Port of Mostyn

Mostyn Energy Park Extension Project

Further Clarification in Support of Marine Licence Application CML2283

March 2024





Innovative Thinking - Sustainable Solutions

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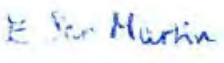		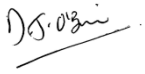

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Notice

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Contents

Appendices

Figures

Tables

1 Introduction

The Port of Mostyn Limited submitted a Marine Licence application to Natural Resources Wales (NRW) Marine Licensing Team (MLT) in December 2022 for Construction and Dredge Works associated with the Mostyn Energy Park Extension (MEPE) Project (CML2283). A Further Information Submission dated 29 August 2023 was subsequently prepared in response to the first round of consultation comments that were received on the Marine Licence application (ABPmer, 2023). A second round of consultation comments were received on the Further Information Submission in October and November 2023. NRW MLT in their email dated 29 November 2023 confirmed that there were still a number of issues raised which needed to be addressed.

As such, a meeting was held with NRW MLT and NRW Advisory (NRW A) on 9 January 2024 to clarify and agree the additional evidence that needed to be prepared for this Further Clarification Submission (this report). This represents the third submission of evidence in support of the application, which has been prepared to provide the remaining requests for information and resolve all outstanding concerns. The letter issued by NRW MLT on 12 January 2024 sets out the specific matters that were agreed as requiring further clarification for the determination of the Marine Licence to be concluded.

As requested, a comments log (or signposting matrix) is provided in Appendix A which sets out all of the individual comments that were received from NRW MLT and consultees on the Further Information Submission dated 29 August 2023. The comments log provides a response to each comment and signposts to the relevant section of this report where more in-depth additional evidence has been prepared to support the response.

This report is structured according to the following assessment topics and key agreed areas of clarification:

- Ornithology (Section 2):
  - Assessment of disturbance during construction; and
  - Assessment of habitat loss.
- Fish Receptors (Section 3):
  - Sandeel assessment; and
  - Timing restrictions.
- Benthic Ecology/HRA (Section 4):
  - Loss of Estuaries feature.
- Cockle Bed (Section 5):
  - Potential impact of sedimentation on cockle spat.
- Conditions and Monitoring (Section 6):
  - Proposed Monitoring Plan.

1.1 Pile driving process

As discussed at the meeting with NRW MLT and NRW A on 9 January 2024, the applicant is now able to confirm some of the specific details around the piling activity following a review of the available geotechnical information and more detailed design work that has been undertaken by the project engineering team.

The new quay wall will be constructed as a combination pile wall ("combi-wall"), involving tubular (King) piles with a pair of AZ infill sheet panel piles. This will require *circa* 96 King piles and 96 AZ panel piles. The King piles are estimated to be of a maximum diameter of 2.5 m and approximate length of 37 m.

The King piles will need to be driven to a level of -26 mCD and the AZ panel piles will need to extend to -16 mCD.

The King piles will be driven first, with the piles being supported from a jack up barge or from the existing quay. These piles will initially be driven using a vibratory piling hammer to refusal. A hydraulically operated pile hammer (IHC S280 or similar) will then be used to percussively (impact) drive the piles to their final design level. The AZ panel piles can be driven using vibratory piling methods only to reach the shallower design depths.

The piling works will be carried out by up to two piling rigs working simultaneously. Every pile will involve a different duration of installation based on the specific ground conditions that the pile is being driven through. Based on the latest available geotechnical information, each King pile is anticipated to require up to approximately 15 minutes of vibro piling and approximately 35 minutes of percussive piling. Each AZ panel pile is estimated to require approximately 20 minutes of vibro piling. The likely worst case percussive piling scenario is for one King pile to be installed by each rig per day (i.e., a total of up to two King piles installed per day). In other words, this will involve a total of up to approximately 30 minutes of vibro piling and 70 minutes of percussive piling for the King piles per day. The underwater noise assessment included in Appendix 8.4 of the Environmental Statement (ES) assumed the piling works would be carried out by up to two piling rigs and involve approximately 200 tubular piles being installed requiring approximately 20 minutes of vibro piling and approximately 120 minutes of impact piling per pile. The assessment in the ES is therefore very much based on worst case assumptions.

Assuming the installation of each individual King pile will take a total of approximately 50 minutes of piling in total (involving 15 minutes of vibro driving and 35 minutes of percussive driving), the total driving time for installing all the King piles (no. 96) will be 80 piling hours. Installation of each AZ panel pile will take approximately 20 minutes and therefore the total driving time for installing all the AZ panel piles (no. 96) will be approximately 32 actual piling hours. The total pile driving time for all King and AZ panel piles will therefore be approximately 112 hours, plus an allowance for soft start (20 minutes per King pile), giving an overall time of approximately 144 hours which equates to a total of 6 days of continuous pile driving.

The piling works will not, however, take place continuously as they will be subject to a number of timing restrictions, as discussed in more detail in Sections 2.1 and 3.2, including:

- Piling activities are not to be undertaken in September (autumn bird passage) in any given year;
- No percussive piling is to be undertaken 3 hours either side of high water during sensitive periods for migratory fish in any given year; and
- No percussive piling is to take place between 7 pm and 7 am on any given day.

Furthermore, the piling activity is not a continuous process over the available daily schedule as there will be periods of downtime, pile positioning and set up, as well as jack up barge movements between pile locations. The actual driving time is only a very small element of the overall process which includes shipping the pile out from the construction compound to the pile driving site, hoisting it up in a crane and placing in the gate (essentially a placement guide) – this element in itself being a very slow and intricate process – picking up the vibro-hammer and positioning it above the pile. Once the vibro-driving element has been completed, the crane needs to swap over pile driving hammers and position the percussive hammer over the pile and only then will percussive piling occur. It is anticipated that one piling rig will drive one pile per day, such is the complex nature of the process. In reality the amount of piling and magnitude of any potential disturbance to receptors is therefore already limited by the logistics of that very process.

Assuming that a maximum of 2 tubular piles are installed each day, involving approximately 70 minutes of percussive piling per day, there will be significant periods over a 24-hour period when receptors will not be disturbed by any percussive piling noise. The actual proportion of percussive piling is estimated to be less than 5 %. In other words, receptors will only be potentially exposed to disturbance from percussive piling up to around 5 % of the time over the piling programme.

2 Ornithology

2.1 Assessment of disturbance during construction

2.1.1 Introduction

As highlighted in Section 8.7.1 of the ES, the proposed development will involve a range of activities, which will result in a temporary source of noise and visual disturbance to roosting and feeding waterbirds during construction. These include the following key potential sources of disturbance:

- Piling: See the information about piling provided above in Section 1.1; and
- The operation of plant machinery such as rollers/dozers within the reclamation area.

Section 8.7.1 of the ES provides a detailed review of potential disturbance effects during construction (including identifying the sensitivity of different key species to disturbance). This included data and literature from a wide variety of sources, including the Cutts *et al.* (2009) report (which is referenced in the ES as "IECS, 2009a") and the IECS (2013) disturbance toolkit which was developed based on the Cutts *et al.* (2009) report. It should be noted that at the request of NRW, the noise criteria in the IECS disturbance toolkit has been used to inform the assessment and has been supplemented with a wide variety of other evidence (summarised in Section 8.7.1 of the ES and Appendix B of this report).

In summary, the following key principles from the IECS (2013) disturbance toolkit have been applied:

- High level responses to noise (such as dispersal away from marine works) are typically associated with prolonged noise over 70 to 80 dB at the receptor (i.e., bird) (IECS, 2013; IECS *et al.*, 2009a). The application of a 70 dB threshold is a widely accepted approach used in impact assessments and is also consistent with other literature and evidence on noise disturbance (e.g., Xodus, 2012; Wright *et al.*, 2013; ABPmer, 2002).
- IECS (2013) states that sudden noise events of over 60 dB (at the receptor, not at the source) also has the potential to cause high-level responses (IECS, 2013). In addition, IECS (2013) states that occasional noise events above 55 dB and regular noise levels of 60 to 72 dB have the potential to cause moderate noise effects and these have therefore also been considered in this assessment. However, noise levels should be considered in the context of background sound levels that birds are likely to be typically exposed to on the foreshore. In this respect, IECS (2013) stated that noise levels between 55 to 72 dB in areas with high levels of existing anthropogenic activity (such as industrial/port operational areas) may only produce low levels of disturbance provided the noise levels are regular as birds will often habituate to a constant noise level.

In addition, evidence suggests that waterbirds generally show a flight response to anthropogenic activities such as construction and a presence of people (such as workers) on or near the foreshore at distances less than 200 to 300 m (and more typically between 20 m and 100 m for certain species such as Turnstone or Dunlin) although distances over 300 m have been recorded more occasionally for some sensitive species such as Curlew or Shelduck. Responses are typically less in areas subject to already high levels of existing anthropogenic activity (as found in the Port of Mostyn area) (ABPmer, 2002; IECS, 2009a; Scott Wilson, 2009; IECS, 2009b; Dwyer, 2010; IECS, 2013; Ross & Liley, 2014; Goodship & Furness, 2022; Collop *et al.*, 2016; Goodship & Furness, 2019; ABPmer, 2013).

Summary evidence on the responses of key SPA species recorded in the vicinity of the project to noise and visual disturbance is provided in Appendix B.

To better understand the potential noise disturbance effects on waterbirds, airborne noise modelling has been undertaken and is summarised in Appendix C. With respect to understanding the worst-case peak noise levels that are predicted to be generated during the proposed construction of the MEPE Project, the dB L_{AFmax} noise metric data is considered most appropriate as it characterises the maximum instantaneous sound levels reached during construction activity (i.e., an impact sound, bang, thud, etc.). The dB $L_{Aeq,1\ hr}$ measurement is the A-weighted sound pressure level of a continuous steady sound, adjusted for tonal character, that within a 1 hour period has the same mean square sound pressure of a sound that varies with time. This is considered a more appropriate metric to understand prolonged sources of noise (e.g. construction plant or vehicle engine noise).

2.1.2 Potential effects during construction (in advance of mitigation)

The nearest functionally important waterbird habitat to the construction activity is the mid to upper shore ledge roost on the western side of the breakwater (next to the Mostyn Bank). As described in Section 8.6.5 of the ES, the breakwater is considered an important roost for Oystercatcher and is also used by large numbers of Redshank during September (an important month for the movement of passage birds) (see the *Breakwater West* sub-section in Section 8.6.5 of the ES). The nearby Mostyn Bank and mudflat habitat between the Mostyn Channel and Salisbury Channel are important areas for feeding birds (see the *Ffynnongroyw Bay South* sub-section in Section 8.6.5 of the ES).

Habitat to the north and north east of the proposed development on Salisbury Bank, located approximately 250 to 300 m away, consists of low elevation sandflat habitat (which is highly dynamic and impoverished with a low prey availability for waterbirds). This is reflected in its use by relatively low numbers of waterbirds and this area (Appendix D) is therefore not considered further in this assessment.

Noise levels during piling

Disturbance to birds using the breakwater roost is considered possible as a result of noise associated with piling (which will be undertaken within a minimum of approximately 100 to 150 m of the breakwater ledge roost). Piling related disturbance is also considered possible to feeding waterbirds on the Mostyn Bank and mudflat habitat between the Mostyn Channel and Salisbury Channel (these important feeding areas are located over 200 m from piling activity).

The airborne noise modelling (Appendix C) predicts the following noise levels during piling without considering mitigation:

- **Piling noise levels at the breakwater roost:** Piling along the quay wall is predicted to cause noise levels of up to 68 dB $L_{Aeq,1\ hr}$ and 81 dB L_{AFmax} at the breakwater roost; and
- **Piling noise levels on nearby mudflat used by feeding waterbirds:** Piling along the quay wall is predicted to cause noise levels of up to 69 dB $L_{Aeq,1\ hr}$ and 82 dB L_{AFmax} on the nearest area of mudflat on the Mostyn Bank and similar levels on mudflat habitat between the Mostyn Channel and Salisbury Channel.

It is worth noting that the piling works will not take place continuously as they will be subject to a number of timing restrictions for migratory fish (Section 3.2). Furthermore, the piling activity is not a continuous process over the available daily schedule as there will be periods of downtime, pile positioning and set up, as well as jack up barge movements between pile locations. It is estimated that waterbirds will only be exposed to potential disturbance from percussive piling up to around 5 % of the time over the piling programme (Section 1.1).

Noise levels during other construction activity

Construction activity on the breakwater and area of infill (reclamation) will involve the pumping of dredged material and the use of bulldozers and compaction plant (the use of this plant represents the construction activities with the highest noise source levels not associated with the piling). The airborne noise modelling (Appendix C) predicts the following noise levels without considering mitigation:

- **Noise levels at the breakwater roost associated with other construction activity:** The use of bulldozers and compaction plant is predicted to cause noise levels of up to 52 dB $L_{Aeq,1\ hr}$ at the breakwater roost; and
- **Noise levels on nearby mudflat used by feeding waterbirds associated with other construction activity:** The use of bulldozers and compaction plant is predicted to cause noise levels of up to 62 dB $L_{Aeq,1\ hr}$ on the nearest area of mudflat on the Mostyn Bank.

Background sound levels

As noted above, it is important to consider the predicted noise levels in the context of existing background sound levels, and the levels of habituation to existing potential noise and visual disturbance stimuli (IECS, 2013; IECS, 2009a).

Background sound monitoring was undertaken at the Port of Mostyn over a five day period in March 2024 (Appendix E). Levels were regularly recorded in the range of 60 to 70 L_{AFmax} on the breakwater with levels also exceeding 70 dB L_{AFmax} on occasion. Sound monitoring near to the foreshore in other areas of the Port of Mostyn also recorded levels of over 70 dB L_{AFmax}. Waterbirds are therefore already currently experiencing noise levels above 60 and 70 dB repeatedly. Observations of disturbance events, which were recorded as part of ornithology surveys undertaken in the area from September 2017 to April 2021, suggest that birds show limited responses and continue to feed and roost in important numbers on the foreshore (i.e., they show existing habituation to noise at these levels, as well as through any associated visual stimuli). Specific examples from the ornithology surveys include:

- Very large numbers of coastal waterbirds regularly roost on rocks and deposited cockle shell material on the upper foreshore between Mostyn and Ffynnongroyw (known as count sector 'H' as shown on Figure 8.1 of the ES). This roost is used extensively by waders, particularly Oystercatcher (with nationally important counts of over 5,000 birds of this species recorded) along with Knot and Redshank. This roost is within 10 to 20 m of the nearby railway line which has trains regularly transiting past (typically 4 to 5 trains per hour). Trains are known to cause noise levels generally around 80 to 90 dB (Gillen *et al*., 1997), with noise levels of 75 dB L_{AFmax} measured within approximately 50 m of the railway line during the background sound monitoring in March 2024. However, no disturbance events were recorded during the ornithology surveys as a result of train movements; and
- Heavy plant (excavators/bulldozers) are regularly operating within 20 m of the foreshore as part of existing port operations at the Port of Mostyn estate. No disturbance events as a result of these activities were recorded during the ornithology surveys.

Summary of potential effects

An assessment of potential effects on SPA qualifying species regularly recorded in the vicinity of the proposed development is provided in Table 1. Based on the additional information provided by the airborne noise modelling, the conclusions reached in Chapter 8 of the ES remain the same. In other words, the potential effects of airborne noise and visual disturbance on waterbirds during construction is assessed as **minor to moderate adverse** without mitigation. In an HRA context, the potential for an Adverse Effect on Integrity (AEOI) without mitigation cannot be ruled out.

Table 1. Potential effects on SPA qualifying species during construction

Species	Abundance and Distribution (Based on data presented in Section 8.6.5 and Appendix 8.3 of the ES)	Assessment of Potential Effects
Redshank	Ornithology data suggests this species is regularly recorded feeding and roosting on the inner Mostyn Bank (i.e., covered by the Ffynnongroyw Bay South count sector) in abundances exceeding nationally important numbers. The largest numbers of Redshank have been typically during the period September to November. Distribution data and observations also suggests that this species is regularly observed feeding in areas of the Mostyn Bank near to the Port as well as roosting on the ledge on the western side of the breakwater in numbers approaching or exceeding nationally important numbers. The largest number of Redshank have been recorded using the roost in Autumn passage periods (particularly September).	Redshank and Oystercatcher are known to occur in large numbers feeding on the Mostyn Bank with both species also known to roost on the ledge on the western side of the breakwater (which is particularly used by Redshank during Autumn passage periods). The noise modelling predicts that without mitigation, piling is predicted to cause noise levels of up to approximately 80 dB on nearby mudflat of the Mostyn Bank and the breakwater (with dB levels of above 80 dB extending for over 1 km). Redshank and Oystercatcher are considered potentially sensitive to the noise levels that will be created during piling with dispersive disturbance responses considered possible (IECS, 2013). Noise levels associated with other construction activity (such as bulldozers and compaction plant) are predicted to be much lower on the nearby breakwater roost and mudflat habitat (up to around 50 dB). Noise at this level will not be discernible from background sound levels and unlikely to cause responses. However, disturbance to birds as a result of visual stimuli could potentially occur as result of these activities. On this basis, avoidance responses or dispersive disturbance events resulting in the redistribution of waterbird flocks to nearby areas occurring relatively frequently during these elements of construction cannot be ruled out.
Oystercatcher	Ornithology data suggests this species is regularly recorded feeding and roosting on the inner Mostyn Bank (i.e., covered by the Ffynnongroyw Bay South count sector) in abundances exceeding nationally important numbers. Peak counts of Oystercatcher typically occurred during the winter months of November to February. Distribution data and observations also suggests that this species is regularly observed feeding in areas of the Mostyn Bank near to the Port as well as roosting on the ledge on the western side of the breakwater.	

Species	Abundance and Distribution (Based on data presented in Section 8.6.5 and Appendix 8.3 of the ES)	Assessment of Potential Effects
Shelduck	Ornithology data suggests this species is regularly recorded feeding and roosting on the inner Mostyn Bank (i.e., covered by the Ffynnongroyw Bay South count sector) in abundances near or approaching nationally important numbers. Distribution data and observations also suggests that this species is regularly observed feeding in areas of the Mostyn Bank near to the Port.	These species are known to occur in large numbers on the foreshore in the local area. Shelduck and Curlew are known to be particularly sensitive to anthropogenic disturbance. The noise modelling predicts that without mitigation, piling is predicted to cause noise levels of up to approximately 80 dB on nearby mudflat of the Mostyn Bank and the breakwater (with dB levels of above 80 dB extending for over 1 km). Shelduck and Curlew are considered potentially sensitive to the noise levels that will be created during piling with dispersive disturbance responses considered possible (IECS, 2013). Noise levels associated with other construction activity (such as bulldozers and compaction plant) are predicted to be much lower on the nearby breakwater roost and mudflat habitat (up to around 50 dB). Noise at this level will not be discernible from background sound levels and unlikely to cause responses. However, disturbance to birds as a result of visual stimuli could potentially occur as result of these activities. On this basis, avoidance responses or dispersive disturbance events resulting in the redistribution of waterbird flocks to nearby areas occurring relatively frequently during these elements of construction cannot be ruled out.
Curlew	Ornithology data suggests this species is regularly recorded feeding and roosting on the inner Mostyn Bank (i.e., covered by the Ffynnongroyw Bay South count sector) including foraging on areas of Mostyn Bank mudflat in relatively close proximity to the Port.	
Black-tailed Godwit	Ornithology data suggests this species is regularly recorded feeding and roosting on the inner Mostyn Bank (i.e., covered by the Ffynnongroyw Bay South count sector) in abundances exceeding nationally important numbers. Peak counts of Black-tailed Godwit typically occurred from September to December. Distribution data and observations also suggests that this species	Black-tailed Godwit (and to a lesser extent Pintail) are known to regularly occur feeding on the Mostyn Bank. Both species are considered to be of moderate sensitivity to disturbance. The noise modelling predicts that without mitigation, piling is predicted to cause noise levels of up to approximately 80 dB on

Species	Abundance and Distribution (Based on data presented in Section 8.6.5 and Appendix 8.3 of the ES)	Assessment of Potential Effects
	is regularly observed feeding in areas of the Mostyn Bank near to the Port.	nearby mudflat of the Mostyn Bank and the breakwater (with dB levels of above 80 dB extending for over 1 km). These species are considered potentially sensitive to the noise levels that will be created during piling with dispersive disturbance responses considered possible (IECS, 2013). Noise levels associated with other construction activity (such as bulldozers and compaction plant) are predicted to be much lower on the nearby breakwater roost and mudflat habitat (up to around 50 dB). Noise at this level will not be discernible from background sound levels and unlikely to cause responses. However, disturbance to birds as a result of visual stimuli could potentially occur as result of these activities. On this basis, avoidance responses or dispersive disturbance events resulting in the redistribution of waterbird flocks to nearby areas occurring relatively frequently during
Pintail	Ornithology data suggests this species is regularly recorded feeding and roosting on the inner Mostyn Bank (i.e., covered by the Ffynnongroyw Bay South count sector).	
Knot	Ornithology data suggests this species is regularly recorded feeding and roosting on inner the Mostyn Bank (i.e., covered by the Ffynnongroyw Bay South count sector) including foraging on areas of Mostyn Bank mudflat in relatively close proximity to the Port.	Based on the information provided, Knot and Dunlin typically occur in large numbers on the foreshore in the local area but are also known to be relatively tolerant to anthropogenic disturbance. Evidence suggests these species can occur in relatively close proximity to potential disturbance stimuli before responses are recorded (often within 50 to 100 m or less of a disturbance sources). Nevertheless, any birds present could be susceptible to potential disturbance and displacement as a result of the predicted noise levels during piling.
Dunlin	Ornithology data suggests this species is regularly recorded feeding and roosting on inner the Mostyn Bank (i.e., covered by the Ffynnongroyw Bay South count sector) including foraging on areas of Mostyn Bank mudflat in relatively close proximity to the Port.	
Grey Plover	Only one Grey Plover was recorded in the Ffynnongroyw Bay South sector survey in the Port of Mostyn surveys (September 2017 to April 2021) and has therefore not been considered further in the assessment as this species is considered rare in the development footprint.	

2.1.3 Proposed mitigation (and summary of effectiveness)

As a result of the potential to cause significant environmental effects (in an EIA context) or a potential AEOI (in an HRA context) in advance of mitigation, the following mitigation measures are proposed:

- **Piling activities are not to be undertaken in September (autumn bird passage) in any given year**: This measure will help minimise potential disturbance as a result of piling related noise on the ledge roost on the western side of the breakwater in September. Ornithology survey data indicates that the main use of this roost by Redshank occurs in this month when passage birds are in the area (noting that the acoustic/visual screens proposed below will help minimise noise and visual related disturbance stimuli associated with other construction nearby to the roost);
- **Noise suppression system:** It is proposed that a noise suppression system (consisting of a pile shroud or sleeve with noise insulating properties) is used during percussive piling activities of the tubular piles for the new quay wall to reduce noise levels on the Mostyn Bank or breakwater roost. Airborne noise modelling predicts that the noise suppression system will reduce noise by up to 10 dB levels (at the piling source) (Appendix C). The visual/acoustic screens proposed below will also help minimise noise and visual-related disturbance stimuli associated with other construction activity nearby to feeding habitat of the Mostyn Bank and roosting habitat on the breakwater;
- **Soft starts:** Using soft starts will allow birds to become more tolerant to piling noise by allowing a more gradual increase in noise levels which will reduce the potential for birds to become startled. The application of soft start procedures for piling activities is a widely established measure to help reduce disturbance to waterbirds, as well as fish and marine mammals. It is acknowledged that initial sudden noise associated with an activity elicits a greater response in waterbirds than further subsequent noise (due to increasing tolerance of the birds to the stimuli) (Collop *et al.*, 2016; IECS, 2009a; Hockin *et al.,* 1992). On this basis, soft starts will allow the more gradual increase in noise levels which would help reduce potential 'startling' effects to waterbird associated with the first sudden bangs of piling;
- **Cold weather construction restriction:** Coastal waterbirds are considered particularly vulnerable to bird disturbance during periods of extreme winter weather. On this basis, it is proposed that a temporary cessation of piling and any activities taking place along the new quay wall is implemented following seven consecutive days of freezing (zero or sub-zero temperature) weather conditions. The restriction should not be lifted until after 24 hours of above freezing temperatures, and also that Metrological Office weather forecasts indicate that freezing conditions will not return for the next five days. Similar measures have been implemented for other port developments and also as part of the JNCC scheme to reduce disturbance to waterfowl due to shooting activity during severe winter weather; and
- **Acoustic barrier/visual screening:** In order to reduce potential visual and/or noise disturbance stimuli to waterbirds on the Mostyn Bank or breakwater roost, an acoustic barrier/visual screen will be installed along the breakwater prior to the commencement of construction so that movements of construction workers or vehicles will not be as visible and the levels of noise will be attenuated (noise modelling predicts that the acoustic barrier will result in a 3 dB reduction in noise levels). These screens will be at least 2 m in height, opaque or made out of material that distorts outlines of anthropogenic activity[1]. Acoustic screens are widely used in the construction industry to help minimise noise levels on sensitive receptors (both human and ecological). Screens (such as fences and other barriers) are a widely used measure to help reduce potential disturbance to coastal waterbirds (Ikuta & Blumstein, 2003; Liley & Tyldesley, 2013; Hockin *et al.*, 1992) and have been successfully applied as mitigation to reduce

[1] As a result of the profile of the breakwater, any birds roosting on the breakwater ledge or feeding on the adjacent mudflat will already be several metres lower than activity on top of breakwater which will further help to screen construction activity.

disturbance at a number of port locations including the Port of Mostyn (GoBe Consultants Ltd, 2011, ABPmer, 2014; MMO, 2018).

The above measures have been based on consideration of the spatiotemporal distribution and sensitivities of bird species, established disturbance criteria, background sound levels, and also mitigation that is currently required for the existing marine licence to construct a new quay for a Mostyn Energy Park (MEP) facility (CML1343v3), which is for a very similar type and scale of development, in broadly the same development footprint and using similar construction techniques including piling (Section 4.1, Figure 2).

It is important to understand that the proposed restrictions and mitigation for overwintering coastal waterbirds sit within a much wider package of mitigation measures for other receptors, including migratory fish and marine mammals that are sensitive to underwater noise and vibration. To address this issue, the Port of Mostyn has committed to a range of restrictions relating to the timing and duration of percussive piling. Together with the above restrictions that are currently proposed for birds, the construction programme for the MEPE Project is already highly constrained, more so than what is currently consented for the Mostyn Energy Park (MEP) facility which also involves the construction of a new quay using percussive piling methods (CML1343v3). Any further seasonal or timing restrictions could extend the overall construction period for the MEPE Project. The currently proposed measures are designed to reduce the impacts as far as reasonably practicable whilst also noting that this project is considered a key project to support renewable energy development in the region.

2.1.4 Residual effects (following application of proposed mitigation)

The potential residual disturbance effects on SPA qualifying species during construction, following the application of the proposed mitigation measures, is outlined below and in Table 2. The potential residual effects on SPA species based on nearby important waterbird feeding and roosting areas is provided in Table 3. This assessment has been supported by airborne noise modelling (Appendix C) of the construction activity together with the proposed mitigation measures that aim to reduce noise levels at the source and at the nearest key areas used by birds (i.e. a noise suppression system and acoustic screen/barrier).

Noise levels during piling with mitigation

The airborne noise modelling (Appendix C) predicts the following noise levels during piling with mitigation in place (i.e., a noise suppression system and acoustic screen/barrier):

- **Piling noise levels at the breakwater roost:** Piling along the quay wall is predicted to cause noise levels of up to 52 dB $L_{Aeq,1\ hr}$ and 65 dB L_{AFmax} at the breakwater roost; and

- **Piling noise levels on nearby mudflat used by feeding waterbirds:** Piling along the quay wall is predicted to cause noise levels of up to 53 dB $L_{Aeq,1\ hr}$ and 65 dB L_{AFmax} on the nearest area of mudflat on the Mostyn Bank and also similar levels on mudflat habitat between the Mostyn Channel and Salisbury Channel.

These noise levels are presented together with the levels that were predicted without mitigation (Section 2.1.2) in Table 2 for ease of comparison.

Table 2. Predicted noise levels at key receptor locations during piling with and without mitigation

Receptor Location	Without Mitigation		With Mitigation	
	$L_{Aeq,1\ hr}$	L_{AFmax}	$L_{Aeq,1\ hr}$	L_{AFmax}
Breakwater roost	68	81	52	65
Mudflats	69	82	53	65

Noise levels during other construction activity with mitigation

The airborne noise modelling (Appendix C) predicts the following noise levels for construction activity on the breakwater and area of infill (reclamation) involving the use of bulldozers and compaction plant with mitigation in place (i.e., the acoustic screen/barrier):

- **Noise levels at the breakwater roost associated with construction activity:** The use of bulldozers and compaction plant are predicted to cause noise levels of up to 50 dB $L_{Aeq,1\ hr}$ at the breakwater roost; and

- **Noise levels on nearby mudflat used by feeding waterbirds associated with other construction activity:** The use of bulldozers and compaction plant is predicted to cause noise levels of up to 57 dB $L_{Aeq,1\ hr}$ on the nearest area of mudflat on the Mostyn Bank.

These noise levels are presented together with the levels that were predicted without mitigation (Section 2.1.2) in Table 3 for ease of comparison.

Table 3. Predicted noise levels at key receptor locations during other construction activity with and without mitigation

Receptor Location	Without Mitigation	With Mitigation
	$L_{Aeq,1\ hr}$	$L_{Aeq,1\ hr}$
Breakwater roost	52	50
Mudflats	62	57

Background sound levels

As discussed in more detail in Section 2.1.2, background sound monitoring undertaken in 2024 found levels regularly exceeded 60 to 70 dB L_{AFmax} and on occasion over 70 dB L_{AFmax}. On this basis, waterbirds are therefore subjected to noise levels of over 60 to 70 dB L_{AFmax} repeatedly with observations from ongoing ornithology surveys in the area suggesting that birds show limited responses and continue to feed and roost in important numbers.

It is also important to note that as a result of high background sound levels in the breakwater, noise levels during construction in the range of 60 to 70 dB L_{AFmax} are unlikely to be discernible above background ambient sound on the breakwater roost and nearby mudflat.

Summary of effects

In summary, with the application of the proposed mitigation measures, disturbance responses are expected to be limited, both in terms of frequency and the spatial extent of effects. Any disturbance that does occur is expected to be infrequent, highly localised, mild (i.e., short flights or avoidance walking with birds rapidly resuming feeding or roosting nearby) and with responses restricted to nearby

waterbird habitat in close proximity to the Port on the Mostyn Bank (including breakwater roost) or Mudflat feeding habitat between the Mostyn Channel and Salisbury Channel. Furthermore, bird distribution is not expected to change in the wider area and population level consequences (at both a local and fly way level) in terms of mortality or changes in breeding success would not be expected. Residual effects are therefore considered to be **minor adverse** following the application of proposed mitigation measures.

In HRA terms, in the context of the site's conservation objectives, the population size of a number of bird interest features of the Dee Estuary SPA/Ramsar site will be maintained with the application of the proposed mitigation measures. In other words, there is not expected to be a discernible change in the overall populations of these bird interest features. Overall, there is considered to be no potential for an AEOI on these bird interest features of the Dee Estuary SPA/Ramsar site with the proposed mitigation.

Table 4. Potential residual effects on SPA qualifying species during construction (with mitigation)

Species	Potential Visual Effects (With Mitigation)	Potential Noise Effects (With Mitigation)
Redshank	The visual/acoustic screen along the breakwater will mean that machinery, workers and plant operating in the reclamation footprint and harbour construction area will not be visible to birds roosting on the breakwater ledge roost or on nearby mudflat of the Mostyn Bank and is therefore considered effective at preventing waterbirds from being exposed to close range visual stimuli. On this basis, visual related disturbance effects are anticipated to be negligible.	IECS (2013) stated that Redshank are considered sensitive to noise stimuli and that a noise level of up to 72 dB at the receptor (i.e., bird) is typically considered acceptable. With the use of the proposed piling noise suppression system noise and acoustic screen/barrier, piling is predicted to cause noise up to 65 dB on the breakwater roost and the nearby mudflat of the Mostyn Bank. While it is also acknowledged that noise above 60 dB at the receptor has the potential to cause disturbance responses in some situations, given the existing background sound levels (levels in the range of around 60 to 70 dB and above regularly occur near the foreshore) and evidence from the ornithology surveys of existing habituation, any responses would be anticipated to be limited (IECS, 2013). Furthermore, the existing ambient sound levels are likely to mask to some extent the noise associated with the piling. Noise levels associated with other construction activity (such as bulldozers and compaction plant) are predicted to be much lower on the nearby breakwater roost and mudflat habitat (up to around 57 dB). Noise at this level will not be discernible from background sound levels and are unlikely to cause any responses. On this basis, disturbance responses due to noise stimuli would be anticipated to be limited at nearby important areas for these species (i.e., the breakwater roost and nearby mudflat of the Mostyn Bank). In addition, the use of softs starts would also help further minimise disturbance responses as discussed in Section 2.1.3.
Oystercatcher		Oystercatcher are not thought to be particularly sensitive to noise stimuli, with noise level of up to 72 dB at the receptor typically considered acceptable (IECS, 2013). With the use of the proposed piling noise suppression system noise and acoustic screen/barrier, piling is predicted to cause noise up to 65 dB on the breakwater roost and the nearby mudflat of the Mostyn Bank. While it is also acknowledged that noise above 60 dB at the receptor has the potential to cause disturbance responses in some situations, given the existing background sound levels (levels in the range of around 60 to 70 dB and above regularly occur near the foreshore) and evidence from the ornithology surveys of existing habituation, any responses would be anticipated to be limited (IECS, 2013). Furthermore, the existing ambient sound levels are likely to mask to some extent the noise associated with the piling. Noise levels associated with other construction activity (such as bulldozers and compaction plant) are predicted to be much lower on the nearby breakwater roost and mudflat habitat (up to around 57 dB). Noise at this level will not be discernible from background sound levels and are unlikely to cause any responses. On this basis, disturbance responses due to noise stimuli would be anticipated to be limited at nearby important areas for these species (i.e., the breakwater roost and nearby mudflat of the Mostyn Bank). In addition, the use of softs starts would also help further minimise disturbance responses as discussed in Section 2.1.3.
Shelduck		IECS (2013) stated that noise disturbance has been reported from 72 dB upwards for Shelduck. However, this species is subject to a high degree of habituation and further exposure to sounds of the same or greater level can lead to no response to stimuli. With the use of the proposed piling noise suppression system noise and acoustic screen/barrier, piling is predicted to cause noise up to 65 dB on the breakwater roost and the nearby mudflat of the Mostyn Bank. While it is also acknowledged that noise above 60 dB at the receptor has the potential to cause disturbance responses in some

Species	Potential Visual Effects (With Mitigation)	Potential Noise Effects (With Mitigation)
		situations, given the existing background sound levels (levels in the range of around 60 to 70 dB and above regularly occur near the foreshore) and evidence from the ornithology surveys of existing habituation, any responses would be anticipated to be limited (IECS, 2013). Furthermore, the existing ambient sound levels are likely to mask to some extent the noise associated with the piling. Noise levels associated with other construction activity (such as bulldozers and compaction plant) are predicted to be much lower on the nearby breakwater roost and mudflat habitat (up to around 57 dB). Noise at this level will not be discernible from background sound levels and are unlikely to cause any responses. On this basis, disturbance responses due to noise stimuli would be anticipated to be limited at nearby important areas for these species (i.e., the breakwater roost and nearby mudflat of the Mostyn Bank). In addition, the use of softs starts would also help further minimise disturbance responses as discussed in Section 2.1.3.
Curlew		Curlew are considered moderately sensitive to noise stimuli but rarely approach nearer than 100 m to potential activity (IECS, 2013). With the use of the proposed piling noise suppression system noise and acoustic screen/barrier, piling is predicted to cause noise up to 65 dB on the breakwater roost and the nearby mudflat of the Mostyn Bank. While it is also acknowledged that noise above 60 dB at the receptor has the potential to cause disturbance responses in some situations, given the existing background sound levels (levels in the range of around 60 to 70 dB and above regularly occur near the foreshore) and evidence from the ornithology surveys of existing habituation, any responses would be anticipated to be limited (IECS, 2013). Furthermore, the existing ambient sound levels are likely to mask to some extent the noise associated with the piling. Noise levels associated with other construction activity (such as bulldozers and compaction plant) are predicted to be much lower on the nearby breakwater roost and mudflat habitat (up to around 57 dB). Noise at this level will not be discernible from background sound levels and are unlikely to cause any responses. On this basis, disturbance responses due to noise stimuli would be anticipated to be limited at nearby important areas for these species (i.e., the breakwater roost and nearby mudflat of the Mostyn Bank). In addition, the use of softs starts would also help further minimise disturbance responses as discussed in Section 2.1.3.
Black-tailed Godwit		Black-tailed Godwit are considered moderately sensitive to noise stimuli but rarely approach nearer than 100 m to potential activity (IECS, 2013). With the use of the proposed piling noise suppression system noise and acoustic screen/barrier, piling is predicted to cause noise up to 65 dB on the breakwater roost and the nearby mudflat of the Mostyn Bank. While it is also acknowledged that noise above 60 dB at the receptor has the potential to cause disturbance responses in some situations, given the existing background sound levels (levels in the range of around 60 to 70 dB and above regularly occur near the foreshore) and evidence from the ornithology surveys of existing habituation, any responses would be anticipated to be limited (IECS, 2013). Furthermore, the existing ambient sound levels are likely to mask to some extent the noise associated with the piling. Noise levels associated with other construction activity (such as bulldozers and compaction plant) are predicted to be much lower on the nearby breakwater roost and mudflat habitat (up to around 57 dB). Noise at this level will not be discernible from background sound levels and are unlikely to cause any responses.

Species	Potential Visual Effects (With Mitigation)	Potential Noise Effects (With Mitigation)
		On this basis, disturbance responses due to noise stimuli would be anticipated to be limited at nearby important areas for these species (i.e., the breakwater roost and nearby mudflat of the Mostyn Bank). In addition, the use of softs starts would also help further minimise disturbance responses as discussed in Section 2.1.3.
Pintail		Pintail are not specifically mentioned in the IECS (2013) toolkit but the broad principles of the toolkit have also been applied to this species. With the use of the proposed piling noise suppression system noise and acoustic screen/barrier, piling is predicted to cause noise up to 65 dB on the breakwater roost and the nearby mudflat of the Mostyn Bank. While it is also acknowledged that noise above 60 dB at the receptor has the potential to cause disturbance responses in some situations, given the existing background sound levels (levels in the range of around 60 to 70 dB and above regularly occur near the foreshore) and evidence from the ornithology surveys of existing habituation, any responses would be anticipated to be limited (IECS, 2013). Furthermore, the existing ambient sound levels are likely to mask to some extent the noise associated with the piling. Noise levels associated with other construction activity (such as bulldozers and compaction plant) are predicted to be much lower on the nearby breakwater roost and mudflat habitat (up to around 57 dB). Noise at this level will not be discernible from background sound levels and are unlikely to cause any responses. On this basis, disturbance responses due to noise stimuli would be anticipated to be limited at nearby important areas for these species (i.e., the breakwater roost and nearby mudflat of the Mostyn Bank). In addition, the use of softs starts would also help further minimise disturbance responses as discussed in Section 2.1.3.
Knot		Knot are considered relatively sensitive to noise stimuli with noise of up to 72 dB at the receptor typically considered acceptable (IECS, 2013). With the use of the proposed piling noise suppression system noise and acoustic screen/barrier, piling is predicted to cause noise up to 65 dB on the breakwater roost and the nearby mudflat of the Mostyn Bank. While it is also acknowledged that noise above 60 dB at the receptor has the potential to cause disturbance responses in some situations, given the existing background sound levels (levels in the range of around 60 to 70 dB and above regularly occur near the foreshore) and evidence from the ornithology surveys of existing habituation, any responses would be anticipated to be limited (IECS, 2013). Furthermore, the existing ambient sound levels are likely to mask to some extent the noise associated with the piling. Noise levels associated with other construction activity (such as bulldozers and compaction plant) are predicted to be much lower on the nearby breakwater roost and mudflat habitat (up to around 57 dB). Noise at this level will not be discernible from background sound levels and are unlikely to cause any responses. On this basis, disturbance responses due to noise stimuli would be anticipated to be limited at nearby important areas for these species (i.e., the breakwater roost and nearby mudflat of the Mostyn Bank). In addition, the use of softs starts would also help further minimise disturbance responses as discussed in Section 2.1.3.

Species	Potential Visual Effects (With Mitigation)	Potential Noise Effects (With Mitigation)
Dunlin		Dunlin are not thought to be particularly sensitive to noise stimuli with noise of up to 72 dB at the receptor typically considered acceptable (IECS, 2013). With the use of the proposed piling noise suppression system noise and acoustic screen/barrier, piling is predicted to cause noise up to 65 dB on the breakwater roost and the nearby mudflat of the Mostyn Bank. While it is also acknowledged that noise above 60 dB at the receptor has the potential to cause disturbance responses in some situations, given the existing background sound levels (levels in the range of around 60 to 70 dB and above regularly occur near the foreshore) and evidence from the ornithology surveys of existing habituation, any responses would be anticipated to be limited (IECS, 2013). Furthermore, the existing ambient sound levels are likely to mask to some extent the noise associated with the piling. Noise levels associated with other construction activity (such as bulldozers and compaction plant) are predicted to be much lower on the nearby breakwater roost and mudflat habitat (up to around 57 dB). Noise at this level will not be discernible from background sound levels and are unlikely to cause any responses. On this basis, disturbance responses due to noise stimuli would be anticipated to be limited at nearby important areas for these species (i.e., the breakwater roost and nearby mudflat of the Mostyn Bank). In addition, the use of softs starts would also help further minimise disturbance responses as discussed in Section 2.1.3.

Table 5. Potential residual effects on SPA qualifying species based on nearby important feeding and roosting areas during construction (with mitigation)

Location (See blue shaded area of interest)	Approximate Distance from the Proposed Development	SPA Species Recorded (Based on ornithology surveys undertaken from September 2017 to April 2021)	Potential Visual Effects (With mitigation)	Potential Noise Effects (With mitigation)
Breakwater roosting ledge 	Approximately 20 m from the reclamation works and 100 m from the quay wall piling.	Supports large numbers of roosting birds including Redshank in Autumn passage and Oystercatcher during high water periods (see the *Breakwater West* sub-section in Section 8.6.5 of the ES).	The visual/acoustic screen along the breakwater will mean that machinery, workers and plant operating in the reclamation footprint and harbour construction area will not be visible to birds roosting on the breakwater ledge roost and is therefore considered effective at preventing waterbirds from being exposed to close range visual stimuli. On this basis, visual related disturbance effects are anticipated to be negligible.	Based on information provided in IECS (2013), noise of up to 72 dB at the receptor (i.e., the bird) is generally considered acceptable for the species that typically use this area (see Table 4 above). With the use of the proposed piling noise suppression system noise and acoustic screen/barrier, piling is predicted to cause noise up to 65 dB on the breakwater roost. While it is also acknowledged that noise above 60 dB at the receptor has the potential to cause disturbance responses in some situations, given the existing background sound levels (levels in the range of around 60-70 dB and above regularly occur near the foreshore) and evidence from the ornithology surveys of existing habituation, any responses would be anticipated to be limited (IECS, 2013). Furthermore, the existing ambient sound levels are likely to mask to some extent the noise associated with the piling. Noise levels associated with other construction activity (such as bulldozers and compaction plant) are predicted to be much lower on the nearby breakwater roost (up to around 50 dB). Noise at this level will not be discernible from background sound levels and are unlikely to cause any responses.

Location (See blue shaded area of interest)	Approximate Distance from the Proposed Development	SPA Species Recorded (Based on ornithology surveys undertaken from September 2017 to April 2021)	Potential Visual Effects (With mitigation)	Potential Noise Effects (With mitigation)
				On this basis, disturbance responses due to noise stimuli would be anticipated to be limited at the breakwater roost. In addition, the use of softs starts would also help further minimise disturbance responses as discussed in Section 2.1.3.
Mudflat feeding habitat of the Mostyn Bank 	Approximately 50 to 100 m from the reclamation works and 200 m from the quay wall piling.	Regularly supports large numbers of feeding birds including Oystercatcher, Redshank, Black-tailed Godwit, Knot, Dunlin and Shelduck during low water periods (see the *Ffynnongroyw Bay South* sub-section in Section 8.6.5 of the ES).	The visual/acoustic screen along the breakwater will mean that machinery, workers and plant operating in the reclamation footprint and harbour construction area will not be visible to birds feeding on the Mostyn Bank and is therefore considered effective at preventing waterbirds from being exposed to close range visual stimuli. On this basis, visual related disturbance effects are anticipated to be negligible.	Based on information provided in IECS (2013), noise of up to 72 dB at the receptor (i.e., the bird) is generally considered acceptable for the species that typically use this area (see Table 4 above). With the use of the proposed piling noise suppression system noise and acoustic screen/barrier, piling is predicted to cause noise up to 65 dB on mudflat in this area. While it is also acknowledged that noise above 60 dB at the receptor has the potential to cause disturbance responses in some situations, given the existing background sound levels (levels in the range of around 60-70 dB and above regularly occur near the foreshore) and evidence from the ornithology surveys of existing habituation, any responses would be anticipated to be limited (IECS, 2013). Furthermore, the existing ambient sound levels are likely to mask to some extent the noise associated with the piling. Noise levels associated with other construction activity (such as bulldozers and compaction plant) are predicted to be much lower on nearby mudflat habitat in this area (up to around 57 dB). Noise at this level will not be discernible from background sound levels and are unlikely to cause any responses.

Location (See blue shaded area of interest)	Approximate Distance from the Proposed Development	SPA Species Recorded (Based on ornithology surveys undertaken from September 2017 to April 2021)	Potential Visual Effects (With mitigation)	Potential Noise Effects (With mitigation)
				On this basis, disturbance responses due to noise stimuli would be anticipated to be limited in this area. In addition, the use of softs starts would also help further minimise disturbance responses as discussed in Section 2.1.3.
Mudflat feeding habitat between the Mostyn Channel and Salisbury Channel 	Approximately 50 to 100m from the reclamation works and 200 m from the quay wall piling.	Regularly supports large numbers of feeding birds including Oystercatcher, Redshank, Black-tailed Godwit, Knot, Dunlin and Shelduck during low water periods (see the *Ffynnongroyw Bay South* sub-section in Section 8.6.5 of the ES).	The visual/acoustic screen along the breakwater will mean that machinery, workers and plant operating in the reclamation footprint and harbour construction area will not be visible to birds feeding on the mudflat and is therefore considered effective at preventing waterbirds from being exposed to close range visual stimuli. On this basis, visual related disturbance effects are anticipated to be negligible.	Based on information provided in IECS (2013), noise of up to 72 dB at the receptor (i.e., the bird) is generally considered acceptable for the species that typically use this area (see Table 4 above). With the use of the proposed piling noise suppression system noise and acoustic screen/barrier, piling is predicted to cause noise up to 65 dB on mudflat in this area. While it is also acknowledged that noise above 60 dB at the receptor has the potential to cause disturbance responses in some situations, given the existing background sound levels (levels in the range of around 60-70 dB and above regularly occur near the foreshore) and evidence from the ornithology surveys of existing habituation, any responses would be anticipated to be limited (IECS, 2013). Furthermore, the existing ambient sound levels are likely to mask to some extent the noise associated with the piling. Noise levels associated with other construction activity (such as bulldozers and compaction plant) are predicted to be much lower on nearby mudflat habitat in this area (< 55 dB). Noise at this level will not be discernible from background sound levels and are unlikely to cause any responses.

Location (See blue shaded area of interest)	Approximate Distance from the Proposed Development	SPA Species Recorded (Based on ornithology surveys undertaken from September 2017 to April 2021)	Potential Visual Effects (With mitigation)	Potential Noise Effects (With mitigation)
				On this basis, disturbance responses due to noise stimuli would be anticipated to be limited in this area. In addition, the use of softs starts would also help further minimise disturbance responses as discussed in Section 2.1.3.
Roosting habitat (known as count sector 'G' as shown on Figure 8.1 of the ES) 	Approximately 450 to 600 m from the reclamation and quay wall piling works. Approximately 150 m away from the piling required for the relocation of existing dolphins	Counts of over 1,000 roosting Oystercatcher and Redshank regularly recorded roosting during high water periods with lower numbers of other waterbirds also recorded roosting (see the *Mostyn Dock Shore* sub-section in Section 8.6.5 of the ES).	This area is outside of the zone of potential visual disturbance effects as a result of construction activity associated with reclamation and quay wall piling works. As a result of the existing Gwynt y Môr jetty and pontoon, visual stimuli associated with the relocation of existing dolphins will also be screened from this roost.	Based on information provided in IECS (2013), noise of up to 72 dB at the receptor (i.e., the bird) is generally considered acceptable for the species that typically use this area (see Table 4 above). With the use of the proposed piling noise suppression system noise and acoustic screen/barrier, piling is predicted to cause noise of less than 70 dB at this roost. While it is also acknowledged that noise above 60 dB at the receptor has the potential to cause disturbance responses in some situations, given the existing background sound levels (levels in the range of around 60-70 dB and above regularly occur near the foreshore) and evidence from the ornithology surveys of existing habituation, any responses would be anticipated to be limited (IECS, 2013). Furthermore, the existing ambient sound levels are likely to mask to some extent the noise associated with the piling. There is also an existing jetty and port infrastructure located between the proposed development and this roost which will act to screen the works to some extent. Noise levels associated with other construction activity (such as bulldozers and compaction plant) are predicted to be much lower in this area (<40 dB). Noise at this level will not be discernible from background sound levels and are unlikely to cause any responses.

Location (See blue shaded area of interest)	Approximate Distance from the Proposed Development	SPA Species Recorded (Based on ornithology surveys undertaken from September 2017 to April 2021)	Potential Visual Effects (With mitigation)	Potential Noise Effects (With mitigation)
				It is worth noting that the piling restrictions that are proposed for migratory fish will mean that there would be no percussive piling taking place between 7 pm and 7 am, and also no percussive piling undertaken 3 hours either side of high water during sensitive periods for migratory fish (Section 3.2). On this basis, disturbance responses due to noise stimuli would be anticipated to be limited at this roost. In addition, the use of softs starts would also help further minimise disturbance responses as discussed in Section 2.1.3.
Upper shore roosting habitat in the southern corner of the Mostyn Bank (known as count sector 'E' as shown on Figure 8.1 of the ES) 	Approximately 700 to 800 m from the reclamation and piling works	Used relatively infrequently by up to approximately 100 roosting Oystercatcher 60 Redshank and lower numbers of other waterbirds.	This area is out of the zone of potential visual disturbance effects as a result of construction activity associated with the proposed development.	Based on information provided in IECS (2013), noise of up to 72 dB at the receptor (i.e., the bird) is generally considered acceptable for the species that typically use this area (see Table 4 above). With the use of the proposed piling noise suppression system noise and acoustic screen/barrier, piling is predicted to be in the range of 55 to 60 dB at this roost. While it is also acknowledged that noise above 60 dB at the receptor has the potential to cause disturbance responses in some situations, given the existing background sound levels (levels in the range of around 60-70 dB and above regularly occur near the foreshore) and evidence from the ornithology surveys of existing habituation, any responses would be anticipated to be limited (IECS, 2013). Furthermore, the existing ambient sound levels are likely to mask to some extent the noise associated with the piling.

Location (See blue shaded area of interest)	Approximate Distance from the Proposed Development	SPA Species Recorded (Based on ornithology surveys undertaken from September 2017 to April 2021)	Potential Visual Effects (With mitigation)	Potential Noise Effects (With mitigation)
				Noise levels associated with other construction activity (such as bulldozers and compaction plant) are predicted to be much lower this area (<40 dB). Noise at this level will not be discernible from background sound levels and are unlikely to cause any responses. It is worth noting that the piling restrictions that are proposed for migratory fish will mean that there would be no percussive piling taking place between 7 pm and 7 am, and also no percussive piling undertaken 3 hours either side of high water during sensitive periods for migratory fish (Section 3.2). On this basis, disturbance responses due to noise stimuli would be anticipated to be limited at this roost. In addition, the use of softs starts would also help further minimise disturbance responses as discussed in Section 2.1.3.
Cockle shell/rock roosting habitat on the Mostyn Bank (known as count sector 'H' as shown on Figure 8.1 of the ES) 	Approximately 1 km from the reclamation and piling works	Counts of over 5,000 roosting Oystercatcher regularly recorded on the roost during high water periods	This area is outside of the zone of potential visual disturbance effects as a result of construction activity associated with the proposed development.	Based on information provided in IECS (2013), noise of up to 72 dB at the receptor (i.e., the bird) is generally considered acceptable for the species that typically use this area (see Table 4 above). With the use of the proposed piling noise suppression system noise and acoustic screen/barrier, piling is predicted to be in the range of 60 to 65 dB at this roost. While it is also acknowledged that noise above 60 dB at the receptor has the potential to cause disturbance responses in some situations, given the existing background sound levels (levels in the range of around 60-70 dB and above regularly occur near the foreshore) and evidence from the ornithology surveys of existing

Location (See blue shaded area of interest)	Approximate Distance from the Proposed Development	SPA Species Recorded (Based on ornithology surveys undertaken from September 2017 to April 2021)	Potential Visual Effects (With mitigation)	Potential Noise Effects (With mitigation)
				habituation, any responses would be anticipated to be limited (IECS, 2013). Furthermore, the existing ambient sound levels are likely to mask to some extent the noise associated with the piling. Noise levels associated with other construction activity (such as bulldozers and compaction plant) are predicted to be much lower in this area (<40 dB). Noise at this level will not be discernible from background sound levels and are unlikely to cause any responses. It is worth noting that the piling restrictions that are proposed for migratory fish will mean that there would be no percussive piling taking place between 7 pm and 7 am, and also no percussive piling undertaken 3 hours either side of high water during sensitive periods for migratory fish (Section 3.2). On this basis, disturbance responses due to noise stimuli would be anticipated to be limited at this roost. In addition, the use of softs starts would also help further minimise disturbance responses as discussed in Section 2.1.3.
Other important habitats for feeding and roosting birds in the Dee Estuary	More than 1 km from the reclamation and piling works		This area is outside of the zone of potential visual disturbance effects as a result of construction activity associated with the proposed development.	Based on information provided in IECS (2013), noise of up to 72 dB at the receptor (i.e., the bird) is generally considered acceptable for the species that typically use this area (see Table 4 above). With the use of the proposed piling noise suppression system noise and acoustic screen/barrier, piling is predicted to be in the range of <70 dB at these locations.

Location (See blue shaded area of interest)	Approximate Distance from the Proposed Development	SPA Species Recorded (Based on ornithology surveys undertaken from September 2017 to April 2021)	Potential Visual Effects (With mitigation)	Potential Noise Effects (With mitigation)
				While it is also acknowledged that noise above 60 dB at the receptor has the potential to cause disturbance responses in some situations, given the existing background sound levels (levels in the range of around 60-70 dB and above regularly occur near the foreshore) and evidence from the ornithology surveys of existing habituation, any responses would be anticipated to be limited (IECS, 2013). Furthermore, the existing ambient sound levels are likely to mask to some extent the noise associated with the piling. Noise levels associated with other construction activity (such as bulldozers and compaction plant) are predicted to be much lower on nearby mudflat habitat in this area (<40 dB). Noise at this level will not be discernible from background sound levels and are unlikely to cause any responses. On this basis, disturbance responses due to noise stimuli would be anticipated to be limited at this roost. In addition, the use of softs starts would also help further minimise disturbance responses as discussed in Section 2.1.3.

2.2 Assessment of habitat loss

The capital dredge will result in the loss of 1.34 ha of lower elevation intertidal habitat as a direct result of the deepening the berth pocket required for the new quay wall (i.e., it will permanently change to subtidal habitat).

The intertidal habitat loss as a result of the capital dredge represents approximately 0.008 % the Dee Estuary SAC and 0.013 % of the 'mudflats and sandflats not covered by seawater at low tide' feature of the Dee Estuary SAC[2]. This loss also represents 0.009 % of the Dee Estuary SPA/Ramsar site[3].

This change will be highly localised and will not change the overall structure or functioning of the nearby mudflats within the Port of Mostyn area or more widely in the Dee Estuary. This habitat loss is, therefore, considered to be negligible in the context of similar suitable habitat in the Dee Estuary SPA/Ramsar site.

The habitat in this area (which is known as 'Bug Bank') consists of low elevation and dynamic sandflat habitat. The project-specific intertidal benthic survey recorded a highly impoverished faunal assemblage with very low abundances of prey items for coastal waterbirds recorded (such as polychaetes, the mudsnail *Peringia* spp., the mud shrimp *Corophium* spp., and bivalves Tellinoidea spp.). No cockles (which are a key prey item for Oystercatchers) were recorded during the surveys (Section 8.6.2 and Appendix 8.1 of the ES). In addition, Bug Bank is only exposed for a relatively short amount of time during low water periods with much of this bank only becoming exposed during spring tidal phases. To put this into context, water levels for a one month period (including mean spring and neap tidal ranges) were extracted from the project modelling tools. The Digital Terrain Model (DTM) of the proposed capital dredge extent was then interrogated and the area of bank exposure at a range of tidal elevations (from Lowest Astronomical Tide (LAT) to the highest elevation of the bank area) was calculated. Subsequent comparison of the timeseries water levels and the bank elevation data found that none of the area of bank to be dredged is exposed at Mean Low Water Neaps (MLWN) tidal elevations. Furthermore, the top of the bank (covering an area of around 0.05 ha) is submerged underwater for approximately 84 % of the time within an average month. At lower tidal elevations (Mean Low Water Springs (MLWS)), a total bank area of approximately 1.3 ha is exposed but for a total of less than six hours during an average month and is completely submerged for more than 99 % of the time.

On this basis, the area of predicted loss currently (i.e., under pre-capital dredge baseline conditions), provides very limited feeding opportunities for coastal waterbirds with the spatial extent of loss representing a barely measurable and inconsequential reduction in available habitat for these mobile species even at a local scale. Such a highly localised and negligible change in the prey resources available for birds feeding will not be of a magnitude that will affect individual survival rates or local population levels (either directly through mortality or due to birds dispersing to new feeding areas in other areas of the Dee Estuary).

This very limited functional value to coastal waterbirds is reflected in very low use of this area by waterbirds compared with nearby areas. This is shown in the bird distribution mapping data collected on a monthly basis as part of the Port of Mostyn Ornithology Surveys between September 2017 to April 2021 (Section 8.6.2 and Appendix 8.3). Appendix D provides the distribution maps of SPA waterbirds during high water (HW) and low water (LW) counts. In summary, the data shows that the only SPA species recorded on Bug Bank in the capital dredge footprint was Oystercatcher. Abundance data extracted from the distribution mapping data shows that only very low numbers of Oystercatcher were recorded during the surveys, loafing and more rarely feeding in this area (maximum of 15 birds on one

[2] Based on the extents provided in the Standard Data Form on the JNCC website (JNCC, 2015a)
[3] Based on the extents provided in the Standard Data Form on the JNCC website (JNCC, 2015b)

occasion and typically much lower numbers of less than 5 birds). Further discussions with the survey ornithologists confirmed that the findings of the bird distribution mapping analysis is also consistent with the surveyors understanding from undertaking surveys in the area over the last 15 years. The results presented are also consistent with observations during the Phase 1 habitat surveys, as well as other ecological surveys undertaken on behalf of the Port of the last 20 years by ABPmer.

With respect to non-SPA qualifying features, Herring Gull have been frequently recorded loafing on Bug Bank (flocks of typically 15 to 100 birds) as well as low numbers of other species (consisting of a few individuals) such as Black-headed Gulls, Great Black-backed Gulls and Cormorants are also occasionally recorded on Bug Bank.

Therefore, Bug Bank is only used by a very small proportion of the overall Dee Estuary populations of the species commonly recorded (for example less than 0.03 % of Oystercatchers and 0.7 % of the Herring Gull population[4]).

In summary, based on the above considerations and following the standard impact assessment matrix in Section 5.3 of the ES, the probability of occurrence is considered to be high with magnitude of change considered to be low, leading to a low exposure to change. Local populations of waterbirds, including both SPA qualifying and assemblage species, are considered to have a low sensitivity to habitat that has limited functional use. On this basis, vulnerability is considered to be low. Importance is high given the protection afforded to the bird species in the area of predicted loss. On this basis, the impact is assessed as **minor adverse**.

In HRA terms, in the context of the site's conservation objectives, the loss of low ecological habitat with very limited functional use will not result in a change in the population size of bird interest features of the Dee Estuary SPA/Ramsar site. In other words, there is not expected to be a measurable change to the overall populations of these bird interest features. Overall, there is considered to be no potential for an AEOI on these bird interest features of the Dee Estuary SPA/Ramsar site.

4 When compared against Dee Estuary Low Tide data winter for 2021/22 data (BTO, 2022).

3 Fish Receptors

3.1 Sandeel assessment

3.1.1 Habitat change due to dredging and disposal activity

Potentially suitable sand habitat in the Dee Estuary[5] is shown in Figure 1. The total area of suitable sandeel habitat in the Dee Estuary based on this dataset is 3,570 ha.

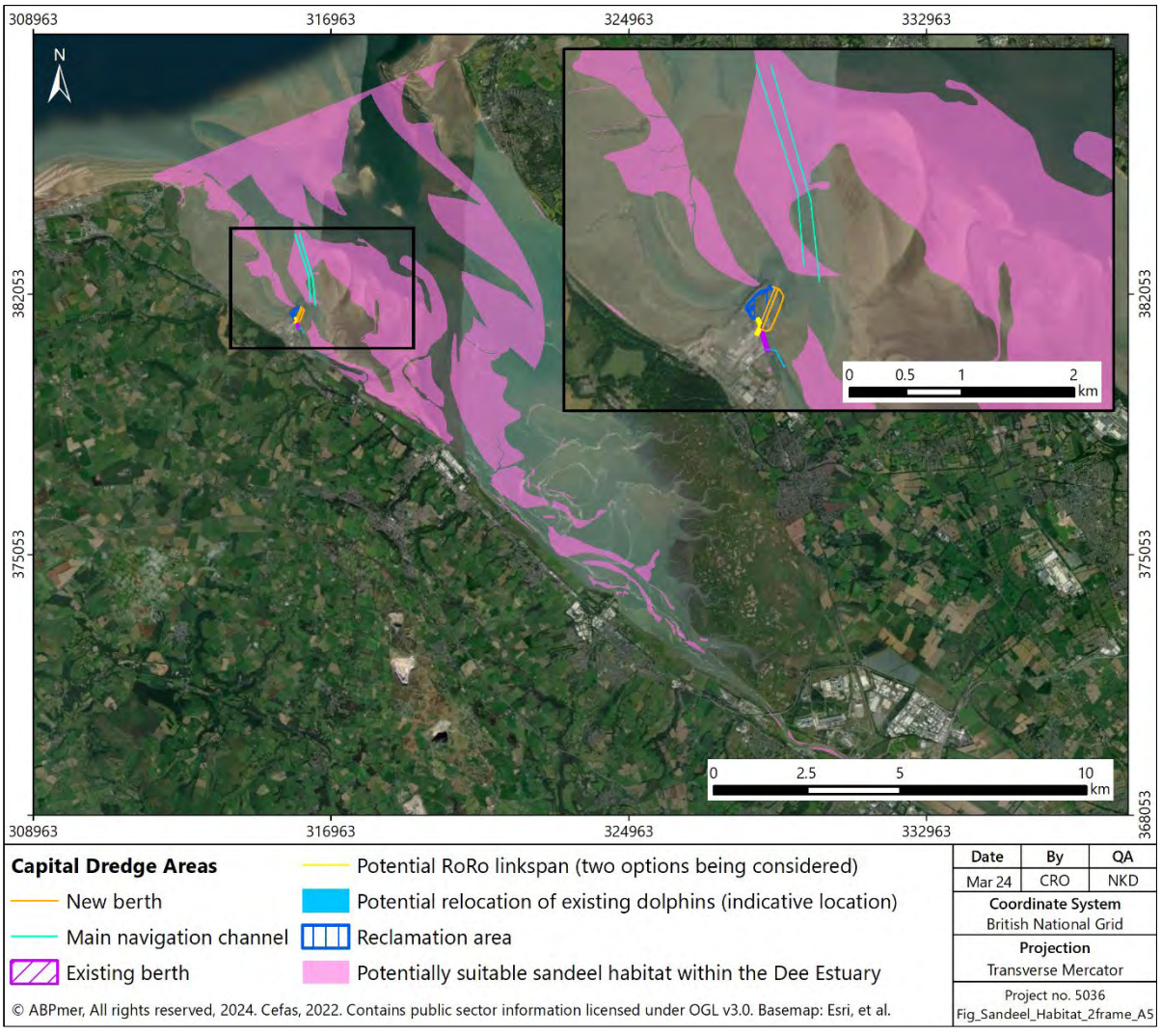

Figure 1. Potentially suitable sandeel habitat in the Dee Estuary.

[5] EMODnet EUNIS Habitat Map MESH Atlantic dataset (https://emodnet.ec.europa.eu/en/seabed-habitats) was used to estimate the total area of potentially suitable sand habitat within the Dee Estuary (3,570 ha). Relevant EUNIS Habitat codes that are considered to represent preferred/marginal or prime/sub-prime habitat for sandeels within the estuary are sand habitats under codes A5.2, A5.233, A2.2232, A2.2, A2.245, A2.231, and A2.221. Following consultation with NRW A, muddy sand habitats under codes 2.2, 2.24, 2.241. 2.242 and 2.244 were removed from this updated estimate of sandeel habitat.

The proportion of the total sandeel habitat potentially affected by different elements of the proposed development is provided in Table 6. In summary, potentially affected areas only constitute a negligible proportion of the total amount of sandeel habitat in the Dee Estuary. On this basis, the further analysis provided in this report is not considered to change the key findings and conclusions presented in the Further Information Report (ABPmer, 2023), with the overall potential impact of the MEPE Project on sandeels still assessed as **minor adverse**.

Table 6. The proportion of total sandeel habitat in the Dee Estuary potential impacted by different elements of the proposed development

Area	Potential Effects on Sandeels	Proportion of Available Sandeel Habitat in the Dee Estuary Potentially Impacted
Reclamation	The 3.49 ha of intertidal and subtidal habitat that will be lost as part of the reclamation consists of hard substrate habitat, intertidal mud habitat and subtidal muddy sand habitat. None of these habitats are considered suitable habitat for sandeels.	No overlap with suitable sandeel habitat
Berth capital dredge area	Deepening in the Bug Bank area will result in the loss of up to 1.34 ha of clean sand habitat which is considered potentially suitable for sandeels. Potential effects are discussed in Section 4.4 of the Further Information Report (ABPmer, 2023).	<0.04 %
Channel capital and maintenance dredging	Dredging in channel areas will result in the potential direct removal/entrainment of sandeel and sandeel eggs by the dredger. Potential effects are discussed in Section 4.4 of the Further Information Report (ABPmer, 2023).	0.42 %
Dredge disposal areas	Dredge disposal has the potential to result in smothering effects to sandeels and sandeel eggs. Potential effects are discussed in Section 4.4 of the Further Information Report (ABPmer, 2023) and in Section 3.1.2 below.	2.79 %

3.1.2 The impact of smothering of sandeels eggs during disposal activities

The impact of smothering on sandeel (but not sandeel eggs) during disposal activities was assessed in Section 4.4 of the Further Information Report (ABPmer, 2023). In summary, peak sedimentation depths within the Mostyn Deep disposal site (IS102 disposal site) are predicted to be around 50 to 60 mm, reducing to around 4 to 6 mm within the plume at distances of approximately 1 km from the disposal site. Effects during maintenance dredge and dredge disposal are predicted to be comparable or less than predicted for the capital dredge and disposal. The results of the modelling work are also explained in more detail in Section 2.4 of the Further Information Report which include a map of where in the estuary, maximum sedimentation is predicted to occur as a result of dredging and disposal in relation to cockle beds. This map is included in Section 5 of this report. These changes are effectively no different to what is already currently licensed to be dredged and disposed at the Mostyn Deep disposal site, in terms of the volume of individual deposits and daily/annual limits.

As was presented in Section 2.3 of the Further Information Report (ABPmer, 2023), historic dredge records and ongoing annual monitoring indicate that all material that has previously been deposited at the Mostyn Deep disposal site (under current and previous licences) has been dispersed. This is true under a range of annual disposal volumes from relatively little to upwards of 350,000 m^3 (700,000 tonnes). The Mostyn Deep area is a high-energy site and a variety of studies have shown that, due to the dispersive nature of the location, it is self-sustaining, which results in the area maintaining near-consistent water depths (ABPmer, 2023).

It is acknowledged that deposition of dredged material in the immediate vicinity of the disposal site has the potential to cause some short-lived and temporary smothering of sandeel eggs at the time of the disposal activity. This material will be rapidly re-dispersed back into the estuary within a matter of weeks (ABPmer, 2023). As a result of past and ongoing licensed dredge disposal activities, conditions within this localised area are likely to be sub-optimal for sandeels eggs and unlikely to represent important habitat for this species. Furthermore, as discussed above in Section 3.1.1, the dredge disposal site also only represents a small proportion of sandeel habitat in the Dee Estuary (<3 %).

Sedimentation outside of the disposal site during both capital and maintenance dredge disposal is predicted to be immeasurable and within the range of natural background variability in the context of the very dynamic environment and highly mobile nature of the sand habitat within the Dee Estuary. These effects are also in line with changes that have been experienced during past and ongoing licensed disposal activities within the estuary. Furthermore, any fine sediment material (such as silt) deposited due to the dredge arisings will be rapidly dispersed and will not change the sediment characteristics of the sand sediment habitat types in the wider area around the disposal site.

Research suggests that sandeel eggs are tolerant to some sediment deposition in the range that can occur naturally. For example, experiments have shown that eggs are capable of developing normally following deposition of several centimetres of sediment and hatch as soon as currents uncover them again (RWE, 2002; Winslade, 1971). Any sandeel eggs present in the wider area around the disposal site would therefore be expected to be uncovered within a short period of time as part of natural sand movements linked to the strong hydrodynamic conditions in the area and develop normally once exposed.

Based on the information provided above and applying the impact assessment matrix, magnitude of change is, therefore, assessed as small. Probability of occurrence is high and, thus, the overall exposure to change is low. Sensitivity of sandeels eggs is considered to be moderate. Vulnerability is therefore assessed as low. Sandeels eggs are considered to be of high importance given they are a Section 7 species and are an important prey resource for a wide variety of species. Taking all these factors into consideration, the impact of smothering to sandeel eggs during disposal activities is assessed as **minor adverse.**

3.1.3 Potential effects on Common Tern prey

As stated in Section 8.6.5 of the ES, Common Terns nest at Shotton Steelworks (approximately 17 km to the south-east of the proposed development) and this species is a qualifying feature of the Dee Estuary SPA. Common Terns are known to have a foraging range of up to 30 km (Woodward *et al*., 2019). On this basis, Common Terns are likely to exploit prey from throughout the Dee Estuary and approaches.

This species is known to feed on a variety of prey in the UK, including fish (marine and freshwater), crustaceans, squid and marine worms. They also feed on aquatic and terrestrial insects more frequently than other tern species. The main prey delivered to chicks in the marine environment are herring, sprat, sandeel and small gadoids (Eglington & Perrow, 2014). Overall, Common Tern is considered to be a foraging generalist and displays considerable plasticity in foraging and provisioning strategy, with a

capacity to exploit diverse prey resources by utilising a variety of foraging methods (Eglington & Perrow, 2014).

Sandeels are therefore likely to only make up a small component of the diet of Common Terns from the Shotton colony which are likely to exploit a wide variety of prey other than sandeels, and from a variety of other nearby habitats, including saline lagoons, freshwater lakes and creeks in the local area.

The loss of sandeel habitat that will occur as a result of the proposed development (1.34 ha) also only constitutes a negligible proportion of the overall amount of suitable sandeel habitat in the Dee Estuary (<0.04 %), with the entire Dee Estuary located within the known foraging range of Common Terns from the Shotton colony. It is also worth noting that this proportion of suitable sandeel habitat referred to does not include potential sandeel resources from the subtidal sandbank habitats of the approaches to the Dee Estuary (which is also within the foraging range of this species albeit at the outer limits). In addition, Common Terns will be able to utilise some sandeel resource from outside their foraging range[6].

On this basis, the contribution that sandeels from the area of direct habitat loss is likely to make to the overall diet of Common Terns from the Shotton colony is considered inconsequential. Based on these factors, the loss of Common Tern prey resources due to the capital dredge is considered to be negligible.

In summary, based on the above considerations and following the standard impact assessment matrix, the magnitude of the change is considered to be negligible and so, while the probability of occurrence is high, the overall exposure is assessed as negligible. Sensitivity of Common Tern to a loss of prey resources is considered to be moderate. Vulnerability is therefore assessed as none. Importance is high given the protection afforded to Common Terns. Taking all these factors into consideration, the overall potential effects of changes in sandeel prey on Common Tern is assessed as **insignificant**.

In HRA terms, in the context of the site's conservation objectives, the potential change in prey will not result in a change in the population size of the Common Tern qualifying feature of the Dee Estuary SPA/Ramsar site. In other words, there is not expected to be a measurable change in the overall populations of this bird interest feature. Overall, there is considered to be no potential for an AEOI on the Common Tern interest feature of the Dee Estuary SPA/Ramsar site.

3.2 Timing restrictions

Following the initial consultation response provided by NRW A to the ES and supporting information, the following piling restriction was proposed in the Further Information Report (ABPmer, 2023):

- No percussive piling is to be undertaken 3 hours either side of high water [mid-April to mid-June] in any given year. Percussive piling operations that have already been initiated will, however, be completed where an immediate cessation of the activity would form an unsafe working practice.

This was based on the outputs of the underwater noise assessment (Appendix 8.4 of the ES) and NRW A's advice on the key sensitive periods for migratory fish in the Dee Estuary, in particular the smolt migration from mid-April to mid-June.

Following further advice from NRW A in their written consultation response to the Further Information Submission and meeting on 9 January 2024, they have advised that further consideration should be

[6] Sandeels show site fidelity to large patches of sand (known as grounds) and typically remain within 10 km of their grounds (Wright *et al.*, 2019).

given to whether the proposed timing restriction for migratory fish should be extended beyond mid-April to mid-June for other key fish species in the Dee Estuary, with a particular focus on European smelt and herring.

As noted in Section 8.6.3 of Chapter 8 Nature Conservation and Marine Ecology of the ES, migratory fish recorded in the Dee Estuary include European eel, Atlantic salmon, sea trout, river lamprey, sea lamprey, twaite shad and European smelt (Port of Mostyn, 2013; Natural England and CCW, 2010). These species are all afforded protection under various legislation. Information on the ecology and movements of these key migratory species was provided in Table 8.11, Chapter 8 Nature Conservation and Marine Ecology of the ES. Further to this information, NRW A has advised that European smelt are understood to congregate in estuaries and migrate upstream to their spawning grounds between February and April.

As well as these migratory fish, there are other protected fish species under Section 7 of the Environment (Wales) Act 2016 that are sensitive to underwater noise and have key seasonal or nursery/spawning periods in the Dee Estuary, namely Atlantic herring, Atlantic cod, whiting and Atlantic mackerel. A review of the use of the Dee Estuary by these other fish based on site specific surveys and available published data is included in Section 8.6.3 of Chapter 8 Nature Conservation and Marine Ecology of the ES.

A risk based approach has been applied to the available evidence of the movements of key migratory fish and other fish in the Dee Estuary to help define the proposed piling restrictions for the MEPE Project. This has involved identifying the months of the year each of the key fish are known to be predominantly using the estuary for migration or as spawning/nursery grounds based on available data, and assigning a corresponding relative level of potential risk of exposure to piling noise. The relative level of potential risk (higher or lower) that has been assigned to each month is based on the consideration of a number of factors as set out in Table 7. The relative level of potential risk each month of the year taking account of all these considerations and advice from NRW A for all of the key fish species in the Dee Estuary is set out in Table 8.

Based on the risk based approach that has been undertaken, the proposed piling restriction between mid-April to mid-June could, if necessary, be extended to cover the higher potential risk of exposure to European smelt during the months of February and March and/or the higher potential risk to herring in September to November.

It is worth noting that the piling works will not take place continuously as there will be periods of downtime, pile positioning and set up, as well as jack up barge movements between pile locations. In advance of any proposed piling restriction, it is estimated that fish will only be potentially exposed to disturbance from percussive piling up to around 5 % of the time over the piling programme (Section 1.1). Furthermore, assuming that up to 2 tubular piles will be installed each day, the percussive piling activity will be undertaken over a period of around 48 days which is less than half the duration of piling that was assumed in the ES (approximately 100 piling days over a 12 month construction programme).

Table 7. Relative level of potential risk of exposure taking account of a range of factors

Factors	Explanation	Higher	Lower
Hearing sensitivity of the fish	The hearing sensitivity of the fish based on the Popper *et al.* (2014) categories and in accordance with the sensitivity criteria set out in the impact assessment methodology in Section 8.3.2 of the ES.	Fish with a swim bladder (i.e., European eel, twaite shad, Atlantic salmon, sea trout, European smelt, herring, Atlantic cod, whiting, Atlantic mackerel).	Fish with no swim bladder (i.e., river lamprey and sea lamprey).
Life stage and associated mobility of the fish	Juveniles are generally considered to be less actively mobile and therefore have a potentially higher level of risk of exposure to piling activity.	Juveniles (e.g. glass eel/elvers, and Atlantic salmon and sea trout smolts).	Adults.
Distribution and occurrence within the Dee Estuary	Distribution and occurrence in the estuary based on the available published and site specific survey data reviewed in detail in Section 8.6.3 of the ES.	Fish regularly recorded in the Dee Estuary.	Fish rarely recorded in the estuary (e.g. Atlantic cod and Atlantic mackerel).
Day versus night	The night time piling restriction that the applicant has committed to (i.e., no percussive piling is to take place between 7 pm and 7 am on any given day) will reduce the level of risk of exposure for fish that migrate exclusively or preferentially during the night.	Fish that migrate exclusively or preferentially during the day.	Fish that migrate exclusively or preferentially at night (i.e., glass eel and river lamprey).

Table 8. Relative level of potential risk to key fish in the Dee Estuary

Fish Species/ Life Stage	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Glass eels/elvers				↑	↑	↑						
Silver eel								↓	↓	↓		
European smelt		↑	↑	↑								
River lamprey	↑	↑										↑
Sea lamprey				↑	↑							
Twaite shad				↑	↑	↑	↑					
Atlantic salmon and sea trout smolts				↓	↓	↓						
Atlantic salmon adults				↑				↑	↑			
Herring									**S**	**S**	**N/S**	
Atlantic cod*			**N/S**	**N/S**								
Whiting			**N/S**	**N/S**	**N/S**	**N/S**						
Atlantic mackerel**												
Relative level of potential risk: H = higher M = moderate L = lower	L	M	M	H	H	H	L	L	M	M	H	L

↑ Fish species moving upstream through estuary.
↓ Fish species moving downstream through estuary.
N Potentially using estuary as nursery ground.
S Potentially using estuary as spawning ground.
* Gadidae species (codfish family) recorded in the fish surveys undertaken outside the Dee Estuary in spring, predominantly in March (no. 17) and April (no. 10) (Appendix 8.2 of the ES).
** Very small numbers of Atlantic mackerel recorded in the fish trawl surveys outside the Dee Estuary in spring (no. 4) and autumn (no. 2) (Appendix 8.2 of the ES).

4 Benthic Ecology/ HRA

4.1 Loss of estuaries feature

Natural Resources Wales MLT has given ABPmer the opportunity to provide any further evidence that can be considered in the HRA for the proposed MEPE Project (CML2283) that NRW MLT is preparing as the competent authority in response to the consultation comments received from NRW A on the Further Information Submission.

The proposed reclamation for the MEPE Project will result in the loss of marine habitat. The total area of loss represents 3.22 ha of the Annex I Estuaries feature of the Dee Estuary SAC and Ramsar site, comprising 2.57 ha of intertidal habitat and 0.65 of subtidal habitat. The type of habitat and associated scale of the loss in the context of the SAC/Ramsar site features and components are set out in Table 9.

Table 9. Loss of habitat as a result of the MEPE reclamation

Type of Habitat	Seabed Sediment	Scale of Loss (ha)	SAC/Ramsar Feature*	Components of the SAC/Ramsar Feature**
Intertidal	Intertidal hard substrate (tipped slag waste)	0.27	Does not qualify as any SAC/Ramsar feature.	-
	Intertidal soft/fluid sandy mud	2.57	Does not qualify as Annex I mudflat and sandflat feature. Qualifies as Annex I Estuaries feature.	This Annex I Estuaries habitat feature is not currently representative of any of the components of the Annex I Estuaries feature.
Subtidal	Slightly gravelly sandy mud and slightly gravelly muddy sand	0.65	Qualifies as Annex I Estuaries feature.	

* As agreed by NRW A.

** The habitat components of the Annex I Estuaries feature are defined in Box 1 (see Appendix F) of the Regulation 37 of the Conservation of Habitats and Species Regulations 2017 for the Dee Estuary European Marine Site (Natural England and CCW, 2010).

Although it is recognised that a proportion of the habitat that will be lost under the footprint of the MEPE reclamation forms part of the Annex I Estuaries feature of the Dee Estuary SAC and Ramsar site, given the nature of the habitat that is currently present and has been present since the site was designated, as is discussed further in Section 4.4, it is not considered representative of any of the components of the Estuaries feature.

The competent Authority, NRW MLT, has not yet come to a position on the conclusions of the HRA. The following sections of this report, therefore, sets out all the evidence and rationale for the applicant concluding that the loss of Estuaries feature is not significant and would not have an AEOI of the Dee Estuary SAC and Ramsar site.

4.2 Current and past consents and activities

The Port of Mostyn already has an existing licence (DML2001) to dredge part of the area within the footprint for the proposed MEPE reclamation which is valid until 31 March 2026 (Figure 2). In addition, the Port has a licence to construct a new quay for an MEP facility (CML1343v3) which is valid until 14 August 2025. The reclamation that falls under CML1343v3 covers a total area of 2.5 ha. In other words, the proposed MEPE reclamation is a small extension to the already consented MEP facility and will result in a slight increase (0.72 ha) in the total loss of Estuaries habitat feature. Further details regarding the already consented MEP facility and conclusions of the HRA and EIA consent decision are provided in Section 4.5.

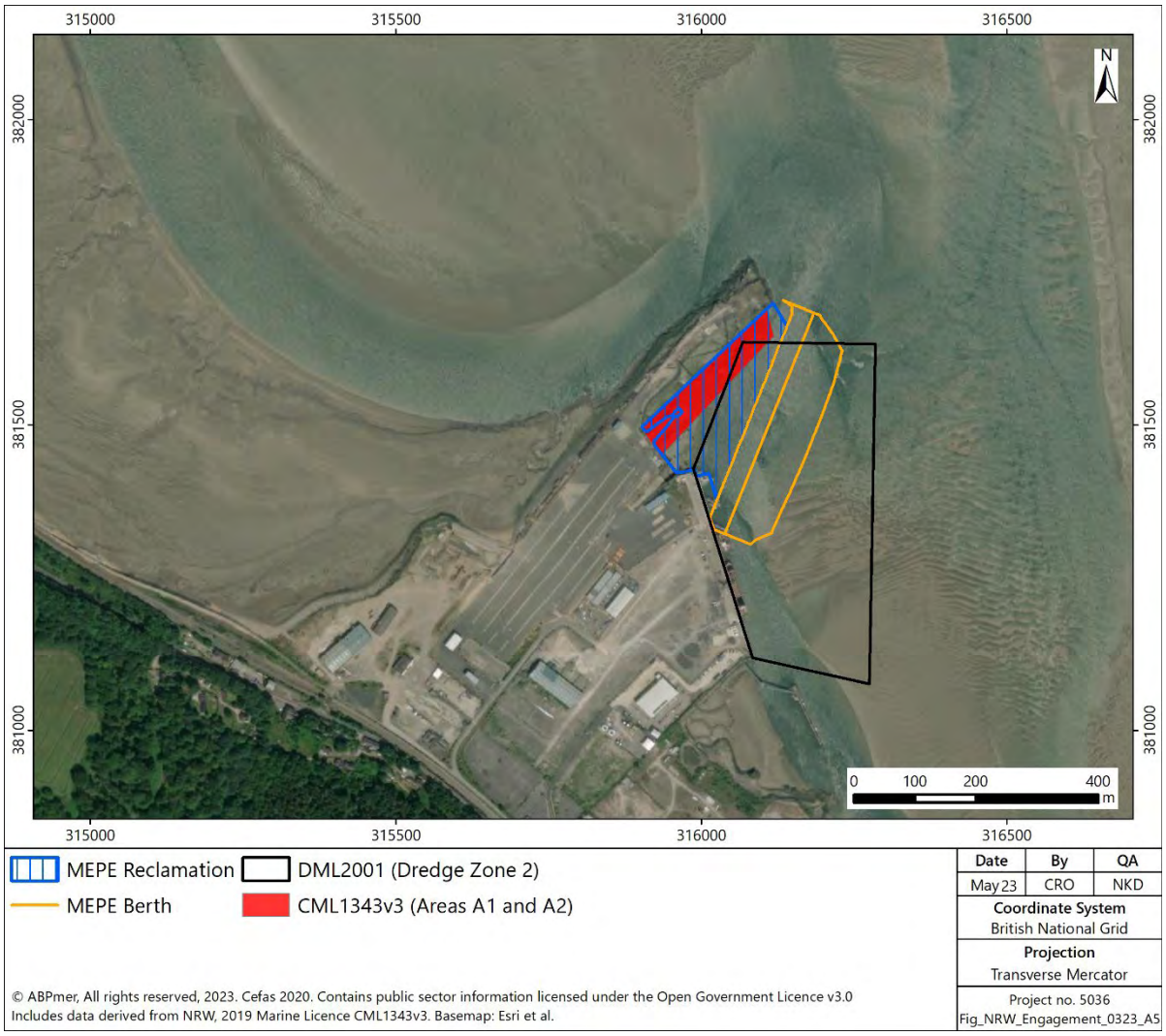

Figure 2. Existing permissions to remove and/or deposit materials within proposed MEPE reclamation and new berth

The areas covered by existing permissions (DML2001 and CML1343v3) overlap the majority of the marine habitat under the footprint of the proposed MEPE reclamation. The remaining area of Estuaries feature habitat (0.91 ha) under the footprint of the proposed MEPE reclamation that is not covered by either DML2001 or CML1343v3 is shown on Figure 3. A large part of this remaining area, including all of the intertidal mud, was included in a previous consent to reclaim 21.5 acres (8.71 ha) of land which was granted by Secretaries of State for Wales and Transport to the Port of Mostyn in 1996, and which at the time was not regarded as a significant adverse effect in the context of the whole estuary area. Further details regarding this past decision are provided in Section 4.5.

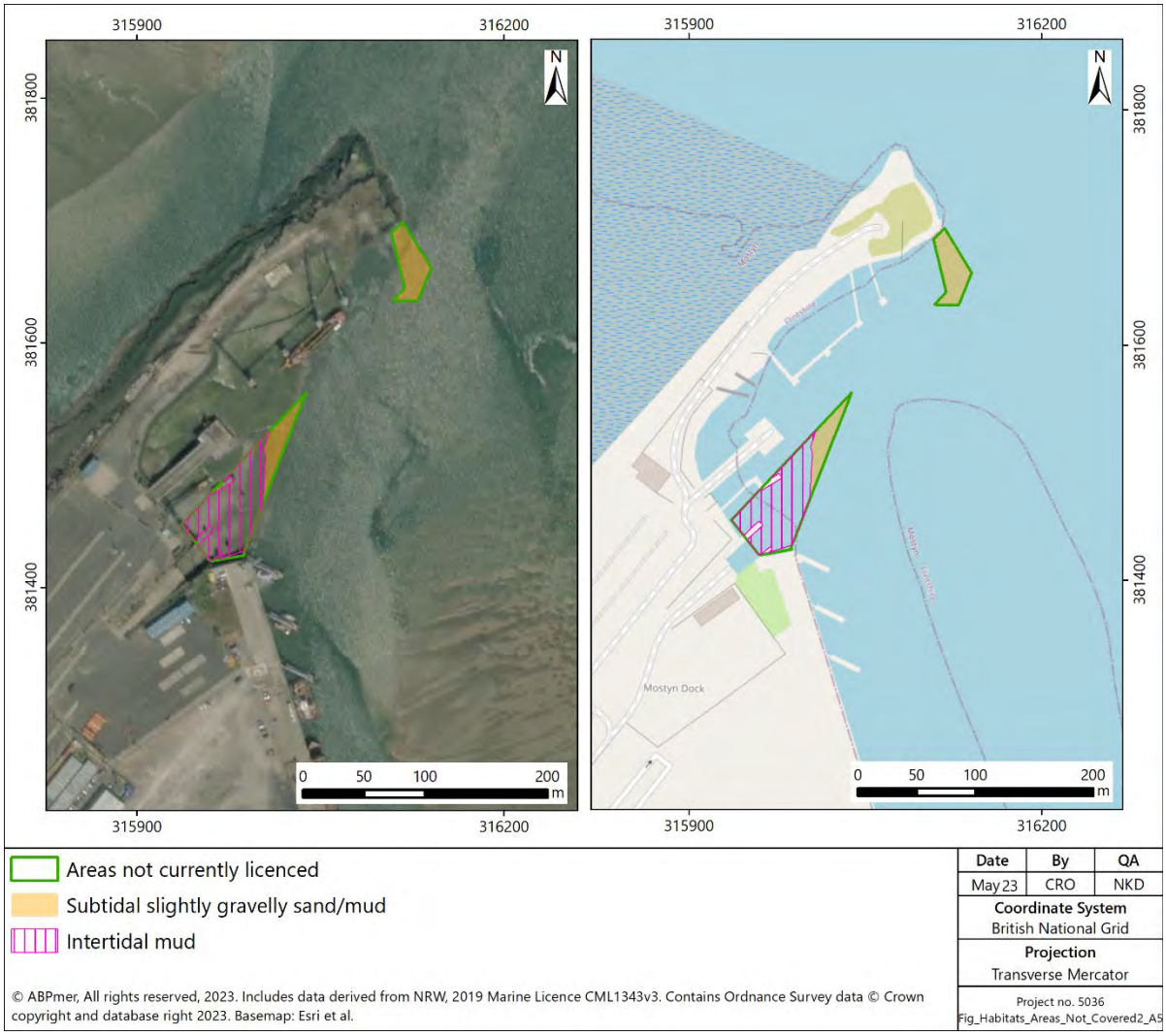

Figure 3. Habitats within MEPE reclamation that are not covered by existing permissions

This area has since been partly developed for the Roll-on/Roll-off (RoRo) Terminal and berth, the NAABSA (Not Always Afloat But Safely Aground) barge berth, and the RWE workboat re-fuelling pontoon berth (Image 1).

It is also worth noting that the MEPE reclamation is located within the Statutory Harbour Authority (SHA) area and that the Port of Mostyn had a licence (DML1663) to dredge the entire SHA area up until 5 April 2020 (Figure 4). This licence was not renewed as the RoRo Terminal ceased to be fully operational (although it can still be used for general shipping at any time), and the area was allowed to accrete to reduce the volume of infill required for the proposed MEPE reclamation and thus also avoid any unnecessary dredging and associated environmental impact.

In line with previous discussions with NRW MLT, a single marine licence is being applied for the MEPE Project with the aim of subsuming the existing dredging related marine licences for ongoing maintenance dredge and disposal activities in the harbour and its approaches (DML2001 and DML1542v2). It will also replace the existing construction marine licence to build a new quay and extend the MEP development (CML1343v3).

Image 1. **Aerial view of Port of Mostyn with Airbus barge vessel berthed at the RoRo Terminal**

Figure 4. **Recent permission to dredge within entire Port of Mostyn's Statutory Harbour Authority (SHA) area**

4.3 Review of NRW Advisory's position

NRW A, in their latest consultation response to the Further Information Submission, consider "*that the habitat being lost is of value to the Annex I Estuaries feature…, contributing to both the sedimentary processes and* **(if allowed to recover from recent activity) the habitat area available for estuarine communities***, essential elements contributing to the structure and function of the habitat feature*".

In reality, the intertidal and subtidal habitat at this specific location that comprises the Annex I Estuaries feature is highly impoverished, characterised by very low numbers of species and low abundance levels (Sections 4.4.2 and 4.4.5). Furthermore, it is in operational use and has been dredged up until relatively recently (DML1663), and a proportion of the area can continue to be dredged under existing permissions (DML2001) (Section 4.2). Therefore, whilst the area is within an operational port, which it has been for many years (and prior to the area being designated as an SAC and Ramsar site) and will continue to be for the foreseeable future, it will not comprise 'subtidal sediment communities[7]' or 'intertidal mudflats and sandflats communities' (for the same reason it does not qualify as Annex I intertidal mudflat and sandflat feature as agreed by NRW A, see Table 9), nor 'any notable subtidal sediment communities that may be identified including those important for estuarine fish'[8]. Furthermore, the Site Improvement Plan for the Dee Estuary does not identify measures to reduce existing activity in the area of the Port to assist the formation of estuarine communities (Natural England, 2015).

NRW A further advise that "*the scale of the loss cannot be considered negligible and that whilst the habitat is a broad-scale feature that is currently subject to impacts from dredging, it is still a functioning part of the estuary that contributes to the ecological structure and coherence of the site*". In summary, NRW A consider that the permanent loss of 3.22 ha of Annex I Estuaries feature would result in an adverse effect on integrity (AEOI) of the site. In contrast the HRA, that was prepared by ABPmer in Appendix 8.5 of the Environmental Statement (ES) (ABPmer, 2022) and the Further Information Report that supplements the marine licence application (ABPmer, 2023), concludes that the loss of 3.22 ha of Annex I Estuaries feature would not result in an AEOI in terms of the sites' conservation objectives (Appendix F). In its current condition as part of an operational harbour (which will persist for the foreseeable future), the habitat contributes only negligibly to the ecological structure and function of the estuary (see Section 4.4.5), and due to its size and specific location contributes only negligibly to sedimentary processes (see Section 4.4.2).

It should be noted that the rubble from the toe of the rock armour along the western side of the dock estate that is proposed to be scraped back as part of the proposed development as described in Section 3.1.7 of the Project Methodology Chapter of the MEPE ES (ABPmer, 2022) is not to mitigate or compensate for any loss of habitat (given that the loss is not considered significant by the applicant) but rather has been put forward as an 'ecological enhancement' to support natural mudflat restoration. On this basis, it should not be considered to be 'compensation' as part of the derogations process as suggested by NRW A.

[7] Due to the lack of information regarding the subtidal communities present within the Dee Estuary no specific areas have been identified as being of sub-feature status in the Regulation 37 of the Conservation of Habitats and Species Regulations 2017 for the Dee Estuary European Marine Site (Natural England and CCW, 2010).

[8] No notable subtidal sediment communities were identified within the Favourable Condition Table for SAC interest features of the Dee Estuary European marine site in the Regulation 37 of the Conservation of Habitats and Species Regulations 2017 for the Dee Estuary European Marine Site (Natural England and CCW, 2010).

4.4 Influential factors considered when determining significance of loss

Natural England's Commissioned Report NECR205 (Chapman & Tyldesley, 2016) provides an analysis of the authoritative decisions[9] that have been made on small scale effects on European sites from plans and projects, which can serve as a referencing tool for Natural England and other decision makers, including NRW. Loss of habitat was relevant to 27 of the 42 cases that were reviewed from UK decisions, European Court judgments and European Commission opinions.

The detailed review of past cases found no evidence that any particular decision maker consistently applied a more or less rigorous judgement, at the screening or integrity test stages, in terms of small scale effects of habitat loss (Chapman & Tyldesley, 2016). Nor was there any evidence that any particular type of decision maker has regarded any specific range of smaller scale effects as either more significant or insignificant when compared to other decision makers. Furthermore, no decision maker in the research systematically applied any formula or 'rule-of-thumb' that either a certain level (expressed in say square metres or hectares) or a certain proportion (expressed as a percentage) of loss of habitat is to be regarded as a significant or an insignificant effect, or is or is not to be considered as an AEOI (Chapman & Tyldesley, 2016).

The most influential factors considered by decision-makers when determining the significance of small scale effects in terms of loss of qualifying Annex I SAC habitat type were the relative importance of the area affected in terms of the **rarity, location, distribution, vulnerability to change and ecological structure** (Chapman & Tyldesley, 2016). The contribution the area of loss made to the overall integrity of the site (and hence that site's contribution to the conservation status of that habitat type at a member state level) exerted a stronger influence than the spatial extent of the loss. Scale was a factor when considering the significance of the habitat loss, and can be an important factor, but never the only factor.

The findings from the Natural England's Commissioned Report NECR205 and precedents that have been set by past cases have helped to inform the HRA that was prepared by ABPmer (ABPmer, 2023). The evidence and rationale in support of each of the key determining factors that have been considered in reaching a conclusion on the significance of the loss of Estuaries feature of the Dee Estuary SAC and Ramsar site are presented below.

4.4.1 Rarity

The total area of loss as result of the MEPE reclamation is set out in Table 9 and represents 3.22 ha of the Annex I Estuaries feature. According to the Dee Estuary SAC Standard Data Form (JNCC, 2015a), the Annex I Estuaries feature is not a priority habitat[10] and is widespread, covering 83.87 % (13,255.88 ha) of the Dee Estuary SAC (total site area is 15,805.27 ha). This feature is therefore not considered a rare component of the SAC. In addition, as noted in 'Location' sub-section below, no subtidal species considered nationally rare or protected were recorded in the footprint of the reclamation.

[9] In the context of the Natural England Commissioned Report NECR205, 'authoritative decisions' are limited to those of the European and domestic (UK wide) court judgments and rulings, Secretary of State, Welsh or Scottish Ministers, and certain Planning Inspector or Reporter decisions in respect of a proposed plan or project, and certain legally enforceable management measures such as a bye-law or statutory order. Also included are Article 6(4) 'opinions' from the European Commission

[10] A priority habitat is one in danger of disappearance and for which there is a particular responsibility to conserve (JNCC, 2024).

The loss of 3.22 ha of the Annex I Estuaries feature as a result of the MEPE reclamation represents 0.024 % of the total extent of this feature within the site (and 0.020 % of the total extent of the site). The spatial scale of loss is considered inconsequential and negligible in the context of the size of the estuary and as a proportion of the Dee Estuary SAC and Ramsar site. This is further illustrated in Figure 5 which shows the location of the reclamation (and capital dredge) area in the context of the size of the Dee Estuary SAC.

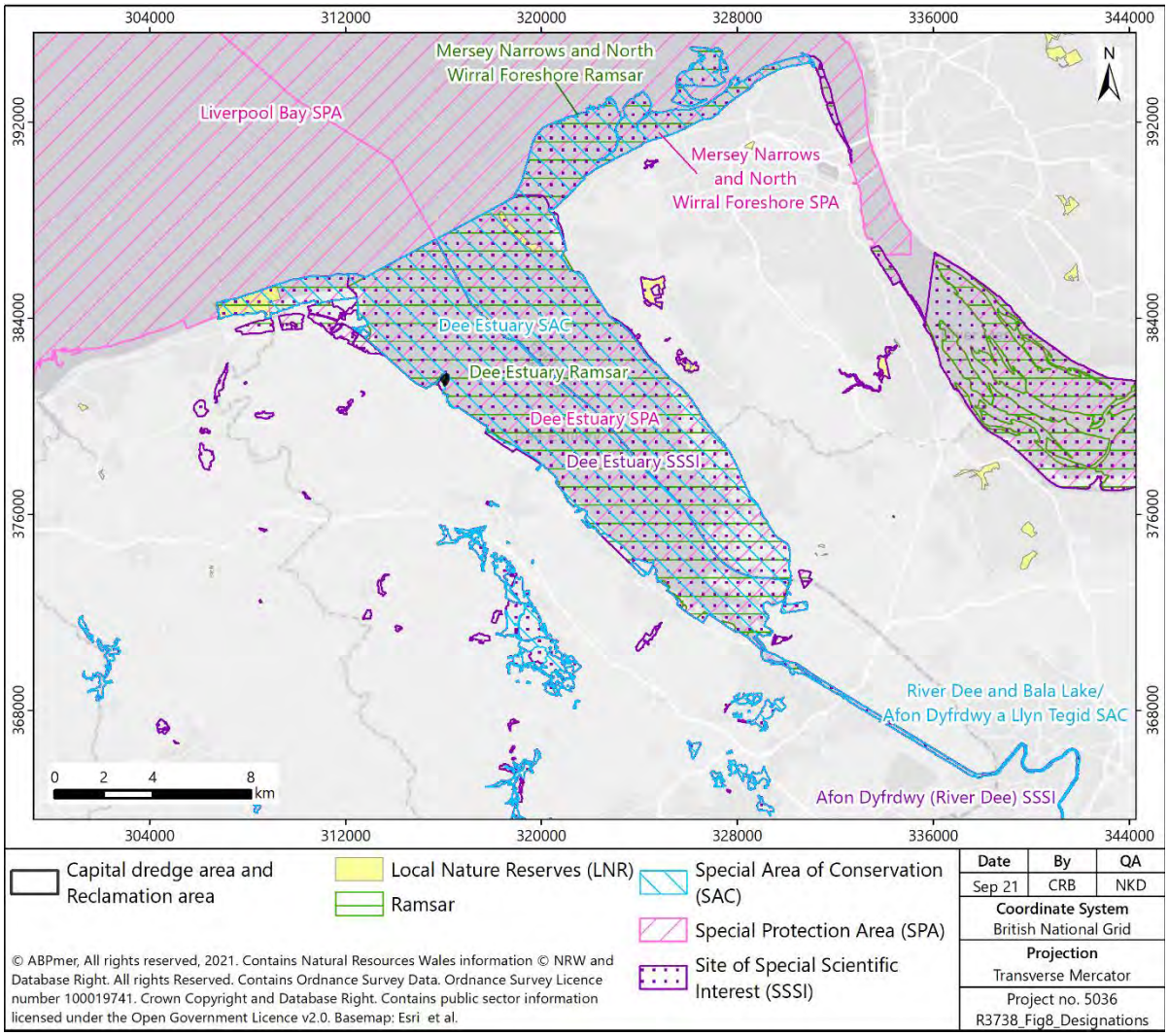

Figure 5. Location and size of MEPE reclamation in relation to Dee Estuary SAC and Ramsar site

4.4.2 Location

The location of the habitat that will be lost under the footprint of the reclamation forms part of the existing operational harbour of the Port of Mostyn and currently overlaps the workboat re-fuelling pontoon berth and NAABSA barge berth, and the RoRo Terminal and berth (Image 2). Although tidally restricted, all of the berths are fully functional: the pontoon berth and NAABSA barge berth continue to be in use, and the RoRo berth was fully operational and dredged until recently (2019/2020) and could be used for general shipping at any time (Image 3). In other words, the habitat present in this area is disturbed by the movement and manoeuvring of vessels given its ongoing function as an operational harbour. This area has been highly modified throughout history, and these activities were taking place before the SAC was designated in 2009 and the Ramsar site was classified in 1985.

Image 2. **Workboat re-fuelling pontoon berth and RoRo Terminal and berth at low water**

Image 3. **Aerial image of the workboat re-fuelling pontoon berth, the NAABSA barge berth, and the RoRo Terminal at low water (2019)**

The habitat that is present within the footprint of the MEPE reclamation is located within the boundary of the Dee Estuary SAC and forms part of the Estuaries feature but as discussed in the introduction above, is not currently representative of any of the feature components. This includes notable subtidal sediment communities that are important in supporting estuarine fish. As noted in Appendix 8.1 of the ES (ABPmer, 2022), the three subtidal benthic sites that were sampled from within the footprint of the reclamation (see Figure 6) consisted of slightly gravelly sandy mud (Stations SUB 2 and SUB 3) and slightly gravelly muddy sand (Station SUB 4) which is not suitable for sandeels.

Figure 6. The location of the intertidal core and subtidal grab sample stations

The samples consisted of impoverished fauna, characterised by low numbers of species that exhibit opportunistic traits[11] and low abundance levels. The number of taxa ranged from 6 (Station SUB 3) to 10 (Stations SUB 2). The number of individuals ranged from 140 individuals per m^2 (Station SUB 4) to 650 individuals per m^2 (Station SUB 3). The range in total species biomass in the samples was between 0.98 grams per m^2 at Station SUB 2 and 52.60 grams per m^2 at Station SUB 4 (which was primarily attributed to the European green crab *Carcinus maenas*). The samples were predominantly characterised by low numbers of the polychaete *Nephtys sp.* (particularly *Nephtys hombergii),* oligochaete *Tubificoides benedii*, nematodes and juvenile blue mussel *Mytilus edulis*. These

[11] Species that are typically fast growing and/or have rapid reproductive rates which allow populations to fully re-establish in typically less than 1 to 2 years and for some species within a few months.

characterising species dominated the assemblage and contributed almost entirely to the total abundances of organisms recorded at most of the sites. No subtidal species considered nationally rare or protected were recorded. The subtidal habitat at this specific location, therefore, neither comprises notable subtidal sediment communities nor is considered important in supporting estuarine fish.

The prevailing physical conditions within estuaries, including the Dee Estuary, are the result of geomorphology and the natural processes of tidal flow, the wind and wave environment and river flow (Natural England and CCW, 2010). Natural processes within estuaries are a key control on the distribution of estuarine habitats and many of the habitats within an estuary are interdependent and inextricably linked to the structure and functioning of others. The history of human influence on estuary morphology also affects the existing prevailing conditions (Natural England and CCW, 2010). The area that will be lost by the reclamation is located within the Dee Estuary but is not considered representative or characteristic of the qualifying Estuaries feature of the Dee Estuary SAC and Ramsar site. The location of the reclamation is entirely sheltered from the dominant north-westerly wave approach direction by the existing Mostyn Breakwater structure. This Breakwater was constructed in 1899 from industrial slag[12] waste from the Darwen and Mostyn Iron Works. The hydrodynamics and sediment transport within the reclaim (and across the wider area) are primarily influenced by the position of the Mostyn Breakwater which means it is less exposed and therefore also less connected or linked to the main part of the estuary ecosystem. Furthermore, the area within the existing Port of Mostyn harbour (including the proposed reclaim) is already heavily influenced by the existing Port operations (including vessel transits and ongoing licensed maintenance dredging). There is also an existing licensed disposal site, the Mostyn Breakwater disposal site (IS103), located at the end of the breakwater that is being used for the current maintenance dredging campaign of the main berth. Overall, the value of the specific area affected to the future evolution and physical processes of the estuary system is considered negligible in the context of natural processes[13], will not significantly impact the existing sources, sinks or sediment transport pathways[14] and will not affect the capacity for estuarine habitats to readjust.

On the basis that the specific location of the reclamation is in an area of the estuary that is an operational harbour that has been disturbed for many years by vessel movements and dredging activities, is of low ecological value and due to its sheltered position is not important for the functioning and evolution of the estuary as a whole, its conservation is unlikely to have been a reason for designating the area concerned as an SAC and Ramsar site. In other words, it would not have been possible to designate the area of the reclamation in its own right and it is only included in the designation because it is within the estuary system. It is worth noting that the operational harbour of Pembroke Dock in Milford Haven was not included as part of the Estuaries feature of the Pembrokeshire Marine SAC despite it also being located within the estuary system. Had a consistent approach been applied to the Dee Estuary, the area of the reclamation would not have been included within the Dee Estuary SAC and Ramsar site. In any case, despite this discrepancy, the contribution that the location of the reclamation makes to the integrity of the Dee Estuary SAC and Ramsar site is considered to be negligible.

4.4.3 Distribution

The Estuaries feature of the Dee Estuary SAC and Ramsar site is spread over a very wide area (13,255.88 ha). A reduction in the overall distribution of the Estuaries feature by 3.22 ha due to the reclamation represents 0.024 % of the total extent of this feature within the site and is not considered to have an AEOI of the site. Furthermore, the reclamation will not result in estuary habitats becoming

[12] Slag is a by-product of smelting ores and used metals.

[13] As defined in Box 1 (see Appendix F) of the cross-border advice document produced under Regulation 37 of the Conservation of Habitats and Species Regulations 2017 for the Dee Estuary European Marine Site (Natural England and CCW, 2010).

[14] As concluded within the Physical Processes Chapter of the MEPE ES (ABPmer, 2022).

fragmented, disconnected, or marginalised from each other. The impact of a small scale loss on the widely distributed Estuaries feature is therefore considered to be negligible.

The most recently available indicative site level feature condition assessments of the Dee Estuary SAC were undertaken in 2018 which noted that there is a long-term trend of erosion to the Welsh side and accretion on the English side, and that the site is losing mudflats and sandflats to Atlantic salt meadows and *Salicornia* due to pre-designation constraints and a continued move towards a dynamic equilibrium. No coastal squeeze, however, was identified in the first epoch (2005 to 2025) in the relevant shoreline management plan (SMP) and on this basis, the 'distribution and extent' of the Estuaries feature was assessed as favourable (NRW, 2018). Furthermore, analysis reported in ABPmer (2023) with respect to the ongoing maintenance dredging and disposal practices, also indicates that the wider Dee Estuary will remain generally accretionary and that accretion rates across the wider system will remain generally consistent with the present (baseline) conditions. This suggests that the distribution and extent of the Estuaries feature and its habitat components will continue to be maintained in favourable condition.

4.4.4 Vulnerability to change

The condition status of the Estuaries feature and its vulnerability to change is another relevant factor in deciding whether the loss of habitat caused by the MEPE reclamation would or would not have an AEOI of the Dee Estuary SAC and Ramsar site.

The indicative site level feature condition assessments of the Dee Estuary SAC undertaken in 2018 assessed the overall condition of the Estuaries feature as unfavourable with a low confidence in the assessment (NRW, 2018). The 'distribution and extent' (as noted in the 'Distribution' sub-section) and 'typical species' components of the Estuaries feature were assessed as favourable but the 'structure and function' component, and therefore overall condition, was assessed as unfavourable due to the failing chemical status of the relevant Water Framework Directive (WFD) waterbodies (North Wales and Dee (N. Wales)). At the time of the indicative condition assessment, both waterbodies had a moderate overall status and a fail for chemical status, the chemical status fails in both cases for mercury and its compounds. However, there was a low level of agreement between assessors and therefore the confidence in the condition assessment was low (NRW, 2018).

It should be noted that the current (2021) overall status of the Dee (N. Wales) transitional waterbody in which the reclamation is located is 'moderate', with an ecological potential of 'good', and a chemical status of 'moderate', and the current (2021) overall status of the North Wales waterbody is 'moderate', with an ecological potential of 'moderate', and a chemical status of 'moderate'. It is presumed that if the site level feature condition assessment were to be updated, that the status would no longer be assessed as unfavourable as the chemical status of the relevant water bodies are no longer failing.

Furthermore, the indicative site level feature condition assessment undertaken in 2018 noted that Port of Mostyn casework monitoring shows no detriment to the structure and function of the Estuaries feature as a result of the dredging that takes place (NRW, 2018). Material that is dredged by the Port and placed within either of the two licensed estuary disposal sites remains in the system and dredging is typically minimal. As noted in Section 6.6.6 of the Physical Processes ES Chapter (ABPmer, 2022), changes in habitat are deemed to be a function of natural morphological shifts within the estuary, rather than a response to the very limited dredging work that takes place. The 11 years monitoring review at the Port of Mostyn indicates that the observed changes across the estuary are a result of the natural evolution of the wider system of banks and channels and are not influenced by the ongoing Port operations.

Another relevant consideration in terms of the Estuaries feature's vulnerability to change, is that the reclamation will act to enhance the robustness and longevity of the Mostyn Breakwater by increasing

the overall size of this hard physical structure. This Breakwater feature plays a key role in stabilising the wider intertidal mudflats and sandbanks of the estuary beyond the harbour area (including Mostyn Bank, New Bed and Salisbury Bank) and therefore the reclamation inherently could support the protection of these components of the Estuaries feature. Whilst the number of influential variables (evolution and sedimentation in the Dee Estuary, projected erosion/accretion rates of the Mostyn Breakwater, sea level rise etc.) and the timescales involved (many decades) make it difficult to quantify such a beneficial effect, it should still warrant consideration.

4.4.5 Ecological structure

The integrity of a site is the coherence of its ecological structure and function, across its whole area that enables it to sustain the habitat, complex of habitats and/or the levels of populations of the species for which it was classified (Department of the Environment, Transport and the Regions (DETR), 1994; Defra 2019).

A habitat or species is defined as being at favourable conservation status when its natural range and the areas it covers within that range are stable or increasing and the specific structure and functions which are necessary for its long term maintenance exist and are likely to continue to exist for the foreseeable future (Natural England and CCW, 2010). As already noted in the 'Location' sub-section, given its specific sheltered location, the existing importance of the area of the reclamation to the future evolution and therefore ecological structure and coherence of the Estuaries feature is considered negligible.

The existing ecological structure of the Estuaries feature within the area of the reclamation in terms of the condition of habitats present is also an important consideration. The 2.57 ha of intertidal habitat that will be lost under the footprint of the reclamation is not considered Annex I mudflat and sandflat feature (as agreed by NRW A) and although it forms part of the Estuaries feature of the Dee Estuary SAC, it is not currently representative of any of the components of the Estuaries feature (see the 'Location' sub-section). This habitat comprises ephemeral soft/fluid sandy mud that has recently accreted since the RoRo Terminal and berth was operational and dredged until 2019/2020 (Image 4). Although tidally restricted, this berth is still fully functional and if its use were to be resumed by the Port, the movement of RoRo vessels would re-disturb a large area of the seabed at the berth and its approaches.

Image 4. Soft/fluid sandy mud habitat at the site of the RoRo Terminal and berth

As noted in Appendix 8.1 of the ES (ABPmer, 2022), the number of taxa at the three intertidal benthic sites that were sampled from within footprint of the reclamation (see Figure 6) ranged from 4 (Station INT 3) to 5 (Stations INT 1 and INT 2) and the number of individuals ranged from 400 organisms per m^2 (Station INT 3) to 1,400 organisms per m^2 (Station INT 2). The infaunal samples were impoverished and characterised by low numbers of species with opportunistic traits, including the mud shrimp *Corophium volutator*, mud snail *Peringia ulvae*, the oligochaete *Tubificoides benedii,* polychaetes (including the tube-dwelling deposit feeder *Streblospio shrubsolii*, and tube-dwelling *Pygospio elegans* which is a deposit/suspension feeder) and clams (*Tellinoidea* spp. and Baltic tellin *Limecola balthica*). These species are all considered commonly occurring, not protected and typical of estuarine mudflat habitat.

The number of species and abundance levels recorded in the samples within the reclamation are much lower than recorded in ecologically richer mudflat habitats in the nearby local area. For example, over 20 taxa and number of organisms typically in the range of 20,000-50,000 per m^2 have been regularly recorded in benthic core samples collected on the inner Mostyn Bank. Key species such as *Corophium volutator* and *Tubificoides benedii* occurred in numbers exceeding over 7,000-10,000 m^2 in these samples (ABPmer, 2012; ABPmer, 2013; Port of Mostyn, 2013). This is expected given that the mudflat habitat on the Mostyn Bank is considered much more stable than the fluid/soft sandy mud observed within the harbour. The unconsolidated habitat within the footprint of the reclamation therefore does not represent the standard and more stable physical form and ecological structure and function of the intertidal mudflat that is found in the Dee Estuary beyond the immediate area of the harbour and existing berths which is more consolidated, stable and ecologically diverse.

The 0.65 ha of subtidal habitat that will be lost by the reclamation is also not considered characteristic of any of the specific components of the Estuaries feature although it is overlaps the Estuaries feature (see the 'Location' sub-section). This subtidal habitat consists of slightly gravelly sandy mud and slightly gravelly muddy sand. The habitat is impoverished and characterised by low numbers of species with opportunistic traits because it is within an area that has been and continues to be subject to disturbance through regular surface sediment movements, vessel movements and/or dredging activities. The subtidal channel habitat is therefore of low conservation concern.

As noted earlier, the habitat present at the site of the reclamation has for a long time been disturbed by port activity and will continue to be disturbed in future given that it is present within an established operational harbour. This habitat will therefore not have the opportunity to develop a similar ecological structure as the intertidal and subtidal communities found outside the harbour area. It is also not an area that had significant ecological value or was important to the structure and function of the Estuaries feature at the time the Dee Estuary SAC and Ramsar site were designated.

4.5 Review of regulatory decisions on past applications

A large part of the area of habitat loss for the MEPE Project overlaps past applications involving reclamation which were all consented. These past applications and the decisions made by regulators are reviewed below in the context of the MEPE Project.

4.5.1 Mostyn Docks, 1996

When the Port of Mostyn was granted planning consent to reclaim 21.5 acres (8.71 ha) of land in 1996, a large area of which overlaps the proposed MEPE reclamation, the loss was not regarded as significant. This development involved the construction of a new quay including mooring dolphins and reclamation of foreshore with dredged material. The proposal included a new quay across the foreshore and estuarine flats of the Dee Estuary, a new berthing facility, and the dredging of the channel to provide access for larger vessels. The dredged material was spread and compacted within the reclamation. At the time of the determination of the planning application, the majority of the development site (5.67 ha)

was an SPA and a Ramsar site, and constituted 0.04 % of the whole SPA and 0.063 % of the mudflat resource within the SPA (Chapman & Tyldesley, 2016).

Following a Public Enquiry, the Planning Inspector's report concluded that the project would be unlikely to have a significant effect upon the SSSI, stating that the proposal "*1. Is not necessary for the preservation or enhancement of the SSSI; 2. would not be likely to have a significant effect upon the SSSI; 3. would not be likely to have an adverse effect on the integrity of the SSSI/SPA/Ramsar site; 4. would not be likely to have an adverse effect on the nature conservation interests of the SSSI and its surroundings…*" (paragraph 16.12.10, Annex A of the consent decision). The Inspector further stated that "*as the project would be unlikely to have a significant effect upon the SSSI there would seem to be no impediment to the grant of planning permission. It is therefore reasonable to assume that there would be no apparent breach of either the Ramsar Convention or the requirements of the 'Habitats Directive'*" (paragraph 16.12.11). In summary the Inspector concludes that "*the project would be unlikely to materially harm the integrity of the Dee Estuary SSSI as a whole, and neither would it be likely to have an adverse effect on the nature conservation of the site*" (paragraph 16.14.1).

After considering all the evidence provided by the Planning Inspector and Assessor, the Secretaries of State concluded in their decision letter that there was no likely significant effect on the SPA or Ramsar site, and the development was granted permission as follows:

- "*The Secretaries of State agreed with the Assessor's conclusion that the development proposal is not likely to have a significant effect on the designated sites of the Dee Estuary*" (paragraph 13);
- "*They agree with the Assessor that, as the development is considered to make an insignificant impact on the sites, it cannot destroy their integrity, and that the proposed development would not have an adverse effect on the nature conservation interest of the sites or their surroundings*" (paragraph 14);
- "*The Secretaries of State consider that the nature conservation interests in this respect include the coherence of the sites' ecological structure and function across their whole area, enabling them to sustain the habitat and levels of populations of species for which the sites were classified*" (paragraph 15); and
- "*The proposed development has no significant implications for the European site and they have reached the same conclusion in respect of the Ramsar site*" (paragraph 16).

4.5.2 Mostyn Energy Park Development (MEP), 2016

The Port of Mostyn's previous proposal for a Mostyn Energy Park (MEP) facility which was consented in 2016 (CML1343v3) also encroached on intertidal and subtidal habitats and if implemented would have resulted in the permanent losses of these habitats. An audit of the direct marine habitat losses and change within the MEP footprint was included in the ES (Port of Mostyn, 2013).

In summary, the previous MEP proposal was to result in a combined loss of 3.7 ha of habitat which equated to less than 0.03 % of the Dee Estuary European Marine Site (EMS) which is 15,806 ha in extent (Natural England and CCW, 2010). The proposed reclamation for this previous MEP facility entirely overlaps the proposed MEPE reclamation, covering a total area of 2.5 ha, of which at the time of the previous application was 0.5 ha intertidal and 2 ha subtidal sand habitat. In other words, the currently proposed MEPE reclamation is a small extension to the already consented MEP facility and will effectively result in a slight increase (0.72 ha) in the total loss of Estuaries habitat feature.

NRW's EIA consent decision for the previous MEP proposal noted that "*A Habitats Regulations Assessment was undertaken and potential significant effects on features of the European Sites could be ruled out. It was concluded that the proposal, when considered alone and in-combination, would not*

adversely affect the integrity of the European site(s) concerned" (NRW, 2016). It is also noteworthy that the EIA consent decision made no specific mention of the Annex I Estuaries feature (NRW, 2016).

4.6 Summary

Having reviewed all the evidence and rationale in support of each of the key influencing factors considered when determining significance of loss, together with the decisions that were made on relevant past applications at this location, the loss of 3.22 ha of Annex I Estuaries feature of the Dee Estuary SAC and Ramsar site is not considered to result in a failure of the site's conservation objectives because:

Rarity: the Estuaries feature is not a rare component of the site, and the scale of the loss is negligible in the context of the size of the estuary and as a proportion of the site. The loss represents 0.02 % of the total extent of Estuaries feature within the Dee Estuary SAC and Ramsar site which is less than any of the percentages that were considered insignificant in past applications at the Port of Mostyn.

Location: the area that will be lost is within an operational harbour that has been disturbed for many years, is of low ecological value and due to its sheltered position and small size, is not important for the functioning and evolution of the estuary. Consented activities in this area are necessary for port operations to continue and for the Port to bring important social and economic benefits to this part of North Wales.

Distribution: the Estuaries feature is spread over a wide area and the area that will be lost will not result in habitats being fragmented. Furthermore, the 'distribution and extent' element of the Estuaries feature is currently assessed as favourable, and current evidence indicates that the overall estuary system is generally accreting and therefore will be maintained.

Vulnerability to change: although the most recently available overall condition status (2018) of the Estuaries feature is assessed as unfavourable due to the failing chemical status of the relevant WFD waterbodies at the time of the assessment, the current condition is likely to now be assessed as favourable given these water bodies are not currently (2021) failing in chemical status. Furthermore, the proposed reclamation will reduce the Estuaries feature's vulnerability to change as it will support the Mostyn Breakwater in stabilising the intertidal mudflats and sandbanks of the estuary.

Ecological structure: the area of estuary habitat that will be lost is considered to be of negligible importance to the future evolution, and therefore ecological structure and coherence, of the Estuaries feature due to its small size and level of ongoing disturbance from port activity. The intertidal and subtidal habitats that will be lost are not representative of any of the components of the Estuaries feature and are of low ecological value and conservation concern. The species found within the area of the proposed reclamation are also located in the surrounding area. Given the low abundance found within the area of the proposed reclamation, the area of habitat which would be lost is assessed to not provide an important supporting ecological function to the surrounding habitat and its species.

In summary, the affected area is not characteristic of the Estuaries feature and is not considered to make a significant contribution to the overall integrity of the Dee Estuary SAC and Ramsar site. A small scale loss of this area will therefore not undermine the conservation objectives of the Dee Estuary SAC and Ramsar site. It can therefore be concluded, in line with existing guidance and consistent with other relevant case law, that there will be no AEOI on the Estuaries feature of the Dee Estuary SAC and Ramsar site as a result of the MEPE Project.

5 Cockle Bed

5.1 Potential impact of sedimentation on cockle spat

The NRW cockle officer in their consultation response expressed concerns over the smothering of cockle spat (juveniles) through late spring to early summer period (June/July) which due to their small size might be less able than adults to tolerate the predicted rate of sedimentation as a result of the proposed dredge and disposal activity for the MEPE Project.

Based on a review of the available published scientific evidence, there is no indication that increased sedimentation would lead to mortality of settled spat or reduced recruitment of cockles. The key factors affecting recruitment are geographic location, annual variation in climate and a previous severe winter, heavy storm surges reducing the adult population, post-settlement erosion and surface sediment erosion by currents and storms, post-settlement mortalities due to intra and interspecific mortality and predation, ingestion of settling larvae and juveniles by adult cockles, smothering by adult cockles due to sediment displaced in burrowing and suspension feeding, exhausted energy reserves (after winter) and spring predation from shore crabs (Sanchez-Salazar *et al.*, 1987; Ducrotoy *et al.*, 1991; André *et al.*,1993; Guillou & Tartu, 1994; Olaffsson *et al.*, 1994; Dame, 1996; Montaudouin and Bachelet, 1996). Furthermore, Bourma *et al.* (2001) indicated a positive correlation between settlement and silt content in the sediment as the greater water retention ability improves survival during early settlement stages.

As discussed in Section 4.3.1 of the Further Information Report (ABPmer, 2023), peak sedimentation depths within the Mostyn Deep disposal site (IS102 disposal site) are predicted to be around 50 to 60 mm, reducing to around 4 to 6 mm within the disposal plume at distances of approximately 1 km from the disposal site. Due to the flow direction at this location, no sedimentation on adjacent intertidal areas, including any of the cockle beds and harvesting areas, however, is predicted (Figure 7). The plume from the capital dredge of the berth pockets will reach the New Bed but total sedimentation for all modelled dredge and disposal activity is predicted to be less than 0.4 mm in this area (Figure 7).

The maximum predicted rate of sedimentation outside of the immediate berths, channel and dredge disposal areas is well within the existing range of natural variability that is already experienced within the Dee Estuary. Subtidal channel habitats and adjacent intertidal habitats are already subject to high levels of deposition naturally. This is as a result of high background SSC and strong hydrodynamic conditions (due to tidal flows and the exposed nature of the Dee Estuary) causing the resuspension and deposition of sediments on a daily basis and the regular movement of morphological features such as sand waves which are often dynamic in nature (ABPmer, 2017; ABPmer, 2021). The New Bed is a very mobile sediment load, particularly during big tides, and the ongoing erosion of Mostyn Bank and the accretion at the end of the Mostyn Breakwater provide a good indicator of how mobile the sediment in this part of Dee Estuary has been over recent years.

Deposition of sediment as a result of dredging and/or disposal activities outside of the immediate berths, channel and dredge disposal areas will be immeasurable from natural background variation in deposition. Magnitude of change is, therefore, assessed as negligible. Probability of occurrence is high as it is certain that this change will occur, and thus the overall exposure to change is negligible. Based on the available published evidence, sensitivity of cockle spat to increased smothering is considered to be low given that there is no evidence of this being a contributing factor to the successful settlement and survival of this species. Vulnerability is therefore assessed as none. Intertidal habitats in the study area comprising the cockle beds are considered to be of high importance taking into account their designated status (as a qualifying feature/habitat component of the Dee Estuary SAC, supporting habitat of the Dee Estuary SPA and a NERC Habitat of Principle Importance), as well as how representative they

are of the physical form and ecological structure and function of the qualifying feature, and also the ecological value and functional importance they provide in terms of benthic prey resources for intertidal birds. Taking all these factors into consideration, the overall potential impact of deposition on cockle spat is assessed as **insignificant**.

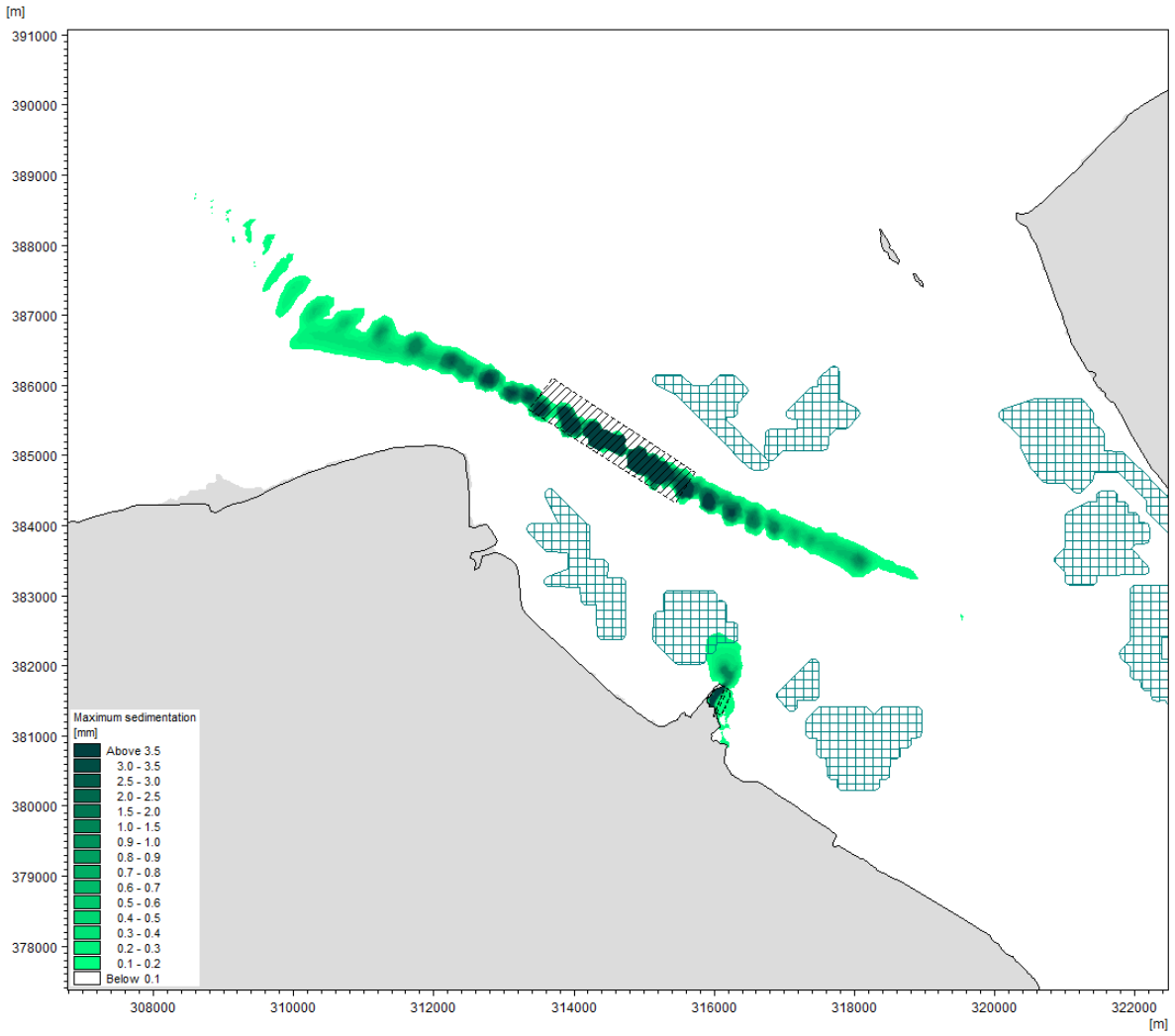

Figure 7. Predicted excess sedimentation in relation to local and regional cockle bed features

6 Conditions and Monitoring

6.1 Proposed Monitoring Plan

Section 6.8.3 of the ES and Section 5 of the Further Information Report (ABPmer, 2023) set out a proposed future monitoring schedule for the MEPE Project based on the outcomes of the ongoing monitoring and numerical modelling that was undertaken in support of the application for the MEPE Project. The approach that was proposed was designed to maintain a proportionate ongoing monitoring of the local estuary morphology, as had previously been discussed and considered appropriate by NRW A during the pre-application phase of the MEPE Project. In order to manage any potential concerns, it was also suggested in the Further Information Report that conditions could be included to increase the frequency or extent of any given survey in the event of any issues being flagged by the data collection or analysis.

NRW A, in their consultation response to the Further Information Submission, advised that the same project specific and monitoring conditions as detailed in DML1542v2 and DML2001 should be transferred to the new combined licence for the capital and maintenance dredging for the MEPE Project.

Based on the current monitoring practices at the Port of Mostyn, the results of the ongoing monitoring, and the assessed level of potential impact as a result of the proposed MEPE Project, the Monitoring Plan set out in Table 10 is proposed. This proposed Monitoring Plan is in line with existing monitoring conditions detailed in DML1542v2 and DML2001 under Monitoring Plan for estuary basis definition (EB) and under Monitoring Plan for local and ambient effects definition for dredging and deposition (LA).

Table 10. Proposed monitoring plan for the MEPE Project

Task	Frequency	Extent	Analysis and Reporting
Estuary Basis (EB) Definition			
EB1 – Estuary LiDAR survey	Every 5 years	Between a straight line joining Hilbre Point to Point of Ayr and OSGB Northing 369000	Difference map of elevation change to previous survey. Reporting in Annual Report.
EB2 – Estuary Transects	Annually	North, Middle and South transects, as presently defined	Profile comparison against previous surveys. Reporting in Annual Report.
EB3 – Mid Hoyle Channel / Welsh Channel confluence	Every 2 years	Channel confluence with southern extents to tie in with Mostyn Deep survey.	Difference map of elevation change to previous survey. Reporting in Annual Report.
EB4 – Mostyn Deep	Annually	Mostyn Deep disposal site out to channel flanks up to 1 mCD.	Difference map of elevation change to previous survey. Reporting in Annual Report.
EB5 – Holocene clay bank	Annually	Visual survey of the Holocene clay bank around (317300, 384400).	Photographic evidence of continued sand cover or mapped extent of exposed clay area (if present). Reporting in Annual Report.

Task	Frequency	Extent	Analysis and Reporting
Local Area (LA) Definition			
LA1 – Port of Mostyn (PoM) Approach Channel	Annually	Survey of main PoM approach channel, harbour area and Mostyn Breakwater disposal site.	Difference map of elevation change to previous survey. Reporting in Annual Report.
LA3 – Mostyn Deep grab sampling	Annually	Repeat sampling of 10 sites within Mostyn Deep disposal site.	Particle size analysis and comparison of descriptive grain size statistics against previous survey. Reporting in Annual Report.
LA4 – NRW Cockle Survey	Annually	Cockle survey undertaken by NRW across Dee Estuary cockle beds.	Summary results and conclusions included in Annual Report.
LA5 – Benthic survey	Annually	Repeat benthic sampling survey at established sample sites.	Comparison of results against previous survey. Reporting in Benthic Survey Report and appended to Annual Report.
Reporting			
Annual Monitoring Report	Annually		Reported results of all monitoring surveys undertaken during the year. To include dredging and disposal tonnages.

Notes:

Existing monitoring metrics for LA2 (Mostyn Deep Site A) and LA6 (Port area and local cockle survey) have been excluded from the proposed Monitoring Plan. This is on the basis that they are not currently undertaken, and the survey coverage for each is already covered by other EB or LA definition surveys:

- In the case of LA2, the bathymetric survey of the whole Mostyn Deep (and surrounding area) is already covered by the proposed continuation of the annual EB4 (Mostyn Deep) survey; and
- In the case of LA6, the bathymetric survey of the PoM harbour area and approaches is already covered by the proposed continuation of the annual LA1 (PoM Approach Channel) survey, whilst the cockle survey is also already covered by the proposed continuation of the annual LA4 (NRW Cockle Survey).

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8 Abbreviations/Acronyms

ABP	Associated British Ports
AEOI	Adverse Effect on Integrity
am	Ante Meridiem
ANSI	American National Standards Institute
ASA	Advertising Standards Authority
AZ	Z-Shaped Sheet Pile (ArcelorMittal Group)
BTO	British Trust for Ornithology
CCW	Countryside Council for Wales
CD	Chart Datum
dB	Decibel
DETR	Department of the Environment, Transport and the Regions
DML	Dredge Marine Licence
DTM	Digital Terrain Model
EB	Estuary Basis
EIA	Environmental Impact Assessment
EMODnet	European Marine Observation and Data Network
EMS	European Marine Site
ES	Environmental Statement
EUNIS	European Nature Information System
FID	Flight Initiation Distance
GIS	Geographic Information System
HRA	Habitats Regulations Assessment
HW	High Water
IECS	International Estuarine & Coastal Specialists
IHC	Royal IHC (Netherlands Shipbuilder)
INCA	Industry Nature Conservation Association
INT	Intertidal
JNCC	Joint Nature Conservation Committee
LA	Local Area
L_{Aeq}	Equivalent Continuous Sound Pressure Level
L_{AFmax}	Maximum Sound Level
LAT	Lowest Astronomical Tide
LiDAR	Light Detection and Ranging
LW	Low Water
MEP	Mostyn Energy Park
MEPE	Mostyn Energy Park Extension
MESH	Mapping European Seabed Habitats
MLA	Marine Licence Application
MLT	Marine Licensing Team
MLWN	Mean Low Water Neaps
MLWS	Mean Low Water Springs
MMO	Marine Management Organisation
NAABSA	Not Always Afloat But Safely Aground
NERC	Natural Environment and Rural Communities
NRW	Natural Resources Wales
OSGB	Ordnance Survey Great Britain
pm	Post Meridiam
PoM	Port of Mostyn

Ramsar	Wetlands of international importance, designated under The Convention on Wetlands (Ramsar, Iran, 1971)
RoRo	Roll-on/Roll-off
SAC	Special Area of Conservation
SHA	Statutory Harbour Authority
SMP	Shoreline Management Plan
SPA	Special Protection Area
SSC	Suspended Sediment Concentrations
SSSI	Special Site of Scientific Interest
UK	United Kingdom
WFD	Water Framework Directive

Cardinal points/directions are used unless otherwise stated.

SI units are used unless otherwise stated.

Appendices





Innovative Thinking - Sustainable Solutions

ABP mer

A Comments Log

Data from Excel Spreadsheet (also provided separately):

- AppendixA_CML2283_Further_Clarification_Comments_Log_22Mar2024.xlsx

B Review of the Sensitivity of Key SPA Waterbird Species to Noise and Visual Disturbance

Species	Sensitivity to Noise and Visual Disturbance	
	Evidence on the Sensitivity to Noise Stimuli	Evidence on the Sensitivity to Visual Stimuli
Shelduck	Noise disturbance has been reported from 72 dB upwards for Shelduck. However, the species is subject to a high degree of habituation and further exposure to sounds of the same or greater level can lead to no response to stimuli. No response has been recorded for noise levels as high as 88 dB but this is likely to be an extreme 'no response' level and caution should be exercised at receptor levels over 70 dB. Observation of disturbance responses from flood protection works has suggested that Shelduck react to noise in approximately 30 % of exposure events to sudden noise above 60 dB or any noise above 70 dB (IECS, 2013).	Shelduck are generally a wary species and are considered particularly sensitive to visual disturbance. Typically, they approach construction works no closer than 300 m and can be affected by visual disturbance up to 500 m away from source (IECS, 2013). Goodship & Furness (2022) assessed Shelduck as having a high sensitivity to human disturbance with the range in mean FID from the literature reviewed of 36 m to 250 m as a result of the presence of people on or near the foreshore although FIDs up to 700 m have been recorded. Goodship & Furness (2019) undertake a disturbance literature review and assessed Shelduck as one of the species considered most sensitive to disturbance stimuli with the range in mean FID from the literature reviewed of 148 m to 250 m as a result of the presence of people on or near the foreshore.
Curlew	Curlew are moderately sensitive to noise stimuli but due to their wary nature the minimum approach distance can be expected to be no less than 100 m. At this distance using the noise response table, noise required to create high level disturbance would be 107-112 dB at source and thus not particularly prohibitive, and increasing to 117-122 dB at 300m. If birds should approach closer than 100 m, then highly disturbing activities should be avoided if possible (IECS, 2013).	Research evidence indicates that Curlew are a cautious species that does not habituate to works rapidly and are also particularly intolerant of people, allowing approach to a range of typically 120-300 m before flushing (IECS, 2013; Lausen *et al.*,2005). Goodship & Furness (2022) assessed Curlew as having a high sensitivity to human disturbance with the with the range in mean FID from the literature reviewed of 38 m to 340 m as a result of the presence of people on or near the foreshore with motorised vessels having a mean FID of 140 m and motorised vehicles 188 m. Collop *et al., (*2016) recorded a minimum FID of 88 m and a maximum FID of 570 m (with a mean of 340 m) for this species through experimentally disturbing foraging birds

Species	Sensitivity to Noise and Visual Disturbance	
	Evidence on the Sensitivity to Noise Stimuli	Evidence on the Sensitivity to Visual Stimuli
		(approaching a total of 39 times) as part of a research study. Goodship & Furness (2019) undertake a disturbance literature review and assessed Curlew as one of the species considered most sensitive to disturbance stimuli with the range in mean FID from the literature reviewed of 38 m to 340 m as a result of the presence of people on or near the foreshore with motorised vessels having a mean FID of 140 m.
Black-tailed Godwit	This species could approach works to within 100 m. At this distance using noise response data, the source level required to create high level disturbance would be 110-115 dB and possibly greater (based on limited observed response information) thus not particularly prohibitive. Moderate disturbance at this distance would be caused by source noise of 92 dB plus, but this is considered precautionary given data deficiencies (IECS, 2013).	Disturbance responses have been recorded at distances over 100 m from construction activity (IECS, 2013). Goodship & Furness (2022) found evidence of FIDs between 20 and 150 m as a result of presence of people on or near the foreshore from the literature reviewed in the study. This study also considered this species to have a relatively high tolerance towards human disturbance and appear to be able to habituate to human activities. The study concluded that a buffer zone of 100-200 m was considered appropriate with respect to disturbance in the non-breeding season. Burton *et al.* (2002) also considered overwintering Black-tailed Godwit to be one of the most tolerant species to potential disturbance with a 200 m zone recommended to avoid disturbance to this species (and other waterbirds). Gill *et al.* (2001) found no evidence that human presence reduced the number of Black-tailed Godwits with the authors finding that the presence of infrastructure (as such as marinas/small ports or footpaths) did not impact the number of godwits supported by the food supply on the adjacent mudflats. This study compared marinas/ports against reference sites that contained similar sediment type and fauna but was far enough away (> 200 m) to be considered unaffected by human activity at a marina.
Bar-tailed Godwit	Bar-tailed Godwit are moderately sensitive to noise stimuli, but due to their wary nature the minimum approach distance can be expected to be no less than 150m. At this distance, using works noise response levels, sound levels	Bar-tailed Godwit can be a relatively disturbance tolerant species that habituates to works rapidly (allowing an approach range of as close as 40-100 m before flushing). However, despite this tolerance, Bar-tailed Godwits can abandon highly disturbed areas in favour of quieter areas to forage and roost. For example, direct observation of disturbance responses by the

Species	Sensitivity to Noise and Visual Disturbance	
	Evidence on the Sensitivity to Noise Stimuli	Evidence on the Sensitivity to Visual Stimuli
	required to create a high level disturbance would be 115-120dB at source and thus not particularly prohibitive. This increases to a 125-130dB source tolerance at a range of 500m.	species to flood defence works found the species did not forage within 200 m of the activity, despite foraging being actively pursued beyond this range, suggesting that they had actively vacated the area close to the works. This is consistent with previous research findings (IECS. 2013). Collop *et al., (*2016) recorded a minimum FID of 32 m and a maximum FID of 225 m (with a mean of 84 m) for this species through experimentally disturbing foraging birds (approaching a total of 92 times) as part of a research study. Goodship & Furness (2019) and Goodship & Furness (2022) undertake disturbance literature reviews and assessed Bar-tailed Godwit as being of moderate sensitivity to disturbance stimuli with the range in mean FID from the literature reviewed of 22 m to 219 m as a result of the presence of people on or near the foreshore.
Oystercatcher	Oystercatcher are not thought to be particularly sensitive to noise stimuli but there is little evidence for this, so as such a standard approach should be applied, with noise up to 72dB acceptable at the bird but with caution used at levels of above 55dB (60dB in a highly disturbed area). As Oystercatcher could forage up to within 50 m of construction activity, this means that a source noise threshold of 105-110dB may be possible but applied with caution at levels above 87-92dB (IECS, 2013).	Oystercatchers are relatively tolerant of disturbance stimuli and will habituate rapidly to ongoing activity. In undisturbed areas they will often flush at great ranges but in more disturbed locations such as a typical estuary, this figure reduces to typically between approximately 25-200 m dependent upon the stimuli (with people causing the most extreme reaction) (IECS, 2013). Collop *et al. (*2016) recorded a minimum FID of 30 m and a maximum FID of 228 m (with a mean of 97 m) for this species through experimentally disturbing foraging birds (approaching a total of 147 times) as part of a research study. Goodship & Furness (2019) and Goodship & Furness (2022) undertake disturbance literature reviews and assessed Oystercatcher as being of moderate sensitivity to disturbance stimuli with the range in mean FID from the literature reviewed of 26 m to 136 m as a result of the presence of people on or near the foreshore with motorised vessels having a mean FID of 74 m and motorised vehicles a mean FID of 106 m.

Species	Sensitivity to Noise and Visual Disturbance	
	Evidence on the Sensitivity to Noise Stimuli	Evidence on the Sensitivity to Visual Stimuli
Redshank	Redshank are considered sensitive to noise stimuli, especially in conjunction with visual stimuli. As such a noise of up to 70 dB is acceptable at the bird but with caution above 55 dB (60 dB in a highly disturbed area). As Redshank will often forage extremely close to plant (<50m) and >75m to workers, this means that a source noise threshold of 100-105 dB should be applied, with caution above 87-92 dB (IECS, 2013).	Redshank are a relatively tolerant species to visual stimuli and will often approach much closer than 100 m before flushing (sometimes as close as 30-50 m). They are also considered to habituate to works rapidly (IECS, 2013). Collop *et al. (*2016) recorded a minimum FID of 28 m and a maximum FID of 187 m (with a mean of 80 m) for this species through experimentally disturbing foraging birds (approaching a total of 53 times) as part of a research study. Goodship & Furness (2022) assessed Redshank as having a moderate sensitivity to human disturbance with the range in mean FID from the literature reviewed of 4 to 150 m as a result of the presence of people on or near the foreshore. Goodship & Furness (2019) undertake a disturbance literature review and assessed Redshank as being relatively sensitive to disturbance stimuli with the range in mean FID from the literature reviewed of 24 m to 137 m as a result of the presence of people on or near the foreshore.
Knot	Knot are considered quite sensitive to noise stimuli, especially in conjunction with visual stimuli, and as such a noise of up to 70 dB is acceptable at the bird but with caution required at levels above 55 dB (60 dB in a highly disturbed area). As Knot will forage close to plant (<50m) and to workers (>75m), this means that a source noise threshold of 100-105 dB can be applied with caution required above 87-92 dB (IECS, 2013).	Knot appear to be a species relatively tolerant to visual stimuli and are considered to habituate relatively rapidly to people although disturbance responses have been recorded within <75-100 m of visual stimuli (IECS, 2013). Collop *et al. (*2016) recorded a minimum FID of 20 m and a maximum FID of 240 m (with a mean of 72 m) for this species through experimentally disturbing foraging birds (approaching a total of 78 times) as part of a research study. Goodship & Furness (2022) assessed Knot as having a moderate sensitivity to human disturbance with the range in mean FID from the literature reviewed of 21 to 74 m as a result of the presence of people on or near the foreshore with motorised vessels having a mean FID of 200 m.

Species	Sensitivity to Noise and Visual Disturbance	
	Evidence on the Sensitivity to Noise Stimuli	Evidence on the Sensitivity to Visual Stimuli
Dunlin	Dunlin are not particularly sensitive to noise stimuli and as such a noise level of 72 dB measured at the bird is acceptable but with caution above 60 dB. Dunlin will forage extremely closely to plant (<50 m) and >75 m from worker. This means that a source noise threshold of 102-107dB can be applied but with caution above 92 dB (IECS, 2013).	Dunlin appear to be a species relatively tolerant to visual stimuli and are considered to habituate to people with most responses occurring in <75-100 m of visual stimuli. When foraging, they can be initially disturbed by activity start-up, with a flight response, but will then forage back towards construction works, approaching to within 25m on occasion, before sometimes flushing and moving away again, to repeat the process. Collop *et al. (*2016) recorded a minimum FID of 9 m and a maximum FID of 194 m (with a mean of 44 m) for this species through experimentally disturbing foraging birds (approaching a total of 117 times) as part of a research study (IECS, 2013). Goodship & Furness (2019) and Goodship & Furness (2022) undertake disturbance literature reviews with the evidence reviewed suggesting that Dunlin is less sensitive to disturbance than many other waders with the range in mean FID from the literature reviewed of 39 m to 163 m as a result of the presence of people on or near the foreshore.
Pintail	Information on the sensitivity of this species to noise is limited and this species is not specifically mentioned in IECS (2013).	Goodship & Furness (2022) considered Pintail to have some tolerance to human disturbance with a maximum FID of 100 m from the literature reviewed.
Teal	Information on the sensitivity of this species to noise is limited and this species is not specifically mentioned in IECS (2013).	Bregnballe *et al.* (2009) found most disturbance responses to this species were within 150 m with limited responses at greater distances. Mayer *et al.* (2019) recorded a mean FID of 169 m during an experimental disturbance study.

C Construction Noise Modelling Results

Technical Note

Project name Port of Mostyn	**Project number** 60725748	**Client** ABPmer	**Subject** Construction Piling Noise Predictions
Date March 21st 2024	**Document ref** 60725748- P01	**Issued by** Jago Edwards	**Prepared by** Jago Edwards
Checked by Debbie Preston	**Approved by** Jason Evans	**Revision No.** P03	**Location** Manchester

Introduction

A new roll-on/roll-off (Ro-Ro) linkspan pontoon is proposed as part of the Mostyn Energy Park Expansion (MEPE) Project to upgrade the Port of Mostyn, Flintshire, North Wales.

The construction works as part of the MEPE Project will consist of the following:

- Construction of 360 m of new quay wall;
- Land reclamation works;
- Construction of a Ro-Ro linkspan pontoon;
- Relocation of four existing Ro-Ro dolphins (piles);
- Laying of hardstanding on the reclaimed land;
- Dredging work associated with new and existing berths.

The construction for the quay wall will require percussive and vibratory piling methods. This technical note will focus on noise predictions from piling and reclamation works at ecological receptors in the vicinity of the proposed works, the locations of which have been identified by ABPmer as birds are present at the nearby mudflats and at the breakwater roost.

Guidance and Criteria

BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites (BS 5228)

Construction noise has been predicted using the procedures given in BS 5228-1:2009+A1:2014. The prediction method considers the noise emission level of the plant (generally expressed as sound power levels), the separation distance between the source and the receptor, the periods of operation of the plant know as its ‘on-time, along with the effect of the intervening topography and structures.

Proposed Construction Works

A summary of the proposed construction involving either piling or reclamation works are presented below:

- Construction of a 360 m length of new quay wall involving both impact (percussive) and vibratory piling methods to reach the required design depths;
  - The new quay wall will be constructed as a combination pile wall (“combi-wall”), involving tubular (King) piles with a pair of AZ infill sheet panel piles.

  - Each King pile is anticipated to require up to approximately 15 minutes of vibratory piling and approximately 35 minutes of impact piling. Each AZ panel pile is estimated to required approximately 20 minutes of vibratory piling.
  - The piling rig(s) will be either set up on jack-up barges or alternatively a temporary raised stone bund will be constructed behind the line of the new quay wall to provide a stable platform or pad for the crane and associated piling rig(s).
  - An IHC S-280 piling hammer will be used for percussive piling.
- Infilling of the area that is to be reclaimed (approximately 3.5 ha) behind the new quay wall with approximately 600,000 m³ of infill material to reach a final fill height of 12 m above Chart Datum (CD). This infill requirement is proposed to be fully met by reusing a selected proportion of the suitable capital dredge arisings;
  - It is proposed that a road roller will be used to compact the infill material and a bulldozer will be used for levelling.

A barrier will also be installed to provide noise mitigation, which is assumed to be 2 m in height. The location of the barrier, locations of the proposed construction areas, indicative locations of piling, and the location of the 'breakwater roost' ecological receptors, are presented in Figure 1.

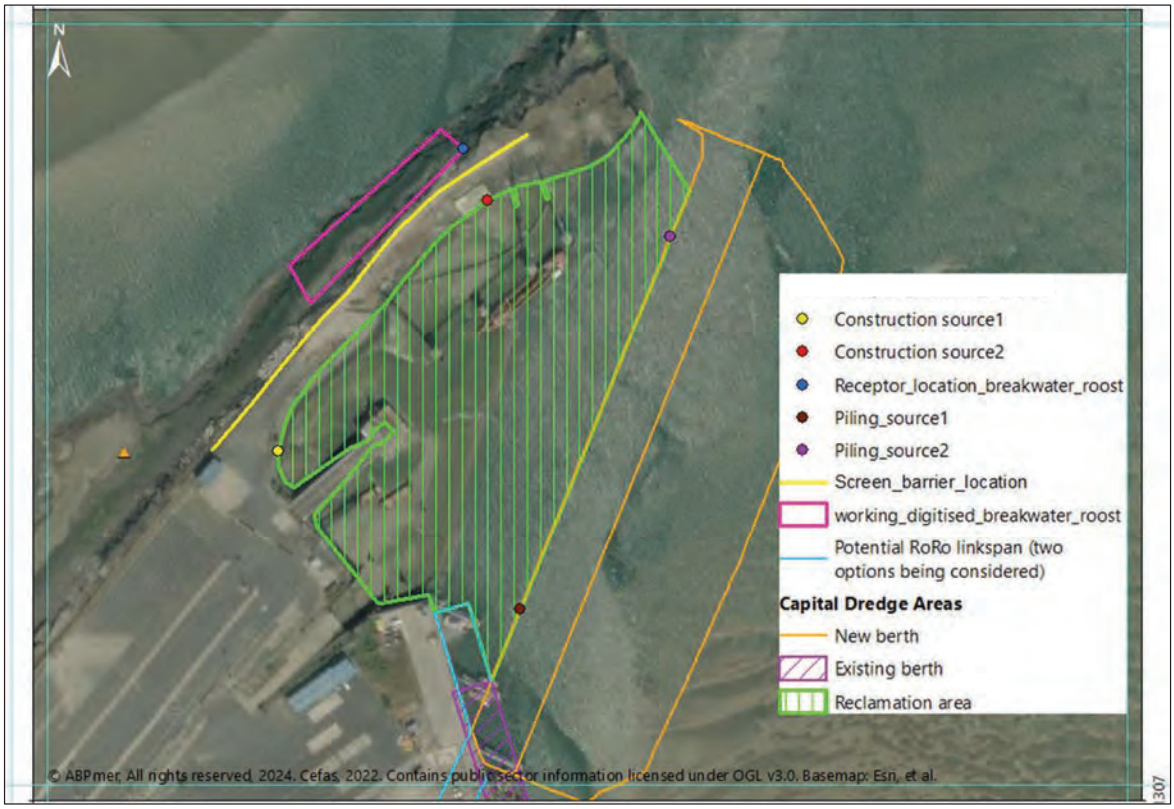


Figure 1 Location of Construction Works and Ecological Receptors

In addition to the breakwater roost receptor, the location of the mudflats to the northwest of the port are shown in Figure 2.

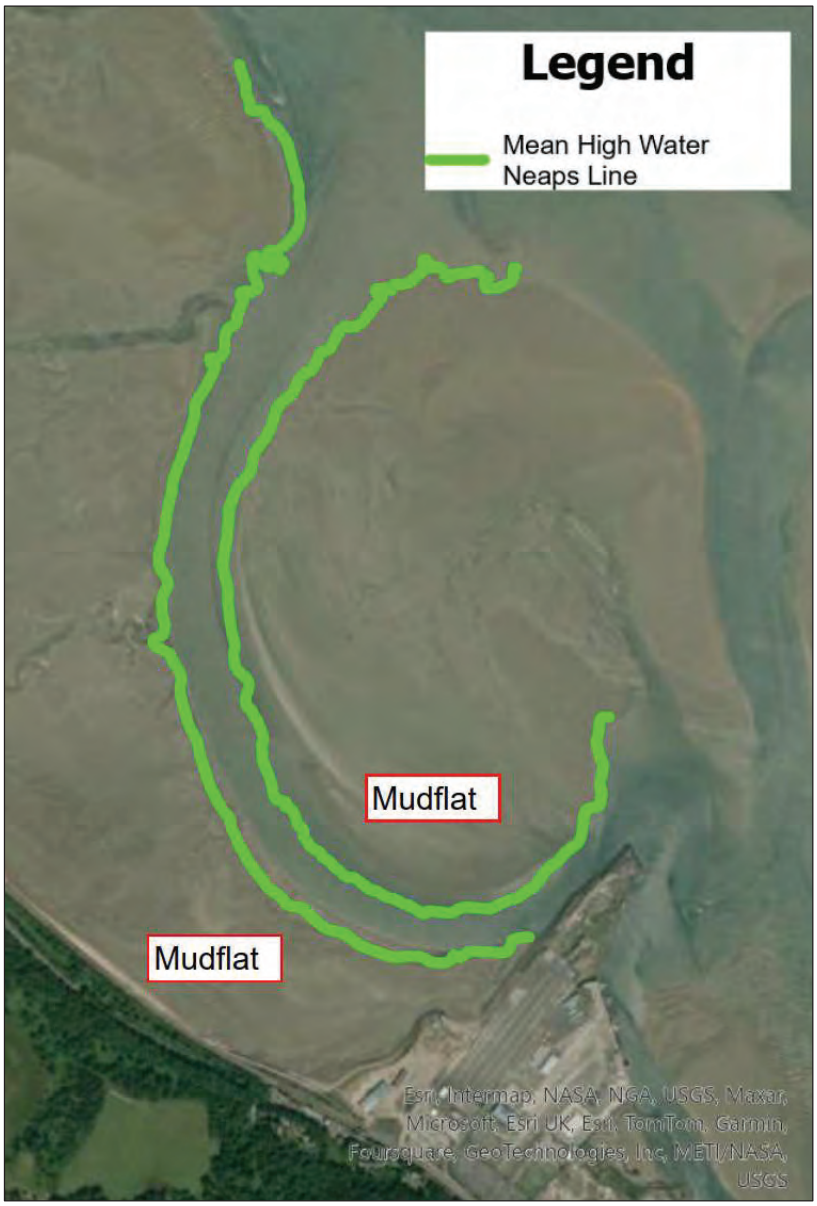


Figure 2 Location of Mudflats

Construction Noise Predictions

Noise predictions have been carried out for four construction scenarios. These are:

1. Impact piling of the quay wall (indicated as 'piling source 1' on Figure 1) with and without mitigation measures (noise suppression system (shroud on piling rig) and screen/barrier)
2. Impact piling of the quay wall (indicated as 'piling source 2' on Figure 1) with and without mitigation measures (noise suppression system (shroud on piling rig) and screen/barrier)
3. Reclamation area construction activity (indicated as 'construction source 2' on Figure 1) with and without mitigation measures (screen/barrier)
4. Reclamation area construction activity (indicated as 'construction source 1' on Figure 1) with and without mitigation measures (screen/barrier)

It is assumed that both the bulldozer and road roller will be present at both 'construction source 1' and 'construction source 2'.

Plant Sound Source Data

Impact Piling Noise

Noise data from a similar hammer piling rig have been provided to AECOM to be used in the noise predictions. This data was measured by Bureau Veritas on behalf of Associated British Ports (ABP) to assess noise from piling at the Port of Southampton[1]. The noise data are presented in Table 1 and contain data with and without a noise mitigating shroud.

Table 1. Piling Sound Power Level Measurements

Description	Octave Band Sound Power Levels, L_w (dB)								A
	63	125	250	500	1k	2k	4k	8k	
IHC S200 piling hammer	109	119	116	128	138	126	115	99	140
IHC S200 piling hammer (shrouded)	105	115	110	116	124	112	103	87	125

Bureau Veritas noted that a larger piling hammer, such as a IHC S280 S-280, which is proposed to be used at the Port of Mostyn, would generate noise up to **2 dB(A) greater** than the IHC S200 piling hammer.

Noise data presented by Bureau Veritas show the measured instantaneous maximum piling noise levels (L_{AFMax}) are up to 11 dB above the measured equivalent continuous noise level (L_{Aeq}) ('average') piling noise level over a 5-minute period.

[1] *Bureau Veritas (2008) Environmental Noise and Vibration Assessment Development of Proposed Deepwater Berths 201 & 202 at Port of Southampton, Rev 2 (Reference: NSOX0549/1 Rev 2)*

The L_{Aeq} and L_{AFMax} noise levels in Table 2 have been used to represent the ICH S280 piling hammer in this assessment. To enable prediction of the $L_{Aeq,1hr}$ noise levels at the ecological receptors, a reference time of 1-hour has been used to calculate percentage on-times.

Table 2. Impact Piling Noise Source Data for Use in Noise Modelling

Description	Octave Band Sound Power Levels, L_w (dB)								A	Percentage on Time
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz		
IHC S280 piling hammer, L_{Aeq}	111	121	118	130	140	128	117	101	142	58%
IHC S280 piling hammer (shrouded), L_{Aeq}	107	117	112	118	126	114	105	89	127	58%
IHC S280 piling hammer, L_{AFmax}	122	132	129	141	151	139	128	112	153	-
IHC S280 piling hammer (shrouded), L_{AFMax}	118	128	123	129	137	125	116	100	138	-

Reclamation Area Construction Noise

Where measured noise levels for construction plant have not been available, data from Annex C of BS 5228 have been used, which covers typical equipment used in construction. Table 3 presents the plant which have been included in the noise model. Again, a reference time of 1-hour has been used to calculate percentage on-times, for use in subsequent prediction of the $L_{Aeq,1hr}$ noise levels at the ecological receptors.

Table 3. Reclamation Area Noise Source Data for Use in Noise Modelling

Plant Type	BS5228 reference		Number of Plant	Sound Pressure Level at 10m, dB (L_{Aeq})	Percentage on Time
	Description	Ref			
Piling power pack	Power pack	C.3-7	2	70	100%
Bulldozer	Dozer 20t	C.2-12	2	81	100%
Road Roller	Roller 18t	C.2-38	2	73	100%

Noise Modelling

A detailed noise model has been created in CadnaA (Version 2023 MR 1) 3-dimensional acoustic modelling software to predict the L_{Aeq} and L_{Amax} noise levels from quay wall piling and reclamation area construction activities. The noise levels have been predicted at receiver points representative of the ecological receptors and on a grid which spans the Port of Mostyn and surrounding area. The following parameters have been used in the noise model:

- The noise model has been set up to apply the noise prediction methodology set out in BS 5228;
- The 3D digital terrain model (DTM) has been created using the LIBA Composite 1 m DTM which is available from the data.gov.uk website;
- To represent the local ground and water, ground absorption has been set at G = 0 (i.e. to represent a hard, fully reflective surface);
- The model has been set to include second order reflections from solid structures;
- The impact piling noise source has been modelled at 10 m above local ground level, with the power pack at 5 m above local ground level to represent it's likely location on a jack-up barge;

- It is assumed that the reclamation area will be infilled to be level with the surrounding existing hardstanding. Noise sources representing the bulldozer and road roller are modelled at a height 1 m above the existing hardstanding;
- The screen barrier on the breakwater is assumed to be 2 m high and will interface with the existing building located at the southern end of the barrier;
- Ecological receptors are modelled 0.1 m above local ground/water level.
- The highest noise level within the mudflat areas indicated in Figure 2 will be reported.

Noise Modelling Results

Noise modelling results for each modelling scenario are presented in the following sections. Predictions using L_{Amax} noise source data represent instantaneous noise levels from the single highest noise source per activity (i.e. an impact sound, bang, thud, etc.). Noise contours of all scenarios covering the worst affected parts of the mudflats and breakwater roost receptors are presented in Appendix A.

Noise Predictions at the Mudflats Receptor

Table 4 below presents the highest predicted noise level from impact piling (either during scenario 1 or scenario 2) and reclamation area construction activity (either during scenario 3 or scenario 4) anywhere on the mudflats. Predictions both without and with proposed mitigation (2 m noise screen/barrier along the breakwater and noise suppressing shroud fixed to the piling rig) are presented.

Table 4. Summary of Construction Noise Predictions, Mudflats Receptor

Construction Activity	Without Mitigation		With Mitigation	
	$L_{Aeq,1hr}$ (dB)	L_{AFMax} (dB)	$L_{Aeq,1hr}$ (dB)	L_{AFMax} (dB)
Impact Piling	69	82	53	65
Reclamation Area Construction Activity	62	-	57	-

Table 4 shows that the proposed mitigation provides at least to 16 dB reduction in L_{Aeq} noise levels and at least 17 dB reduction in the L_{Amax} noise levels during impact piling activities, and a reduction of at least 5 dB $L_{Aeq,1hr}$ during reclamation area construction activities.

Noise Predictions at the Breakwater Roost Receptor

Table 5 below presents a the highest predicted noise level from impact piling (either during scenario 1 or scenario 2) and reclamation area construction (either during scenario 3 or scenario 4) at the breakwater roost receptor. Predictions both without and with the proposed mitigation (in the form of a 2 m noise screen/barrier along the breakwater and noise suppressing shroud fixed to the piling rig) are presented.

Table 5. Summary of Construction Noise Predictions, Breakwater Roost Receptor

Scenario	Without Mitigation		With Mitigation	
	$L_{Aeq,\ 1hr}$ (dB)	L_{AFMax} (dB)	$L_{Aeq,\ 1hr}$ (dB)	L_{AFMax} (dB)
Impact Piling	68	81	52	65
Reclamation Area Construction Activity	52	-	50	-

Table 5 shows that the proposed mitigation provides up to 16 dB reduction in both the $L_{Aeq,1hr}$ and L_{Amax} noise levels during impact piling activities, and up to 2 dBA in the $L_{Aeq,1hr}$ during reclamation area construction activity.

Summary

Noise predictions have been carried out for four construction scenarios which consist of both impact piling of the quay wall and reclamation area construction activity, without mitigation and with mitigation consisting of a 2 m noise screen/barrier along the breakwater and noise suppressing shroud fixed to the piling rig.

The highest predicted mitigated construction noise levels are on the mudflats during the impact piling of the quay wall and reclamation activities.

Appendix A Construction Noise Contours

A.1 Scenario 1 - Impact piling of the quay wall - predicted $L_{Aeq,1hr}$

Figure 3 Piling Noise at 0.1m Above Local Ground Without Mitigation ($L_{Aeq,1hr}$)

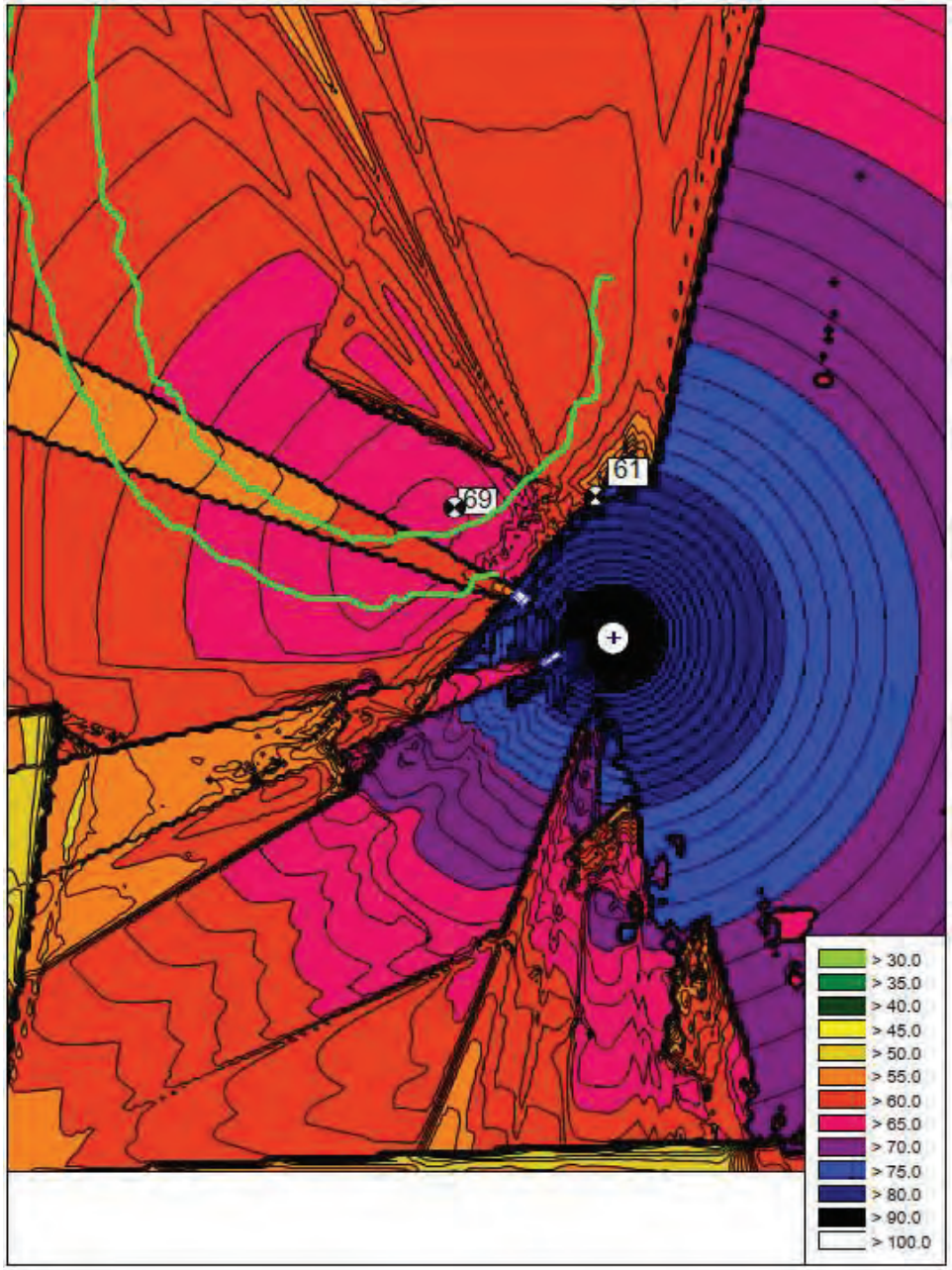
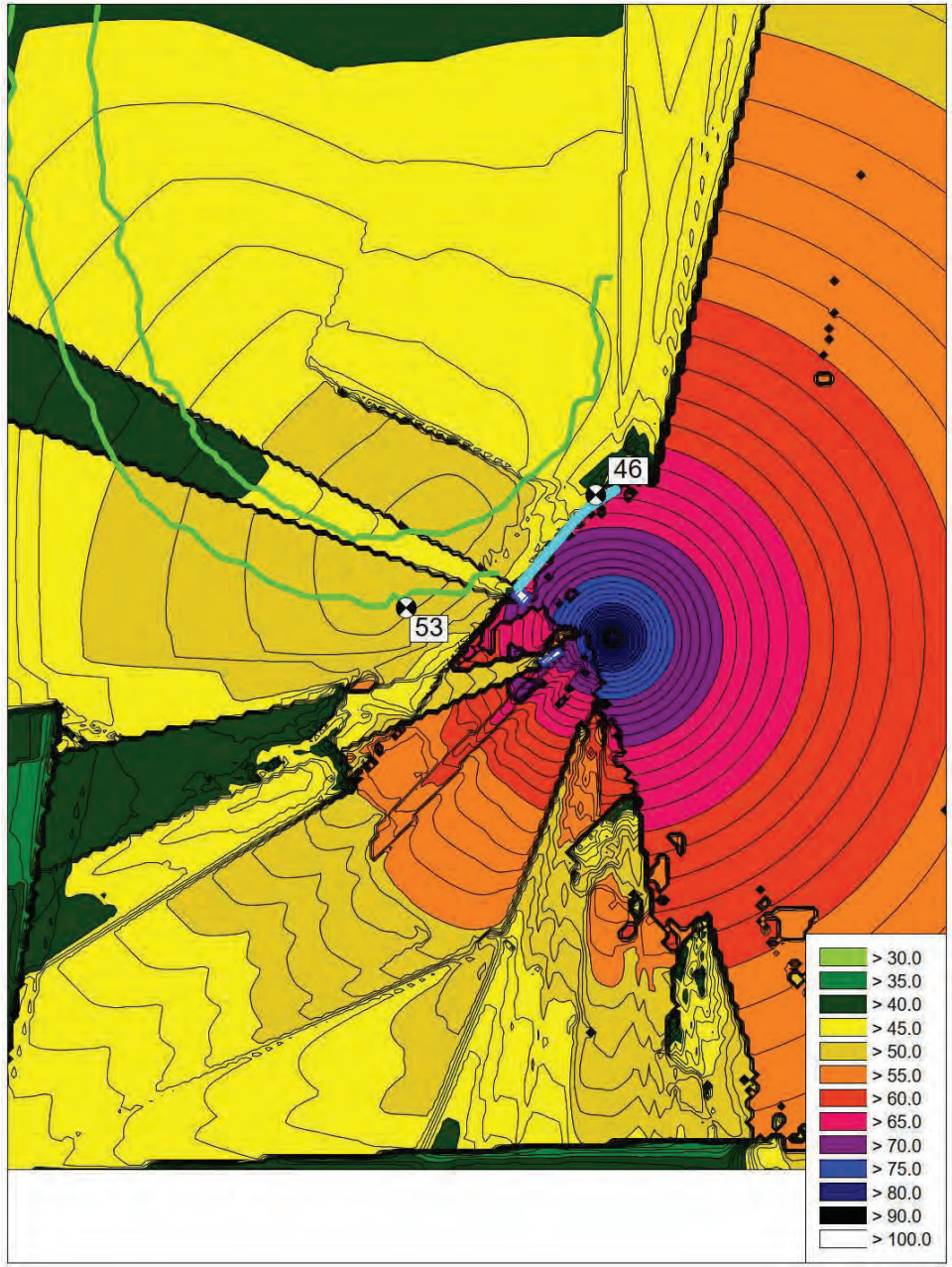


Figure 4 Piling Noise at 0.1m Above Local Ground With Mitigation ($L_{Aeq,1hr}$)



A.2 Scenario 1 - Impact piling of the quay wall - predicted L_{AFMax}

Figure 5 Piling Noise at 0.1m Above Local Ground Without Mitigation (L_{AFMax})

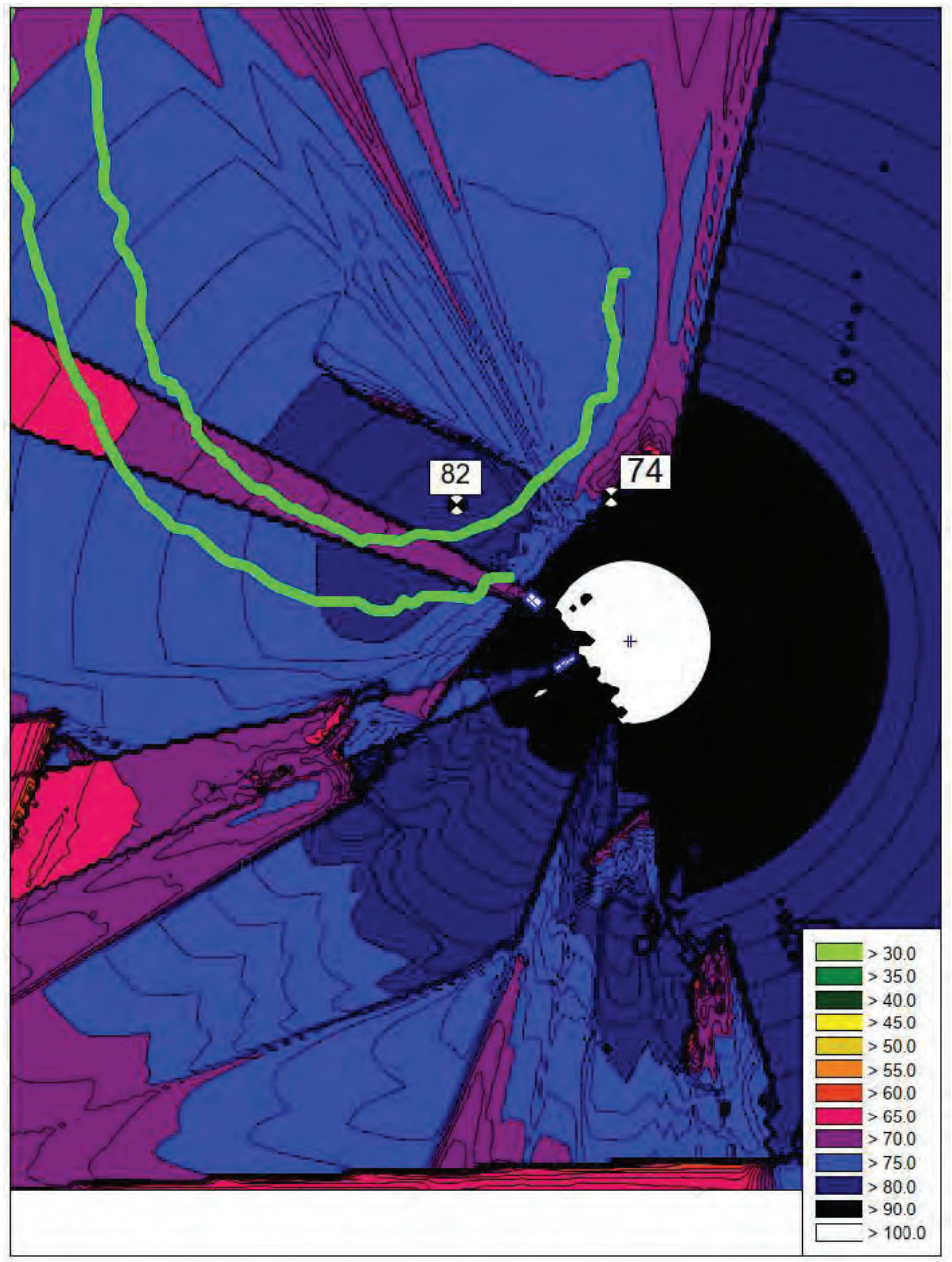
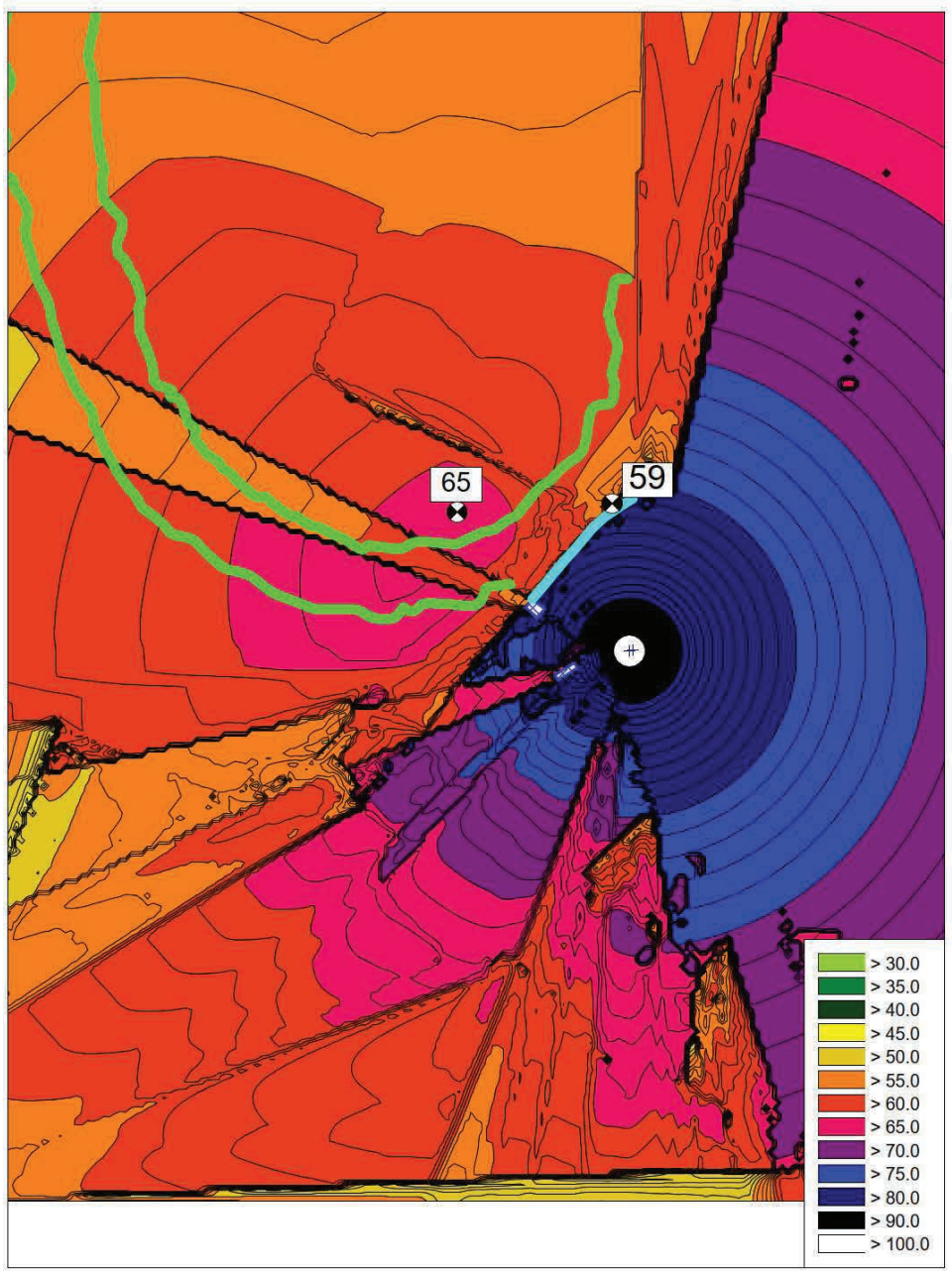


Figure 6 Piling Noise at 0.1m Above Local Ground With Mitigation (L_{AFMax})



A.3 Scenario 2 (Construction Noise, $L_{Aeq,T}$)

Figure 7 Piling Noise at 0.1m Above Local Ground Without Mitigation ($L_{Aeq,1hr}$)

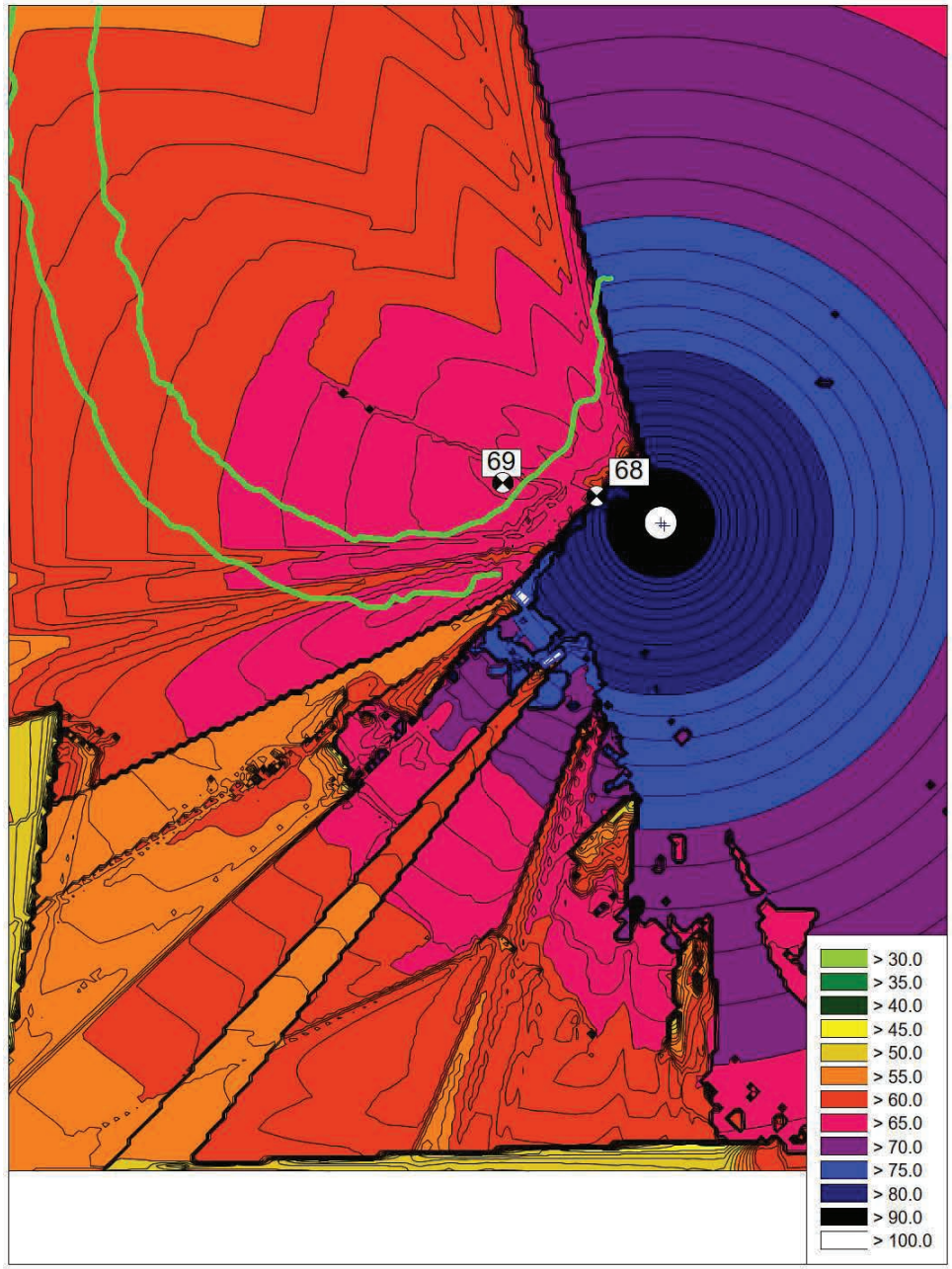
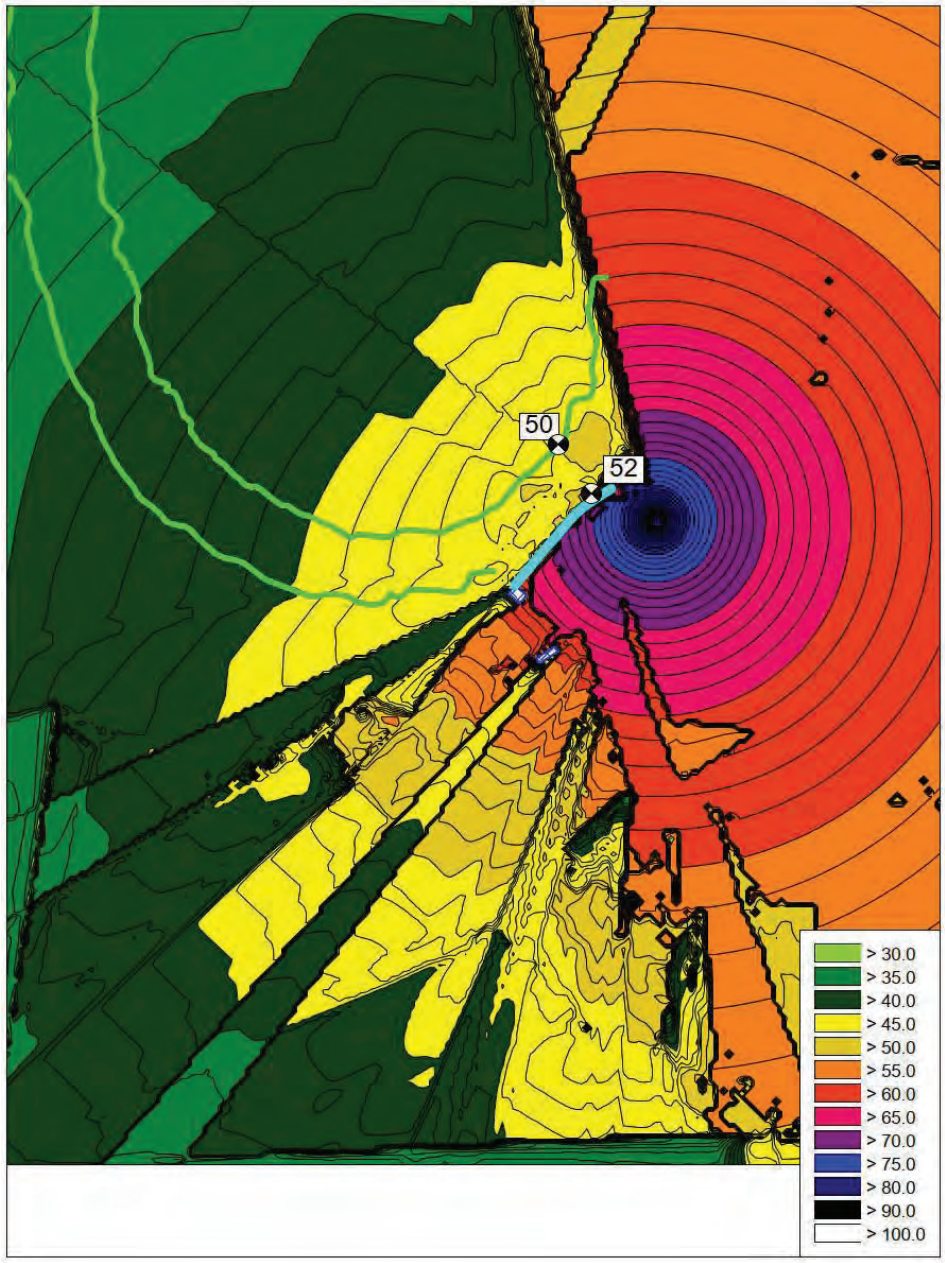


Figure 8 Piling Noise at 0.1m Above Local Ground With Mitigation ($L_{Aeq,1hr}$))



A.4 Scenario 2 (Maximum Construction Noise, L_{AFMax})

Figure 9 Piling Noise at 0.1m Above Local Ground Without Mitigation (L_{AFMax})

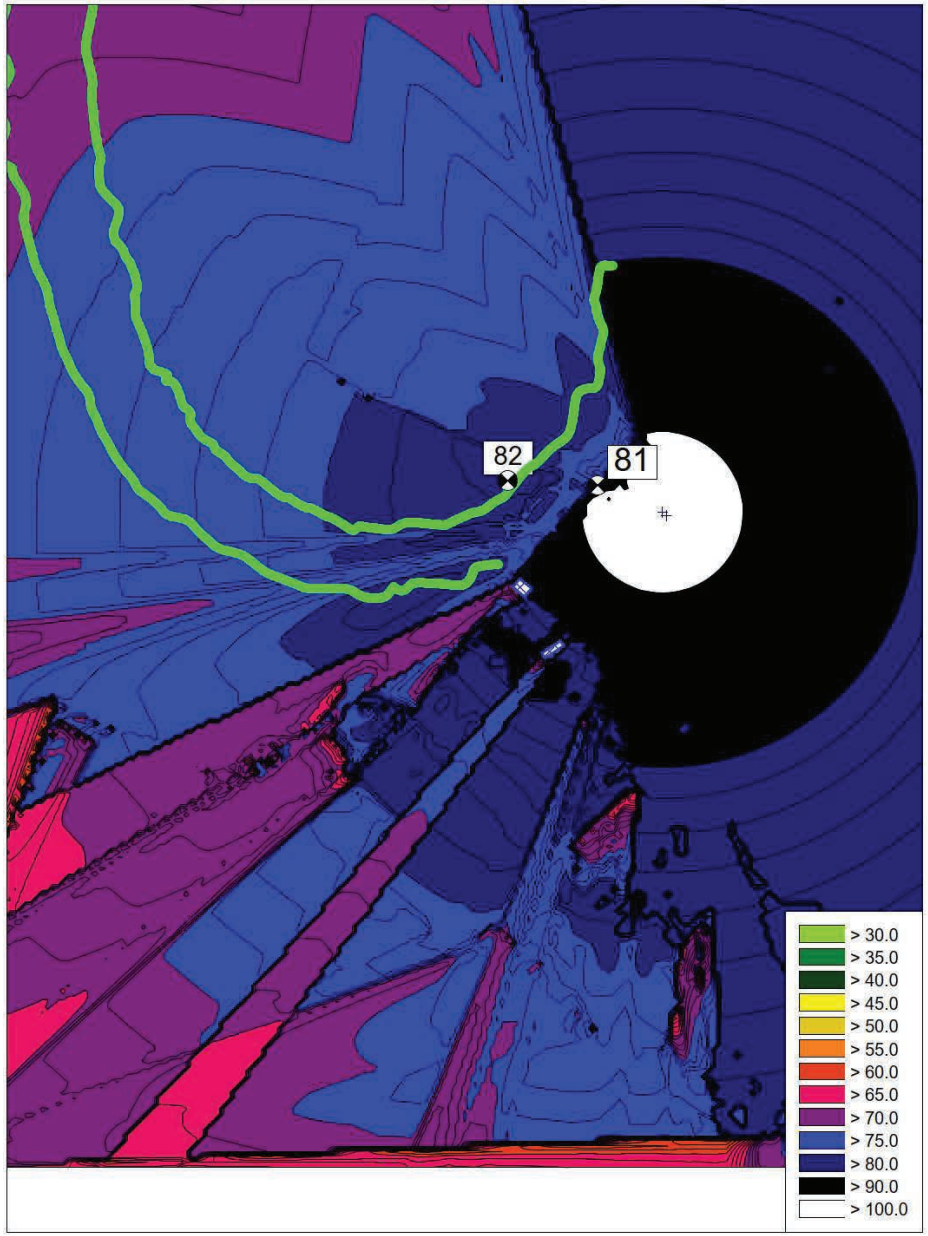
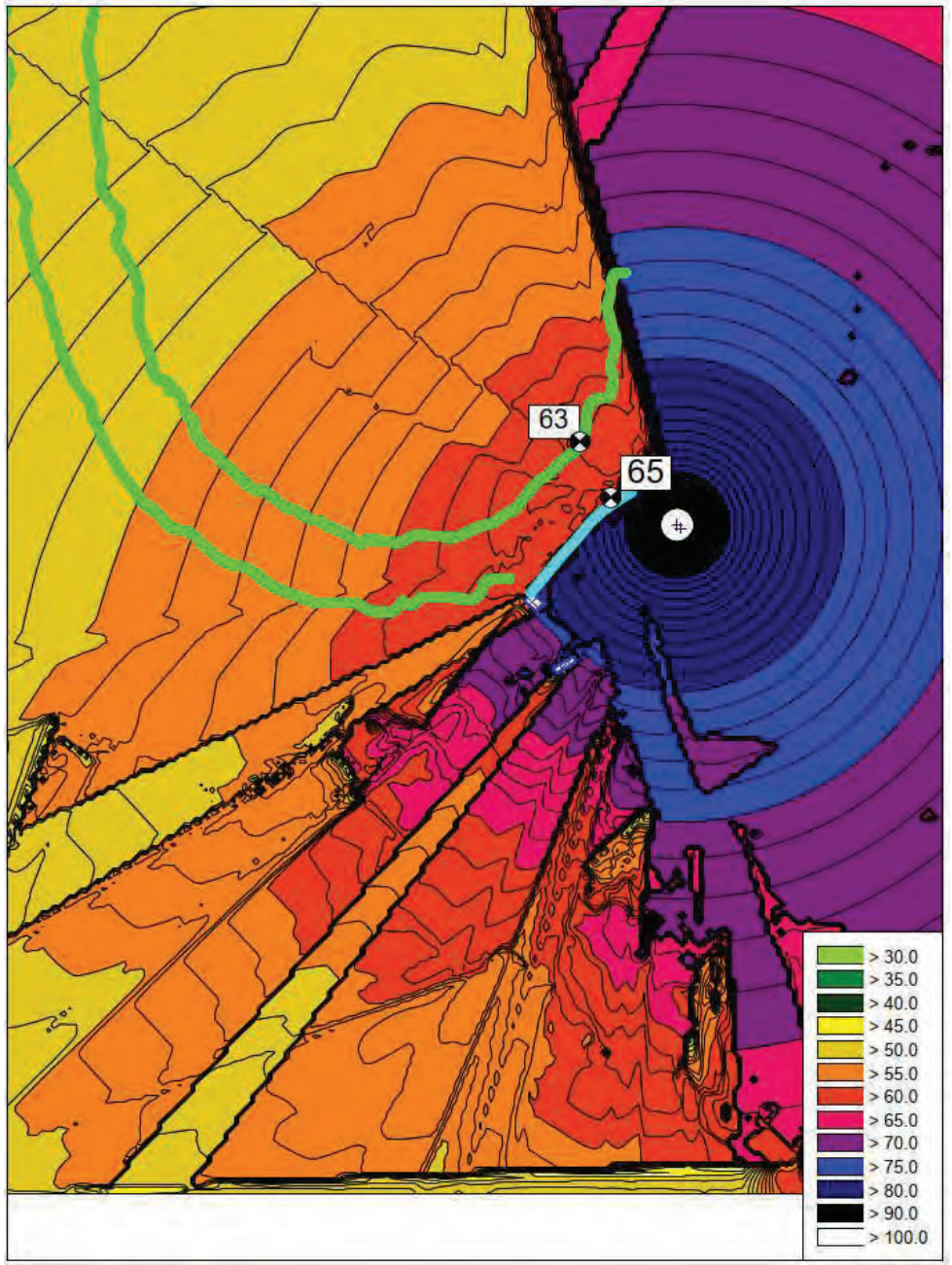


Figure 10 Piling Noise at 0.1m Above Local Ground With Mitigation (L_{AFMax})



A.5 Scenario 3 (Construction Noise, $L_{Aeq,T}$)

Figure 11 Construction Noise at 0.1m Above Local Ground Without Mitigation ($L_{Aeq,1hr}$)

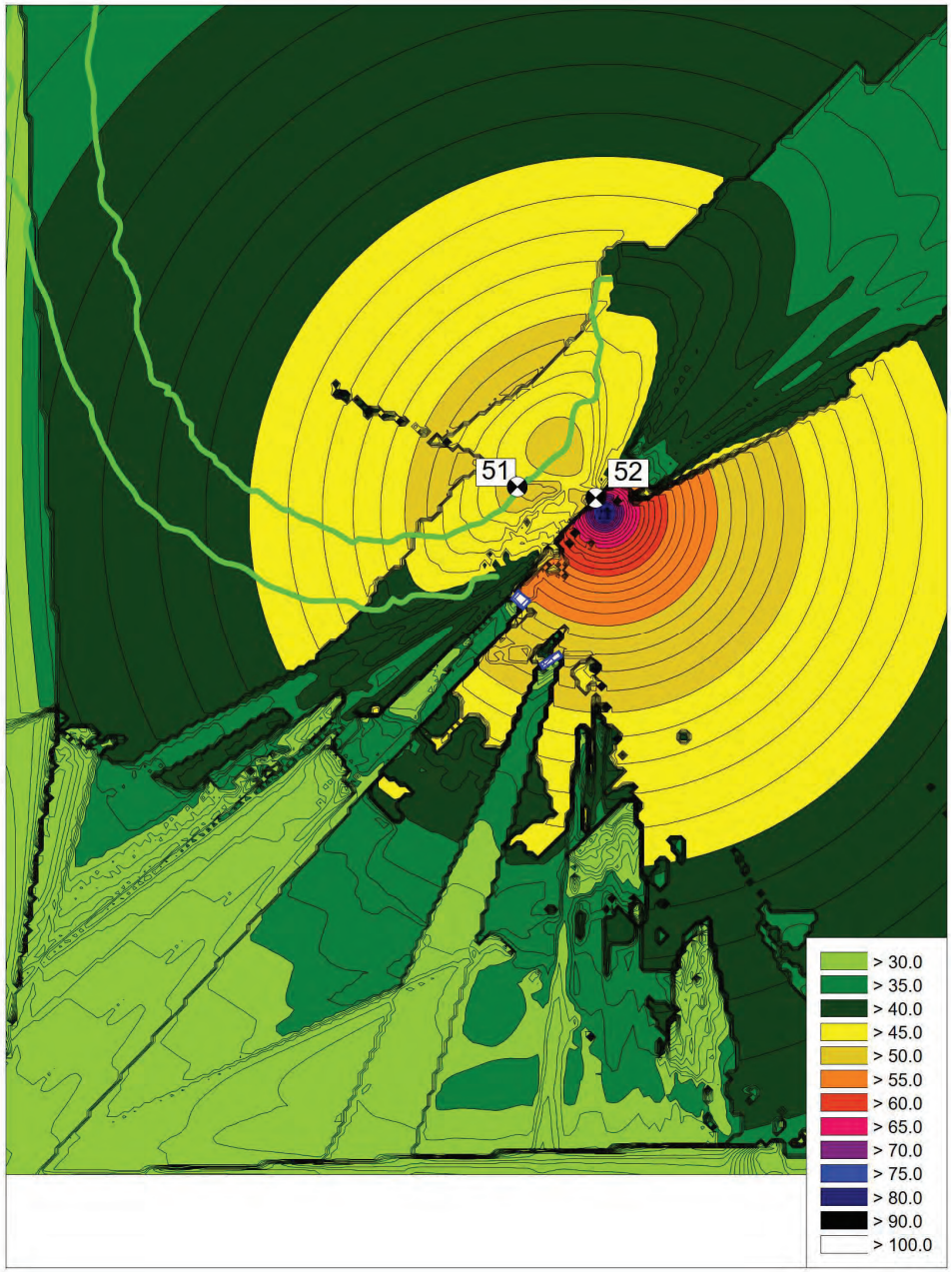
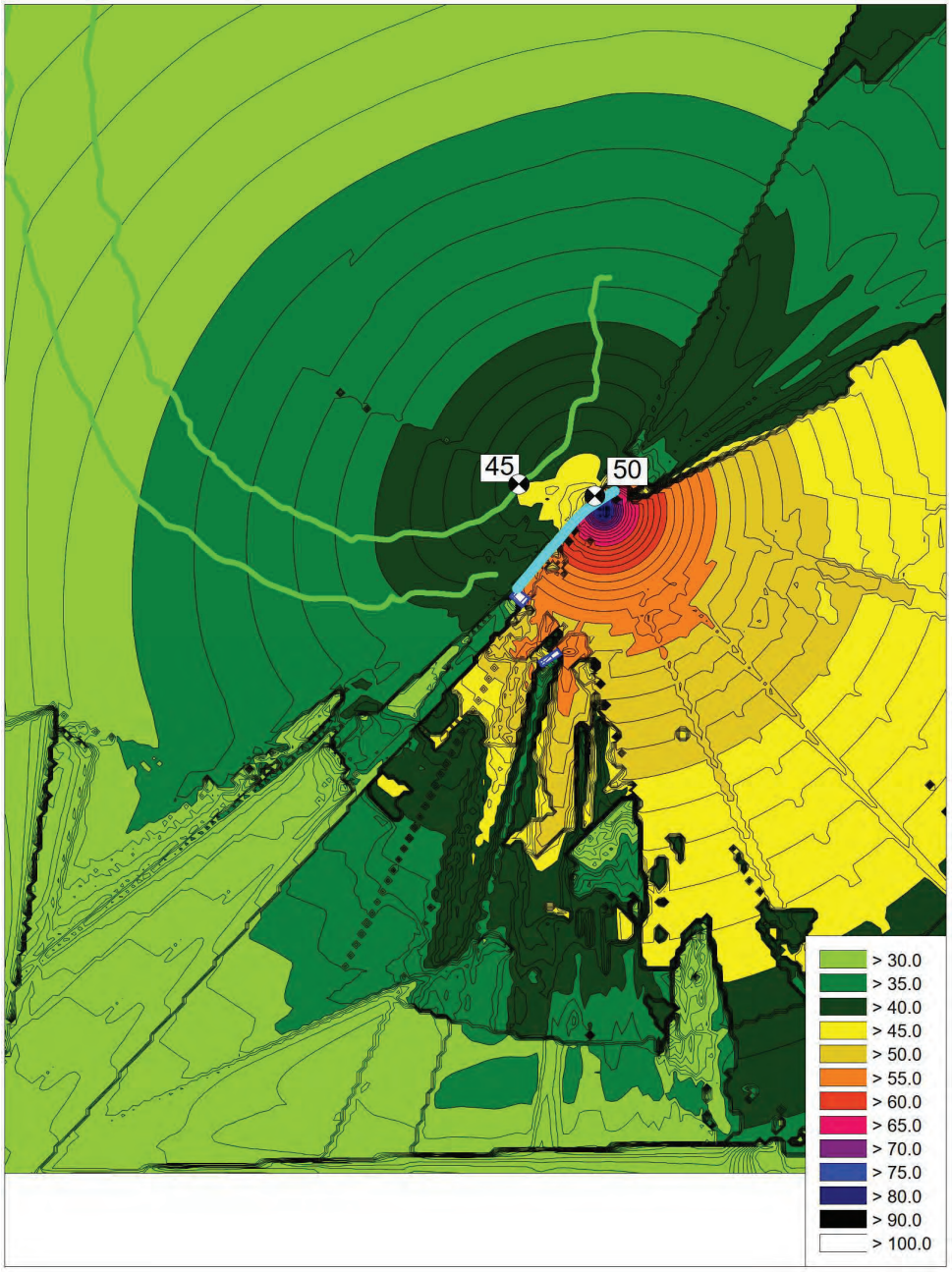


Figure 12 Construction Noise at 0.1m Above Local Ground With Mitigation ($L_{Aeq,1hr}$))



A.6 Scenario 4 (Construction Noise, $L_{Aeq,T}$)

Figure 13 Construction Noise at 0.1m Above Local Ground Without Mitigation ($L_{Aeq,1hr}$)

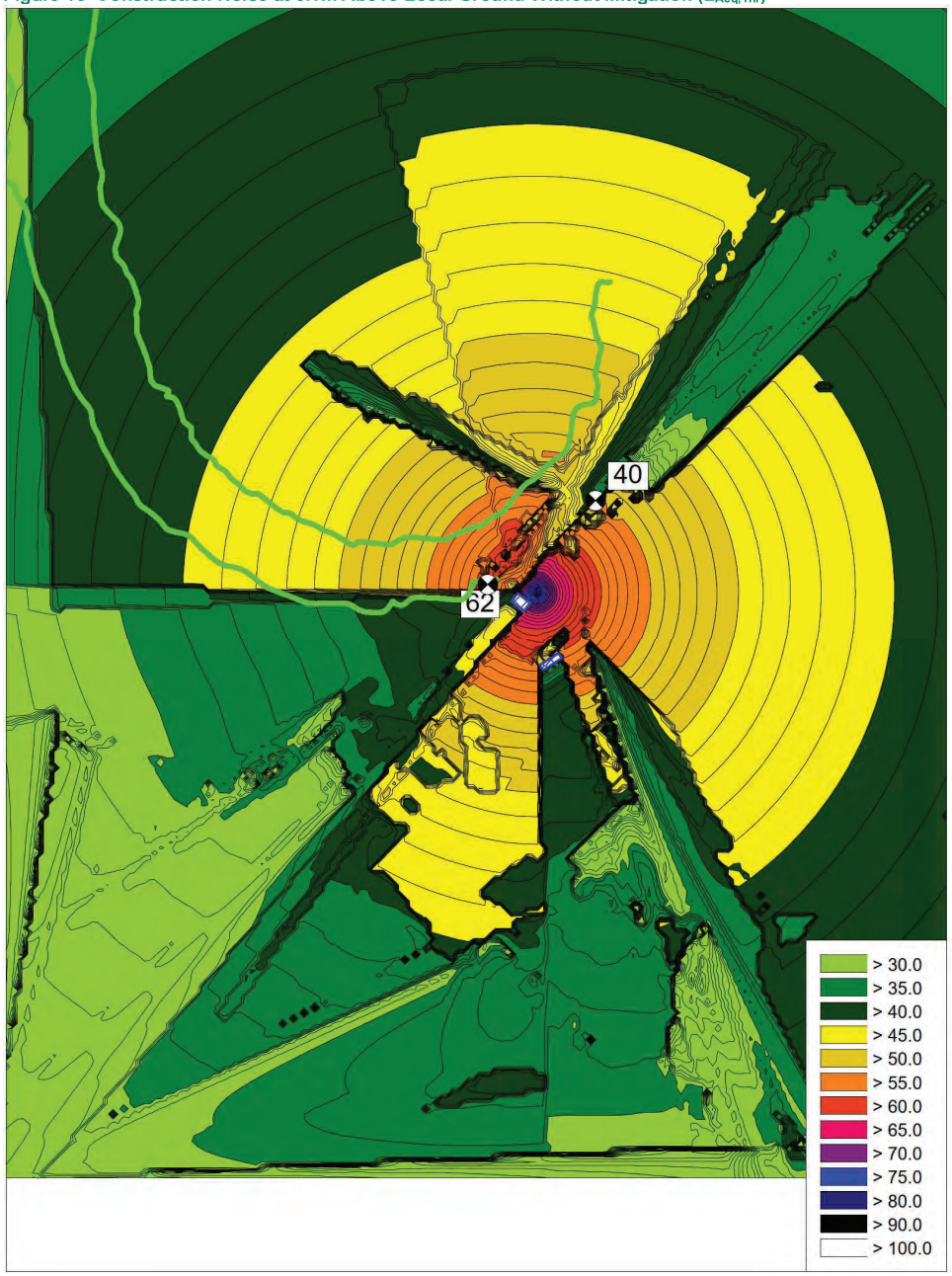
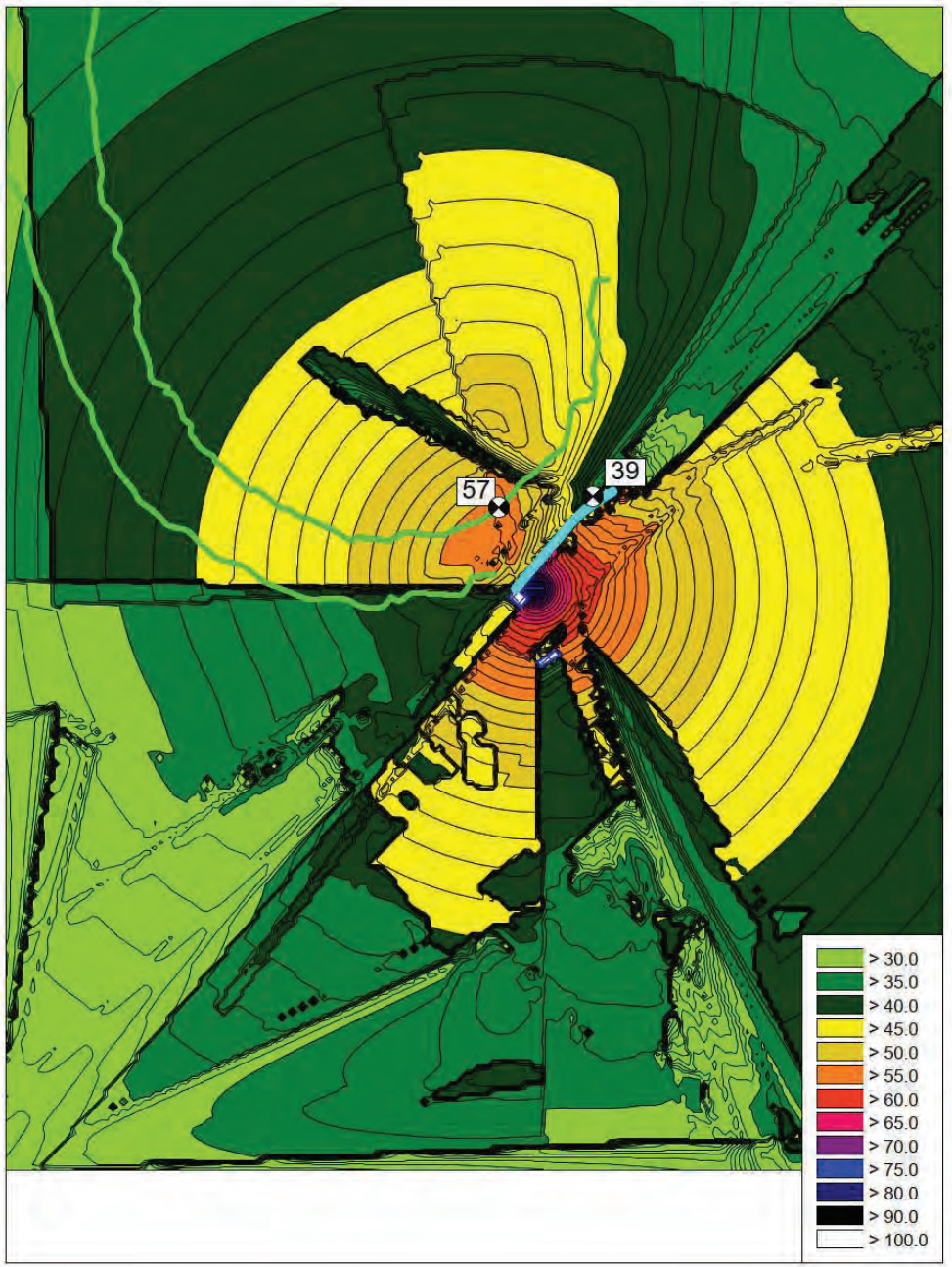


Figure 14 Construction Noise at 0.1m Above Local Ground With Mitigation ($L_{Aeq,1hr}$))



D Bird Distribution Figures

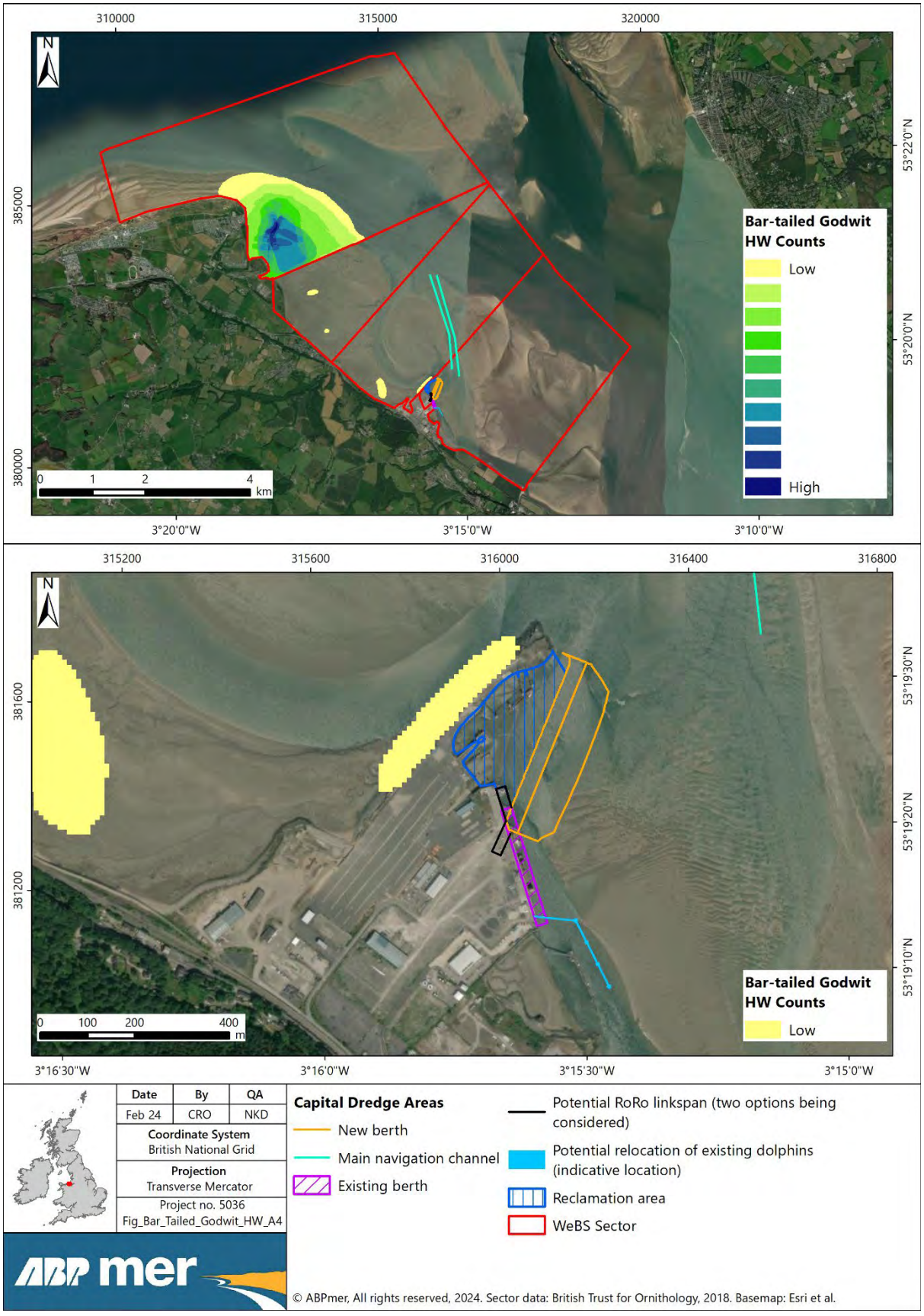


Figure D1. Bar-tailed Godwit HW Count

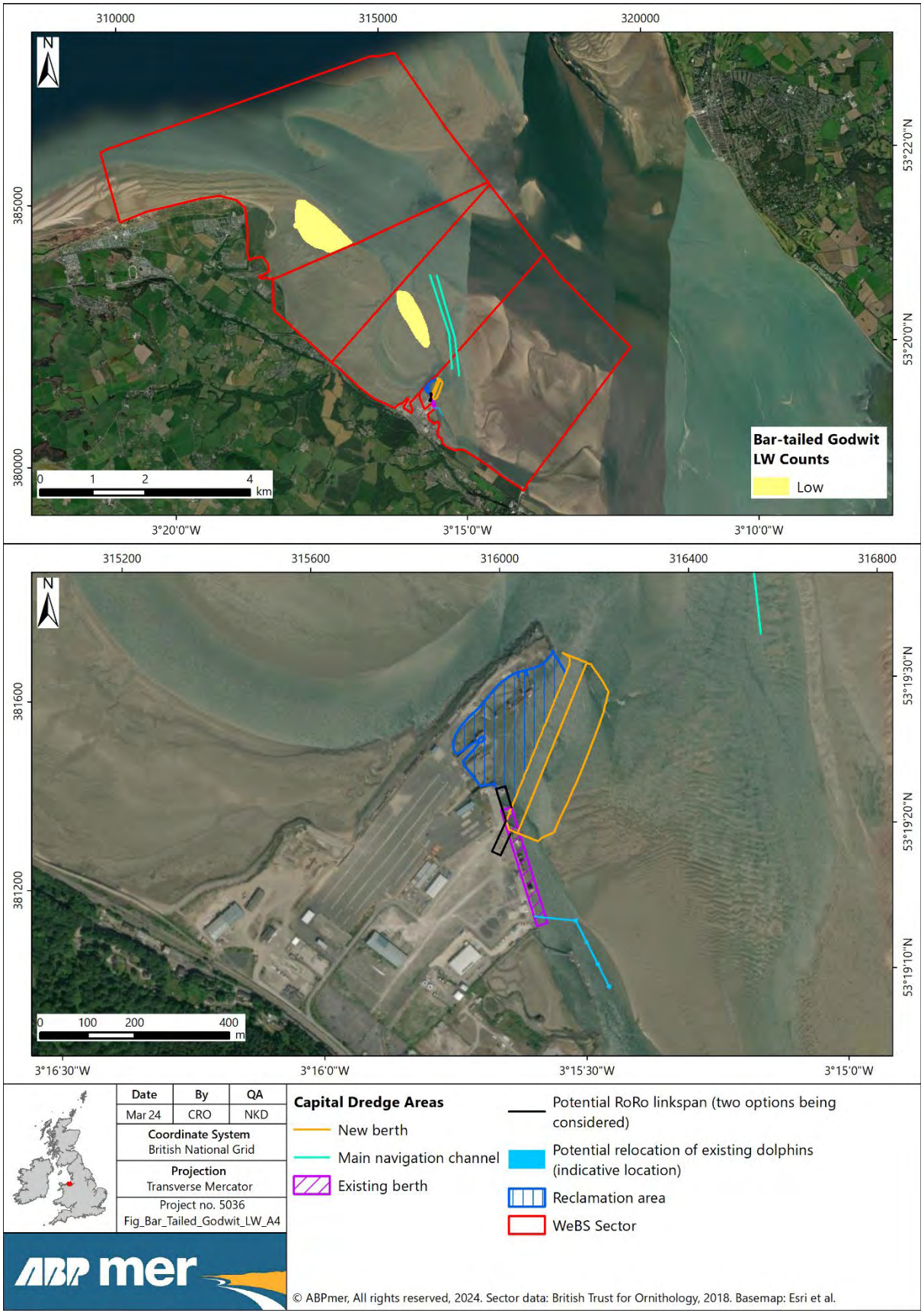


Figure D2. Bar-tailed Godwit LW Count

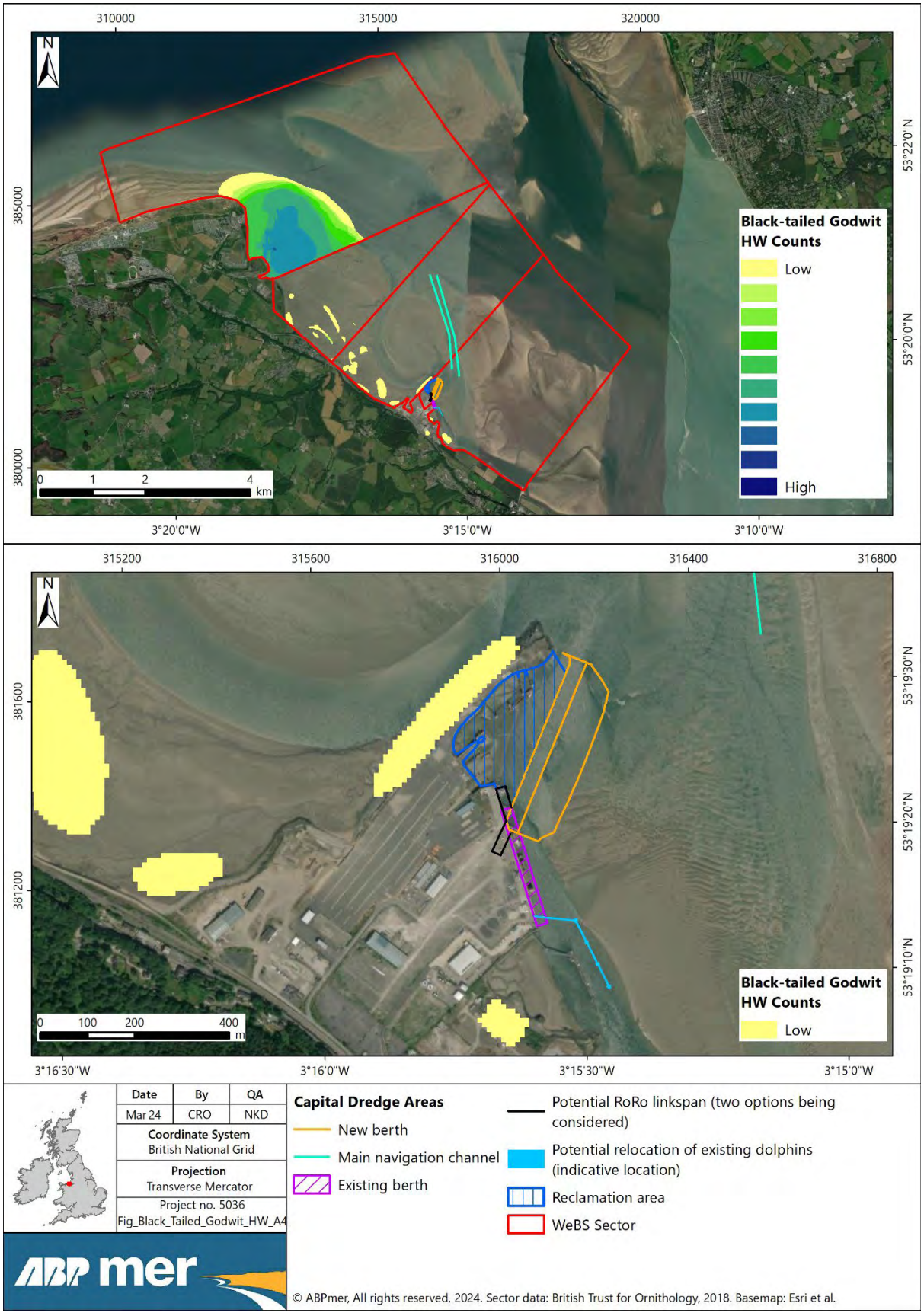


Figure D3. Black-tailed Godwit HW Count

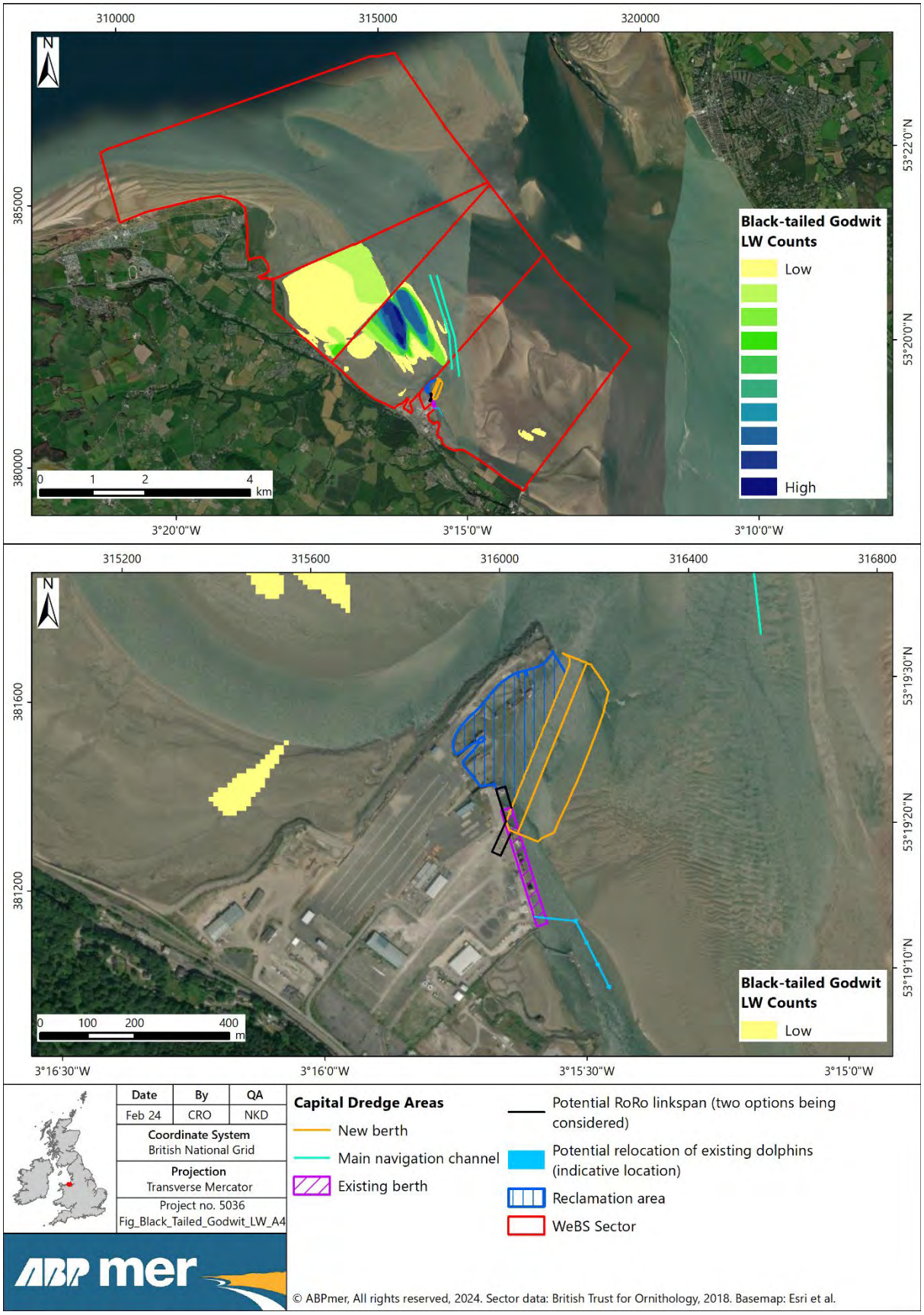


Figure D4. Black-tailed Godwit LW Count

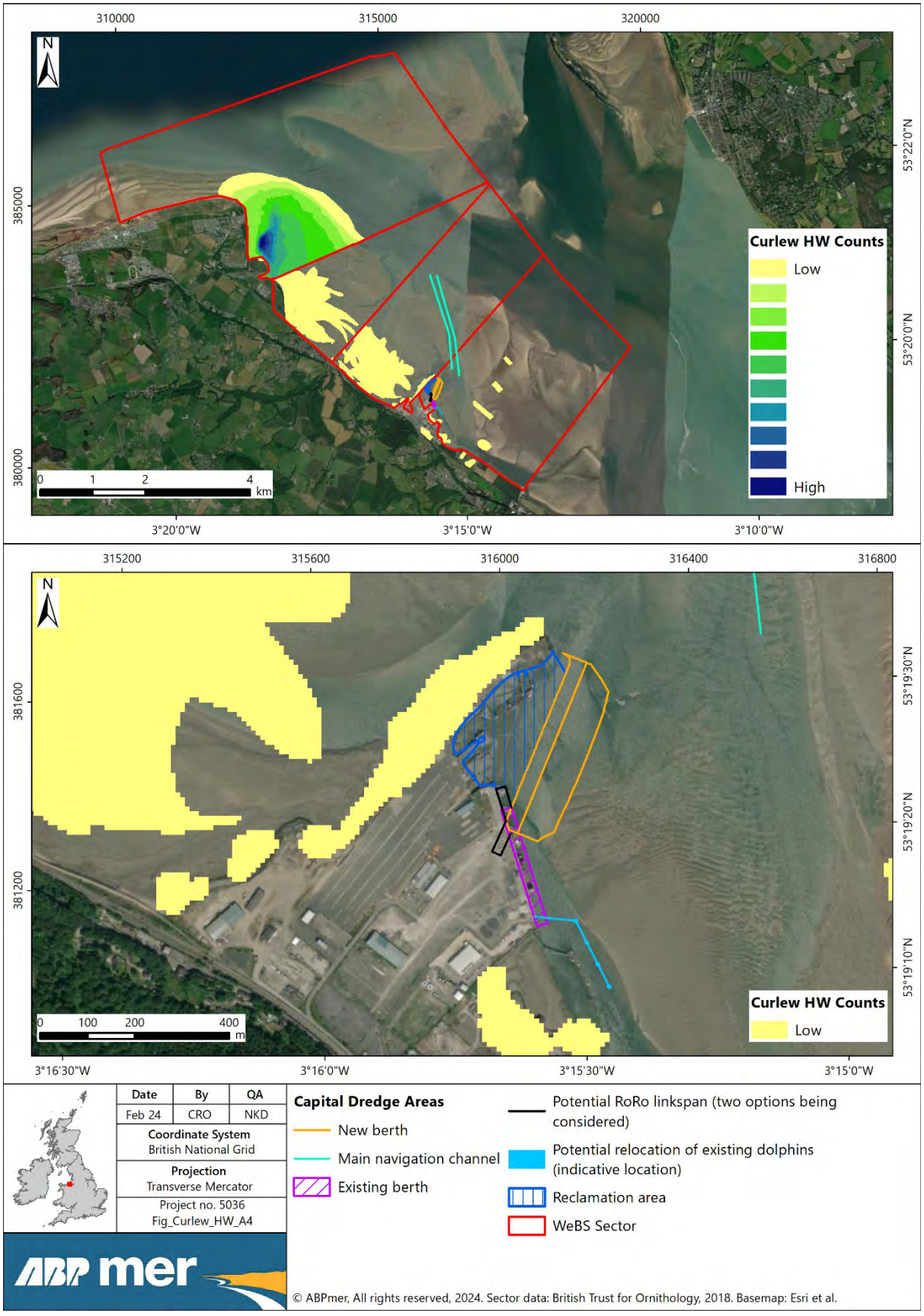


Figure D5. Curlew HW Count

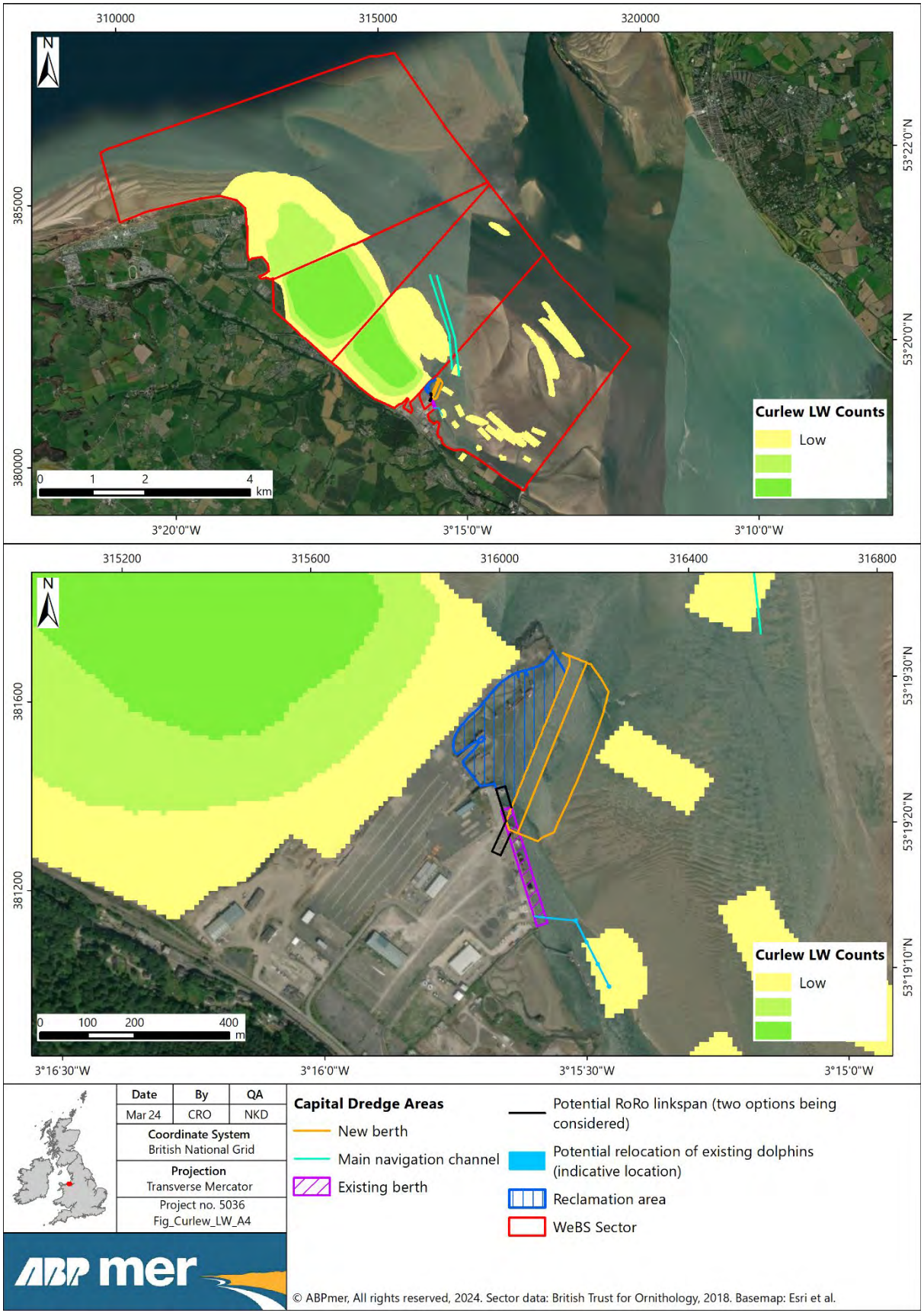


Figure D6. Curlew LW Count

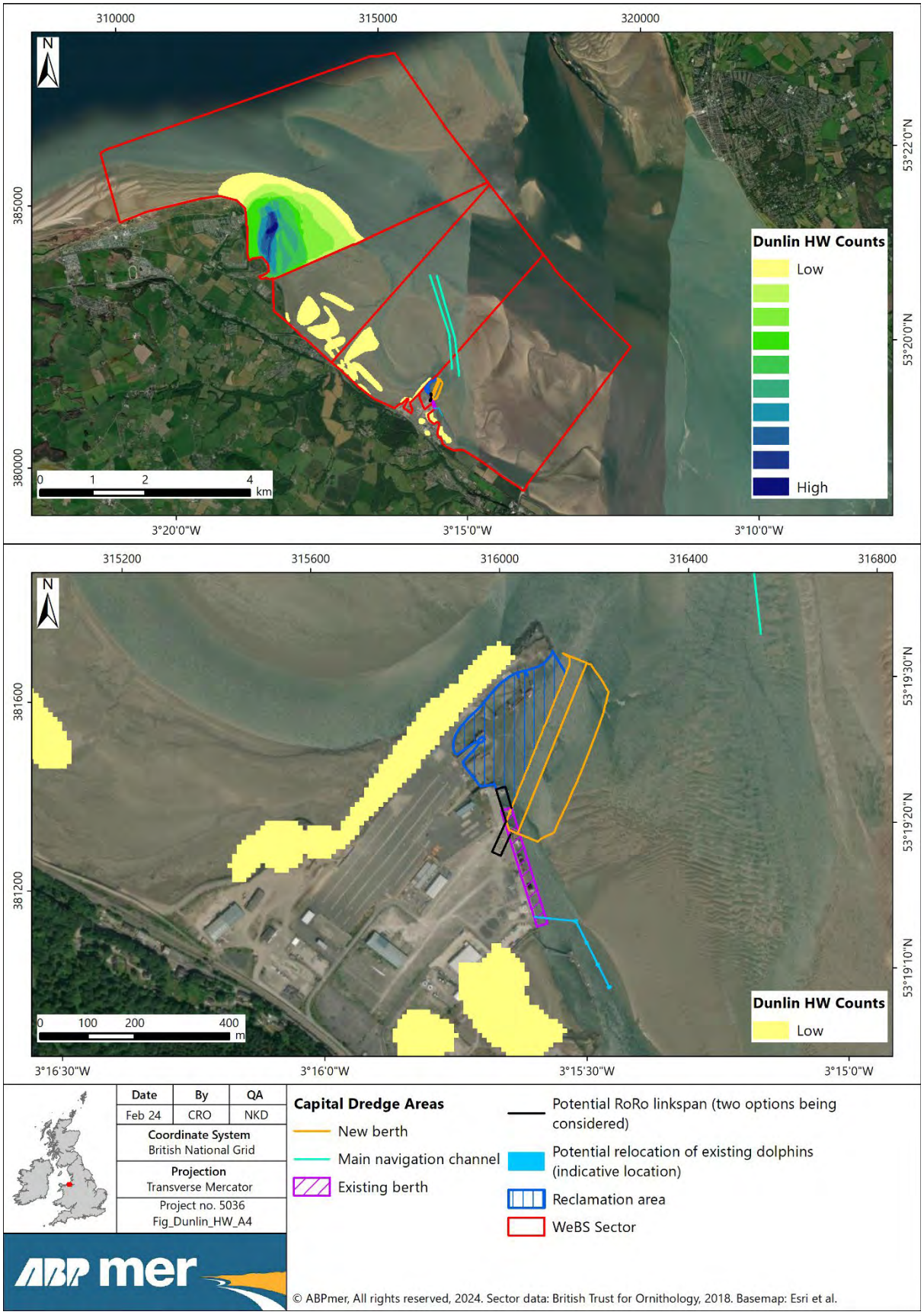


Figure D7. Dunlin HW Count

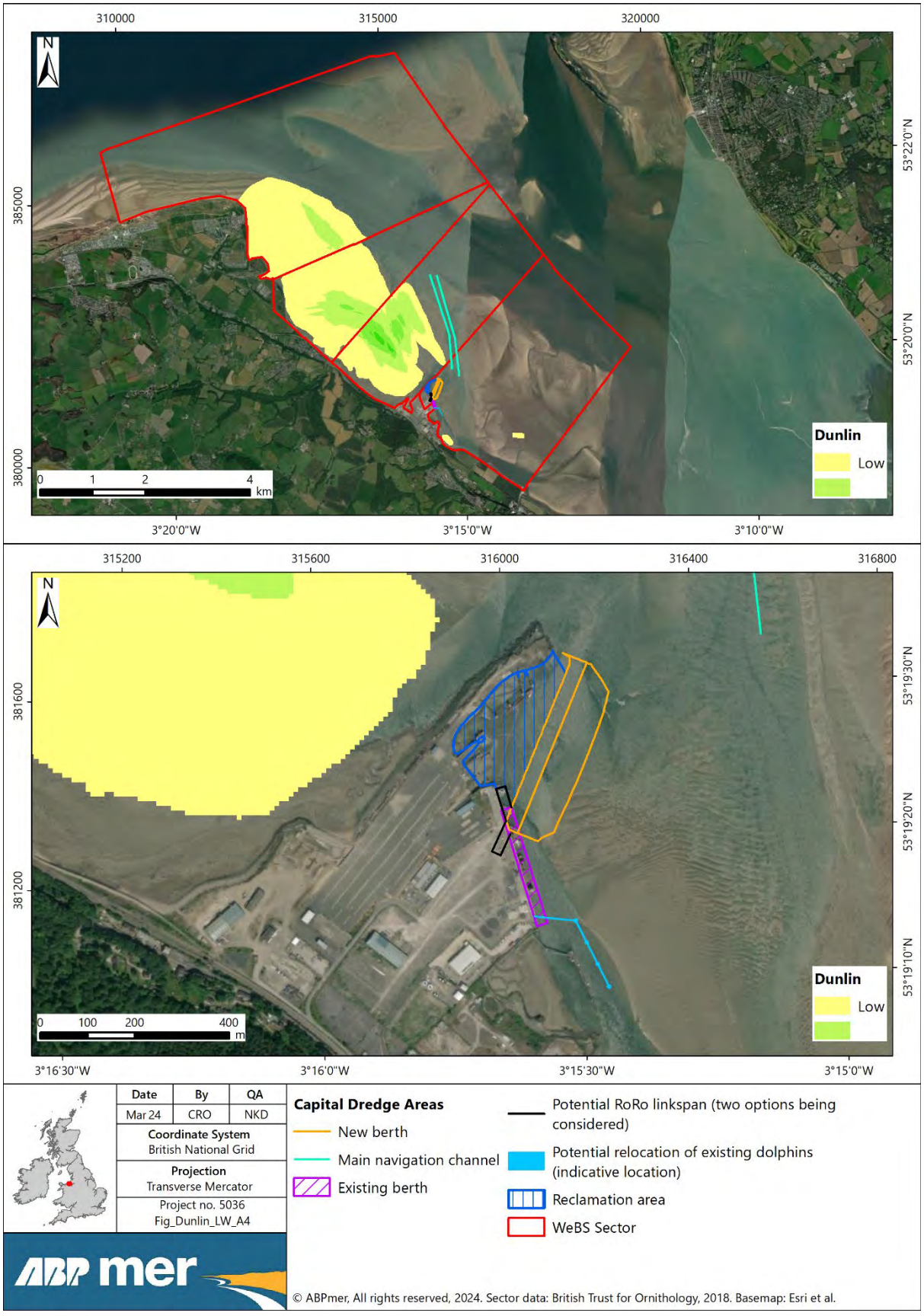


Figure D8. Dunlin LW Count

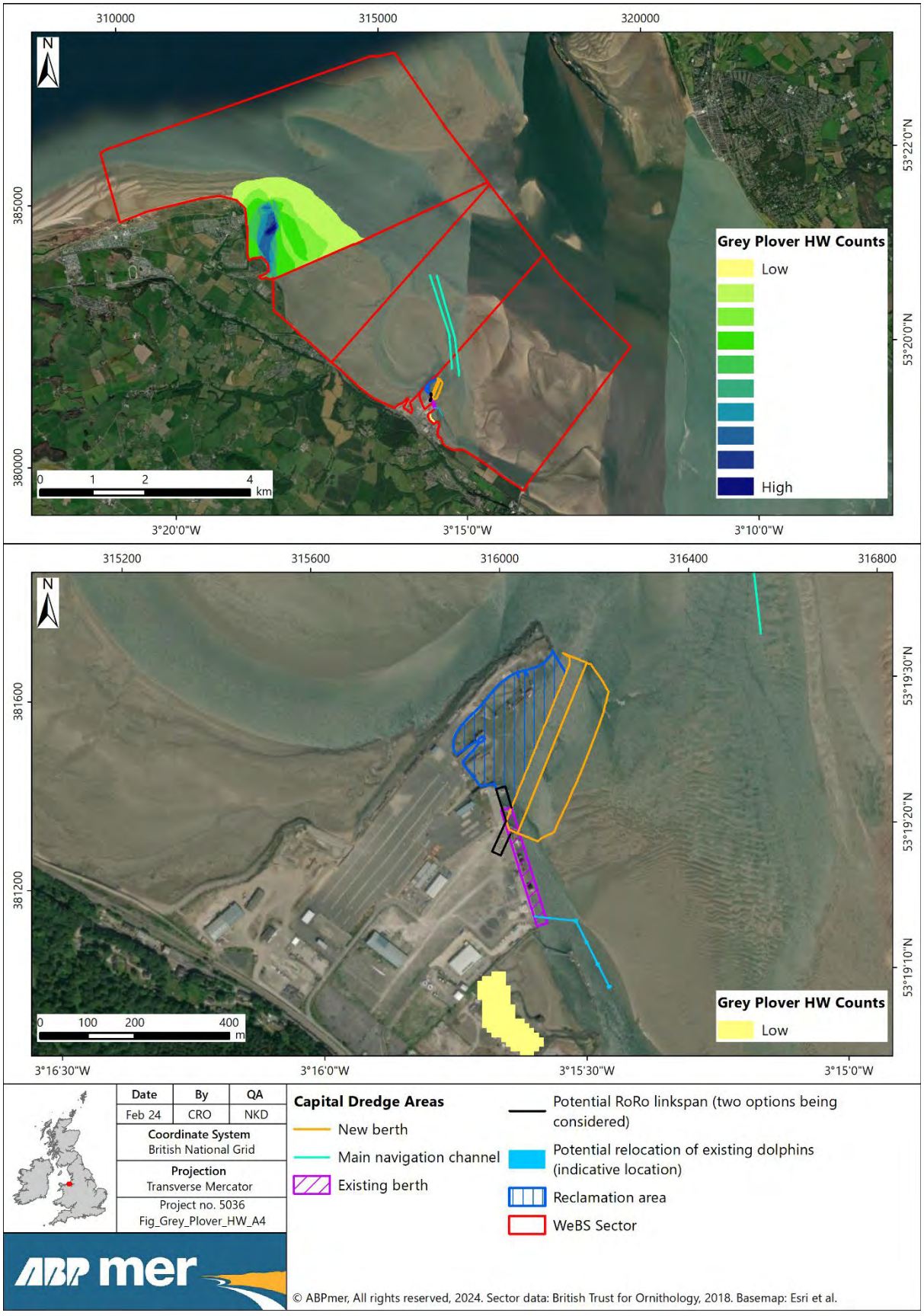


Figure D9. Grey Plover HW Count

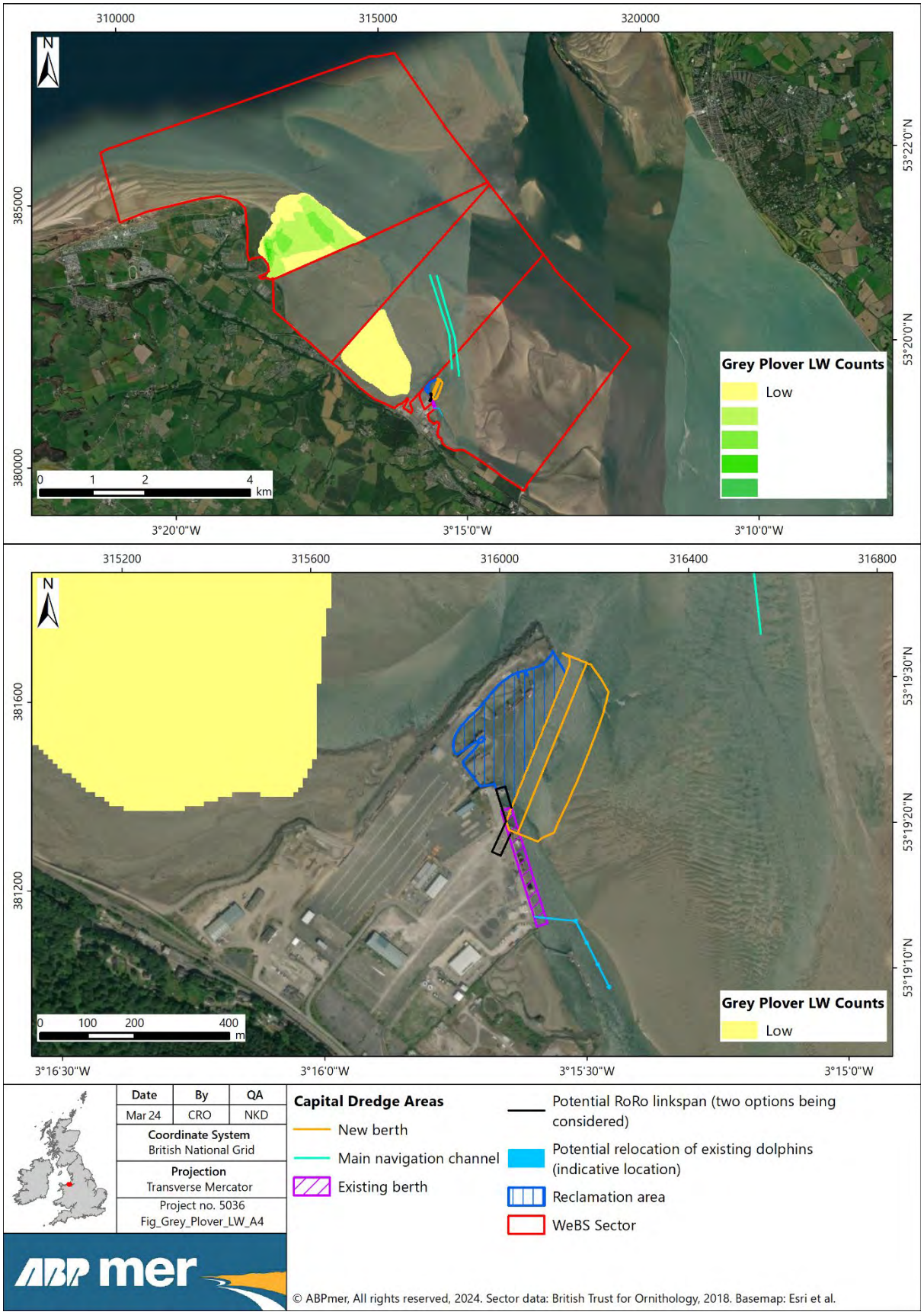


Figure D10. Grey Plover LW Count

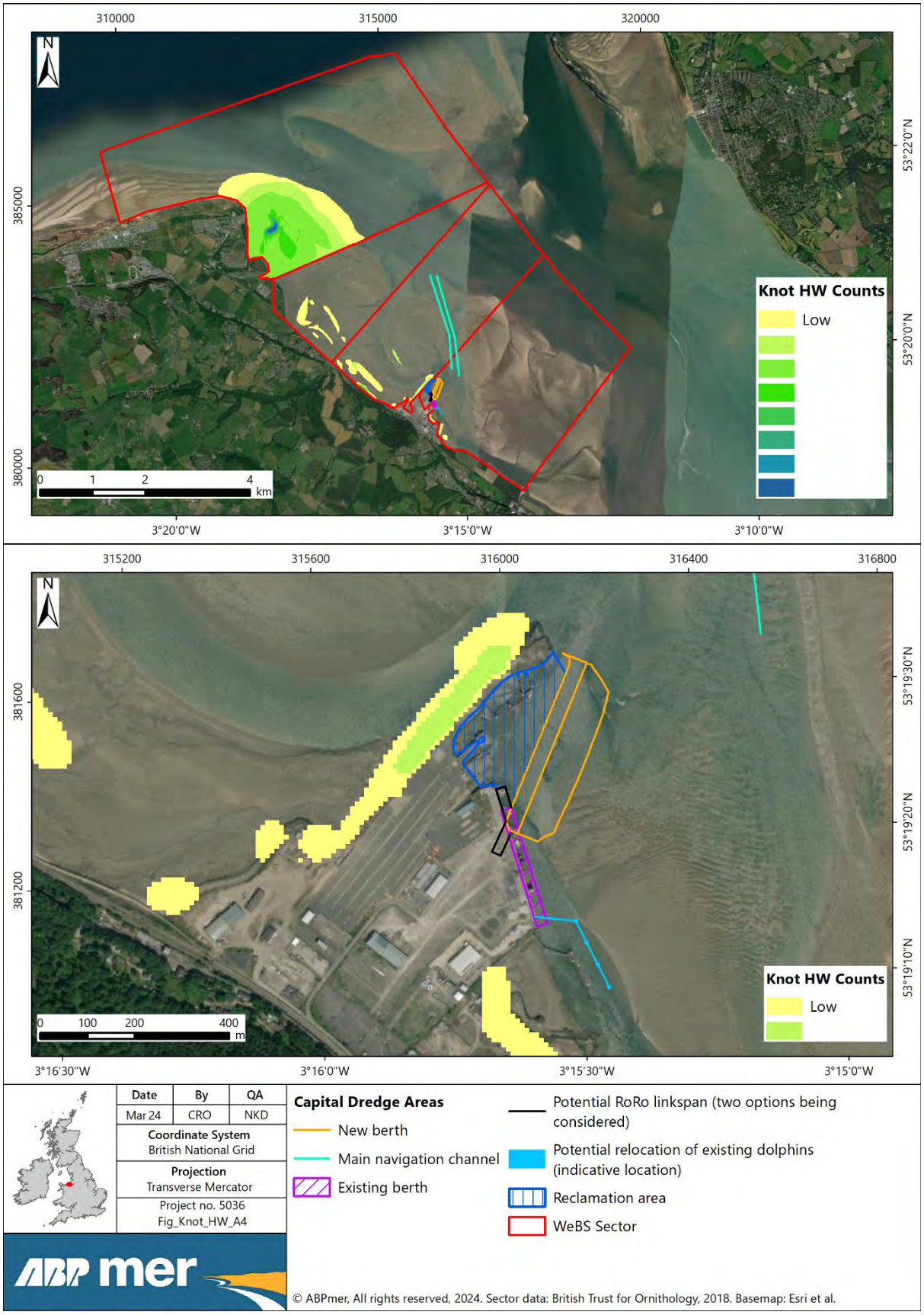


Figure D11. Knot HW Count

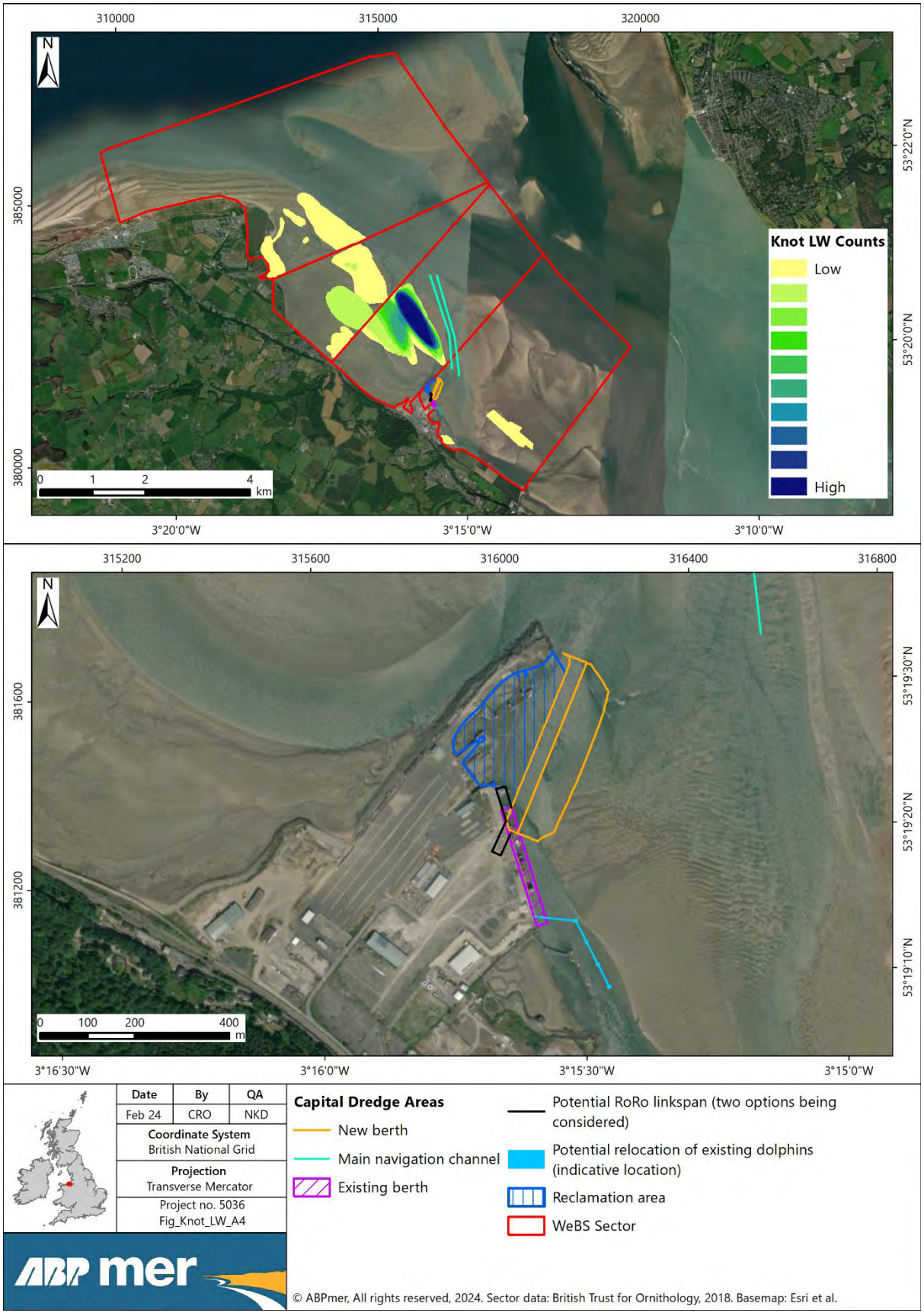


Figure D12. Knot LW Count

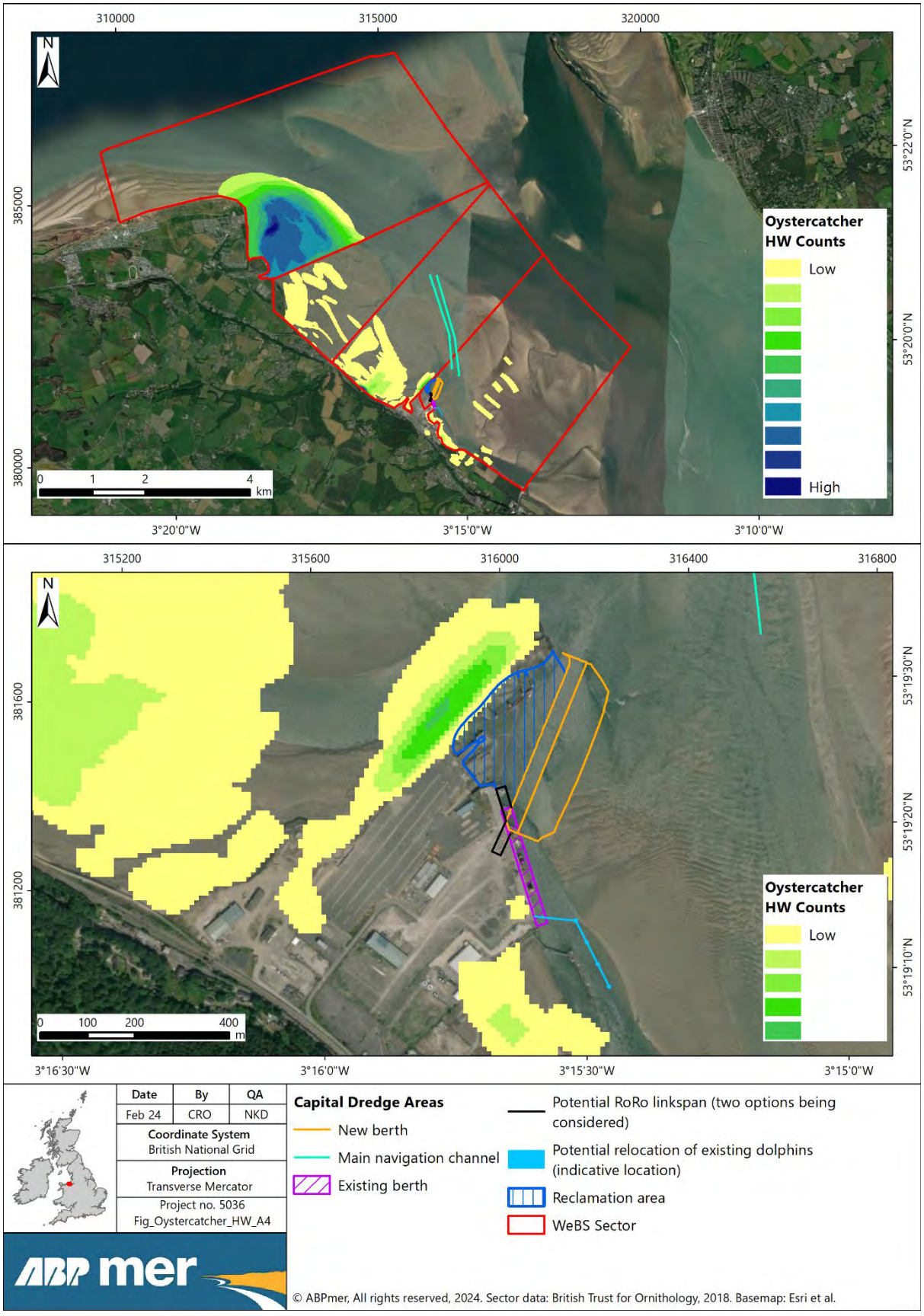


Figure D13. Oystercatcher HW Count

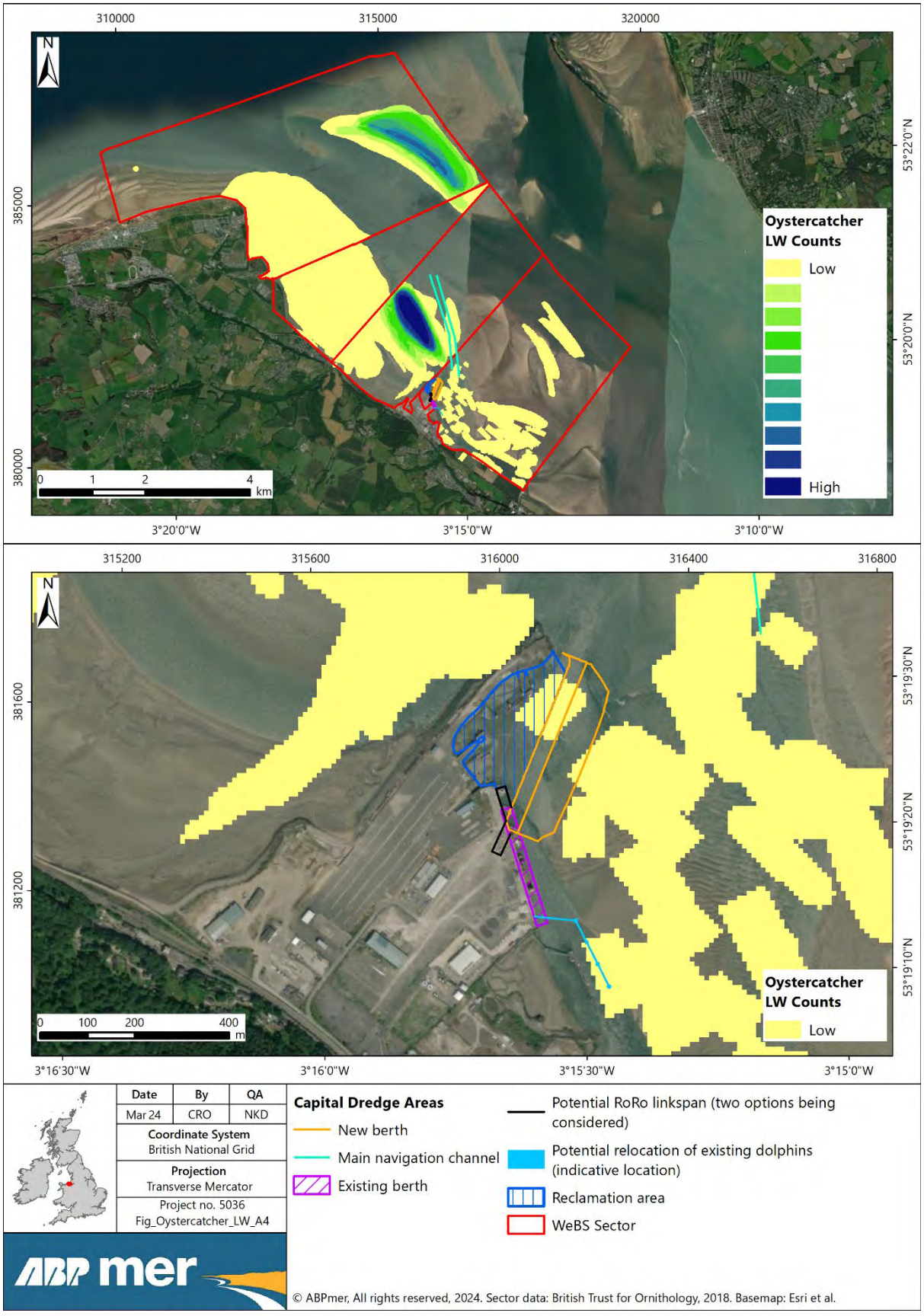


Figure D14. Oystercatcher LW Count

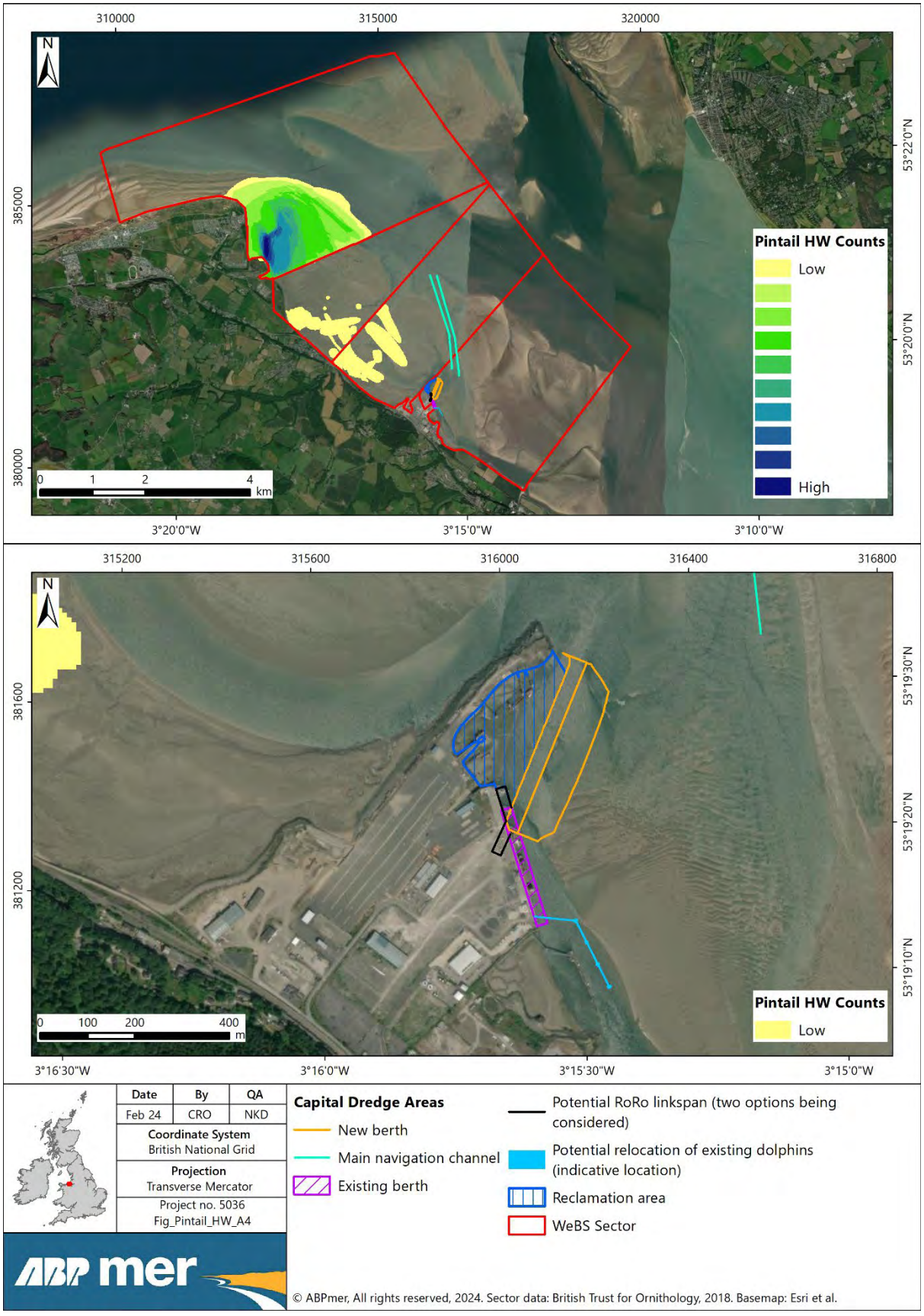


Figure D15. Pintail HW Count

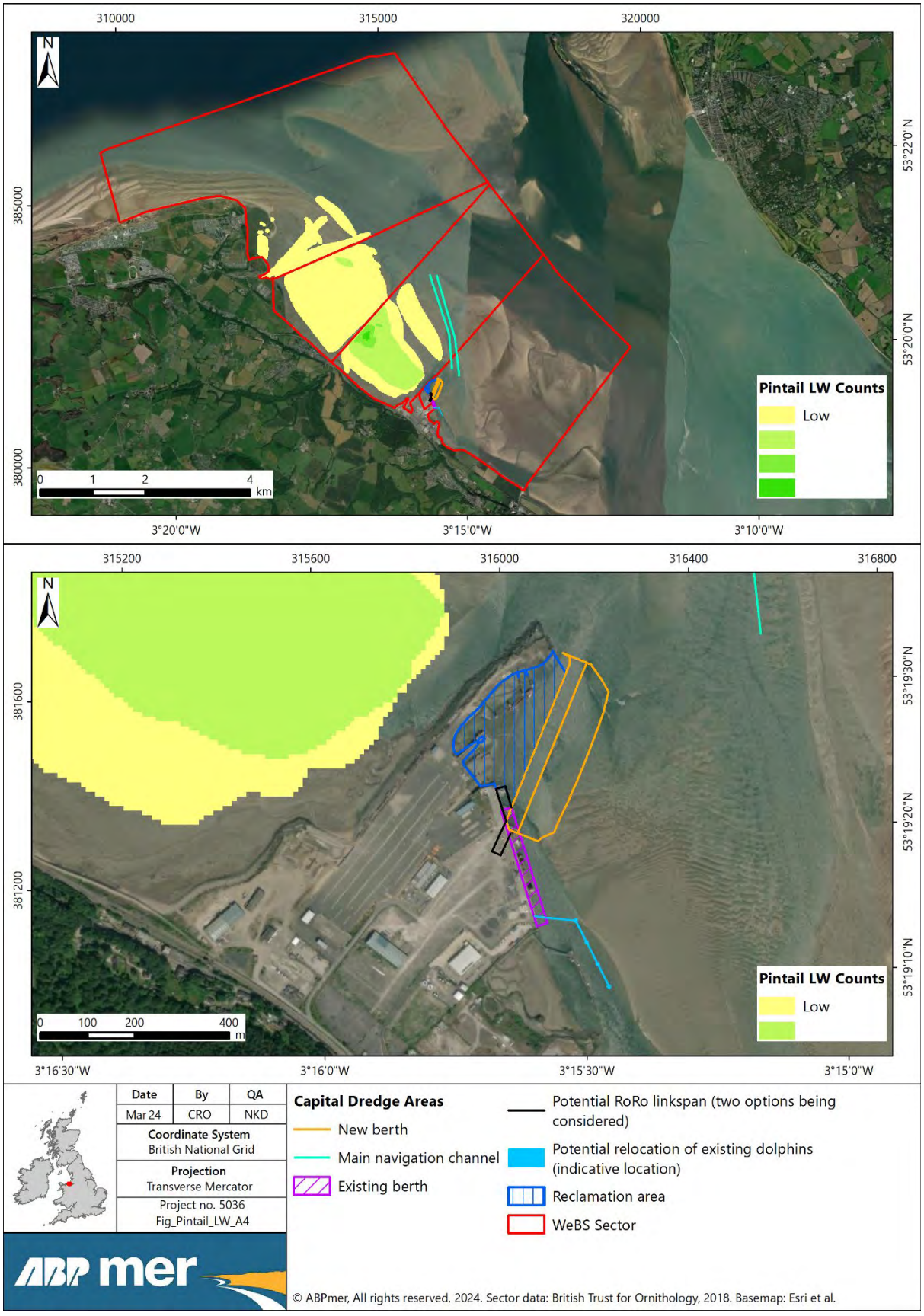


Figure D16. Pintail LW Count

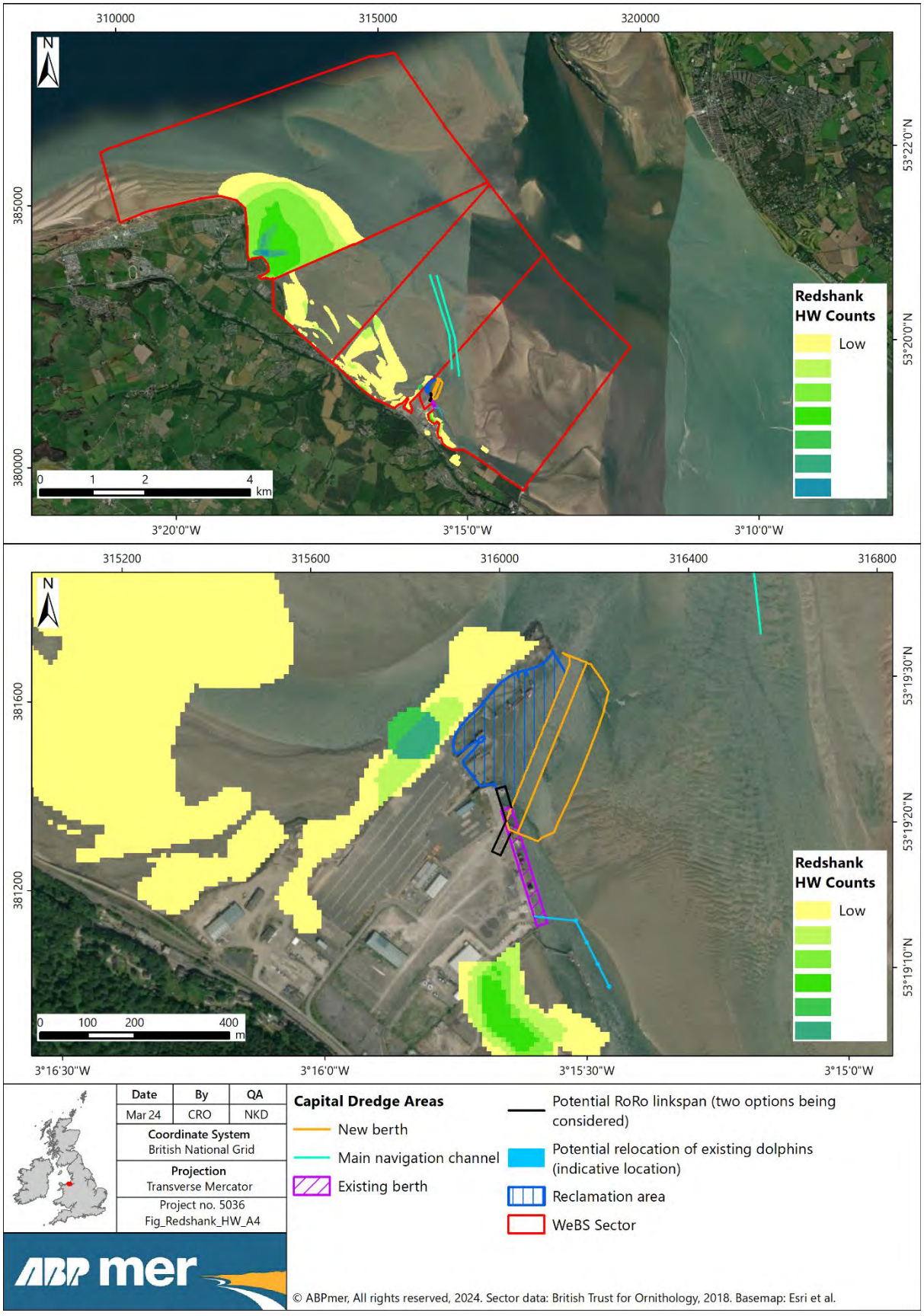


Figure D17. Redshank HW Count

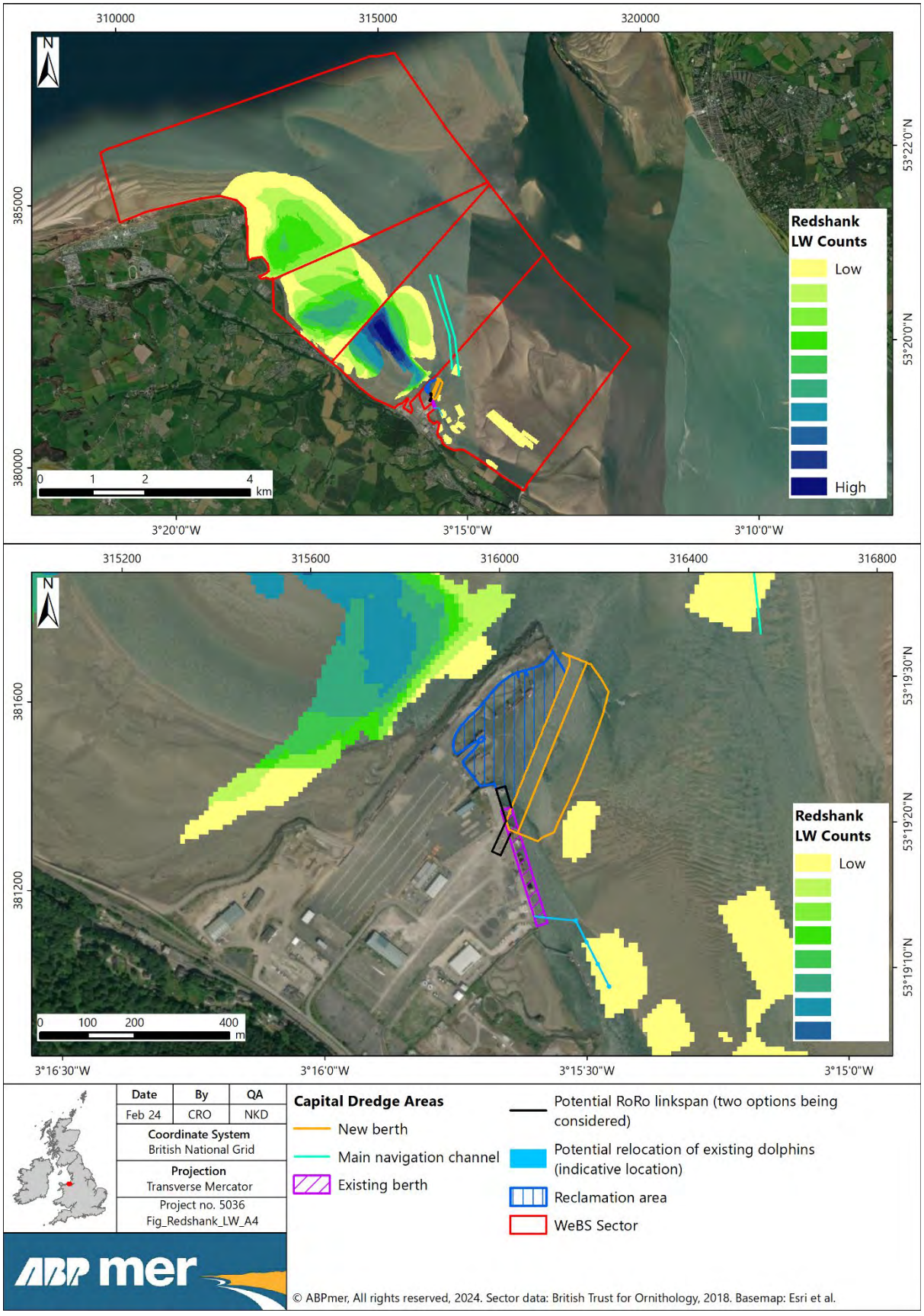


Figure D18. Redshank LW Count

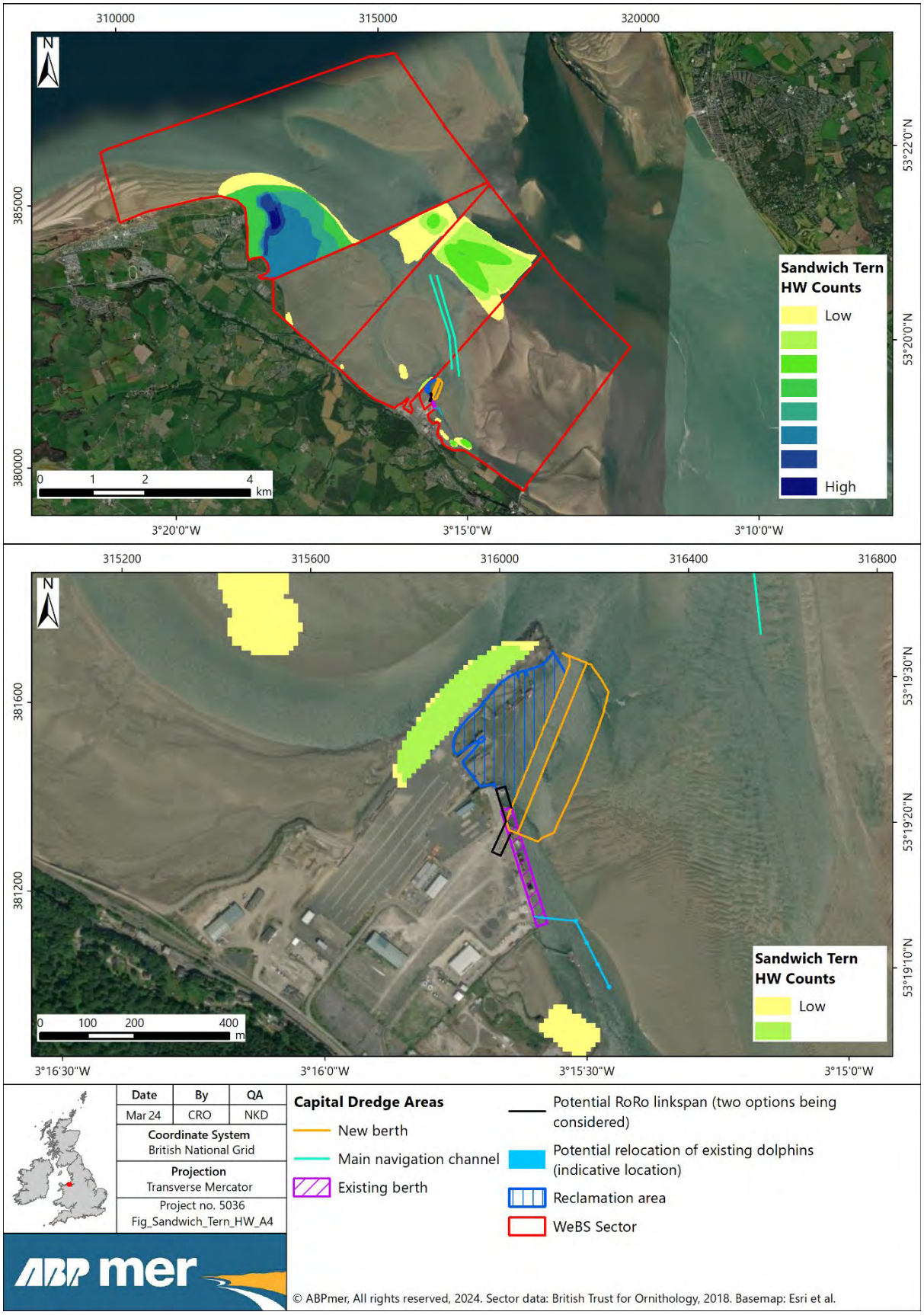


Figure D19. Sandwich HW Count

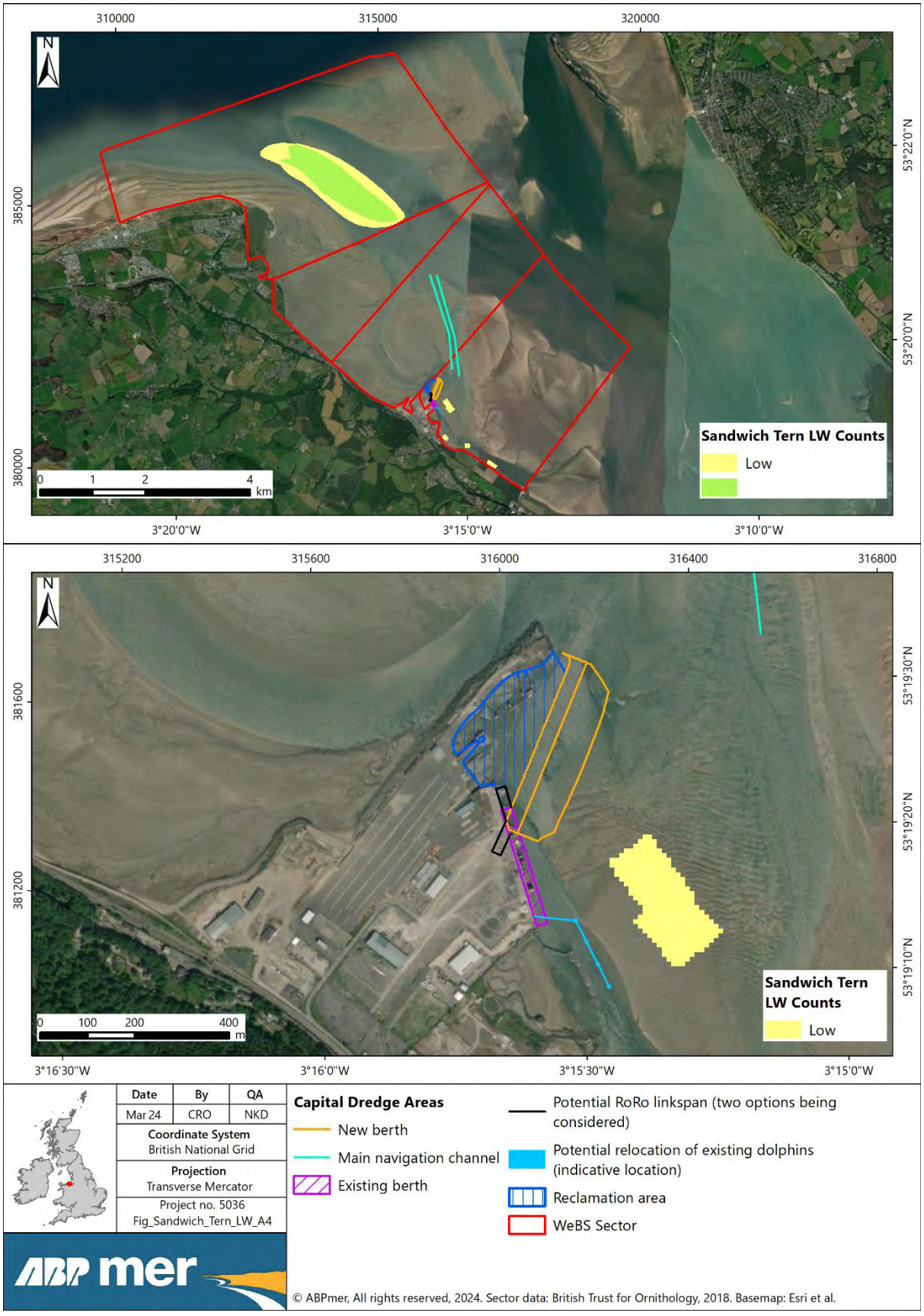


Figure D20. Sandwich LW Count

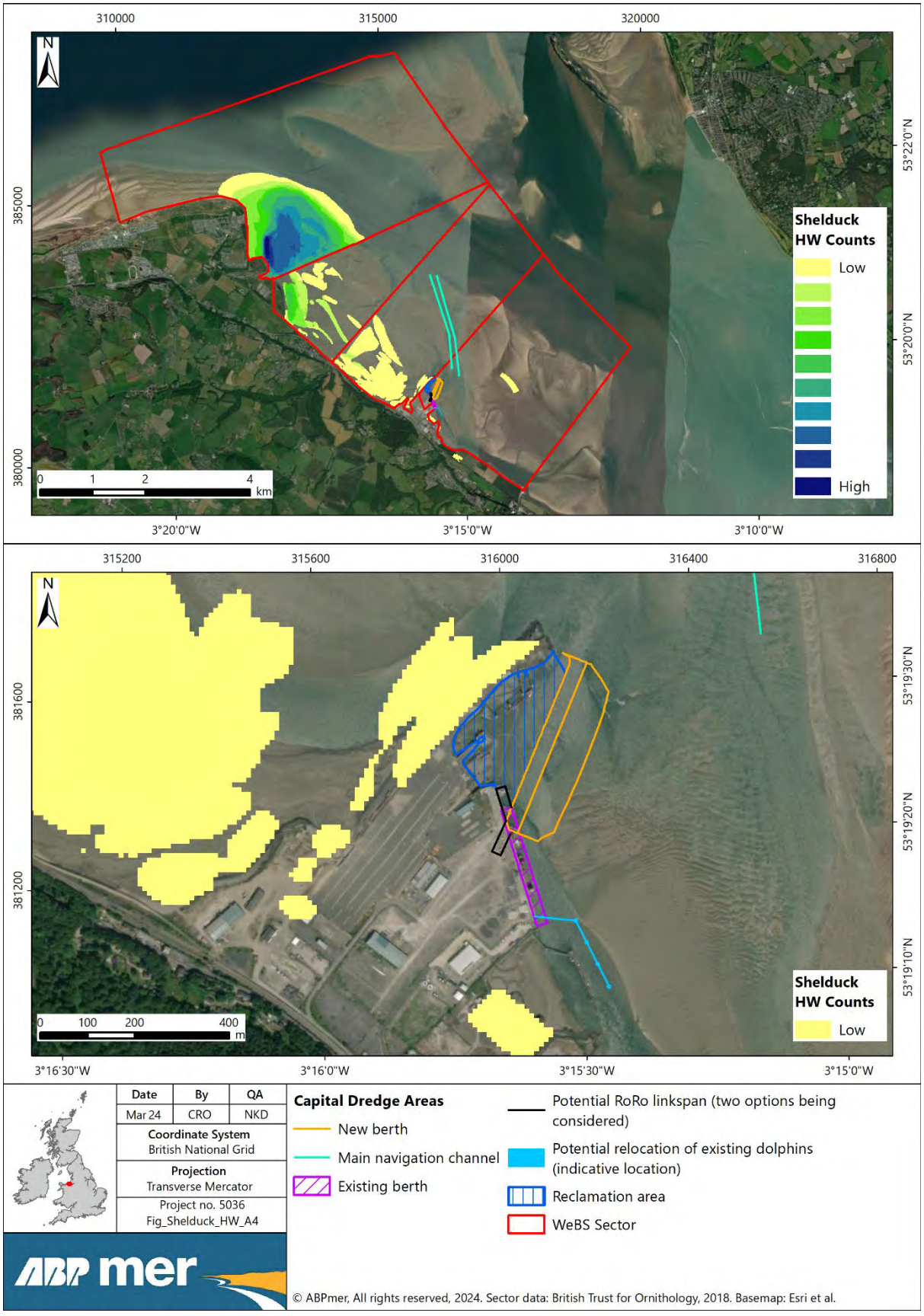


Figure D21. Shelduck HW Count

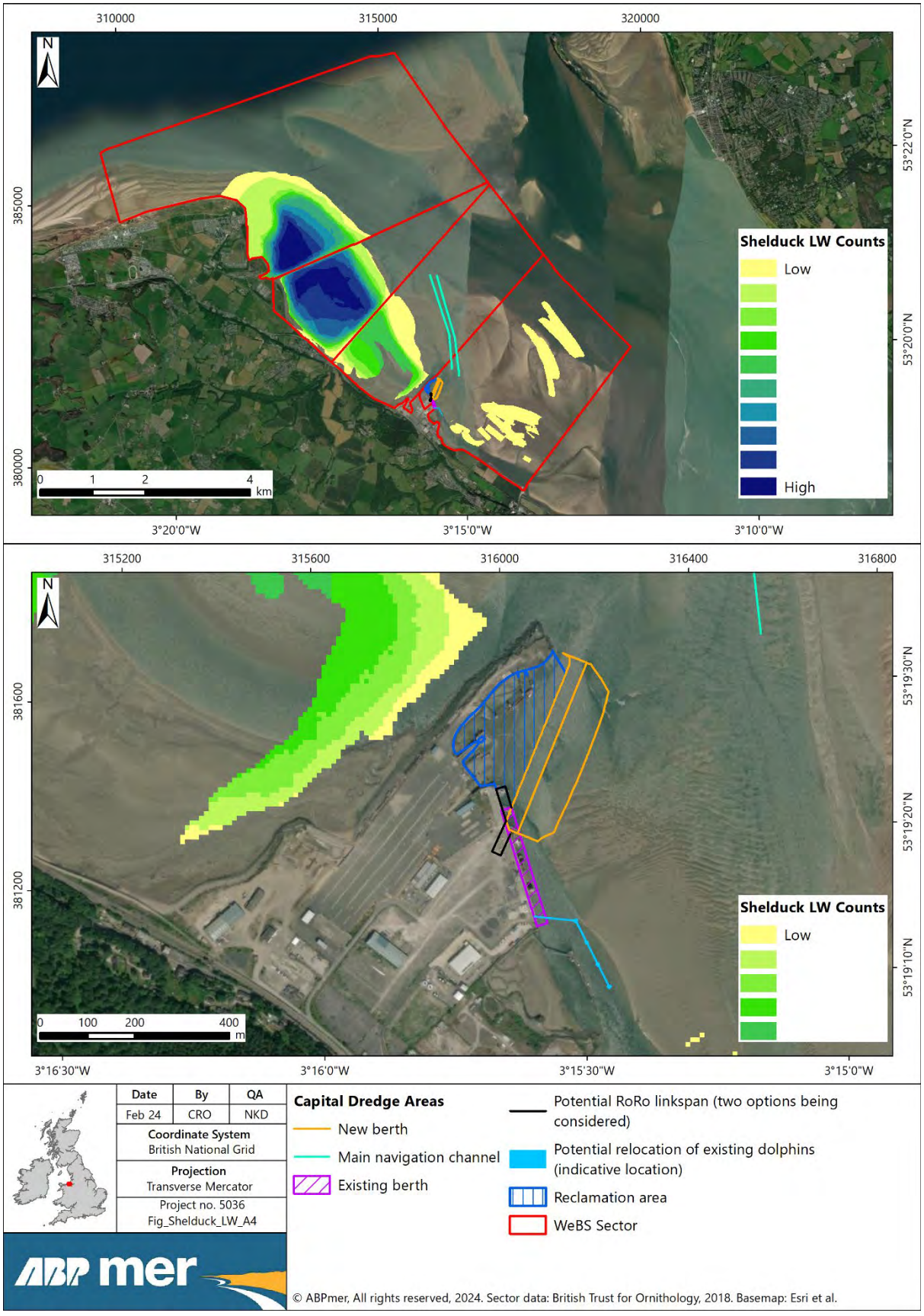


Figure D22. Shelduck LW Count

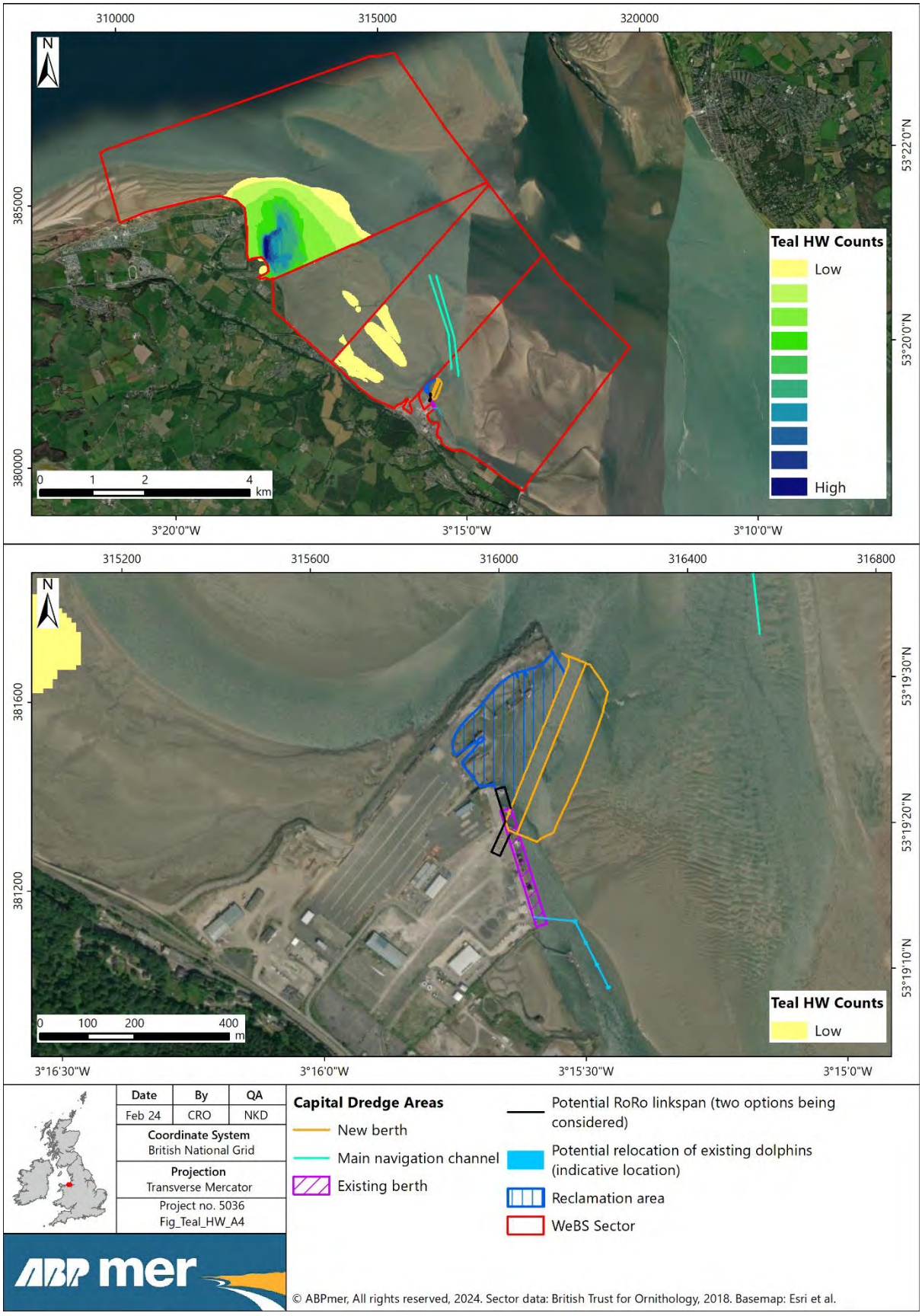


Figure D23. Teal HW Count

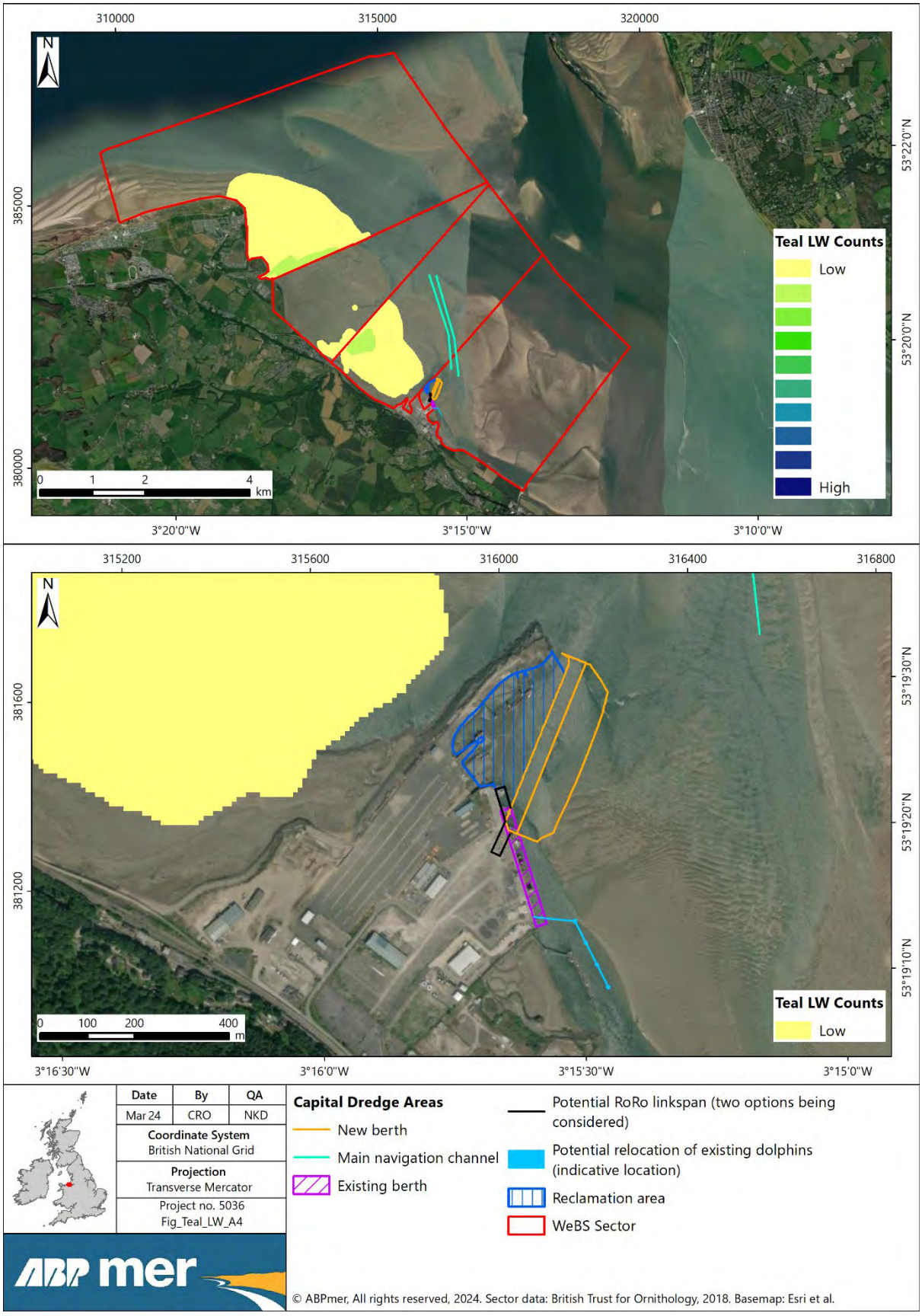


Figure D24. Teal LW Count

E Sound Monitoring Results

Port of Mostyn Monitoring Technical Note

Project Reference: Port of Mostyn
Project number: 60725748

25 March 2024

Delivering a better world

ProjectReference: Port of Mostyn
Project number: 60725748

Quality information

Prepared by	Checked by	Verified by	Approved by
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Revision History

Revision	Revision date	Details	Authorized	Name	Position

Distribution List

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Table of Contents

Figures

Tables

1. Introduction

The Port of Mostyn Limited submitted a Marine Licence application to Natural Resources Wales (NRW) for marine construction and dredge works associated with the Mostyn Energy Park Extension (MEPE) Project (CML2283), Flintshire, North Wales. To aide assessment of potential piling noise impacts on ecological receptors at the Port of Mostyn baseline ambient sound level monitoring has been undertaken over a period of five days, from 01/03/24 to 06/03/24. This has comprised monitoring at one unattended and two attended locations.

2. Sound Monitoring Survey Methodology

2.1 General Methodology

Baseline sound monitoring was carried out to establish the existing sound climate in the area. The monitoring procedures followed guidance from British Standard (BS) 7445-1:2003 'Description and measurement of environmental noise - Part 1: Guide to quantities and procedures' (herein referred to as BS 7445).

Long term unattended sound level measurements were undertaken at one location (LT1), and attended measurements undertaken at a further two locations (ST1 and ST2). The locations can be seen in Appendix A. The attended measurements were taken over the period of one hour each, between 11am and 2pm on 06/03/24, and the unattended was set to record over the period of five days, from 01/03/24 to 06/03/24.

The unattended sound level meter was housed within a weatherproof box with batteries to power the instrument for the measurement duration. Appropriate outdoor all-weather equipment was used on all microphones. Observations were made of existing sound sources at set up and on collection of the sound level meters. Weather data was available from the Port of Mostyn weather station.

2.2 Sound Monitoring Equipment

The equipment used for the baseline sound surveys is set out Table 1, below:

Table 1. Sound Monitoring Equipment

Description	Manufacturer	Type	Serial Number	Locations Used*
Calibrator	Brüel & Kjær	4231	3005464	LT1, ST1, ST2
Sound Level Meter	Rion	NL-52	710387	LT1,
Sound Level Meter	Norsonic	NOR140	1403909	ST1, ST2

**See Section 3 for description of locations*

The above sound monitoring equipment has factory calibration certificates as shown in Appendix D. The sound level meters had their calibration checked in the field before and after conducting measurements. No significant drift was recorded.

2.3 Meteorological Conditions

Periods of rain or of wind speeds greater than 5 m/s were excluded from the analysis of the unattended monitoring location. The wind direction was recorded and measurements at each receptor were subject to a range of wind directions. It was noted that due to the weather conditions at this coastal location, wind noise was impossible to avoid for all measurements, the measurement at ST1 was undertaken with an average wind speed of 8 m/s so the measurement will be wind influenced.

3. Measurement Locations

The sound monitoring locations are summarised below in Table 2. An aerial image of the monitoring locations can be seen in Appendix A and a photographic record of the locations is presented in Appendix C. All monitoring locations were free-field (i.e. >3.5m from all reflecting surfaces other than the ground). All were carried out at a height of approximately 1.5m above local ground level.

Table 2. Sound Monitoring Locations

Location	Description	Approx. British National Grid Coordinates (X,Y)	Measurement Date/Times
LT1	Unattended. Measurement location at the Seaward end of Ro Ro Terminal.	315880, 381517	01/03/24 11:46 to 06/03/24 12:42
ST1	Attended. Measured at the Seaward end of Mostyn Breakwater.	316061, 381702	06/03/24 11:16 to 12:35
ST2	Attended. Measured adjacent to railway wall to the West of the Mostyn Signal Box and Warehouse 3	315326, 381157	06/03/24 13:06 to 14:06

4. Survey Results and Observations

For each location, the ambient and maximum sound level is presented in the tables below. The ambient sound level is calculated over the full measurement period and the maximum sound level is the highest L_{Amax} recorded (after the weather affected data has been excluded). Due to the construction works taking place during the daytime, only the daytime sound levels are presented in the results.

The full sound survey results for each monitoring location are presented in Appendix B.

4.1 LT1

The main sound sources noted at this location were wind and seagulls. Other minor sound sources included objects being moved by gusts of wind, distant planes overhead, and waves hitting the shore.

Table 3. LT1 Results

Time Period	Maximum sound level (L_{Amax} dB)	Ambient sound level ($L_{Aeq,T}$ dB)
Daytime (07:00 to 19:00)	73	44

4.2 ST1

The main sound sources noted at this location were wind, nearby birds, and a dredger boat at the end of the jetty. This measurement was undertaken with an average wind speed of 8 m/s so the measurement will be wind influenced.

Table 4. ST1 Results

Time Period	Maximum sound level (L_{Amax} dB)	Ambient sound level ($L_{Aeq,T}$ dB)
Daytime (07:00 to 19:00)	81	68

4.3 ST2

The main sound sources noted at this location was the nearby road. Sound from four trains passing was also noted at this location. Other sources noticed included a drill from a nearby scaffolding shed, which was very infrequent, and a steel pipe that was dropped close by. Birdsong was also present.

Table 5. ST2 Results

Time Period	Maximum sound level (L_{Amax} dB)	Ambient sound level ($L_{Aeq,T}$ dB)
Daytime (07:00 to 19:00)	78	52

5. References

British Standard (BS) 7445-1:2003 Description and measurement of environmental noise - Part 1: Guide to quantities and procedures

Appendix A Measurement Locations

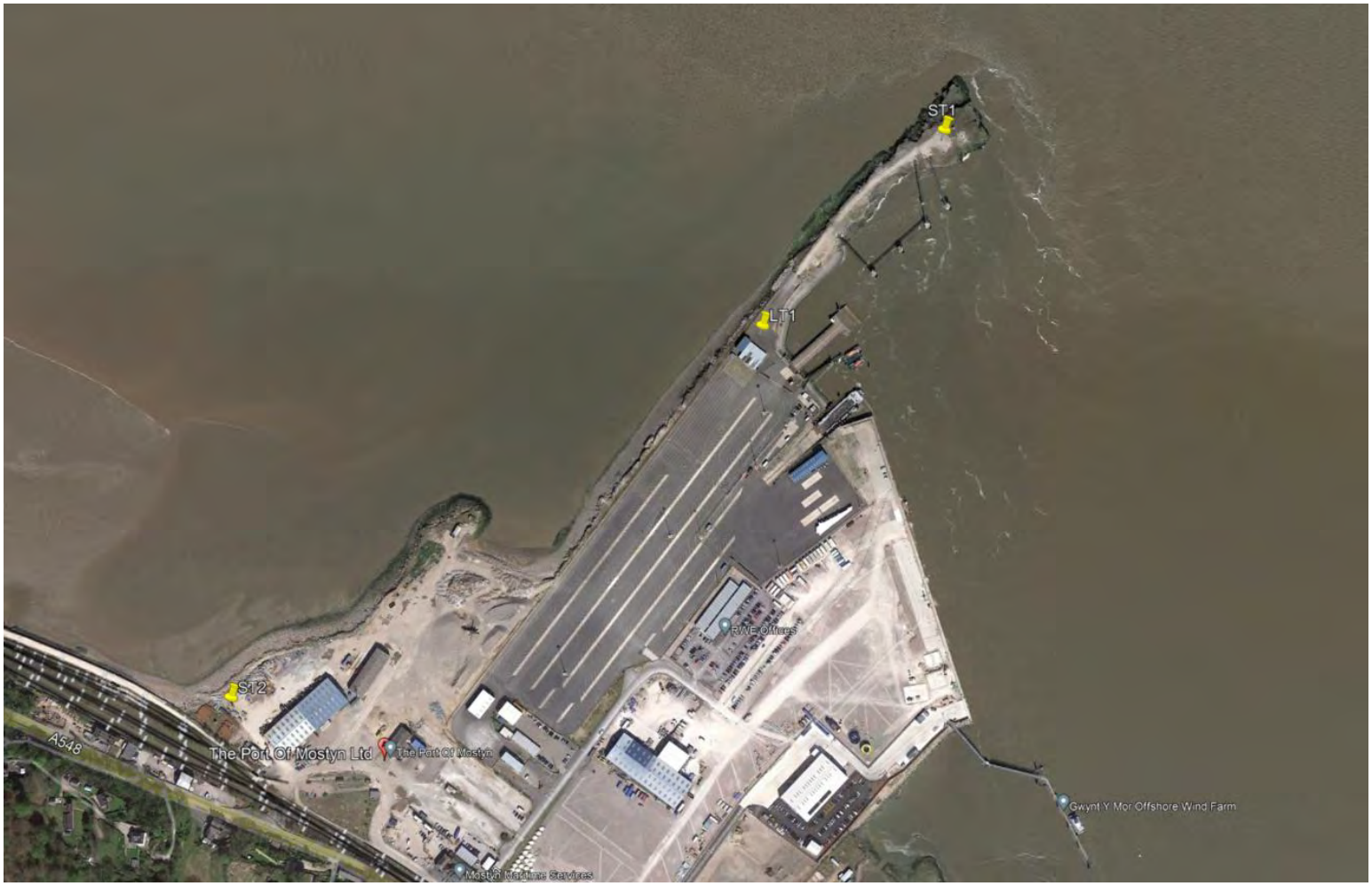

Figure 1 Measurement Locations, LT1, ST1, and ST2.

Appendix B Full Sound Survey Results

B.1 LT1

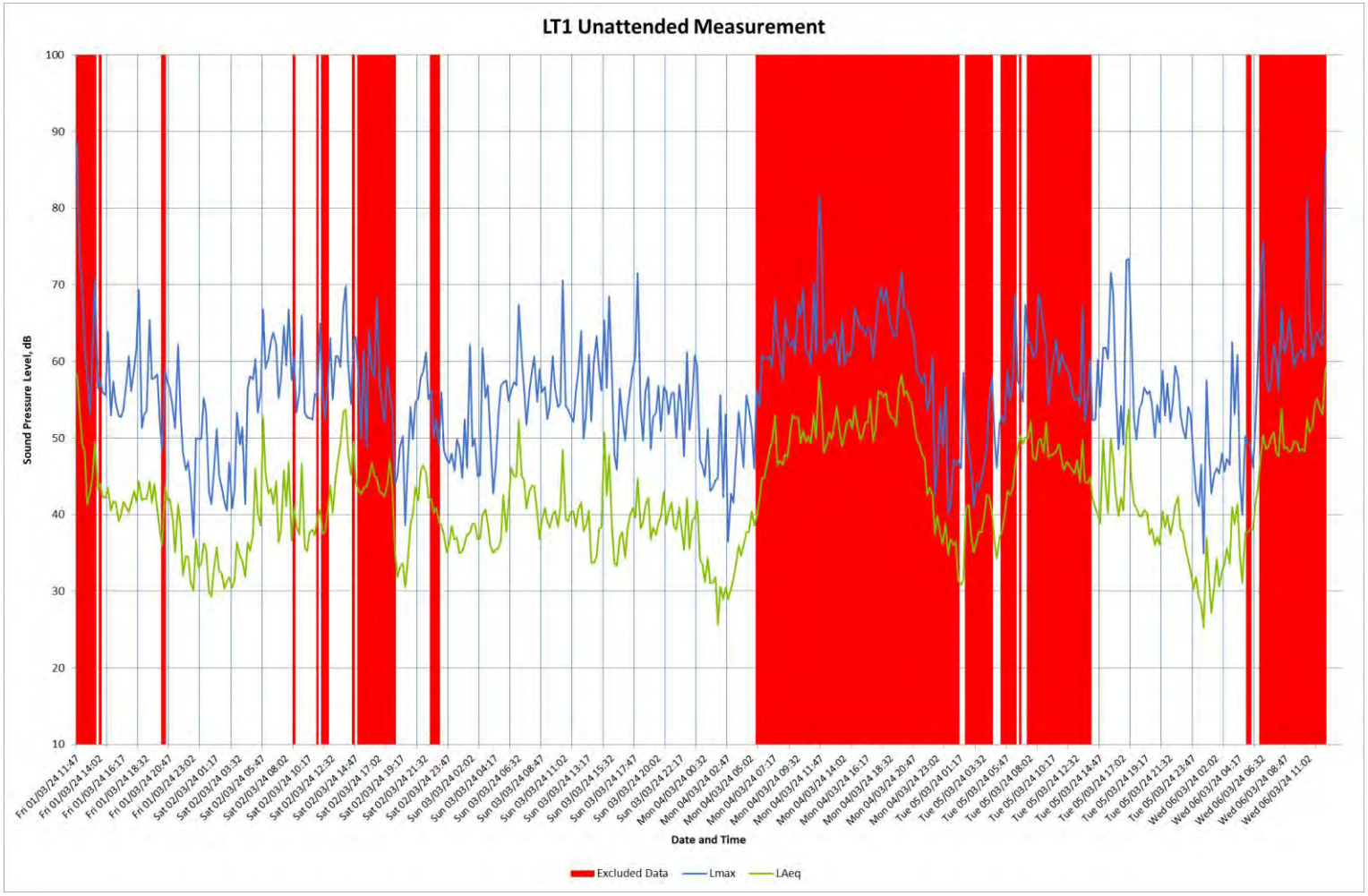

Figure 2 LT1 Sound Survey Results from 01/03/24 to 06/03/24

B.2 ST1

Time	Measurement Duration	Maximum sound level (L_{Amax} dB)	Ambient sound level ($L_{Aeq,T}$ dB)
11:16	15 mins	76	66
11:31	15 mins	79	68
11:46	15 mins	81	70
12:01	15 mins	78	69

B.3 ST2

Time	Measurement Duration	Maximum sound level (L_{Amax} dB)	Ambient sound level ($L_{Aeq,T}$ dB)
11:16	15 mins	70	52
11:31	15 mins	69	51
11:46	15 mins	68	50
12:01	15 mins	78	55

Appendix C Photographic Record

Figure 3 Attended measurement location ST1

Figure 4 Attended measurement location ST2

Figure 5 Unattended measurement location LT1

Appendix D Calibration Certificates

ANV MEASUREMENT SYSTEMS

CERTIFICATE OF CALIBRATION

ilac-MRA UKAS CALIBRATION 0653

Date of Issue: 04 October 2023

Certificate Number: UCRT23/2291

Calibrated at & Certificate issued by:
ANV Measurement Systems
Beaufort Court
17 Roebuck Way
Milton Keynes MK5 8HL
Telephone 01908 642846 Fax 01908 642814
E-Mail: info@noise-and-vibration.co.uk
Web: www.noise-and-vibration.co.uk
Acoustics Noise and Vibration Ltd trading as ANV Measurement Systems

Page 1 of 2 Pages

Approved Signatory

K. Mistry

Customer	AECOM Limited Floor 4 100 Embankment East Tower Cathedral Approach Salford Manchester, M3 7FB
Order No.	713192
Test Procedure	Procedure TP 1 Calibration of Sound Calibrators
Description	Acoustic Calibrator

Identification	*Manufacturer*	*Instrument*	*Model*	*Serial No.*
	Brüel & Kjær	Calibrator	4231	3005464

The calibrator has been tested as specified in Annex B of IEC 60942:2003. As public evidence was available from a testing organisation (PTB) responsible for approving the results of pattern evaluation tests, to demonstrate that the model of sound calibrator fully conformed to the requirements for pattern evaluation described in Annex A of IEC 60942:2003, the sound calibrator tested is considered to conform to all the class 1 requirements of IEC 60942:2003.

ANV Job No.	UKAS23/10681	
Date Received	02 October 2023	
Date Calibrated	04 October 2023	
Previous Certificate	*Dated*	09 December 2022
	Certificate No.	UCRT22/2452
	Laboratory	0653

CERTIFICATE OF CALIBRATION	Certificate Number UCRT23/2291
UKAS Accredited Calibration Laboratory No. 0653	Page 2 of 2 Pages

Measurements

The sound pressure level generated by the calibrator in its WS2 configuration was measured five times by the Insert Voltage Method using a microphone as detailed below. The mean of the results obtained is shown below. It is corrected to the standard atmospheric pressure of 101.3 kPa (1013 mBar) using original manufacturers information.

Test Microphone	*Manufacturer*	*Type*
	Brüel & Kjær	4134

Results

The level of the calibrator output under the conditions outlined above was

94.10 ± 0.10 dB rel 20 µPa
114.12 ± 0.10 dB rel 20 µPa

Functional Tests and Observations

The frequency at	94 dB	999.99	±	0.12 Hz
The frequency at	114 dB	999.99	±	0.12 Hz
The total distortion at	94 dB	0.26	±	0.03 % Distortion
The total distortion at	114 dB	0.36	±	0.04 % Distortion

During the measurements environmental conditions were

Temperature	23	to	24	°C
Relative Humidity	34	to	40	%
Barometric Pressure	101.5	to	101.6	kPa

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2, providing a coverage probability of approximately 95%. The uncertainty evaluation has been carried out in accordance with UKAS requirements.

The uncertainties refer to the measured values only with no account being taken of the ability of the instrument to maintain its calibration.

A small correction factor may need to be applied to the sound pressure level quoted above if the device is used to calibrate a sound level meter which is fitted with a free-field response microphone. See manufacturers handbook for details.

..... END .....

Note:

Calibrator adjusted prior to calibration?	NO	
Initial Level 1	N/A	dB
Initial Level 2	N/A	dB
Initial Frequency	N/A	Hz

Additional Comments The results on this certificate only relate to the items calibrated as identified above.
None

Calibrated by: K. Zablocki R 1

CERTIFICATE OF CALIBRATION

0653

Date of Issue: 22 December 2023 **Certificate Number: UCRT23/2618**

Calibrated at & Certificate issued by:
ANV Measurement Systems
Beaufort Court
17 Roebuck Way
Milton Keynes MK5 8HL
Telephone 01908 642846 Fax 01908 642814
E-Mail: info@noise-and-vibration.co.uk
Web: www.noise-and-vibration.co.uk
Acoustics Noise and Vibration Ltd trading as ANV Measurement Systems

Page 1 of 2 Pages

Approved Signatory

K. Mistry

Customer	AECOM Limited 100 Embankment Level 4 Manchester M3 7FB
Order No.	1627338
Description	Sound Level Meter / Pre-amp / Microphone / Associated Calibrator

Identification	*Manufacturer*	*Instrument*	*Type*	*Serial No. / Version*
	Rion	Sound Level Meter	NL-52	00710387
	Rion	Firmware		2.1
	Rion	Pre Amplifier	NH-25	10930
	Rion	Microphone	UC-59	19663
	Rion	Calibrator	NC-75	34334830
		Calibrator adaptor type if applicable		NC-75-022

Performance Class	1
Test Procedure	TP 10. SLM 61672-3:2013
	Procedures from IEC 61672-3:2013 were used to perform the periodic tests.
Type Approved to IEC 61672-1:2013	Yes
	If YES above there is public evidence that the SLM has successfully completed the applicable pattern evaluation tests of IEC 61672-2:2013
Date Received	19 December 2023 ANV Job No. UKAS23/12859
Date Calibrated	22 December 2023

The sound level meter submitted for testing has successfully completed the periodic tests of IEC 61672-3:2013, for the environmental conditions under which the tests were performed. As evidence was publicly available, from an independent testing organisation responsible for approving the results of pattern-evaluation tests performed in accordance with IEC 61672-2:2013, to demonstrate that the model of sound level meter fully conformed to the class 1 specifications in IEC 61672-1:2013, the sound level meter submitted for testing conforms to the class 1 specifications of IEC 61672-1:2013.

Previous Certificate	*Dated*	*Certificate No.*	*Laboratory*
	Initial Calibration		

CERTIFICATE OF CALIBRATION

UKAS Accredited Calibration Laboratory No. 0653

Certificate Number
UCRT23/2618

Page 2 of 2 Pages

Sound Level Meter Instruction manual and data used to adjust the sound levels indicated.

SLM instruction manual title	NL-52/NL-42 Description for IEC 61672-1		
SLM instruction manual ref / issue	No. 56034 21-03	Source	Rion
Date provided or internet download date	19 March 2021		

	Case Corrections	Wind Shield Corrections	Mic Pressure to Free Field Corrections
Uncertainties provided	Yes	Yes	Yes

Total expanded uncertainties within the requirements of IEC 61672-1:2013	YES		
Specified or equivalent Calibrator	Specified		
Customer or Lab Calibrator	Lab Calibrator		
Calibrator adaptor type if applicable	NC-75-022		
Calibrator cal. date	18 December 2023		
Calibrator cert. number	UCRT23/2596		
Calibrator cal cert issued by Lab	0653		
Calibrator SPL @ STP	94.01	dB	Calibration reference sound pressure level
Calibrator frequency	1000.00	Hz	Calibration check frequency
Reference level range	Single	dB	

Accessories used or corrected for during calibration - None

Environmental conditions during tests	Start	End	
Temperature	23.08	23.03	± 0.30 °C
Humidity	44.3	44.3	± 3.00 %RH
Ambient Pressure	100.13	100.13	± 0.03 kPa

Indication at the Calibration Check Frequency				
Initial indicated level	94.1	dB	Adjusted indicated level	94.0 dB
Uncertainty of calibrator used for Indication at the Calibration Check Frequency ±				0.10 dB

Self Generated Noise

Microphone installed - Less Than 18.4 dB A Weighting

Microphone replaced with electrical input device - UR = Under Range indicated

Weighting	A			C			Z		
	12.3	dB	UR	17.1	dB	UR	24.2	dB	UR

Self Generated Noise reported for information only and not used to assess conformance to a requirement

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor *k* =2, providing a coverage probability of approximately 95%. The uncertainty evaluation has been carried out in accordance with UKAS requirements.

Additional Comments The results on this certificate only relate to the items calibrated as identified above.

None

END

Calibrated by: B. Bogdan

R 2

CERTIFICATE OF CALIBRATION

0653

Date of Issue: 05 February 2024

Certificate Number: UCRT24/1192

Calibrated at & Certificate issued by:
ANV Measurement Systems
Beaufort Court
17 Roebuck Way
Milton Keynes MK5 8HL
Telephone 01908 642846 Fax 01908 642814
E-Mail: info@noise-and-vibration.co.uk
Web: www.noise-and-vibration.co.uk
Acoustics Noise and Vibration Ltd trading as ANV Measurement Systems

Page 1 of 3 Pages

Approved Signatory

K. Mistry

CUSTOMER	AECOM Limited 100 Embankment East Tower Level 4 Cathedral Approach Salford Manchester M3 7FB
ORDER No	1633417 Job No UKAS24/02095
DATE OF RECEIPT	01 February 2024
PROCEDURE	Calibration Engineer's Handbook, section 25: periodic testing of sound level meters to IEC 61672-3:2006 (BS EN 61672-3:2006) as modified by UKAS TPS 49
IDENTIFICATION	Sound level meter Norsonic type 140 serial No 1403909 connected via a preamplifier type 1209 serial No 13283 to a half-inch microphone type GRAS 40AF serial No 102590.
CALIBRATED ON	05 February 2024
PREVIOUS CALIBRATION	Calibrated on 19 January 2022, Certificate No. UCRT22/1085 issued by this laboratory.

CERTIFICATE OF CALIBRATION

UKAS ACCREDITED CALIBRATION LABORATORY No 0653

Certificate No UCRT24/1192

The sound level meter was set up using a type 4231 sound calibrator supplied by the laboratory; it was set to frequency weighting A, and initially read 114.3 dB. It was then adjusted to read 114.0 dB (corresponding to 114.0 dB at standard atmospheric pressure). This reading was derived from the certified output level of the calibrator and manufacturers' information on the free-field response of the sound level meter. The calibration check frequency was 1kHz. The final microphone sensitivity calculated and stored by the meter was -25.6 dB.

Procedures from IEC 61672-3:2006 (BS EN 61672-3:2006) as modified by UKAS TPS 49 were used to perform the periodic tests.

RESULTS

The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2006 (BS EN 61672-3:2006), for the environmental conditions under which the tests were performed. However, no general statement or conclusion can be made about conformance of the sound level meter to the full requirements of IEC 61672-1 : 2002 (BS EN 61672-1 : 2003) because evidence was not publicly available, from an independent testing organization responsible for pattern approvals, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1 : 2002 (BS EN 61672-1 : 2003) and because the periodic tests of IEC 61672-3:2006 (BS EN 61672-3:2006) cover only a limited subset of the specifications in IEC 61672-1 : 2002 (BS EN 61672-1 : 2003).

The self-generated noise recorded with the microphone replaced by the electrical input device was:

8.4 dB (A) 11.0 dB (C) 22.3 dB (Z, normal) 40.1 dB (Z, wide)

No expected maximum noise level has been published for Z (wide) weighting.

The environmental conditions recorded at the start and end of testing were:

Start: 22 to 23 ºC, 41 to 51 %RH and 100.8 to 100.9 kPa
End: 22 to 23 ºC, 41 to 51 %RH and 100.6 to 100.7 kPa

Technical information including adjustment data specified in the manufacturers' User Guide dated August 2007 and additional manufacturer's information has been used to carry out this verification. No information on the uncertainty of measurement, required by 11.7 of IEC 61672-3:2006 (BS EN 61672-3:2006), of the adjustment data given in the instruction manual was made available by the manufacturer. The uncertainty of measurement of the adjustment data has therefore been assumed to be numerically zero for the purpose of this periodic test. If these uncertainties are not actually zero, there is a possibility that the frequency response of the sound level meter may not conform to the requirements of IEC 61672-1:2002 (BS EN 61672-1:2003).

No publicly-available evidence has been found that the Norsonic 140 sound level meter design has successfully undergone pattern evaluation in accordance with IEC 61672-2:2002 (BS EN 61672-2:2003) by an independent testing organisation responsible for pattern approvals. It has therefore been tested as a Class 1 instrument in accordance with the manufacturer's claims.

All measurement data are held at ANV Measurement Systems for a period of at least six years.

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor *k*=2, providing a coverage probability of approximately 95%. The uncertainty evaluation has been carried out in accordance with UKAS requirements.

CERTIFICATE OF CALIBRATION

UKAS ACCREDITED CALIBRATION LABORATORY No 0653

Certificate No UCRT24/1192

Page 3 of 3 Pages

NOTES

Any opinions or interpretations which may be expressed in the following notes are not UKAS Accredited.

1 The instrument was running firmware version 1.4.6190

2 It should be noted that the meter is not equipped with an under-range indicator, and care should therefore be taken to restrict measurements to the linearity ranges specified in the User Guide.

3 The correction filters were set as follows during testing:

	Random	Windscreen	Preamp	Self-noise
Status	OFF	OFF	ON	N/A
Screen marker			G	

4 As received, the random incidence correction filter was found to be switched on. It was switched off for the purposes of this verification

5 Typical case reflection factors specified by the manufacturer have been used for this verification.

6 No suitable microphone frequency response information was supplied with the instrument. It was therefore measured by this laboratory using the electrostatic actuator method. This response in isolation is not UKAS accredited.

The results on this certificate only relate to the items calibrated as identified above.

END

CERTIFICATE OF CALIBRATION

0653

Date of Issue: 05 February 2024

Certificate Number: UCRT24/1194

Calibrated at & Certificate issued by:
ANV Measurement Systems
Beaufort Court
17 Roebuck Way
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Telephone 01908 642846 Fax 01908 642814
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Web: www.noise-and-vibration.co.uk
Acoustics Noise and Vibration Ltd trading as ANV Measurement Systems

Page 1 of 5 Pages

Approved Signatory

K. Mistry

CUSTOMER	AECOM Limited 100 Embankment East Tower Level 4 Cathedral Approach Salford Manchester M3 7FB
ORDER No	1633417
Job No	UKAS24/02095
DATE OF RECEIPT	01 February 2024
PROCEDURE	Procedure TP 9 - Calibration of Filters

IDENTIFICATION	*Manufacturer*	*Model*	*Serial No*
Filters in sound level meter	Norsonic	140	1403909

CALIBRATED ON	05 February 2024
PREVIOUS CALIBRATION	Calibrated on 19 January 2022 Certificate No. UCRT22/1086 issued by this laboratory.

CERTIFICATE OF CALIBRATION

UKAS ACCREDITED CALIBRATION LABORATORY No 0653

Certificate N° UCRT24/1194

The sound level meter was calibrated in accordance with the manufacturer's instructions, using an appropriate sound level calibrator, prior to measurements being carried out on the filters. The sound level meter has also undergone a full verification procedure, see certificate UCRT24/1192 issued by this laboratory. The manufacturer claims that the filters were designed in accordance with the Class 1 third octave requirements of IEC 61260:1995, and these tolerances are given with the results in this certificate. Base 10 test frequencies have been used throughout the filter calibration, in accordance with manufacturers' information.

Inter-band level accuracy test

The meter was set to the single measurement range and the 1 kHz third octave filter was selected. A 1 kHz sinusoidal signal was then injected and adjusted to give a reading of 114.0 dB. Following this each filter band was selected in turn, the signal frequency was adjusted to the centre-frequency of the filter, and the sound level meter reading relative to that for the 1 kHz band was noted. A similar test was carried out for the Z setting using a 1 kHz signal.

As the tolerance at the centre frequency in each band is ± 0.3 dB , it is expected (but not explicitly required in IEC 61260:1995), that the relative levels at each centre frequency shall lie within this spread. All bands tested met this expectation.

Filter shape test

Using the same measurement range as above, the 1 kHz third octave filter was again selected. A sinusoidal signal at the centre frequency of 1 kHz was injected, and its level adjusted to give a reading of 136.0 dB. The frequency of the input signal was then changed to each of the values shown in the table of results in turn, and the new meter reading was noted. Two further third octave bands (as shown) were then selected and tested in the same manner, with the signal level being set at the new centre frequency in each case.

All bands tested met the requirements of the standard, which are shown with the results.

CERTIFICATE OF CALIBRATION

UKAS ACCREDITED CALIBRATION LABORATORY No 0653

Certificate N° UCRT24/1194

Uncertainties

The laboratories expanded measurement uncertainties are estimated as ± 0.16 dB at the centre frequency & at other frequencies within the pass-band of the filter, and ± 0.20 dB for frequencies outside the pass-band. **The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor *k*=2, providing a coverage probability of approximately 95%. The uncertainty evaluation has been carried out in accordance with UKAS requirements.**

NOTES

1 The attenuation figures given in the table(s) of filter shapes refer to the meter reading at the given frequency relative to that at the centre frequency in question. The required value is denoted as Δ in the column showing attenuation limits.

2 Since the tests carried out cover only a limited subset of the content of IEC 61260:1995, the results obtained do not confer compliance with the full requirements of that standard, and are applicable only to those filter bands tested.

3 Any linearity errors which the sound level meter may exhibit are included in the filter errors shown in this certificate. Since the meter errors may vary with frequency, it cannot be assumed that they are the same as those given in certificate number UCRT24/1192

4 The following firmware was in use at the time of the testing:

Identification	Version
SLM	1.4.6190

The results on this certificate only relate to the items calibrated as identified above.

CERTIFICATE OF CALIBRATION	Certificate N° UCRT24/1194
UKAS ACCREDITED CALIBRATION LABORATORY No 0653	Page 4 of 5 Pages

1/3 octave filters: Inter-band accuracy

Band (Hz)	Error, dB
4	N/A
8	-0.1
16	-0.1
31.5	-0.1
63	-0.1
125	-0.1
250	-0.1
500	0.0
1000	Ref
2000	-0.1
4000	-0.1
8000	-0.1
16000	0.0
31500	N/A
Z @ 1 kHz	0.0

Band (Hz)	Error, dB
5	N/A
10	0.0
20	-0.1
40	-0.2
80	-0.1
160	0.0
315	0.0
630	0.0
1250	-0.1
2500	-0.1
5000	-0.1
10000	-0.1
20000	0.0

Band (Hz)	Error, dB
6.3	0.0
12.5	0.0
25	-0.1
50	-0.1
100	-0.1
200	-0.1
400	-0.1
800	0.0
1600	-0.1
3150	-0.1
6300	-0.1
12500	-0.1
25000	N/A

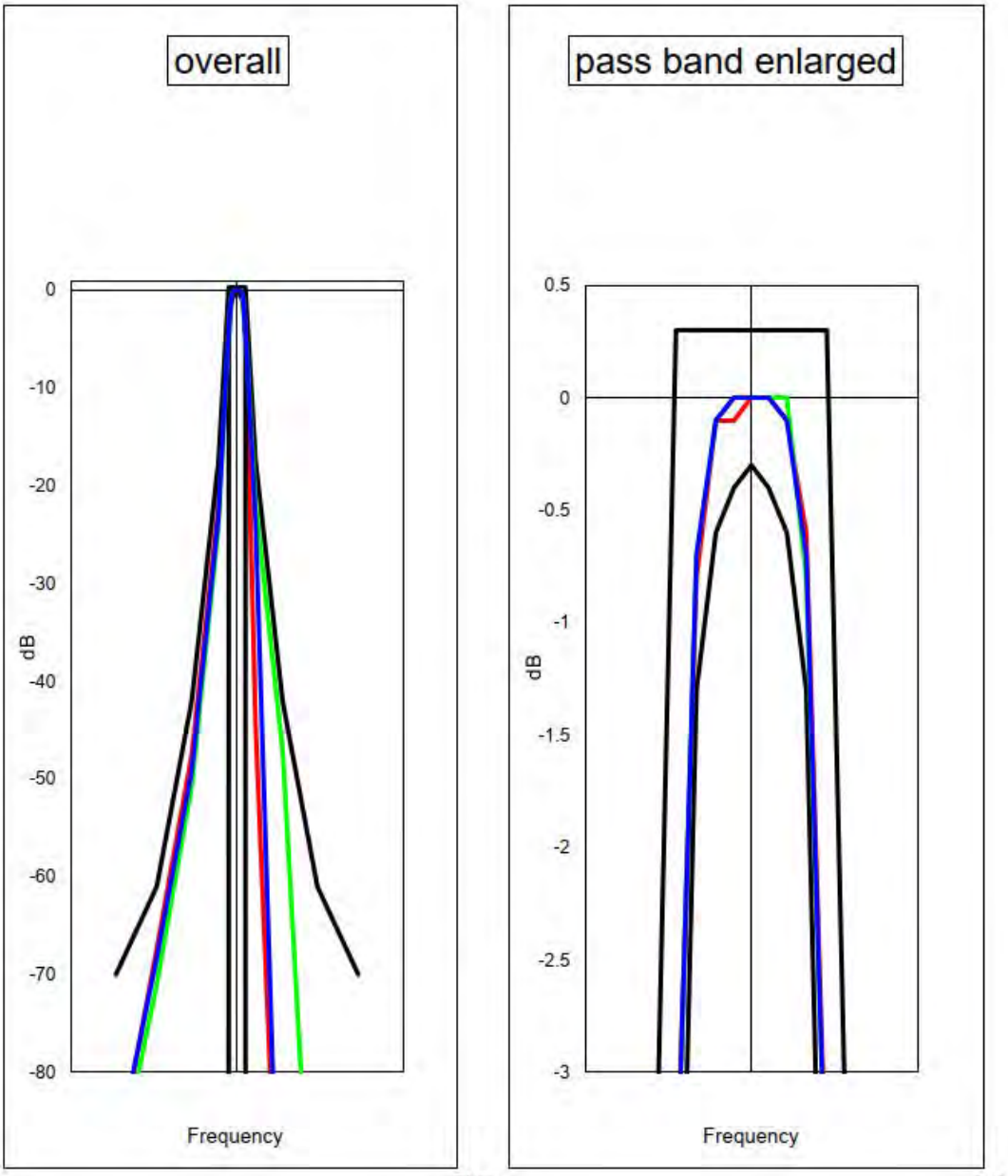
1/3 octave filters: Filter shape

1000 Hz band		160 Hz band		3150 Hz band		Attenuation
Freq, Hz	Atten, dB	Freq, Hz	Atten, dB	Freq, Hz	Atten, dB	limits, dB
185.460	89.7	29.394	91.2	586.480	88.6	$70.0 \le \Delta \le \infty$
327.480	67.4	51.902	71.0	1035.59	68.3	$61.0 \le \Delta \le \infty$
531.430	47.5	84.226	50.7	1680.54	49.2	$42.0 \le \Delta \le \infty$
772.570	22.1	122.445	24.2	2443.10	23.2	$17.5 \le \Delta \le \infty$
891.260	3.6	141.256	3.7	2818.43	3.7	$-0.3 \le \Delta \le 5.0$
919.580	0.8	145.744	0.7	2907.99	0.7	$-0.3 \le \Delta \le 1.3$
947.190	0.1	150.120	0.1	2995.30	0.1	$-0.3 \le \Delta \le 0.6$
974.020	0.1	154.372	0.0	3080.14	0.0	$-0.3 \le \Delta \le 0.4$
1000.00	Ref	158.490	Ref	3162.30	Ref	$-0.3 \le \Delta \le 0.3$
1026.67	0.0	162.717	0.0	3246.64	0.0	$-0.3 \le \Delta \le 0.4$
1055.75	0.1	167.326	0.0	3338.60	0.1	$-0.3 \le \Delta \le 0.6$
1087.46	0.6	172.352	0.8	3438.87	0.7	$-0.3 \le \Delta \le 1.3$
1122.01	3.6	177.827	3.7	3548.13	3.7	$-0.3 \le \Delta \le 5.0$
1294.37	44.6	205.145	21.9	4093.19	24.0	$17.5 \le \Delta \le \infty$
1881.73	110.4	298.235	47.0	5950.59	>112.0	$42.0 \le \Delta \le \infty$
3053.65	>112.0	483.973	109.4	9656.56	>112.0	$61.0 \le \Delta \le \infty$
5391.95	>112.0	854.570	109.2	17051.0	>112.0	$70.0 \le \Delta \le \infty$

CERTIFICATE OF CALIBRATION	Certificate N° UCRT24/1194
UKAS ACCREDITED CALIBRATION LABORATORY No 0653	Page 5 of 5 Pages

THIRD OCTAVE FILTERS

black IEC 61260 limits green 160 Hz band
red 1000 Hz band blue 3150 Hz band



END R 3

F Cross-Border Conservation Objectives

As set out on Pages 61 to 62 of Regulation 37 of the Conservation of Habitats and Species Regulations 2017 for the Dee Estuary European Marine Site (Natural England and CCW, 2010), the conservation objective for the Estuaries feature of the Dee Estuary SAC is to maintain the feature in favourable condition as defined below:

"The "estuaries" feature will be considered in favourable condition when, subject to natural processes[1], each of the following conditions are met:

i. the aggregate total extent of all estuarine communities[2] within the site is maintained;
ii. the spatial distribution[3] of estuarine communities[2] within the site is maintained;
iii. the extent of individual estuarine habitat features[4] within the site is maintained;
iv. the variety and relative proportions of sediment and rocky substrates within the estuary is maintained;
v. the variety and extent of any notable subtidal sediment communities[5] is maintained;
vi. the variety and extent of notable intertidal hard substrata communities[6] is maintained; and
vii. the spatial and temporal patterns of salinity, suspended sediments and nutrients concentrations are maintained within limits sufficient to satisfy the requirements of statements (i) to (vi) above.

Further explanatory information clarifying the meaning of terms [1-6] above is provided in Box 1".

Box 1: Explanatory information for the "estuaries feature" conservation objective

[1] **Natural processes:**

Each feature may be subject to both natural processes and human influence. Human influence on the interest features is acceptable provided that it is proved to be / can be established to be compatible with the achievement of the conditions set out under the definition of favourable condition for each interest feature. A failure to meet these conditions, which is entirely a result of natural process will not constitute unfavourable condition, but may trigger a review of the definition of favourable condition.

Dynamic physical process within estuaries can stem from variable weather conditions including one off storm events, and result in changes in wave exposure, riverine floods or tidal surges. These events can move large quantities of sediments and alter channel morphology, which affect current patterns and sediment transport within the estuary. Where these processes occur without significant anthropogenic influence they fall under the umbrella of 'natural change'. Because estuaries are dynamic systems we can expect the amount and gross distribution of habitats to change in the future. In general estuarine communities and their supporting habitats are intrinsically more dynamic over short time scales when compared to other marine and terrestrial habitats. Some estuarine communities occur in cycles dependant upon the prevailing physical conditions. Features should not necessarily be considered in unfavourable condition due to the short term disappearance of a particular community due to natural processes.

An important example of natural processes occurring over a longer timescale is that estuaries have a natural tendency to accumulate sediment, thereby changing their form from their original glacial morphology to a state where tidal energy is dissipated by sediment banks and other features such as salt marsh. This, with other forces of natural change, will therefore cause the width and depth of the estuary to change over time, moving towards a state of dynamic equilibrium or 'most probable state'. As part of this process, the location and extent of saltmarshes and mudflats may change, provided there is capacity to accommodate readjustment. Future developments should aim to avoid impact on the future evolution of the system as where this process is constrained by human influence, the capacity of habitats to accommodate readjustment may be affected.

[2] **All estuarine communities**:

- Subtidal sediment communities.
- Intertidal hard substrate communities.
- Intertidal mudflats and sandflats communities.
- *Salicornia* and other annual plants colonising mud and sand.
- Atlantic salt meadow.
- Annual vegetation of drift lines.

Box 1(continued): Explanatory information for the "estuaries feature" conservation objective

[3] **Spatial distribution**

Spatial distribution of estuarine communities refers to the macro spatial pattern in which communities are distributed around the estuary. For example it concerns the zonation of clean sands being found towards the estuary mouth, muddy sands in the mid estuary and mud in the upper estuary with saltmarsh concentrated along sheltered shores in the mid-upper estuary. The statement does not require micro-distribution of communities e.g. the exact mapped positions of specific communities to be maintained.

[4] **Individual estuarine habitat features**:

- Intertidal mudflats and sandflats communities.
- *Salicornia* and other annual plants colonising mud and sand.
- Atlantic salt meadow.
- Annual vegetation of drift lines.

[5] **Notable subtidal sediment communities**:

- Any notable subtidal sediment communities that may be identified including those important for estuarine fish.

[6] **Notable intertidal hard substrata communities**:

- *Mytilus edulis* and piddocks on eulittoral firm clay.
- *Sabellaria alveolata* reefs on sand-abraded eulittoral rock.
- Hydroids, ephemeral seaweeds and *Littorina littorea* in shallow eulittoral mixed substrata pools.
- Any other notable intertidal hard substrate communities that may be identified.

NB. The four individual estuarine habitat features[4] together with the notable subtidal sediment communities[5] and the notable hard substrate communities[6] together comprise the six "sub-features" of the "estuary" feature. Maps provided in Appendix IV show the extent of the various habitat features based on best available information.

(Natural England and CCW, 2010)

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