Scapa Deep Water Quay Habitats Regulations Appraisal

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EXECUTIVE SUMMARY

EnviroCentre Limited has been commissioned by Orkney Islands Council Harbour Authority (OICHA) to undertake a Habitats Regulation Appraisal (HRA) to determine whether the construction of a proposed development of Scapa Deep Water Quay (SDWQ) will have any adverse impact on the integrity of any European designated sites.

The potential effects of the proposal on the designated features of the European designated sites were considered as part of a Habitats Regulations Assessment. Likely Significant Effects (LSE) on Scapa Flow Special Protection Area (SPA), North Orkney SPA, Orkney Mainland Moors SPA, Hoy SPA, Loch of Stenness Special Area of Conservation (SAC) and Sanday SAC could not be ruled out during the screening stage of the assessment; and so an Appropriate Assessment (AA) has been conducted to ascertain whether the proposed works will adversely affect the integrity of the sites' qualifying features.

During the AA process it was possible to rule out adverse effects from impacts to the assessed designated sites.

Potential impacts to SPA qualifying bird species and harbour seal (designated features of Sanday SAC) include disturbance as a result of noise, vibration, human presence and light pollution during construction activities, indirect impacts from accidental pollution incidents or increased sedimentation and turbidity during works impacting water quality and therefore food availability and harbour seals could be subject to death or injury through underwater noise or collision with vessels during works. However, assuming mitigation during the construction phase is implemented, the works are not considered to impact the integrity of sites or designated feature.

Mitigation to be enacted includes:

- Ornithological monitoring to be undertaken during the construction phase and during years 1, 2, 3, 5 and 10 of operation to assess whether the populations of SPA species has been maintained. This will focus on the area around the proposed development (where the new/novel vessel route is situated and around Scapa Pier and surrounding areas where there will be a significant reduction in port services vessels). The monitoring methods and reporting outcomes will be discussed and agreed with NatureScot, along with any required mitigation measures depending on survey results;

- For the first three years of SDWQ operations, during the flightless moult period (mid-September to end-December), an ornithologist will conduct structured observations of Black-throated Divers associated with selected crane activity. The purpose of these observations is to improve the evidence base on black-throated diver responses to mobile crane operations. The Ornithological Observation Protocol will be included in the Operational Environmental Management Plan. This will include:

    - Timing: Observations will take place two hours prior to, during, and two hours following crane operations (subject to adequate visibility).
    - Data collection: Counts of individuals present and systematic recording of any behavioural responses indicative of disturbance (e.g. displacement, diving, directional swimming, or other changes in activity).
    - Reporting: Data will be collated into a post-season summary at the end of each flightless moult period. Reports will be submitted to the Orkney Marine Environment Protection Forum.

- Production of a Vessel Management Plan, with input from NatureScot, for the Construction phases which will detail vessel routes, speeds etc to minimise, and where possible, avoid any disturbance impacts;

- Adherence to measures set out in the Construction Environmental Management Document (CEMD), Biodiversity Action Plan (BAP) and Biodiversity Net Gain (BNG) document.

- Deployment of an Ornithologist and marine mammal observer to monitor for the presence of qualifying species of the Scapa Flow SPA, and cetaceans and pinnipeds (in particular harbour seal) in the vicinity of the Proposed Development during terrestrial blasting and dredging works;
- Production and adherence to detailed Seal Protection Plan (SPP);
- Production and adherence to a detailed Pollution Prevention Plan;
- A silt boom to contain fine sediments will be used whilst reclamation work activities are undertaken.
- Controls and mitigation measures can and should be implemented when undertaking terrestrial blasting, including screens and bunding to dampen sound would also reduce the effects of noise on seals on land.

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1 INTRODUCTION

1.1 Terms of Reference

EnviroCentre Limited has been commissioned by Orkney Islands Council Harbour Authority (OICHA) to undertake a Habitats Regulation Appraisal (HRA) to determine whether the construction of the proposed development of Scapa Deep Water Quay (SDWQ) will have any adverse impact on the integrity of any European designated sites.

1.2 Scope of Report

A HRA is required to assess whether the project, alone or in combination with other projects, will have an adverse impact on the integrity of the European designated sites. It is the responsibility of the competent authority to conduct the HRA. This document aims to provide the information necessary for them to carry out Stage One of the assessment (Screening) and Stage Two (Assessment) by:

- Providing a description of the proposed works;
- Identifying those European designated sites which are connected to and/or could potentially be affected by the proposed construction works;
- Identifying how the proposed construction works may impact on the qualifying features of the designated site(s);
- Considering other projects which may have "in combination" effects on the European designated sites; and
- Recommending the designated sites which need to be taken forward for further assessment if impacts on their qualifying features cannot be ruled out.
- Assessing the designated against the Proposed Development to determine if there is an adverse effect on the integrity of the designated sites.

1.3 Report Usage

The information and recommendations contained within this report have been prepared in the specific context stated above and should not be utilised in any other context without prior written permission from EnviroCentre Limited.

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2 METHODOLOGY

2.1 The Habitats Regulations Appraisal Process

The HRA is a four-stage process. An important aspect of the process is that the outcome at each successive stage determines whether a further stage in the process is required. The stages are summarised in Table 2-1. It is stated within the EU guidelines that "where, without any detailed assessment at the screening stage, it can be assumed (because of the size or scale of the project or the characteristics of the national site network) that significant effects are likely, it will be sufficient to move directly to the appropriate assessment (Stage Two) rather than complete the screening assessments explained below."

Table 2.1 Key Stages in the HRA Process

Stage 1	
Screening for Likely Significant Effect (LSE)	- Identify international sites in and around the project area. - Examine conservation objectives of the interest feature(s) (where available). - Review plan policies and proposals and consider potential effects on UK sites (magnitude, duration, location, extent). - Examine other plans and programmes that could contribute to 'in combination' effects.
	- If no effects likely – report no likely significant effect. - If effects are judged likely or uncertainty exists – the precautionary principle applies, proceed to Stage 2. - If following screening the project is reviewed and includes integral mitigation which will ensure no likely significant effects, then no further Appropriate Assessment needed.
Stage 2	
Appropriate Assessment (AA)	- Complete additional scoping work including the collation of further information on sites as necessary to evaluate impact in light of conservation objectives. - Agree scope and method of AA with the competent authority. - Consider how the project 'in combination' with other projects will interact when implemented (the Appropriate Assessment). - Consider how effects on integrity of the site could be avoided by changes to the project and the consideration of alternatives. - Develop mitigation measures (including timescale and mechanisms). - Report outcomes of AA including mitigation measures.
	- If the project will not adversely affect European site integrity proceed with plan. - If effects or uncertainty remain following the consideration of alternatives and development of mitigation proceed to Stage 3.
Stage 3	
Alternative Solutions	- Consider alternative solutions, delete from project or modify. - Consider if priority species/habitats affected - identify 'imperative reasons of overriding public interest' (IROPI), economic, social, environmental, human health, public safety (only applicable in highly exceptional circumstances).
Stage 4	
Imperative Reasons of Overriding Public Interest (IROPI)	- Stage 4 is the main derogation process of Article 6(4) which examines whether there are imperative reasons of overriding public interest (IROPI) for allowing a plan or project that will have adverse effects on the integrity of a UK site to proceed in cases where it has been established that no less damaging alternative solution exists. - The extra protection measures for Annex I priority habitats come into effect when making the IROPI case. Compensatory measures must be proposed and assessed. The Commission must be informed of the compensatory measures.

	Compensatory measures must be practical, implementable, likely to succeed, proportionate and enforceable, and they must be approved by the Minister.

2.2 Screening

Screening determines whether or not the project is likely to (or potentially could) have significant effects on the national site network. A list of all Special Areas of Conservation (SACs), candidate SACs (cSACs) and Special Protection Areas (SPAs) and potential SPAs (pSPAs) that are within proximity to the site, or sites designated for mobile species which have the potential to be affected by the proposed development, was compiled and the qualifying interest features noted. Following this, the key environmental conditions (conservation objectives) needed to support site integrity were detailed for each site.

With reference to the NatureScot guidance[1] the screening stage determines whether Appropriate Assessment is required, by:

- Determining whether a project (or plan) is directly connected with or necessary to the conservation management of any European sites;
- Describing the details of the project (or plan) proposals and other projects that may cumulatively affect any European sites;
- Describing the characteristics of relevant European sites; and
- Appraising likely significant effects (LSE) of the proposed project on relevant European sites.

The guidance gives the following definition of LSE:

"The test of significance is where a plan or project could undermine the site's conservation objectives. The assessment of that risk (of 'significance') must be made in the light, amongst other things, of the characteristics and specific environmental conditions of the site concerned."

*"A likely effect is one that cannot be ruled out on the basis of objective information. The test is a 'likelihood' of effects rather than a 'certainty' of effects. Although some dictionary definitions define 'likely' as 'probable' or 'well might happen', in the Waddenzee case the European Court of Justice ruled that a project should be subject to Appropriate Assessment "**if it cannot be excluded, on the basis of objective information, that it will have a significant effect on the site, either individually or in combination with other plans and projects**". Therefore, 'likely', in this context, should not simply be interpreted as 'probable' or 'more likely than not', but rather whether a significant effect can objectively be ruled out."*

2.3 Screening Conclusion

The outcome of screening for appropriate assessment is to reach one of the following determinations:

a) A Stage Two AA of the proposed development is required if it cannot be excluded, on the basis of objective information, that the proposed development, individually or in combination with other plans or projects, will have a significant effect on a European site.
b) A Stage Two AA of the proposed development is not required if it can be excluded, on the basis of objective information, that the proposed development, individually or in combination with other plans or projects, will have a significant effect on a European site.

[1]NatureScot, formerly SNH guidance available at : https://www.nature.scot/sites/default/files/2019-07/Habitats%20Regulations%20Appraisal%20of%20Plans%20-%20plan-making%20bodies%20in%20Scotland%20-%20Jan%202015.pdf (Accesses 20/12/2022)

2.4 Appropriate Assessment

The Appropriate Assessment establishes whether or not a project's LSE identified during the screening stage will have an adverse effect on the integrity of the affected site with regard to its conservation objectives. Based on the guidance provided by NatureScot the effects of the proposal on the designated sites' qualifying features will be determined by:

- Gathering information required to assess impacts (from site documents, scientific literature, EU and UK guidance on impact assessment and impact assessments from similar projects);
- Predicting the type and nature of impacts e.g. direct or indirect, short or long term;
- Assessing whether there will be adverse effects on the integrity of the site as defined by the conservation objectives and the status of the site. The precautionary principle must be applied at this stage. If it cannot be demonstrated with supporting evidence that there will be no adverse effects, then adverse effects will be assumed; and
- Ascertaining if it is possible to mitigate adverse effects.

2.5 In-Combination Effects

Under Regulation 43(1)(a) of the Habitats Regulations 1995 (as amended) it is necessary to consider whether a plan or project is likely to have a significant effect on a national site network site "either alone or in combination with other plans or projects."

These should include:

- Approved but as yet uncompleted plans or projects;
- Plans and projects for which an application has been made, and which are currently under consideration but not yet approved by the competent authorities; and
- Permitted ongoing activities such as discharge consents, abstraction licences or consecutive/simultaneous maintenance activities.

3 DESCRIPTION OF THE PROPOSED DEVELOPMENT AND CONSTRUCTION METHODS

3.1 Site Location

The proposed development is located on the southern shore of the Orkney mainland, approximately 8km south of Kirkwall. It is located on the coastline within Scapa Flow, approximately 4km south of the existing Scapa Pier and approx. 835m from a fish farm site located to the south. A Location Plan can be found in Section 2 of the EIAR.

3.2 Main Purpose and Associated Activities

The main purpose of this facility would be to undertake multiple industrial activities that require both deep-water berthing and large laydown area.

It is envisaged that the main activity will be the construction/assembly and maintenance of offshore wind turbines. This is also a potential location for the development of a storage and supply hub for future marine fuels.

There will also be an access road from the A961 to the site.

3.2.1 SDWQ Design Mitigation and Project Description

There have been various changes to the proposed development since the original Scapa Deep Water Quay (SDWQ) EIAR was produced, and these are detailed below. It should be noted that these changes do not affect the assessments within the existing EIAR.

Based on consultee feedback the project team has taken proactive steps during the design and environmental assessment process to reduce the potential negative impacts of the project, a crucial part of responsible project management (mitigation by design), aiming to prevent or minimise environmental impacts before they arise. It must be noted that the overall development footprint and dredge area remain unchanged from the reference design.

3.2.2 Design

Environmental Impact Assessment (EIA) is generally considered an iterative process, meaning it is not a one-time only assessment undertaken after a project is designed. Rather, it's a continuous process where findings from the EIA inform and influence the design of the project throughout its development. In the case of SDWQ, EIA assessments identified potential impacts on certain habitats and wildlife. Based on these findings, the design has been modified.

The design, manufacture, and construction of both temporary and permanent marine works shall adhere to current good practice and comply with all relevant and up-to-date Eurocodes, British Standards, Codes of Practice, and other applicable international standards and regulations. This includes structural, geotechnical, maritime, corrosion protection, drainage, and other discipline-specific codes necessary to ensure safety, durability, and regulatory compliance.

The design of the marine structures for the SDWQ Project is based on a minimum design life of 60 years, ensuring resilience in a highly aggressive marine environment, with salt spray, seawater immersion, and

scour action. The quay structure must be designed for a return period of 570 years, while the revetment has a return period of 200 years, reflecting different failure probabilities for each element (10% for the quay and 20% for the revetment).

Key design parameters include:

- **Dredging Requirements:** The operational depths of -15.0m CD and -20.0m CD must be achieved.
- **Environmental Conditions:** Consideration of climate change and sea-level rise scenarios (A projected sea level rise of 0.9 m by 2100 is considered, based on national climate projections), with tidal lag and wave conditions (1/50-year,1/200-year,1/570-year return periods) integrated into the design.
- **Materials:** Concrete and reinforcement materials must comply with Eurocodes and British Standards, with specifications for exposure classes, cement types, and aggregate properties.
- **Caisson Design:** The caissons are designed with a focus on durability, using concrete that is resistant to corrosion in marine environments. Concrete properties, cement types, and aggregate characteristics have been carefully specified to ensure a long lifespan (Diagram 3-2).
- **Foundations and fill:** Crushed igneous rock is used as the foundation layer, with strict controls on durability and strength. Fill materials inside and behind caissons are selected for high density and internal friction to ensure stability.
- **Scour Protection:** Concrete scour protection mattresses and rock armour is installed to mitigate seabed erosion caused by vessel thrusters and propellers near the quay (Diagram 3-3)
- **Load types considered:** Includes structural dead loads and imposed loads, wave loads, buoyancy effects, hydrostatic pressures, vessel impacts, and backfill pressures
- **Structural Stability**: The strength and stability of the marine works are evaluated for failure modes such as sliding, overturning, bearing capacity, and structural integrity following BS 6349, Eurocode, and PIANC guidelines. Additional considerations include buoyancy, hydrostatic pressure, and surcharge loads.

These criteria form the foundation for the design of a robust, long-lasting marine structure, ensuring safety, stability, and durability under challenging environmental conditions.

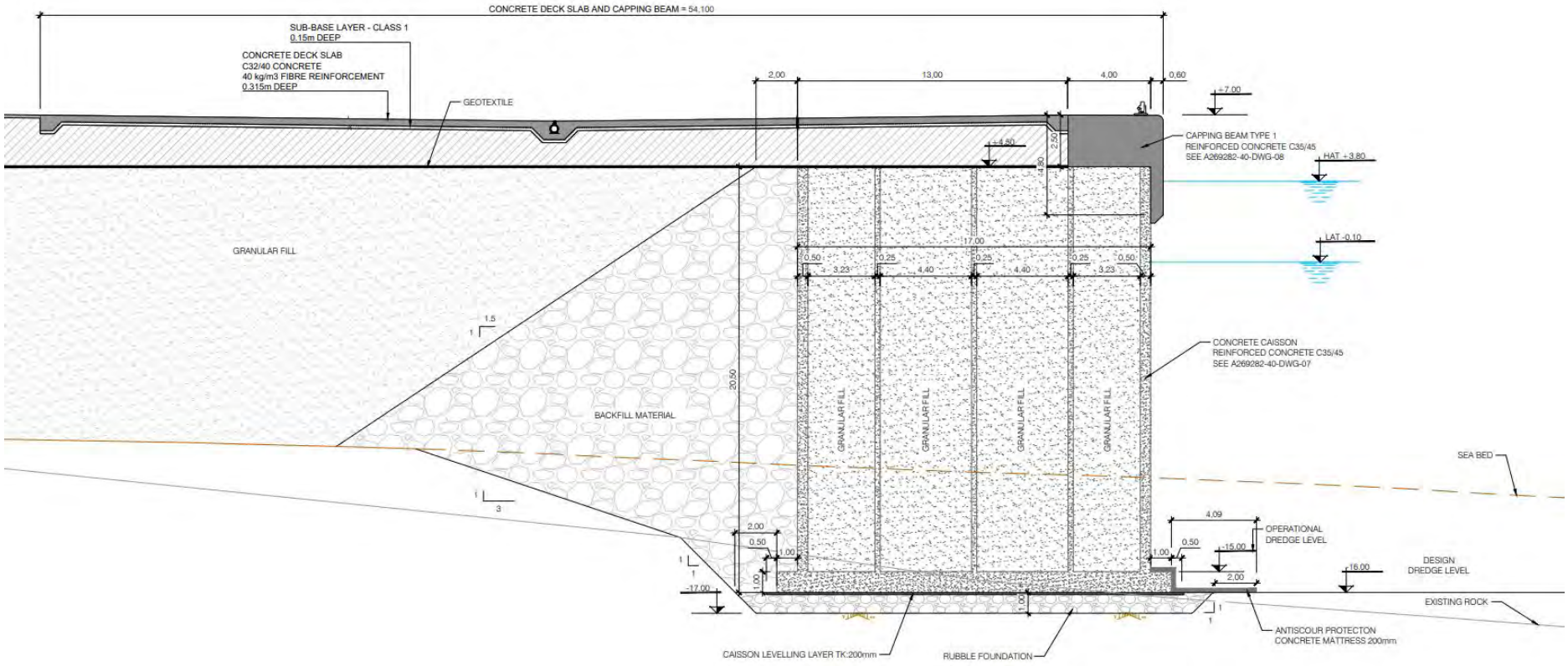

Diagram 3-1: Typical Cross Section

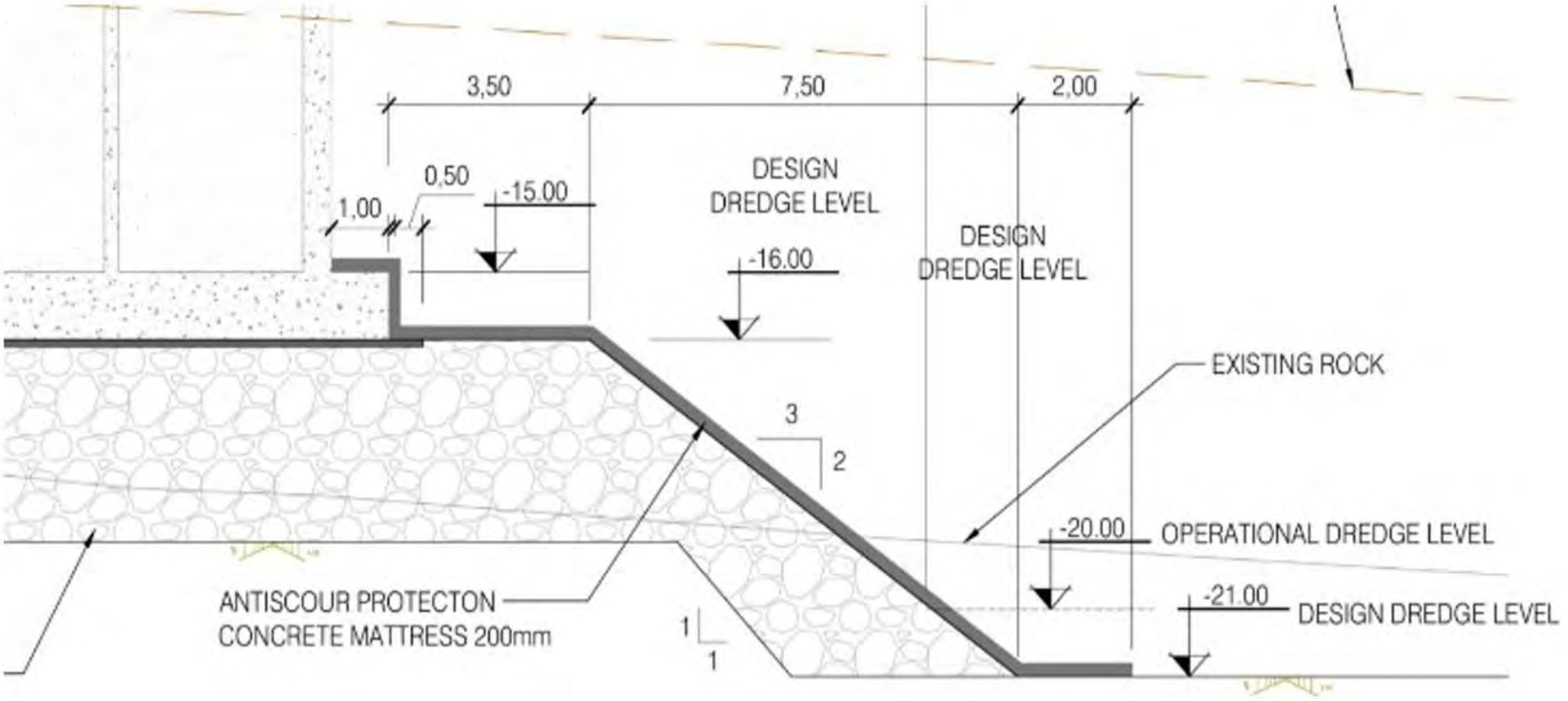

Diagram 3-2: Concrete mattress on rock

3.2.3 Caisson Design Summary

- The main quay is composed of nine large reinforced concrete caissons, with a smaller caisson at the south end that ties into the south revetment.
- Different caisson cross-sections are used along the alignment to adapt to dredging depths and variable geotechnical conditions.
- The quay top level is at +7.00m CD and dredging in front of the quay reaches -15.00m CD, with a 1m over-dredge allowance for design purposes.
- A specific 140m section includes a deeper dredge pocket of -20.00m CD, offset 10m from the quay face. This will be confirmed with the developed design.
- At the north end, the OICHA tug and pilot boat berths are formed by four caissons, and one berth (62m long) uses a blockwork wall due to shallower seabed depth.
- Dredging design considers slopes based on soil type, ensuring foundation levels reach engineering rock.
- Geotechnical stability of caissons is checked against sliding, overturning, bearing capacity, and overall stability, using standard analytical methods and software tools such as SLOPE/W.

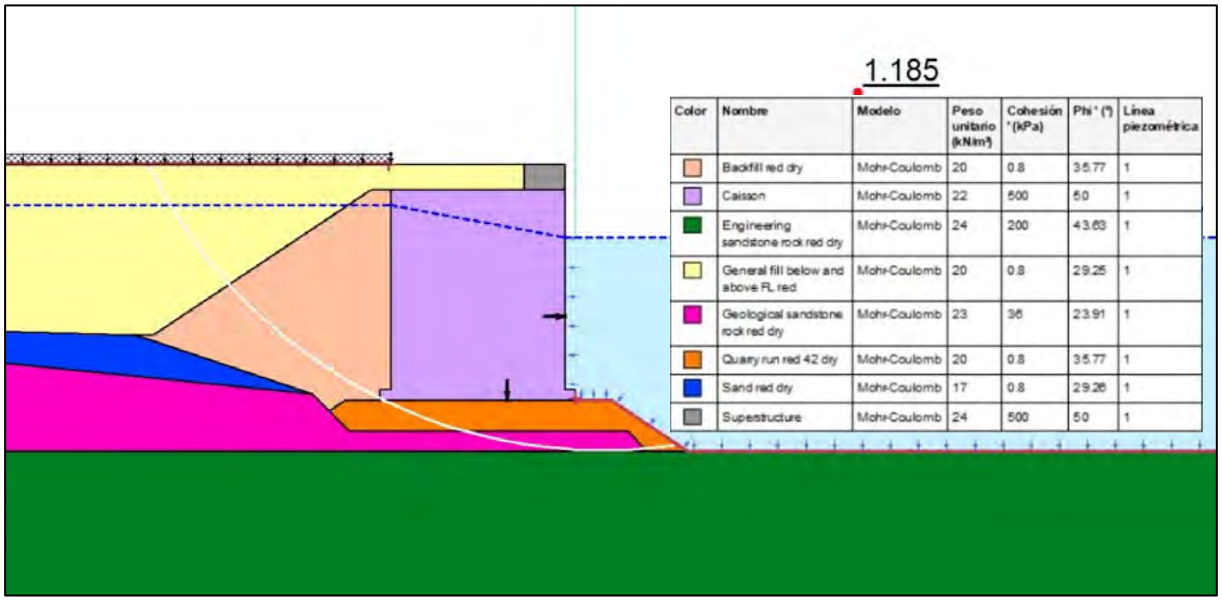

Diagram 3-3: Example of results of the geotechnical stability analysis for bearing capacity and overall stability using SLOPE/W and Plaxis software

Structural analysis is based on a representative caisson (A1) using FEM.. Reinforcement is currently unified across all caissons but may be optimised later.

- In areas where the foundation is not directly on rock, scour protection is provided with a concrete mattress, adjusted based on the seabed material and vessel propeller forces.
- The geometry of the caissons has been standardized as much as possible, especially in the main quay (all 17 m wide and 20.5 m high for types A1–A3), to simplify construction and allow reuse of formwork. Caissons in the tug and pilot berth areas (types B1–B4) have lower heights, adapted to specific site and operational conditions. Some include multilevel steps for vessel access.
- Buoyancy stability was analysed to ensure safe transport and installation, by adjusting internal ballast water to maintain appropriate draft and stability.
- A range of cross-sections have been developed to match site conditions, particularly for the tug and pilot berths, which include pre-and post-tender bulletin design options. Key design assumptions include:
    - 1m over-dredge applied throughout

- Rock profiles interpolated from borehole data
- Slope angles based on material type (e.g. 3:1 for granular soils)
- Caisson foundations in the main quay resting on engineering rock where feasible

3.2.4 Dredging works

In addition to the dredging required at the berth pockets, the caisson design approach requires additional dredging for the caissons/block wall foundations. The design assumes that the structures will be founded on hard bearing strata, requiring the removal of superficial soils and hard strata from approx. -15m CD down to a maximum depth of -20.5m CD. The dredged area edge slopes depend on the material type ranging from 1:3 in superficial soils to 1:1 in engineering rock, whilst the dredging berth pockets are required to be operative for elevations of -15m CD and -20m CD. The structures have been designed to accommodate an over-dredge of 1m.

Refer to the dredging section below for dredge volumes, particularly disposal to sea. The Best Practicable Environmental Option (BPEO) report has been updated to take account of updated dredge volumes.[2]

3.2.5 Dredging

Dredging will be performed as one of the first construction activities in a single campaign. It is proposed to be executed by a combination of different methodologies that can tackle the scope while minimising impacts on the environment and coordinated with the critical path activities.

For reference, the dredge volumes associated with the **exemplar design** were as follows.

Table 3-3.1: Dredging Area and Sediment Quantities (Exemplar Design)

Dredging Phases	Area (m^2)	Est. Quantities (m^3)
Phases 1 and 2 - Initial to -15m CD	39,000	86,000
Phase 3 -20m CD berthing pocket	26,000	90,000

Of the 176,000m^3 dredge material noted above, 25,000m^3 was intended to be disposed offshore. Sea disposal was originally calculated using a barge expected to carry material up to 1,000m^3 volume, therefore 25 return trips (50vessel movements in total).

As a result of the modified **caisson design**, additional dredging volume is required compared to the exemplar design to provide the caisson foundations. The revised total dredge volume is detailed in Table 3-3.2.

Table 3-3.2: Dredge Material (Caisson Design)

Material type	Total volume dredged (m^3)	Volume reused on site (m^3)	Volume disposed offshore (m^3)
Sand	249,859	49,972	199,887
Clay	53,022	0	53,022
Rock	61,627	61,627	0
TOTAL	**364,508**	**111,599**	**252,909**

Dredging methods: Sand and clay will be dredged either by hydraulic dredging using a trailer suction hopper dredger (TSHD) or mechanically using backhoe or grab dredgers. Rock will be dredged using a

[2] Rev 2 (May 2025)

cutter suction dredger (CSD) or mechanical equipment such as backhoe dredgers equipped with rock rippers.

Dredging Caisson trench: Additional dredging is required to accommodate the caisson section (rock foundation, scour protection and caisson). Different levels have been considered following assumptions of founding the caisson on suitable hard bearing strata along the full length of the quay line. The width of this trench at the lowest level is 24 m from toe to toe.

Disposal at sea: As stated above, the volume of material (predominantly sand with some clay) to be disposed of at sea has increased to a maximum of 252,909m^3 (this figure may be reduced once additional geotechnical information is available). Further information about sea disposal is provided in the updated BPEO. It is assumed that 4,000m^3 capacity barge(s) will be used to transport material to the offshore disposal site. Therefore, the revised estimated dredge disposal vessel movements will increase from 25 round trips (50 vessel movements in total over a two-month period or almost 1 vessel movement each day) to approximately 63 round trips (126 vessel movements in total) over 33 weeks between end of October 2026 and end of May 2027. This equates to approximately 4 vessel movements each week.

It should be noted that dredging vessel routes to the sea disposal site are within existing shipping lanes. Much of the barge movements shall be within harbour limits and therefore speeds shall require to be adhered based on the Ports requirements.

3.2.6 Quay Wall

The quay wall will be formed from reinforced concrete caissons installed on a rock bed foundation, as shown on Diagram 3-5)

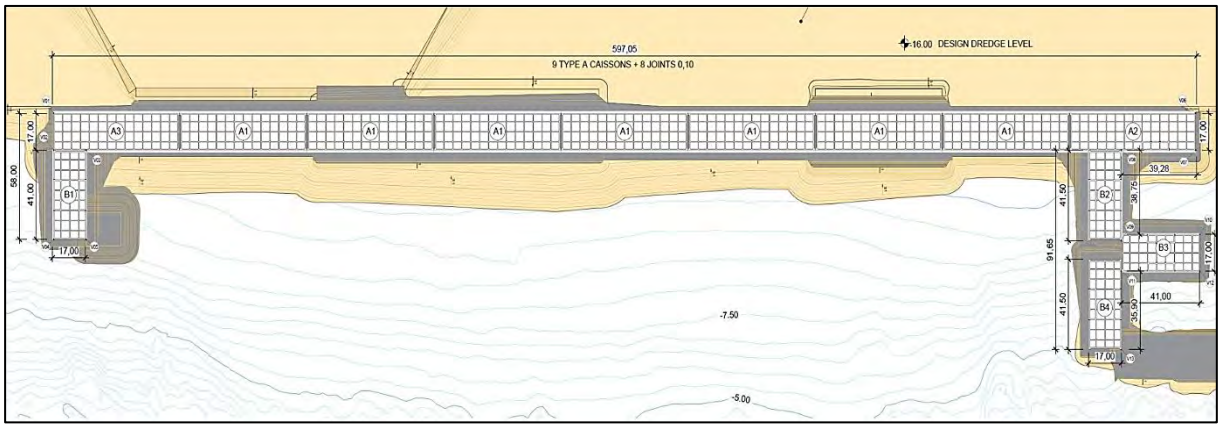

Diagram3-4: General arrangement

The main quay is composed of nine large reinforced concrete caissons, with a smaller caisson at the south end that ties into the south revetment.

At the north end, the OICHA tug and pilot boat berths are formed by four caissons. At the innermost berths of the tug and pilot boat area, where seabed levels are shallow, concrete block walls are used instead of caissons. Another block wall acts as a retaining structure behind the southern end of the main quay. The block walls are built using large interlocking concrete blocks reinforced with vertical steel bars for added stability.

3.2.7 Caisson Transport and Unloading

Following the fabrication of caissons in a floating dock in Spain, they will be towed to a sheltered area within the port basin. There, they will be stored in a floating condition, secured with mooring lines/anchors until the arrival of the semisubmersible vessel, which will transport them to the SDWQ site. It is anticipated that 3 or 4 four trips using a semi-submersible vessel will be required to deliver all caissons to the SDWQ site. The estimated transit time for the transfer of the caissons to SDWQ is 8 days (round-trip). Consecutive trips will be undertaken to transport all caissons.

A Biosecurity Plan will be produced as part of the Detailed Construction Environmental Management Plan (CEMD) which will set out the measures to prevent introduction of invasive non-native species, in accordance with relevant legislation and best practice.

Diagram 3-5: Image of a previous caisson loading operation onto semisubmersible vessel at Langosteira Port.

3.2.8 Caisson Unloading

The unloading operation (Diagram 3-9) at Scapa Flow requires water depths over 27m due to the draft of the vessel and caissons, and favourable metocean conditions (Table 3-3)

Table 3-3: Required metocean conditions for vessel loading/unloading

Limiting weather criteria for loading/discharge operations		
Maximum 10-minute sustained wind speed	15	knots
Maximum significant wave height	0.5	m
Maximum swell	0.3	m
Maximum swell period	7	seconds
Maximum current	1	knots

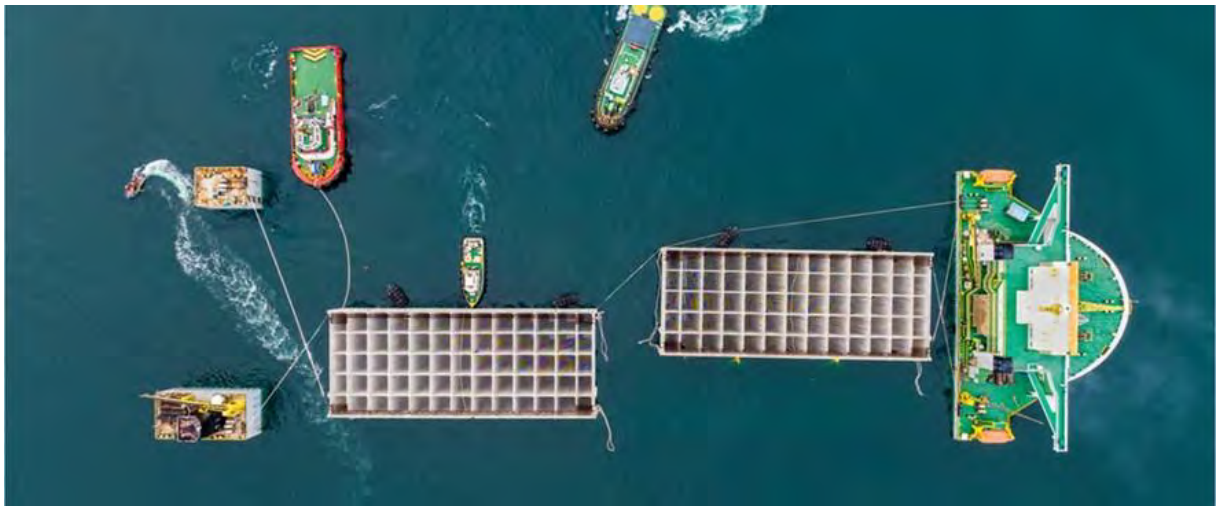

Diagram 3-6; Caisson loading into the semi submersible vessel

The three/four batches of caisson deliveries will be unloaded using 3 tugboats of at least 4000 Horsepower which will be hired locally, with the operation carried out in one to two good weather days per shipment.

Caissons will be unloaded from the semisubmersible vessel to the quay location and stored within the project area, as shown in Diagram 3-7. They will be prepared with the installation of auxiliary equipment such as winches, mooring ropes and anchors, walking platforms, ballast systems, topographic prisms and fenders. Once caissons are unloaded from the semi-submersible vessel, they will be either temporarily tied to each other at the (partially-constructed) quayside, or temporarily secured to the seabed using anchors, close to the project site. No piling or drilling is required. Negligible underwater noise is generated by this activity. Once the weather conditions permit, they will be sunk into their final positions. Alternatively, caissons can be temporarily stored onto the foundation at the quay line and refloated to install within tolerance later.

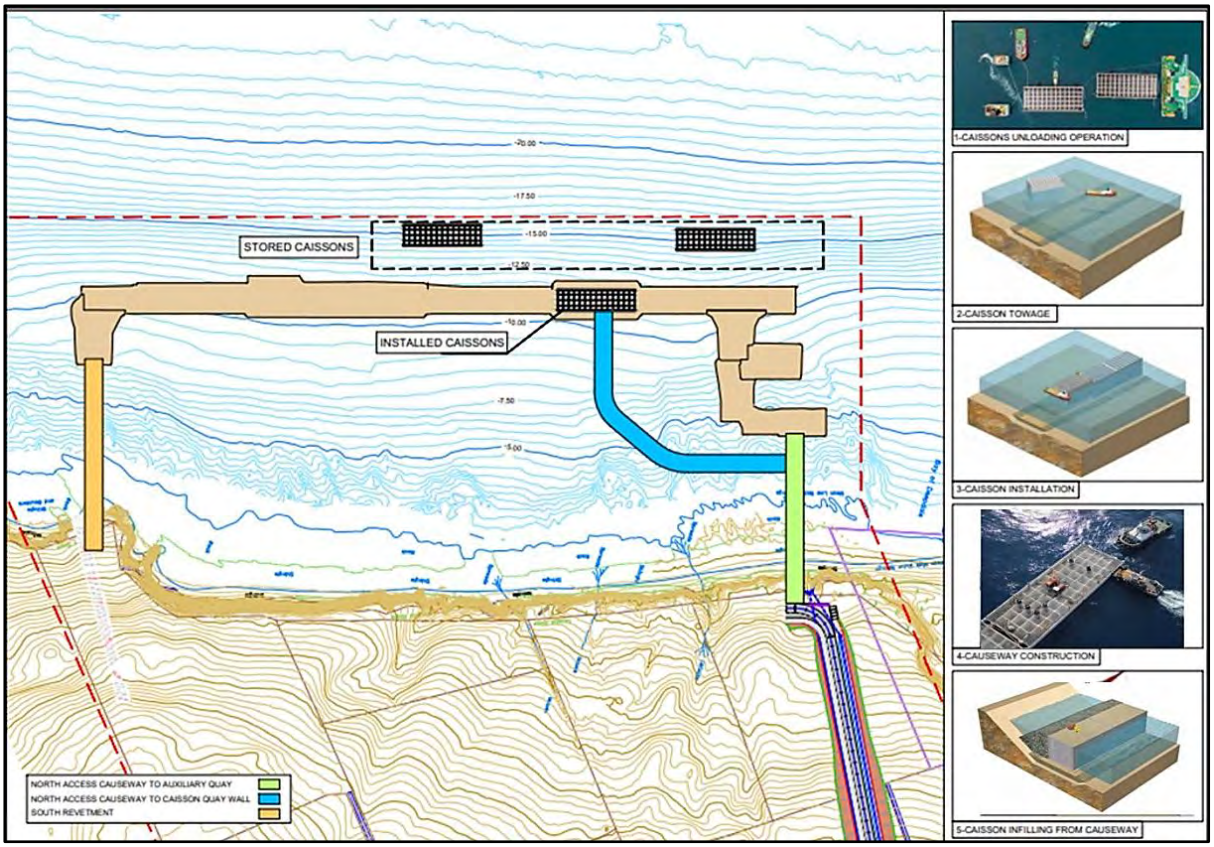

Diagram 3-7: Storage area for caisson within project boundaries.

3.2.9 Caisson Installation

The process to install a caisson is typically performed in around 6-8 hours given suitable metocean conditions. Caissons will be towed individually from their temporary storage location to the quay line. Typically, one tugboat will be sufficient, with the same tug used to assist the installation operation.

Diagram 3-8: Caisson control platform and equipment to position and sink them.

The caisson will be positioned while sinking, using tugs and winches until a final controlled touchdown on the rock foundation. Each caisson has independent and watertight groups of cells. During the operation, each group of cells is filled simultaneously with sea water either using a pump or a valve, with

surveyors monitoring the level in each group to ensure that the installation process is performed in a controlled manner.

The caissons arrive dry and any ballasting uses water introduced locally and not imported. Each caisson is ballasted with seawater until touchdown on the gravel foundation. If the final positioning is within specified tolerances, ballasting continues until the caisson is filled with seawater. Where tolerances are not achieved, the caisson is re-floated by de-ballasting water and repeating the operation, until tolerances are met. It is typical for a single operation to achieve successful installation within tolerance.

Once caissons are unloaded from the semi-submersible vessel, they will be either temporarily tied to each other at the (partially constructed) quayside or temporarily secured to the seabed using anchors, close to the project site. No piling or drilling is required. Negligible underwater noise is generated by this activity.

The installation process requires specific conditions to ensure the operation is safely and accurately completed as shown in Table 3-4.

Table 333: Required metocean conditions for installation

Limiting weather criteria for caisson sinking operations		
Maximum 10-minute sustained wind speed	10	m/s
Maximum significant wave height	0.8	m
Maximum swell	0.3	m
Maximum swell period	8	seconds
Maximum current	0.5	m/s

3.2.10 Revetments

Rock-armoured revetments will be constructed to protect the north and south sides of the site from wave action, as shown in Diagram 3-8. Armour layers will consist of 2.5 tonnes (north) and 4.5 tonnes (south) of imported rock with appropriately sized underlayers and geotextiles.

3.2.11 Sea Filling

Once caissons are installed, filled and backfilled, and the revetments are also in place closing the perimeter, general infilling will commence. Reclamation material is comprised of dredged material and land-based excavated material (which will be screened on site to remove fines before placement). Substantial marine area containment will be achieved before land reclamation fill is progressed, thus minimising sediment discharge outside the works. It should be noted that OICHA intend to install turbidity meters to measure any rouge emissions, which will be included within the supporting outline CEMD, and will be detailed in full within the final working version to be prepared by the contractor once commissioned i.e. post-consent.

This element of the project is largely unchanged when considering the exemplar design and the new development proposals (caisson design).

3.2.12 Site Setup and Access Road Construction

The access road design utilises the exemplar design alignment retaining the swale on the northern side and footpath on the southern side. The road surface has been modified to a fully flexible solution to meet

the requirements of the proposed design vehicle and loading. To ensure stability of the slope in the fill sections the swale has been designed to incorporate a High-Density Polyethylene (HDPE) liner.

A safety barrier assessment indicates that H1/W2 safety barriers are required at the bend to the compound entrance access road, signage, lighting utility connections and stock fencing have all been reviewed and the design updated as required.

The access road is prioritised as a critical path activity as its completion triggers the commencement of the esplanade cut and fill operations. The contractor will require temporary service connections to the esplanades early in the programme to facilitate blasting, quarrying and earthworks operations.

Access will be formed from the realigned highway. Safe access and egress from the A961 will be achieved with reflective signage, 2-way lights as necessary, and the utilisation of banksmen.

The contractor will carry out the topsoil strip, overburden removal and elements of rock cut for the new access road. The contractor will place the subbase and surcharge it to act as a robust haul road during the construction programme. This will take cognisance of Scottish Environment Protection Agency (SEPA) comments on the need to protect Groundwater Dependent Terrestrial Ecosystems (GWDTE) in Deepdale.

The contractor will install the service trenching, drainage and ducting as the works progress to ensure water is managed effectively, services can be connected to the esplanade and a safe road is completed prior to temporary traffic using it. Upon completion of the project, the contractor will trim the surcharge and carry out the final surfacing.

3.2.13 Excavation Platform

The excavation of soft soils on land will be excavated by mechanical means, and the rock will be excavated by drilling and terrestrial blasting consisting of approximately one blast per week over 35 weeks (no marine blasting is proposed). Initially, the contractor will install pre-earthworks drainage to control surface water run-off. After installing perimeter cut off V ditches and ahead of main land excavation and land blasting, a 6m high bund will be formed at the seaward boundary of the site by retaining the existing land and excavating behind. This will create a natural noise screen and sediment runoff retention barrier. This natural bund will be removed once the remainder of the site is excavated to create the final profile.

3.2.14 Programme

The project contractor will deliver the Project ten months early when compared with the exemplar design duration of 52 months. This will be achieved through an innovative and robust off-site caisson manufacturing methodology, which delivers a de-risked project solution and minimises disruption to the Orkney Islands residents and environment.

A summary of the main programme milestones is included below (Diagram 3-10)

Diagram 3-9: Proposed Programme

The proposed programme is comprehensive, feasible and delivers a low risk and quicker approach to the design and construction of the Project by:

- Progressing the construction of the quay wall using an offsite caisson fabrication solution while the dredging and earthworks progress concurrently on site
- Installing 13 caisson units instead of approximately 1800m of combi-wall/sheet pile wall, significantly reducing the volume of activities on site and the associated exposure to downtime risk from seasonal weather (especially wind and the effect on craneage operations)
- Using the time savings (Diagram 3-10) from the caisson solution and concurrent working approach to: – De-risk the critical path by creating a programme float of ten months.
- Propose 1st of March 2026 as the Start Date to enable continuous works sequencing for summer transport and installation of caissons.

Diagram 3-10: Critical path through programme

3.3 Hydrodynamic Modelling

In section 4.7.2.4 in Volume 1 of the EIAR, hydrodynamic modelling has shown that during the construction phase, low current speeds and corresponding low bed shear stresses observed remain, as under existing baseline conditions, indicative of a low energy environment and that any impacts are negligible. Therefore, post-construction prey species for all waterfowl (fish, crustaceans, polychaetes and cephalopods) outwith the development footprint will remain as existing.

3.4 Pollution Control

There is the risk of pollution events (oil spills etc) during the construction phase of the Proposed Development. Adherence to strict Pollution Prevention controls and the use of a silt boom during land reclamation works will mitigate against pollution spills which could affect the qualifying interests of the SPA and SACs, and their prey sources.

In terms of surface water pollution, drainage will be designed, in accordance with best practice and SEPA requirements to ensure that there are no untreated surface water discharges directly to surrounding coastal waters. Suitable prevention measures will be in place at all times to prevent the release of pollutants to the water environment, including adjacent coastal waters.

A draft Construction Environmental Management Document (CEMD) has been produced specifically tailored to this project. This document will be further edited and enhanced to fully reflect the potential effects and suitable forms of mitigation specific to the chosen contractor's construction methods and the conditions of all consents.

3.5 Wet Storage

There will be no planned wet storage of constructed turbines at the SDWQ site. Therefore, there will be no risk of collision for bird species, in particular Red-throated Diver.

3.6 Cranes

The current development proposals do not include for any form of fixed or permanent cranage. Instead, it is anticipated that lifting operations will be carried out by a mixture of cranes attached to heavy lift vessels themselves and temporary mobile cranes deployed from the quay edge. Heavy lifting activities will typically coincide with large vessel movements, so cranes will be operating to similar timeframes as vessel movements.

As stated in Section 4.3, there will be approximately 48 operational vessel trips per year (96 vessel movements) with approximately 80% occurring in the summer months (April – September). However, this includes 18 pilot vessel trips, so when these are excluded, the number of vessel trips that would require craneage is 30 per year. This equates to 4 vessel trips per month (1 a week) in summer and 1 vessel trip per month (0.25 a week) in winter. As each vessel will be berthed at SDWQ for approx. 2-5 days, in the summer months cranes are likely to be active between 8 – 20 days per month, and in winter 2 – 5 days per month.

Crane activity will be dependent on weather conditions, particularly in winter months, as lifting of large loads is highly susceptible to even light to moderate winds. Based on analysis of 1 in 10 year weather averages in Kirkwall (1979-2010), the time lost to wind in the winter months is >200 hours per month. As such, it is likely that even less than 20% of lifting operations will take place in the winter.

The mobile cranes will be typically up to 250 tonnes capacity (Liebherr LTM1250 or similar). This type of crane has an extendable telescopic boom with maximum height of 60m in vertical lift. Smaller mobile cranes of 60 tonnes and 90 tonnes capacity will be used to support the larger cranes and will find more use during the winter months due to lower boom heights and lower windage. The maximum boom height for Leibherr LTM10-60 is 48m. On-vessel cranes would be in region of 70-100m height. The maximum number of cranes in use on site will depend on activities undertaken, but in summer months including on-vessel cranes could be up to 4 cranes on site i.e. one on-vessel crane plus 3 mobile cranes. In winter, this number will be far less and could be expected to be 2 mobile cranes given large shipments requiring on-vessel cranes will be planned for summer months. Mobile cranes are slow moving and generate limited engine noise at ground level.

During the summer months, mobile cranes will typically be stored on site at SDWQ, and in winter either stored on site or taken offsite if they are required elsewhere. Mobile cranes when not in use will be lowered with booms retracted and placed horizontally. In this configuration they are approximately 5m in height. These type of cranes do not normally provide own lighting, and lifting operations in winter will typically be carried out in daylight hours.

4 VESSEL MOVEMENTS

4.1 Existing Baseline for Scapa Flow

As part of the Navigational Risk Assessment (NRA) undertaken for the SDWQ Proposed Development, raw Automatic Identification System (AIS) data on vessel movements in Scapa Flow was purchased. The data contains information on vessel movements for a two-week period in August 2023 (14th-28th), representative of a summer period and for a two-week period in February 2024 (12th-26th), representative of the winter period. The data for these are tabulated below.

Table 4.1: Vessel Movements and type within Scapa Flow during a two-week period in August 2023

Vessel Type	Movements/month
Accommodation Vessel	1
Bulk Carrier	19
Buoy Laying Vessel	7
Cargo	233
Container Ship	21
Crew Boat	2
Crude Vessel Tanker	12
Dive Vessel	68
Diving Support Vessel	11
Dredger	3
Ferry (Houton – Flotta-Lyness route & Gills Bay to St Margaret's Hope Pentland Ferries)	327
Fire Fighting Vessel	10
Fishing	104
Fish Carrier	37
Fishing Support Vessel	6
Fishing Vessel	28
General Cargo	27
High Speed Craft	36
Local Vessel	14

LPG Tanker	6
Military Operations Vessel	2
Multi-Purpose Offshore Vessel	4
Offshore Supply Ship	28
Oil/Chemical Tanker	12
Other	55
Pilot Ship	9
Pilot Vessel	12
Pleasure Craft	53
Reefer	3
Research Vessel	5
RNJI Lifeboat	8
RoRo Cargo	19
Sailing Vessel	132
Shuttle Tanker	3
Special Craft	6
Supply Vessel	4
Trawler	18
Tug	56
Tug Supply Vessel	2
Unspecified	2
Utility Vessel	20
Vehicles Carrier	5
Work Vessel	12
Total	**1442**

Table 4.2: Vessel Movements and type within Scapa Flow during a two-week period in February 2024

Vessel Type	Movements/month
Bulk Carrier	14
Buoy Laying Vessel	2
Cargo	267
Cement Carrier	1
Combat Vessel	1
Container Ship	11
Crew Boat	5
Crude Vessel Tanker	8
Dive Vessel	36
Diving Support Vessel	2
Ferry (Houton – Flotta-Lyness route & Gills Bay to St Margaret's Hope Pentland Ferries)	327
Fishing	96
Fish Carrier	29
Fishing Support Vessel	2
Fishing Vessel	91
General Cargo	32
Heavy Lift Vessel	2
High Speed Craft	29
Local Vessel	15
LPG Tanker	2
Multi-Purpose Offshore Vessel	3
Offshore Supply Ship	29
Oil/Chemical Tanker	4
Other	35
Patrol Vessel	1

Pilot Ship	15
Pilot Vessel	45
Pleasure Craft	12
Reefer	2
Research Vessel	16
RNJI Lifeboat	3
RoRo Cargo	18
Sailing Vessel	3
Shuttle Tanker	4
Standby Safety Vessel	1
Supply Vessel	5
Trawler	19
Tug	57
Tug Supply Vessel	1
Unspecified	5
Utility Vessel	29
Vehicles Carrier	5
Work Vessel	2
Total	**1252**

A valid assumption is that the volume of vessel traffic over a two-week period is replicated for the month. Therefore, the total volume of vessel movements within Scapa Flow during August is 2884 and the total volume of vessel movements during February is 2504.

Extrapolating further, these movements can be replicated for both the summer (April to September) and winter (October to March) periods. This would give the following total of number of vessel movements within Scapa Flow:

- Summer period – 15,342 vessel movements
- Winter period – 13,062 vessel movements

OICHA have provided information on the current typical monthly vessel movements experienced within the eastern area of Scapa Flow. This is summarised below:

- One Flotta fuel tanker;

- 5 Ship to Ship Operations;
- 3 tugs, each with 11 trips in and out of Scapa Pier;
- Escort duties for 1 tug with 12 trips in and out of Scapa Pier;
- 22 pilot boat trips: and
- Occasional workboats to the rigs.

This equates to 124 vessel movements each month in the vicinity of the SDWQ site. This is approximately 5% of the total volume of vessel movements within Scapa Flow.

4.2 Vessel Movements Associated with Construction

The new caisson design will see the following vessel movements during construction (excluding dredging).

Table 4.3: Number of Predicted Vessel Movements During Construction

Vessel	Predicted Number of Vessel Movements.	Timescales
Caisson delivery	8 (4 deliveries) using semi-submersible vessel	June to August 2027
Caisson offloading (3 tugs for 13 caissons)	39	June to August 2027
Caisson installation (1 tug for 13 caissons)	26	June to August 2027
Scour protection	10 trips (20 movements)	Unknown. Taking precautionary approach, these will be undertaken between October and March.
Caisson infilling	15 trips (30 movements)	July 2027 – March 2028. Equates to 1 movement each week.
Dredging	63 trips (126 movements)	October 2026 – May 2027. Equates to 4 movements each week
Total	**249**	

The 249 vessel movements during construction results in a 91% increase of vessel movements from the previous submission using the exemplar design (which incorporated assessed 130 vessel movements).

When the 249 vessel movements are split between seasons (103 during summer and 146 during the period October to May when SPA qualifying species are still present) they would represent an increase in vessel movements of 0.7% over existing baseline for the whole of Scapa Flow and an increase in

monthly summer vessel movements within the eastern area of Scapa Flow of 13%. During winter, these additional vessel movements represent a 11% increase over the whole of Scapa Flow and an 13% increase in monthly winter vessel movements within the eastern area of Scapa Flow.

4.3 Vessel Movements associated with Operation

The size and number of vessels anticipated to utilise the quay will effectively occupy a water surface area of 39,000 m^2, when fully occupied, which is additional lost habitat to waterfowl species. Full occupation of the berths is expected to occur for about 100% of the time (worst case scenario).

There is significant existing vessel activity in the wider area around the proposed SDWQ. The only 'new' vessel route introduced by SDWQ is from the existing shipping channel to the site (hatched orange in Appendix C of the HRA). There are, in fact, existing vessel movements in this area, as shown by the vessel tracks in Appendix C of the HRA, and in more detail in the Navigation Risk Assessment submitted with the Environmental Impact Assessment Report.

During previous iterations of this HRA and dialogue with NatureScot, they have suggested a limit on vessel movements along this 'new' vessel route to SDWQ, to mitigate impacts from disturbance and displacement of SPA qualifying features and in particular Black-throated Diver, stating that 'birds are already habituated to tug and pilot boat traffic at the existing Scapa Pier, therefore a less impactful scenario would see tug and pilot boats remain at Scapa Pier, significantly reducing the vessel traffic along the 'new' route to the 60 vessel movements associated with offshore wind, and baseline traffic at Scapa Pier remaining as it is.'

To address NatureScot's concerns about operational vessel movements, Orkney Islands Council Harbour Authority (OICHA) will not relocate the tug and pilot boats from Scapa Pier to SDWQ in the current consent applications.

In this scenario, the estimated number of vessels calling at SDWQ in the operational phase is 30 per year (60 vessel movements), comprising 18 large vessels and 12 smaller vessel per year. This is the most up-to-date estimate and has not changed since previous iterations of the HRA. Each of the 18 large vessels will have one associated pilot boat (2 vessel movements). In addition, 2 or 3 tugs will assist with berthing the large vessels, although these will be operating in very close proximity to these large vessels, so do not constitute a separate disturbance.

In total, the estimated vessel movements per year is 96. The majority of these vessels (approximately 80%) are expected to occur during the summer months (April – September), so there will be an average of 12.8 vessel movements per month (3.2 per week) in summer and 3.2 per month (0.8 per week) in winter.

While the quay is a major strategic facility, its operational profile is characterised by the infrequent arrival of large vessels, aligned with the integration and deployment schedules of major offshore wind developments described elsewhere.

5 SCREENING FOR LIKELY SIGNIFICANT EFFECT

5.1 Likely Significant Effect

For significant effects to arise, there must be a risk enabled by having a 'source' (e.g. construction works at a proposed development site), a 'receptor' (e.g. a European site or its qualifying interests), and a pathway between the source and the receptor (e.g. mobile marine species travelling between the proposed development site and the designated site). The identification of a pathway does not automatically mean that significant effects will arise. The likelihood for significant effects will depend upon the characteristics of the source (e.g. duration of construction works), the characteristics of the pathway (e.g. what species and the number of individuals travelling between the two sites) and the characteristics of the receptor (e.g. the sensitivities of the European site and its qualifying interests).

NatureScot (2015) guidance states that sites with mobile species should be considered within the screening process where there is a significant ecological link between the designated site and the proposed development site. It also states that for developments which could increase recreational pressures on designated sites, all sites within reasonable travel distance of the development should be considered for screening. It is also necessary to consider sites which are part of the same coastal ecosystem, where the proposed development may affect coastal processes.

5.2 Relevant European Sites

The following sites have been scoped in for assessment due to them being within proximity to the site and/ or considered connected to the site via dispersal of designated mobile species:

- Scapa Flow SPA
- North Orkney SPA
- Orkney Mainland Moors SPA
- Hoy SPA
- Loch of Stenness SAC
- Sanday SAC

The sites are listed in Table 5-1, along with their screening assessment.

5.2.1 In-Combination Effects

At the request of NatureScot, a more robust cumulative assessment was required, including, but not limited to, aquaculture sites, renewables energy developments and other harbour developments. A search of all existing and planned aquaculture sites with the potential for adverse effects on the integrity of Scapa Flow SPA, North Orkney SPA and Sanday SAC was undertaken, along with a search for proposed renewable sites and harbour developments. The list below provides the results of that search, and which are taken forward for an assessment of in-combination effects:

- Orkney Logistics Base: Planning Application 23/256/NATEIA
- Westbister Fish Farm: Planning Application 15/409/MAR
- Veantrow Bay, Shapinsay Orkney Fish Farm: Planning Application 24/423/MARMAJ
- Bring Head Fish Farm: Planning Application 21/411/MAR
- Toyness Fish Farm: Planning Application 21/410/MAR
- South Cava Fish Farm: Planning Application 17/134/MAR

- Chalmers Hope Fish Farm: Planning Application 20/231/MAR
- Lyrawa Bay Fish Farm: Planning Application 18/057/MAR
- Pegal Bay Fish Farm: Planning Application 18/058/MAR
- Hunda North Fish Farm: Planning Application 17/198/MAR
- Wyre Fish Farm, Gairsay Sound: Planning Application 23/183/MARPN
- Quanterness Fish Farm: Planning Application 24/216/MAR
- Warebeth And Seabed Offshore, Stromness, Orkney: Planning Application 25/117/WL

Table 5.1: List of European Designated Sites within proximity to the site along with their Qualifying Features and Screening Assessment for Likely Significant Effects

Site Name (distance and orientation from works)	**Conservation Objectives**	**Qualifying Features**	**Likely Significant Effect (LSE)**	**Screening Assessment**
Scapa Flow SPA (On site)	To ensure that the qualifying features of the Scapa Flow SPA are in favourable condition and make an appropriate contribution to achieving Favourable Conservation Status.	Great northern diver, non-breeding	Pathway for LSE identified. Great Northern Diver were regularly recorded during the surveys. There is potential for the species to be subject to disturbance during the construction and operational phase of the proposed development via temporary noise from dredging and vessel and onshore vehicle movements. This could result in displacement from the habitat and a reduction in overall foraging habitat.	Scoped in
		Long-tailed duck (*Clangula hyemalis*), non-breeding	Pathway for LSE identified. Long-tailed Duck were regularly recorded during the surveys. There is potential for the species to be subject to disturbance during the construction and operational phase of the proposed development via temporary noise from dredging and vessel and onshore vehicle movements. This could result in displacement from the habitat and a reduction in overall foraging habitat.	Scoped in
		Red-breasted merganser (*Mergus serrator*), non-breeding	Pathway for LSE identified. There is potential for the species to be subject to disturbance during the construction and operational phase of the proposed development via temporary noise from dredging and vessel and onshore vehicle movements. This could result in displacement from the habitat and a reduction in overall foraging habitat	Scoped in
		Red-throated diver, breeding	Pathway for LSE identified. During the construction and operational phase of the proposed development foraging Red-throated Divers could be impacted temporarily by noise from dredging and vessel and onshore vehicle movements. This could result in displacement from the habitat and a reduction in overall foraging habitat.	Scoped in

Site Name (distance and orientation from works)	**Conservation Objectives**	**Qualifying Features**	**Likely Significant Effect (LSE)**	**Screening Assessment**
		Shag (*Phalacrocorax aristotelis*), non-breeding	Pathway for LSE identified. There is potential for the species to be subject to disturbance during the construction and operational phase of the proposed development via temporary noise from dredging and vessel and onshore vehicle movements. This could result in displacement from the habitat and a reduction in overall foraging habitat.	Scoped in
		Slavonian grebe (*Podiceps auritus*), non-breeding	Pathway for LSE identified. There is potential for the species to be subject to disturbance during the construction and operational phase of the proposed development via temporary noise from dredging and vessel and onshore vehicle movements. This could result in displacement from the habitat and a reduction in overall foraging habitat.	Scoped in
		Black-throatedDiver, non-breeding	Pathway for LSE identified. There is potential for the species to be subject to disturbance during the construction and operational phase of the proposed development via temporary noise from dredging and vessel and onshore vehicle movements. This could result in displacement from the habitat and a reduction in overall foraging habitat.	Scoped in
		Eider (*Somateria mollissima*), non-breeding	Pathway for LSE identified. There is potential for the species to be subject to disturbance during the construction and operational phase of the proposed development via temporary noise from dredging and vessel and onshore vehicle movements. This could result in displacement from the habitat and a reduction in overall foraging habitat.	Scoped in
North Orkney SPA (4 km north east)	To ensure that the qualifying features of the North Orkney	Great northern diver (*Gavia immer*), non-breeding	There is the potential for Great Northern Divers from North Orkney SPA to also utilise Scapa Flow SPA. LSE identified	Scoped in

Site Name (distance and orientation from works)	**Conservation Objectives**	**Qualifying Features**	**Likely Significant Effect (LSE)**	**Screening Assessment**
	SPA are in favourable condition and make an appropriate contribution to achieving Favourable Conservation Status.	Red-throated diver (*Gavia stellata*), breeding	There is the potential for Red-throated Divers from North Orkney SPA to also utilise Scapa Flow SPA. LSE identified	Scoped in
		Slavonian grebe (*Podiceps auritus*), non-breeding	There is the potential for Slavonian Grebe from North Orkney SPA to also utilise Scapa Flow SPA. LSE identified.	Scoped in
		Velvet scoter (*Melanitta fusca*), non-breeding	No Velvet Scoter were recorded during the surveys. Therefore, it is unlikely that this species utilises Scapa Flow SPA No LSE is predicted.	Scoped out
Orkney Mainland Moors SPA (6km north west)	To avoid deterioration of the habitats of the qualifying species (listed below) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and To ensure for the qualifying species that the following are maintained in the long term:	Hen harrier (*Circus cyaneus*), breeding	Pathway for LSE identified. Pendlebury et al. (2011) state that the maximum foraging range from nests is 2km for females and males can travel up to 8.5km from a nest site. Hen harriers can utilise coastal areas to predate waders, therefore it is It possible that birds breeding within the SPA could utilise the water within the proposed harbour area for foraging. During the construction phase of the proposed development foraging Hen Harriers could be impacted temporarily by noise from construction activities This could result in displacement from the habitat and a reduction in overall foraging habitat. However, as Hen harriers favour heather moorland and stream habitat when nesting, and there are plenty of accessible coastal areas outside the working area available, it is unlikely that works associated with the Scapa site will have a significant effect on the foraging success of breeding Hen Harrier.	Scoped out
		Hen harrier non-breeding	Pathway for LSE identified. It possible that birds within the SPA could utilise the water within the proposed harbour area for foraging. During the construction phase of the proposed development foraging Hen Harriers could be impacted temporarily by noise from construction activities. This could result in displacement from the habitat and a reduction in overall foraging habitat. However, as winter foraging Hen Harriers favour open rank habitats for foraging, and there are plenty of accessible coastal areas outside the working area available, it is unlikely that works associated with the pier will have a significant effect on the foraging success of foraging Hen Harrier in the locale.	Scoped out

Site Name (distance and orientation from works)	**Conservation Objectives**	**Qualifying Features**	**Likely Significant Effect (LSE)**	**Screening Assessment**
		Red-throated diver, breeding	Pathway for LSE identified. Pendlebury et al. (2011) state that the maximum foraging range from nests during the breeding season is generally 8km for Red-throated Diver but can be up to 13.5km in the Western Isles. It is possible that birds breeding within the SPA could utilise the water within the proposed works area for foraging. During the construction phase of the proposed development foraging Red-throated Divers could be impacted temporarily by noise from dredging and vessel and onshore vehicle movements. This could result in displacement from the habitat and a reduction in overall foraging habitat.	Scoped in
		Short-eared owl (*Asio flammeus),* breeding	No pathway identified. No potential impacts to breeding Short- eared owl or their habitat within the SPA are predicted due to the distance between the SPA and the proposed development and the species not being associated with coastal habitats. No LSE is predicted.	Scoped out
Hoy SPA (16.5 km west)	To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus	Arctic skua (*Pterocarpus parasiticus*), breeding	Pathway for LSE identified. It possible that birds within the SPA could utilise the water within the proposed works area for foraging. During the construction phase of the proposed development foraging Arctic Skua could be impacted temporarily by noise from construction activities. This could result in displacement from the habitat and a reduction in overall foraging habitat.	Scoped in

Site Name (distance and orientation from works)	Conservation Objectives	Qualifying Features	Likely Significant Effect (LSE)	Screening Assessment
	ensuring that the integrity of the site is maintained.	Fulmar (*Fulmarus glacialis*), breeding	Pathway for LSE identified. It possible that birds within the SPA could utilise the water within the proposed works area for foraging. During the construction phase of the proposed development foraging Fulmar could be impacted temporarily by noise from construction activities This could result in displacement from the habitat and a reduction in overall foraging habitat.	Scoped in
		Great black-backed gull (*Larus marinus*), breeding	Pathway for LSE identified. It possible that birds within the SPA could utilise the water within the proposed works area for foraging. During the construction phase of the proposed development foraging Great Black-backed Gull could be impacted temporarily by noise from construction activities. This could result in displacement from the habitat and a reduction in overall foraging habitat.	Scoped in
		Great skua (*Stercorarius skua*), breeding	Pathway for LSE identified. It possible that birds within the SPA could utilise the water within the proposed works area for foraging. During the construction phase of the proposed development foraging Great Skua could be impacted temporarily by noise from construction activities. This could result in displacement from the habitat and a reduction in overall foraging habitat.	Scoped in
		Guillemot (*Uria aalge*), breeding	Pathway for LSE identified. It possible that birds within the SPA could utilise the water within the proposed works area for foraging. During the construction phase of the proposed development foraging Guillemot could be impacted temporarily by noise from construction activities, this could result in displacement from the habitat and a reduction in overall foraging habitat.	Scoped in

Site Name (distance and orientation from works)	**Conservation Objectives**	**Qualifying Features**	**Likely Significant Effect (LSE)**	**Screening Assessment**
		Kittiwake (*Rissa tridactyla*), breeding	Pathway for LSE identified. It possible that birds within the SPA could utilise the water within the proposed works area for foraging. During the construction phase of the proposed development foraging Kittiwake could be impacted temporarily by noise from construction activities. This could result in displacement from the habitat and a reduction in overall foraging habitat.	Scoped in
		Peregrine (*Falco peregrinus*), breeding	No Pathway for LSE identified. The core foraging range for Peregrine is 2km. The site is located 16.5km from the SPA. Therefore, at the distance It is unlikely for birds from within the SPA utilise the site for foraging.	Scoped out
		Puffin (*Fratercula arctica*), breeding	It possible that birds within the SPA could utilise the water within the proposed works area for foraging. During the construction phase of the proposed development foraging Puffin could be impacted temporarily by noise from construction activities. This could result in displacement from the habitat and a reduction in overall foraging habitat.	Scoped in
		Red-throated diver (*Gavia stellata*), breeding	Pathway for LSE identified. Vessel movements associated with dredge material will be transported to the dredge disposal via areas that are utilised by feeding divers during the breeding season,	Scoped in

Site Name (distance and orientation from works)	**Conservation Objectives**	**Qualifying Features**	**Likely Significant Effect (LSE)**	**Screening Assessment**
		Seabird assemblage, breeding	Pathway for LSE identified. It possible that bird assemblages within the SPA could utilise the water within the proposed works area for foraging. During the construction phase of the proposed development foraging Hen Harriers could be impacted temporarily by noise from dredging and vessel and onshore vehicle movements. This could result in displacement from the habitat and a reduction in overall foraging habitat.	Scoped in
Loch of Stenness SAC (16km north west)	To maintain the condition of the SAC feature	Lagoons	Pathway for LSE identified. At its nearest point the site is 16km north west of the proposed development. No alterations to coastal processes are predicted at these distances and no significant sediment transportation is likely. Dredging disposal will occur at FI040 to the west of Stromness. This is ~13km from the Loch of Stenness SAC. With a small amount of proposed dredge disposal, sediment transport over a distance of 13km is considered highly unlikely. There is the potential risk of Invasive non-native species spread from dredging barge water ballast.	Scoped in
Sanday SAC (36km north east)	To avoid deterioration of the qualifying habitats thus ensuring that the integrity of the site is maintained, and the site makes an appropriate contribution to	Harbour seal (*Phoca vitulina*)	Pathway for LSE identified. It is not considered that seals within the SAC will be directly influenced by works due to the distance between the development area and the SAC. There is potential for the species to be indirectly impacted by accidental pollution incidents or increased sedimentation and turbidity during works impacting water quality and therefore food availability. Harbour seals could be subject to death or injury through underwater noise or collision with vessels during works.	Scoped in

Site Name (distance and orientation from works)	**Conservation Objectives**	**Qualifying Features**	**Likely Significant Effect (LSE)**	**Screening Assessment**
	achieving favourable conservation status for each of the qualifying features; and To ensure for the qualifying habitats are maintained in the long term:	Intertidal mudflats and sandflats	No pathway for LSE identified. At its nearest point the site is 16km north west of the proposed development. No alterations to coastal processes are predicted at these distances and no significant sediment transportation is likely.	Scoped out
		Reefs	No pathway for LSE identified At its nearest point the site is 16km north west of the proposed development. No alterations to coastal processes are predicted at these distances and no significant sediment transportation is likely.	Scoped out
		Subtidal sandbanks	No pathway for LSE identified. At its nearest point the site is 16km north west of the proposed development. No alterations to coastal processes are predicted at these distances and no significant sediment transportation is likely.	Scoped out
Pentland Firth Islands SPA		Arctic Tern	No pathway for LSE identified. Arctic Tern has been recorded during the surveys. However, none were recorded foraging or loafing within the proposed development area. The mean foraging distance for Arctic Tern is 4.4km. The nearest breeding Island within the SPA complex is Swona which is 19km from the proposed development. Therefore, there is no connectivity.	Scoped out

In addition to these designated sites, there are three SPAs that have Northern Gannet (*Morus bassanus*) as a qualifying feature, either on their own or as part of a seabird assemblage, within 140km of the proposed SDWQ site which is the mean foraging range for this species. These sites are:

- Sule Skerry and Sule Stack SPA
- Fair Isle SPA; and
- Troup, Pennan and Lion's Head SPA

Although the SDWQ lies within the foraging range of Gannets from each of these SPAs, they were recorded only infrequently within the survey area (20-25% of survey visits) with a peak of three birds. Given the low frequency of sightings, the small numbers of birds involved and the fact that the foraging range of Gannets is extremely large, it is considered that the survey area around the proposed SDWQ site is of negligible importance to this species. Therefore, there is no LSE for this species as a result of the proposed development, and they have therefore been scoped out of further assessment.

5.3 Screening Conclusion

The outcome of screening for appropriate assessment is to reach one of the following determinations:

a) A stage 2 AA of the proposed development is required if it is concluded, on the basis of objective information, that the proposed development, individually or in combination with other plans or projects, will have a significant effect on a European site.
b) A stage two AA of the proposed development is not required if it can be concluded, on the basis of objective information, that the proposed development, individually or in combination with other plans or projects, will not have a significant effect on a European site.

Following an examination, analysis and evaluation of the relevant information including, in particular, the nature of the proposed development and the likelihood of significant effects on scoped in designated sites.

- Scapa Flow SPA
- North Orkney SPA;
- Orkney Mainland Moors SPA (Red-throated Diver)
- Hoy SPA (Arctic Skua, Great Skua, Fulmar, Great Black-backed Gull, Kittiwake, Puffin and Guillemot);
- Loch of Stenness SAC; and
- Sanday SAC (Harbour Seal)

6 APPROPRIATE ASSESSMENT: SCAPA FLOW SPA

6.1 Site Description

The Scapa Flow SPA comprises a total area of 31,819 ha located within Scapa Flow, an enclosed sea area, sheltered by Mainland Orkney to the north, Hoy, South Walls and Flotta to the west and south, and Burray and South Ronaldsay to the east. The Flow is linked to the Pentland Firth in the south through the Sound of Hoxa, and to the Atlantic Ocean in the west through Hoy Sound. The site also includes nearshore waters to the east of Orkney, extending from South Ronaldsay to Deerness, and including the sheltered shallow waters of Holm Sound, between Burray and East Mainland. It encompasses a range sheltered and diverse marine communities which provide a range of food resource for breeding, moulting and roosting sea birds.

The SPA supports the following species:

- The third largest population of wintering Great Northern Diver (c.20% of the GB population or 505 individuals).
- Wintering Black-throated Diver (c. 9.5% of the GB population or 57 individuals).
- Wintering Slavonian Grebe (c.12% of GB population or 135 birds)
- The second largest population of wintering European Shag in Scotland (c.3% of GB population or 2927 individuals)
- Wintering Common Eider (3% of GB population or 1997 individuals)
- Wintering Red-breasted Merganser (6% of GB population or 539 individuals)
- Wintering Long-tailed Duck (13% of GB population or 1395 individuals)
- Red-throated Diver (c.6% of GB population or 76 pairs) breeding within fresh water lochans within 10km of the SPA.

All the designated site features are assessed as favourable.

6.2 Conservation Objectives

The conservation objectives for Scapa Flow SPA are as follows:

1. To ensure that the qualifying features of the Scapa Flow SPA are in favourable condition and make an appropriate contribution to achieving Favourable Conservation Status.

2. To ensure that the integrity of the Scapa Flow SPA is maintained in the context of environmental changes by meeting objectives 2a, 2b and 2c for each qualifying feature:

> 2a. The populations of qualifying features are viable components of the site.
>
> 2b. The distribution of the qualifying features is maintained throughout the site by avoiding significant disturbance of the species.
>
> 2c. The supporting habitats and processes relevant to qualifying features and their prey/food resources are maintained.

6.3 Great Northern Diver, non-breeding

Baseline surveys were undertaken between November 2020 and March 2024, details of which can be found in the Ornithological Technical Report (EIAR Technical Appendix 5.3: Scapa Deep Water Quay Ornithology Technical Report). A summary of findings is found below.

6.3.1 Summary of Occurrence at the Development Site and in Scapa Flow

Seasonality: The more or less regular spread of count days at the Deepdale site gives a good indication of the seasonal spread of records.

- 2020/21 peaks (up to 2km from the main VP) in November and again in May
- 2021/22 peaks (up to 2km from the main VP) in November and again in April/May
- 2023/24 peaks (up to 2km from the main VP) in November and again in March

Wider occurrence across Scapa Flow SPA: The Scapa Flow inshore survey in 2017/18[3] found a peak of 1016 birds, with a mean count of 826 birds across the four rounds of surveys. These counts are significantly higher than the SPA citation population (505 birds). Based on the maps and tables from each count provided in the 2017/18 survey report, Great Northern Divers were spread out across Scapa Flow, with the exception of the "Southern Approaches" vantage points. The HiDef survey results from 2021/22 and 2022/23 indicates that the largest numbers of Great Northern Divers within the eastern half of Scapa Flow occur off the Tongue of Westerbister and St Mary's Bay, located 2.5-4km south of the Proposed Development. A map showing the distribution of birds recorded both during the baseline surveys and HiDef surveys from 2021/22 and 2022/23, as well as maps showing the current baseline vessel routes and the 2017/18 wintering bird data can be found in Appendix A.

Numbers from Deepdale survey work: Table 6-1 below indicates the peak and average counts within various distance bands around the main VP at Deepdale in each recording year.

Table 6.1: Peak and average numbers of Great Northern Diver in zones around the main Deepdale VP (NB different start dates in calculation of averages due to survey timing differences between years).

Distance band	Survey period	Peak month	Peak number	% SPA population (505 birds)	Average number (Oct/Nov to Mar)	% SPA population (505 birds)
0 – 500 m	Yr 1 - 2020/21	April	8	1.6%	2.036	0.4 %
	Yr 2 - 2021/22	March	9	1.8%	**2.156**	**0.4 %**
	Yr 3 - 2023/24	Nov	6	1.2%	2.125	0.4 %
0 – 1 km	Yr 1 - 2020/21	Nov/Feb	**27**	**5.3%**	8.608	1.7 %
	Yr 2 - 2021/22	Dec	**27**	**5.3%**	7.063	1.4 %
	Yr 3 - 2023/24	Nov	21	4.2%	**8.875**	**1.8 %**
0 – 2 km	Yr 1 - 2020/21	May	40	5.9%	15.429	3.1%
	Yr 2 - 2021/22	Jan	38	7.5%	16.031	3.2 %
	Yr 3 - 2023/24	Nov	**59**	**12 %**	**24.167**	**4.8 %**

A peak count of 27 Great Northern Divers was recorded within 1km of the Proposed Development, with a peak of 59 birds within 2km. The 2020/21 and 2021/22 data correlates well with the inshore surveys

[3] Jackson, D. 2018. Scapa Flow proposed Special Protection Area (pSPA) – inshore wintering waterfowl survey 2017/18. Scottish Natural Heritage Research Report No. 1075

undertaken by HiDef for NatureScot[4], where a peak count of 28 birds were recorded in the same general area in January 2022. There was a significantly higher peak count during the 2023/24 surveys. The peak of 59 birds represents 12% of the Scapa Flow SPA population, with the average count representing 4.8% of the SPA population.

Table 6-2 below details the numbers of Great Northern Divers present within 2km of the Proposed Development during their flightless moult period (February to mid-April).

Table 6.2: Great Northern Diver numbers during flightless moult period

Month	No. count days	Average count <2km	Peak count <2km
Feb 2021	4	6.5	16
March 2021	4	9	12
April 2021	2	24	26
2021 seasonal figures	10	11	26
Feb 2022	4	17.25 [25.5]*	24 [35]
March 2022	4	22 [27.25]	30 [51]
April 2022	2	35 [36]	38 [40]
2022 seasonal figures	10	22.7 [28.3]	38 [51]
Feb 2024	4	20.5 [23]	26 [29]
March 2024	4	26.5 [28]	35 [35]
2024 seasonal figures	8	23.5 [24.25]	35 [35]

* figures in square brackets include all diver sp.

The peak average count of 35 birds (April 2022) and peak count of 38 (April 2022) represents 7% and 7.5% of the SPA population respectively. Taken as an average across years, the average of 19 birds (taken from 2021, 2022 and 2024 seasonal figures) represents 3.8% of the SPA population and the average peak count of 33 birds represents 6.5% of the SPA population.

6.3.2 Assessment of Potential Impacts on Conservation Objectives

6.3.2.1 Conservation Objective 2a: The populations of qualifying features are viable components of the site.

The Proposed Development will result in the loss of 19.1Ha of the Scapa Flow SPA. This equates to 0.06% of the total SPA area. Given the number and distribution across Scapa Flow of Great Northern Divers from the 2017/18 surveys and during the HiDef surveys of 2021/22 and 2022/23, the wider SPA site has the capacity to accommodate Great Northern Divers that utilise the current Proposed Development site boundary for foraging.

During the operational phase, and with the redeployment of port service vessels (tugs and pilot boats) working out of SDWQ, it is anticipated that in the worst case scenario the area of new/novel route (branching from the main shipping channel towards the Proposed Development) will see 100% displacement of birds. This area totals 167Ha (this is precautionary as areas of this are currently already used by vessels). As previously noted above, the wider SPA has the capacity to accommodate birds that utilise this small area of new/novel route.

[4] Peters-Grundy, R., Thompson, K., Humphries, G., Harvey, J., Semple, M., Tyler, K., Harker, A.J., Pavat, D., Thomson, R., Olley, N. and Macleod, K. Scapa Flow and North Orkney Special Protection Areas (SPAs) - Inshore wintering waterfowl surveys 2021/22 and 2022/2023. Report for NatureScot

There is minimal risk of mortality through collision with marine vessels as a result of the Proposed Development. Other direct effects affecting water quality are dealt with in Conservation Objective 2c and indirect effects (ie disturbance resulting in reduced body condition and survival) are dealt with in Conservation Objective 2b.

With no predicted impacts in either conservation Objectives 2b and 2c, it is considered that the population of Great Northern Diver remain a viable component of the site.

6.3.2.2 Conservation Objective 2b: The distribution of the qualifying features is maintained throughout the site by avoiding significant disturbance of the species.

Disturbance may occur through dredging activities and airborne noise through terrestrial works during the construction phase. Empirical data specifically linking marine bird response to noise disturbance (and underwater noise in particular), separate from other sources of disturbance (e.g. vessel movement or human presence), is limited and this source of disturbance on marine birds is not yet well understood. Recent research generally suggests that diving seabirds could be more sensitive to underwater noise than previously assumed. For example, hearing thresholds for Great Cormorant (*Phalacrocorax carbo*) were found to be comparable to seals and toothed whales in the frequency band 1 to 4 kHz (Hansen et al., 2017). A number of assessments have, based on the limited information available, and the similar frequency ranges between seabirds and phocid pinniped and cetacean species, applied methodologies developed for pinnipeds or low frequency cetaceans in assessing seabird sensitivity to underwater noise (Teachout, 2012). Underwater noise modelling (Technical Appendix 5.6 of the EIAR) for dredging shows a TTS range of up to 250m and a PTS range of 50m or less for prolonged exposure (8 hours). During works, an ornithologist will be present to monitor the works, specifically within the 250m zone. Should any impacts become apparent, the disturbance zone can be increased to mitigate against this.

The Construction activities have been highlighted in the Airborne Noise Report (Technical Appendix 9.1 of the EIAR) and noise contour maps have been prepared (see Appendix B) as having noise creation levels of between 70 and 90dB at 10m from source, with noise levels decreasing over distance. With the creation of a 6m bund on the seaward side of the working area, the noise maps demonstrate that noise levels beyond the seaward bund would be between 40-50dB in the immediate vicinity of the bund and dissipate to <35dB at 250m, A study compiled by the Institute of Estuarine and Coastal Studies (IECS), University of Hull (2009) found that construction noise emissions below 50 dB had a low effect and no impact on waterbirds. Disturbance noise above 70 dB resulted in a moderate to high effect to birds resulting in movement within the feeding zone. The study concluded that construction noise levels should be restricted to below 70 dB. It is concluded that the main terrestrial works will not result in impacts to Great Northern Diver.

Terrestrial blasting associated with the construction phase could cause disturbance to Great Northern Diver via noise associated from terrestrial blasting. However, routine blasting operations regularly generate air overpressure levels at the closest point to blast area of around 120 dB but the intensity of these noise levels experienced at a distance from the blast site are affected by a range of meteorological conditions (wind speed and direction, temperature, cloud cover and humidity) and in general reduce by 6 dB reduction as the distance from the source doubles, and that when sound waves pass a given position, the pressure of the air rises very rapidly then falls more slowly then returns to the ambient value after a number of oscillations, Terrestrial blasting activities will occur on site. This will occur once a week over a 35-week period. The Construction Environmental Management Document (CEMD) (Technical Appendix 10.3) details mitigation measures to avoid any significant impacts on marine bird species, including Great Northern Diver. This includes the presence of an ornithologist to monitor for the presence of SPA qualifying species within 500m of the Proposed Development and record behavioural responses within this zone. If impacts are recorded, then the disturbance zone shall be increased.

It is highly likely that birds will be displaced from the working area (but acknowledging that the wider Scapa Flow SPA has the capacity to accommodate displaced birds) a sufficient distance that noise disturbance does not cause an impact.

Mitigation, including adaptive management measures through the provision of an ornithologist monitoring works (both dredging and terrestrial blasting and determining the need to increase or decrease disturbance buffers would limit any potential disturbance impact. This localised and temporary impact would not result in significant Impacts to Great Northern Diver within the SPA.

OICHA have provided information on the current typical monthly vessel movements experienced within the eastern area of Scapa Flow. This is summarised below:

- One Flotta fuel tanker;
- 5 Ship to Ship Operations;
- 3 tugs, each with 11 trips in and out of Scapa Pier;
- Escort duties for 1 tug with 12 trips in and out of Scapa Pier;
- 22 pilot boat trips: and
- Occasional workboats to the rigs.

This equates to 124 vessel movements each month in the vicinity of the SDWQ site.

During construction, the number of vessel movements associated with the caisson delivery and installation, and relevant to the period when Great Northern Divers are present will equate to 126 vessel movements associated with dredge disposal over a 33-week period between October 2026 and May 2027 (4 movements each week).

The majority of the routes used by these vessels will be along established routes (ie, the main shipping channel and the shipping lane west towards Stromness). The only new, or seldom used, section of route to be used for vessels will be the 167Ha branching east off the established route to the SDWQ site. Maps in Appendix C shows the survey data from both the project surveys and HiDef surveys, along with the proposed shipping routes for construction and dredging and diagram 6-1 shows an analysis of the mean density of Great Northern Diver across Scapa Flow (taken from HiDef survey reporting). As can be seen, the density of Great Northern Divers within the main shipping routes are low and disturbance is considered unlikely.

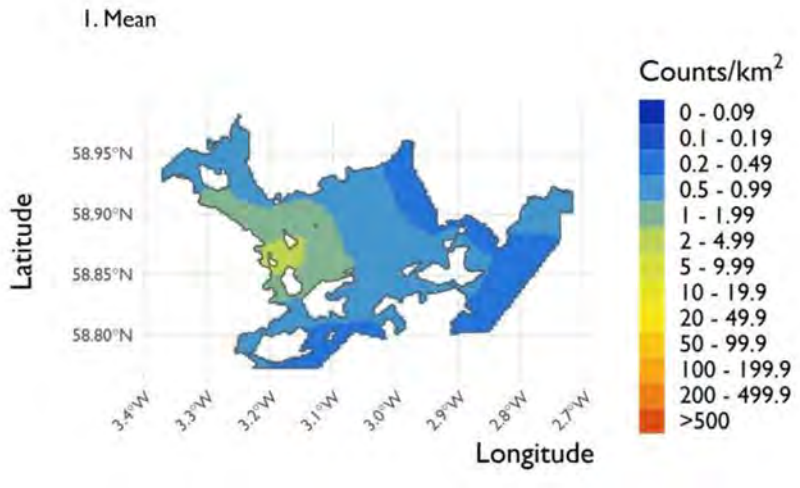

Diagram 6-1: Modelled Great Northern Diver densities across Scapa Flow SPA (taken from HiDef 2022/23 wintering bird survey report).

During the operational phase, with the retention of tugs and pilot vessels at Scapa Pier, the estimated number of vessels calling at SDWQ in the operational phase is 30 per year (60 vessel movements), comprising 18 large vessels and 12 smaller vessel per year. Each of the 18 large vessels will have one associated pilot boat (2 vessel movements). In addition, 2 or 3 tugs will assist with berthing the large vessels, although these will be operating in very close proximity to these large vessels, so do not constitute a separate disturbance.

In total, the estimated vessel movements per year is 96. The majority of these vessels (approximately 80 %) are expected to occur during the summer months (April – September), so there will be an average of 12.8 vessel movements per month (3.2 per week) in summer and 3.2 per month (0.8 per week) in winter.

During the ornithological surveys undertaken between 2020 and 2022, bird and boat interactions were recorded. For Great Northern Diver, there were 49 observations of interactions with boats. Of these, 24 resulted in no reaction, 10 resulted in birds swimming away slowly, 11 were of birds diving and three caused an alert (sitting) response. There were no instances of boat movements causing a flight response. This correlates with the findings of Jarrett et al (2021) where at least 95% of reactions to vessel were either no response, slowly swimming away or diving. There were very few instances of vessels causing a flight response.

Great Northern Divers are thought to be highly sensitive to disturbance through vessel movements. However, the increase in vessel use along the new/less disturbed route of 0.8 vessel movements a week is not considered significant. Taken in combination with the use out of Scapa Pier (124 vessel movements each month), the increase in vessel movements would equate to 2.5%. Again, this is not considered significant. Schwemmer et al (2011)[5] make the point that spatial planning should aim to channel ship and boat traffic wherever possible to avoid further habitat fragmentation (e.g. if cargo vessels, tugs and pilots were to range freely either side of the quay) and to allow for habituation, at least in some species.

A Vessel Management Plan will be produced, with input from NatureScot, for both the Construction and Operational phases which will detail vessel routes, speeds etc to minimise, and where possible, avoid any disturbance impacts within the new/novel vessel route.

None of these potential disturbance effects will result in barriers to movement, or reduce access to, preferred foraging and roosting habitats, resulting in a significant energy expenditure and possible reduction in body condition required for survival and subsequent migration.

Therefore, it is considered that distribution of Great Northern Diver will be maintained throughout the site.

6.3.2.3 Conservation Objective 2c: The supporting habitats and processes relevant to qualifying features and their prey/food resources are maintained

As described in NatureScot's Conservation and Management Advice Document for Scapa Flow SPA[6], supporting habitats refer to the characteristics of the seabed and water column relevant to their use by the qualifying features. It relates to wider oceanographic processes such as up-wellings, tidal Flows, hydrological movements which may be necessary for the habitat and could affect nutrient cycling and prey distribution.

[5] Schwemmer P., Mendel B., Sonntag N., Dierschke V., Garthe S. Effects of ship traffic on seabirds in offshore waters: implications for marine conservation and spatial planning, Ecological Applications, 2011, vol. 21 (pg. 1851-1860)

[6] NatureScot: Conservation and Management Advice Scapa Flow SPA, UK Site: 9020321, June 2022

Hydrodynamic modelling summarised in 3.3 above showed little impact on the surrounding water column and seabed due to the low energy environment in this part of Scapa Flow. The impacts on prey species for Great Northern Diver, outwith the development footprint, are expected to be negligible such that their abundance and general distribution remains unchanged from the baseline.

The dredge budget consists of approximately 17% gravel, 60% sand, and 23% silt and clay, which with the weak tidal currents in the vicinity of the proposed dredge pockets, will result in very localised and short-term plumes from dredging. The magnitude or the sediment discharge and dispersion from dredging works will be low within the dredge area and its immediate vicinity, and negligible out with this area.

For dredging, no sediment transport will occur within the Scapa Flow SPA boundary. Therefore, the supporting habitats for Great Northern Diver beyond the development footprint will be maintained.

Drainage designs to ensure that there are no untreated surface water discharges directly to surrounding coastal waters and the use of a silt boom during land reclamation works will mitigate against pollution spills which could affect the qualifying interests of the SPA and their prey sources. In terms of water pollution from the quay and attendant vessels, adherence to strict Pollution Prevention controls will aim to prevent the release of pollutants to the water environment. With these measures in place, the supporting habitats for Great Northern Diver will be maintained.

6.3.2.4 Conservation Objective 1: To ensure that the qualifying features of the Scapa Flow SPA are in favourable condition and make an appropriate contribution to achieving Favourable Conservation Status.

It is predicted that, with mitigation, there will be no significant impacts on Conservation Objectives 2a to 2c. Therefore, the favourable condition of Great Northern Diver in Scapa Flow SPA will be maintained.

6.4 Black-throated Diver, non-breeding

Baseline surveys were undertaken between November 2020 and March 2024, details of which can be found in the Ornithological Technical Report (EIAR Technical Appendix 5.3: Scapa Deep Water Quay Ornithology Technical Report). A summary of findings is found below.

6.4.1 Summary of Occurrence at the Development Site and in Scapa Flow

Seasonality: The more or less regular spread of count days at the Deepdale site gives a good indication of the seasonal spread of records.

- 2020/21 peaks (within 1km of the main VP) in November and again in February/March.
- 2021/22 peaks (within 1km) in October and again in December/January, but overall peaking within 2km in January.
- 2023/24 peaks (within 1km) in November and January, but overall peaking within 2km in late October/November.

Wider occurrence across Scapa Flow SPA: The Scapa Flow inshore survey in 2017/18 found a total of 39 Black-throated Divers during a dedicated search for the species in February (the third of four count rounds). Based on the maps and tables from each count provided in the 2017/18 survey report, the key area for Black-throated Divers was along the central north shore of the Flow between Bay of Swanbister and Hobbister, three or more kilometres to the west of the proposed development. All of the divers were seen in that area during the second count, while a group of three birds was in the Deepdale vicinity on

each of the first and third counts, and most were scattered at the far, western, side of the Flow in the fourth (last) count round in March.

HiDef surveys undertaken in 2021/22 and 2022/23 indicate that the majority of Black-throated Divers were recorded off the Tongue of Gangsta, approximately 1km south of the Proposed Developed and in St Mary's Bay, 4km south in 2021/22 and in Scapa Bay and off Hemp Stack, to the north of the Proposed Development and off Tongue of Westbister, approximately 2.5km south in 2022/23. This demonstrates the transient nature of this species within Scapa Flow throughout the winter season.

On 13th December 2023 a tight group of 11 was seen fishing in Mill Bay, Hoy at the far side of the Flow from Deepdale (AU personal observation), then on 26th December 2023 a tight group of 25 actively foraging divers, almost certainly Black-throated, was seen from Deepdale in calm conditions at the mouth of Waulkmill Bay some 5 km to the west (from the upper and north VPs, beyond the spreadsheet recording zones). This larger group was probably comprised mainly of the same individuals as seen the previous month much closer to Deepdale, whilst the smaller group may have represented additional birds. If so, this suggests an SPA minimum total of around 36 Black-throated Divers in 2023/24, in the same two general areas where most were found during the first and third count rounds in 2017/18, thus possibly forming the bulk of the SPA population.

A map showing the distribution of birds recorded both during the baseline surveys and HiDef surveys from 2021/22 and 2022/23 can be found in Appendix A.

Diagram 6.2 below, taken from the Marine Scotland Assessment website[7], shows the predicted distribution of Black-throated Diver across Scapa Flow. Although it shows the area around the Proposed Development to be a regularly used area, it also shows the other areas across Scapa Flow that the species frequents.

Diagram 6.2: Predicted Site Usage of Black-throated Diver in Scapa Flow SPA

[7] https://marinescotland.atkinsgeospatial.com/nmpi/default.aspx?layers=1274

Numbers from Deepdale survey work: Table 6-3 below indicates the peak and average counts within various distance bands around the main VP at Deepdale in each recording year.

Table 6.3: Peak and average numbers of Black-throated Diver in zones around the main Deepdale VP (NB different start dates in calculation of averages due to survey timing differences between years).

Distance band	Survey period	Peak month	Peak number	% SPA population (57 birds)	Average number (Oct/Nov to Mar)	% SPA population (57 birds)
0 – 500 m	Yr 1 - 2020/21	Nov	7	12%	**0.70**	**1.2 %**
	Yr 2 - 2021/22	Oct	7	12 %	0.46	0.8 %
	Yr 3 - 2023/24	Nov	**11**	**19 %**	0.64	1.1 %
0 – 1 km	Yr 1 - 2020/21	Nov/Feb	7	12%	**2.15**	**3.8 %**
	Yr 2 - 2021/22	Dec	10	17 %	1.33	2.3 %
	Yr 3 - 2023/24	Nov	**11**	**19 %**	1.55	2.7 %
0 – 2 km	Yr 1 - 2020/21	n/c	-	-	-	-
	Yr 2 - 2021/22	Jan	11	19 %	3.00	5.3 %
	Yr 3 - 2023/24	Nov	**27**	**47 %**	**6.23**	**11.0 %**

The 2021/22 peak of 11 birds within 2 km in January 2022 correlates well with the inshore surveys undertake by HiDef for NatureScot, where a peak count of 14 birds was recorded in the same general area in the same month.

The numbers present at or near Deepdale in the 2023/24 winter were higher than previously, particularly in the autumn, when four out of five days at the end of October through November held double figures within 2 km of the main VP (19 on 31st October; 20 on 7th November, and 27 on 19th November 2023).

Based on the Scapa Flow SPA population of 57 birds, the peak of 11 birds in the first two survey years represents 19% of the total numbers, with the peak of 14 birds during the HiDef surveys in 2022 representing 24.6%. Assuming the same SPA population, then up to 47% of birds were within 2 km of the main VP at times for a month in the autumn of 2023.

The average number of birds present within 500 m of the main VP was less than 2 % of the SPA numbers in all three years, rising to 3.8 % within 1 km (2020/21) and up to 11 % within 2 km (2023/24).

Table 6-4 below details the numbers of Black-throated Divers present within 2km of the Proposed Development during their flightless moult period (mid-September to end of December).

Table 6.4: Black-throated Diver numbers during flightless moult period

Month	No. count days	Average count 0-1km	Peak count 0-1km	Average count 2km	Peak count <2km
Nov 2020	4	4.25	7	4.25	7
Dec 2020*	4	0.75	2	2.25	6

2020 seasonal figures	8	2.5	7	3.25	7
Sept 2021	2	1	2	1	2
Oct 2021	4	3	7	3	7
Nov 2021	4	0	0	0	0
Dec 2021	4	3	10	3.5	10
2021 seasonal figures	14	1.9	10	2	10
Sept 2022	2	0	0	0	0
Oct 2023	2	7	11	9.5	19
Nov 2023	4	0.5	1	16.5	28
Dec 2023	4	1.25	3	3.25	11
2023 seasonal figures	10	2.1	11	9.8	28

The peak average count of 16.5 birds (November 2023) and peak count of 28 (November 2023) represents 29% and 49% of the SPA population respectively. Taken as an average across years, the average of 5.02 birds (taken from 2020, 2021 and 2023 seasonal figures) represents 8.8% of the SPA population and the average peak count of 15 birds represents 26% of the SPA population.

Features of observed distribution around Deepdale: As can be seen in Table 6-2 and as illustrated in the bar charts and the density heat maps produced in EIAR Technical Appendix 5.3: Scapa Deep Water Quay Ornithology Technical Report, single figures of birds were recorded within the 500 m radius around the main VP (the effective habitat loss zone) in the first two survey years, with up to 11 in November 2023, these swimming steadily through the area as a group and away to the northwest.

The heat maps for the first two years indicate a rather uniform likelihood of occurrence within the 1 km radius, and a slightly lower density at 1–2 km in the second year. However, the monthly bar charts indicate a considerably higher proportion of birds at 1–2 km in the third year (2023/24).

Observed behaviours around Deepdale: The swimming track observations from the first two survey years show that Black-throated Divers can move rapidly, especially when foraging in groups. This was also noted in 2023/24, although detailed swimming track maps were not made, and was commented on in the report for the 2017/18 pSPA survey when birds were noted moving several kilometres in a few hours.

The swimming track samples recorded the behaviour of individuals or groups of birds at approximately five-minute intervals; the results were variable between years for Black-throated Diver, with 33 % of bird-records noted as foraging in 2020/21 (from nearly 14 hours) and 66 % in 2021/22 (from nearly 27 hours).

This species undergoes wing-moult for several weeks during the winter when the birds are rendered flightless and can only move around by swimming or diving.

Observed reactions to vessels at Deepdale and Hatston: The combined table of observed reactions (referenced in EIAR Technical Appendix 5.3: Scapa Deep Water Quay Ornithology Technical Report) to vessels at the Deepdale and Hatston sites includes Black-throated Diver. During the ornithological surveys undertaken, bird and boat interactions were recorded. For Black-throated Diver, there were ten observations of interactions with boats. Of these, five resulted in birds swimming away slowly, two were of birds diving, one caused an alert response and two resulted in no apparent response. There were no instances of boat movements causing a flight response.

This compares to the findings of Jarrett *et al* (2021[8]) where 21 observations of Black-throated Divers from ferries in Scapa Flow (in 2016/17) also recorded no flight responses. In that study, one third of individuals/groups within 300 m of a ferry did not respond at all, another quarter (approximately) swam out of the way and the rest dived. All birds within 100 m of the ferry track exhibited a response, with fewer responding birds at 100–300 m. Overall however, there were too few records for this difference to be statistically significant.

A recent paper (O'Hanlon *et al*, 2024[9]) following tagged Kittiwakes off Aberdeenshire highlighted a wide range of individual differences in foraging and habitat selection, which are hidden when averaged across individuals to give a population response. Thus, an averaged response will underestimate some individuals and overestimate others, potentially leading to unforeseen impacts on population dynamics. Whilst the authors' concern was the underestimation of some individuals' response, in the present case, an assumption of responses towards the maximum recorded clearly does not account for the many birds that do not exhibit such a great response, as indicated by the data collected at Deepdale and Hatston. Ad hoc observations also show that some individuals appear unmoved by vessels in their close vicinity e.g. a Black-throated Diver inside Scrabster harbour that merely continued to forage within 100 m while the MV Hamnavoe arrived and tied up (AU personal observation, 18th Dec 2021).

6.4.2 Assessment of Potential Impacts on Conservation Objectives

6.4.2.1 Conservation Objective 2a: The populations of qualifying features are viable components of the site

The Proposed Development will result in the loss of 19.1ha of the Scapa Flow SPA. The wider SPA site has the capacity to accommodate Black-throated Divers that utilise the current Proposed Development site boundary for foraging.

In previous correspondence, NatureScot suggested referring to Guidance Note 8: Guidance to support Offshore Wind Applications: Marine Ornithology Advice for assessing the distributional responses, displacement and barrier effects on Marine birds. Specifically, the suggestion was to undertake a matrix based model to calculate potential displacement and mortality as a result of the Proposed Development on Black-throated Diver. This has been undertaken (see Appendix D).

The matrix table has been populated for Black-throated Diver using the mean peak across the three winters of survey effort (7, 11 and 27 – mean peak of 15), as per recommendations in Guidance Note 8: Guidance to support Offshore Wind Applications: Marine Ornithology Advice for assessing the distributional responses, displacement and barrier effects of Marine birds.

Sensitivity scales have been obtained from both Guidance Note (referenced above) and Furness et al 2012 . The two most relevant sensitivity scales are disturbance susceptibility and habitat specialisation. For disturbance Black-throated Diver scores 5 (highest) and for habitats scores 4. As a result, and as per NatureScot's communications, a displacement scale of between 90% as been used.

As can be seen from the 2017/18 pSPA surveys undertaken by Jackson et al and the HiDef surveys (both shore-based and aerial surveys) in 2021/22 and 2022/23 , Black-throated Diver were recorded across suitable areas in Scapa Flow – along the northern coastline of the flow from Houton Head to Greenigoe (accounted for 64% of all records in the 2017/18 survey), in the north west around Hoy Sound and Burra Sound, east of Hoy on the west side of the Flow, in Echnaloch Bay in the south east and along

[8] Jarret et al (2021). Behavioural responses of non-breeding waterbirds to marine traffic in the near shore environment. Bird Study, Vol 68, p443-454

[9] N J O'Hanlon, C B Thaxter, G D Clewley, J G Davies, E M Humphreys, P I Miller, C J Pollock, J Shamoun-Baranes, E Weston and A S C P Cook (2024). Challenges in quantifying the responses of Black-legged Kittiwake Rissa tridactyla to habitat variables and local stressors due to individual variation. Bird Study, Vol. 71, part 1 48-64.

the eastern coastline (see maps provided of these locations). None of the surveys recorded Black-throated Diver within 2km of the Proposed Development, highlighting the transient and mobile nature of this species within the Flow. Indeed, the 2017/18 states that "The additional day of survey work dedicated to this species showed that flocks are relatively mobile, moving up to several kilometres in a period of a few hours."

The above is also backed up by the surveys undertaken for the Proposed Development. Black-throated Diver was present on 47% of watch days within 1km (35/74 days) and 44% within 1-2km (22/50 days), indicating that these birds do move around within the Flow. Although high numbers (in excess of 20 birds and a peak of 27 birds) were recorded in the 2023/24 surveys, there were just three hourly counts with 20 or more birds and 71 with zero (six and 52 respectively out to a 3km buffer), indicating the ephemeral occurrence of the largest numbers.

Daily and hourly peaks can be obtained from the data collected (using the 'max counts' worksheet in each seasonal Excel document getting an estimate of the average hourly count by going through the field sheets and Black-throated Diver swimming track maps or location maps to identify four points (2021/22) or six points (2023/24) at hourly intervals during each watch day and noting the Black-throated Diver counts at that point. That gave 96 and 132 hourly point counts across each season respectively). Below are the average daily and hourly peaks from 2021/22 and 2023/24.

- •2021/22 - 2km season's peak: 11 // average daily peak: 3.54 // average hourly count: 2.08
- •2023/24 - 2km season's peak: 27 // average daily peak: 6.00 // average hourly count: 2.78
- •2023/24 - '3km' season's peak: 29 // average daily peak: 9.32 // average hourly count: 4.89

It is acknowledged that the relocation of port services to the Proposed Development (mainly tug and pilots) will result in a new/novel vessel route. This new route will extend for approximately 2.6km from the Proposed Development to the main shipping channel. The study undertaken by Jarret et al on bird responses to vessel movements noted that Black-throated Diver exhibiting a response up to 300m from a passing shipping vessel. This would give a potential habitat loss of 167Ha. This represents a 4.8% reduction in utilised suitable habitat available for Black-throated Diver (which is evidenced by the sightings recorded in each of the 2017/18, 2021/22 and 2022/23 surveys of the wider Scapa Flow SPA).

It is highly unlikely that the proposed new vessel route will provide a barrier effect to birds moving through the area as vessel movements are likely to occur every hour (taking the precautionary approach) as opposed to continuous. During the 2021/22 surveys, boats were in and out from Scapa pier on an hourly to two-hourly basis, mostly passing at 1 - 2km offshore. There was also the presence of a small test rig close to shore adjacent to the proposed development site, which was attended at times by its own two boats, plus intensive inshore surveying by another small boat on occasions. Although numbers of Black-throated Diver were down on subsequent years (and a demonstration of some displacement effects), birds were still present and observed moving through the site (present on 14/24 watch days or 58% of watch days), which supports the consideration that no barrier effects will occur.

It is our assessment that the Proposed Development will result in a 1% mortality increase annually. This equates to 0.135 birds annually, or 0.2% of the SPA population. This is not considered significant. Taken over a 25-year operational period (a period agreed with NatureScot), this would result in a mortality figure of 3.375 birds, or 6% of the SPA population. These figures have been agreed and considered not significant.

Therefore, it is considered that population of Black-throated Diver as a viable component of the site will be maintained throughout the site.

Other direct effects affecting water quality are dealt with in Conservation Objective 2c and indirect effects (i.e. disturbance resulting in reduced body condition and survival) are dealt with in Conservation Objective 2b.

With no predicted impacts in either conservation Objectives 2b and 2c, it is considered that the population of Black-throated Diver remains a viable component of the site.

6.4.2.2 Conservation Objective 2b: The distribution of the qualifying features is maintained throughout the site by avoiding significant disturbance of the species

Disturbance may occur through dredging activities and airborne noise through terrestrial works during the construction phase. Empirical data specifically linking marine bird response to noise disturbance (and underwater noise in particular), separate from other sources of disturbance (e.g. vessel movement or human presence), is limited and this source of disturbance on marine birds is not yet well understood. Recent research generally suggests that diving seabirds could be more sensitive to underwater noise than previously assumed. For example, hearing thresholds for Great Cormorant were found to be comparable to seals and toothed whales in the frequency band 1 to 4 kHz (Hansen et al., 2017). A number of assessments have, based on the limited information available, and the similar frequency ranges between seabirds and phocid pinniped and cetacean species, applied methodologies developed for pinnipeds or low frequency cetaceans in assessing seabird sensitivity to underwater noise (Teachout, 2012). Underwater noise modelling (Technical Appendix 5.6 of the EIAR) for dredging shows a TTS range of up to 250m and a PTS range of 50m or less for prolonged exposure (8 hours). During works, an ornithologist will be present to monitor the works, specifically within the 250m zone. Should any impacts become apparent, the disturbance zone can be increased to mitigate against this.

The Construction activities have been highlighted in the Airborne Noise Report (Technical Appendix 9.1 of the EIAR) and noise contour maps have been prepared (see Appendix B) as having noise creation levels of between 70 and 90dB at 10m from source, with noise levels decreasing over distance. With the creation of a 6m bund on the seaward side of the working area, the noise maps demonstrate that noise levels beyond the seaward bund would be between 40-50dB in the immediate vicinity of the bund and dissipate to <35dB at 250m, A study compiled by the Institute of Estuarine and Coastal Studies (IECS), University of Hull (2009) found that construction noise emissions below 50 dB had a low effect and no impact on waterbirds. Disturbance noise above 70 dB resulted in a moderate to high effect to birds resulting in movement within the feeding zone. The study concluded that construction noise levels should be restricted to below 70 dB. It is concluded that the main terrestrial works will not result in impacts to Black-throated Diver.

Terrestrial blasting associated with the construction phase could cause disturbance to Black-throated Diver via noise associated from this blasting. However, routine blasting operations regularly generate air overpressure levels at the closest point to blast area of around 120 dB but the intensity of these noise levels experienced at a distance from the blast site are affected by a range of meteorological conditions (wind speed and direction, temperature, cloud cover and humidity) and in general reduce by 6 dB reduction as the distance from the source doubles, and that when sound waves pass a given position, the pressure of the air rises very rapidly then falls more slowly then returns to the ambient value after a number of oscillations, Terrestrial blasting activities will occur on site. This will occur once a week over a 35-week period. The Construction Environmental Management Document (CEMD) (Technical Appendix 10.3) details mitigation measures to avoid any significant impacts on marine bird species, including Black-throated Diver. This includes the presence of an ornithologist to monitor for the presence of SPA qualifying species within 500m of the Proposed Development and record behavioural responses within this zone. If impacts are recorded, then the disturbance zone shall be increased.

It is highly likely that birds will be displaced from the working area (but acknowledging that the wider Scapa Flow SPA has the capacity to accommodate displaced birds) a sufficient distance that noise disturbance does not cause an impact.

Mitigation, including adaptive management measures through the provision of an ornithologist monitoring works (both dredging and terrestrial blasting and determining the need to increase or decrease disturbance buffers would limit any potential disturbance impact. This localised and temporary impact would not result in significant Impacts to Black-throated Diver within the SPA.

OICHA have provided information on the current typical monthly vessel movements experienced within the eastern area of Scapa Flow. This is summarised below:

- One Flotta fuel tanker;
- 5 Ship to Ship Operations;
- 3 tugs, each with 11 trips in and out of Scapa Pier;
- Escort duties for 1 tug with 12 trips in and out of Scapa Pier;
- 22 pilot boat trips: and
- Occasional workboats to the rigs.

This equates to 124 vessel movements each month in the vicinity of the SDWQ site.

During construction, the number of vessel movements associated with the caisson delivery and installation, and relevant to the period when Black-throated Divers are present will equate to 126 vessel movements associated with dredge disposal over a 33-week period between October 2026 and May 2027 (4 movements each week). The majority of the routes used by these vessels will be along established routes (ie, the main shipping channel and the shipping lane west towards Stromness). The only new, or seldom used, section of route to be used for vessels will be the 167Ha branching east off the established route to the SDWQ site. Maps in Appendix C shows the survey data from both the project surveys and HiDef surveys, along with the proposed shipping routes for construction and dredging. As can be seen, the density of Black-throated Divers within the main shipping routes are low and disturbance is considered unlikely.

During the operational phase, with the retention of tugs and pilot vessel at Scapa Pier, the estimated number of vessels calling at SDWQ in the operational phase is 30 per year (60 vessel movements), comprising 18 large vessels and 12 smaller vessel per year. Each of the 18 large vessels will have one associated pilot boat (2 vessel movements). In addition, 2 or 3 tugs will assist with berthing the large vessels, although these will be operating in very close proximity to these large vessels, so do not constitute a separate disturbance.

In total, the estimated vessel movements per year is 96. The majority of these vessels (approximately 80 %) are expected to occur during the summer months (April – September), so there will be an average of 12.8 vessel movements per month (3.2 per week) in summer and 3.2 per month (0.8 per week) in winter.

Black-throated Diver is thought to be highly sensitive to disturbance through vessel movements. However, the increase in vessel use along the new/less disturbed route of 0.8 vessel movements a week is not considered significant. Taken in combination with the use out of Scapa Pier (124 vessel movements each month), the increase in vessel movements would equate to 2.5%. Again, this is not considered significant.

As detailed in Section 6.4.2.1, the Proposed Development will result in the loss of 167Ha of suitable Black-throated Diver habitat. This represents a 4.8% reduction in utilised suitable habitat (3,478Ha – taken as all areas where Black-throated Divers have been recorded out of 2kmf from land). As shown in

Appendix A there are several areas where Black-throated Divers have been recorded in double digit numbers, showing the ephemeral nature of distribution across the flow and demonstrates that the flow has the capacity to support displaced birds and as a result significant disturbance would not occur.

Schwemmer et al (2011)[10] make the point that spatial planning should aim to channel ship and boat traffic wherever possible to avoid further habitat fragmentation (e.g. if cargo vessels, tugs and pilots were to range freely either side of the quay) and to allow for habituation, at least in some species.

A Vessel Management Plan will be produced, with input from NatureScot, for both the Construction and Operational phases which will detail vessel routes, speeds etc to minimise, and where possible, avoid any disturbance impacts within the new/novel vessel route.

With regards to the use of cranes, NatureScot expressed concern on their usage and disturbance/displacement effects on Black-throated Diver, given that literature states that they "move away from a variety of structures in the marine environment, including wind turbines[11]". It should be noted that there is no literature regarding the infrequent use of mobile cranes causing significant disturbance or displacement effects on birds.

NatureScot requested as assessment of Black-throated Diver disturbance up to 1km (recommended disturbance buffer for this species[12]) from cranes is to be assessed during their flightless moult period (mid-September to end December).

As described in Section 3.6, the use and erection of mobile cranes will not be permanent and are likely to be active between 8 – 20 days per month in the summer, and in winter 2 – 5 days per month in the winter, reflecting the frequency of vessels berthing throughout a given year.

In the surveys during Black-throated Divers flightless moult period, birds were present within 1km of the Proposed Development 58% of the time (20 surveys out of 34), demonstrating the ephemeral nature of their movements throughout Scapa Flow. During this period, the average count of birds within 1km across the three winter's worth of surveys was 2 birds, with a peak of 11 birds in November (although it is noted that these birds were not recorded foraging within the 1km area, merely steadily moving through to the north west). Counts of over 5 birds were recorded on 7 out of 34 survey visits, and double figure counts on 2 out of 34 visits. During this period, peak counts of 28 birds were present between 1km-2km distance from the Proposed Development, demonstrating that this area has the capacity to support any displaced birds through avoidance.

Therefore, given the infrequent nature of crane usage during the winter months, and particularly during the birds flightless moult period, the low numbers of birds present (as an average across the three winter's worth of surveys), and the fact that the area between 1km -2km from the Proposed Development has been demonstrated to have the capacity to support these birds should they undertake avoidance of the area during crane use, it is considered that there would be no significant impact to the species, and no adverse effect on site integrity.

Although no adverse effects are predicted, to further knowledge of and apply some adaptive management measures regarding this activity, the following mitigation is proposed:

For the first three years of SDWQ operations, during the flightless moult period (mid-September to end-December), an ornithologist will conduct structured observations of Black-throated Divers

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[10] Schwemmer P., Mendel B., Sonntag N., Dierschke V., Garthe S. Effects of ship traffic on seabirds in offshore waters: implications for marine conservation and spatial planning, Ecological Applications, 2011, vol. 21 (pg. 1851-1860)

[11] Dierschke, V., Furness, R.W., Gray, C.E., Petersen, I.K., Schmutz, J., Zydelis, R. & Daunt, F. 2017. Possible Behavioural, Energetic and Demographic Effects of Displacement of Red-throated Divers. JNCC Report No. 605. JNCC, Peterborough.

[12] Goodship, N.M. and Furness, R.W. 2022. Disturbance Distances Review: An updated literature review of disturbance distances of selected bird species. A report from MacArthur Green to NatureScot.

associated with selected crane activity. The Ornithological Observation Protocol will be included in the Operational Environmental Management Plan. This will include:

- *Timing: Observations will take place two hours prior to, during, and two hours following crane operations (subject to adequate visibility).*
- *Data collection: Counts of individuals present and systematic recording of any behavioural responses indicative of disturbance (e.g. displacement, diving, directional swimming, or other changes in activity).*
- *Reporting: Data will be collated into a post-season summary at the end of each flightless moult period. Reports will be submitted to the Orkney Marine Environment Protection Forum.*

The purpose of these observations is to improve the evidence base on black-throated diver responses to mobile crane operations.

None of these potential disturbance effects will result in barriers to movement, or reduce access to, preferred foraging and roosting habitats, resulting in a significant energy expenditure and possible reduction in body condition required for survival and subsequent migration.

Therefore, it is considered that distribution of Black-throated Diver will be maintained throughout the site.

6.4.2.3 Conservation Objective 2c: The supporting habitats and processes relevant to qualifying features and their prey/food resources are maintained

As detailed in Section 6.4.2.1, the Proposed Development will result in the loss of 167Ha of suitable Black-throated Diver habitat. This represents a 4.8% reduction in utilised suitable habitat (3,478Ha – taken as all areas where Black-throated Divers have been recorded out of 2kmf from land). As shown in Appendix A there are several areas where Black-throated Divers have been recorded in double digit numbers, showing the ephemeral nature of distribution across the flow and demonstrates that the flow has the capacity to support displaced birds and that supporting habitats relevant to this species is maintained.

As described in NatureScot's Conservation and Management Advice Document for Scapa Flow SPA[5], supporting habitats refer to the characteristics of the seabed and water column relevant to their use by the qualifying features. It relates to wider oceanographic processes such as up-wellings, tidal flows, hydrological movements which may be necessary for the habitat and could affect nutrient cycling and prey distribution.

Hydrodynamic modelling summarised in 3.3 above show little impact on the surrounding water column and seabed due to the low energy environment in this part of Scapa Flow. The impacts on prey species for Black-throated Diver are expected to be negligible such that their abundance and general distribution remains unchanged from the baseline.

The dredge budget consists of approximately 17% gravel, 60% sand, and 23% silt and clay, which with the weak tidal currents in the vicinity of the proposed dredge pockets, will result in very localised and short-term plumes from dredging. The magnitude or the sediment discharge and dispersion from dredging works will be low within the dredge area and its immediate vicinity, and negligible out with this area. Thus, the supporting habitats for Black-throated Diver beyond the development footprint will be maintained.

No sediment transport will occur within the Scapa Flow SPA boundary. Therefore, the supporting habitats for Black-throated Diver beyond the development footprint will be maintained.

Drainage designs to ensure that there are no untreated surface water discharges directly to surrounding coastal waters and the use of silt booms during land reclamation works will mitigate against pollution spills which could affect the qualifying interests of the SPA and their prey sources. In terms of water pollution from the pier and attendant vessels, adherence to strict Pollution Prevention controls will aim to prevent the release of pollutants to the water environment. With these measures in place, the supporting habitats for Black-throated Diver will be maintained.

6.4.2.4 Conservation Objective 1: To ensure that the qualifying features of the Scapa Flow SPA are in favourable condition and make an appropriate contribution to achieving Favourable Conservation Status.

It is predicted that, with mitigation, there will be no significant impacts on Conservation Objectives 2a to 2c. Therefore, the favourable condition of Black-throated Diver in Scapa Flow SPA will be maintained.

6.5 Slavonian Grebe, non-breeding

Baseline surveys were undertaken between November 2020 and March 2024, details of which can be found in the Ornithological Technical Report (EIAR Technical Appendix 5.3: Scapa Deep Water Quay Ornithology Technical Report). A summary of findings is found below.

6.5.1 Summary of Occurrence at the Development Site and in Scapa Flow

Seasonality: The more or less regular spread of count days at the Deepdale site gives a good indication of the seasonal spread of records.

- 2020/21 peaks (within 500m of the main VP) in February.
- 2021/22 peaks (within 1km) in December and again in February.
- 2023/24 peaks (within 1km) in March.

Wider occurrence across Scapa Flow SPA: During the inshore surveys undertaken in 2017/18, Slavonian grebes showed a strong preference for sheltered, relatively shallow parts of the survey area with only seven birds seen in all the boat-based surveys, underlining the lack of importance of the central part of Scapa Flow. The 'East Coast' part of the SPA also had low numbers of this species, and none were recorded in the 'Southern Approaches' count sections. The largest counts were around Swanbister and Waulkmill Bay in the northern part of the SPA, and around Burray. The distribution of records in Scapa Flow showed that there was some noticeable redistribution throughout the winter. In particular, moderate numbers were seen in Round 1 between Hoy and South Walls (but these had largely moved away in later count rounds). In contrast, relatively few birds were seen between South Ronaldsay and Burray in Round 1, but they were commonly seen in here in later count rounds.

A map showing the distribution of birds recorded both during the baseline surveys and HiDef surveys from 2021/22 and 2022/23 can be found in Appendix A.

Numbers from Deepdale survey work: Table 6-5 below indicates the peak and average counts within various distance bands around the main VP at Deepdale in each recording year.

Table 6.5: Peak and average numbers of Slavonian Grebe in zones around the main Deepdale VP (NB different start dates in calculation of averages due to survey timing differences between years).

Distance band	Survey period	Peak month	Peak number	% SPA population (135 birds)	Average number (Oct/Nov to Mar)	% SPA population (135 birds)
0 – 500 m	Yr 1 - 2020/21	Feb	**7**	**%**	**3.45**	**2.5 %**
	Yr 2 - 2021/22	Dec/Feb	5	3.7 %	1.85	1.4%
	Yr 3 - 2023/24	March	5	3.7%	1.125	0.8%
0 – 1 km	Yr 1 - 2020/21	Feb	**7**	**5.2%**	**3.55**	**2.6%**
	Yr 2 - 2021/22	Dec/Feb	5	3.7%	2.05	1.5 %
	Yr 3 - 2023/24	Nov	5	**3.7%**	1.625	1.2 %
0 – 2 km	Yr 1 - 2020/21	Feb	**7**	**5.2%**	**3.55**	**2.6%**
	Yr 2 - 2021/22	Dec/Feb	5	3.7 %	2.05	1.5 %
	Yr 3 - 2023/24	March	5	3.7 %	1.625	1.2 %

A peak count of 7 Slavonian Grebes was recorded within 1km of the Proposed Development, with a peak of 7 birds within 2km. This is slightly higher than the counts from the inshore surveys undertaken by HiDef for NatureScot, where a peak count of 2 birds were recorded in the same general area in January and February 2022. The peak of 7 birds represents 5% of the Scapa Flow SPA population.

As can be seen in the density heat maps produced in EIAR Technical Appendix 5.3: Scapa Deep Water Quay Ornithology Technical Report, birds were recorded within the Proposed Development footprint area, although in small numbers (usually singles). However, there was a peak count of five birds on 26th January 2022.

6.5.2 Assessment of Potential Impacts on Conservation Objectives

6.5.2.1 Conservation Objective 2a: The populations of qualifying features are viable components of the site

The Proposed Development will result in the loss of 19.1Ha of the Scapa Flow SPA. Given that nearly all Slavonian Grebe are recorded within 500m of the shoreline, and none were recorded in the "Southern Approaches" part of the SPA, this equates to 0.4% of the utilised SPA area. Although the Proposed Development footprint provides suitable foraging habitat for Slavonian Grebes, the 2017/18 survey demonstrates that there was some notable redistribution of birds during the winter period and that the wider SPA site has the capacity to accommodate a peak of 7 birds.

There is minimal risk of mortality through vessel collision with marine vessels as a result of the Proposed Development. Other direct effects affecting water quality are dealt with in Conservation Objective 2c and indirect effects (ie disturbance resulting in reduced body condition and survival) are dealt with in Conservation Objective 2b.

With no predicted impacts in either conservation Objectives 2b and 2c, it is considered that the population of Slavonian Grebe remains a viable component of the site.

6.5.2.2 Conservation Objective 2b: The distribution of the qualifying features is maintained throughout the site by avoiding significant disturbance of the species

Disturbance may occur through dredging activities and airborne noise through terrestrial works during the construction phase. Empirical data specifically linking marine bird response to noise disturbance (and underwater noise in particular), separate from other sources of disturbance (e.g. vessel movement or human presence), is limited and this source of disturbance on marine birds is not yet well understood.

Recent research generally suggests that diving seabirds could be more sensitive to underwater noise than previously assumed. For example, hearing thresholds for Great Cormorant were found to be comparable to seals and toothed whales in the frequency band 1 to 4 kHz (Hansen et al., 2017). A number of assessments have, based on the limited information available, and the similar frequency ranges between seabirds and phocid pinniped and cetacean species, applied methodologies developed for pinnipeds or low frequency cetaceans in assessing seabird sensitivity to underwater noise (Teachout, 2012). Underwater noise modelling (Technical Appendix 5.6 of the EIAR) for dredging shows a TTS range of up to 250m and a PTS range of 50m or less for prolonged exposure (8 hours). During works, an ornithologist will be present to monitor the works, specifically within the 250m zone. Should any impacts become apparent, the disturbance zone can be increased to mitigate against this.

The Construction activities have been highlighted in the Airborne Noise Report (Technical Appendix 9.1 of the EIAR) and noise contour maps have been prepared (see Appendix B) as having noise creation levels of between 70 and 90dB at 10m from source, with noise levels decreasing over distance. With the creation of a 6m bund on the seaward side of the working area, the noise maps demonstrate that noise levels beyond the seaward bund would be between 40-50dB in the immediate vicinity of the bund and dissipate to <35dB at 250m, A study compiled by the Institute of Estuarine and Coastal Studies (IECS), University of Hull (2009) found that construction noise emissions below 50 dB had a low effect and no impact on waterbirds. Disturbance noise above 70 dB resulted in a moderate to high effect to birds resulting in movement within the feeding zone. The study concluded that construction noise levels should be restricted to below 70 dB. It is concluded that the main terrestrial works will not result in impacts to Slavonian Grebe.

Terrestrial blasting associated with the construction phase could cause disturbance to Slavonian Grebe via noise associated from terrestrial blasting. However, routine blasting operations regularly generate air overpressure levels at the closest point to blast area of around 120 dB but the intensity of these noise levels experienced at a distance from the blast site are affected by a range of meteorological conditions (wind speed and direction, temperature, cloud cover and humidity) and in general reduce by 6 dB reduction as the distance from the source doubles, and that when sound waves pass a given position, the pressure of the air rises very rapidly then falls more slowly then returns to the ambient value after a number of oscillations, Terrestrial blasting activities will occur on site. This will occur once a week over a 35-week period. The Construction Environmental Management Document (CEMD) (Technical Appendix 10.3) details mitigation measures to avoid any significant impacts on marine bird species, including Slavonian Grebe. This includes the presence of an ornithologist to monitor for the presence of SPA qualifying species within 500m of the Proposed Development and record behavioural responses within this zone. If impacts are recorded, then the disturbance zone shall be increased.

It is highly likely that birds will be displaced from the working area (but acknowledging that the wider Scapa Flow SPA has the capacity to accommodate displaced birds) a sufficient distance that noise disturbance does not cause an impact.

Mitigation, including adaptive management measures through the provision of an ornithologist monitoring works (both dredging and terrestrial blasting and determining the need to increase or decrease disturbance buffers would limit any potential disturbance impact. This localised and temporary impact would not result in significant Impacts to Slavonian Grebe within the SPA.

OICHA have provided information on the current typical monthly vessel movements experienced within the eastern area of Scapa Flow. This is summarised below:

- One Flotta fuel tanker;
- 5 Ship to Ship Operations;
- 3 tugs, each with 11 trips in and out of Scapa Pier;
- Escort duties for 1 tug with 12 trips in and out of Scapa Pier;

- 22 pilot boat trips: and
- Occasional workboats to the rigs.

This equates to 124 vessel movements each month in the vicinity of the SDWQ site.

During construction, the number of vessel movements associated with the caisson delivery and installation, and relevant to the period when Slavonian Grebes are present will equate to 126 vessel movements associated with dredge disposal over a 33-week period between October 2026 and May 2027 (4 movements each week). The majority of the routes used by these vessels will be along established routes (ie, the main shipping channel and the shipping lane west towards Stromness). The only new, or seldom used, section of route to be used for vessels will be the 2.6km (or 1.3 nautical miles)167Ha branching east off the established route to the SDWQ site. Maps in Appendix C shows the survey data from both the project surveys and HiDef surveys, along with the proposed shipping routes for construction and dredging and diagram 6-2 shows an analysis of the mean density of Slavonian Grebe across Scapa Flow (taken from HiDef survey reporting). As can be seen, the density of Slavonian Grebe within the main shipping routes are low and disturbance is considered unlikely.

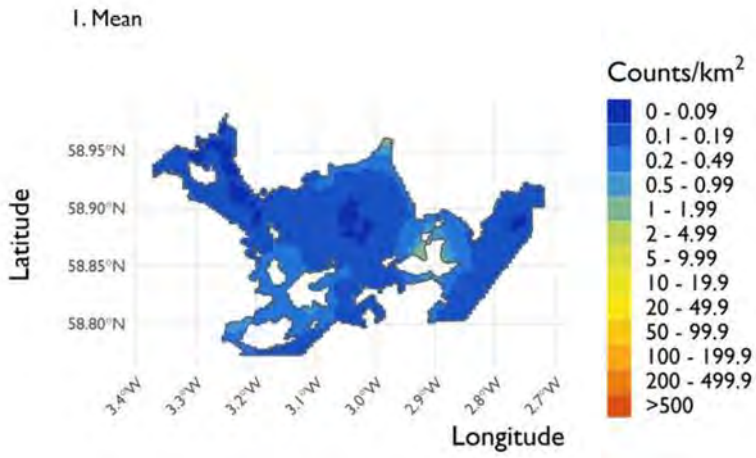

Diagram 6-3: Modelled Slavonian Grebe densities across Scapa Flow SPA (taken from HiDef 2021/22 and 2022/23 wintering bird survey report).

During the operational phase, with the retention of tugs and pilot vessel at Scapa Pier, the estimated number of vessels calling at SDWQ in the operational phase is 30 per year (60 vessel movements), comprising 18 large vessels and 12 smaller vessel per year. Each of the 18 large vessels will have one associated pilot boat (2 vessel movements). In addition, 2 or 3 tugs will assist with berthing the large vessels, although these will be operating in very close proximity to these large vessels, so do not constitute a separate disturbance.

In total, the estimated vessel movements per year is 96. The majority of these vessels (approximately 80 %) are expected to occur during the summer months (April – September), so there will be an average of 12.8 vessel movements per month (3.2 per week) in summer and 3.2 per month (0.8 per week) in winter. During the ornithological surveys at both Scapa and Hatston undertaken between 2020 and 2022 (EIAR Technical Appendix 5.3: SDWQ Ornithological Technical Report), bird and boat interactions were recorded. For Slavonian Grebe, there were 7 observations of interactions with boats. Of these, 1 resulted in no reaction, 1 resulted in a dive response, 1 caused an alert response and 4 caused a flight response.

Slavonian Grebe is thought to be highly sensitive to disturbance through vessel movements. However, the increase in vessel use along the new/less disturbed route of 0.8 vessel movements a week is not considered significant. Taken in combination with the use out of Scapa Pier (124 vessel movements each month), the increase in vessel movements would equate to 2.5%. Again, this is not considered significant. The potential displacement of a peak of 7 birds represents 5.2% of the SPA population, although it is acknowledged that the wider Scapa Flow area has the capacity to support these birds.

Schwemmer et al (2011)[13] make the point that spatial planning should aim to channel ship and boat traffic wherever possible to avoid further habitat fragmentation (e.g. if cargo vessels, tugs and pilots were to range freely either side of the quay) and to allow for habituation, at least in some species.

A Vessel Management Plan will be produced, with input from NatureScot, for both the Construction and Operational phases which will detail vessel routes, speeds etc to minimise, and where possible, avoid any disturbance impacts along the proposed new/novel vessel route.

None of these potential disturbance effects will result in barriers to movement, or reduce access to, preferred foraging and roosting habitats, resulting in a significant energy expenditure and possible reduction in body condition required for survival and subsequent migration.

Therefore, it is considered that distribution of Slavonian Grebe will be maintained throughout the site.

6.5.2.3 Conservation Objective 2c: The supporting habitats and processes relevant to qualifying features and their prey/food resources are maintained

As described in NatureScot's Conservation and Management Advice Document for Scapa Flow SPA[5], supporting habitats refer to the characteristics of the seabed and water column relevant to their use by the qualifying features. It relates to wider oceanographic processes such as up-wellings, tidal Flows, hydrological movements which may be necessary for the habitat and could affect nutrient cycling and prey distribution.

Hydrodynamic modelling summarised in 3.3 above show little impact on the surrounding water column and seabed due to the low energy environment in this part of Scapa Flow. The impacts on prey species for Slavonian Grebe are expected to be negligible such that their abundance and general distribution remains unchanged from the baseline.

The dredge budget consists of approximately 17% gravel, 60% sand, and 23% silt and clay, which with the weak tidal currents in the vicinity of the proposed dredge pockets, will result in very localised and short-term plumes from dredging. The magnitude or the sediment discharge and dispersion from dredging works will be low within the dredge area and its immediate vicinity, and negligible out with this area. Thus, the supporting habitats for Slavonian Grebe beyond the development footprint will be maintained.

No sediment transport will occur within the Scapa Flow SPA boundary. Therefore, the supporting habitats for Slavonian Grebe beyond the development footprint will be maintained.

Drainage designs to ensure that there are no untreated surface water discharges directly to surrounding coastal waters and the use of silt booms during land reclamation works will mitigate against pollution spills which could affect the qualifying interests of the SPA and their prey sources. In terms of water pollution from the pier and attendant vessels, adherence to strict Pollution Prevention controls will aim

[13] Schwemmer P., Mendel B., Sonntag N., Dierschke V., Garthe S. Effects of ship traffic on seabirds in offshore waters: implications for marine conservation and spatial planning, Ecological Applications, 2011, vol. 21 (pg. 1851-1860)

to prevent the release of pollutants to the water environment. With these measures in place, the supporting habitats for Slavonian Grebe will be maintained.

6.5.2.4 Conservation Objective 1: To ensure that the qualifying features of the Scapa Flow SPA are in favourable condition and make an appropriate contribution to achieving Favourable Conservation Status.

It is predicted that, with mitigation, there will be no significant impacts on Conservation Objectives 2a to 2c. Therefore, the favourable condition of Slavonian Grebe in Scapa Flow SPA will be maintained.

6.6 European Shag, non-breeding

6.6.1 Summary of Occurrence at the Development Site and in Scapa Flow

Seasonality: The more or less regular spread of count days at the Deepdale site gives a good indication of the seasonal spread of records.

- 2020/21 peaks (up to 2km from the main VP) in October
- 2021/22 peaks (up to 2km from the main VP) in September
- 2023/24 peaks (up to 2km from the main VP) in November

This correlates with the findings of the 2017/18 inshore surveys which found that Scapa Flow SPA has particular importance for this species in the early part of the winter.

Wider occurrence across Scapa Flow SPA: During the inshore surveys undertaken in 2017/18, Shags on the sea were very widely distributed across the SPA with the only part where they were infrequently seen was the central part of Scapa Flow, where presumably the seabed lies too deep for profitable foraging. The majority of European shags (on average 58%) were recorded in the Scapa Flow inshore count sectors with the 'East Coast' count sectors having particular importance for this species, accounting, on average, for nearly 12% of the birds seen. The 'Southern Approaches' count sectors also accounted, on average, for 7% of the birds seen. European shag was the only SPA qualifying species that occurred in reasonably high numbers in this part of the SPA.

Numbers from Deepdale survey work: During the vantage point surveys, a peak count of 72 Shag were recorded within 1km of the Proposed Development, with a peak of 73 birds within 2km. This is higher than the counts from the inshore surveys undertaken by HiDef for NatureScot, where a peak count of 24 birds were recorded in the same general area in January and February 2022. The peak of 73 birds represents 2.5% of the Scapa Flow SPA population.

As can be seen in the density heat maps produced in Technical Appendix 5.3: Scapa Deep Water Quay Ornithology Technical Report, birds were recorded within the Proposed Development footprint area, although in small numbers (usually between one and five). However, there was a peak count of 30 birds on 18th December 2022.

6.6.2 Assessment of Potential Impacts on Conservation Objectives

6.6.2.1 Conservation Objective 2a: The populations of qualifying features are viable components of the site

The Proposed Development will result in the loss of 19.1Ha of the Scapa Flow SPA. This equates to 0.06% of the total SPA area. Although the Proposed Development footprint provides suitable foraging habitat for Shag, the findings from the 2017/18 surveys which shows a wide-ranging distribution across Scapa Flow demonstrates that the wider SPA site has the capacity to accommodate these birds (a peak of 73 birds).

There is minimal risk of mortality through collision with marine vessels as a result of the Proposed Development. Other direct effects affecting water quality are dealt with in Conservation Objective 2c and indirect effects (ie disturbance resulting in reduced body condition and survival) are dealt with in Conservation Objective 2b.

With no predicted impacts in either conservation Objectives 2b and 2c, it is considered that the population of Shag remains a viable component of the site.

6.6.2.2 Conservation Objective 2b: The distribution of the qualifying features is maintained throughout the site by avoiding significant disturbance of the species

Disturbance may occur through dredging activities and airborne noise through terrestrial works during the construction phase. Empirical data specifically linking marine bird response to noise disturbance (and underwater noise in particular), separate from other sources of disturbance (e.g. vessel movement or human presence), is limited and this source of disturbance on marine birds is not yet well understood. Recent research generally suggests that diving seabirds could be more sensitive to underwater noise than previously assumed. For example, hearing thresholds for Great Cormorant were found to be comparable to seals and toothed whales in the frequency band 1 to 4 kHz (Hansen et al., 2017). A number of assessments have, based on the limited information available, and the similar frequency ranges between seabirds and phocid pinniped and cetacean species, applied methodologies developed for pinnipeds or low frequency cetaceans in assessing seabird sensitivity to underwater noise (Teachout, 2012). Underwater noise modelling (Technical Appendix 5.6 of the EIAR) for dredging shows a TTS range of up to 250m and a PTS range of 50m or less for prolonged exposure (8 hours). During works, an ornithologist will be present to monitor the works, specifically within the 250m zone. Should any impacts become apparent, the disturbance zone can be increased to mitigate against this.

The Construction activities have been highlighted in the Airborne Noise Report (Technical Appendix 9.1 of the EIAR) and noise contour maps have been prepared (see Appendix B) as having noise creation levels of between 70 and 90dB at 10m from source, with noise levels decreasing over distance. With the creation of a 6m bund on the seaward side of the working area, the noise maps demonstrate that noise levels beyond the seaward bund would be between 40-50dB in the immediate vicinity of the bund and dissipate to <35dB at 250m, A study compiled by the Institute of Estuarine and Coastal Studies (IECS), University of Hull (2009) found that construction noise emissions below 50 dB had a low effect and no impact on waterbirds. Disturbance noise above 70 dB resulted in a moderate to high effect to birds resulting in movement within the feeding zone. The study concluded that construction noise levels should be restricted to below 70 dB. It is concluded that the main terrestrial works will not result in impacts to European Shag.

Terrestrial blasting associated with the construction phase could cause disturbance to European Shag via noise associated from terrestrial blasting. However, routine blasting operations regularly generate air overpressure levels at the closest point to blast area of around 120 dB but the intensity of these noise levels experienced at a distance from the blast site are affected by a range of meteorological conditions (wind speed and direction, temperature, cloud cover and humidity) and in general reduce by 6 dB reduction as the distance from the source doubles, and that when sound waves pass a given position, the pressure of the air rises very rapidly then falls more slowly then returns to the ambient value after a number of oscillations, Terrestrial blasting activities will occur on site. This will occur once a week over

a 35-week period. The Construction Environmental Management Document (CEMD) (Technical Appendix 10.3) details mitigation measures to avoid any significant impacts on marine bird species, including European Shag. This includes the presence of an ornithologist to monitor for the presence of SPA qualifying species within 500m of the Proposed Development and record behavioural responses within this zone. If impacts are recorded, then the disturbance zone shall be increased.

It is highly likely that birds will be displaced from the working area (but acknowledging that the wider Scapa Flow SPA has the capacity to accommodate displaced birds) a sufficient distance that noise disturbance does not cause an impact.

Mitigation, including adaptive management measures through the provision of an ornithologist monitoring works (both dredging and terrestrial blasting and determining the need to increase or decrease disturbance buffers would limit any potential disturbance impact. This localised and temporary impact would not result in significant Impacts to European Shag within the SPA.

OICHA have provided information on the current typical monthly vessel movements experienced within the eastern area of Scapa Flow. This is summarised below:

- One Flotta fuel tanker;
- 5 Ship to Ship Operations;
- 3 tugs, each with 11 trips in and out of Scapa Pier;
- Escort duties for 1 tug with 12 trips in and out of Scapa Pier;
- 22 pilot boat trips: and
- Occasional workboats to the rigs.

This equates to 124 vessel movements each month in the vicinity of the SDWQ site.

During construction, the number of vessel movements associated with the caisson delivery and installation, and relevant to the period when European Shag are present will equate to 126 vessel movements associated with dredge disposal over a 33-week period between October 2026 and May 2027 (4 movements each week).

During the operational phase, with the retention of tugs and pilot vessel at Scapa Pier, the estimated number of vessels calling at SDWQ in the operational phase is 30 per year (60 vessel movements), comprising 18 large vessels and 12 smaller vessel per year. Each of the 18 large vessels will have one associated pilot boat (2 vessel movements). In addition, 2 or 3 tugs will assist with berthing the large vessels, although these will be operating in very close proximity to these large vessels, so do not constitute a separate disturbance.

In total, the estimated vessel movements per year is 96. The majority of these vessels (approximately 80 %) are expected to occur during the summer months (April – September), so there will be an average of 12.8 vessel movements per month (3.2 per week) in summer and 3.2 per month (0.8 per week) in winter. European Shag are considered less sensitive to disturbance through vessel movements and will unlikely be displaced during the construction and operational phases.

Schwemmer et al (2011)[14] make the point that spatial planning should aim to channel ship and boat traffic wherever possible to avoid further habitat fragmentation (e.g. if cargo vessels, tugs and pilots were to range freely either side of the quay) and to allow for habituation, at least in some species.

[14] Schwemmer P., Mendel B., Sonntag N., Dierschke V., Garthe S. Effects of ship traffic on seabirds in offshore waters: implications for marine conservation and spatial planning, Ecological Applications, 2011, vol. 21 (pg. 1851-1860)

A Vessel Management Plan will be produced, with input from NatureScot, for both the Construction and Operational phases which will detail vessel routes, speeds etc to minimise, and where possible, avoid any disturbance impacts along the proposed new/novel vessel route.

None of these potential disturbance effects will result in barriers to movement, or reduce access to, preferred foraging and roosting habitats, resulting in a significant energy expenditure and possible reduction in body condition required for survival and subsequent migration.

Therefore, it is considered that distribution of European Shag will be maintained throughout the site.

6.6.2.3 Conservation Objective 2c: The supporting habitats and processes relevant to qualifying features and their prey/food resources are maintained

As described in NatureScot's Conservation and Management Advice Document for Scapa Flow SPA[5], supporting habitats refer to the characteristics of the seabed and water column relevant to their use by the qualifying features. It relates to wider oceanographic processes such as up-wellings, tidal Flows, hydrological movements which may be necessary for the habitat and could affect nutrient cycling and prey distribution.

Hydrodynamic modelling summarised in 3.3 above show little impact on the surrounding water column and seabed due to the low energy environment in this part of Scapa Flow. The impacts on prey species for European Shag are expected to be negligible such that their abundance and general distribution remains unchanged from the baseline.

The dredge budget consists of approximately 17% gravel, 60% sand, and 23% silt and clay, which with the weak tidal currents in the vicinity of the proposed dredge pockets, will result in very localised and short-term plumes from dredging. The magnitude or the sediment discharge and dispersion from dredging works will be low within the dredge area and its immediate vicinity, and negligible out with this area. No sediment transport will occur within the Scapa Flow SPA boundary. Thus, the supporting habitats for European Shag beyond the development footprint will be maintained.

Drainage designs to ensure that there are no untreated surface water discharges directly to surrounding coastal waters and the use of silt booms during land reclamation works will mitigate against pollution spills which could affect the qualifying interests of the SPA and their prey sources. In terms of water pollution from the pier and attendant vessels, adherence to strict Pollution Prevention controls will aim to prevent the release of pollutants to the water environment. With these measures in place, the supporting habitats for European Shag will be maintained.

6.6.2.4 Conservation Objective 1: To ensure that the qualifying features of the Scapa Flow SPA are in favourable condition and make an appropriate contribution to achieving Favourable Conservation Status.

It is predicted that, with mitigation, there will be no significant impacts on Conservation Objectives 2a to 2c. Therefore, the favourable condition of European Shag in Scapa Flow SPA will be maintained.

6.7 Eider, non-breeding

6.7.1 Summary of Occurrence at the Development Site and in Scapa Flow

Seasonality: The more or less regular spread of count days at the Deepdale site gives a good indication of the seasonal spread of records.

- 2020/21 peaks (up to 2km from the main VP) in August
- 2021/22 peaks (up to 2km from the main VP) in August
- 2023/24 peaks (up to 2km from the main VP) in November

Wider occurrence across Scapa Flow: During inshore surveys undertaken in 2017/18, Eider were distributed all around the coast of the SPA, apart from the 'Southern Approaches' sectors where they were scarce. Particularly large numbers were present along the east coast of Hoy, where they were commonly found in relatively large numbers around fish farms. The east coast of Hoy, between Ore Bay and Burra Sound accounted for 55% of the total recorded Eider.

A map showing the distribution of birds recorded both during the baseline surveys and HiDef surveys from 2021/22 and 2022/23 can be found in Appendix A.

Numbers from Deepdale survey work: During the vantage point surveys between, a peak count of 104 Eider were recorded within 2km of the Proposed Development. This is higher than the counts from the inshore surveys undertake by HiDef for NatureScot, where a peak count of 30 birds were recorded in the same general area in January 2022. The peak counts for 2020/21 and 2021/22 occurred in August, when Eider are moulting and form large flightless flocks. The peak of 104 birds represents 5% of the SPA population.

As can be seen in the density heat maps produced in EIAR Technical Appendix 5.3: Scapa Deep Water Quay Ornithology Technical Report, a large proportion of the birds were recorded within the Proposed Development footprint area, feeding and loafing close inshore.

Table 6-6 below details the numbers of Eider present within 2km of the Proposed Development during their flightless moult period (July to mid-September).

Table 6.6: Eider Numbers during their flightless moult period

Month	No. count days	Average count <2km	Peak count <2km
July 2021	4	1.25	3
August 2021	4	51.75	93
September 2021	2	51	71
2021 seasonal figures	10	31.4	93
July 2022	4	72	80
August 2022	4	64.75	91
September 2022	2	50.5	57
2022 seasonal figures	10	64.8	91

The peak average count of 64.75 birds (August 2022) and peak count of 93 (August 2021) represents 3.2% and 4.6% of the SPA population respectively. Taken as an average across years, the average of 48.1 birds (taken from 2021 and 2022 seasonal figures) represents 2.4% of the SPA population and the average peak count of 92 birds represents 4.6% of the SPA population.

6.7.2 Assessment of Potential Impacts on Conservation Objectives

6.7.2.1 Conservation Objective 2a: The populations of qualifying features are viable components of the site

The Proposed Development will result in the loss of 19.1Ha of the Scapa Flow SPA. This equates to 0.06% of the total SPA area. Although the Proposed Development footprint provides suitable foraging habitat for Eider, the wider SPA site has the capacity to accommodate these birds.

There is minimal risk of mortality through collision as a result of the Proposed Development. Other direct effects affecting water quality is dealt with in Conservation Objective 2c and indirect effects (ie disturbance resulting in reduced body condition and survival) are dealt with in Conservation Objective 2b.

With no predicted impacts in either conservation Objectives 2b and 2c, it is considered that the population of Eider remains a viable component of the site.

6.7.2.2 Conservation Objective 2b: The distribution of the qualifying features is maintained throughout the site by avoiding significant disturbance of the species

Disturbance may occur through dredging activities and airborne noise through terrestrial works during the construction phase. Empirical data specifically linking marine bird response to noise disturbance (and underwater noise in particular), separate from other sources of disturbance (e.g. vessel movement or human presence), is limited and this source of disturbance on marine birds is not yet well understood. Recent research generally suggests that diving seabirds could be more sensitive to underwater noise than previously assumed. For example, hearing thresholds for Great Cormorant were found to be comparable to seals and toothed whales in the frequency band 1 to 4 kHz (Hansen et al., 2017). A number of assessments have, based on the limited information available, and the similar frequency ranges between seabirds and phocid pinniped and cetacean species, applied methodologies developed for pinnipeds or low frequency cetaceans in assessing seabird sensitivity to underwater noise (Teachout, 2012). Underwater noise modelling (Technical Appendix 5.6 of the EIAR) for dredging shows a TTS range of up to 250m and a PTS range of 50m or less for prolonged exposure (8 hours). During works, an ornithologist will be present to monitor the works, specifically within the 250m zone. Should any impacts become apparent, the disturbance zone can be increased to mitigate against this.

The Construction activities have been highlighted in the Airborne Noise Report (Technical Appendix 9.1 of the EIAR) and noise contour maps have been prepared (see Appendix B) as having noise creation levels of between 70 and 90dB at 10m from source, with noise levels decreasing over distance. With the creation of a 6m bund on the seaward side of the working area, the noise maps demonstrate that noise levels beyond the seaward bund would be between 40-50dB in the immediate vicinity of the bund and dissipate to <35dB at 250m, A study compiled by the Institute of Estuarine and Coastal Studies (IECS), University of Hull (2009) found that construction noise emissions below 50 dB had a low effect and no impact on waterbirds. Disturbance noise above 70 dB resulted in a moderate to high effect to birds resulting in movement within the feeding zone. The study concluded that construction noise levels should be restricted to below 70 dB. It is concluded that the main terrestrial works will not result in impacts to Eider.

Terrestrial blasting associated with the construction phase could cause disturbance to Eider via noise associated from terrestrial blasting. However, routine blasting operations regularly generate air overpressure levels at the closest point to blast area of around 120 dB but the intensity of these noise levels experienced at a distance from the blast site are affected by a range of meteorological conditions (wind speed and direction, temperature, cloud cover and humidity) and in general reduce by 6 dB

reduction as the distance from the source doubles, and that when sound waves pass a given position, the pressure of the air rises very rapidly then falls more slowly then returns to the ambient value after a number of oscillations, Terrestrial blasting activities will occur on site. This will occur once a week over a 35-week period. The Construction Environmental Management Document (CEMD) (Technical Appendix 10.3) details mitigation measures to avoid any significant impacts on marine bird species, including Eider. This includes the presence of an ornithologist to monitor for the presence of SPA qualifying species within 500m of the Proposed Development and record behavioural responses within this zone. If impacts are recorded, then the disturbance zone shall be increased.

It is highly likely that birds will be displaced from the working area (but acknowledging that the wider Scapa Flow SPA has the capacity to accommodate displaced birds) a sufficient distance that noise disturbance does not cause an impact.

Mitigation, including adaptive management measures through the provision of an ornithologist monitoring works (both dredging and terrestrial blasting and determining the need to increase or decrease disturbance buffers would limit any potential disturbance impact. This localised and temporary impact would not result in significant Impacts to Eider within the SPA.

OICHA have provided information on the current typical monthly vessel movements experienced within the eastern area of Scapa Flow. This is summarised below:

- One Flotta fuel tanker;
- 5 Ship to Ship Operations;
- 3 tugs, each with 11 trips in and out of Scapa Pier;
- Escort duties for 1 tug with 12 trips in and out of Scapa Pier;
- 22 pilot boat trips: and
- Occasional workboats to the rigs.

This equates to 124 vessel movements each month in the vicinity of the SDWQ site.

During construction, the number of vessel movements associated with the caisson delivery and installation, equate to 123 movements during the summer months (June to August) when Eider are in their flightless moult period and 126 vessel movements associated with dredge disposal over a 33-week period between October 2026 and May 2027 (4 movements each week). The majority of the routes used by these vessels will be along established routes (ie, the main shipping channel and the shipping lane west towards Stromness). The only new, or seldom used, section of route to be used for vessels will be the 2.6km (or 1.3 nautical miles - 167Ha) branching east off the established route to the SDWQ site. Maps in Appendix C shows the survey data from both the project surveys and HiDef surveys, along with the proposed shipping routes for construction and dredging and diagram 6-3 shows an analysis of the mean density of Eider across Scapa Flow (taken from HiDef survey reporting). As can be seen, the density of Eider within the main shipping routes are low and disturbance is considered unlikely.

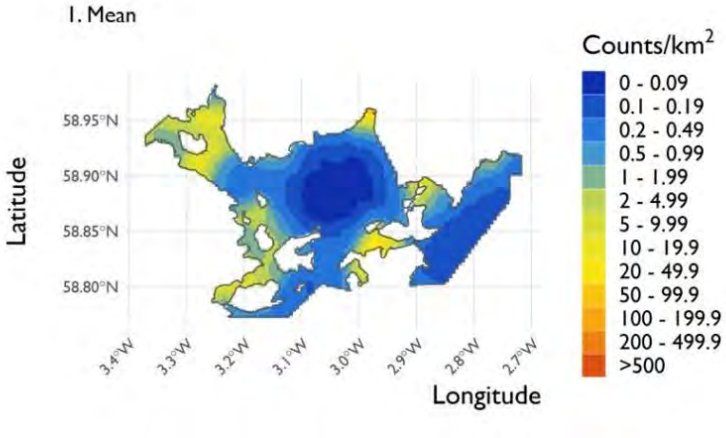

Diagram 6-4: Modelled Eider densities across Scapa Flow SPA (taken from HiDef 2021/22 and 2022/23 wintering bird survey report).

During the operational phase, with the retention of tugs and pilot vessel at Scapa Pier, the estimated number of vessels calling at SDWQ in the operational phase is 30 per year (60 vessel movements), comprising 18 large vessels and 12 smaller vessel per year. Each of the 18 large vessels will have one associated pilot boat (2 vessel movements). In addition, 2 or 3 tugs will assist with berthing the large vessels, although these will be operating in very close proximity to these large vessels, so do not constitute a separate disturbance.

In total, the estimated vessel movements per year is 96. The majority of these vessels (approximately 80 %) are expected to occur during the summer months (April – September), so there will be an average of 12.8 vessel movements per month (3.2 per week) in summer and 3.2 per month (0.8 per week) in winter. Eider is considered less sensitive to disturbance through vessel movements. However, there is the potential for increased disturbance during their moulting period of July to mid-September when birds are flightless. However, the increase in vessel use along the new/less disturbed route of 3.2 vessel movements a week is not considered significant. Taken in combination with the use out of Scapa Pier (124 vessel movements each month), the increase in vessel movements would equate to 10%. Again, this is not considered significant.

Schwemmer et al (2011)[15] make the point that spatial planning should aim to channel ship and boat traffic wherever possible to avoid further habitat fragmentation (e.g. if cargo vessels, tugs and pilots were to range freely either side of the quay) and to allow for habituation, at least in some species.

A Vessel Management Plan will be produced, with input from NatureScot, for both the Construction and Operational phases which will detail vessel routes, speeds etc to minimise, and where possible, avoid any disturbance impacts within the new/novel vessel route during the flightless moult period for Eider (July-mid September).

None of these potential disturbance effects will result in barriers to movement, or reduce access to, preferred foraging and roosting habitats, resulting in a significant energy expenditure and possible reduction in body condition required for survival and subsequent migration.

Therefore, it is considered that distribution of Eider will be maintained throughout the site.

[15] Schwemmer P., Mendel B., Sonntag N., Dierschke V., Garthe S. Effects of ship traffic on seabirds in offshore waters: implications for marine conservation and spatial planning, Ecological Applications, 2011, vol. 21 (pg. 1851-1860)

6.7.2.3 Conservation Objective 2c: The supporting habitats and processes relevant to qualifying features and their prey/food resources are maintained

As described in NatureScot's Conservation and Management Advice Document for Scapa Flow SPA[5], supporting habitats refer to the characteristics of the seabed and water column relevant to their use by the qualifying features. It relates to wider oceanographic processes such as up-wellings, tidal Flows, hydrological movements which may be necessary for the habitat and could affect nutrient cycling and prey distribution.

Hydrodynamic modelling summarised in 3.3 above show little impact on the surrounding water column and seabed due to the low energy environment in this part of Scapa Flow. The impacts on prey species for Eider are expected to be negligible such that their abundance and general distribution remains unchanged from the baseline.

The dredge budget consists of approximately 17% gravel, 60% sand, and 23% silt and clay, which with the weak tidal currents in the vicinity of the proposed dredge pockets, will result in very localised and short-term plumes from dredging. The magnitude or the sediment discharge and dispersion from dredging works will be low within the dredge area and its immediate vicinity, and negligible out with this area. No sediment transport will occur within the Scapa Flow SPA boundary. Thus, the supporting habitats for Eider beyond the development footprint will be maintained.

Drainage designs to ensure that there are no untreated surface water discharges directly to surrounding coastal waters and the use of silt booms during land reclamation works will mitigate against pollution spills which could affect the qualifying interests of the SPA and their prey sources. In terms of water pollution from the pier and attendant vessels, adherence to strict Pollution Prevention controls will aim to prevent the release of pollutants to the water environment. With these measures in place, the supporting habitats for Eider will be maintained.

6.7.2.4 Conservation Objective 1: To ensure that the qualifying features of the Scapa Flow SPA are in favourable condition and make an appropriate contribution to achieving Favourable Conservation Status.

It is predicted that, with mitigation, there will be no significant impacts on Conservation Objectives 2a to 2c. Therefore, the favourable condition of Eider in Scapa Flow SPA will be maintained.

6.8 Red-breasted Merganser, non-breeding

6.8.1 Summary of Occurrence at the Development Site and in Scapa Flow

Seasonality: The more or less regular spread of count days at the Deepdale site gives a good indication of the seasonal spread of records.

- 2020/21 peaks (up to 2km from the main VP) in January to March
- 2021/22 peaks (up to 2km from the main VP) in January
- 2023/24 peaks (up to 2km from the main VP) in October

Wider occurrence across Scapa Flow: During the inshore surveys undertaken in 2017/18, Red-breasted mergansers occurred almost exclusively along the most sheltered coastlines and typically were close inshore, in pairs or small groups. The highest numbers were recorded in North Bay at Hoy, around Burray and in Water Sound between South Ronaldsay and Burray.

Numbers from Deepdale survey work: During the vantage point surveys between, Red-breasted Merganser was very infrequently recorded, with a peak of three birds noted. This correlates well with the counts from the inshore surveys undertake by HiDef for NatureScot, where a peak count of 2 birds was recorded in the same general area. The peak of 3 birds represents 0.5% of the Scapa Flow SPA population.

6.8.2 Assessment of Potential Impacts on Conservation Objectives

6.8.2.1 Conservation Objective 2a: The populations of qualifying features are viable components of the site

The Proposed Development will result in the loss of 19.1Ha of the Scapa Flow SPA. Given that nearly all Red-breasted Merganser are recorded within 500m of the shoreline, this equates to 0.4% of the utilised SPA area. Although the Proposed Development footprint provides suitable foraging habitat for Red-breasted Merganser, the wider SPA site has the capacity to accommodate these birds.

There is minimal risk of mortality through collision as a result of the Proposed Development. Other direct effects affecting water quality is dealt with in Conservation Objective 2c and indirect effects (ie disturbance resulting in reduced body condition and survival) are dealt with in Conservation Objective 2b.

With no predicted impacts in either conservation Objectives 2b and 2c, it is considered that the population of Red-breasted Merganser remains a viable component of the site.

6.8.2.2 Conservation Objective 2b: The distribution of the qualifying features is maintained throughout the site by avoiding significant disturbance of the species

Disturbance may occur through dredging activities and airborne noise through terrestrial works during the construction phase. Empirical data specifically linking marine bird response to noise disturbance (and underwater noise in particular), separate from other sources of disturbance (e.g. vessel movement or human presence), is limited and this source of disturbance on marine birds is not yet well understood. Recent research generally suggests that diving seabirds could be more sensitive to underwater noise than previously assumed. For example, hearing thresholds for Great Cormorant were found to be comparable to seals and toothed whales in the frequency band 1 to 4 kHz (Hansen et al., 2017). A number of assessments have, based on the limited information available, and the similar frequency ranges between seabirds and phocid pinniped and cetacean species, applied methodologies developed for pinnipeds or low frequency cetaceans in assessing seabird sensitivity to underwater noise (Teachout, 2012). Underwater noise modelling (Technical Appendix 5.6 of the EIAR) for dredging shows a TTS range of up to 250m and a PTS range of 50m or less for prolonged exposure (8 hours). During works, an ornithologist will be present to monitor the works, specifically within the 250m zone. Should any impacts become apparent, the disturbance zone can be increased to mitigate against this.

The Construction activities have been highlighted in the Airborne Noise Report (Technical Appendix 9.1 of the EIAR) and noise contour maps have been prepared (see Appendix B) as having noise creation levels of between 70 and 90dB at 10m from source, with noise levels decreasing over distance. With the creation of a 6m bund on the seaward side of the working area, the noise maps demonstrate that noise levels beyond the seaward bund would be between 40-50dB in the immediate vicinity of the bund and dissipate to <35dB at 250m, A study compiled by the Institute of Estuarine and Coastal Studies (IECS), University of Hull (2009) found that construction noise emissions below 50 dB had a low effect and no impact on waterbirds. Disturbance noise above 70 dB resulted in a moderate to high effect to birds resulting in movement within the feeding zone. The study concluded that construction noise levels

should be restricted to below 70 dB. It is concluded that the main terrestrial works will not result in impacts to Red-breasted Merganser.

Terrestrial blasting associated with the construction phase could cause disturbance to Red-breasted Merganser via noise associated from terrestrial blasting. However, routine blasting operations regularly generate air overpressure levels at the closest point to blast area of around 120 dB but the intensity of these noise levels experienced at a distance from the blast site are affected by a range of meteorological conditions (wind speed and direction, temperature, cloud cover and humidity) and in general reduce by 6 dB reduction as the distance from the source doubles, and that when sound waves pass a given position, the pressure of the air rises very rapidly then falls more slowly then returns to the ambient value after a number of oscillations, Terrestrial blasting activities will occur on site. This will occur once a week over a 35-week period. The Construction Environmental Management Document (CEMD) (Technical Appendix 10.3) details mitigation measures to avoid any significant impacts on marine bird species, including Red-breasted Merganser. This includes the presence of an ornithologist to monitor for the presence of SPA qualifying species within 500m of the Proposed Development and record behavioural responses within this zone. If impacts are recorded, then the disturbance zone shall be increased.

It is highly likely that birds will be displaced from the working area (but acknowledging that the wider Scapa Flow SPA has the capacity to accommodate displaced birds) a sufficient distance that noise disturbance does not cause an impact.

Mitigation, including adaptive management measures through the provision of an ornithologist monitoring works (both dredging and terrestrial blasting and determining the need to increase or decrease disturbance buffers would limit any potential disturbance impact. This localised and temporary impact would not result in significant Impacts to Red-breasted Merganser within the SPA.

OICHA have provided information on the current typical monthly vessel movements experienced within the eastern area of Scapa Flow. This is summarised below:

- One Flotta fuel tanker;
- 5 Ship to Ship Operations;
- 3 tugs, each with 11 trips in and out of Scapa Pier;
- Escort duties for 1 tug with 12 trips in and out of Scapa Pier;
- 22 pilot boat trips: and
- Occasional workboats to the rigs.

This equates to 124 vessel movements each month in the vicinity of the SDWQ site.

During construction, the number of vessel movements associated with the caisson delivery and installation, and relevant to Red-breasted Merganser, equate to 126 vessel movements associated with dredge disposal over a 33-week period between October 2026 and May 2027 (4 movements each week).

During the operational phase, with the retention of tugs and pilot vessel at Scapa Pier, the estimated number of vessels calling at SDWQ in the operational phase is 30 per year (60 vessel movements), comprising 18 large vessels and 12 smaller vessel per year. Each of the 18 large vessels will have one associated pilot boat (2 vessel movements). In addition, 2 or 3 tugs will assist with berthing the large vessels, although these will be operating in very close proximity to these large vessels, so do not constitute a separate disturbance.

In total, the estimated vessel movements per year is 96. The majority of these vessels (approximately 80 %) are expected to occur during the summer months (April – September), so there will be an average of 12.8 vessel movements per month (3.2 per week) in summer and 3.2 per month (0.8 per week) in

winter. Given the paucity of Red-breasted Merganser in the area of the proposed SDWQ site, there is no significant risk of disturbance to this species.

Therefore, it is considered that distribution of Red-breasted Merganser will be maintained throughout the site.

6.8.2.3 Conservation Objective 2c: The supporting habitats and processes relevant to qualifying features and their prey/food resources are maintained

As described in NatureScot's Conservation and Management Advice Document for Scapa Flow SPA[5] supporting habitats refer to the characteristics of the seabed and water column relevant to their use by the qualifying features. It relates to wider oceanographic processes such as up-wellings, tidal Flows, hydrological movements which may be necessary for the habitat and could affect nutrient cycling and prey distribution.

Hydrodynamic modelling summarised in 3.3 above show little impact on the surrounding water column and seabed due to the low energy environment in this part of Scapa Flow. The impacts on prey species for Red-breasted Merganser are expected to be negligible such that their abundance and general distribution remains unchanged from the baseline.

The dredge budget consists of approximately 17% gravel, 60% sand, and 23% silt and clay, which with the weak tidal currents in the vicinity of the proposed dredge pockets, will result in very localised and short-term plumes from dredging. The magnitude or the sediment discharge and dispersion from dredging works will be low within the dredge area and its immediate vicinity, and negligible out with this area. No sediment transport will occur within the Scapa Flow SPA boundary. Thus, the supporting habitats for Red-breasted Merganser beyond the development footprint will be maintained.

Drainage designs to ensure that there are no untreated surface water discharges directly to surrounding coastal waters and the use of silt booms during land reclamation works will mitigate against pollution spills which could affect the qualifying interests of the SPA and their prey sources. In terms of water pollution from the pier and attendant vessels, adherence to strict Pollution Prevention controls will aim to prevent the release of pollutants to the water environment. With these measures in place, the supporting habitats for Red-breasted Merganser will be maintained.

6.8.2.4 Conservation Objective 1: To ensure that the qualifying features of the Scapa Flow SPA are in favourable condition and make an appropriate contribution to achieving Favourable Conservation Status.

It is predicted that, with mitigation, there will be no significant impacts on Conservation Objectives 2a to 2c. Therefore, the favourable condition of Red-breasted Merganser in Scapa Flow SPA will be maintained.

6.9 Long-tailed Duck, non-breeding

Seasonality: The more or less regular spread of count days at the Deepdale site gives a good indication of the seasonal spread of records.

- 2020/21 peaks (up to 2km from the main VP) in May
- 2021/22 peaks (up to 2km from the main VP) in March
- 2023/24 peaks (up to 2km from the main VP) in March

Wider occurrence across Scapa Flow: During inshore surveys undertaken in 2017/18, Long-tailed Duck were distributed all around the coast of the SPA, apart from the 'Southern Approaches' sectors where they were scarce. Particularly large numbers were present along the east coast of Hoy, where they were commonly found in relatively large numbers around fish farms. The east coast of Hoy, between Ore Bay and Burra Sound accounted for 39% of the total recorded Long-tailed Duck.

A map showing the distribution of birds recorded both during the baseline surveys and HiDef surveys from 2021/22 and 2022/23 can be found in Appendix A.

Numbers from Deepdale survey work: During the vantage point surveys undertaken, a peak count of 655 birds were recorded in March 2024. This correlates with previous surveys findings, with peak counts of 414 and 232 around the finish farm in May 2021 and March 2022 respectively. During the Spring, this species forms larger concentrated flocks prior to migration.

As can be seen in the density heat maps produced in EIAR Technical Appendix 5.3: Scapa Deep Water Quay Ornithology Technical Report, small numbers of Long-tailed Duck were recorded within the Proposed Development footprint (mainly between 1 and 3 but with a peak of 10 birds). The vast majority of birds were recorded to the south, in the vicinity of the fish farm cages.

Table 6-7 below details the numbers of Long-tailed Duck present within 2km of the Proposed Development during their pre-migration congregation period (March to mid-May).

Table 6.7: Long-tailed Duck numbers during pre-migration congregation period

Month	No. count days	Average count <2km	Peak count <2km
March 2021	4	35	60
April 2021	4	134	176
May 2021	2	310	414
2021 seasonal figures	10	130	414
March 2022	4	73	234
April 2022	4	42	75
May 2022	1	58	58
2022 seasonal figures	9	58	234
March 2024	4	374	515

The peak average count of 374 birds (March 2024) and peak count of 515 (March 2024) represents 26.8% and 37% of the SPA population respectively. Taken as an average across years, the average of 187.3 birds (taken from 2021, 2022 and 2024 seasonal figures) represents 13.4% of the SPA population and the average peak count of 387.6 birds represents 27.8% of the SPA population.

6.9.1 Assessment of Potential Impacts on Conservation Objectives

6.9.1.1 Conservation Objective 2a: The populations of qualifying features are viable components of the site

The Proposed Development will result in the loss of 19.1Ha of the Scapa Flow SPA. This equates to 0.06% of the total SPA area. Although the Proposed Development footprint provides suitable foraging habitat for Long-tailed Duck, the wider SPA site has the capacity to accommodate these birds.

There is minimal risk of mortality through collision as a result of the Proposed Development. Other direct effects affecting water quality is dealt with in Conservation Objective 2c and indirect effects (ie disturbance resulting in reduced body condition and survival) are dealt with in Conservation Objective 2b.

With no predicted impacts in either conservation Objectives 2b and 2c, it is considered that the population of Long-tailed Duck remains a viable component of the site.

6.9.1.2 Conservation Objective 2b: The distribution of the qualifying features is maintained throughout the site by avoiding significant disturbance of the species

Disturbance may occur through dredging activities and airborne noise through terrestrial works during the construction phase. Empirical data specifically linking marine bird response to noise disturbance (and underwater noise in particular), separate from other sources of disturbance (e.g. vessel movement or human presence), is limited and this source of disturbance on marine birds is not yet well understood. Recent research generally suggests that diving seabirds could be more sensitive to underwater noise than previously assumed. For example, hearing thresholds for Great Cormorant were found to be comparable to seals and toothed whales in the frequency band 1 to 4 kHz (Hansen et al., 2017). A number of assessments have, based on the limited information available, and the similar frequency ranges between seabirds and phocid pinniped and cetacean species, applied methodologies developed for pinnipeds or low frequency cetaceans in assessing seabird sensitivity to underwater noise (Teachout, 2012). Underwater noise modelling (Technical Appendix 5.6 of the EIAR) for dredging shows a TTS range of up to 250m and a PTS range of 50m or less for prolonged exposure (8 hours). During works, an ornithologist will be present to monitor the works, specifically within the 250m zone. Should any impacts become apparent, the disturbance zone can be increased to mitigate against this.

The Construction activities have been highlighted in the Airborne Noise Report (Technical Appendix 9.1 of the EIAR) and noise contour maps have been prepared (see Appendix B) as having noise creation levels of between 70 and 90dB at 10m from source, with noise levels decreasing over distance. With the creation of a 6m bund on the seaward side of the working area, the noise maps demonstrate that noise levels beyond the seaward bund would be between 40-50dB in the immediate vicinity of the bund and dissipate to <35dB at 250m, A study compiled by the Institute of Estuarine and Coastal Studies (IECS), University of Hull (2009) found that construction noise emissions below 50 dB had a low effect and no impact on waterbirds. Disturbance noise above 70 dB resulted in a moderate to high effect to birds resulting in movement within the feeding zone. The study concluded that construction noise levels should be restricted to below 70 dB. It is concluded that the main terrestrial works will not result in impacts to Long-tailed Duck.

Terrestrial blasting associated with the construction phase could cause disturbance to Long-tailed Duck via noise associated from terrestrial blasting. However, routine blasting operations regularly generate air overpressure levels at the closest point to blast area of around 120 dB but the intensity of these noise levels experienced at a distance from the blast site are affected by a range of meteorological conditions (wind speed and direction, temperature, cloud cover and humidity) and in general reduce by 6 dB reduction as the distance from the source doubles, and that when sound waves pass a given position, the pressure of the air rises very rapidly then falls more slowly then returns to the ambient value after a number of oscillations, Terrestrial blasting activities will occur on site. This will occur once a week over a 35-week period. The Construction Environmental Management Document (CEMD) (Technical Appendix 10.3) details mitigation measures to avoid any significant impacts on marine bird species, including Eider. This includes the presence of an ornithologist to monitor for the presence of SPA qualifying species within 500m of the Proposed Development and record behavioural responses within this zone. If impacts are recorded, then the disturbance zone shall be increased.

It is highly likely that birds will be displaced from the working area (but acknowledging that the wider Scapa Flow SPA has the capacity to accommodate displaced birds) a sufficient distance that noise disturbance does not cause an impact.

Mitigation, including adaptive management measures through the provision of an ornithologist monitoring works (both dredging and terrestrial blasting and determining the need to increase or decrease disturbance buffers would limit any potential disturbance impact. This localised and temporary impact would not result in significant Impacts to Long-tailed Duck within the SPA.

OICHA have provided information on the current typical monthly vessel movements experienced within the eastern area of Scapa Flow. This is summarised below:

- One Flotta fuel tanker;
- 5 Ship to Ship Operations;
- 3 tugs, each with 11 trips in and out of Scapa Pier;
- Escort duties for 1 tug with 12 trips in and out of Scapa Pier;
- 22 pilot boat trips: and
- Occasional workboats to the rigs.

This equates to 124 vessel movements each month in the vicinity of the SDWQ site.

During construction, the number of vessel movements associated with the caisson delivery and installation, and relevant to when Long-tailed Duck are present will equate to 126 vessel movements associated with dredge disposal over a 33-week period between October 2026 and May 2027 (4 movements each week).

The majority of the routes used by these vessels will be along established routes (ie, the main shipping channel and the shipping lane west towards Stromness). The only new, or seldom used, section of route to be used for vessels will be the 2.6km (or 1.3 nautical miles - 167Ha) branching east off the established route to the SDWQ site. Maps in Appendix C shows the survey data from both the project surveys and HiDef surveys, along with the proposed shipping routes for construction and dredging and diagram 6-4 shows an analysis of the mean density of Long-tailed Duck across Scapa Flow (taken from HiDef survey reporting). As can be seen, the density of Long-tailed Duck within the main shipping routes are low and disturbance is considered unlikely.

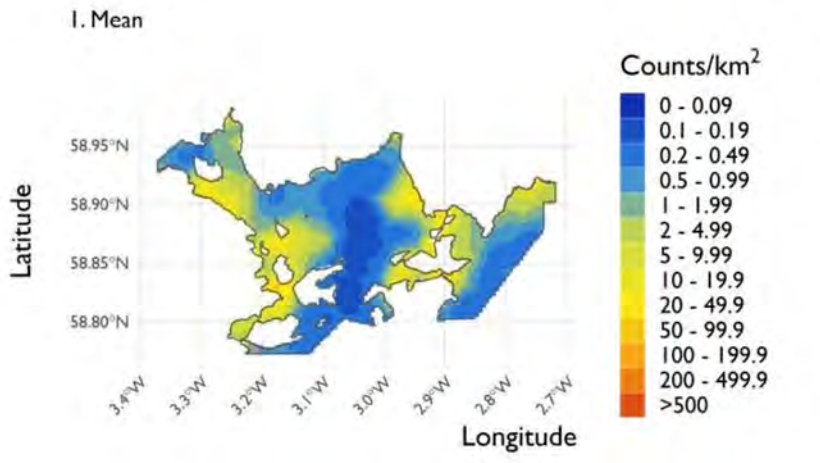

Diagram 6-5: Modelled Long-tailed Duck densities across Scapa Flow SPA (taken from HiDef 2021/22 and 2022/23 wintering bird survey report).

During the operational phase, with the retention of tugs and pilot vessel at Scapa Pier, the estimated number of vessels calling at SDWQ in the operational phase is 30 per year (60 vessel movements), comprising 18 large vessels and 12 smaller vessel per year. Each of the 18 large vessels will have one associated pilot boat (2 vessel movements). In addition, 2 or 3 tugs will assist with berthing the large vessels, although these will be operating in very close proximity to these large vessels, so do not constitute a separate disturbance.

In total, the estimated vessel movements per year is 96. The majority of these vessels (approximately 80 %) are expected to occur during the summer months (April – September), so there will be an average of 12.8 vessel movements per month (3.2 per week) in summer and 3.2 per month (0.8 per week) in winter.

Long-tailed Duck are considered less sensitive to disturbance through vessel movements. However, there is the potential for increased disturbance during their pre-migration period where they concentrate in larger flocks.

Schwemmer et al (2011) make the point that spatial planning should aim to channel ship and boat traffic wherever possible to avoid further habitat fragmentation (e.g. if cargo vessels, tugs and pilots were to range freely either side of the quay) and to allow for habituation, at least in some species.

A Vessel Management Plan will be produced, with input from NatureScot, for both the Construction and Operational phases which will detail vessel routes, speeds etc to minimise, and where possible, avoid any disturbance impacts. For Long-tailed Duck, reference will be made to the pre-migration period of March to May.

None of these potential disturbance effects will result in barriers to movement, or reduce access to, preferred foraging and roosting habitats, resulting in a significant energy expenditure and possible reduction in body condition required for survival and subsequent migration.

Therefore, it is considered that distribution of Long-tailed Duck will be maintained throughout the site.

6.9.1.3 Conservation Objective 2c: The supporting habitats and processes relevant to qualifying features and their prey/food resources are maintained

As described in NatureScot's Conservation and Management Advice Document for Scapa Flow SPA[5], supporting habitats refer to the characteristics of the seabed and water column relevant to their use by the qualifying features. It relates to wider oceanographic processes such as up-wellings, tidal Flows, hydrological movements which may be necessary for the habitat and could affect nutrient cycling and prey distribution.

Hydrodynamic modelling summarised in 3.3 above show little impact on the surrounding water column and seabed due to the low energy environment in this part of Scapa Flow. The impacts on prey species for Long-tailed Duck are expected to be negligible such that their abundance and general distribution remains unchanged from the baseline.

The dredge budget consists of approximately 17% gravel, 60% sand, and 23% silt and clay, which with the weak tidal currents in the vicinity of the proposed dredge pockets, will result in very localised and short-term plumes from dredging. The magnitude or the sediment discharge and dispersion from dredging works will be low within the dredge area and its immediate vicinity, and negligible out with this area. No sediment transport will occur within the Scapa Flow SPA boundary. Thus, the supporting habitats for Long-tailed Duck beyond the development footprint will be maintained.

Drainage designs to ensure that there are no untreated surface water discharges directly to surrounding coastal waters and the use of silt booms during land reclamation works will mitigate against pollution spills which could affect the qualifying interests of the SPA and their prey sources. In terms of water pollution from the pier and attendant vessels, adherence to strict Pollution Prevention controls will aim to prevent the release of pollutants to the water environment. With these measures in place, the supporting habitats for Long-tailed Duck will be maintained.

6.9.1.4 Conservation Objective 1: To ensure that the qualifying features of the Scapa Flow SPA are in favourable condition and make an appropriate contribution to achieving Favourable Conservation Status.

It is predicted that, with mitigation, there will be no significant impacts on Conservation Objectives 2a to 2c. Therefore, the favourable condition of Long-tailed Duck in Scapa Flow SPA will be maintained.

6.10 Red-throated Diver, breeding

6.10.1 Status and distribution of breeding Red-throated Divers around SDWQ

The results of the 2006 national diver survey are published in Bird Study[16], the research publication of the British Trust for Ornithology. This paper includes a map with the presence of breeding and non-breeding Red-throated Divers mapped at a scale of 5-km squares across Orkney.

The general distribution of divers in Orkney is quite stable, given that it is dependent on the presence of suitable breeding waters – no material change is likely since 2006.

The breeding divers comprising the Scapa Flow SPA foraging population are expected to be from:

- Hoy – up to 60 or more pairs on the western side of Scapa Flow, most of which are on the Hoy SPA; these are all well to the west of SDWQ.
- Fara – one pair on the western side of Scapa Flow, not on the Hoy SPA (it is beyond 10 km to the west of SDWQ).
- West Mainland – usually more than 20 pairs, the bulk of which are on the northern part of the Orkney Mainland Moors SPA (OMM SPA) and most likely to utilise the North Orkney SPA for foraging. There are no OMM SPA pairs within 14 km of the SDWQ site and very few foraging trips from there would be expected towards Scapa Flow. There are also several West Mainland sites that are not on the OMM SPA – up to four pairs set back a little from the north Scapa Flow shoreline and a pair or two much more distantly from SDWQ on the larger lochs of Harray, Hundland and Swannay.
- East Mainland – up to five pairs in two locations; only the closest birds in Holm are likely to utilise Scapa Flow SPA, and for these Scapa Flow is known to be important from the Deepdale VP watches.

NatureScot guidance[17] indicates that the foraging distance from the nest site for Red-throated Divers is "generally less than 8 km…" although it can be up to 10 km.

[16] Dillon I. A., Smith T. D., Williams S. J., Haysom S. and Eaton M. A. (2009). Red-throated Divers in Britain in 2006. Bird Study **56**, 147-157.
[17] Scottish Natural Heritage (2016). Assessing Connectivity with Special Protection Areas

From examination of the 1:25,000 Ordnance Survey maps and personal observations (Andrew Upton), it is possible to deduce the number and location of breeding pairs within 10 km of the SDWQ proposal.

The Deepdale 5-km square, and all of the squares to the south of it, held no breeding divers in 2006. The Loch of Tankerness (a non-breeding site in 2006) is eight or nine kilometres to the northeast and is not particularly suitable for breeding Red-throated Divers, being surrounded by intensively managed grass fields with only small areas of natural vegetation.

There are two breeding locations within 8 km and one more at 8–10 km distance. The closest birds are inland from SDWQ and known to fly down to Deepdale Bay regularly during the breeding season, where they loaf and forage, before often moving on into Scapa Flow. The Griffyelt and Loch of Kirbister birds are within foraging distance of Deepdale but have a very large area of suitable foraging much closer to them; the majority of flight paths at Deepdale in 2022 could be related to the inland pairs there.

The Red-throated Divers on Hoy, Fara, a few West Mainland pairs (facing Scapa Flow) and a few on East Mainland, comprise the total breeding population likely to utilise the Scapa Flow SPA for feeding. This will be in the region of 70 pairs, the vast majority of which are located on the Hoy SPA well to the west and beyond any likelihood of a significant interaction with the SDWQ site.

The closest diver-supporting parts of the Orkney Mainland Moors SPA lie at about 15 km northwest of SDWQ, half of which is overland – since there is plenty of good foraging ground much closer to these breeding lochans in the North Orkney SPA, there is no possibility of a regular or significant connection between the OMM SPA and the SDWQ site.

The Marine Scotland website shows a map[18] of the predicted foraging occurrence of Red-throated Divers across the North Orkney and Scapa Flow SPAs. It indicates that Deepdale is in the lowest category of modelled diver foraging,

6.10.2 Assessment of Potential Impacts on Conservation Objectives

6.10.2.1 Conservation Objective 2a: The populations of qualifying features are viable components of the site

During the vantage point surveys and flight surveys undertaken between 2020 and 2022, at least one breeding pair of Red-throated Divers utilised the site and environs for foraging.

The Proposed Development will result in the loss of 19.1Ha of the Scapa Flow SPA. This equates to 0.06% of the total SPA area. Although the Proposed Development footprint provides suitable foraging habitat for Red-throated Diver, the wider SPA site has the capacity to accommodate this pair.

There is minimal risk of mortality through collision as a result of the Proposed Development as there will be no wet storage of turbines on site. Other direct effects affecting water quality is dealt with in Conservation Objective 2c and indirect effects (ie disturbance resulting in reduced body condition and survival) are dealt with in Conservation Objective 2b.

With no predicted impacts in either conservation Objectives 2b and 2c, it is considered that the population of Red-throated Diver remains a viable component of the site.

[18] https://marinescotland.atkinsgeospatial.com/nmpi/default.aspx?layers=1262

6.10.2.2 *Conservation Objective 2b: The distribution of the qualifying features is maintained throughout the site by avoiding significant disturbance of the species*

Disturbance may occur through dredging activities and airborne noise through terrestrial works during the construction phase. Empirical data specifically linking marine bird response to noise disturbance (and underwater noise in particular), separate from other sources of disturbance (e.g. vessel movement or human presence), is limited and this source of disturbance on marine birds is not yet well understood. Recent research generally suggests that diving seabirds could be more sensitive to underwater noise than previously assumed. For example, hearing thresholds for Great Cormorant were found to be comparable to seals and toothed whales in the frequency band 1 to 4 kHz (Hansen et al., 2017). A number of assessments have, based on the limited information available, and the similar frequency ranges between seabirds and phocid pinniped and cetacean species, applied methodologies developed for pinnipeds or low frequency cetaceans in assessing seabird sensitivity to underwater noise (Teachout, 2012). Underwater noise modelling (Technical Appendix 5.6 of the EIAR) for dredging shows a TTS range of up to 250m and a PTS range of 50m or less for prolonged exposure (8 hours). During works, an ornithologist will be present to monitor the works, specifically within the 250m zone. Should any impacts become apparent, the disturbance zone can be increased to mitigate against this.

The Construction activities have been highlighted in the Airborne Noise Report (Technical Appendix 9.1 of the EIAR) and noise contour maps have been prepared (see Appendix B) as having noise creation levels of between 70 and 90dB at 10m from source, with noise levels decreasing over distance. With the creation of a 6m bund on the seaward side of the working area, the noise maps demonstrate that noise levels beyond the seaward bund would be between 40-50dB in the immediate vicinity of the bund and dissipate to <35dB at 250m, A study compiled by the Institute of Estuarine and Coastal Studies (IECS), University of Hull (2009) found that construction noise emissions below 50 dB had a low effect and no impact on waterbirds. Disturbance noise above 70 dB resulted in a moderate to high effect to birds resulting in movement within the feeding zone. The study concluded that construction noise levels should be restricted to below 70 dB. It is concluded that the main terrestrial works will not result in impacts to Red-throated Diver.

Terrestrial blasting associated with the construction phase could cause disturbance to Red-throated Diver via noise associated from terrestrial blasting. However, routine blasting operations regularly generate air overpressure levels at the closest point to blast area of around 120 dB but the intensity of these noise levels experienced at a distance from the blast site are affected by a range of meteorological conditions (wind speed and direction, temperature, cloud cover and humidity) and in general reduce by 6 dB reduction as the distance from the source doubles, and that when sound waves pass a given position, the pressure of the air rises very rapidly then falls more slowly then returns to the ambient value after a number of oscillations, Terrestrial blasting activities will occur on site. This will occur once a week over a 35-week period. The Construction Environmental Management Document (CEMD) (Technical Appendix 10.3) details mitigation measures to avoid any significant impacts on marine bird species, including Eider. This includes the presence of an ornithologist to monitor for the presence of SPA qualifying species within 500m of the Proposed Development and record behavioural responses within this zone. If impacts are recorded, then the disturbance zone shall be increased.

It is highly likely that birds will be displaced from the working area (but acknowledging that the wider Scapa Flow SPA has the capacity to accommodate displaced birds) a sufficient distance that noise disturbance does not cause an impact.

Mitigation, including adaptive management measures through the provision of an ornithologist monitoring works (both dredging and terrestrial blasting and determining the need to increase or decrease disturbance buffers would limit any potential disturbance impact. This localised and temporary impact would not result in significant Impacts to Red-throated Diver within the SPA.

OICHA have provided information on the current typical monthly vessel movements experienced within the eastern area of Scapa Flow. This is summarised below:

- One Flotta fuel tanker;
- 5 Ship to Ship Operations;
- 3 tugs, each with 11 trips in and out of Scapa Pier;
- Escort duties for 1 tug with 12 trips in and out of Scapa Pier;
- 22 pilot boat trips: and
- Occasional workboats to the rigs.

This equates to 124 vessel movements each month in the vicinity of the SDWQ site.

During construction, the number of vessel movements associated with the caisson delivery and installation, and relevant to Red-throated Diver, equate to 123 vessel movements during the summer months.

During the operational phase, with the retention of tugs and pilot vessel at Scapa Pier, the estimated number of vessels calling at SDWQ in the operational phase is 30 per year (60 vessel movements), comprising 18 large vessels and 12 smaller vessel per year. Each of the 18 large vessels will have one associated pilot boat (2 vessel movements). In addition, 2 or 3 tugs will assist with berthing the large vessels, although these will be operating in very close proximity to these large vessels, so do not constitute a separate disturbance.

In total, the estimated vessel movements per year is 96. The majority of these vessels (approximately 80 %) are expected to occur during the summer months (April – September), so there will be an average of 12.8 vessel movements per month (3.2 per week) in summer and 3.2 per month (0.8 per week) in winter .Given that the site is of low importance to foraging Red-throated Diver within Scapa Flow, there is no significant risk of disturbance to this species. Therefore, there will be no adverse effect on site integrity with regards to this species.

6.10.2.3 Conservation Objective 2c: The supporting habitats and processes relevant to qualifying features and their prey/food resources are maintained

As described in NatureScot's Conservation and Management Advice Document for Scapa Flow SPA[5], supporting habitats refer to the characteristics of the seabed and water column relevant to their use by the qualifying features. It relates to wider oceanographic processes such as up-wellings, tidal Flows, hydrological movements which may be necessary for the habitat and could affect nutrient cycling and prey distribution.

Hydrodynamic modelling summarised in 3.3 above show little impact on the surrounding water column and seabed due to the low energy environment in this part of Scapa Flow. The impacts on prey species for Red-throated Diver are expected to be negligible such that their abundance and general distribution remains unchanged from the baseline.

The dredge budget consists of approximately 17% gravel, 60% sand, and 23% silt and clay, which with the weak tidal currents in the vicinity of the proposed dredge pockets, will result in very localised and short-term plumes from dredging. The magnitude or the sediment discharge and dispersion from dredging works will be low within the dredge area and its immediate vicinity, and negligible out with this area. No sediment transport will occur within the Scapa Flow SPA boundary. Thus, the supporting habitats for Red-throated Diver beyond the development footprint will be maintained.

Drainage designs to ensure that there are no untreated surface water discharges directly to surrounding coastal waters and the use of silt booms during land reclamation works will mitigate against pollution spills which could affect the qualifying interests of the SPA and their prey sources. In terms of water pollution from the pier and attendant vessels, adherence to strict Pollution Prevention controls will aim to prevent the release of pollutants to the water environment. With these measures in place, the supporting habitats for Red-throated Diver will be maintained.

6.10.2.4 Conservation Objective 1: To ensure that the qualifying features of the Scapa Flow SPA are in favourable condition and make an appropriate contribution to achieving Favourable Conservation Status.

It is predicted that, with mitigation, there will be no significant impacts on Conservation Objectives 2a to 2c. Therefore, the favourable condition of Red-throated Diver in Scapa Flow SPA will be maintained.

7 APPROPRIATE ASSESSMENT: NORTH ORKNEY SPA

7.1 Site Description

The North Orkney Special Protection Area (SPA) lies to the north of Mainland in the Orkney Islands, extending from Deerness in the east to Eynhallow in the west. The site includes Wide Firth and several large sheltered bays, such as Deer Sound, Inganess Bay and Bay of Firth. North Orkney SPA also encompasses Shapinsay Sound and tidal channels among the islands of Gairsay, Rousay, Egilsay and Wyre, including Rousay Sound and Eynhallow Sound. Water depths are generally less than 20m. Sediments are primarily mixtures of mud, sand and gravel but become coarser in areas where tidal currents are stronger and there are extensive maerl beds in the sounds around Rousay. The varied marine habitats support a rich and varied invertebrate fauna, including polychaete worms, crustaceans and bivalve molluscs, many of which are important prey species for marine birds. These rich sheltered waters support large numbers of waterfowl, particularly in the winter months when frequent storms affect the surrounding North Sea and eastern Atlantic.

The North Orkney Special Protection Area (SPA) qualifies under **Article 4.1** by regularly supporting a non-breeding population of European importance of the following Annex 1 species:

- Great Northern Diver (*Gavia immer*) - a mean peak annual non-breeding population of 308 birds (12.3% of the Great Britain population) for the years 2006/07 to 2008/09); and
- Slavonian Grebe (*Podiceps auratus*) - a mean peak annual non-breeding population of 120 birds (10.9% of the Great Britain population) for the years 2007/08-2008/9).

The site also qualifies under **Article 4.1** by regularly supporting a population of European importance of the following Annex 1 species during the breeding season:

- Red-throated Diver (*Gavia stellata*) - up to 47 pairs (3.7% of the Great Britain population) for the year of 2006).

The site further qualifies under **Article 4.2** by regularly supporting a population of European importance of the following migratory species:

- Velvet Scoter (*Melanitta fusca*) - a mean peak annual non-breeding population of 147 birds (5.9% of the Great Britain population) for the years of 2006/07 to 2008/09).

7.2 Conservation Objectives

1. To ensure that the qualifying features of the North Orkney SPA are in favourable condition and make an appropriate contribution to achieving Favourable Conservation Status.

2. To ensure that the integrity of the North Orkney SPA is maintained in the context of environmental changes by meeting objectives 2a, 2b and 2c for each qualifying feature:

2a. The populations of qualifying features are viable components of the site.

2b. The distribution of the qualifying features is maintained throughout the site by avoiding significant disturbance of the species.

2c. The supporting habitats and processes relevant to qualifying features and their

prey/food resources are maintained.

7.3 Qualifying Features to be Assessed

Although possible, there is no evidence of connectivity between overlapping SPA qualifying features (Great Northern Diver and Slavonian Grebe) of Scapa Flow SPA and North Orkney SPA. Survey data does not show flights of Great Northern Diver and Slavonian Grebe commuting over Kirkwall between sites (albeit it is acknowledged that Slavonian grebe most likely fly at night). Recent NatureScot responses to developments within North Orkney SPA (Quanterness Fish Farm – NatureScot response dated 21st August 2024 and subsequent email dated 26th March 2025) do not mention connectivity between the two SPA sites, highlighting the uncertainty of this.

For the purposes of this assessment, it is unreasonable to assume that all birds present at Scapa Flow SPA could also be birds as part of the North Orkney SPA, even as a precautionary principle. A more realistic precautionary estimate is that 10% of the birds (Great Northern Diver and Slavonian Grebe) cross over between North Orkney SPA and Scapa Flow SPA.

Using this criterion, the peak count of 59 Great Northern Diver would therefore constitute 5.9 birds associated with North Orkney SPA. This represents 1.9% of the North Orkney SPA population. Similarly, the peak of 7 Slavonian Grebes would constitute 0.7 birds associated with North Orkney SPA, which equates to 0.6% of the SPA population.

Given these small numbers, and with the mitigation measures in place for Scapa Flow SPA qualifying species, no adverse effects on the integrity of North Orkney SPA are predicted.

8 APPROPRIATE ASSESSMENT: ORKNEY MAINLAND MOORS SPA

Orkney Mainland Moors SPA comprises four areas of moorland on Mainland; at its closest point, it lies within 6km from the Proposed Development site. The predominant habitats include extensive areas of blanket bog, heaths and mires, with these upland areas supporting 5.9% of the UK's breeding and 2% of the UK's overwintering Hen Harrier population, 2% of the UK's breeding Short-eared Owl population. In both cases one of very few sites to support such dense and significant numbers. The area also supports 2% of the UK's breeding Red-throated Diver population. This site's boundaries also correspond to Keelylang Hill and Swartaback Burn Site of Special Scientific Interest (SSSI) which is designated for breeding Hen Harrier.

Red-throated Diver is the only qualifying species of this SPA that could potentially be impacted by the works at SDWQ. Breeding Red-throated Diver will use the Scapa Flow as a feeding resource during the breeding season, bringing food back to their nesting lochan.

8.1 Red-throated Diver, breeding

8.1.1 Assessment of Potential Impacts on Conservation Objectives

8.1.1.1 Conservation Objective: The populations of the species as a viable component of the site

During the vantage point surveys and flight surveys, at least one breeding pair of Red-throated Divers utilised the site and environs for foraging. However, the flightline data shows that the birds using the area are not from the Orkney Mainland Moors SPA. In addition, the area around the proposed SDWQ is of relatively low importance to foraging Red-throated Diver. Therefore, breeding success and adult survival will not be affected by the proposed development, and the population will remain as a viable component of the site.

8.1.1.2 Conservation Objective: Distribution of the species within the site

During the vantage point surveys and flight surveys, at least one breeding pair of Red-throated Divers utilised the site and environs for foraging. However, the flightline data shows that the birds using the area are not from the Orkney Mainland Moors SPA. Therefore, the distribution of the species within the site will remain unaffected.

8.1.1.3 Conservation Objective: Distribution and extent of habitats supporting the species

The proposed development would not affect the distribution and extent of habitats supporting Red-throated Diver within the boundary of Orkney Mainland SPA. The vicinity of the Proposed Development is of relatively low importance to foraging Red-throated Diver. Therefore, the distribution and extent of habitats supporting this species will be maintained.

8.1.1.4 Structure, function and supporting processes of habitats supporting the species

The proposed development would not affect the structure, function and supporting processes supporting Red-throated Diver within the boundary of Orkney Mainland Moors SPA. The vicinity of the Proposed Development is of relatively low importance to foraging Red-throated Diver. Therefore, the structure, function and supporting processes supporting this species will be maintained.

8.1.1.5 No significant disturbance of the species

During the vantage point surveys and flight surveys, at least one breeding pair of Red-throated Divers utilised the site and environs for foraging. However, the flightline data shows that the birds using the area are not from the Orkney Mainland Moors SPA. In addition, the area around the proposed SDWQ is of relatively low importance to foraging Red-throated Diver. Therefore, there will be no significant disturbance to this species.

9 APPROPRIATE ASSESSMENT: HOY SPA

The island of Hoy lies to the south of the Orkney mainland and makes up much of the western shoreline of Scapa Flow. The Hoy SPA covers the northern and western two-thirds of the island, which is formed of Old Red Sandstone and contains Orkney's highest hills. Most of the island is moorland, drained by numerous streams, and it supports a diverse mixture of mire, heath and alpine vegetation, as well as Britain's most northerly native woodland. On the west coast, Old Red Sandstone cliffs reach 339m in height and include several notable stacks and crags. These cliffs provide important breeding sites for a number of seabird species such as Puffin, Guillemot, Kittiwake, Great Black-backed Gull and Fulmar. Inland moorland areas also support large numbers of breeding birds, in particular Great Skua and Arctic Skua. Red-throated Diver nest on the numerous small lochans found on the moorland. Peregrine is also known to breed in Hoy. The divers and seabirds feed in the rich waters around Hoy, outside the SPA.

9.1 Conservation Objectives

The conservation objectives for Hoy SPA are as follows:

- To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and
- To ensure for the qualifying species that the following are maintained in the long term:
    - Population of the species as a viable component of the site;
    - Distribution of the species within site;
    - Distribution and extent of habitats supporting the species;
    - Structure, function and supporting processes of habitats supporting the species; and
    - No significant disturbance of the species

9.1.1 Assessment of Potential Impacts on Conservation Objectives

All of the species scoped into this assessment have been recorded within and adjacent to the Proposed Development site. They are as follows:

- Arctic Skua – Small numbers were recorded flying past very infrequently during the summer months, with a peak of five birds in June 2022. The closest known breeding areas are on East Mainland, ~10km distance, supporting only one or a few pairs at each location. The five birds recorded represents 4.2% of the Hoy SPA population (59 pairs)
- Great Skua – Small numbers, with a peak of 4 birds/hr flying past in July 2021. Numbers in 2022 were significantly lower, probably due to the prevalence of avian flu which has decimated the local, and national, populations. The 4 birds/hr represents 0.1% of the Hoy SPA population (1,900 pairs).
- Great Black-backed Gull – a peak of 11 birds were recorded during the summer, and up to 7 birds and hour recorded flying past at its peak. One pair nesting close to the Proposed Development site. It is unlikely that birds recorded were part of the Hoy SPA complex. The peak of 11 birds represents 0.96% of the Hoy SPA population (570 pairs).
- Fulmar – Sizable numbers were recorded flying past during the summer months, with a peak of 56/hr in July 2022. It is considered that the vast majority, if not all, birds recorded were from the breeding colony to the north of the Proposed Development site. The peak of 56 birds/hr represents 0.08% of the Hoy SPA population (35,000 pairs).

- Kittiwake – Small numbers were recorded flying past during the summer months, with a peak of 7/hr in June 2022. A peak count of 83 birds on the water within 2km was also recorded. It is considered that the vast majority, if not all, birds recorded were from the breeding colony to the north of the Proposed Development site. The peak of 83 birds represents 1.4% of the Hoy SPA population (3000 pairs).
- Guillemot – Small numbers were recorded, with a peak of 27 birds within 1km of the Proposed Development and 87 within 2km. Small numbers were also recorded flying past the Proposed Development site, with a peak of 6/hr in June 2022. It is considered that the vast majority, if not all, birds recorded were from the breeding colony to the north of the Proposed Development site. The peak of 87 birds represents 0.3% of the Hoy SPA population (13,400 pairs)
- Puffin – This species was recorded on 7 out of 48 watch days during 2020 and 2022, with a peak of 3 birds. It is possible that these birds are from Hoy SPA but the area in the vicinity of the proposed SDWQ site is not considered to be of importance to this species. The peak of three birds represents 0.04% of the Hoy SPA population (3,500 pairs).

Although unlikely given that the qualifying species of Hoy SPA are also present close to the Proposed Development, it is possible that some of the birds recorded above are part of the Hoy SPA complex.

Of the Conservation Objectives above, the only relevant one with regards to the Proposed Development is *"no significant disturbance to the species".*

Disturbance may occur through dredging activities and airborne noise through terrestrial works during the construction phase. Empirical data specifically linking marine bird response to noise disturbance (and underwater noise in particular), separate from other sources of disturbance (e.g. vessel movement or human presence), is limited and this source of disturbance on marine birds is not yet well understood. Recent research generally suggests that diving seabirds could be more sensitive to underwater noise than previously assumed. For example, hearing thresholds for Great Cormorant were found to be comparable to seals and toothed whales in the frequency band 1 to 4 kHz (Hansen et al., 2017). A number of assessments have, based on the limited information available, and the similar frequency ranges between seabirds and phocid pinniped and cetacean species, applied methodologies developed for pinnipeds or low frequency cetaceans in assessing seabird sensitivity to underwater noise (Teachout, 2012). Underwater noise modelling (Technical Appendix 5.6 of the EIAR) for dredging shows a TTS range of up to 250m and a PTS range of 50m or less for prolonged exposure (8 hours).

The Construction activities have been highlighted in the Airborne Noise Report (Technical Appendix 9.1 of the EIAR) and noise contour maps have been prepared (see Appendix B in relation to Scapa Flow SPA qualifying species) as having noise creation levels of between 70 and 90dB at 10m from source, with noise levels decreasing over distance. With the creation of a 6m bund on the seaward side of the working area, the noise maps demonstrate that noise levels beyond the seaward bund would be between 40-50dB in the immediate vicinity of the bund and dissipate to <35dB at 250m, A study compiled by the Institute of Estuarine and Coastal Studies (IECS), University of Hull (2009) found that construction noise emissions below 50 dB had a low effect and no impact on waterbirds. Disturbance noise above 70 dB resulted in a moderate to high effect to birds resulting in movement within the feeding zone.

Terrestrial blasting associated with the construction phase could cause disturbance via noise associated from terrestrial blasting. However, routine blasting operations regularly generate air overpressure levels at the closest point to blast area of around 120 dB but the intensity of these noise levels experienced at a distance from the blast site are affected by a range of meteorological conditions (wind speed and direction, temperature, cloud cover and humidity) and in general reduce by 6 dB reduction as the distance from the source doubles, and that when sound waves pass a given position, the pressure of the air rises very rapidly then falls more slowly then returns to the ambient value after a number of oscillations, Terrestrial blasting activities will occur on site. This will occur once a week over a 35-week period. The Construction Environmental Management Document (CEMD) (Technical Appendix 10.3)

details mitigation measures to avoid any significant impacts on marine bird species. This includes the presence of an ornithologist to monitor for the presence of SPA qualifying species within 500m of the Proposed Development and record behavioural responses within this zone. If impacts are recorded, then the disturbance zone shall be increased.

Given the low number of Hoy SPA birds present, it is considered that there would be no adverse effect on the integrity of the SPA.

OICHA have provided information on the current typical monthly vessel movements experienced within the eastern area of Scapa Flow. This is summarised below:

- One Flotta fuel tanker;
- 5 Ship to Ship Operations;
- 3 tugs, each with 11 trips in and out of Scapa Pier;
- Escort duties for 1 tug with 12 trips in and out of Scapa Pier;
- 22 pilot boat trips: and
- Occasional workboats to the rigs.

This equates to 124 vessel movements each month in the vicinity of the SDWQ site.

During construction, the number of vessel movements associated with the caisson delivery and installation, and relevant to Hoy SPA qualifying species, equates to 123 vessel movements during the summer months.

During the operational phase, with the retention of tugs and pilot vessel at Scapa Pier, the estimated number of vessels calling at SDWQ in the operational phase is 30 per year (60 vessel movements), comprising 18 large vessels and 12 smaller vessel per year. Each of the 18 large vessels will have one associated pilot boat (2 vessel movements). In addition, 2 or 3 tugs will assist with berthing the large vessels, although these will be operating in very close proximity to these large vessels, so do not constitute a separate disturbance.

In total, the estimated vessel movements per year is 96. The majority of these vessels (approximately 80 %) are expected to occur during the summer months (April – September), so there will be an average of 12.8 vessel movements per month (3.2 per week) in summer and 3.2 per month (0.8 per week) in winter. The majority of the routes used by these vessels will be along established routes (ie, the main shipping channel and the shipping lane west towards Stromness). The only new, or seldom used, section of route to be used for vessels will be the 2.6km (or 1.3 nautical miles – 167Ha) branching east off the established route to the SDWQ site.

The vessel movements to and from the dredging site will pass through an area that is a favoured foraging area for breeding Red-throated Diver, However, the dredging works and disposal will occur between October 2026 and end May 2027. This period is outwith the important foraging period during the Red-throated Diver breeding cycle (June -August). As such, it is considered that there will be no adverse effect on the SPA in relation to this species.

10 APPROPRIATE ASSESSMENT: SANDAY SAC

Sanday is a large, low-lying island situated in the north-east of the Orkney archipelago. The island has a complex coastline characterised by extensive sandy beaches, sheltered inlets and exposed rocky headlands and comprises 10976.97 hectares (ha). The coastal waters of Sanday hold the largest colony of harbour seals at any relatively discrete site in Scotland. Around 1,450 adults haul out on the intertidal reefs to pup, moult and rest. This represents around 17% of the Orkney, 5% of the UK and 2% of the EU populations of the species. During the 1998 breeding survey over 550 pups were observed at the site, accounting for 34% of new born pups in Orkney. Large breeding colonies are important in maintaining overall population size and are significant as sources of emigration to smaller or newly established groups. The current status of harbour seals at Sanday is unfavourable declining, with a significant decline in numbers since the designation. Based on counts from 1997-2019, there has been a decline of 95% at Sanday SAC, indicating it is one of the local areas hit hardest by the harbour seal declines observed in northern and eastern areas of Scotland. In the last count in 2019, the SAC represented 77 individuals (around 5% of the North Coast and Orkney SMU). This is reflected across the whole of Orkney, where populations have declined by ~90%. The Sanday conservation management advice suggests that research is indicating that off-site factors such as predation, competition for prey, prey quality and availability, and toxin exposure from harmful algae are the most likely potential causes of the decline. For harbour seal at Sanday SAC, the reasons for the unfavourable condition appear to lie out with the SAC.

The SAC is located 36km northeast from SDWQ (or 55km via sea).

a. Assessment of Potential Impacts on Conservation Objectives

The conservation objectives are to avoid deterioration of the habitats of qualifying species (harbour seal) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained, and the site makes an appropriate contribution to achieving favourable conservation status for the qualifying interest.

To ensure for the qualifying species that the following are maintained in the long term:

- Population of the species as a viable component of the site;
- Distribution of the species within site;
- Distribution and extent of habitats supporting the species;
- Structure, function and supporting processes of habitats supporting the species; and
- No significant disturbance of the species

There are several potential impact pathways from the Proposed Development and harbour seals. These are; disturbance and displacement from the affected area, temporary or long-term injury as a result of underwater noise, risk of collision with vessels and a reduction in water quality.

The designated site is approx. 55km from the proposed development as the seal swims. It is not anticipated that there will be any disturbance to harbour seals or their habitats within the designated sites themselves. The typical foraging ranges of harbour seals are in the range of 50km, between haul outs and feeding areas, with harbour seals from Sanday SAC noted to forage from 20km to over 100km from the SAC (however the majority of these will be at the shorter end of the range). Telemetry studies also do not indicate strong connectivity between the seal tagged at Sanday SAC and the area of the

Proposed Development[19]. Therefore, although the development site is not considered widely used by harbour seal form the SAC, it is possible individuals could be present within waters surrounding the development site.

Construction activities within the marine environment will be limited to dredging and will result in underwater noise which can cause injuries and result in a Permanent Threshold Shift (PTS) or Temporary Threshold Shift (TTS) in hearing. Prolonged exposure to underwater noise below the PTS and TTS thresholds can reduce individual fitness as it interferes with individuals' ability to communicate with others, feed and navigate in an effect known as masking. In extreme cases, exposure to high levels of underwater noise can result in death.

Underwater noise modelling (Technical Appendix 5.6 of the EIAR) for dredging shows the noise from dredging, has short risk ranges for PTS for harbour and grey seal of <50m regardless of longevity (1-8hrs). There is no acute risk of noise related injury related to the dredging, and seals have time to swim away. TTS risk ranges span from 70 m to 250m from 1 to 8 hours dredging, respectively, however, this is only for animals staying close to the activity for extended periods (prolonged exposure). It is considered that any individuals would move away from the noise source fairly quickly once commenced and so prolonged exposure is considered unlikely. The effects of this will most likely be temporary displacement of individuals from the waters surrounding the site. It is not considered that the habitat is important for breeding, mating or resting and that there are sufficient alternative foraging areas for them to utilise.

General disturbance to seals may occur as a result of the construction works. The most likely disturbance to seals as a result of the noise related activities include both physiological (increased stress and cortisol levels, rapid heartbeat, increased breathing rate, cold water shock (if on land)) and behavioural disturbance (increased vigilance, crash diving, flipper splashing and vocalisation)[20]. Seals are considered to be more easily disturbed when on land. However, due to the distance of the Sanday SAC to the Proposed Development, it is not considered that seals would be disturbed or exhibit behaviours such as tombstoning and stampeding, as the noise levels associated with the works would not extend this far. However, it is expected that harbour seals would be likely to exhibit a behavioural change as a result of the noise, when in water, predominantly fleeing away from the noise source, with vocalisations and splashing occurring. In addition, physiological stress is likely to also occur. This could impact seals energy and fitness levels through disturbing foraging or causing avoidance of feeding areas for periods of time.

Quantitative data analysis was undertaken (Figure 3-6 in EIAR Technical Appendix X.X: Seal Risk Assessment) to try and obtain an indicative numerical value for the number of individual seals that could be subject to general disturbance when at sea, as a result of development activities. A worst-case scenario 5km disturbance buffer around the Proposed Development was utilised and absolute seal densities from Carter et al 2025 data 'at sea' within this buffer were used to calculate that four harbour seals could be in in influence of construction works at one time. It is possible that these seals are associated with the Sanday SAC. However, as the 5km disturbance buffer is a worst-case scenario and therefore actual numbers would likely be lower than calculated, the potential for disturbance is considered very limited. The implementation of Marine Mammal Observers (MMO) and vessel movement protocols should further avoid risks to harbour seals.

Terrestrial blasting associated with the construction phase could cause disturbance to seals on land via noise associated from terrestrial blasting. However, routine blasting operations regularly generate air overpressure levels at the closest point to blast area of around 120 dB but the intensity of these noise

[19] Marine Scotland (2016) Fine-scale harbour seal at-sea usage mapping around Orkney and the North coast of Scotland Scottish Marine and Freshwater Science Vol 7 No 27, available at: https://data.marine.gov.scot/sites/default/files/SMFS%200727_0.pdf

[20] https://britishcanoeingawarding.org.uk/wp-content/files/Seal_Disturbance_Factsheet.pdf

levels experienced at a distance from the blast site are affected by a range of meteorological conditions (wind speed and direction, temperature, cloud cover and humidity) and in general reduce by 6 dB reduction as the distance from the source doubles, and that when sound waves pass a given position, the pressure of the air rises very rapidly then falls more slowly then returns to the ambient value after a number of oscillations, it is unlikely that seals within the Sanday SAC would be impacted. A 6m high bund will be formed at the seaward boundary of the site by retaining the existing land and excavating behind, creating a natural noise screen from terrestrial blasting (and other works) and will only be removed once the site is excavated to the final profile. This would reduce the effects of noise on seals on land. In addition, a range of controls and mitigation measures can and should be implemented when undertaking terrestrial blasting, including screens to further dampen sound, which would also reduce the effects of noise on seals on land or at the water's surface.

Impacts associated with disturbance from increased vessel movements will be temporary during construction, with the increase being relatively small, and it is considered that seals utilising waters around the site will be somewhat habituated to vessel activity associated with Scapa Pier and the oil industry related activities in the wider Scapa Flow. For example, telemetry based studies of the swimming behaviour of seals undertaken by the Sea Mammal Research Unit carried out in the Moray Firth to compare seal and vessel movements with the purpose of identifying potential areas with high spatial overlap found the movements of individual seals and vessels did not show any apparent responses, with seals not appearing to react to close passing vessels (not moving towards nor away from them)[21]. In addition, the majority of the routes used by these vessels will be along established routes (ie, the main shipping channel and the shipping lane west towards Stromness). The only new, or seldom used, section of route to be used for vessels will be the new/novel route of 2.9km (1.6 nautical miles) leading from the main shipping lane into the SDWQ being the only new route section (See Appendix B of this report). If there is some displacement from areas of high activity, it is considered that there is sufficient alternative habitat for foraging and commuting and so there is unlikely to be an effect on the conservation status of populations of Sanday SAC.

Vessel movements of approximately 4 per week over a 33-week period are expected for the dredge disposal for SDWQ. And 126 vessel movements for works associated with caisson delivery, scour protection and caisson installation. This equates to 249 vessel movements in total, which is considered a relatively low number of vessel movements over the length of the period of works. Vessel strikes are generally more associated with larger and less agile marine mammals, and so the numbers of harbour seals affected will likely be minimal. The effects of these impacts will be highly localised and unlikely to affect the conservation status of this species. In addition, although larger vessels have a greater footprint and therefore may be considered more likely to make encounters with seals, the speed at which they travel is considered less detrimental to seals than smaller vessels. The likelihood of vessel collisions is dependent upon vessel speed, animal behaviour and vessel manoeuvrability[22]. Vessels travelling at slower speeds in general can allow time for seals and vessel operators to react to avoid collisions. The Seal Protection Plan (SPP) details protocols to be implemented to reduce collision risk. This includes limits on vessel speed.

During the operational phase, with the retention of tugs and pilot vessel at Scapa Pier, the estimated number of vessels calling at SDWQ in the operational phase is 30 per year (60 vessel movements), comprising 18 large vessels and 12 smaller vessel per year. Each of the 18 large vessels will have one associated pilot boat (2 vessel movements). In addition, 2 or 3 tugs will assist with berthing the large vessels, although these will be operating in very close proximity to these large vessels, so do not constitute a separate disturbance.

[21] https://data.marine.gov.scot/sites/default/files/SMFS%20Vol%207%20No%2024.pdf
[22] SEER U.S. Offshore Wind Synthesis pf Environmental Effects Research: Presence of Vessels: Effects of Vessel Collision on Marine Life (2022): https://tethys.pnnl.gov/sites/default/files/summaries/SEER-Educational-Research-Brief-Effects-of-Vessel-Collision-on-Marine-Life.pdf

In total, the estimated vessel movements per year is 96. The majority of these vessels (approximately 80 %) are expected to occur during the summer months (April – September), so there will be an average of 12.8 vessel movements per month (3.2 per week) in summer and 3.2 per month (0.8 per week) in winter.

The majority of the routes used by these vessels will be along established routes (i.e, the main shipping channel and the shipping lane west towards Stromness). The only new, or seldom used, section of route to be used for vessels will be the 2.6km (or 1.3 nautical miles – 167Ha) branching east off the established route to the SDWQ site. As with the construction phase vessel movements, the effects of the operational phase impacts will be highly localised and unlikely to affect the conservation status of this species. As the majority of the vessel routes will be using existing routes, seals will likely already be habituated to vessels in those areas and/ or avoid the area already. It is likely that in the seldom used new route that there is a greater likelihood of vessel collision with seals, however the vessel numbers in this area are very low as stated above, and over time, seals would likely become habituated to vessels using this route. Again, as above, the likelihood of vessel collisions is dependent upon vessel speed, animal behaviour and vessel manoeuvrability, therefore vessels travelling at slower speeds in general can allow time for seals and vessel operators to react to avoid collisions. The Seal Protection Plan (SPP) details protocols to be implemented to reduce collision risk during operation. This includes limits on vessel speed.

Hydrodynamic modelling summarised in 3.3 above show little impact on the surrounding water column and seabed due to the low energy environment in this part of Scapa Flow. The impacts on prey species for harbour seal are expected to be negligible such that their abundance and general distribution remains unchanged from the baseline.

The dredge budget consists of approximately 17% gravel, 60% sand, and 23% silt and clay, which with the weak tidal currents in the vicinity of the proposed dredge pockets, will result in very localised and short-term plumes from dredging. The magnitude or the sediment discharge and dispersion from dredging works will be low within the dredge area and its immediate vicinity, and negligible out with this area. Thus, the supporting habitats for harbour seal beyond the development footprint will be maintained.

Drainage designs to ensure that there are no untreated surface water discharges directly to surrounding coastal waters and the use of silt booms during land reclamation works will mitigate against pollution spills which could affect the qualifying interests of the SAC and their prey sources. The MMO or ECoW that will be utilised during dredging and blasting works will periodically checks the silt boom. In terms of water pollution from the pier and attendant vessels, adherence to strict Pollution Prevention controls will aim to prevent the release of pollutants to the water environment. With these measures in place, the supporting habitats for harbour seal will be maintained.

The dredge disposal site is < 4.5km from a designated seal haul out site (Selwick) for grey and harbour seals, therefore both seal species associated would likely forage and commute as well as haul out on land in proximity to the disposal site. However, the last counts for the Selwick haul out site recorded only 17 harbour seal, with numbers generally considered low. In addition, the disposal site has been active since 2020, and therefore it is likely that seals within the Selwick haul out site would have become relatively used to vessels travelling to and disposing dredge materials over the past five years it has been open.

Given the above, it is considered that there would be no adverse effect on the integrity of Sanday SAC.

11 APPROPRIATE ASSESSMENT: LOCH OF STENNESS SAC

The Loch of Stenness SAC has been designated as it provides conservation benefits by affording protection to lagoons and their associated species. In summary the conservation benefits of this designation are:

- Loch of Stenness is the largest brackish lagoon in the UK and is of particular importance on account of its large size, stability, reduced salinity regime and northern location.
- Loch of Stenness gives protection to a diverse range of lagoon species because of the varying salinities in the lagoon system.
- Loch of Stenness is potentially the least vulnerable saline lagoons in the UK to the direct impacts climate change, as its size gives it habitat variation and complexity, the fresh water and marine inflows are likely to be maintained. The long, sinuous sea exchange ('The Bush') also confers protection from storm surges (Angus, 2017).

As detailed in the HRA screening (Section 5), an LSE was identified through the potential introduction of Invasive non-native Species (INNS).

Mitigation, in the form of a detailed Biosecurity Plan which will be produced with approval from NatureScot, will avoid any potential spread, or risk of spread, of INNS. The Biosecurity Management Plan will also include provision that all vessels used in construction and operation phase of the development with follow the Orkney Islands Council Ballast Water Policy and Ballast Water Management (BWM) Convention.

12 IN COMBINATION EFFECTS

It is a requirement of Appropriate Assessment that the cumulative or in-combination effects of the proposed development together with other plans or projects are assessed. Cumulative impacts can be defined as a project/plan/programme likely to have a significant effect thereon, either individually or in combination with other plans or projects. In- combination effects associated with the construction phase only were considered. It was agreed in- combination operational impacts would be considered as a separate assessment, as the project details developed [23].

In order to adequately assess in-combination effects, a thorough search of both the MD-Lot planning portal and the Orkney Islands Council planning applications portal. By default, all aquaculture sites within Scapa Flow SPA are included, regardless of time since the application was decided. In addition, aquaculture sites elsewhere in Orkney that could cause impacts to the qualifying features of Sanday SAC are also included. Given that harbour seals can travel up to 50km from haul out and pupping sites, a 50km radius was used for determining projects to screen for in-combination assessment. The MD-Lot planning portal does not have a map search feature to enable a quick search for planning applications within this distance, so best judgement based on site names and project descriptions was made.

For other development sites, a search of both planning portals for developments since 2022 was undertaken and a determination made whether to screen them in or out for assessment. Projects were screened out if there was no information on project specifics such as impacts or adverse effects on SPA/SAC qualifying features or if projects were deemed to have been completed (ie marine licence expiry).

Table 12.1 below details the sites taken forward for in-combination effects and provides information and predicted impacts on designated sites.

In isolation, with mitigation, the Proposed Development will not have an adverse impact on the integrity of the designated sites assessed. From a review of the other projects assessed as part of this process, no significant impacts are predicted. Therefore, it is considered highly unlikely that the Proposed Development would contribute cumulatively to adverse effects on the integrity of these designated sites. However due to the lack of details in relation to vessel movements from other projects, cumulative impacts on seals from Sanday SAC, cannot be ruled out (Quanterness Fish Farm).

[23] Agreed during design team meeting with NatureScot 19th December 2024.

Table 12.1:Summary table of predicted impacts on designated sites

Project (Distance to Proposed Development)	Local Authority and Ref No.	Applicant	Status / Decision	Project Details	Discussion and Conclusion
Hatston Logistics Base	Orkney Islands Council 23/256/NATEIA Supplementary Environmental Information to be re-submitted	Orkney Islands Council Harbour Authority	Pending	Construct a 300-metre pier extension, reclaim land to create a 7.5 hectare laydown area including rock armour, construct a ship lift, linkspan, fuel supply infrastructure, water storage tanks, roads and vehicle parking and associated infrastructure	Details on quantitative assessments on SPA and SAC features are not available at this time. However, with the low numbers of potentially disturbed SPA and SAC features from the SDWQ development it is predicted that there will be no adverse effect on site integrity with regards to Scapa Flow SPA, North Orkney SPA and Sanday SAC. **As such, there will be no in-combination effects.**
Westbister Fish Farm	Orkney Islands Council 15/409/MAR		Consented	Create a salmon farming site, comprising 16 x 100m circumference cages, 2 x 8 in a 60m grid and include a feed barge at Westerbister, Scapa Flow	Consented in 2014 before Scapa Flow SPA designation. HRA undertaken with respect to Sanday SAC. Concluded no adverse effect on site integrity through inclusion of Predator Inclusion Plan. Approved by NatureScot. Vessel movements were not considered a factor with regards to this project. No cumulative effects on seals predicted from SDWQ with respect to Westbister. No ornithological data available in 2014 HRA as SPA not designated. Vessel movements for this site fall under existing baseline which fall under the assessment for the Proposed SDWQ development. **As such, there will be no in-combination effects.**
Veantrow Bay, Shapinsay Orkney Fish Farm	Orkney Islands Council 24/423/MARMAJ	Scottish Sea Farms	Awaiting Decision	Create salmon farming site comprising of 12 x 140 metre circumference circular cages in a 100 metre mooring grid, with pole mounted top nets,	NatureScot request further information on vessel movements from Shapinsay to Burray boatyard.

Project (Distance to Proposed Development)	Local Authority and Ref No.	Applicant	Status / Decision	Project Details	Discussion and Conclusion
				underwater lighting, and 250 tonne capacity automated feed barge (replacement of existing equipment)	For SDWQ, only 8 vessel movements will occur within the southern approaches, the same area the Shapinsay works will take. This, coupled with the small increase in operational vessel movements within the eastern half of Scapa Flow (2.5% increase), will not give rise to any cumulative effects. **As such, there will be no in-combination effects.**
Bring Head Fish Farm	Orkney Islands Council 21/411/MAR	Scottish Sea Farms	Consented	Create salmon farming site comprising of 12 x 120 metre circumference circular cages arranged in a 2 x 6 formation in a 70 metre mooring grid, with pole mounted top nets, underwater lighting, and 420 tonne capacity semi-automated feed barge (replacement of existing equipment)	Consented in 2021 when the SPA was still a pSPA. HRA undertaken concluded no adverse effects on site integrity through the implementation of a vessel management plan. Approved by NatureScot. Current vessel movements for this site fall under existing baseline vessel movements which fall under the assessment for the Proposed SDWQ development. **As such, there will be no in-combination effects.**
Toyness Fish Farm	Orkney Islands Council 21/410/MAR	Scottish Sea Farms	Consented	Create salmon farming site comprising of 12 x 120 metre circumference circular cages arranged in a 2 x 6 formation in an 80 metre mooring grid, with pole mounted top nets, underwater lighting, and 420 tonne capacity semi-automated feed barge (replacement of existing equipment)	Consented in 2021 when the SPA was still a pSPA. HRA undertaken concluded no adverse effects on site integrity Approved by NatureScot. Current vessel movements for this site fall under existing baseline vessel movements which fall under the assessment for the Proposed SDWQ development **As such, there will be no in-combination effects.**

Project (Distance to Proposed Development)	Local Authority and Ref No.	Applicant	Status / Decision	Project Details	Discussion and Conclusion
South Cava Fish Farm	Orkney Islands Council 17/134/MAR	Cooke Aquaculture	Consented	Create a salmon farming site, comprising 16 x 120m circumference cages, 2 x 8 in a 70m grid and a 200t feed barge	Consented in 2018 when SPA was still a pSPA. Concluded no adverse effect on site integrity with inclusion of vessel management plan, particularly no vessel movements on the western side of the island during July and August (sensitive period for foraging Red-throated Diver). Vessel movements for this site fall under existing baseline vessel movements. For SDWQ, no construction vessel movements will impact on favoured Red-throated Diver foraging sites during sensitive time periods (July-August). **As such, there will be no in-combination effects.**
Chalmers Hope Fish Farm	Orkney Islands Council 20/231/MAR	Cooke Aquaculture	Consented	Create salmon farming site comprising of 12 x 120 metre circumference circular cages arranged in a 2 x 6 formation with a 70 metre grid, with a 300 tonne capacity semi-automated feed barge (replacement of existing equipment)	Concluded no adverse effects on integrity of Hoy SPA. Approved by NatureScot. SDWQ also concludes no adverse effects on integrity of Hoy SPA. Current vessel movements for this site fall under existing baseline vessel movements. which fall under the assessment for the Proposed SDWQ development **As such, there will be no in-combination effects.**
Lyrawa Bay Fish Farm	Orkney Islands Council 18/057/MAR	Cooke Aquaculture	Consented	Increase consented cage size from 8 x 70 meter to 8 x 90 meter circumference cages	Concluded no adverse effects on integrity of Hoy SPA, through avoidance of vessel movements during sensitive foraging period for Red-throated Diver (July and August). SDWQ also concludes no adverse effects on integrity of Hoy SPA. At the time, Scapa Flow SPA was still a pSPA. Concluded no adverse effect on site integrity by NatureScot. Vessel movements for this site fall under existing

Project (Distance to Proposed Development)	Local Authority and Ref No.	Applicant	Status / Decision	Project Details	Discussion and Conclusion
					baseline vessel movements. which fall under the assessment for the Proposed SDWQ development **As such, there will be no in-combination effects.**
Pegal Bay Fish Farm	Orkney Islands Council 18/058/MAR	Cooke Aquaculture	Consented	Increase consented cage size from 8 x 70m to 8 x 90m circumference cages	Concluded no adverse effects on integrity of Hoy SPA, through avoidance of vessel movements during sensitive foraging period for Red-throated Diver (July and August). SDWQ also concludes no adverse effects on integrity of Hoy SPA. At the time, Scapa Flow SPA was still a pSPA. Concluded no adverse effect on site integrity by NatureScot. Vessel movements for this site fall under existing baseline vessel movements. which fall under the assessment for the Proposed SDWQ development **As such, there will be no in-combination effects.**
Hunda North Fish Farm	Orkney Islands Council 17/198/MAR	Scottish Sea Farms	Refused April 2017, Consented on appeal Jan 2018	Create a salmon farming site comprising 12 x 100m circumference cages in a 60m grid with a 200 tonne feed barge	At the time, Scapa Flow SPA was still a pSPA. Concluded no adverse effect on site integrity by NatureScot subject to adherence to vessel management plan. Considered no adverse effect on distribution of Slavonian Grebe in isolation but could give rise to cumulative effect. Proposed SDWQ projects may result in displacement of 5 birds but considered (and agreed by NatureScot) that the wider Scapa Flow SPA has the capacity to accommodate these birds. **As such, there will be no in-combination effects.**

Project (Distance to Proposed Development)	Local Authority and Ref No.	Applicant	Status / Decision	Project Details	Discussion and Conclusion
Noust Geo Fish Farm	Orkney Islands Council 14/202/MAR	Scottish Sea Farms	Consented	Install 12 x 100m circumference cages with feed barge (to replace existing fish farm cages at Noust Geo (Backaland) and at Kirk Taing)	NatureScot concluded it was unlikely that the proposals will have a significant effect on the seal qualifying interests Sanday SACs, either directly or indirectly. An appropriate assessment is therefore not required. Vessel movements for this site fall under existing baseline vessel movements. which fall under the assessment for the Proposed SDWQ development. **As such, there will be no in-combination effects**
Wyre Fish Farm, Gairsay Sound	Orkney Islands Council 23/183/MARPN	Scottish Sea Farms	Unknown	Replace 12 x 100metre circumference cages with 9 x 120 metre cages, install pole-supported top nets and reposition a feed barge	NatureScot concluded no adverse effect on Sanday SAC. The proposed Predator Exclusion Plan includes the appropriate measures to prevent and reduce any risk of entanglement to seals as a result of predation. Measures include appropriate mesh size and strength for the site, and also sufficient tensioning with the use of net weights. Suitable monitoring of the site has been proposed to ensure equipment is maintained and seal interactions are monitored and reported. There was no information on vessel movements associated with these works, but given that the works are for replacement of cages, required vessel movements will be extremely low. This, coupled with the small increase in operational vessel movements within the eastern half of Scapa Flow (2.5% increase), will not give rise to any cumulative effects.

Project (Distance to Proposed Development)	Local Authority and Ref No.	Applicant	Status / Decision	Project Details	Discussion and Conclusion
					As such, there will be no in-combination effects
Quanterness Fish Farm	Orkney Islands Council 24/216/MAR		Awaiting Decision	Create salmon farming site comprising of 14 x 120 metre circumference circular cages, with pole mounted top nets, underwater lighting, and 200 tonne capacity feed barge (replacement of existing equipment	No HRA available on planning portal at time of search (May 2025). NatureScot advice was for further information with regards to impacts to North Orkney SPA qualifying features to determine any adverse effect. No mention of connectivity between North Orkney SPA and Scapa Flow SPA NatureScot concluded no adverse effect on the integrity of Sanday SAC. There was no information on vessel movements associated with these works, therefore it is not possible to undertake an assessment of in-combination effects during the operational phase. **As such, although unlikely, it cannot be concluded if there are any in-combination effects.**
Warebeth And Seabed Offshore, Stromness, Orkney	Orkney Islands Council 25/117/WL	RJ MacLeod Ltd	Awaiting Decision	Install horizontal directional drills	NatureScot advised that it is unlikely that the proposal will have a significant effect on any qualifying interests of Scapa Flow SPA either directly or indirectly. An appropriate assessment is therefore not required. Given that an HRA is not required due to no effects, coupled with the predicted no significant impacts from SDWQ, it is considered that in-combination effects are highly unlikely. **As such, there will be no in-combination effects**

13 MITIGATION

The following mitigation will be employed to avoid and minimise any impacts occurring both during the construction and operational phases of the proposed development:

- Ornithological monitoring to be undertaken during the construction phase and during years 1, 2,3, 5 and 10 of operation to assess whether the populations of SPA species has been maintained. This will focus on the area around the proposed development (where the new/novel vessel route is situated and around Scapa Pier and surrounding areas where there will be a significant reduction in port services vessels). The monitoring methods and reporting outcomes will be discussed and agreed with NatureScot, along with any required mitigation measures depending on survey results;
- For the first three years of SDWQ operations, during the flightless moult period (mid-September to end-December), an ornithologist will conduct structured observations of Black-throated Divers associated with selected crane activity. The purpose of these observations is to improve the evidence base on black-throated diver responses to mobile crane operations. The Ornithological Observation Protocol will be included in the Operational Environmental Management Plan. This will include:

    - Timing: Observations will take place two hours prior to, during, and two hours following crane operations (subject to adequate visibility).
    - Data collection: Counts of individuals present and systematic recording of any behavioural responses indicative of disturbance (e.g. displacement, diving, directional swimming, or other changes in activity).
    - Reporting: Data will be collated into a post-season summary at the end of each flightless moult period. Reports will be submitted to the Orkney Marine Environment Protection Forum.

- Production of a Vessel Management Plan, with input from NatureScot, for the Construction phase which will detail vessel routes etc to minimise, and where possible, avoid any disturbance impacts;
- Production of A Biosecurity Management Plan;
- Adherence to measures set out in the Construction Environmental Management Document (CEMD), Biodiversity Action Plan (BAP) and Biodiversity Net Gain (BNG) document.
- Deployment of an ECoW and marine mammal observer to monitor for the presence of qualifying species of the Scapa Flow SPA, and cetaceans and pinnipeds (in particular harbour seal) in the vicinity of the Proposed Development during terrestrial blasting and dredging works;
- Production and adherence to detailed Seal Protection Plan (SPP);
- Production and adherence to a detailed Pollution Prevention Plan;
- A silt boom to contain fine sediments will be used whilst reclamation work activities are undertaken.
- Controls and mitigation measures can and should be implemented when undertaking terrestrial blasting, including screens and bunding to dampen sound would also reduce the effects of noise on birds in the marine environment and seals on land.