[1] (%)
		0.2352	<1	0.01
		0.116527	<1	<0.01
120 +donor	<0.05	0.0201	<1	<0.01
		0.2352	<1	<0.01
		0.116527	<1	<0.01
240 + donor	<0.05	0.0201	<1	<0.01
		0.2352	<1	<0.01
		0.116527	<1	<0.01
525 + donor	0.05	0.0201	<1	<0.01
		0.2352	<1	<0.01
		0.116527	<1	<0.01
700 + donor	0.06	0.0201	<1	<0.01
		0.2352	<1	<0.01
		0.116527	<1	<0.01
800 + donor	0.06	0.0201	<1	<0.01
		0.2352	<1	<0.01
		0.116527	<1	<0.01

[1]*The number of animals disturbed and the reference population are representative of the Irish Sea MU population (IAMMWG, 2023). The number of animals disturbed is not representative of the numbers disturbed within the Lleyn Peninsula and the Sarnau SAC.*

6.4.19.20 The nearest boundary of the Lleyn Peninsula and the Sarnau SAC is located approximately 71.35 km from the Proposed Development. As such, even under the largest charge weight modelled, the predicted PTS-onset ranges for both high-order and low-order UXO clearance do not overlap with the SAC. Therefore, no bottlenose dolphins within the SAC are predicted to experience auditory injury as a result of UXO clearance activities associated with the Proposed Development.

6.4.19.21 The dominant energy produced by high-order detonation occurs at low frequencies, outside the region of greatest hearing sensitivity for bottlenose dolphin (Southall *et al.*, 2019), with a pronounced reduction in energy levels above approximately 5-10 kHz (von Benda-Beckmann *et al.*, 2015; Salomons *et al.*, 2021). This further reduces the likelihood of auditory injury from UXO clearance for bottlenose dolphin.

6.4.19.22 Furthermore, the Developer has committed to the implementation of project-specific mitigation measures for UXO clearance activities, as set out within the MMMP (NIS Volume III, Appendix 25.2: Marine Mammal Mitigation Plan (Revised March 2026)). These measures are designed to minimise the risk of auditory injury (PTS) to marine mammals arising from UXO-related noise and will, as a minimum, adhere to relevant international best practice, including DAHG (2014) guidance ((Table 6.7).

6.4.19.23 In relation to the site-specific COs for Lleyn Peninsula and the Sarnau SAC (Table 5.1), the potential effects of underwater noise associated with UXO clearance on bottlenose dolphin have been assessed with respect to the attributes of access to supporting habitat and ensuring that the population is maintained in favourable condition.

6.4.19.24 UXO clearance events and the associated underwater noise capable of causing auditory injury, would be short-term and highly localised, typically comprising a single, one-off detonation at any given location. As such, UXO clearance would not create a permanent or long-term barrier to the use of supporting habitat within or connected to the SAC, nor would it result in any sustained exclusion of bottlenose dolphins from the wider area.

6.4.19.25 Regarding the population attribute, even in the highly unlikely event that an individual experienced PTS-onset, available evidence indicates that would be unlikely to significantly affect individual fitness (i.e. its ability to survive and reproduce; Kastelein *et al.*, 2017). Therefore, UXO clearance activities are not expected to introduce anthropogenic noise at levels that could affect the population using the site or their residency in the site, and therefore they will not affect the condition of, or the contribution to FCS by, bottlenose dolphins associated with the Lleyn Peninsula and the Sarnau SAC.

6.4.19.26 **With consideration of the very limited spatial extent of predicted auditory injury (PTS-onset) ranges, the absence of overlap with the SAC (with the greatest predicted impact range predicted of up to 840 m), the implementation of mitigation measures, and the negligible proportion of the wider MU potentially affected (0.18%) even under the most precautionary scenario, it is concluded there will be no AEoI of the bottlenose dolphin QI of the Lleyn Peninsula and the Sarnau SAC / Pen Llyn a'r Sarnau SAC, as defined by its COs, as a result of auditory injury due to underwater noise associated with UXO clearance for Project Design Options 1 and 2.**

BEHAVIOURAL DISTURBANCE

6.4.19.27 The estimated number of bottlenose dolphins potentially disturbed as a result of high order UXO detonation, based on the application of a 20 km EDR, is presented in Table 6.22. When using the uniform SCANS-IV density estimate of 0.2352 animals/km^2, it is estimated that up to 273 animals (93.12% of the Irish Sea MU reference population of 293 animals; IAMMWG, 2023) could theoretically be affected under the highly precautionary scenario.

6.4.19.28 This is considered highly conservative, as it assumes uniform densities and does not account for natural variation in coastal and offshore distributions of bottlenose dolphins within the Irish Sea. Large-scale surveys, such as SCANS, used to derive MU population estimates are not designed to capture localised, coastal populations, such as that of Cardigan Bay (alone considered to be 232 individuals; Cuthbertson *et al.*, 2025); therefore, the reference population size is likely under-estimated. A more realistic density estimate using the ObSERVE survey density (Rogan *et al.,* 2018) of 0.0201 animals/km^2, predicts that 23 individuals (7.96% of the MU reference population) could be disturbed by high order UXO clearance (Table 6.32).

6.4.19.29 For low order clearance, application of the 5 km EDR results in an estimated two individuals potentially disturbed, when using the ObSERVE survey density (Rogan *et al.,* 2018) (0.68% of the Irish Sea MU reference population; Table 6.22). It should be noted that this estimate is illustrative only, as there is only limited empirical evidence to support a defined disturbance range for low order UXO clearance.

Table 6.32: Predicted impact of disturbance to bottlenose dolphins from UXO for both high order (20 km) and low order clearance (5 km) EDRs. For further information on densities used, see Table 6.6.

UXO Scenario	EDR	Density (animals/km^2)	Number of animals disturbed[1]	Percentage of the reference population[1] (%)
High Order Clearance	20 km^2	0.0201	23	7.96
		0.2352	273	93.12
		0.198099	230	78.43
Low Order Clearance	5 km	0.0201	2	0.68
		0.2352	19	6.48
		0.198099	16	5.46

[1]The number of animals disturbed and the reference population are representative of the Irish Sea MU population (IAMMWG, 2023). The number of animals disturbed is not representative of the numbers disturbed within the Lleyn Peninsula and the Sarnau SAC.

[2]Reduced EDR to account for land overlap within the nominal 20 km radius (effective area 1,159.98 km^2 rather than 1,256.31 km^2)

6.4.19.30 The nearest boundary of Lleyn Peninsula and the Sarnau SAC is located approximately 71.35 km from the Proposed Development. As such, the EDRs for UXO clearance do not overlap with the SAC. Therefore, no bottlenose dolphins within the SAC are predicted to experience behavioural disturbance as a result of UXO clearance activities associated with the Proposed Development. Any behavioural disturbance associated with UXO clearance, which may occur outwith the site, is expected to be highly localised in time, recoverable, and infrequent during the construction phase, due to the single-pulse nature of UXO clearance.

6.4.19.31 Potential behavioural disturbance to marine mammals arising from UXO clearance activities has been managed through the implementation of the project-specific MMMP (NIS Volume III, Appendix 25.2: Marine Mammal Mitigation Plan (Revised March 2026)), which includes the application of mitigation measures, informed by international best practice including DAHG

(2014), to reduce the likelihood, spatial extent and duration of any behavioural responses, such that any disturbance would be temporary, localised and not of a nature that could affect population-level processes (Table 6.7).

6.4.19.32 In relation to the site-specific COs for Lleyn Peninsula and the Sarnau SAC (Table 5.1), the potential effects of underwater noise associated with UXO clearance on bottlenose dolphins have been considered with respect to the attributes of access to supporting habitat and ensuring that the population is maintained in favourable condition.

6.4.19.33 Whilst underwater noise generated from UXO clearance may result in a short-term startle response and temporary displacement of some individuals outside of but associated with the SAC, such disturbance would be brief in duration and would not impede access to the site or constitute a permanent barrier to habitat use of the site.

6.4.19.34 Any individuals disturbed by UXO clearance are not predicted to experience significant negative effects on fitness, survival, or reproductive success for any life stage, nor is the activity expected to result in injury or mortality at a scale capable of affecting the bottlenose dolphin population associated with Lleyn Peninsula and the Sarnau SAC.

6.4.19.35 **With consideration of the precautionary nature of the assessment, the absence of overlap with the SAC, the low proportion of the population predicted to be affected, the implementation of mitigation measures, the short-term and recoverable nature of behavioural disturbance, and the limited frequency of UXO clearance events, it is concluded there will be no AEoI of the bottlenose dolphin QI of the Lleyn Peninsula and the Sarnau SAC / Pen Llyn a'r Sarnau SAC, as defined by its COs, as a result of behavioural disturbance due to underwater noise during UXO clearance for Project Design Options 1 and 2.**

INJURY AND/OR DISTURBANCE FROM UNDERWATER NOISE DURING SITE SURVEYS

CONSTRUCTION PHASE ASSESSMENT

6.4.19.36 The Subsea Noise Assessment (Seiche Ltd., 2022) concluded that PTS-onset ranges from confirmatory site surveys are limited to relatively small distances from the sound source and vary by survey type and marine mammal FHG, with bottlenose dolphins considered under high frequency (HF) cetaceans.

6.4.19.37 While PTS is a permanent effect which cannot be recovered from, animals exposed to noise levels that could induce TTS are likely to avoid hearing damage by moving away from the source (Southall *et al.,* 2007). Like the other underwater noise assessments, whilst the TTS impact ranges are presented here, the resulting implications of TTS are considered alongside behavioural disturbance, reflecting its temporary and recoverable nature and its relevance to short-term changes in behaviour rather than long-term population level effects.

6.4.19.38 Predicted impact ranges for auditory (PTS-onset) and TTS-onset to bottlenose dolphins from site surveys (geophysical and geotechnical surveys) are summarised in Table 6.33. The largest cumulative PTS-onset range is 82 m for SBP surveys, while the largest cumulative TTS-onset range is 352 m. Other survey activities have smaller ranges, typically tens of metres or less (Table 6.23; Seiche Ltd., 2022).

Table 6.33: Predicted maximum impact ranges for bottlenose dolphins from proposed site surveys (Seiche Ltd., 2022)

Survey category	Equipment type	Noise type	Effect	PTS Maximum predicted range (m)	TTS Maximum predicted range (m)
Geophysical	MBES	Non-impulsive	Cumulative	25	26
Geophysical	SSS	Non-impulsive	Cumulative	25	26
Geophysical	SBP	Non-impulsive	Cumulative	82	352
Geophysical	USBL positioning equipment	Non-impulsive	Cumulative	0[1]	50[2]
Geophysical	Seismic refraction	Impulsive	Instantaneous	N/E	N/E
			Cumulative	2	19
Geophysical	Sparker (2DUHRS and 3DUHRS)	Impulsive	Instantaneous	N/E	N/E
			Cumulative	N/E	N/E
Geotechnical	Seismic CPT	Impulsive	Instantaneous	N/E	N/E
			Cumulative	N/E	9
Geotechnical	Vibrocore	Non-impulsive	Cumulative	N/E	N/E

[1]USBL was not included in the Subsea Noise Assessment (Seiche Ltd., 2022) however, CSA Ocean Sciences Inc. (2020) estimated that the maximum distance to the weighted Level A threshold (cumulative PTS) is 0 m for HF (bottlenose dolphin).

[2]Based on maximum distance to all FHG Level B threshold (SPL_{rms}; CSA Ocen Sciences Inc., 2020).

6.4.19.39 The nearest boundary of Lleyn Peninsula and the Sarnau SAC is located approximately 71.35 km from the survey area, substantially greater than the maximum predicted PTS- or TTS-onset ranges for all survey activities (Table 6.33). As such, no bottlenose dolphins within the SAC are predicted to experience auditory injury (PTS) or TTS as a result of the site surveys.

6.4.19.40 With consideration that bottlenose dolphins have a lower sensitivity to underwater noise compared to harbour porpoise, the predicted impact ranges for bottlenose dolphin presented in Table 6.33 are smaller compared than those outlined in Table 6.17. The implementation of mitigation measures (Table 6.7), including a project-specific MMMP (NIS Volume III, Appendix 25.2: Marine Mammal Mitigation Plan (Revised March 2026)) during site surveys and adherence to DAHG (2014) guidance, is designed to address exposure under the most precautionary scenario for the most sensitive species with the largest distances i.e. for harbour porpoise. As such, these measures provide a precautionary buffer, and the actual likelihood and spatial extent of PTS-onset for bottlenose dolphins will be further reduced.

6.4.19.41 Predicted behavioural disturbance ranges are greater than PTS/TTS distances, with maximum distances of up to 4.95 km for non-impulsive geophysical survey sound sources (SBP), 700 m for sparker, 1.32 km for seismic refraction, 10 km for vibrocore and 1.5 km for seismic CPT for all marine mammal FHGs (Seiche Ltd., 2022). USBL were not included in the Subsea Noise Assessment (Seiche Ltd., 2022) however, CSA Ocean Sciences Inc. (2020) estimated that the

maximum distance to the Level B threshold (disturbance) is 50 m for all marine mammal hearing groups.

6.4.19.42 While some predicted disturbance ranges extend beyond the Proposed Development boundary, the closest distance to the Lleyn Peninsula and the Sarnau SAC (71.35 km away) remains greater than the predicted disturbance ranges, and any behavioural responses are expected to be short-term and reversible in nature.

6.4.19.43 In relation to the Lleyn Peninsula and the Sarnau SAC site-specific COs (Table 5.1), site survey activities are temporary, intermittent and spatially limited, and are not expected to result in sustained displacement, or permanent habitat exclusion from the site. Any behavioural responses would be brief and limited to very few individuals outside of the SAC, without causing significant effects on individual fitness or population integrity.

6.4.19.44 **With consideration of the limited spatial extent of predicted impact ranges, the absence of overlap with the SAC (with the greatest predicted impact range predicted of 10 km), and the implementation of mitigation measures, it is concluded there will be no AEoI of the bottlenose dolphin QI of the Lleyn Peninsula and the Sarnau SAC / Pen Llyn a'r Sarnau SAC, as defined by its COs, as a result of auditory injury or behavioural disturbance due to underwater noise associated with site surveys during the construction phase for Project Design Options 1 and 2.**

OPERATIONAL AND MAINTENANCE PHASE ASSESSMENT

6.4.19.45 Routine geophysical surveys of inter-array, inter-connector, and export cables will occur every six months during the first two years and annually thereafter throughout the operational and maintenance phase of the Proposed Development (Table 6.8).

6.4.19.46 As the exact equipment is not yet confirmed, an assessment has been undertaken assuming the same survey equipment and source level types as that proposed during the pre-construction surveys (Table 6.15 and Table 6.16). Therefore, the impact ranges of auditory injury (PTS), TTS and behavioural disturbance from site surveys during the operational and maintenance phase are expected to be similar to the results of the Subsea Noise Assessment (Seiche Ltd., 2022; CSA Ocean Sciences Inc, 2020) conducted for site surveys during the pre-construction phase.

6.4.19.47 **With consideration of the limited spatial extent of predicted impact ranges, the absence of overlap with the SAC (with the greatest predicted impact range predicted of 10 km), and the implementation of mitigation measures, it is concluded there will be no AEoI of the bottlenose dolphin QI of the Lleyn Peninsula and the Sarnau SAC / Pen Llyn a'r Sarnau SAC, as defined by its COs, as a result of auditory injury or behavioural disturbance due to underwater noise associated with site surveys during the operational and maintenance phase for Project Design Options 1 and 2.**

INJURY AND/OR DISTURBANCE FROM UNDERWATER NOISE DURING DREDGING AND TRENCHING

CONSTRUCTION PHASE ASSESSMENT

6.4.19.48 The Underwater Noise Assessment (NIS Volume III, Appendix 11.1: Underwater Noise Assessment (Revised March 2026)) concluded that for non-impulsive construction activities, including dredging and trenching, cumulative PTS-onset ranges could only occur at very short distances from the sound source. For trenching, backhoe dredging and suction dredging, predicted cumulative PTS- and TTS-onset ranges for bottlenose dolphin (HF FHG; Southall *et al.*, 2019) are less than <50 m.

6.4.19.49 Dredging and trenching activities produce continuous, non-impulsive underwater noise and are not expected to result in auditory injury (PTS) in marine mammals. The dominant energy from

these activities typically occurs below 1 kHz (Todd *et al.*, 2015), which lies outside the peak hearing sensitivity range of HF cetaceans such as bottlenose dolphins (Southall *et al.*, 2019). As a result, the potential for PTS (or TTS) to occur from these construction activities is expected to have little relevance to individual fitness, survival or reproductive success, as the hearing sensitivity of these receptors is relatively poor below 1 kHz (Southall *et al.,* 2019).

6.4.19.50 Although PTS is a permanent effect, the combination of very limited spatial extent of predicted PTS-onset ranges and low sensitivity of bottlenose dolphins to low-frequency noise, indicates that dredging and trenching will not result in auditory injury (PTS) at levels that would affect population-level parameters.

6.4.19.51 Information on marine mammal sensitivity to dredging and trenching noise is limited, with available studies focusing primarily on the impact of behavioural disturbance from dredging. However, it is often difficult to distinguish the effects of underwater noise from disturbance associated with vessel presence required to undertake the activity (Todd *et al.*, 2015).

6.4.19.52 Pirotta *et al.* (2013) observed temporary avoidance from foraging areas in Aberdeen Harbour during an increase intensity of dredging activity, with bottlenose dolphins absent from the vicinity for approximately five weeks during the initial dredge operations; however, these individuals followed cessation of activities. In western Australia, Marley *et al.* (2017a), reported variable responses to dredging between sites. No bottlenose dolphins were sighted during backhoe dredging activities at one site, while dolphins remained using the other site despite the same dredging activities occurring, suggesting site- and context-specific behaviours.

6.4.19.53 There are currently no empirical data describing bottlenose dolphin responses specifically to trenching activities. In the absence of such data, it is assumed that behavioural responses and deterrence distances would be limited to within 5 km of the activity (McQueen *et al.*, 2020). Should behavioural disturbance occur, it is expected to be short-term and reversible, with animals returning to the area following cessation of activities.

6.4.19.54 The closest distance between dredging and trenching activities and the boundary of the Lleyn Peninsula and the Sarnau SAC is approximately 71.35 km. This distance substantially exceeds the maximum predicted ranges for PTS-onset, TTS-onset and behavioural disturbance (5 km) associated with dredging and trenching. Therefore no bottlenose dolphins within the SAC are predicted to be affected.

6.4.19.55 In relation to the Lleyn Peninsula and the Sarnau SAC site-specific COs (Table 5.1), dredging and trenching during construction will not result in permanent or long-term restriction of access to supporting habitat within the SAC, nor introduce underwater noise at levels that would adversely affect the bottlenose dolphin population in, or connected to the SAC, through injury or disturbance.

6.4.19.56 **With consideration of the limited spatial extent of predicted auditory injury (PTS-onset) and behavioural disturbance ranges associated with dredging and trenching activities, the absence of overlap with the Lleyn Peninsula and the Sarnau SAC (with the greatest predicted disturbance impact range of up to 5 km), and the temporary, localised and reversible nature of any behavioural disturbance, it is concluded that there will be no AEoI of the bottlenose dolphin QI of the Lleyn Peninsula and the Sarnau SAC / Pen Llyn a'r Sarnau SAC, as defined by its COs, as a result of underwater noise arising from dredging and trenching activities during the construction phase for Project Design Options 1 and 2.**

OPERATIONAL AND MAINTENANCE PHASE ASSESSMENT

6.4.19.57 During the operational and maintenance phase, dredging and trenching may be required intermittently for scour protection repair and maintenance of foundations and cables. These activities are expected to be localised, short-term and less frequent than those undertaken during the construction phase.

6.4.19.58 Based on the predicted underwater noise modelling presented in the Underwater Noise Assessment (NIS Volume III, Appendix 11.1: Underwater Noise Assessment (Revised March 2026)), the precited ranges for auditory injury (PTS-onset), TTS-onset and behavioural disturbance during operation and maintenance are expected to be comparable to those assessed for the construction phase, as similar equipment and methods are anticipated to be used.

6.4.19.59 The closest distance between dredging and trenching activities during the operational and maintenance phase and the boundary of the Lleyn Peninsula and the Sarnau SAC is approximately 71.35 km. This distance substantially exceeds the maximum predicted ranges for auditory injury (PTS), TTS, and behavioural disturbance associated with dredging and trenching activities.

6.4.19.60 In relation to the Lleyn Peninsula and the Sarnau SAC site-specific COs (Table 5.1), dredging and trenching during construction will not result in restriction of access to supporting habitat within the SAC, nor introduce underwater noise at levels that would adversely affect the bottlenose dolphin population through injury or disturbance.

6.4.19.61 **With consideration of the limited spatial extent of predicted auditory injury (PTS-onset) and behavioural disturbance ranges associated with dredging and trenching activities, the absence of overlap with the Lleyn Peninsula and the Sarnau SAC (with the greatest predicted disturbance impact range of up to 5 km), and the temporary, localised and reversible nature of any behavioural disturbance, it is concluded that there will be no AEoI of the bottlenose dolphin QI of the Lleyn Peninsula and the Sarnau SAC / Pen Llyn a'r Sarnau SAC, as defined by its COs, as a result of underwater noise arising from dredging and trenching activities during the operational and maintenance phase for Project Design Options 1 and 2.**

INJURY AND/ OR DISTURBANCE FROM VESSEL MOVEMENTS

INJURY FROM VESSEL ACTIVITIES

6.4.19.62 Bottlenose dolphins are relatively small, highly mobile, and given observed responses to noise, are capable of detecting vessels in close proximity, allowing them to largely avoid collisions.

6.4.19.63 There is limited information on the frequency of marine mammal vessel collisions in Irish waters, and stranding data provide little evidence that injury from vessel collisions are a significant cause of marine mammal mortality in the region. In 2018, CSIP recorded nine bottlenose dolphin strandings, of which only one underwent a post-mortem; the cause of death in this case was not associated with vessel collision (CSIP, 2019). On a precautionary basis, post-mortem data for short-beaked common dolphin (*Delphinus delphis*) were also considered. In 2018, 191 strandings were reported, with 45 individuals examined; causes of death were established for 43 animals (CSIP, 2019). Of these, two individuals died from physical trauma of unknown origin, which could have included vessel strike, but this is not confirmed (CSIP, 2019). Considering that only two of the 43 examined cases had potential, but unconfirmed, links to vessel collision, it is concluded that vessel strikes are not a significant cause of mortality for dolphins in the Irish Sea

CONSTRUCTION AND DECOMMISSIONING PHASE ASSESSMENT

6.4.19.64 During the construction phase, up to 69 installation vessels may be present within the Proposed Development at any one time, resulting in a maximum of 4,150 vessel return trips over the four-year construction period, and a maximum of 1,797 vessel return trips per year. A similar number of vessels are anticipated for the decommissioning phase.

6.4.19.65 The majority of vessels used during the construction and decommissioning phase are likely to be large installation vessels that will operate at relatively low speeds or remain stationary for extended periods of time. The key collision risk threshold for large vessels is generally associated

with speeds exceeding approximately 7 m/s; however, such speeds are not anticipated to be routinely exceeded during construction or decommissioning activities. Consequently, increases in vessel traffic within the Proposed Development and along transit routes will be intermittent and largely confined to discrete periods of offshore activity.

6.4.19.66 Smaller vessels associated with construction and decommissioning activities (i.e. tug/anchor handlers, guard vessels, survey vessels, and crew transfer vessels) are more manoeuvrable than larger installation vessels and are therefore better able to avoid marine mammals when detected, even when an animal is close and the vessel is going at higher operating speed (Schoeman *et al.*, 2020). In contrast, larger vessels, such as jack-up vessels, have reduced manoeuvrability and may require larger distances to avoid an animal, but travel at slower speeds, reducing collision risk.

6.4.19.67 In addition, the mitigation measures (see Table 6.7), which includes an Environmental VMP (NIS Volume III, Appendix 25.10: Environmental Vessel Management Plan), will ensure that vessel traffic will move along predictable routes, which is known to be a key aspect in minimising the potential risk of injuries imposed by vessel traffic (Nowacek *et al.*, 2001; Lusseau, 2003; 2006).

6.4.19.68 Construction and decommissioning vessel noise is expected to be detectable by marine mammals and is therefore likely to facilitate avoidance behaviour by bottlenose dolphin. Although construction will result in a temporary increase in vessel activity, vessel movements will be largely restricted to the Array Area, Cable Corridor and Working Area, and will generally follow existing shipping routes to and from port. Given the high levels of baseline vessel traffic in the Irish Sea, the introduction of construction and decommissioning vessels is not considered to represent a novel or atypical pressure for bottlenose dolphins in the region. Accordingly, vessel activity associated with the Proposed Development is not expected to materially increase the risk of injury from vessel activities.

6.4.19.69 With consideration of the mobility of bottlenose dolphins, the nature of construction and decommissioning vessel traffic, distance from the SAC (71.35 km) and the implementation of Environmental VMP measures, vessel movements are not expected to result in reduced access to habitat, or effects on the favourable condition of the population. **It is therefore concluded that there will be no AEoI of the bottlenose dolphin QI of the Lleyn Peninsula and the Sarnau SAC / Pen Llyn a'r Sarnau SAC, as defined by its COs, as a result of injury from vessel activities associated with the construction and decommissioning phase for Project Design Option 1 and 2.**

OPERARTION AND MAINTENANCE PHASE ASSESSMENT

6.4.19.70 During the operational and maintenance phase, a maximum of 30 vessels will be present within the Proposed Development at any one time, resulting in a maximum of 1,359 vessel return trips per year. Vessels that will be used during the operational and maintenance phase (up to 36.5 years) include crew transfer vessels, jack-up vessels, cable repair vessels.

6.4.19.71 As with construction and decommissioning activities, vessels operating during the operational and maintenance phase are expected to travel at relatively low speeds within the Proposed Development, with larger vessels either stationary or operating at slow speeds during maintenance activities. Smaller, more manoeuvrable vessels (e.g. crew transfer vessels) are able to alter course to avoid marine mammals when detected. Bottlenose dolphins are therefore expected to detect and avoid vessels, resulting in a low likelihood of collision.

6.4.19.72 The continued implementation of mitigation measures, including the Environmental VMP (NIS Volume III, Appendix 25.10: Environmental Vessel Management Plan; Table 6.7), will ensure predictable vessel routing and adherence to appropriate vessel management procedures, further reducing collision risk. Given the lower vessel numbers relative to construction, the absence of novel vessel activity, and the high baseline levels of vessel traffic in the Irish Sea, vessel

movements during operation and maintenance are not expected to materially increase collision risk for bottlenose dolphins.

6.4.19.73 Given the relatively low number of vessel activity, the intermittent nature of any operation and maintenance activities, and continued application of Environmental VMP measures, vessel movements during operational and maintenance phase will not result in reduced access to habitats, or effects on the favourable condition of the population. **Therefore, it is concluded that there are no AEoI of the bottlenose dolphin QI of the Lleyn Peninsula and the Sarnau SAC / Pen Llyn a'r Sarnau SAC, as defined by its COs, as a result of injury from vessel activities associated with the operational and maintenance phase for Project Design Options 1 and 2.**

VESSEL DISTURBANCE

6.4.19.74 With regards to vessel disturbance, studies examining bottlenose dolphin responses to vessel presence consistently show that behavioural disturbance, where it occurs, is typically short-term, context-specific, and limited to the period when vessels are present. Acoustic monitoring in the Moray Firth, Scotland, demonstrated a temporary reduction in foraging activity by 49% during vessel presence, with bottlenose dolphins resuming foraging behaviour once the vessel had travelled through the area, indicating that disturbance was transient and localised (Pirotta *et al.*, 2015). As a result, the study concluded that the physical presence of vessels plays a larger role in disturbance, as vessel noise was not taken into consideration (Pirotta *et al.*, 2015).

6.4.19.75 Modelling studies further indicate that increases in vessel traffic do not necessarily translate into biologically significant population-level effects. In the Moray Firth, modelling of increased vessel movements associated with offshore wind development found no predicted negative effects on the local population of bottlenose dolphins, despite short-term disruptions to foraging (Lusseau *et al.*, 2011). Similarly, New *et al.* (2013) modelled a substantial increase in vessel traffic (from 70 to 470 vessels per year) and concluded that bottlenose dolphins were able to compensate for short-term behavioural responses, with no predicted effects on health or vital rates.

6.4.19.76 Bottlenose dolphins are also considered to tolerate vessel activity in areas with long-standing or consistently high vessel traffic. For example, bottlenose dolphins have been observed persisting in heavily trafficked areas such as the Moray Firth (Pirotta *et al.* 2013) and Broadhaven Bay (northwest Ireland), where the presence of bottlenose dolphin was positively correlated with overall vessel number during the construction works of an oil pipeline, although this may have also reflected local prey availability at the time (Anderwald *et al.*, 2013).

6.4.19.77 Bottlenose dolphins have also been known to exhibit different behavioural responses depending on vessel type and activity. A study conducted in New Zealand showed that bottlenose dolphin resting behaviour decreased as the number of dolphin-watching tour boats increased (Constantine *et al.*, 2004), while another study conducted in Italy have shown avoidance of fast motorboats but altered acoustic behaviour in the presence of trawlers, likely as a compensatory response to masking noise (La Manna *et al.*, 2013).

6.4.19.78 Evidence from Western Australia and the USA indicates that responses to vessel disturbance are highly context dependent, influenced by habitat quality and behavioural state. In some locations, vessel presence was associated with reduced habitat use or increased swimming speeds, while in others no significant effects were observed, particularly in important foraging habitats (Marley *et al.*, 2017a; 2017b). Changes in activity budgets (e.g. less resting or socialising, more travelling) and vocal behaviour have been reported under high vessel exposure, particularly in the presence of low-frequency noise (Marley *et al.*, 2017b; Piwetz, 2019).

6.4.19.79 Overall, the available evidence indicates that while vessel presence can result in temporary behavioural disturbance, bottlenose dolphins demonstrate a high capacity for behavioural flexibility and compensation. Disturbance effects are generally short-lived, reversible, and unlikely

to result in population-level consequences, particularly where vessel activity is intermittent, predictable, and occurs in areas already subject to regular marine traffic.

CONSTRUCTION AND DECOMMISSIONING PHASE ASSESSMENT

6.4.19.80 During the construction phase, up to 69 installation vessels may be present within the Proposed Development at any one time, resulting in a maximum of 4,150 vessel return trips over the four-year construction period, and a maximum of 1,797 vessel return trips per year. A similar number of vessels are anticipated for the decommissioning phase.

6.4.19.81 With consideration of disturbance and displacement, the coastal areas and immediate surrounding waters of the Proposed Development are already subject to high levels of vessel traffic (see EIAR Volume II, Chapter 15: Shipping and Navigation (Revised March 2026)). Accordingly, the introduction of construction and decommissioning vessels is not considered to represent a novel or significant change in the level of disturbance that bottlenose dolphins naturally present are subject to.

6.4.19.82 Mitigation measures, including implementation of the Environmental VMP (NIS Volume III, Appendix 25.10: Environmental Vessel Management Plan), will ensure that vessels operate along predictable routes and at controlled speeds (Table 6.7). Predictable vessel movements and reduced speeds are recognised as key factors in minimising disturbance to marine mammals. Vessel simulation modelling indicates that reducing vessels speeds by 20-50% can reduce source noise by approximately 5 - 18 dB and reduce the number of animals exposed, thereby decreasing the likelihood and severity of disturbance (Findlay *et al.*, 2023).

6.4.19.83 In relation to the Lleyn Peninsula and the Sarnau SAC site-specific COs (Table 5.1), vessel movements associated with construction and decommissioning will not result in long-term displacement, sustained disturbance, or restriction of access to supporting habitat, nor will they adversely affect the ability of the bottlenose dolphin to be maintained in favourable condition.

6.4.19.84 **With consideration of the temporary and reversible nature of behavioural responses, the localised extent of the disturbance expected, and the implementation of Environmental VMP measures to reduce risk, it is concluded that there will be no AEoI of the bottlenose dolphin QI of the Lleyn Peninsula and the Sarnau SAC / Pen Llyn a'r Sarnau SAC, as defined by its COs, as a result of disturbance from vessel activities associated with the construction and decommissioning for Project Design Options 1 and 2.**

OPERATIONAL AND MAINTENANCE PHASE ASSESSMENT

6.4.19.85 During the operational and maintenance phase, a maximum of 30 vessels will be present within the Proposed Development at any one time, resulting in a maximum of 1,359 vessel return trips per year.

6.4.19.86 Vessel activity during the operational and maintenance phase represents a reduction in both vessel numbers and activity intensity compared to the construction and decommissioning phases. As during construction, all vessel movements will be subject to the Environmental VMP (NIS Volume III, Appendix 25.10: Environmental Vessel Management Plan; Table 6.7), ensuring predictable routing, controlled speeds and adherence to mitigation measures designed to minimise disturbance to marine mammals.

6.4.19.87 Given the relatively low number of vessel present, slow vessel speeds, and similarly mitigated (Environmental VMP), and evidence that behavioural responses to vessel presence are temporary and localised, any disturbance to bottlenose dolphins during the operational and maintenance phase is expected to be short-term and fully reversible, with animals returning to the area following any displacement due to vessel passage. There is therefore no mechanism by which vessel movements could constrain bottlenose dolphin in their use of habitats or comprise

significant anthropogenic disturbance, nor affect the maintenance of the bottlenose dolphin population in favourable condition.

6.4.19.88 Vessel movements associated with the operational and maintenance phase will not restrict access to supporting habitat or adversely affect population condition. **It is therefore concluded that there will be no AEoI of the bottlenose dolphin QI of the Lleyn Peninsula and the Sarnau SAC / Pen Llyn a'r Sarnau SAC, as defined by its COs, as a result of disturbance from vessel activities associated with the operational and maintenance phase of Project Design Options 1 and 2.**

CHANGES IN EMF FROM SUBSEA CABLING

6.4.19.89 The operation of subsea power cables generates localised EMF, which are strongest immediately adjacent to the inter-array, export, and OSP interconnector cables and attenuate rapidly with distance from the buried cable (CMACS, 2003; Normandeau *et al.,* 2011). Any EMF generation occurs during the operational and maintenance phase of the Proposed Development when power is being transmitted (Table 6.8).

OPERATIONAL AND MAINTENANCE PHASE ASSESSMENT

6.4.19.90 There is evidence to suggest that some species of cetacean may be able to detect variations in magnetic fields, therefore it is plausible that they are magneto-sensitive (Normandeau *et al.*, 2011). Bottlenose dolphins have been proposed as a species that could theoretically be sensitive to changes in the Earth's magnetic fields (Kirschvink *et al.*, 1986); however, the evidence base remains theoretical, and studies have reached differing conclusions regarding cetaceans' sensitivity to electric and magnetic fields (Normandeau *et al.*, 2011). To date, the only confirmed evidence of electro-sensitivity in marine mammals relates to Guiana dolphin, which possess a specialised electroreceptive system (Czech-Damal *et al.*, 2013).

6.4.19.91 Potential responses of cetaceans from EMF could include avoidance behaviour, disruption in orientation, and effects on feeding or social interaction (Normandeau *et al.*, 2011); however, these remain unproven. Although subsea cables may create a very localised alteration to the geomagnetic field (Taormina *et al.*, 2018), modelling studies indicate that EMF effects attenuate rapidly with distance and are unlikely to affect a sufficiently large area to elicit biologically significant behavioural responses (Normandeau *et al.*, 2011).

6.4.19.92 Furthermore, given there is no overlap of the Array Area and Cable Corridor and Working Area with the Lleyn Peninsula and the Sarnau SAC, any EMF generated from subsea cables would be well beyond the range at which it could influence bottlenose dolphins within the SAC or affect individuals functionally connected to the site.

6.4.19.93 Considering the Lleyn Peninsula and the Sarnau SAC site-specific COs (Table 5.1), EMF associated with subsea cabling would not result in disturbance or reduction of access to habitats for bottlenose dolphin, nor effects on their favourable condition. **Given the highly localised and theoretical nature of the effect, the absence of spatial overlap with the SAC, it is concluded that there will be no AEoI of the bottlenose dolphin QI of the Lleyn Peninsula and the Sarnau SAC / Pen Llyn a'r Sarnau SAC, as defined by the COs, as a result of EMF from subsea cables for Project Design Options 1 and 2.**

CHANGES IN FISH AND SHELLFISH COMMUNITY AFFECTING PREY RESOURCES

6.4.19.94 Potential impacts to prey resources arising from the Proposed Development are expected to be largely restricted to the boundaries of the Proposed Development due to the localised footprint of seabed disturbance, the temporary nature of construction activities, and the limited spatial extent of predicted underwater noise and sediment dispersion effects. Any indirect effects on bottlenose

dolphin via changes in prey availability would therefore be limited to individuals foraging within, or close proximity to the Proposed Development.

6.4.19.95 Bottlenose dolphin are known to consume a wide variety of prey species, including whiting, blue whiting, pollock, saithe, haddock, poor cod, European hake (*Merluccius merluccius*), Atlantic horse mackerel, a variety of flatfish species, and cephalopods such as pelagic squid and octopus species (Hernandez-Milian *et al.*, 2011; 2015). This broad prey spectrum demonstrates a high degree of dietary flexibility, and bottlenose dolphins are therefore considered generalist feeders.

CONSTRUCTION AND DECOMMISSIONING PHASE ASSESSMENT

6.4.19.96 Bottlenose dolphin have a generalist diet, as can also be said for other Annex II marine mammal species including harbour porpoise. The assessment of the impact from changes in prey to the harbour porpoise QI of Blackwater Bank SAC has been undertaken at a high-level across changes to the prey community, rather than reflecting species-specific prey preferences. It is also highlighted that the diet of harbour porpoise (predominantly whiting, Atlantic herring, and poor cod) has overlap with that of bottlenose dolphin. Accordingly, the assessment of changes in the fish and shellfish community affecting prey resources for the Blackwater Bank SAC are considered applicable to SACs for bottlenose dolphin, including Lleyn Peninsula and the Sarnau SAC.

6.4.19.97 Potential impacts on prey species associated with construction and decommissioning activities are not specific to bottlenose dolphins and have been comprehensively assessed for other Annex II marine mammal receptors, notably harbour porpoise within Blackwater Bank SAC (Section 6.4.1). Blackwater Bank SAC is located approximately 19.13 km from the Proposed Development, substantially closer than the Lleyn Peninsula and the Sarnau SAC (approximately 71.35 km). The conclusions of that assessment are therefore considered precautionary when applied to the bottlenose dolphin QI associated with Lleyn Peninsula and the Sarnau SAC.

6.4.19.98 As detailed in Section 6.4.1 and EIAR Volume II, Chapter 10: Fish, Shellfish and Sea Turtle Ecology (Revised March 2026), potential effects on prey species include temporary habitat disturbance, increased SSC and associated deposition, injury and/or disturbance as a result of underwater noise and vibration, and accidental pollution. These effects are predicted to be highly localised, temporary and recoverable, and affecting only a very small proportion of the prey habitat of bottlenose dolphin.

6.4.19.99 Given their generalist foraging strategy and ability to switch between prey types, bottlenose dolphins are considered to have a low sensitivity to localised or short-term changes in prey availability. The predicted scale, duration and spatial extent of impacts on fish and shellfish communities are not expected to result in any meaningful reduction in prey availability or accessibility at a scale relevant to the bottlenose dolphin population associated with the Lleyn Peninsula and the Sarnau SAC.

6.4.19.100 In the context of the Lleyn Peninsula and the Sarnau SAC site-specific COs, construction and decommissioning activities will not adversely affect prey availability, habitat quality or the ability of bottlenose dolphins to access resources necessary to maintain the population in favourable condition. **It is concluded that there will be no AEoI of the bottlenose dolphin QI of the Lleyn Peninsula and the Sarnau SAC / Pen Llyn a'r Sarnau SAC, as defined by its COs, as a result of changes in prey resources associated with the construction and decommissioning phases for Project Design Option 1.**

6.4.19.101 **Based on the representative risk of effect of Project Design Option 1, it is concluded that no AEoI would also apply to Project Design Option 2.**

OPERATIONAL AND MAINTENANCE PHASE ASSESSMENT

6.4.19.102 During the operational and maintenance phase, potential effects on prey species would be limited to intermittent and localised activities such as maintenance dredging or trenching associated with cable or foundation repair. These activities would be infrequent, short-term and spatially restricted, and would represent a substantial reduction in intensity and extent compared to construction and decommissioning activities.

6.4.19.103 Any potential effects on prey species during operation and maintenance would be of the same nature as those assessed for the construction phase (including temporary habitat disturbance, localised increases in SSC and accidental pollution), but would occur at a reduced intensity, extent and frequency.

6.4.19.104 As detailed within the construction phase assessment for Blackwater Bank SAC (Section 6.4.1), predicted impacts on prey species are highly localised, short-term and fully recoverable, affecting only a very small proportion of available foraging habitat. Applying this precautionary assessment to the operational and maintenance phase, any prey-related effects would be even more limited in scale and duration.

6.4.19.105 Bottlenose dolphins are generalist predators with a broad flexible diet and are therefore resilient to short-term or localised fluctuations in prey availability. The limited and intermittent nature of operation and maintenance activities means that no meaningful reduction in prey availability or accessibility would occur at a scale relevant to the bottlenose dolphin population associated with the Lleyn Peninsula and the Sarnau SAC.

6.4.19.106 The Lleyn Peninsula and the Sarnau SAC is located approximately 71.35 km from the Proposed Development. Given this separation distance, together with the limited spatial extent of any prey-related effects during operation and maintenance activities, there is no plausible mechanism by which prey resources supporting the bottlenose dolphin population within or functionally linked to the SAC would be affected.

6.4.19.107 In the context of the Lleyn Peninsula and the Sarnau SAC site-specific COs (Table 5.1), operation and maintenance activities will not adversely affect prey availability, habitat quality, or the ability of bottlenose dolphins to forage effectively so as to maintain the population in favourable condition**. It is therefore concluded that there will be no AEoI of the bottlenose dolphin QI of the Lleyn Peninsula and the Sarnau SAC / Pen Llyn a'r Sarnau SAC, as defined by its COs, as a result of changes in prey resources associated with the operational and maintenance phase for Project Design Options 1 and 2.**

ACCIDENTAL POLLUTION

6.4.19.108 There is the potential for an accidental release of pollutants to occur from vessels and equipment associated with the construction, operational and maintenance and decommissioning phases of the Proposed Development, which may result in adverse effects on marine mammals. Pollutants may include diesel fuel, bentonite (from drilling activities), lubricants, grease and oils, anti-fouling biocides, and grout.

6.4.19.109 Bottlenose dolphins may be vulnerable to oil pollution as they are obligate air-breathers and cannot leave the marine environment to avoid surface contamination. However, bottlenose dolphins are highly mobile and wide ranging, and any contact with an oil slick would be expected to be brief. Experimental studies have demonstrated that captive bottlenose dolphins are capable of visually discriminating between oiled and uncontaminated water and actively avoiding oil at the surface (Geraci and St. Aubin, 1984). Dolphins are also thought to rely on tactile clues to detect oil, reducing the likelihood of prolonged or repeated exposure in the wild (Helm *et al.*, 2015).

6.4.19.110 Notwithstanding this avoidance capability, bottlenose dolphin must surface periodically to breathe and may therefore come into contact with floating oil or volatile toxic components,

particularly where slicks are extensive (Geraci and St. Aubin, 1980). Although oil does not readily penetrate cetacean skin, exposure may affect mucous membranes, eyes, and other sensitive external soft tissue areas, and in severe cases, could result in injury or mortality (Helm *et al.*, 2015).

CONSTRUCTION AND DECOMMISSIONING PHASE ASSESSMENT

6.4.19.111 The installation and removal of offshore infrastructure for the Proposed Development may result in the accidental release of pollutants through spills and leaks from vessels and equipment (Table 6.8). Potential impacts during the decommissioning phase are expected to be similar to, or less than, those during the construction phase.

6.4.19.112 The magnitude of any accidental pollution event would depend on the type and quantity of material released, with the release of fuel from a construction vessel considered to represent the largest potential spill scenario from installation activities. In the event of an accidental spill from vessels, equipment or from construction activities, pollutants would be subject to immediate dilution and rapid dispersion within the marine environment (Marappan *et al.,* 2022).

6.4.19.113 The likelihood of accidental pollution is considered extremely low due to avoidance through design and management measures (Table 6.7). These include the secure storage and handling of chemicals and hazardous material, double-skinned tanks and pipework where appropriate, chemical risk assessments, and the implementation of an EMP and MPCP. The MPCP sets out emergency response procedures to minimise the scale and duration of any spill should one occur.

6.4.19.114 The Lleyn Peninsula and the Sarnau SAC is located approximately 71.35 km from the Proposed Development. Given this separation distance, the very low likelihood of an accidental pollution event, the highly localised nature of any potential spill, rapid dispersion processes, and the mitigation measures in place, there is no plausible mechanism by which accidental pollution could affect bottlenose dolphin habitat use or population condition within, or functionally linked to, the SAC.

6.4.19.115 Given the inherent low likelihood of an accidental pollution event from vessel activity and other activities, the highly localised nature of any potential exposure, and the mitigation measures (as set out in Table 6.7), accidental pollution associated with construction and decommissioning activities will not adversely affect the ability of bottlenose dolphins to maintain the population in favourable condition or to make appropriate use of the site**. It is therefore concluded that there will be no AEoI of the bottlenose dolphin QI of the Lleyn Peninsula and the Sarnau SAC / Pen Llyn a'r Sarnau SAC, as defined by the COs, as a result of accidental pollution associated with the construction and decommissioning phase for Project Design Option 1.**

6.4.19.116 **Based on the representative risk of effect of Project Design Option 1, it is concluded that no AEoI would also apply to Project Design Option 2.**

OPERATIONAL AND MAINTENANCE PHASE ASSESSMENT

6.4.19.117 During the operational and maintenance phase, there remains a potential for accidental release of pollutants as a result of the presence of offshore infrastructure, routine inspection and maintenance activities, and vessel movements within the Proposed Development (Table 6.8).

6.4.19.118 The potential pathways, likelihood and consequences of accidental pollution during this phase are consistent with those assessed for the construction phase, but would generally be of lower magnitude due to reduced vessel numbers, activity intensity and the intermittent nature of maintenance works. The same avoidance through design and management measures, including the EMP and MPCP (Table 6.7), will be implemented throughout operation and maintenance of the Proposed Development.

6.4.19.119 The Lleyn Peninsula and the Sarnau SAC is located approximately 71.35 km from the Proposed Development. Given this separation distance, the very low likelihood of an accidental pollution event, the highly localised and rapidly dispersive nature of any potential spill, and the mitigation and emergency response measures in place, there is no plausible mechanism by which accidental pollution during the operational and maintenance phase could affect bottlenose dolphin habitat use, health or population viability within, or functionally linked to, the SAC.

6.4.19.120 In the context of the Lleyn Peninsula and the Sarnau SAC site-specific COs (Table 5.1), accidental pollution associated with the operational and maintenance phase will not adversely affect the ability of bottlenose dolphins to maintain the population in favourable condition or to make appropriate use of the site. **It is therefore concluded that there will be no AEoI of the bottlenose dolphin QI of the Lleyn Peninsula and the Sarnau SAC / Pen Llyn a'r Sarnau SAC, as defined by its COs, as a result of accidental pollution associated with the operational and maintenance phase for Project Design Option 1.**

6.4.19.121 **Based on the representative risk of effect of Project Design Option 1, it is concluded that no AEoI would also apply to Project Design Option 2.**

Grey seal

6.4.19.122 The relevant Annex II marine mammal QI site-specific COs at Lleyn Peninsula and the Sarnau SAC is to maintain FCS of the grey seal feature, as defined by the list of attributes and targets set out in Table 5.1 (NRW, 2025a).

6.4.19.123 Seven potential impact pathways relevant to grey seal have been identified in relation to the construction, operation and maintenance, and decommissioning of the Proposed Development, (Table 6.8). These pathways have been assessed in detail for Lambay Island SAC, which is designated for the same Annex II marine mammal QI, and is located approximately 61.89 km from the Proposed Development, compared to approximately 71.35 km from Lleyn Peninsula and the Sarnau SAC.

6.4.19.124 As the severity and likelihood of all relevant impact pathways are intrinsically distance-dependent, Lambay Island SAC represents the closest designated site for grey seal from the Proposed Development. The assessment presented in Section 6.4.5 therefore provides a conservative basis for evaluation and concluded that none of the identified impact pathways would result in an AEoI of Lambay Island SAC, with respect to the grey seal QI.

6.4.19.125 Given that the Lleyn Peninsula and the Sarnau SAC supports the same Annex II marine mammal QI and lies further from the Proposed Development, the magnitude of effects at Lleyn Peninsula and the Sarnau SAC is concluded to be no greater than, and in practice less than, those assessed for Lambay Island SAC. **It is therefore concluded that there will be no AEoI of the grey seal QI of the Lleyn Peninsula and the Sarnau SAC / Pen Llyn a'r Sarnau SAC, as defined by its COs, as a result of any of the impacts considered for Project Design Option 1 across any phase.**

6.4.19.126 **Based on the representative risk of effect of Project Design Option 1, it is concluded that no AEoI would also apply to Project Design Option 2.**

6.4.20 Cardigan Bay / Bae Ceredigion SAC

Bottlenose dolphin

6.4.20.1 The relevant Annex II marine mammal QI site-specific COs at Cardigan Bay SAC is to maintain FCS of the bottlenose dolphin QI, as defined by the list of attributes and targets set out in Table 5.1 (NRW, 2025b).

6.4.20.2 Eight potential impact pathways relevant to bottlenose dolphin have been identified in relation to the construction, operation, and maintenance, and decommissioning of the Proposed

Development (Table 6.8). These pathways have been assessed in detail for Lleyn Peninsula and the Sarnau SAC, which is also designated for the same Annex II marine mammal QI and is located approximately 71.35 km from the Proposed Development, compared to approximately 82.05 km from Cardigan Bay SAC.

6.4.20.3 As the severity and likelihood of all relevant impact pathways are intrinsically distance-dependent, Lleyn Peninsula and the Sarnau SAC represents the closest designated site for bottlenose dolphin from the Proposed Development. The assessment presented in Section 6.4.18 therefore provides a conservative basis for evaluation and concluded that none of the identified impact pathways would result in an AEoI of Lleyn Peninsula and the Sarnau SAC with respect to the bottlenose dolphin QI.

6.4.20.4 Given that Cardigan Bay SAC supports the same Annex II marine mammal QI and lies further from the Proposed Development, the magnitude of effects at Cardigan Bay SAC is concluded to be no greater than, and in practice less than, those associated for Lleyn Peninsula and the Sarnau SAC. **It is therefore concluded that there will be no AEoI of the bottlenose dolphin QI of the Cardigan Bay / Bae Ceredigion SAC, as defined by its COs, as a result of any of the impacts considered for Project Design Option 1 across any phase.**

6.4.20.5 **Based on the representative risk of effect of Project Design Option 1, it is concluded that no AEoI would also apply to Project Design Option 2.**

Grey seal

6.4.20.6 The relevant Annex II marine mammal QI site-specific COs at Cardigan Bay SAC is to maintain FCS of the grey seal QI, as defined by the list of attributes and targets set out in Table 5.1 (NRW, 2025b).

6.4.20.7 Seven potential impact pathways relevant to grey seal have been identified in relation to the construction, operation and maintenance, and decommissioning of the Proposed Development, (Table 6.8). These pathways have been assessed in detail for Lambay Island SAC, which is designated for the same Annex II marine mammal QI, and is located approximately 61.89 km from the Proposed Development, compared to approximately 82.05 km from Cardigan Bay SAC.

6.4.20.8 As the severity and likelihood of all relevant impact pathways are intrinsically distance-dependent, Lambay Island SAC represents the closest designated site for grey seal from the Proposed Development. The assessment presented in Section 6.4.5 therefore provides a conservative basis for evaluation and concluded that none of the identified impact pathways would result in an AEoI of Lambay Island SAC, with respect to the grey seal QI.

6.4.20.9 Given that Cardigan Bay SAC supports the same Annex II marine mammal QI and lies further from the Proposed Development, the magnitude of effects at Cardigan Bay SAC is concluded to be no greater than, and in practice less than, those associated for Lambay Island SAC. **It is therefore concluded that there will be no AEoI of the grey seal QI of the Cardigan Bay / Bae Ceredigion SAC, as defined by its COs, as a result of any of the impacts considered for Project Design Option 1 across any phase.**

6.4.20.10 **Based on the representative risk of effect of Project Design Option 1, it is concluded that no AEoI would also apply to Project Design Option 2.**

6.4.21 Pembrokeshire Marine / Sir Benfro Forol SAC

Grey seal

6.4.21.1 The relevant Annex II marine mammal QI site-specific COs at Pembrokeshire Marine SAC is to maintain FCS of the grey seal QI, as defined by the list of attributes and targets set out in Table 5.1 (NRW, 2025c).

6.4.21.2 Seven potential impact pathways relevant to grey seal have been identified in relation to the construction, operation and maintenance, and decommissioning of the Proposed Development, (Table 6.8). These pathways have been assessed in detail for Lambay Island SAC, which is designated for the same Annex II marine mammal QI, and is located approximately 61.89 km from the Proposed Development, compared to approximately 86.45 km from Pembrokeshire Marine SAC.

6.4.21.3 As the severity and likelihood of all relevant impact pathways are intrinsically distance-dependent, Lambay Island SAC represents the closest designated site for grey seal from the Proposed Development. The assessment presented in Section 6.4.5 therefore provides a conservative basis for evaluation and concluded that none of the identified impact pathways would result in an AEoI of Lambay Island SAC, with respect to the grey seal QI.

6.4.21.4 Given that Pembrokeshire Marine SAC supports the same Annex II marine mammal QI and lies further from the Proposed Development, the magnitude of effects at Pembrokeshire Marine SAC is concluded to be no greater than, and in practice less than, those associated for Lambay Island SAC. **It is therefore concluded that there will be no AEoI of the grey seal QI of the Pembrokeshire Marine / Sir Benfro Forol SAC, as defined by its COs, as a result of any of the impacts considered for Project Design Option 1 across any phase.**

6.4.21.5 **Based on the representative risk of effect of Project Design Option 1, it is concluded that no AEoI would also apply to Project Design Option 2.**

6.4.22 North Channel SAC

Harbour porpoise

6.4.22.1 The relevant Annex II marine mammal QI site-specific COs at North Channel SAC is to ensure that the integrity of the site is maintained and that it makes the best possible contribution to maintaining FCS for harbour porpoise in UK waters, as defined by the list of attributes and targets set out in Table 5.1 (JNCC, 2019a).

6.4.22.2 Eight potential impact pathways relevant to harbour porpoise have been identified in relation to the construction, operation and maintenance, and decommissioning of the Proposed Development (Table 6.8). These pathways have been assessed in detail for Blackwater Bank SAC which is also designated for the same Annex II marine mammal QI and is located approximately 19.13 km from the Proposed Development, compared to approximately 142.32 km from North Channel SAC.

6.4.22.3 As the severity and likelihood of all relevant impact pathways are intrinsically distance-dependent, Blackwater Bank SAC represents the closest designated site for harbour porpoise from the Proposed Development. The assessment presented in Section 6.4.1 therefore provides a conservative basis for evaluation and concluded that none of the identified impact pathways would result in an AEoI of Blackwater Bank SAC, with respect to the harbour porpoise QI.

6.4.22.4 Given that North Channel SAC supports the same Annex II marine mammal QI and lies substantially further away from the Proposed Development, the magnitude of effects at North Channel SAC is concluded to be no greater than, and in practice less than, those assessed for Blackwater Bank SAC. **It is therefore concluded that there will be no AEoI of the harbour porpoise QI of the North Channel SAC, as defined by its COs, as a result of any of the impacts considered for Project Design Option 1 across any phase.**

6.4.22.5 **Based on the representative risk of effect of Project Design Option 1, it is concluded that no AEoI would also apply to Project Design Option 2.**

6.4.23 Bristol Channel Approaches / Dynesfeydd Môr Hafren SAC

Harbour porpoise

6.4.23.1 The relevant Annex II marine mammal QI site-specific COs at Bristol Channel Approaches SAC is to ensure that the integrity of the site is maintained and that it makes the best possible contribution to maintaining FCS for harbour porpoise in UK waters, as defined by the list of attributes and targets set out in Table 5.1 (JNCC, 2019b).

6.4.23.2 Eight potential impact pathways relevant to harbour porpoise have been identified in relation to the construction, operation and maintenance, and decommissioning of the Proposed Development (Table 6.8). These pathways have been assessed in detail for Blackwater Bank SAC which is also designated for the same Annex II marine mammal QI and is located approximately 19.13 km from the Proposed Development, compared to approximately 214.68 km from Bristol Channel Approaches SAC.

6.4.23.3 As the severity and likelihood of all relevant impact pathways are intrinsically distance-dependent, Blackwater Bank SAC represents the closest designated site for harbour porpoise from the Proposed Development. The assessment presented in Section 6.4.1 therefore provides a conservative basis for evaluation and concluded that none of the identified impact pathways would result in an AEoI of Blackwater Bank SAC, with respect to the harbour porpoise QI.

6.4.23.4 Given that Bristol Channel Approaches SAC supports the same Annex II marine mammal QI and lies substantially further away from the Proposed Development, the magnitude of effects at the Bristol Channel Approaches SAC is concluded to be no greater than, and in practice less than, those assessed for Blackwater Bank SAC. **It is therefore concluded that there will be no AEoI of the harbour porpoise QI of the Bristol Channel Approaches / Dynesfeydd Môr Hafren SAC, as defined by its COs, as a result of any of the impacts considered for Project Design Option 1 across any phase.**

6.4.23.5 **Based on the representative risk of effect of Project Design Option 1, it is concluded that no AEoI would also apply to Project Design Option 2.**

6.4.24 Transboundary sites within Mainland Europe

Harbour porpoise

6.4.24.1 These comprise of the following French Natura 2000 sites:

- Abers - Côtes des legends;
- Nord Bretagne DH;
- Baie de Morlaix;
- Ouessant-Molène;
- Côte de Granit rose-Sept-Iles;
- Côtes de Crozon;
- Chaussée de Sein;
- Tregor Goëlo;
- Mers Celtiques - Talus du golfe de Gascogne;
- Récifs et Lands de la Hague;
- Baie de Saint-Brieuc – Est;
- Anse de Vauville;
- Cap d'Erquy-Cap Fréhel;
- Banc et récifs de Surtainville;
- Baie de Lancieux, Baie de l'Arguenon, Archipel de Saint Malo et Dinard;
- Chausey;
- Estuaire de le Rance; and

- Baie du Mont Saint-Michel.

6.4.24.2 There are no published site-specific COs available for the Annex II harbour porpoise QI at these above transboundary designated sites. In the absence of formal site-specific COs and associated attributes and targets, a precautionary approach is applied. The assessment on the integrity of these sites in respect of the harbour porpoise QI adopts the overarching objectives used for Irish and UK SACs designated for the same QI, which aim to maintain favourable conservation condition by ensuring continued access to the site as a suitable habitat, without significant disturbance (as per the COs for all Irish SACs with a harbour porpoise QI; see full detail in Section 6.4.1.1), and where the conditions supporting site use, including prey availability and supporting processes, are maintained (as included in the COs for all English and Welsh SACs with a harbour porpoise QI; Table 5.1).

6.4.24.3 This approach is informed by all the available ecological information for the transboundary sites, including the Natura 2000 Standard Data Forms for each site (EEA, 2025a-r), which provide context on habitat characteristics and species presence, supporting the precautionary assessment. Where available, national guidance and management documents for French designated sites, such as Arrêtés Ministériels and Documents d'Objectifs[6], outline the formally adopted management objectives and conservation measures for species and habitats within the sites. Although not published in the same CO format as in Ireland and the UK, they state that French site management aims to maintain suitable habitat and minimise disturbance to marine mammals, broadly consistent with that applied for Irish and UK sites with the same QI, for example West Wales Marine SAC (NRW, 2019a; Section 6.4.17) and Rockabill to Dalkey Island SAC (NPWS, 2013b; Section 6.4.2). This information supports identification of relevant pressures, including disturbance from underwater noise, habitat degradation or loss, and barriers to movement or foraging access. Therefore, all the available information used provides a robust framework for the assessment of potential impacts on the harbour porpoise QI in these transboundary sites.

6.4.24.4 Eight potential impact pathways relevant to harbour porpoise have been identified in relation to the construction, operation and maintenance, and decommissioning of the Proposed Development (Table 6.8). These pathways have been assessed in detail for Blackwater Bank SAC which is also designated for the same Annex II marine mammal QI and is located approximately 19.13 km from the Proposed Development, compared to the closest being 486.66 km from Abers - Côtes des legends.

6.4.24.5 As the severity and likelihood of all relevant impact pathways are intrinsically distance-dependent, Blackwater Bank SAC represents the closest designated site for harbour porpoise from the Proposed Development. The assessment presented in Section 6.4.1 therefore provides a conservative basis for evaluation and concluded that none of the identified impact pathways would result in an AEoI of Blackwater Bank SAC, with respect to the harbour porpoise QI.

6.4.24.6 Given that these transboundary European sites supports the same Annex II marine mammal QI and lies substantially further away from the Proposed Development, the magnitude of effects at these transboundary sites is concluded to be no greater than, and in practice less than, those assessed for Blackwater Bank SAC. There is therefore no pathway by which the Proposed Development could restrict access to suitable habitat within these sites or result in disturbance at levels capable of adversely affecting harbour porpoise using these sites. **It is therefore concluded that there will be no AEoI of the harbour porpoise QI of these transboundary**

[6] Office Français de la Biodiversité (2025). Natura 2000 France – Site documentation and management objectives. Available at: https://www.natura2000.fr

sites, as a result of any of the impacts considered for Project Design Option 1 across any phase.

6.4.24.7 **Based on the representative risk of effect of Project Design Option 1, it is concluded that no AEoI would also apply to Project Design Option 2.**

6.4.25 Summary of Stage 2 Appraisal for Sites Screened in for Annex II Marine Mammal Species QIs

6.4.25.1 Seven potential impacts for seals and eight potential impacts for cetaceans were assessed for impacts on Annex II marine mammals resulting from construction, operational and maintenance and decommissioning of the Proposed Development, the results of this assessment can be seen in Table 6.34Table 6.34.

Table 6.34: Conclusion for the assessment of potential impacts on European designated sites screened in for Annex II Marine Mammal Species QIs

Potential impact	Differences between Project Design Option 1 and 2	Conclusion
Injury and/ or disturbance by underwater noise from piling and all other construction activities	Project Design Option 1 comprises of 6 more WTGs than Project Design Option 2, installation of these is the primary source of underwater noise produced by the Proposed Development. Other activities producing underwater noise will be the same for both Project Design Option 1 and 2, with no difference.	As both Project Design Options produce underwater noise from construction activities they have both been considered. Based on the above assessment, it is concluded no AEoI for either Project Design Option from underwater noise.
Injury and/or disturbance from UXO clearance	There is no difference between Project Design Option 1 and 2. The methods of UXO clearance, as well as number and size that require clearance, are unknown.	As both Project Design Option 1 and Project Design Option 2 comprise of the same information on UXO clearance, and based on the conclusions above, it is concluded no AEoI from UXO clearance.
Injury and/or disturbance from site surveys	There is no difference between Project Design Option 1 and 2, as the same number and type of site surveys is anticipated to be carried out.	As both Project Design Option 1 and Project Design Option 2 comprise of the same site surveys, and based on the conclusions above, it is concluded no AEoI from site surveys.
Injury and/or disturbance from dredging and trenching	There is no difference between Project Design Option 1 and 2, as the same amount of dredging and trenching is anticipated to be carried out.	As both Project Design Option 1 and Project Design Option 2 comprise of the same dredging and trenching activities, and based on the conclusions above, it is concluded no AEoI from dredging and trenching.
Injury and/or disturbance from vessel movements	There is no difference between Project Design Option 1 and 2, as the same number of vehicles and movements is anticipated to be carried out.	As both Project Design Option 1 and Project Design Option 2 comprise of the same vessel

Potential impact	Differences between Project Design Option 1 and 2	Conclusion
		movements, and based on the conclusions above, it is concluded no AEoI from vessel movements.
Changes in EMF from subsea electrical cabling (cetaceans only)	There is no difference between Project Design Option 1 and 2, as the same amount of cabling is anticipated to be installed.	As both Project Design Option 1 and Project Design Option 2 comprise of the same cabling, based on the above assessment it is concluded no AEoI from EMF.
Changes in fish and shellfish community affecting prey resources	Project Design Option 1 comprises of 6 more WTGs that Project Design Option 2, installation of these is the primary source of underwater noise, increased SSC and associated deposition, and other potential impacts produced by the Proposed Development. Overall, Project Design Option 1 has the higher potential impact.	As both Project Design Option 1 and Project Design Option 2 both have been considered to cause changes in prey, based on the above assessment it is concluded no potential for AEoI for either Project Design Option from changes in prey.
Accidental pollution	Project Design Option 1 comprises of 6 more WTGs than Project Design Option 2, therefore installation of these will have a marginally greater potential for accidental pollution. Within the Decommissioning Phase Project Design Option 1 will result in the deconstruction and removal of all 53 WTG topsides and 2 OSP topsides, with both to be cut at seabed level, whilst Project Design Option 2 consists of the deconstruction and removal of all 47 WTG topsides and 2 OSP topsides, with both to be cut at seabed level. Therefore, Project Design Option 1 will have a marginally greater potential for accidental pollution. Therefore, overall Project Design Option 1 has a higher potential for impact than Project Design Option 2.	As both options have a risk of accidental pollution they have both been considered. Based on the above assessment it is concluded no AEoI for either Project Design Option from accidental pollution.

6.5 Baseline information to inform Stage 2 AA for Migratory Fish Species QIs

6.5.1.1 As outlined in Section 5.1, the following designated sites in Ireland have proceeded from the Stage 1 Screening Assessment, as documented in NIS Volume I: Supporting Information for Screening for Appropriate Assessment (Revised March 2026) to be considered herein and assessed in Stage 2 as a LSE could not be ruled out. These are presented in Figure 6.17.

- Slaney River Valley SAC – freshwater pearl mussels, twaite shad, Atlantic salmon, sea lamprey and river lamprey;
- River Barrow and River Nore SAC – freshwater pearl mussels, twaite shad, Atlantic salmon, sea lamprey and river lamprey;
- Lower River Suir SAC - freshwater pearl mussels, twaite shad, Atlantic salmon, sea lamprey and river lamprey; and
- River Boyne and River Blackwater SAC – Atlantic salmon.

6.5.1.2 The Array Area and Cable Corridor and Working Area do not overlap any designated sites, with the closest site being the Slaney River Valley SAC at 47.55 km from the Proposed Development. All migratory fish species are highly mobile and so despite distance, the above sites have been screened in due to potential LSE on the qualifying features caused by the Proposed Development. NIS Volume I: Supporting Information for Screening for Appropriate Assessment (Revised March 2026) concluded that there is potential for LSE via underwater noise, EMF effects and accidental pollution for freshwater pearl mussels (indirectly via effects on host), twaite shad, Atlantic salmon, sea lamprey and river lamprey.

6.5.1.3 Underwater noise will be produced by the Proposed Development primarily through piling activities, with vessel movements also partly contributing to the LSE potential from underwater noise. Underwater noise from piling and other activities can result in individuals suffering physical injury, hearing damage and disturbance or displacement.

6.5.1.4 EMF induced effects (e.g. effects on navigation and other life-history dependant functions) may arise during the operational and maintenance phase of the Proposed Development if individuals are located within close proximity to the cabling. Overall, the following impact pathways are therefore considered below, with consideration of the COs of the QIs of these SACs:

- Underwater noise from piling activities;
- Underwater noise from other activities;
- EMF; and
- Accidental pollution (including deterioration of water clarity).

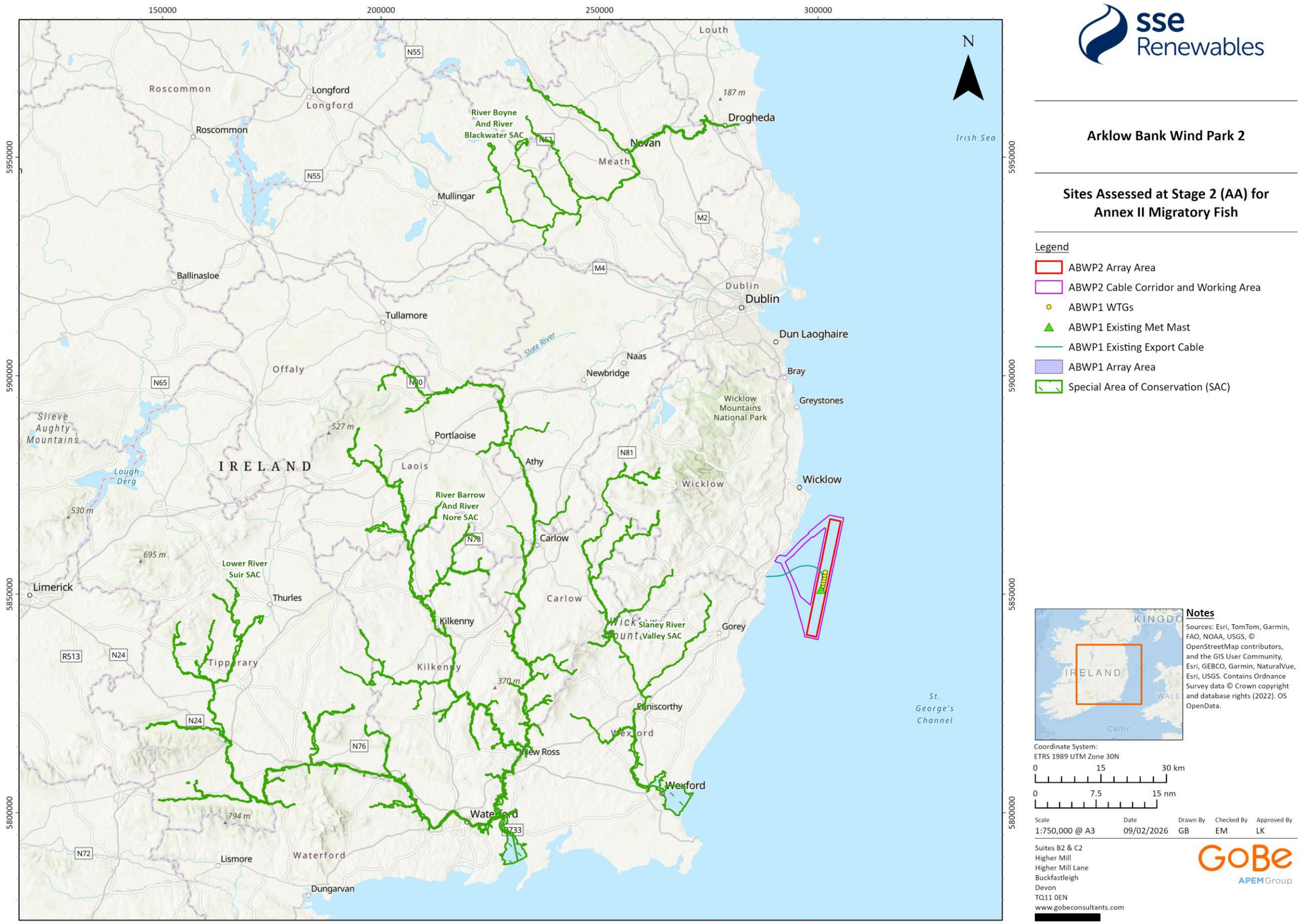

Figure Reference: Ark_Fig6.17_Stage2Sites_MigratoryFish

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Arklow Bank Wind Park 2

Sites Assessed at Stage 2 (AA) for Annex II Migratory Fish

Legend

- ABWP2 Array Area
- ABWP2 Cable Corridor and Working Area
- ABWP1 WTGs
- ABWP1 Existing Met Mast
- ABWP1 Existing Export Cable
- ABWP1 Array Area
- Special Area of Conservation (SAC)

Notes

Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community, Esri, GEBCO, Garmin, NaturalVue, Esri, USGS. Contains Ordnance Survey data © Crown copyright and database rights (2022). OS OpenData.

Coordinate System:
ETRS 1989 UTM Zone 30N

0 15 30 km

0 7.5 15 nm

Scale	Date	Drawn By	Checked By	Approved By
1:750,000 @ A3	09/02/2026	GB	EM	LK

Suites B2 & C2
Higher Mill
Higher Mill Lane
Buckfastleigh
Devon
TQ11 0EN
www.gobeconsultants.com

Figure 6.17: Sites assessed at Stage 2 (AA) for Annex II Migratory Fish

6.5.2 Baseline Environment

6.5.2.1 The Irish Sea is characterised by a deep channel (the Western Channel) running north to south in the western Irish Sea, and extending north into the North Channel, between Northern Ireland and Scotland and south into St George's Channel, between Ireland and Wales (Mellet *et al.*, 2015). The Western Channel is considered to be an important feature in shaping the fish and shellfish assemblages (Parker-Humphreys, 2004). At its deepest point the channel is 230 m deep with an extensive area of relatively flat, shallow (< 60 m depth) seabed (the Eastern Platform) and a narrow shelf of shallow water to the west (the Western Trough) (Mellet *et al.*, 2015).

6.5.2.2 Fish assemblages within the ZoI are typical of the sandy and gravelly seabeds of the wider Western Irish Sea. Species noted during site specific surveys included plaice, dab, poor cod, sand eel *Ammodytes tobianus*, common dragonet *Callionymus lyra* and sand goby *Pomatoschistus minutus*, with sand eel and sand goby being particularly abundant in some years. Other commercial species noted included whiting, lemon sole *Microstomus kitt*, sole, John dory *Zeus faber* and turbot *Psetta maxima*.

6.5.2.3 The western Irish Sea is home to a number of diadromous fish species that migrate between the sea and freshwater at different stages of their lifecycle. Atlantic salmon *Salmo salar* and sea trout *Salmo trutta* are two commercially important species in the region. The rivers Slaney, Boyne, Dargle and Avoca on the east coast of Ireland are key rivers for migratory fish species (Celtic Sea Trout Project, 2016; Inland Fisheries Ireland, 2022). Sea lamprey *Petromyzon marinus*, river lamprey *Lampetra. fluviatilis*, and twaite shad *Allosa fallax* are known to occur in inshore waters off the coast of co. Wicklow (Inland Fisheries Ireland, 2018).

Site-specific survey summary

6.5.2.4 A summary of site-specific surveys undertaken to inform the Stage 2 appraisal on migratory fish is provided in Table 6.35.

Table 6.35: Summary of site-specific survey data for migratory fish species

Data Source	Method	Date
Digital aerial marine mammal and bird surveys (ABWP2)	Aerial	February 2025 to July 2025
Digital aerial marine mammal and bird surveys (ABWP2)	Aerial	August 2023 to June 2024
Digital aerial marine mammal and bird surveys (ABWP2)	Aerial	March 2018 to April 2020
GE Wind Energy. Post-construction surveys (ABWP1)	Anchor dredge Beam trawl	June 2010 to September 2021
Arklow Energy Ltd (2010). Post-construction survey (ABWP1)	Anchor dredge Beam trawl	June 2009
HydroServ Projects Ltd. Post-construction surveys (ABWP1)	Anchor dredge Beam trawl	June 2004 to May 2008
EcoServe (2001). Baseline/pre-construction survey (ABWP1).	Anchor dredge Agassiz trawl	April 2001

Data Source	Method	Date
EcoServe (2001). Baseline/pre-construction survey (ABWP1).	Anchor dredge Otter trawl	September 2000
EcoServe (2001). Baseline/pre-construction survey (ABWP1).	Anchor dredge	June 2000

6.5.3 Avoidance through Design and Standard Project Environmental Protection Measures of the Proposed Development

6.5.3.1 The design of the Proposed Development is such that some potential impact can be avoided as seen by applying the design features and management measures relevant to migratory fish receptors which are presented in Table 6.36.

Table 6.36: Project design and environmental protection measures relevant for migratory fish receptors

Measure	Justification
Scour protection	In the absence of scour protection, there is potential for scour pits to develop around foundations. This may result in the release of sediment into the water column and a change to seabed habitat in the vicinity of the foundation which may result in disturbance to migratory fish. Scour protection will be installed which will reduce the potential for suspended sediment.
The Developer confirms and commits that it will not carry out any works in respect of the Proposed Development under the planning permission (if granted) at the same time as any activities the subject of the Foreshore Licence for Site Investigations (FS007339).	The Developer was granted a Foreshore Licence (FS007339) for Site Investigations (associated with the Proposed Development) from the Minister for Housing, Local Government and Heritage in May 2022. This Foreshore Licence expires in 2027. The Developer confirms and commits that it will not carry out any works in respect of the Proposed Development under the planning permission (if granted) at the same time as any activities the subject of the Foreshore Licence for Site Investigations (FS007339) being carried out. As such there is no temporal overlap between the activities consented in this Foreshore Licence and the Proposed Development and there will be no potential for cumulative effects.
The Developer confirms and commits that it will not carry out any works in respect of the Proposed Development under the planning permission (if granted) at the same time as any activities subject of the Foreshore Licence Application for Site Surveys FS007555 are being carried out.	The Developer submitted a Foreshore Licence Application for Site Surveys to the Minister for Housing, Local Government and Heritage in April 2023 (FS007555) and this application This application was determined and granted on 04 July 2024 and is valid until 04 June 2029. The Developer confirms and commits that it will not carry out any works in respect of the Proposed Development under the planning permission (if granted) at the same time as any activities the subject of the Foreshore Licence Application for Site Surveys FS007555 (should a licence be granted) are being carried out. As such there is no temporal overlap between the activities proposed in the Foreshore Licence Application and the Proposed Development.

Measure	Justification
Impact avoidance/ reduction through implementation of a Construction and Operational and Maintenance activities are detailed in Volume I, Supporting Information for Screening for Appropriate Assessment Report.	The construction activities including cable plans, techniques and burial depths are detailed in EIAR Volume II, Chapter 4: Description of Development (Revised March 2026). Operational and maintenance activities are also set out in EIAR Volume II, Chapter 4: Description of Development (Revised March 2026). These methods are set out using best practice guidelines to reduce the potential for impacts on marine habitats and megafauna including migratory fish.
Impact avoidance/ reduction through development of and adherence to a Rehabilitation Schedule (NIS Volume III, Appendix 4.1: Rehabilitation Schedule).	The Rehabilitation Schedule describes measures for the decommissioning of the Proposed Development. Measures which will be implemented that will mitigate against effects on fish, shellfish and sea turtle include leaving scour protection in-situ.
Impact avoidance/ reduction through implementation of an Environmental VMP (NIS Volume III, Appendix 25.10: Environmental Vessel Management Plan)	The implementation of an Environmental VMP which includes best practice guidance measures to minimise the potential for collision risk, potential injury to, and disturbance of marine megafauna from vessel activities.
Impact avoidance/ reduction through development of and implementation of an EMP (NIS Volume III, Appendix 25.1: Environmental Management Plan (Revised March 2026)).	This will include mitigation/monitoring measures and commitments made within the EIAR, including but not limited to chemical usage, invasive and non-native species, pollution prevention and waste management. These measures are set out using best practice guidelines to reduce the potential for impacts on marine habitats and megafauna including migratory fish.
Impact avoidance/ reduction through implementation of a Marine Pollution Contingency Plan will be included in the EMP (NIS Volume III, Appendix 25.1: Environmental Management Plan (Revised March 2026), Annex 2).	Ensures plans are in place to manage any marine pollution spills including key emergency contact details. These measures are set out using best practice guidelines to reduce the potential for impacts on marine habitats and megafauna including migratory fish.
Impact avoidance/ reduction through implementation of an Invasive Non-Indigenous Species Management Plan will be implemented and will be included in the EMP (NIS Volume III, Appendix 25.1: Environmental Management Plan (Revised March 2026), Annex 4)	The plan outlines measures to ensure vessels comply with the International Maritime Organisation (IMO) ballast water management guidelines, it will consider the origin of vessels and contain standard housekeeping measures for such vessels as well as measures to be adopted in the event that a high alert species is recorded. These measures are set out to reduce the potential for impacts on marine habitats and megafauna including migratory fish.
Impact avoidance/ reduction through development of and adherence to a MMMP (NIS Volume III, Appendix 25.2: Marine Mammal Mitigation Plan (Revised March 2026))	This will identify appropriate mitigation measures during offshore activities that are likely to produce underwater noise and vibration levels capable of potentially causing injury or disturbance to marine mammals. Factored-in measures adopted to reduce the risk of impact to marine mammal receptors will also be employed to reduce the risks to other marine megafauna that can be visually detected on the surface of the sea such as migratory fish.
Impact avoidance/ reduction through implementation of an Environmental Monitoring Measures are set out in NIS Volume I: Supporting Information for Screening for Appropriate Assessment	EIAR Volume II, Chapter 25: Summary of Factored in Measures, Mitigation and Monitoring (Revised March 2026) sets out commitments to environmental monitoring in pre-, during and post-construction phases.

Measure	Justification
(Revised March 2026), Section:4 Tables 4.27 to 4.33.	
Impact avoidance/ reduction through cables being buried where possible and protected where not possible.	Reduces the effect of Electromagnetic Fields (EMF). As EMF can have an adverse effect on migratory fish, burying cables will reduce the potential effects on migratory fish.

6.5.4 Impacts and Parameters Assessed

6.5.4.1 Both Project Design Options identified in Table 6.37 have the same potential to result in the effects on migratory fish species.

Table 6.37: Project Design Options 1 and 2 considered for the assessment of potential impacts on migratory fish receptors

Potential impact	Phase			Project Design Option Assessed (1 and 2)	Parameter Differences Between Project Design Option 1 and 2 (if any)
	C	O	D		
Injury and/or disturbance from UWN and vibration during pile driving and cable installation	✓	✓	X	<u>Project Design Option 1:</u> **Construction phase:** <u>Foundation installation:</u> WTGs installed on monopile foundations: • Installation of 53 WTGs with a pile diameter between 7 m and 11 m within the Array Area; • Maximum of one foundation installed at any one time (within any 24-hour period); • Maximum hammer energy 3,500 kJ and a strike rate of 30 strikes per minute; • Soft start at 825 kJ; • Anticipated maximum duration of piling at 5 hours and 10 minutes per day with an average duration of 4 hours per pile and; • Total of 71 days when piling may occur over construction period, which may last up to 4 years. Offshore Substations Platforms (OSP) installed on monopile foundations: • Installation of two OSPs with a pile diameter between 7 and 14 m within the Array Area; • Maximum of one foundation installed at any one time (within any 24 hour period); • Maximum hammer energy 3,500kJ; • Soft start at 825 kJ; • Average duration of 4 hours per pile and; • Total of 4 days when piling may occur over construction period.	Within the construction phase Project Design Option 1 consists of a larger number of foundations to be installed – 55 monopile foundations in total (53 for WTGs and 2 for OSPs), whilst Project Design Option 2 comprises of 47 foundations in total (47 for WTGs and 2 for OSPs). Therefore, Project Design Option 1 will have a marginally greater potential for UWN from piling activities and is considered representative of potential impacts from Project Design Option 2.

Potential impact	Phase C O D	Project Design Option Assessed (1 and 2)	Parameter Differences Between Project Design Option 1 and 2 (if any)
		Detonation of UXO's. **Operational and maintenance phase** • 53 operational WTGs • Cable repair once every 3 years and cable re-burial once every 3 years for inter-array and interconnector cables. • For export cables, cable repair once every 5 years and cable re-burial once every 5 years. • Operational dredging once every 5 years. • Geophysical surveys every 6 months for first two years and annually thereafter.	
		Project Design Option 2 **Construction Phase:** Foundation installation: WTGs and OSPs installed on monopile foundations: • Installation of 47 WTGs with a pile diameter between 7 m and 11 m within the Array Area; • Maximum of one foundation installed at any one time (within any 24 hour period); • Maximum hammer energy up to 3,500 kJ and a strike rate of 30 strikes per minute; • Soft start energy of 825 kJ; • Anticipated maximum duration of piling at 5 hours and 10 minutes per day with an average duration of 4 hours per pile; and • Total of 63 days when piling may occur over construction period, which may last up to 4 years. OSPs installed on monopile foundations:	

Potential impact	Phase			Project Design Option Assessed (1 and 2)	Parameter Differences Between Project Design Option 1 and 2 (if any)
	C	O	D		
				• Installation of 2 OSPs with a pile diameter between 7 m and 14 m within the Array Area; • Maximum of one foundation installed at any one time (within any 24 hour period); • Maximum hammer energy up to 3,500 kJ; • Soft start of 825 kJ; • Average duration of 4 hours per pile; and • Total of 4 days when piling may occur over construction period. Detonation of UXO's. **Operational and maintenance phase**: • 47 operational WTGs • Cable repair once every 3 years and cable re-burial once every 3 years for inter-array and interconnector cables. • For export cables, cable repair once every 5 years and cable re-burial once every 5 years. • Operational dredging once every 5 years. • Geophysical surveys every 6 months for first two years and annually thereafter.	
UWN from other activities	✓	✓	✓	<u>Project Design Option 1</u> **Construction Phase:** • Installation of between 110 and 122 km inter-array cables and between 35 and 40 km offshore export cables; and • Up to 4,150 vessel round trips and up to 294 helicopter round trips during the construction phase. **Operational and Maintenance phase:**	Within the Construction phase, both Project Design Option 1 and 2 have the same level of potential impact from UWN from Other Activities. Within the Operational and Maintenance Phase, both Project Design Option 1 and 2 have the same level of potential impact.

Potential impact	Phase C O D	Project Design Option Assessed (1 and 2)	Parameter Differences Between Project Design Option 1 and 2 (if any)
		• Up to 1,359 vessel round trips per year and 485 helicopter round trips per year. • 53 operational WTGs • Cable repair once every 3 years and cable re-burial once every 3 years for inter-array and interconnector cables. • For export cables, cable repair once every 5 years and cable re-burial once every 5 years. • Operational dredging once every 5 years. • Geophysical surveys every 6 months for first two years and annually thereafter. **Decommissioning Phase:** • Decommissioning of up to 53 WTGs and up to 2 OSP.	Within the Decommissioning Phase, both Project Design Option 1 and 2 have the same level of potential impact from UWN from Other Activities.
		Project Design Option 2 **Construction Phase:** • Installation between 110 and 122 km inter-array cables and between 35 and 40 km offshore export cables; and Up to 4,150 vessel round trips and up to 294 helicopter round trips during the construction phase. **Operational and Maintenance phase:** • Up to 1,294 vessel round trips per year and 485 helicopter round trips per year. • 47 operational WTGs • Cable repair once every 3 years and cable re-burial once every 3 years for inter-array and interconnector cables. • For export cables, cable repair once every 5 years and cable re-burial once every 5 years. • Operational dredging once every 5 years. • Geophysical surveys every 6 months for first two years and annually thereafter.	

Potential impact	Phase			Project Design Option Assessed (1 and 2)	Parameter Differences Between Project Design Option 1 and 2 (if any)
	C	O	D		
				Decommissioning Phase: • Decommissioning of up to 47 WTGs and up to 2 OSP.	
EMF	X	✓	X	Project Design Option 1 **Operational and Maintenance phase:** Presence of inter-array, OSP interconnector, and offshore export cables: • 66 kV inter-array cables between 110 – 122 km in length. • 220 kV OSP interconnector cables between 25 – 28 km in length. • 220 kV offshore export cables between 35 – 40 km in length. • Burial depth between 0-1.5 m for inter-array cables and 0-2.5 m for OSP interconnector and offshore export cables. • 15% of inter-array cable routes, 50% of OSP interconnector cable routes, and 20% of export cable routes requiring protection. • Third party export cable crossings. • Operational phase of 36.5 years. • Cable protection system (up to 1.5 m in diameter) comprising concrete, polyurethane, steel, cast iron shells, high density polyethylene and/or plastic ducts. Project Design Option 2: **Operational and Maintenance phase:** Presence of inter-array, OSP interconnector, and offshore export cables: • 66 kV inter-array cables between 110 – 122 km in length. • 220 kV OSP interconnector cables between 25 – 28 km in length. • 220 kV offshore export cables between 35 – 40 km in length.	No differences in parameters for EMF for Project Design Option 1 and Project Design Option 2.

Potential impact	Phase			Project Design Option Assessed (1 and 2)	Parameter Differences Between Project Design Option 1 and 2 (if any)
	C	O	D		
				• Burial depth between 0-1.5 m for inter-array cables and 0-2.5 m for OSP interconnector and offshore export cables. • 15% of inter-array cable routes, 50% of OSP interconnector cable routes, and 20% of export cable routes requiring protection. • Third party export cable crossings. • Operational phase of 36.5 years. • Cable protection system (up to 1.5 m in diameter) comprising concrete, polyurethane, steel, cast iron shells, high density polyethylene and/or plastic ducts.	
Accidental pollution	✓	✓	✓	Project Design Option 1 **Construction phase** Accidental pollution within the Proposed Development construction phase from: • Installation of 53 WTGs and two OSPs within the Array Area. • Installation of inter-array cables between 110 – 122 km in length, OSP interconnector cables between 25 – 28 km in length, and offshore export cables between 35 – 40 km in length; • 66 vessels on site at one time comprised of jack up barges, cargo, support, tug/anchor, cable installation, guard, survey, crew transfer, sandwave clearance and UXO clearance vessels. • 4,150 return trips across construction period and 1,797 return trips per year. • Construction schedule of 24 hours a day, 7 days a week for a period of 4 years. • 294 helicopter return trips over the construction phase and 118 helicopter return trips per year. **Operational and maintenance phase**	Within the construction phase Project Design Option 1 consists of a larger number of foundations to be installed – 55 monopile foundations in total (53 for WTGs and 2 for OSPs), whilst Project Design Option 2 comprises of 47 foundations in total (47 for WTGs and 2 for OSPs). Therefore, Project Design Option 1 will have a marginally greater potential for accidental pollution.

Potential impact	Phase C O D	Project Design Option Assessed (1 and 2)	Parameter Differences Between Project Design Option 1 and 2 (if any)
		Accidental pollution within the Proposed Development during the operational and maintenance phase from: • 30 vessels on site at one time comprised of crew transfer, jack-up, cable repair, service operations, cable survey and excavator vessels. • 1,359 return trips per year. • 485 helicopter return trips per year; • Presence of 53 WTGs and 2 OSPs and; • Maintenance activities of 53 WTGs and 2 OSPs **Decommissioning phase** Accidental pollution in the Array Area during decommissioning from: Decommissioning of 53 WTGs and 2 OSPs	
		Project Design Option 2 **Construction phase** Accidental pollution within the Proposed Development construction phase from: • Installation of 47 WTGs and 2 OSPs within the Array Area. • Installation of inter-array cables between 110 – 122 km in length, OSP interconnector cables between 25 – 28 km in length, and offshore export cables between 35 – 40 km in length; • 66 vessels on site at one time comprised of jack up barges, cargo, support, tug/anchor, cable installation, guard, survey, crew transfer, sandwave clearance and UXO clearance vessels. • 4,150 return trips across construction period and 1,797 return trips per year.	

Potential impact	Phase C	Phase O	Phase D	Project Design Option Assessed (1 and 2)	Parameter Differences Between Project Design Option 1 and 2 (if any)
				• Construction schedule of 24 hours a day, 7 days a week for a period of 4 years. • 294 helicopter return trips over the construction phase and 118 helicopter return trips per year. **Operational and maintenance phase** Accidental pollution within the Proposed Development during the operational and maintenance phase from: • 30 vessels on site at one time comprised of crew transfer, jack-up, cable repair, service operations, cable survey and excavator vessels. • 1,359 return trips per year. • 485 helicopter return trips per year; • Presence of 47 WTGs and 2 OSPs and; • Maintenance activities of 47 WTGs and 2 OSPs **Decommissioning phase** Accidental pollution in the Array Area during decommissioning from: Decommissioning of 47 WTGs and 2 OSPs	

6.6 Assessment of Proposed Development alone for Migratory Fish QIs

6.6.1 Slaney River Valley SAC

Twaite Shad

6.6.1.1 The COs for twaite shad at this designated site is to restore the favourable conservation condition of the QI, this is defined and presented in Table 5.1.

6.6.1.2 There are four key potential impact pathways considered for twaite shad associated with construction, operational and maintenance, and decommissioning of the Proposed Development, which are presented in Table 6.37 and are assessed below for each phase of the Proposed Development.

INJURY AND/ OR DISTURBANCE FROM UNDERWATER NOISE – PILING AND OTHER ACTIVITIES

6.6.1.3 Underwater noise and vibration within the Array Area and Cable Corridor and Working Area will occur during the construction, operational and maintenance, and decommissioning phases as a result of a range of activities including impact piling, cable laying, dredging, drilling, rock placement, vessel movements, operational WTG noise, and UXO clearance. This can cause injury and/or disturbance to fish and shellfish.

6.6.1.4 The assessment has been informed by the Underwater Noise Assessment by Subacoustech (NIS Volume III, Appendix 11.1: Underwater Noise Assessment (Revised March 2026)) which includes the results of numerical modelling using the INSPIRE underwater noise model.

6.6.1.5 Two precautionary piling foundation scenarios were used for modelling:

- 11 m monopile foundations at the N, C and SW WTG locations, installed with a maximum blow energy of 3,500 kJ; and
- 14 m monopile foundations at the N-OSP and S-OSP location, installed with a maximum blow energy of 3,500 kJ.

6.6.1.6 For each foundation scenario, two mitigation scenarios were assessed: a ramp-up mitigation scenario (considered the base-case) and an extended ramp-up mitigation scenario. Both piling scenarios assume the same maximum hammer energy (3,500 kJ), but differ in soft-start energy levels, with ramp-up commencing at 825 kJ under the base-case ramp up mitigation scenario and at 400 kJ under the extended ramp-up mitigation scenario. Further details of these scenarios are provided in Underwater Noise Assessment (NIS Volume III, Appendix 11.1: Underwater Noise Assessment (Revised March 2026)).

6.6.1.7 Underwater noise and vibration may cause the following effects on fish:

- Behavioural effects (e.g. reduced detection of predators/prey, inhibited communication between conspecifics, alteration in swimming behaviour);
- Masking effects (i.e. the reduced detectability of a given sound owing to the simultaneous occurrence of another sound);
- Temporary threshold shift (TTS) in hearing (short or long-term changes in hearing sensitivity that may or may not reduce fitness);
- Recoverable tissue injury (not resulting in mortality e.g. hair cell damage, minor internal or external hematoma etc.); and
- Mortality or potential mortal injury (immediate or delayed death).

6.6.1.8 There can also be vibration effects within the immediate vicinity of piling or other sources of noise that can cause slight movement of sediment that in turn may have an effect on the behaviour of benthic fish species or could potentially affect the viability of fish eggs near the source (Popper and Hawkins, 2018). Vibration can also refer to the effects of particle motion (separate from sound pressure) in the water column. However, very little research has been conducted on the effects of vibration on fish. Noise and vibration are produced at the same time and are interconnected and so for the purposes of this assessment we have referred to them together as appropriate.

6.6.1.9 Hearing abilities of fish are related to the morphological adaptations of the acoustico-lateralis apparatus, in particular the distance of the swim bladder to the inner ear (Hastings and Popper, 2005; Mason, 2013). Species with no swim bladder (e.g. Sea and river lamprey) have a lower hearing ability than many other fish species and rely on the detection of particle motion (the oscillatory displacement of fluid particles in a sound field) (Popper *et al.*, 2014). They are considered to have a low sensitivity to underwater noise and vibration effects.

6.6.1.10 Fish species with a swim bladder but with no connection to the inner ear (e.g. salmon) have better hearing but can also only detect particle motion. They are considered to have a medium sensitivity to underwater noise and vibration effects.

6.6.1.11 Species that have an extension of the swim bladder that terminates in the inner ear (e.g. Twaite shad) can hear sounds over a far greater range than other species (Popper *et al.*, 2014; Gill *et al.*, 2012) and can detect both particle motion and sound pressure (a form of stress measured in terms of force/unit area). They are considered to have a high sensitivity to underwater noise and vibration effects.

6.6.1.12 Popper *et al.* (2014) provides criteria that can be applied to assess the potential effects of noise and vibration on fish from different marine activities such as piling, dredging and vessel movements (Table 6.38). The approach assesses the potential effects of underwater noise and vibration on fish based on grouping species according to their hearing apparatus, specifically whether they have no swim bladder, they have a swim bladder but it is not involved in hearing, or they have a swim bladder which is involved in hearing (Popper *et al.* 2014).

6.6.1.13 The noise levels are based on consideration of peak noise (SPL_{peak}, the maximum absolute value of the instantaneous sound pressure during a specified time interval), and cumulative Sound Exposure Level (SEL_{cum}) which is the linear summation of the individual sound events over the time period of interest (NIS Volume III, Appendix 11.1: Underwater Noise Assessment (Revised 2026) for further details).

6.6.1.14 Insufficient data exists to make a recommendation for guidelines in relation to masking effects or behavioural effects and therefore a qualitative approach has been adopted in which relative risk of an effect is placed in order of rank at three distances from the source – near (N) (tens of metres from the source), intermediate (I) (hundreds of metres from the source) and far (F) (thousands of metres from the source) (refer to Table 6.38).

6.6.1.15 As mentioned in Section 4 above, two piling scenarios have been modelled (a ramp-up mitigation scenario and an extended ramp-up mitigation scenario; see NIS Volume III, Appendix 11.1: Underwater Noise Assessment (Revised March 2026)). For the purposes of this assessment, the ramp-up mitigation scenario (the base-case) is applied, as it represents the greatest spatial extent over which the relevant thresholds of effect given in Table 6.38 are exceeded. The extended ramp-up scenario represents additional mitigation committed by the Applicant in order to further reduce the potential significance of underwater noise effects. As demonstrated by the modelling (see NIS Volume III, Appendix 11.1: Underwater Noise Assessment (Revised March 2026)), this scenario results in a reduced spatial extent of effect compared to the ramp-up mitigation scenario. Accordingly, while the assessment conclusions are based on the ramp-up mitigation scenario,

the Proposed Development will implement the extended ramp-up mitigation in practice, meaning that actual effects are expected to be equal to or less than those assessed.

Table 6.38: Mortality, potential injury, temporary threshold shift, masking and behaviour criteria for fish and shellfish in relation to pile driving noise (Popper *et al.*, 2014)

Fish grouping	Impairment				
	Mortality and potential mortal injury	Recoverable injury	Temporary Threshold Shift (TTS)	Masking	Behaviour
No swim bladder (particle motion detection)	>219 dB SEL_{cum} or >213 dB SPL_{peak}	>216 dB SEL_{cum} or >213 dB SPL_{peak}	>186 dB SEL_{cum}	(N) Moderate (I) Low (F) Low	(N) High (I) Moderate (F) Low
Swim bladder is not involved in hearing (particle motion detection)	>210 dB SEL_{cum} or >207 dB SPL_{peak}	>203 dB SEL_{cum} or >207 dB SPL_{peak}	>186 dB SEL_{cum}	(N) Moderate (I) Low (F) Low	(N) High (I) Moderate (F) Low
Swim bladder is involved in hearing (primarily pressure detection)	>207 dB SEL_{cum} or >207 dB SPL_{peak}	>203 dB SEL_{cum} or >207 dB SPL_{peak}	>186 dB SEL_{cum}	(N) High (I) High (F) Moderate	(N) High (I) High (F) Moderate

6.6.1.16 For continuous noise sources such as vibropiling, dredging and vessel noise, quantitative criteria for assessment are only available for recoverable injury and TTS for fish with a swim bladder involved in hearing. For other potential effects (i.e. masking and behaviour changes) the qualitative approach described in Table 6.39 is applicable.

Table 6.39: Mortality, potential injury, temporary threshold shift, masking and behaviour criteria for fish and shellfish in relation to vessel noise and other continuous sounds (Popper *et al.*, 2014)

Fish grouping	Impairment				
	Mortality and potential mortal injury	Recoverable injury	Temporary Threshold Shift	Masking	Behaviour
No swim bladder (particle motion detection)	(N) Low (I) Low (F) Low	(N) Low (I) Low (F) Low	(N) Moderate (I) Low (F) Low	(N) High (I) High (F) Moderate	(N) Moderate (I) Moderate (F) Low
Swim bladder is not involved in hearing (particle motion detection)	(N) Low (I) Low (F) Low	(N) Low (I) Low (F) Low	(N) Moderate (I) Low (F) Low	(N) High (I) High (F) Moderate	(N) Moderate (I) Moderate (F) Low
Swim bladder is involved in hearing (primarily pressure detection)	(N) Low (I) Low (F) Low	170 dB SPL_{rms} for 48 hrs	158 dB SPL_{rms} for 12 hours	(N) High (I) High (F) High	(N) High (I) Moderate (F) Low

6.6.1.17 The results of noise modelling for the piling of 11 m monopiles within the Array Area for Group 1, 2 and 3 fleeing receptors can be seen inFigure 6.18, Figure 6.19 and Figure 6.20 respectively.

6.6.1.18 The results of noise modelling for the piling of 14 m monopiles within the Array Area for Group 1, 2 and 3 fleeing receptors can be seen in Figure 6.21, Figure 6.22 and Figure 6.23.

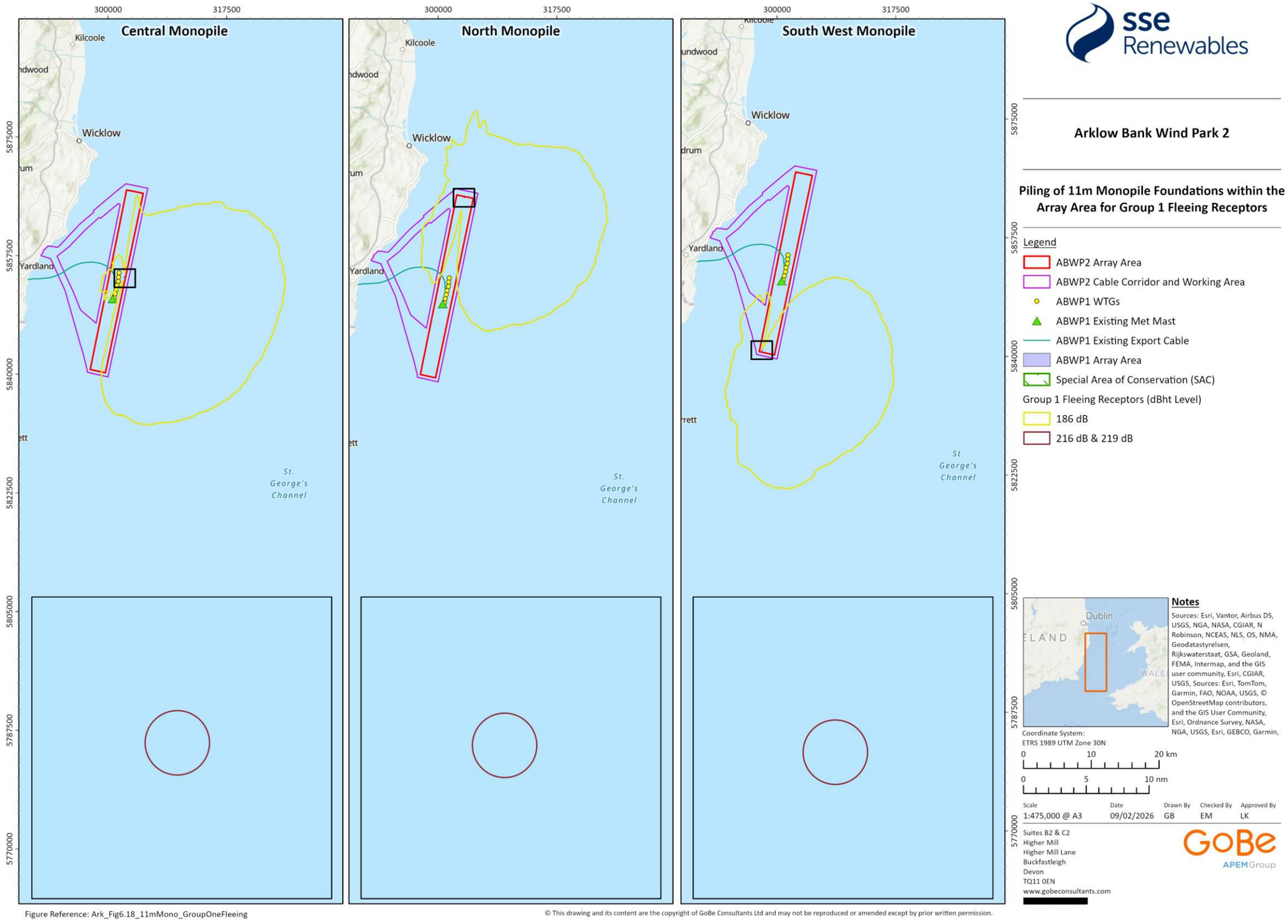

Figure Reference: Ark_Fig6.18_11mMono_GroupOneFleeing

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Figure 6.18: Piling of 11 m Monopile Foundations within the Array Area for Group 1 fleeing receptors

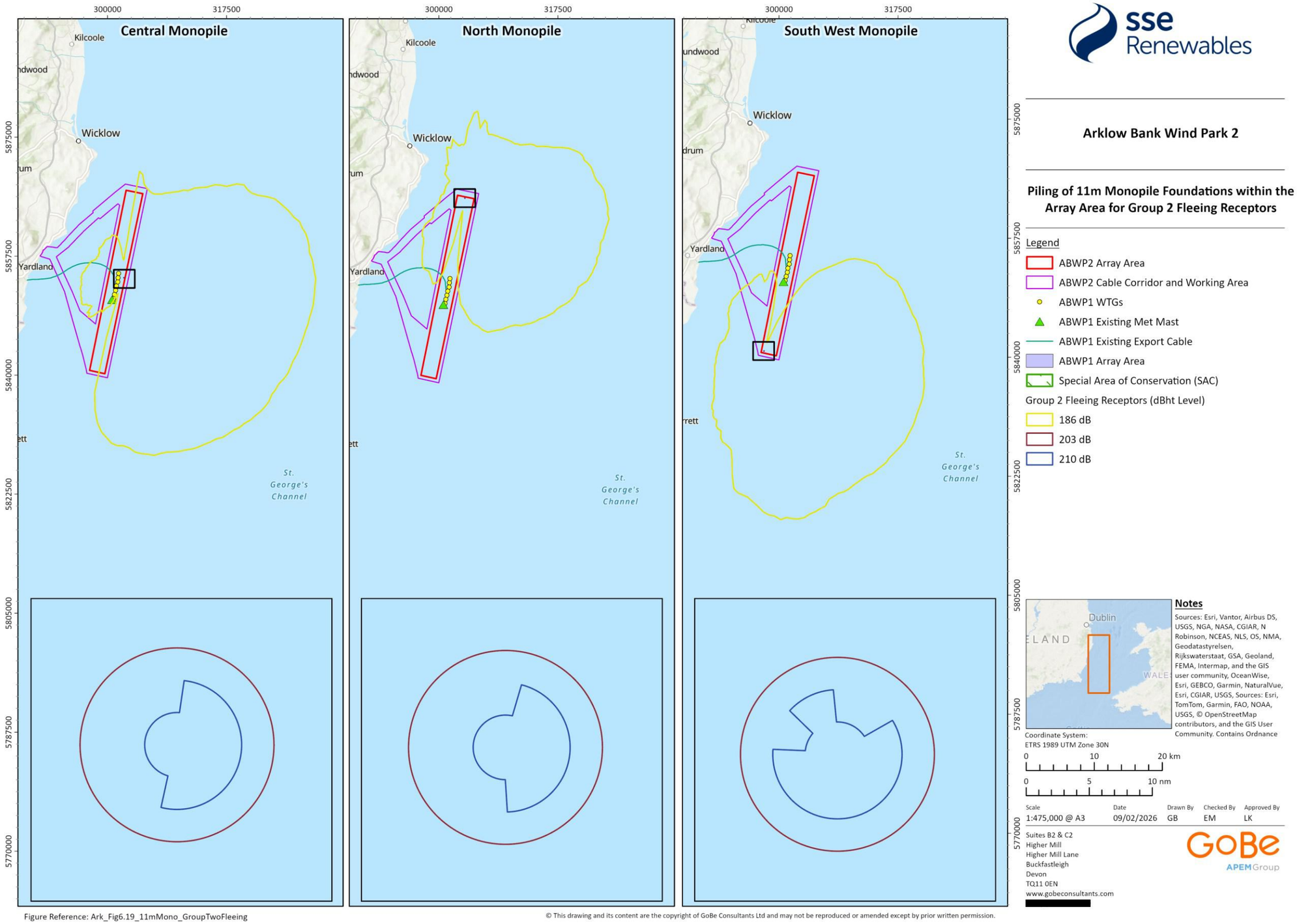

Figure 6.19: Piling of 11 m Monopile Foundations within the Array Area for Group 2 fleeing receptors

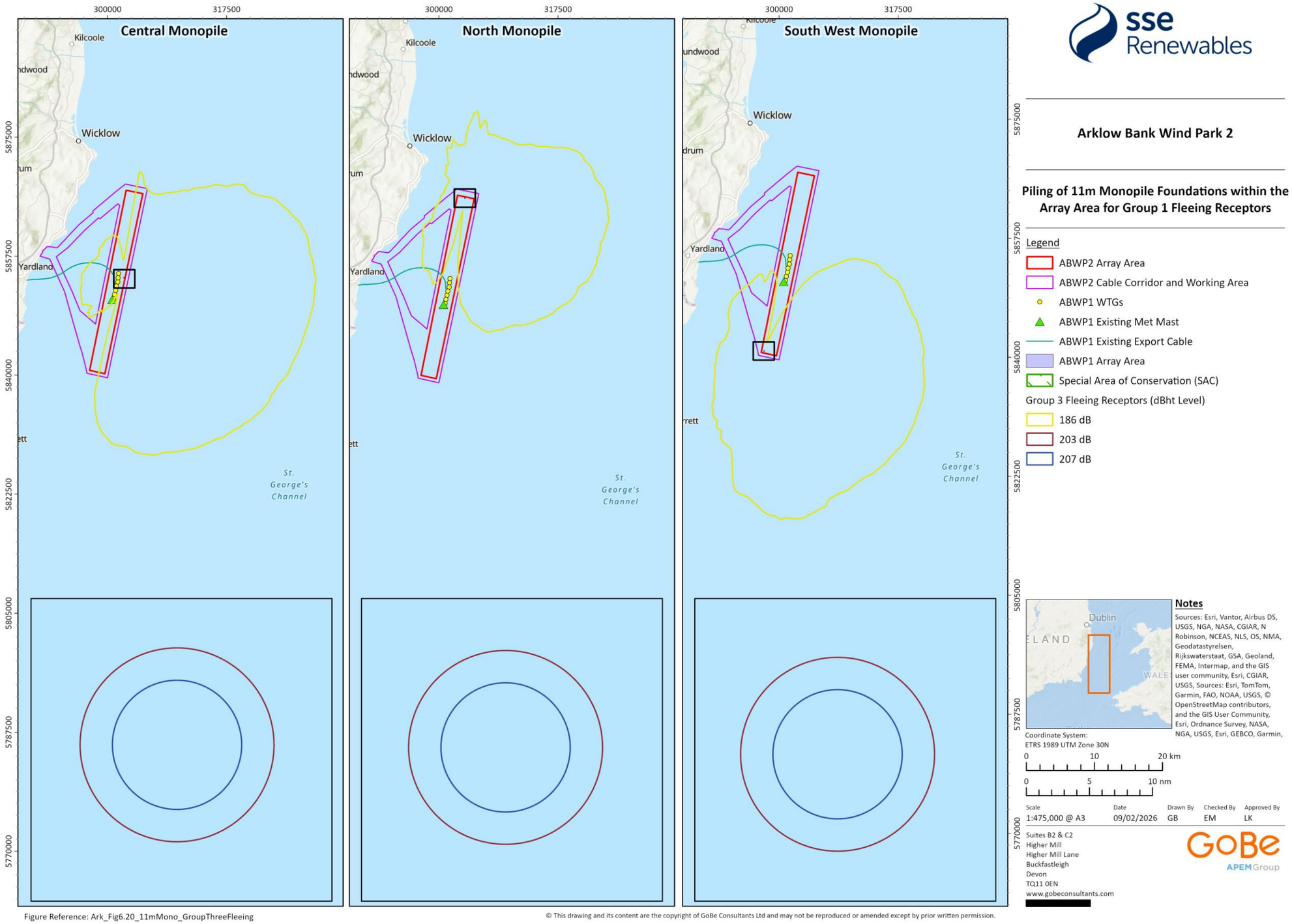

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Figure 6.20: Piling of 11 m Monopile Foundations within the Array Area for Group 3 fleeing receptors

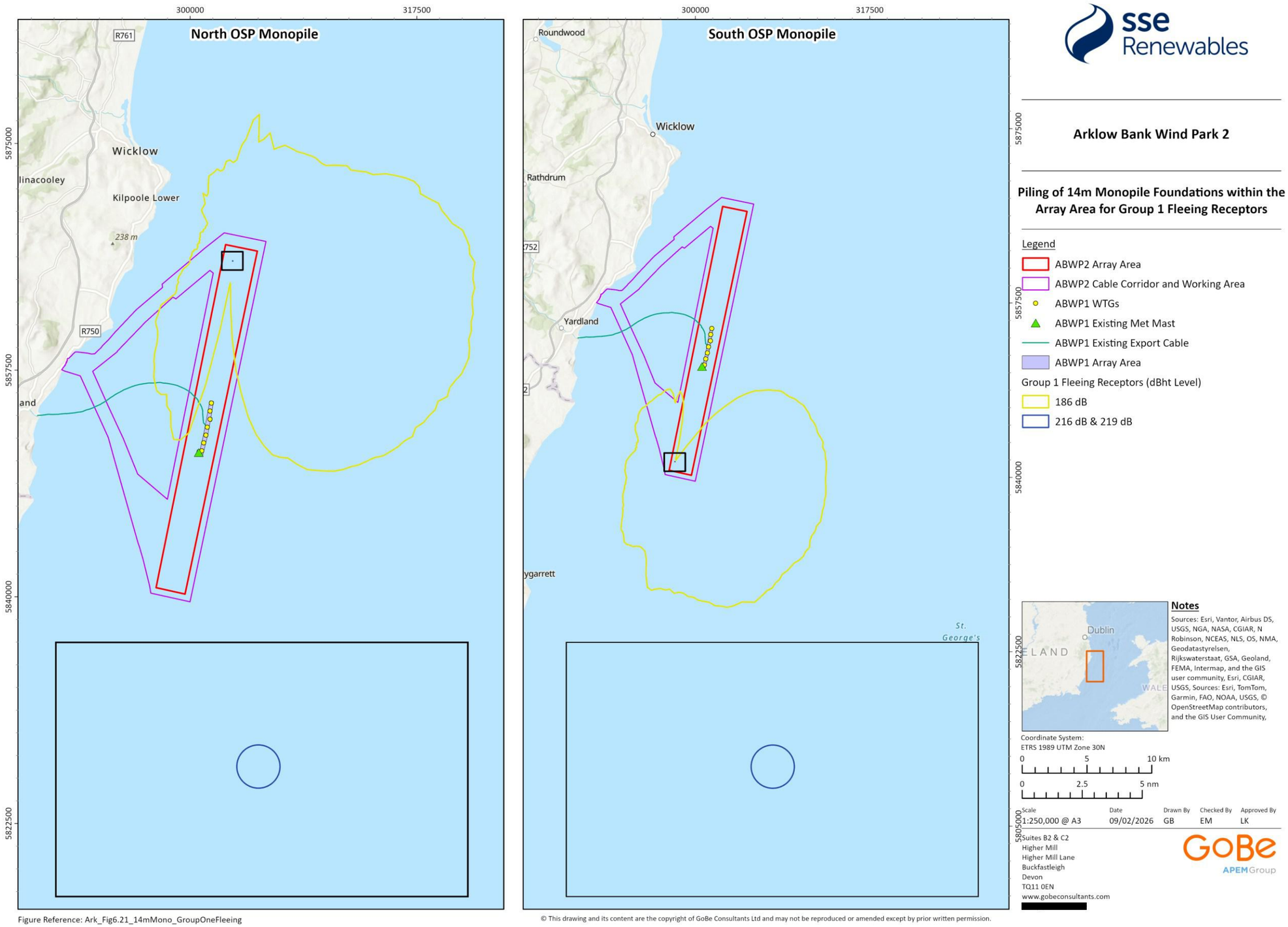

Figure Reference: Ark_Fig6.21_14mMono_GroupOneFleeing

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Figure 6.21: Piling of 14 m Monopile Foundations within the Array Area for Group 1 fleeing receptors

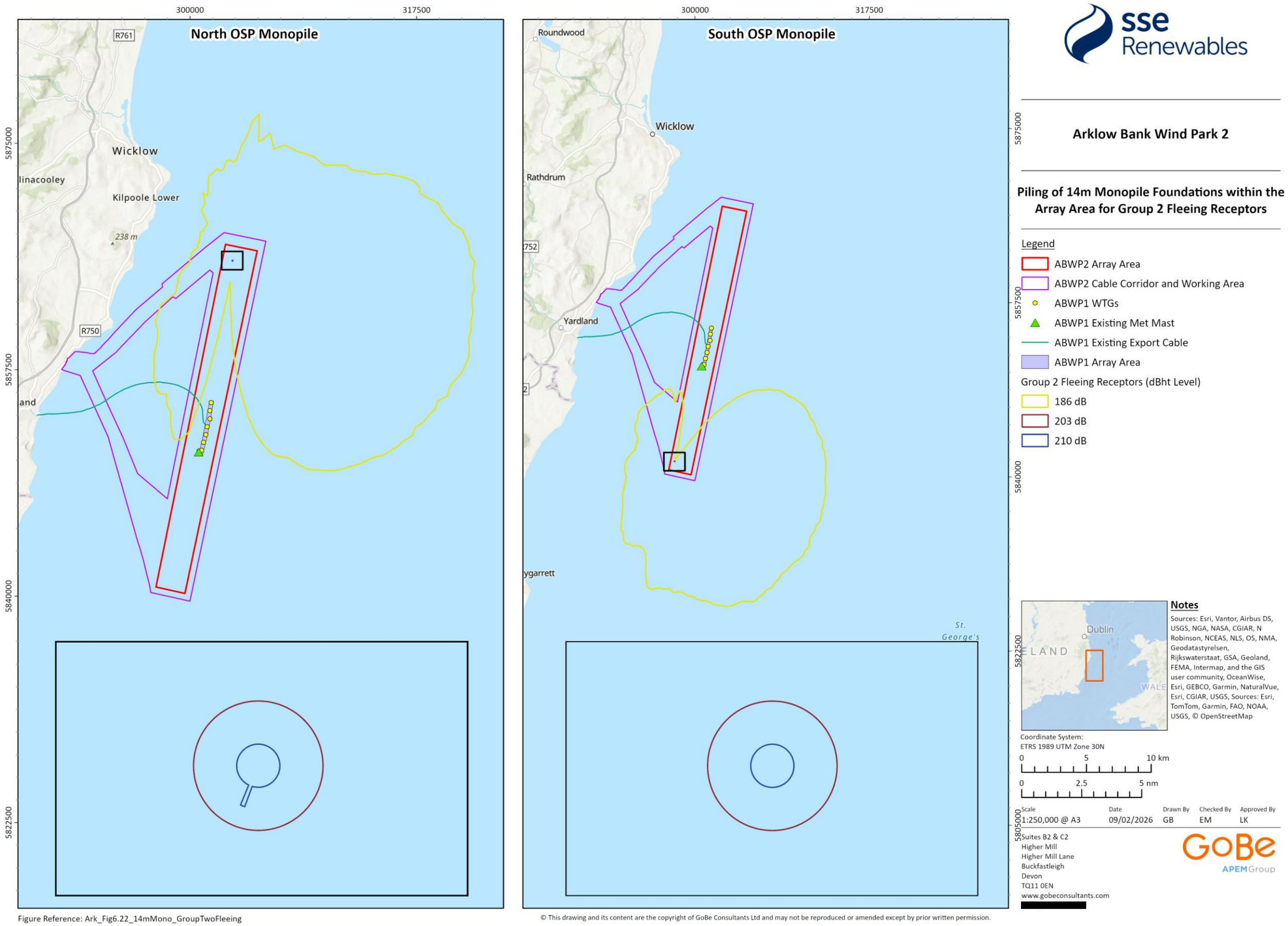

Figure Reference: Ark_Fig6.22_14mMono_GroupTwoFleeing

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Figure 6.22: Piling of 14 m Monopile Foundations within the Array Area for Group 2 fleeing receptors

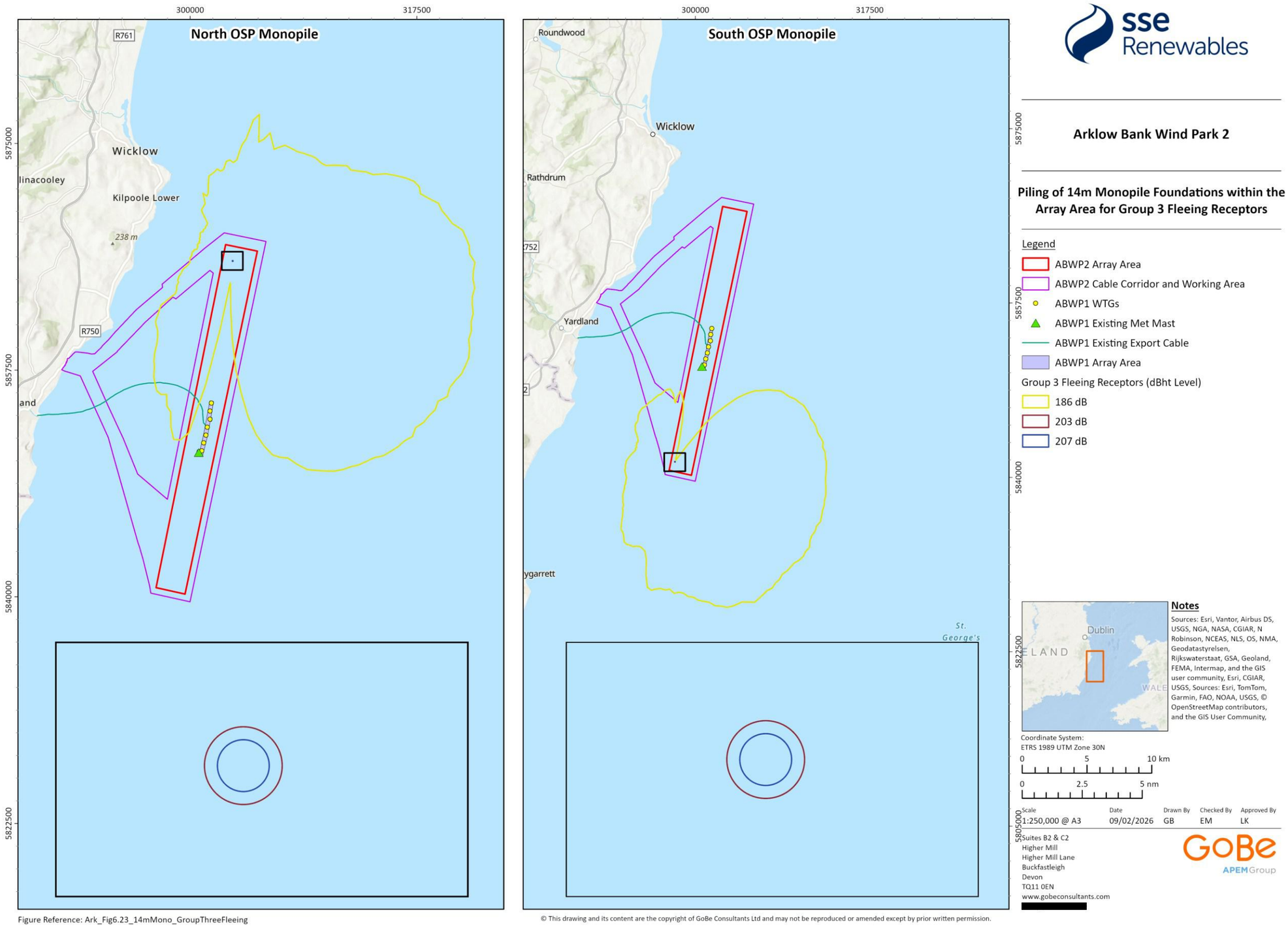

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Figure 6.23: Piling of 14 m Monopile Foundations within the Array Area for Group 3 fleeing receptors

INJURY AND/ OR DISTURBANCE FROM UNDERWATER NOISE – PILING ACTIVITIES (CONSTRUCTION)

6.6.1.19 As twaite shad fall into the category of fish with a swim bladder which is involved in hearing they are the most susceptible to underwater noise impacts. For fish with a swim bladder which is involved in hearing (Type 3 fish), the >207 dB SPL_{peak} threshold for mortality and potential mortal injury and recoverable injury may be exceeded up to 330 m away from the sound source at the C WTG monopile, covering an area of up to 0.31 km^2. At the other WTG foundation sites modelled, the maximum distance range was 280-290 m (0.22-0.25 km^2). For the two OSP foundation sites modelled, the maximum distance range was 190-260 m (0.1-0.21 km^2). This is the distance at which underwater noise and vibration may cause mortality or a recoverable injury to fish that have a swim bladder that is involved in hearing. It should be noted that the >207 dB SPL_{peak} threshold range is larger than the >207 dB SEL_{cum} threshold range, therefore the larger range of impact was used for this assessment.

6.6.1.20 The >186 dB SEL_{cum} threshold for TTS was modelled to be exceeded up to 28,000 m from the noise source at the C WTG monopile, covering an area of up to 1,000 km^2 for fleeing animals. At the other locations, this threshold for fleeing receptors was exceeded between 16,000-25,000 m (350-890 km^2) from the noise source.

6.6.1.21 The Popper *et al.* (2014) criteria for fish with a swim bladder that is involved in hearing indicates that piling in likely to have a high effect on both masking and behaviour on fish within tens and hundreds of metres from the noise source and a Moderate effect beyond this.

6.6.1.22 As the Slaney River Valley SAC is located 47.55 km from the Proposed Development, the site is not within the threshold for mortality, recoverable injury or TTS (Figure 6.18 through Figure 6.23). However, individuals migrating past the Proposed Development may come into contact with these thresholds. As highly mobile fish species, twaite shad are expected to be able to avoid the noise sources before potential mortal injuries could occur and therefore effects are likely to be restricted to temporary TTS effects and temporary disruption/avoidance during migration.

6.6.1.23 **It is concluded that there will be no AEoI on the twaite shad QI of Slaney River Valley SAC as defined by the COs of the site as a result of underwater noise from piling activities as described above, from Project Design Option 1.**

6.6.1.24 **Based on the representative risk of effect of Project Design Option 1, it is concluded that no AEoI would also apply to Project Design Option 2.**

INJURY AND/ OR DISTURBANCE FROM UNDERWATER NOISE – OTHER ACTIVITES (CONSTRUCTION, OPERATIONAL AND MAINTENANCE AND DECOMMISSIONING)

6.6.1.25 The Popper *et al.* (2014) criteria for fish with a swim bladder that is not involved in hearing indicates for vessels and other continuous noise sources, mortality is likely to be Low at all distances as seen in Table 6.39.

6.6.1.26 Moderate TTS effects may be observed within tens of metres and Low TTS effects beyond this distance. High effects on masking are likely within tens and hundreds of metres from the noise source with Moderate effects within thousands of metres. Moderate behavioural effects are likely within tens and hundreds of metres and Low behavioural effects are likely at thousands of metres.

6.6.1.27 Recoverable injury has a numerical criterion of >170 dB SPL_{rms} for 48 hrs for continuous noise sources. Of the continuous noise sources for the Proposed Development, four have source noise levels below this criterion. There are four noise activities with a source noise level of more than >170 dB SPL_{rms}: cable laying; suction dredging; rock placement; and trenching. For these activities the modelling indicates the criterion may be exceeded up to 50 m away from the noise source if continuous for 48 hours or more.

6.6.1.28 The TTS criterion for continuous noise sources is >158 dB SPL_{rms} for 12 hours. Modelling indicates the criterion may be exceeded up to 50 m away from the noise source if continuous for 12 hours or more.

6.6.1.29 For continuous noise sources, it is likely there will be a High masking effect at all distances. For behavioural effects, Popper *et al.* (2014) suggests the effects are likely to be of High significance within tens of metres, Moderate within hundreds of metres and Low within thousands of metres.

6.6.1.30 As the Slaney River Valley SAC is located 47.55 km from the Proposed Development, the site is not within the threshold for mortality or recoverable injury or the threshold for TTS, and the magnitude of individuals at sea is considered to be low, it can be assumed that mortality and recoverable injury will not adversely affect the site.

6.6.1.31 **It is concluded that there will be no AEoI on the twaite shad QI of Slaney River Valley SAC as defined by the COs of the site as a result of underwater noise from other activities, as seen in Table 5.1 from Project Design Option 1.**

6.6.1.32 **Based on the representative risk of effect of Project Design Option 1, it is concluded that no AEoI would also apply to Project Design Option 2.**

CHANGES IN EMF (OPERATIONAL AND MAINTENANCE)

6.6.1.33 The conduction of electricity through subsea power cables has the potential to emit a localised EMF which could potentially affect the sensory mechanisms of some species of fish and shellfish, particularly electrosensitive species including migratory fish species.

6.6.1.34 The presence and operation of inter-array, interconnector and offshore export cables within the Array Area and Cable Corridor and Working Area may lead to a localised EMF affecting fish and shellfish receptors. EMF comprises both the electrical I fields, measured in volts per metre (V/m), and the magnetic (B) fields, measured in microtesla (µT) or milligauss (mG) (1 µT = 10 mG). Direct E-field are typically blocked using conductive sheathing, meaning that the EMFs that are emitted into the marine environment are the B-field and the resultant induced electrical field (iE).

6.6.1.35 The range over which these species can detect electric fields from offshore windfarm subsea cables is very localised and likely to be limited to metres, from the cable (CSA, 2019). EMFs may alter animal behaviour (e.g. via avoidance of EMF, increases in foraging behaviour, reductions in swimming speeds) but there is little evidence to suggest a reduction in survival. Pelagic species are considered unlikely to be exposed to EMF as they generally swim well above the seafloor and consequently would rarely be exposed even at low levels from subsea power cables (CSA, 2019). All QIs are therefore deemed to be of high tolerance and adaptability, high recoverability and of local to international importance. The sensitivity of all relevant fish species to temporary changes in electromagnetic fields is therefore, considered to be Low.

6.6.1.36 While there is some change to EMFs in the vicinity of inter-array and offshore export cables, studies indicate that these are limited in extent, with the strength of EMF dissipating quickly with distance (within metres) from the buried cables. The impact therefore is predicted to be of near-field extent (i.e. restricted to within the Array Area and Cable Corridor and Working Area), long term duration (i.e. the lifetime of the Proposed Development), continuous and of low consequence.

6.6.1.37 **As the Slaney River Valley SAC is 47.55 km from the Proposed Development and the EMF dissipates quickly within metres of the buried cables and the sensitivity of twaite shad is low to EMF, it is concluded that there is no AEoI on the twaite shad QI of Slaney River Valley SAC as defined by the COs of the site as a result of EMF from Project Design Option 1.**

6.6.1.38 **Based on the representative risk of effect of Project Design Option 1, it is concluded that no AEoI would also apply to Project Design Option 2.**

ACCIDENTAL POLLUTION (CONSTRUCTION, OPERATIONAL AND MAINTENANCE AND DECOMMISSIONING)

6.6.1.39 Accidental release of pollutants (such as fuel, lubricants, and anti-fouling biocides) from vessels or equipment associated with the Proposed Development has the potential to occur during the construction, operational and maintenance and decommissioning phases as a result of the installation/removal of foundations, presence of operational equipment, maintenance activities, and the installation of inter-array cables, interconnector cables and offshore export cables.

6.6.1.40 Considering avoidance through design and management (Table 6.36), the likelihood of accidental release is considered extremely low. The measures in the EMP include storage of chemicals in secure designated areas on vessels in line with appropriate regulations and guidelines, and double skinning of any tanks and pipes containing hazardous substances. All chemicals used will be subject to a chemical risk assessment to ensure risks are understood and minimised. The EMP also includes a MPCP which will contain key emergency contact details and response procedures in the event of a spill of any magnitude to ensure minimal impact. Complying with these procedures will also reduce the magnitude of any spill. Adherence to the avoidance design and management measures outlined in Table 6.7, including the EMP and MPCP will significantly reduce the likelihood of an accidental pollution incident occurring, and the magnitude of its impact.

6.6.1.41 **Given the low likelihood of accidental pollution, as well as the proposed avoidance/ impact reduction measures it is concluded that there is no AEoI on the twaite shad QI of Slaney River Valley SAC as defined by the COs of the site as a result of accidental pollution from Project Design Option 1.**

6.6.1.42 **Based on the representative risk of effect of Project Design Option 1, it is concluded that no AEoI would also apply to Project Design Option 2.**

Atlantic salmon

6.6.1.43 The COs for Atlantic salmon at this designated site is to restore the favourable conservation condition of the QI, this is defined and presented in Table 5.1.

6.6.1.44 There are four potential impact pathways considered for Atlantic salmon associated with construction, operational and maintenance, and decommissioning of the Proposed Development, which are presented in Table 6.37 and are assessed below for each phase of the Proposed Development.

INJURY AND/ OR DISTURBANCE FROM UNDERWATER NOISE – PILING ACTIVITIES (CONSTRUCTION)

6.6.1.45 Atlantic salmon fall into the category of fish that have a swim bladder, but it is not involved in hearing.

6.6.1.46 For fish with a swim bladder which is not involved in hearing, the >207 dB peak threshold for mortality and potential mortal injury and recoverable injury may be exceeded up to 330 m away from the sound source at the C WTG monopile, covering an area of up to 0.31 km^2. At the other WTG foundation sites modelled, the maximum distance range was 280-290 m (0.22-0.25 km^2). For the two OSP foundation sites modelled, the maximum distance range was 190-260m (0.1-0.21 km^2). This is the distance at which underwater noise and vibration may cause mortality or a recoverable injury to fish that have a swim bladder that is not involved in hearing. It should be noted that the >207 dB SPL_{peak} threshold range is larger than the >207 dB SEL_{cum} threshold range, therefore the larger range of impact was used for this assessment.

6.6.1.47 The >186 dB SEL_{cum} threshold for TTS was modelled to be exceeded up to 28,000 m from the noise source at the C WTG monopile, covering an area of up to 1,000 km^2 for fleeing animals. At the other locations, this threshold for fleeing receptors was exceeded between 16,000-25,000 m (350-890 km^2) from the noise source.

6.6.1.48 The Popper *et al.* (2014) criteria for fish with a swim bladder that is not involved in hearing indicates that piling in likely to have a Moderate effect on masking for fish within tens of metres from the noise source and a Low effect beyond this. Behavioural effects are likely to be High within tens of metres, Moderate within hundreds of metres and Low at greater distances.

6.6.1.49 As the Slaney River Valley SAC is located 47.55 km from the proposed development, the site is not within the threshold for mortality, recoverable injury or TTS. Migration patterns of Atlantic salmon out of this SAC are not fully understood. However, they are assumed to migrate northerly past the Proposed Development, similar to the migration patterns observed for Atlantic salmon along other East Ireland rivers (Barry *et al.*, 2020). As highly mobile fish species, Atlantic salmon are expected to be able to avoid the noise sources before potential mortal injuries could occur and therefore effects are likely to be restricted to temporary TTS effects and temporary disruption/avoidance during migration.

6.6.1.50 **It is concluded that there will be no AEoI on the Atlantic salmon QI of Slaney River Valley SAC as defined by the COs of the site as a result of underwater noise from piling activities, as seen in Table 5.1 from Project Design Option 1.**

6.6.1.51 **Based on the representative risk of effect of Project Design Option 1, it is concluded that no AEoI would also apply to Project Design Option 2.**

INJURY AND/ OR DISTURBANCE FROM UNDERWATER NOISE – OTHER ACTIVITES (CONSTRUCTION, OPERATIONAL AND MAINTENANCE AND DECOMMISSIONING)

6.6.1.52 The Popper *et al.* (2014) criteria for fish with a swim bladder that is not involved in hearing indicates for vessels and other continuous noise sources, mortality is likely to be Low at all distances as seen in Table 6.39.

6.6.1.53 The Popper *et al.* (2014) criteria for fish with a swim bladder that is not involved in hearing indicates for vessels and other continuous noise sources, mortality and recoverable injuries are likely to be Low at all distances. Moderate TTS effects may be observed within tens of metres and Low beyond this distance. High effects on masking are likely within tens and hundreds of metres from the noise source with Moderate effects within thousands of metres. Moderate behavioural effects are likely within tens and hundreds of metres and Low behavioural effects are likely at thousands of metres.

6.6.1.54 The results of modelling of UXO clearance indicates that if the maximum charge (800 kg + donor) was detonated it could result in mortality or mortal injury in 560-930 m from the explosion. If Low-order deflagration (charge weight of 0.5 kg) is used to initiate a burnout of the explosive any fish within 80 m of the explosion would be at risk of mortality or mortal injury. Low-order deflagration is not always possible and if the original charge is not fully detonated then a High-order detonation would be required to remove the remaining charge. If High-order detonation is required of an 800 kg UXO it has the potential to kill Type 1 fish occurring in the area. Recoverable injury, TTS and behavioural effects are also likely within tens of metres of the noise source and may be observed within hundreds of metres.

6.6.1.55 As the Slaney River Valley SAC is located 47.55 km from the proposed development, the site is not within the threshold for mortality or recoverable injury or the threshold for TTS, and the magnitude of individuals at sea is considered to be low, it can be assumed that mortality and recoverable injury will not have an adversely effect on the site.

6.6.1.56 **It is concluded that there will be no AEoI on the Atlantic salmon QI of Slaney River Valley SAC as defined by the COs of the site as a result of underwater noise from other activities, as seen in Table 5.1 from Project Design Option 1.**

6.6.1.57 **Based on the representative risk of effect of Project Design Option 1, it is concluded that no AEoI would also apply to Project Design Option 2.**

CHANGES IN EMF (OPERATIONAL AND MAINTENANCE)

6.6.1.58 The conduction of electricity through subsea power cables has the potential to emit a localised EMF which could potentially affect the sensory mechanisms of some species of fish and shellfish, particularly electrosensitive species including migratory fish species.

6.6.1.59 The presence and operation of inter-array, interconnector and offshore export cables within the Array Area and Cable Corridor and Working Area may lead to a localised EMF affecting fish and shellfish receptors. EMF comprises both the electrical (E) fields, measured in volts per metre (V/m), and the magnetic (B) fields, measured in microtesla (μT) or milligauss (mG) (1 μT = 10 mG). Direct E-field are typically blocked using conductive sheathing, meaning that the EMFs that are emitted into the marine environment are the B-field and the resultant induced electrical field (iE).

6.6.1.60 The range over which these species can detect EMFs from offshore windfarm subsea cables is very localised and likely to be limited to metres, from the cable (CSA, 2019). EMFs may alter animal behaviour (e.g. via avoidance of EMF, increases in foraging behaviour, reductions in swimming speeds) but there is little evidence to suggest a reduction in survival. Pelagic species are considered unlikely to be exposed to EMF as they generally swim well above the seafloor and consequently would rarely be exposed even at low levels from subsea power cables (CSA, 2019). All IEFs are therefore deemed to be of high tolerance and adaptability, high recoverability and of local to international importance. The sensitivity of all relevant fish species to temporary changes in electromagnetic fields is therefore, considered to be Low.

6.6.1.61 While there is some change to EMFs in the vicinity of inter-array and offshore export cables, studies indicate that these are limited in extent, with the strength of EMF dissipating quickly with distance (within metres) from the buried cables.

6.6.1.62 **As the Slaney River Valley SAC is 47.55 km from the Proposed Development and the EMF dissipates quickly within metres of the buried cables and the sensitivity of Atlantic salmon is low to EMF, it is concluded that there is no AEoI on the Atlantic salmon QI of Slaney River Valley SAC as defined by the COs of the site as a result of EMF from Project Design Option 1.**

6.6.1.63 **Based on the representative risk of effect of Project Design Option 1, it is concluded that no AEoI would also apply to Project Design Option 2.**

ACCIDENTAL POLLUTION (CONSTRUCTION, OPERATIONAL AND MAINTENANCE AND DECOMMISSIONING)

6.6.1.64 Accidental release of pollutants (such as fuel, lubricants, and anti-fouling biocides) from vessels or equipment associated with the Proposed Development has the potential to occur during the construction, operational and maintenance and decommissioning phases as a result of the installation/removal of foundations, presence of operational equipment, maintenance activities, and the installation of inter-array cables, interconnector cables and offshore export cables.

6.6.1.65 Considering avoidance through design and management (Table 6.36), the likelihood of accidental release is considered extremely low. The measures in the EMP include storage of chemicals in secure designated areas on vessels in line with appropriate regulations and guidelines, and double skinning of any tanks and pipes containing hazardous substances. All chemicals used will be subject to a chemical risk assessment to ensure risks are understood and minimised. The EMP also includes a MPCP which will contain key emergency contact details and response procedures in the event of a spill of any magnitude to ensure minimal impact. Complying with these procedures will also reduce the magnitude of any spill. Adherence to the avoidance design and management measures outlined in Table 6.36, including the EMP and MPCP will significantly reduce the likelihood of an accidental pollution incident occurring, and the magnitude of its impact.

6.6.1.66 **Given the low likelihood of accidental pollution, as well as the proposed avoidance/ impact reduction measures it is concluded that there is no AEoI on the Atlantic salmon QI of Slaney River Valley SAC as defined by the COs of the site as a result of accidental pollution from Project Design Option 1.**

6.6.1.67 **Based on the representative risk of effect of Project Design Option 1, it is concluded that no AEoI would also apply to Project Design Option 2.**

Sea lamprey and River lamprey

6.6.1.68 The COs for sea lamprey and river lamprey at this designated site is to restore the favourable conservation condition of the QI, this is defined and presented in Table 5.1.

6.6.1.69 There are four key potential impact pathways considered for sea lamprey and river lamprey associated with construction, operational and maintenance, and decommissioning of the Proposed Development, which are presented in Table 6.37 and are assessed below for each phase of the Proposed Development.

INJURY AND/ OR DISTURBANCE FROM UNDERWATER NOISE – PILING ACTIVITIES (CONSTRUCTION)

6.6.1.70 Sea lamprey and River lamprey fall into the category of fish with no swim bladder. For fish with no swim bladder, the >213 dB peak threshold for mortality and potential mortal injury and recoverable injury, may be exceeded up to 140 m away from the noise source at the C WTG monopile, covering an area of up to 0.06 km^2. At the other WTG foundation sites modelled (SW WTG and N WTG), the maximum distance was 120 m (0.04-0.05 km^2). For the two OSP foundation sites modelled, the maximum distance range was 80-110 m (0.02-0.04 km^2). This is the distance at which underwater noise and vibration may cause mortality or a recoverable injury to fish that have a swim bladder that is not involved in hearing. It should be noted that the >207 dB SPL_{peak} threshold range is larger than the >207 dB SEL_{cum} threshold range, therefore the larger range of impact was used for this assessment.

6.6.1.1 The >186 dB SEL_{cum} threshold for TTS was modelled to be exceeded up to 28,000 m from the noise source at the C WTG site, covering an area of up to 1,000 km^2 for fleeing animals. At the other locations, this threshold for fleeing receptors was exceeded between 16,000-25,000 m (350-890 km^2) from the noise source.

6.6.1.2 The Popper *et al.* (2014) criteria for fish with no swim bladder indicates that piling in likely to have a Moderate effect on masking for fish within tens of metres from the noise source and a Low effect beyond this. Behavioural effects are likely to be High within tens of metres, Moderate within hundreds of metres and Low at greater distances.

6.6.1.3 As the Slaney River Valley SAC is located 47.55 km from the proposed development, the site is not within the threshold for mortality or recoverable injury or the threshold for TTS (Figure 6.23), and the magnitude of individuals at sea is considered to be low, it can be assumed that mortality and recoverable injury will not have an adverse effect on the site.

6.6.1.4 **It is concluded that there will be no AEoI on the sea lamprey and river lamprey QIs of the Slaney River Valley SAC as defined by the COs of the site as a result of underwater noise from other activities, as seen in Table 5.1 from Project Design Option 1.**

6.6.1.5 **Based on the representative risk of effect of Project Design Option 1, it is concluded that no AEoI would also apply to Project Design Option 2.**

INJURY AND/ OR DISTURBANCE FROM UNDERWATER NOISE – OTHER ACTIVITES (CONSTRUCTION, OPERATIONAL AND MAINTENANCE AND DECOMMISSIONING)

6.6.1.6 The Popper *et al.* (2014) criteria for fish with no swim bladder indicates for vessels and other continuous noise sources, mortality and recoverable injuries are likely to be Low at all distances. Moderate TTS effects may be observed within tens of metres and Low beyond this distance. High effects on masking are likely within tens and hundreds of metres from the noise source with Moderate effects within thousands of metres. Moderate behavioural effects are likely within tens and hundreds of metres and Low behavioural effects are likely at thousands of metres as seen in Table 6.39.

6.6.1.7 As the Slaney River Valley SAC is located 47.55 km from the proposed development, the site is not within the threshold for mortality or recoverable injury or the threshold for TTS, and the magnitude of individuals at sea is considered to be low, it can be assumed that mortality and recoverable injury will not have an adverse effect on the site.

6.6.1.8 **It is concluded that there will be no AEoI on the sea lamprey and river lamprey QIs of Slaney River Valley SAC as defined by the COs of the site as a result of underwater noise from other activities, as seen in Table 5.1 from Project Design Option 1.**

6.6.1.9 **Based on the representative risk of effect of Project Design Option 1, it is concluded that no AEoI would also apply to Project Design Option 2.**

CHANGES IN EMF (OPERATIONAL AND MAINTENANCE)

6.6.1.10 The conduction of electricity through subsea power cables has the potential to emit a localised EMF which could potentially affect the sensory mechanisms of some species of fish and shellfish, particularly electrosensitive species including migratory fish species.

6.6.1.11 The presence and operation of inter-array, interconnector and offshore export cables within the Array Area and Cable Corridor and Working Area may lead to a localised EMF affecting fish and shellfish receptors. EMF comprises both the electrical (E) fields, measured in volts per metre (V/m), and the magnetic (B) fields, measured in microtesla (μT) or milligauss (mG) (1 μT = 10 mG). Direct E-field are typically blocked using conductive sheathing, meaning that the EMFs that are emitted into the marine environment are the B-field and the resultant induced electrical field (iE).

6.6.1.12 The range over which these species can detect electric fields from offshore windfarm subsea cables is very localised and likely to be limited to metres, from the cable (CSA, 2019). EMF may alter animal behaviour (e.g. via avoidance of EMF, increases in foraging behaviour, reductions in swimming speeds) but there is little evidence to suggest a reduction in survival. Pelagic species are considered unlikely to be exposed to EMF as they generally swim well above the seafloor and consequently would rarely be exposed even at low levels from subsea power cables (CSA, 2019). All IEFs are therefore deemed to be of high tolerance and adaptability, high recoverability and of local to international importance. The sensitivity of all relevant fish species to temporary changes in electromagnetic fields is therefore, considered to be Low.

6.6.1.13 While there is some change to EMFs in the vicinity of inter-array and offshore export cables, studies indicate that these are limited in extent, with the strength of EMF dissipating quickly with distance (within metres) from the buried cables.

6.6.1.14 **As the Slaney River Valley SAC is 47.55 km from the Proposed Development and the EMF dissipates quickly within metres of the buried cables and the sensitivity of sea lamprey and river lamprey is low to EMF, it is concluded that there is no AEoI on the sea lamprey and river lamprey QIs of Slaney River Valley SAC as defined by the COs of the site as a result of EMF from Project Design Option 1.**

6.6.1.15 **Based on the representative risk of effect of Project Design Option 1, it is concluded that no AEoI would also apply to Project Design Option 2.**

ACCIDENTAL POLLUTION (CONSTRUCTION, OPERATIONAL AND MAINTENANCE AND DECOMMISSIONING)

6.6.1.16 Accidental release of pollutants (such as fuel, lubricants, and anti-fouling biocides) from vessels or equipment associated with the Proposed Development has the potential to occur during the construction, operational and maintenance and decommissioning phases as a result of the installation/removal of foundations, presence of operational equipment, maintenance activities, and the installation of inter-array cables, interconnector cables and offshore export cables.

6.6.1.17 Considering avoidance through design and management (Table 6.36), the likelihood of accidental release is considered extremely low. The measures in the EMP include storage of chemicals in secure designated areas on vessels in line with appropriate regulations and guidelines, and double skinning of any tanks and pipes containing hazardous substances. All chemicals used will be subject to a chemical risk assessment to ensure risks are understood and minimised. The EMP also includes a MPCP which will contain key emergency contact details and response procedures in the event of a spill of any magnitude to ensure minimal impact. Complying with these procedures will also reduce the magnitude of any spill. Adherence to the avoidance design and management measures outlined in Table 6.36, including the EMP and MPCP will significantly reduce the likelihood of an accidental pollution incident occurring, and the magnitude of its impact.

6.6.1.18 **Given the low likelihood of accidental pollution, as well as the proposed avoidance/ impact reduction measures it is concluded that there is no AEoI on the sea lamprey and river lamprey QIs of Slaney River Valley SAC as defined by the COs of the site as a result of accidental pollution from Project Design Option 1.**

6.6.1.19 **Based on the irepresentative risk of effect of Project Design Option 1, it is concluded that no AEoI would also apply to Project Design Option 2.**

Freshwater pearl mussels

6.6.1.20 The COs for freshwater pearl mussels at this designated site is to restore the favourable conservation condition of the QI, this is defined and presented in Table 5.1.

6.6.1.21 There are four potential impact pathways considered for freshwater pearl mussels (via obligate host species) associated with construction, operational and maintenance, and decommissioning of the Proposed Development, which are presented in Table 6.37 and are assessed below.

6.6.1.22 Freshwater pearl mussels are of consideration at this site as within the first year of their life cycle, they live on the gills of either young Atlantic salmon or Brown trout (Moorkens, 1999). As the viability of the mussel population is inherently linked to the viability of the salmon population, it is considered that the maximum potential effect from the Proposed Development on freshwater pearl mussel will be the same as that considered for Atlantic salmon, and the conclusions made to the salmon population will mirror those for freshwater pearl mussel.

6.6.1.23 **As it was concluded that there would be no AEoI for Atlantic salmon from all potential impacts, the same is concluded for freshwater pearl mussels and therefore there is no AEoI on the freshwater pearl mussel QI of the Slaney River Valley SAC as defined by the COs of the site as a result of all potential impacts from Project Design Option 1.**

6.6.1.24 **Based on the representative risk of effect of Project Design Option 1, it is concluded that no AEoI would also apply to Project Design Option 2.**

6.6.2 River Barrow and River Nore SAC

Twaite Shad

6.6.2.1 The COs for twaite shad at this designated site is to restore the favourable conservation condition of the QI, this is defined and presented in Table 5.1.

6.6.2.2 There are four potential impact pathways considered for twaite shad associated with construction, operational and maintenance, and decommissioning of the Proposed Development, which are presented in Table 6.37 and are assessed below for each phase of the Proposed Development. These comprise of injury and/ or disturbance from underwater noise caused by piling activities, injury and/ or disturbance from underwater noise caused by other construction activities, changes in EMF and accidental pollution.

6.6.2.3 With consideration that the magnitude of potential impacts is based on distance from the site of works, Slaney River Valley SAC (47.55 km) is designated for the same QIs as River Barrow and River Nore SAC (125.42 km) and is located nearer to the Proposed Development. On this basis, it was concluded that the potential for AEoI for Annex II Fish and Shellfish QIs is the same or reduced for River Barrow and River Nore SAC as it is for Slaney River Valley SAC. In Section 6.6.1 it has been concluded that none of the potential effects on twaite shad would result in an AEoI of the Annex II Fish and Shellfish QIs of the Slaney River Valley SAC.

6.6.2.4 **Therefore, there is no AEoI on the twaite shad QI of the River Barrow and River Nore SAC as defined by the COs of the site as a result of any of the impacts considered above from Project Design Option 1.**

6.6.2.5 **Based on the representative risk of effect of Project Design Option 1, it is concluded that no AEoI would also apply to Project Design Option 2.**

Atlantic salmon

6.6.2.6 The COs for Atlantic salmon at this designated site is to restore the favourable conservation condition of the QI, this is defined and presented in Table 5.1.

6.6.2.7 There are four potential impact pathways considered for Atlantic salmon associated with construction, operational and maintenance, and decommissioning of the Proposed Development, which are presented in Table 6.37 and are assessed below for each phase of the Proposed Development. These comprise injury and/ or disturbance from underwater noise caused by piling activities, injury and/or disturbance from underwater noise caused by other construction activities, changes in EMF and accidental pollution.

6.6.2.8 With consideration that the impact severity is based on distance from the site of works, Slaney River Valley SAC (47.55 km) is designated for the same QIs as River Barrow and River Nore SAC (125.42 km) and is located nearer to the Proposed Development. On this basis it was concluded that the potential for AEoI for Annex II Fish and Shellfish QIs is the same or reduced for River Barrow and River Nore SAC as it is for Slaney River Valley SAC. In Section 6.6.1, it has been concluded that none of the potential effects on Atlantic salmon would result in an AEoI of the Annex II Fish and Shellfish QIs of the Slaney River Valley SAC.

6.6.2.9 **Therefore, there is no AEoI on the Atlantic salmon QI of the River Barrow and River Nore SAC, as defined by the COs of the site, as a result of any of the impacts considered above from Project Design Option 1.**

6.6.2.10 **Based on the representative risk of effect of Project Design Option 1, it is concluded that no AEoI would also apply to Project Design Option 2.**

Sea lamprey and River lamprey

6.6.2.11 The COs for sea lamprey and river lamprey at this designated site is to restore the favourable conservation condition of the QI, this is defined and presented in Table 5.1.

6.6.2.12 There are four potential impact pathways considered for sea lamprey and river lamprey associated with construction, operational and maintenance, and decommissioning of the Proposed Development, which are presented in Table 6.37 and are assessed below for each phase of the Proposed Development. These comprise injury and/ or disturbance from underwater noise caused by piling activities, injury and/or disturbance from underwater noise caused by other construction activities, changes in EMF and accidental pollution.

6.6.2.13 With consideration that the impact severity is based on distance from the site of works, Slaney River Valley SAC (47.55 km) is designated for the same QIs as River Barrow and River Nore SAC (125.42 km) and is located nearer to the Proposed Development. On this basis, it was concluded that the potential for AEoI on the QIs of Annex II Fish and Shellfish is the same or reduced for River Barrow and River Nore SAC as it is for Slaney River Valley SAC. In Section 6.6.1 it has been concluded that none of the potential effects on sea lamprey and river lamprey would result in an AEoI of the Annex II Fish and Shellfish QIs of the Slaney River Valley SAC.

6.6.2.14 **Therefore, there is no AEoI on the sea lamprey and river lamprey QIs of the River Barrow and River Nore SAC, as defined by the COs of the site, as a result of any of the impacts considered above affecting from Project Design Option 1.**

6.6.2.15 **Based on the representative risk of effect of Project Design Option 1, it is concluded that no AEoI would also apply to Project Design Option 2.**

Freshwater pearl mussels

6.6.2.16 The COs for freshwater pearl mussels at this designated site is to restore the favourable conservation condition of the QI, this is defined and presented in Table 5.1.

6.6.2.17 There are four potential impact pathways considered for freshwater pearl mussels (via obligate host species) associated with construction, operational and maintenance, and decommissioning of the Proposed Development, which are presented in Table 6.37 and are assessed below for each phase of the Proposed Development. These comprise of injury and/ or disturbance from underwater noise caused by piling activities, injury and/or disturbance from underwater noise caused by other construction activities, changes in EMF and accidental pollution.

6.6.2.18 With consideration that the impact severity is based on distance from the site of works, Slaney River Valley SAC (47.55 km) is designated for the same QIs as River Barrow and River Nore SAC (125.42 km) and is located nearer to the Proposed Development. On this basis, it was concluded that the potential for AEoI on Annex II Fish and Shellfish QIs is the same or reduced for River Barrow and River Nore SAC as it is for Slaney River Valley SAC. In Section 6.6.1.23 it has been concluded that none of the potential effects on freshwater pearl mussels would result in an AEoI of the Annex II Fish and Shellfish QIs of the Slaney River Valley SAC.

6.6.2.19 **Therefore, there is no AEoI on the freshwater pearl mussel QI of the River Barrow and River Nore SAC, as defined by the COs of the site, as a result of any of the impacts considered above affecting from Project Design Option 1.**

6.6.2.20 **Based on the representative risk of effect of Project Design Option 1, it is concluded that no AEoI would also apply to Project Design Option 2.**

6.6.3 Lower River Suir SAC

Twaite Shad

6.6.3.1 The COs for twaite shad at this designated site is to restore the favourable conservation condition of the QI, this is defined and presented in Table 5.1.

6.6.3.2 There are four potential impact pathways considered for twaite shad associated with construction, operational and maintenance, and decommissioning of the Proposed Development, which are presented in Table 6.37 and are assessed below for each phase of the Proposed Development.

These comprise injury and/ or disturbance from underwater noise caused by piling activities, injury and/or disturbance from underwater noise caused by other construction activities, changes in EMF and accidental pollution.

6.6.3.3 With consideration that the impact severity is based on distance from the site of works, Slaney River Valley SAC (47.55 km) is designated for the same QIs as Lower River Suir SAC (192.63 km) and is located nearer to the Proposed Development. On this basis, it was concluded that the potential for AEoI on the Annex II Fish and Shellfish QIs is the same or reduced for this Lower River Suir SAC as it is for Slaney River Valley SAC. In Section 6.6.1 it has been concluded that none of the potential effects on twaite shad would result in an AEoI of the Fish and Shellfish QIs of the Slaney River Valley SAC.

6.6.3.4 **Therefore, there is no AEoI on the twaite shad QI of the Lower River Suir SAC, as defined by the COs of the site, as a result of any of the impacts considered above affecting from Project Design Option 1.**

6.6.3.5 **Based on the representative risk of effect of Project Design Option 1, it is concluded that no AEoI would also apply to Project Design Option 2.**

Atlantic salmon

6.6.3.6 The COs for Atlantic salmon at this designated site is to restore the favourable conservation condition of the QI, this is defined and presented in Table 5.1.

6.6.3.7 There are four potential impact pathways considered for Atlantic salmon associated with construction, operational and maintenance, and decommissioning of the Proposed Development, which are presented in Table 6.37 and are assessed below for each phase of the Proposed Development. These comprise injury and/ or disturbance from underwater noise caused by piling activities, injury and/or disturbance from underwater noise caused by other construction activities, changes in EMF and accidental pollution.

6.6.3.8 With consideration that the impact severity is based on distance from the site of works, Slaney River Valley SAC (47.55 km) is designated for the same QIs as Lower River Suir SAC (192.63 km) and is located nearer to the Proposed Development. On this basis, it was concluded that the potential for AEoI on the Annex II Fish and Shellfish QIs is the same or reduced for Lower River Suir SAC as it is for Slaney River Valley SAC. In Section 6.6.1, it has been concluded that none of the potential effects on Atlantic salmon would result in an AEoI of the Annex II Fish and Shellfish QIs of the Slaney River Valley SAC.

6.6.3.9 **Therefore, there is no AEoI on the Atlantic salmon QI of the Lower River Suir SAC, as defined by the COs of the site, as a result of any of the impacts considered above affecting from Project Design Option 1.**

6.6.3.10 **Based on the representative risk of effect of Project Design Option 1, it is concluded that no AEoI would also apply to Project Design Option 2.**

Sea lamprey and River lamprey

6.6.3.11 The COs for sea lamprey at this designated site is to restore the favourable conservation condition of the QI, this is defined and presented in Table 5.1.

6.6.3.12 There are four potential impact pathways on sea lamprey associated with construction, operational and maintenance, and decommissioning of the Proposed Development, which are presented in Table 6.37 and are assessed below for each phase of the Proposed Development. These comprise injury and/ or disturbance from underwater noise caused by piling activities, injury and/or disturbance from underwater noise caused by other construction activities, changes in EMF and accidental pollution.

6.6.3.13 With consideration that the impact severity is based on distance from the site of works, Slaney River Valley SAC (47.55 km) is designated for the same QIs as Lower River Suir SAC (192.63 km) and is located nearer to the Proposed Development. On this basis, it was concluded that the potential for AEoI on Annex II Fish and Shellfish is the same or reduced for Lower River Suir SAC as it is for Slaney River Valley SAC. In Section 6.6.1 it has been concluded that none of the potential effects on sea lamprey would result in an AEoI of the QIs for Annex II Fish and Shellfish for the Slaney River Valley SAC.

6.6.3.14 **Therefore, there is no AEoI on the sea lamprey and river lamprey QIs of the Lower River Suir SAC, as defined by the COs of the site, as a result of any of the impacts considered above affecting from Project Design Option 1.**

6.6.3.15 **Based on the representative risk of effect of Project Design Option 1, it is concluded that no AEoI would also apply to Project Design Option 2.**

Freshwater pearl mussels

6.6.3.16 The COs for freshwater pearl mussels at this designated site is to restore the favourable conservation condition of the QI, this is defined and presented in Table 5.1.

6.6.3.17 There are four potential impact pathways considered for freshwater pearl mussels (via obligatory host species) associated with construction, operational and maintenance, and decommissioning of the Proposed Development, which are presented in Table 6.37 and are assessed below for each phase of the Proposed Development. These comprise injury and/ or disturbance from underwater noise caused by piling activities, injury and/or disturbance from underwater noise caused by other construction activities, changes in EMF and accidental pollution.

6.6.3.18 With consideration that the impact severity is based on distance from the site of works, Slaney River Valley SAC (47.55 km) is designated for the same QIs as Lower River Suir SAC (192.63 km) and is located nearer to the Proposed Development. On this basis, it was concluded that the potential for AEoI on Annex II Fish and Shellfish is the same or reduced for Lower River Suir SAC as it is for Slaney River Valley SAC. In Section 6.6.1 it has been concluded that none of the potential effects on freshwater pearl mussels would result in an AEoI of the QIs of Annex II Fish and Shellfish of the Slaney River Valley SAC.

6.6.3.19 **Therefore, there is no AEoI on the freshwater pearl mussel QI of the Lower River Suir SAC, as defined by the COs of the site, as a result of any of the impacts considered above affecting from Project Design Option 1.**

6.6.3.20 **Based on the representative risk of effect of Project Design Option 1, it is concluded that no AEoI would also apply to Project Design Option 2.**

6.6.4 River Boyne and River Blackwater SAC

Atlantic salmon

6.6.4.1 The COs for Atlantic salmon at this designated site is to restore the favourable conservation condition of the QI, this is defined and presented in Table 5.1.

6.6.4.2 There are four potential impact pathways considered for Atlantic salmon associated with construction, operational and maintenance, and decommissioning of the Proposed Development, which are presented in Table 6.37 and are assessed below for each phase of the Proposed Development. These comprise injury and/ or disturbance from underwater noise caused by piling activities, injury and/or disturbance from underwater noise caused by other construction activities, changes in EMF and accidental pollution.

6.6.4.3 With consideration that the impact severity is based on distance from the site of works, Slaney River Valley SAC (47.55 km) is designated for the same QIs as River Boyne and River Blackwater SAC (123.20 km) and is located nearer to the Proposed Development. On this basis, it was

concluded that the potential for AEoI is the same or reduced for River Boyne and River Blackwater SAC as it is for Slaney River Valley SAC. In Section 6.6.1, it has been concluded that none of the potential effects on Atlantic salmon would result in an AEoI of the QIs for Annex II Fish and Shellfish for the Slaney River Valley SAC.

6.6.4.4 **Therefore, there is no AEoI on the Atlantic salmon QI of the River Boyne and River Blackwater SAC, as defined by the COs of the site, as a result of any of the impacts considered above affecting from Project Design Option 1.**

6.6.4.5 **Based on the representative risk of effect of Project Design Option 1, it is concluded that no AEoI would also apply to Project Design Option 2.**

River Lamprey

6.6.4.6 The COs for River Lamprey is to restore the favourable conversation condition of the QI, this I defined and presented in Table 5.1.

6.6.4.7 There are four potential impact pathways considered for River Lamprey associated with construction, operational and maintenance, and decommissioning of the Proposed Development, which are presented in Table 6.37 and are assessed below for each phase of the Proposed Development. These comprise injury and/ or disturbance from underwater noise caused by piling activities, injury and/or disturbance from underwater noise caused by other construction activities, changes in EMF and accidental pollution.

6.6.4.8 With consideration that the impact severity is based on distance from the site of works, Slaney River Valley SAC (47.55 km) is designated for the same QIs as River Boyne and River Blackwater SAC (123.20 km) and is located nearer to the Proposed Development. On this basis, it was concluded that the potential for AEoI is the same or reduced for River Boyne and River Blackwater SAC as it is for Slaney River Valley SAC. In Section 6.6.1, it has been concluded that none of the potential effects on River Lamprey would result in an AEoI of the QIs for Annex II Fish and Shellfish for the Slaney River Valley SAC.

6.6.4.9 **Therefore, there is no AEoI on the River Lamprey QI of the River Boyne and River Blackwater SAC, as defined by the COs of the site, as a result of any of the impacts considered above affecting from Project Design Option 1.**

6.6.4.10 **Based on the representative risk of effect of Project Design Option 1, it is concluded that no AEoI would also apply to Project Design Option 2.**

6.6.5 Conclusion of Stage 2 Appraisal for Sites Screened in for Migratory Fish Species QIs

6.6.5.1 Three potential impacts were assessed for migratory fish resulting from construction, operational and maintenance and decommissioning of the Proposed Development, the results of this assessment can be seen in Table 6.40.

Table 6.40: Conclusion for the assessment of potential impacts on sites screened in for migratory fish QIs

Potential impact	Differences between Project Design Option 1 and 2	Conclusion
Injury and/or disturbance from UWN and vibration during pile driving and cable installation	Project Design Option 1 presents a larger risk of underwater noise as a higher number of monopile foundations require installation, therefore, piling will take place over a longer period of time. Underwater noise produced by	No AEoI for Slaney River Valley SAC, River Barrow and River Nore SAC, Lower River Suir SAC or River Boyne and River Blackwater

Potential impact	Differences between Project Design Option 1 and 2	Conclusion
	piling will therefore take place over a longer period of time.	SAC for any migratory fish receptors
Underwater noise resulting from other activities	No difference between Project Design Option 1 and 2	No AEoI for Slaney River Valley SAC, River Barrow and River Nore SAC, Lower River Suir SAC or River Boyne and River Blackwater SAC for any migratory fish receptors
EMF	No difference between Project Design Option 1 and 2	No AEoI for Slaney River Valley SAC, River Barrow and River Nore SAC, Lower River Suir SAC or River Boyne and River Blackwater SAC for any migratory fish receptors
Accidental pollution	Option 1 consists of a larger number of foundations to be installed – 55 monopile foundations in total (53 for WTGs and 2 for OSPs), whilst Project Design Option 2 comprises of 47 foundations in total (47 for WTGs and 2 for OSPs). Therefore, Project Design Option 1 will have a marginally greater potential for accidental pollution.	No AEoI for Slaney River Valley SAC, River Barrow and River Nore SAC, Lower River Suir SAC or River Boyne and River Blackwater SAC for any migratory fish receptors

6.7 Baseline information to inform Stage 2 AA for Intertidal and Offshore Ornithology QIs

6.7.1.1 As outlined in Section 5.2 above, the following designated sites have continued through the Stage 1 Screening Assessment to be assessed in Stage 2 as a LSE could not be ruled out. These are presented in Figure 6.24:.

- Howth Head Coast SPA – Kittiwake;
- Ireland's Eye SPA – Guillemot, Herring gull, Kittiwake, Razorbill;
- Lambay Island SPA – Guillemot, Herring gull, Kittiwake, Lesser black-backed gull, Razorbill;
- Saltee Islands SPA – Gannet, Guillemot, Herring gull, Kittiwake, Lesser black-backed gull, Razorbill;
- Skerries Island SPA – Herring gull;
- The Murrough SPA -Red-throated diver; and
- Wicklow Head SPA – Kittiwake.

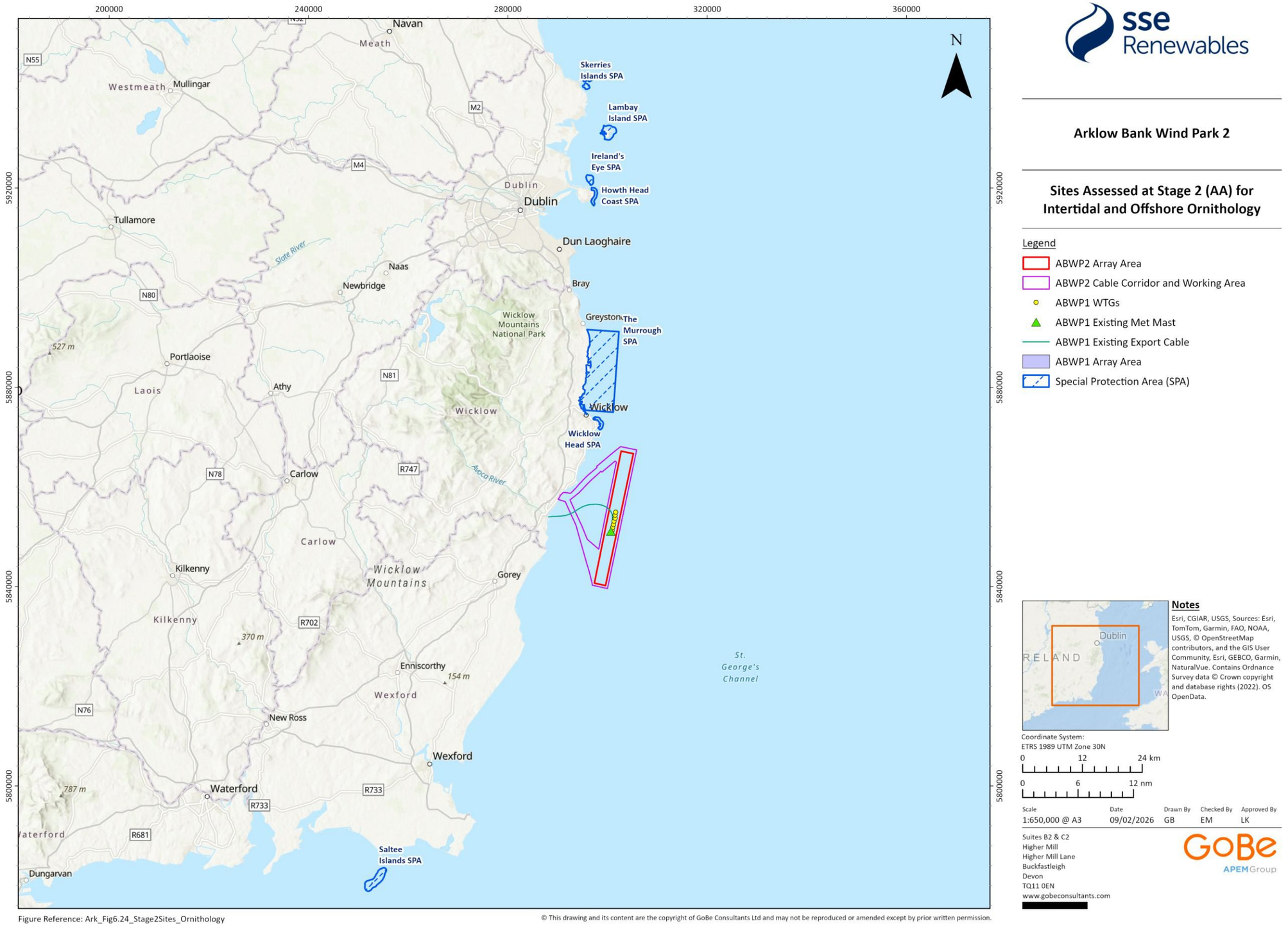
6.7.1.2 The Proposed Development does not overlap any of these designated sites. The closest site is Wicklow Head SPA which is a minimum of 5.27 km from the Proposed Development. However, seabirds are highly mobile with large breeding season foraging ranges and so the above sites have been screened in due to potential LSE on the qualifying features caused by the Proposed Development. The Stage 1 screening concluded that there was potential for LSE via displacement risk during construction and operational phase, and collision risk during operational phase.

6.7.1.3 In reaching determinations about which species and SPAs should be screened in, ecological and behavioural aspects were considered in relation to the risks posed by offshore windfarm development to seabirds, specifically collision risk and displacement (within the latter, barrier effects were also considered).

6.7.1.4 Collision risk varies between seabird species in relation to flight characteristics and in particular flight height. For those species which breed at SPAs within their species-specific foraging ranges, the species sensitivity reviews of Garthe and Hüppop (2004); Furness and Wade (2012) and Wade *et al.*, (2016) were used as a coarse filter (i.e. to screen out those species at very low or negligible risk of collisions irrespective of abundance in the Array Area), in combination with the results of surveys of the Array Area (i.e. to further screen out species with non-negligible theoretical collision risks but present in such low numbers that no population level effect would occur). This enabled identification of species and SPA combinations for which an LSE for collision risk could not be ruled out.

6.7.1.5 Displacement risk similarly varies among species, and in general those species at risk of displacement impacts are those not considered at risk of collisions and vice versa. The species sensitivity reviews (Garthe and Hüppop, 2004; Furness and Wade, 2012 and Wade *et al.*, 2016) were used as a coarse filter (i.e. to screen out those species at very low or negligible risk of displacement irrespective of abundance in the Array Area), in combination with the results of surveys of the Array Area (i.e. to further screen out species with non-negligible theoretical displacement risks but present in such low numbers that no population level effect would occur). This enabled identification of species and SPA combinations for which a LSE for displacement risk could not be ruled out.

6.7.1.6 A summary of the site-specific surveys undertaken to inform the Stage 2 appraisal on seabirds is provided in Table 6.41.



sse Renewables

Arklow Bank Wind Park 2

Sites Assessed at Stage 2 (AA) for Intertidal and Offshore Ornithology

Legend

- ABWP2 Array Area
- ABWP2 Cable Corridor and Working Area
- ABWP1 WTGs
- ABWP1 Existing Met Mast
- ABWP1 Existing Export Cable
- ABWP1 Array Area
- Special Protection Area (SPA)

Notes

Esri, CGIAR, USGS, Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community, Esri, GEBCO, Garmin, NaturalVue. Contains Ordnance Survey data © Crown copyright and database rights (2022). OS OpenData.

Coordinate System:
ETRS 1989 UTM Zone 30N

0 12 24 km

0 6 12 nm

Scale	Date	Drawn By	Checked By	Approved By
1:650,000 @ A3	09/02/2026	GB	EM	LK

Suites B2 & C2
Higher Mill
Higher Mill Lane
Buckfastleigh
Devon
TQ11 0EN
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[redacted]

GoBe APEM Group

Figure Reference: Ark_Fig6.24_Stage2Sites_Ornithology

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Figure 6.24: Sites assessed at Stage 2 (AA) for Intertidal and Offshore Ornithology

6.7.2 Baseline Environment

6.7.2.1 A summary of the site-specific surveys undertaken to inform the Stage 2 appraisal on seabirds is provided in Table 6.41.

Table 6.41: Summary of site-specific survey data for seabirds

Data source	Overview of survey	Survey contractor	Date	Reference to further information
Baseline digital aerial survey (DAS)	DAS	HiDef Aerial Surveying Limited	March 2018 to February 2020 (excluding April 2019 plus April 2020), August 2023 to June 2024 and February to July 2025 [43 surveys in total]	NIS Volume III, Appendix 12.1: Offshore Ornithology Technical Report – Overview (Revised March 2026)
Intertidal survey of landfall location	Visual and walkover surveys	Dixon Brosnan	November 2019 to March 2020	NIS Volume III, Appendix 12.11: Offshore Ornithology Technical Report - Onshore Cable Route and Landfall - Baseline Bird Survey
Seabird flight height surveys	Boat-based recording of seabird flight heights in array area (with a focus on kittiwake)	APEM	September 2025 to January 2026	NIS Volume III, Appendix 12.17: Kittiwake Flight Height Survey Report (RFI March 2026)
Wicklow Head SPA Surveys	Annual surveys of the Wicklow Head kittiwake colonies including seabird census, colony count, disturbance and productivity	APEM	Breeding seasons 2023, 2024, 2025	NIS Volume III, Appendix 12.16: Wicklow Head Seabird Monitoring (RFI March 2026)
Tracking of Black-legged kittiwake distribution in the Irish Sea	GPS and geolocator studies of breeding adult kittiwake at Wicklow Head SPA	UCC	2024 and 2025	NIS Volume III, Appendix 12.18: Kittiwake Tracking Report (RFI March 2026)

Digital Aerial Survey (DAS)

6.7.2.2 These surveys were carried out to inform the baseline for the Proposed Development. Aerial digital methods are widely accepted as an appropriate methodology for collecting baseline data for offshore wind development, both in the UK and Ireland (see for example, DCCAE, 2018a). Aerial surveys of seabirds (and marine mammals) commenced in March 2018 and continued monthly until February 2020 with an additional month (April 2020) added to cover a missed survey in April 2019 (due to adverse weather). Additional surveys were conducted between August 2023 and June 2024 and February to July 2025, bringing the total number of monthly surveys to 43. The surveys were conducted by HiDef from an aircraft equipped with four HiDef Gen II cameras with sensors to set resolution of 2 cm ground sample distance (GSD). The transects were completed at a height of ~550 m above sea level (ASL) and a target flight speed of 220 km per hour.

6.7.2.3 The survey comprised 20 transects spaced 2 km apart, extending perpendicularly from the coast to more than 4 km beyond the Proposed Development's seaward boundary (actual distance beyond the seaward boundary varied across the survey, between 5-6 km). The total transect length was approximately 340 km, and viewed imagery gave 10% coverage of the study area (i.e. a strip width of 200 m). Details are provided in NIS Volume III, Appendix 12.1 Offshore Ornithology Technical Report – Overview (Revised March 2026)

Intertidal Ornithology Survey

6.7.2.4 Six observer-based surveys across the Intertidal Ornithology Study Area were conducted between November 2019 and March 2020 to investigate wintering bird presence and one breeding survey was conducted in July 2020 (Appendix 12.11 Offshore Ornithology Technical report - Onshore Cable Route and Landfall - Baseline Bird Survey). For each wintering bird survey, three counts were made of the coastal waters from vantage points at Arklow town (vantage point A), Johnstown North (Vantage point B) and at Johnstown South (Vantage Point C). At each vantage point (VP), a 180° scan using a 20x telescope and 8x binoculars was made of the inshore waters and adjacent intertidal land and all species of wildfowl, waders and gulls observed were recorded. The breeding seabird survey looked for suitable habitat and signs of seabird breeding (e.g. guano splash on cliff faces etc.)

6.7.2.5 The data collected during these surveys have been used to identify the species present in the intertidal area.

Historical survey data

6.7.2.6 Historical data were reviewed to supplement the recent site-specific surveys. This included data from boat surveys conducted monthly across a portion of the Array Area between July 2000 and June 2010; and aerial surveys of the western Irish Sea conducted in 2016 for the ObSERVE project (Jessopp *et al.*, 2018).

ECOLOGY OF SPECIES SCREENED FOR ASSESSMENT

KITTIWAKE

6.7.2.7 The kittiwake is a small cliff-nesting gull. It breeds in a large number of colonies around the coast of Britain and Ireland. Kittiwake numbers increased dramatically throughout the British Isles between 1900 and 1985, however started to decline during the 1980s in the North of their range, particularly in Shetland, when the local sandeel stock suffered recruitment failure (Mitchell *et al.*, 2004). Numbers have declined considerably since the 1980s, although this decline has been most marked in the north and east (e.g. Shetland) and less severe to the south and west (e.g. England and the west coast of Scotland; Mitchell *et al.*, 2004). The population trend in Ireland between the 1970s and 2000 was largely stable, although a survey conducted in 2015 found a decline of

around a third in many colonies and more recent surveys indicate this decline has been maintained (Cummins *et al.*, 2019). Within UK regions, declines have been greatest in SPA populations (of which there are many) (Furness, 2015) because they are the largest colonies and furthermore, food shortage affects breeding success and recruitment at large colonies more than at small ones (Coulson, 2011).

6.7.2.8 Kittiwakes feed on marine invertebrates, small fish (especially sandeels), and fishing vessel waste (mostly fragments of offal and fish as they are unable to swallow large fish). Sandeels are a key prey during the breeding season (Furness and Tasker, 2000; Coulson, 2011) whereas fishery waste is taken mostly during winter (Garthe *et al.*, 1996).

6.7.2.9 Breeding success of kittiwakes colonies can be closely linked with sandeel stock abundance in areas near colonies, especially in the North Sea (Frederiksen *et al.*, 2004, 2005; Cook *et al.*, 2014). Irish Sea kittiwakes may take a more diverse range of fish prey, including sprat, but very little detailed study of diet in this area has been published (Chivers *et al.*, 2012, 2013). Breeding kittiwakes mostly feed close to their colony, although as more tracking studies have been conducted the estimated foraging ranges have increased; the mean foraging range is 55 km, the mean maximum foraging range is 156 km, and the longest foraging range recorded up to 2019 was 770 km (Woodward *et al.*, 2019). Several tracking studies provide evidence on foraging ranges of breeding kittiwakes and winter movements from different populations. Tracking studies by RSPB show that chick-rearing kittiwakes from Flamborough and Filey Coast SPA mainly feed within 50 km of that colony, but sometimes may travel as far as the Dogger Bank to forage (Carroll *et al.*, 2017; Wischnewski *et al.*, 2018).

6.7.2.10 Kittiwakes disperse from colonies in late summer and may migrate from British and Irish colonies as far as Canada, the central North Atlantic, the Bay of Biscay and the Barents Sea. In the nonbreeding season, British and Irish waters hold a mixture of birds from many breeding areas, including Norway and Russia (Frederiksen *et al.*, 2012).

GANNET

6.7.2.11 Gannets are the largest breeding seabird in the British Isles and are able to swallow fish up to at least the size of adult herring and mackerel (Nelson, 1978). As a result, they can feed on a wide range of fish, from sandeels to mackerel and discards from fishing vessels (Nelson 1978; Garthe *et al.*, 1996). They are also aggressive at sea, displacing smaller seabirds from food and so can access discards from fishing vessels more efficiently than other scavenging seabirds (Garthe *et al.*, 1996). Gannets dive for fish, often from considerable height, and so can be at risk of collision with wind turbine blades while foraging. Foraging activity is by sight and hence birds do not forage during the dark but spend the night either in the colony or sitting on the sea surface (Nelson, 1978; Hamer *et al.*, 2000; Hamer *et al.*, 2007; Garthe *et al.*, 2012).

6.7.2.12 Gannets breed in a relatively small number of colonies, many of which are very large, and all of which are in locations relatively remote from human disturbance and from predatory mammals.

6.7.2.13 Breeding adults have efficient commuting flight and can travel long distances while searching for food. Numerous tracking studies show foraging ranges of breeding adults and overwinter migrations from many different colonies. Breeding adults tend to remain within a foraging area that is discrete to the individual colony (i.e. birds rarely overlap in foraging distribution with birds from neighbouring colonies; Wakefield *et al.*, 2013). Gannet numbers have increased continuously from 1900 to the present, although the rate of population increase has been slowing in the last few years (Murray *et al.*, 2015). Gannets migrate, with birds from Britain mainly wintering off west Africa and southern Europe, and many of the birds wintering around the British Isles are adults from colonies in Norway or Iceland (Fort *et al.*, 2012; Garthe *et al.*, 2016).

HERRING GULL

6.7.2.14 The herring gull is widespread throughout Britain and Ireland, especially around coasts but also in urban environments. The population in Ireland has more than doubled over the last two decades at natural sites, and indications are that even greater increases have occurred at urban sites (Burnell *et al.* 2023). Most herring gull are either resident year-round or undertake local migration of no more than a few hundred kilometres at most (O'Hanlon *et al.*, 2022). A wide range of habitats are utilised, including marine, intertidal, arable and urban locations, with a shift towards terrestrial and urban sites in the nonbreeding season (O'Hanlon *et al.*, 2022). Herring gulls often fly at turbine rotor height and therefore may be vulnerable to collisions (Johnston *et al.*, 2014).

LESSER BLACK-BACKED GULL

6.7.2.15 The lesser black-backed gull breeds in moderate numbers in Ireland and the population has more than doubled over the last two decades, mostly in coastal areas but also in urban sites and some inland sites such as moorland (Burnell *et al.*, 2023). It is primarily a summer visitor, with most birds migrating to southern Europe or north Africa for the winter (Wernham *et al.*, 2002). Breeding numbers increased considerably during the 20th century, probably in part due to provision of fishery discards (Camphuysen 2013). Male lesser black-backed gulls forage mostly at sea, whereas females forage more in terrestrial habitats (Camphuysen *et al.*, 2015). Habitat use is also seasonal, with greater use of inland foraging early and late in the breeding season, and peak marine foraging activity during chick-rearing (Thaxter *et al.*, 2015). Lesser black-backed gulls sometimes fly at heights that make them vulnerable to collision with turbine blades, especially during the day (Ross-Smith *et al.*, 2016). Although they do not show macro-avoidance (i.e. complete avoidance of entire offshore windfarm areas) of offshore windfarms, tracking data suggest a high level of meso-avoidance of turbines (i.e. birds do not approach close to the rotor blades; Thaxter *et al.* 2018, Johnston *et al.*, 2022).

GUILLEMOT

6.7.2.16 The guillemot is a large auk which breeds throughout the northern temperate and colder parts of the Atlantic, Pacific and adjacent Arctic waters. Two sub-species breed around the British Isles, the dark-mantled nominate race aalge occurs in most of Europe including Scotland and possibly northern England; the smaller, much browner mantled albionis occurs in England, Wales, Ireland, Helgoland, France and Iberia. Guillemots breed widely around the coasts using suitable cliff habitat. They form large colonies typically grouping together along suitable ledges, where they lay a single large egg which is incubated directly on the bare rock.

6.7.2.17 Guillemots catch fish by flying underwater, and in order to do so have relatively small wings to reduce drag in the viscous liquid medium. This results in high wing loading that constrains their ability to fly in the air, and as a consequence they tend to avoid flying due to the relatively high energy costs. When they fly, they tend to fly low over the sea surface, at high speed in a straight line. Therefore, their risk of colliding with offshore wind turbines is low. However, they show displacement from offshore windfarms (Dierschke *et al.*, 2016) and are sensitive to disturbance and displacement by ship traffic (Fliessbach *et al.*, 2019). When breeding, they have to fly out from the colony to forage, and foraging distances from large colonies can be tens of kilometres. However, guillemot chicks fledge when only partly grown, and travel out to sea by swimming, led to foraging areas away from the colony by their male parent. Adults moult rapidly after the breeding season, becoming flightless for a period. It is likely that they select areas with reliable food fish availability for moulting but details of the moult locations used are not yet clear. After the moult, birds move to wintering areas. In general, many guillemots spend the winter not far from their breeding area but dispersed over the sea (Buckingham *et al.*, 2022). There is evidence from maps of guillemot densities at sea that they tend to aggregate to an extent over some shallow sandbanks. The ObSERVE study reported particularly dense areas of guillemots (and razorbills,

as the two species were difficult to distinguish) in autumn in the northernmost region of the Irish part of the Irish Sea, with more dispersed observations in summer and winter.

RAZORBILL

6.7.2.18 The razorbill is a large auk which breeds around the North Atlantic. There are two subspecies; nominate A. t. torda breeds in eastern North America, Greenland, Bear Island, White Sea, Norway, Denmark, and Baltic Sea. Subspecies islandica breeds in Iceland, Faroe, British Isles, Germany, and France. Razorbills breed in colonies on cliff ledges, on sea stacks, or under boulders below cliffs. Nest sites differ from those of common guillemots, with razorbill nests more often among boulders and more often scattered rather than in high-density groups. They lay a single egg onto bare rock but will replace lost eggs around 14 days later. While breeding, razorbills forage by diving to catch fish by underwater pursuit, feeding chicks especially on sandeels and sprats, and generally taking smaller fish than caught by common guillemots.

6.7.2.19 British and Irish razorbills generally move south after breeding, wintering from British waters to Iberia including the western Mediterranean (Wernham *et al.*, 2002). However, many British razorbills, especially adults, remain in British waters all year round (Buckingham *et al.* 2022). Rather few foreign-ringed razorbills have been recovered in Britain, but these together with biometrics of tideline corpses indicate that some birds from Scandinavia (from the subspecies torda) winter in British waters and some birds from Iceland do too (Wernham *et al.*, 2002).

6.7.2.20 Razorbills catch fish by flying underwater, and in order to do so have relatively small wings to reduce drag in the viscous liquid medium. This results in high wing loading that constrains their ability to fly in the air, and as a consequence they tend to avoid flying due to the relatively high energy costs. When they fly, they tend to fly low over the sea surface, at high speed in a straight line. Therefore, their risk of colliding with offshore wind turbines is low. However, they show displacement from offshore windfarms (Dierschke *et al.*, 2016) and are sensitive to disturbance and displacement by ship traffic (Fliessbach *et al.*, 2019). When breeding, they have to fly out from the colony to forage, and foraging distances from large colonies can be tens of kilometres. However, razorbill chicks fledge when only partly grown, and travel out to sea by swimming, led to foraging areas away from the colony by their male parent. Adults moult rapidly after the breeding season, becoming flightless for a period. After the moult, birds move predominantly southwards to wintering areas. There is evidence from maps of razorbill densities at sea that they tend to aggregate to an extent over some shallow sandbanks. The ObSERVE study reported particularly dense areas of razorbills (and guillemots, as the two species were difficult to distinguish) in autumn in the northernmost region of the Irish part of the Irish Sea, with more dispersed observations in summer and winter.

RED-THROATED DIVER

6.7.2.21 Wintering red-throated divers are associated with shallow inshore waters (normally between 2 and 20m deep), often occurring within sandy bays (Poot et al. 2009), firths and sea lochs, although open coastline is also frequently used (Skov et al. 1995; Stone et al. 1995). The distribution and concentrations of red-throated divers will at least in part be determined by the presence, abundance, and availability of their prey fish species (Poot et al. 2009), especially sprats and young herring in winter, although a wide variety of small fish species can be taken (Guse et al. 2009). Red-throated divers typically arrive in their wintering areas in September to November and depart to their breeding areas from February to April (Brown and Grice 2005). Small numbers, mostly of birds in their first year of life, remain in the wintering areas through summer (Furness 2015).

6.7.2.22 Red-throated divers are highly sensitive to non-physical disturbance by noise and visual presence during the winter (Garthe and Hüppop 2004, Furness et al. 2013). Petersen et al. (2006) reported a marked post-construction avoidance of the Horns Rev offshore windfarm, including also the