APPENDIX B POTENTIAL EFFECTS OF PROPELLER WASH INDUCED DREDGE SLOPE SCOUR ON WHITENESS HEAD

1.1 Introduction

MD-LOT and their consultees have requested further information and consideration of the potential effects of propeller wash induced scour on Whiteness Head Site of Special Scientific Interest (SSSI), which forms part of the wider Inner Moray Firth Ramsar Site.

To inform this assessment, Royal Haskoning were commissioned to undertake an assessment of scour potential (Royal Haskoning DHV, 2026; attached to this Request For information (RFI) response as Appendix A). Their assessment considered the likelihood of whether propeller-induced near-bed velocities could exceed the threshold for mobilisation of the surficial (unconsolidated) sediment which comprise the dredge slopes proximal to the Whiteness Head SSSI. The Royal Haskoning assessment concluded that based on the calculations, some erosion could occur particularly of loose surface deposits, although the magnitude of actual erosion is difficult to assess.

This addendum builds upon these findings by considering the likely spatiotemporal effects on the prevailing regimes which act to maintain the form, profile and long term integrity of the dynamic geomorphological spit feature at Whiteness Head SSSI. The assessment considers the potential effects of propeller induced scour of the dredge slopes on the SSSI. Proposed mitigation and monitoring measures are also discussed and described.

1.1.1 Whiteness Head SSSI

Whiteness Head SSSI covers approximately 401.5 hectares (ha) and is designated for a combination of geological and biological features of interest, including coastal geomorphology, sandflats, saltmarsh, sand dunes, and shingle. The site also provides a feeding and roosting area for a diversity of waders and wildfowl with knot Calidris canutus and bar-tailed godwit Limosa lapponica present (NatureScot, 2013a).

The Joint Nature Conservation Committee (JNCC) Geological Conservation Review (GCR) identifies the circa 3.5 km-long spit as a feature of outstanding national geomorphological importance. The spit forms a dynamic geomorphological feature, which has been migrating westwards at rates of 10 m to 30 m per year over the last 150 years. The relatively well-documented historic evolution of Whiteness Head adds to the scientific interest providing a useful case study to support the understanding of the long-term evolution of analogous gravel features in areas of active longshore drift (Hansom, 2003).

Owing to the importance of the feature, NatureScot has established the following management objectives to protect and preserve the feature, which are relevant to this assessment (NatureScot, 2013b):

- *To maintain and where appropriate manage coastal processes and features in order to safeguard the extent and condition of the special habitats and landforms present. This should be done by a) ensuring that effective dredging and spit management plans are prepared and implemented, b) restricting vehicle access to sensitive habitats (especially to the spit) and c) ensuring that any works crossing sensitive saltmarsh or shingle features do not cause significant damage.*

Whiteness Head SSSI is therefore considered to be of high sensitivity due to its national designation and geomorphological importance as an SSSI site, as well as its inclusion within the wider Inner Moray Firth Ramsar site (NatureScot, 2026). This assessment of sensitivity is in line with that presented in the EIA Chapter 10 Coastal Processes and Geomorphology (Haventus, 2025a). It is noted however, that the spit is an active and naturally evolving landform with an inherent capacity to accommodate localised sediment erosion, redistribution and accretion. Its sensitivity therefore relates to changes that could significantly disrupt the supporting coastal processes or overall form and integrity of the designated feature, rather than minor, localised or episodic effects on sediment transport in the area .

1.2 Port Layout, Operational Context, and Physical Baseline

The operational vessel traffic and vessel calls to the Port is anticipated to be between 250 to 350 vessel calls per annum, with a potential short-term peak of 400 calls per year. Vessel traffic would include semi-submersible crane vessels, heavy-lift vessels, barges, general cargo vessels and various turbine installation vessels (Haventus, 2025b). During these vessel calls, vessel manoeuvring is expected to be undertaken at low speed and for relatively short periods. Realistic worst case operational scenarios assume vessel speeds of approximately 0.1 m/s, with 10 to 20% of available propulsion power applied.

Vessel operations would take place within the dredged navigation channel, with the dredge slope forming the transition between the channel bed and the existing seabed adjacent to Whiteness Head SSSI. The dredge slope is not itself identified as part of the SSSI and will be formed and maintained at a stable gradient of 1:6. To ensure that these dredge slopes do not encroach on the SSSI, the channel width was reduced from 160 m to 140 m (Haventus, 2025c). At its narrowest, the distance between the top of the dredge slope and the Mean Low Water Springs (MLWS), which is considered to largely represent the edge of the SSSI is 10 m. This distance represents the minimum "stand-off" buffer between the dredge slope and the SSSI, this buffer varies however and is generally greater than 10 m (between 24 m to over 50 m) (Fairhurst, 2026; port layout drawing attached to this RFI response as Appendix C). Large installation vessels are expected to remain at least 45 m from the toe of the dredge slope, while tug-assisted barges would remain approximately 57 m away. This means that, including for the length of the dredge slopes, the distance between where the vessels operate, and the edge of the SSSI is > 70 m.

The spit and adjacent dredge slopes predominantly comprise fine to medium sand, with finer silty sands occurring towards the toe, the D_{50} grain sizes are generally between 0.10 and 0.20 mm within the dredge slope profile, reducing to approximately 0.10 mm towards the toe. The undisturbed seabed is locally blanketed by a loose organic-rich veneer, typically around 1 metres (m) thick and up to 3.7 m thick locally, which is likely to be the material most readily eroded. Beneath this surface layer, the deposits are generally medium dense to dense sand deposits. Within the harbour limits the prevailing hydrodynamic and wave regimes are quiescent (Haventus, 2025a) with limited sediment transport likely to occur only during periods of higher energy (i.e. peak spring phase).

1.3 Potential Effects on Whiteness Head SSSI

Propeller wash induced erosion (scour) is expected to be confined to the immediate vicinity of vessel manoeuvring and berthing operations, where propeller jet velocities interact with the seabed and the dredge slopes outside the bounds of the SSSI. Effects would be intermittent, short-term and spatially localised, occurring only during vessel arrivals, departures, berthing operations, and, where required, during supporting tug activities. Scour extent would

reflect the location and frequency of these operations and would remain confined to established vessel approach, turning and berthing areas, resulting in localised and episodic disturbance to surficial sediments.

The material most susceptible to mobilisation comprises the loose surficial sediments (typically up to approximately 1 m thick) present on parts of the seabed and dredge slope surfaces. These sediments are anticipated to be broadly stable under the quiescent hydrodynamic regime prevailing within the port limits, except potentially during the peak spring tidal phase, prolonged strong winds or surge events. As a result, the loose unconsolidated surficial sediment layer is likely to be highly supply-limited, with limited natural sediment reworking. It is postulated that replenishment occurs primarily through aeolian transport from the adjacent spit.

The erodibility of the underlying sediments beneath this thin veneer of unconsolidated material is uncertain. However, geotechnical information suggests that these sediments are likely to be more consolidated and therefore more resistant to erosion. Consequently, any erosion of the surficial sediment layer on the seabed or dredge slopes is expected to be depth-limited below the seabed surface.

Repeated exposure to enhanced flow velocities results in winnowing of finer particles leading to progressive coarsening of surficial sediment deposits, a process termed *bed armouring*. Through time this leads to the development of more erosion-resistant seabed. At the toe of the dredge slopes, localised scour could potentially trigger minor slope adjustment, slumping or small-scale failures. However, such processes are anticipated to be highly localised and self-limiting, with affected areas expected to rapidly attain a new stable equilibrium with the likelihood of further adjustment reducing over time. Accordingly, the dredge slopes are not anticipated to experience erosion in perpetuity, which is an important consideration in the design of any future mitigation and monitoring requirements and consideration of the magnitude of effects on the SSSI.

As the predicted scour and associated slope adjustment would occur on the dredge slopes and adjacent seabed outside the SSSI, any effect on the SSSI would be indirect only, and may include:

- Progressive recession of the dredge slope towards the SSSI. In theory, this could occur if repeated propeller wash events progressively remove sediment from the same section of the dredge slope leading to a widening of the dredge slopes. However, the intermittent and localised nature of vessel manoeuvring, together with limited scour potential as discussed above, means that significant recession is considered unlikely.
- Contribution to the regional sediment budget and sediment transport processes. The evidence collated has demonstrated that the spit feature does not rely upon reworked sediments from the dredge slopes for sediment nourishment. Consequently, though the volumes mobilised and redistributed are expected to be small, these sediments mobilised due to propeller induced scour, are anticipated to remain broadly within the harbour limits with some sediments contributing to the wider sediment budget. Changes to local sediment transport processes would only occur if scour were sufficiently persistent and extensive to cause significant changes in local bathymetry. Given the localised and intermittent nature of the predicted scour, a material change to these supporting processes is considered highly unlikely.

The resulting effects is therefore expected to comprise localised disturbance and redistribution of surficial sediment, rather than widespread erosion or any material alteration to the prevailing hydrodynamic and sediment transport regime, sediment budget, morphology or function of the wider spit located within the bounds of the SSSI.

Whiteness Head SSSI is an active and naturally evolving landform in which erosion, sediment redistribution and accretion are established components of its ongoing development, this is indicated by the recorded long-term changes to the spit as discussed in Section 1.1.1. The dredge slopes are managed and maintained in broad isolation, with the evolution of the spit not reliant on the dredge slopes as a source of sediment supply. Consequently, the indirect effects described above would be unlikely, in isolation, to alter the underlying character or overall integrity of the approximately 3.5 km long spit, or materially alter the wider coastal processes responsible for maintaining the feature corroborating the conclusions of the submitted EIAR in relation to effects on the SSSI (Haventus, 2025c).

Despite this, the concerns raised by MD-LOT and their consultees regarding potential effects on the SSSI are fully recognised. A precautionary monitoring programme will therefore be implemented to verify that in the unlikely event that any effects occur due to localised vessel induced scour, these will be addressed and mitigated promptly. The proposed monitoring programme is presented in Section 1.1.

1.1 Monitoring Programme

To ensure that operational vessel activities at the Port do not lead to an adverse effect on Whiteness Head SSSI, the following monitoring programme will be implemented. The programme will enable impacts to be identified at an early stage, allowing appropriate operational or remedial measures to be implemented before the designated site is affected.

- On completion of dredging a full bathymetry and topographic survey of the Inner Harbour and the Spit would be undertaken – this would be the baseline against which all subsequent surveys would be assessed,
- Bathymetry surveys would be carried out each six months for the entire Inner Harbour and results (difference plots) and interpretation sent to NatureScot/MDLOT,
- Each year the required frequency of monitoring would be reviewed and a decision made as to its suitability (whether an increase or decrease is appropriate,
- Although considered unlikely, should either (a) any part of the 10 m buffer appear to be in danger of encroachment, or (b) in areas where there is currently >20 m of a design buffer, where 5 m of retreat of that face is observed, then an action plan will be prepared and potentially problematic operations such as tug use and direction in that area cease until any necessary remedial actions have been implemented; and,
- Remedial actions if needed could most appropriately consist of reinstating the eroded area with maintenance dredged sands and gravels, forming a sacrificial layer in the required area, and revised berthing procedures would also be considered. We do not consider that hard scour protection will be needed at this time.

2 REFERENCES

Fairhurst (2026) *Ardersier Port Redevelopment Phase 2: Phase 2 Navigation Channel, Offset to MHWS and MLWS, Sections*. Drawing No. APP2-FHT-DD-CHA-DR-C-009083, Marine Licence issue, 3 July 2026.

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