Fair Isle Harbour Improvement Works

Environmental Statement
Volume 1: Main Report

On behalf of **Shetland Isle Council (SIC)**

Shetland Islands Council

Project Ref: 11168 | Rev: Version 1.0 | Date: April 2023

Registered Office: Buckingham Court Kingsmead Business Park, London Road, High Wycombe, Buckinghamshire, HP11 1JU
Office Address: 10 Queen Square, Bristol, BS1 4NT
T: +44 (0)117 332 7840 E: bristol@stantec.com

Document Control Sheet

Project Name: **Fair Isle Harbour Improvement Works**

Project Ref: **332511168-**

Report Title: **Environmental Statement – Volume 1: Main Report**

Doc Ref: **332511168/EIAR FIE /Rev 0**

Date: **April 2023-**

	Name	Position	Signature	Date
Prepared by:	Nicole Beckett	Senior Environmental Planner	[Redacted]	February 2023
Reviewed by:	Janet Burns	Senior Associate Environmental Consultant	[Redacted]	30 May 2023
Approved by:	Kevin Herman	Senior Associate	[Redacted]	30 May 2023
- **For and on behalf of Stantec UK Limited**				

Revision	Date	Description	Prepared	Reviewed	Approved
A	08/08/2023	Inclusion of additional chapter on Risk of Accidents and Disasters and Use of North Haven.	JB	SS	JB

Contents

Tables

Figures

Appendices

1 Introduction

1.1 Project Background

1.1.1 An Environmental Impact Assessment (EIA) has been prepared by Stantec UK Ltd (Stantec) on behalf of Shetland Islands Council ('the Applicant') in relation to a full planning application and associated marine consents (MS-LOT) for the improvements to the existing ferry port (hereafter referred to as 'the Proposed Development') at North Haven, Fair Isle to facilitate a new ferry (hereafter referred to as 'the Site', which is defined on the Site Location Plan included in **Appendix A1**). The Site is located within the administrative boundary of Shetland Islands Council (SIC).

1.1.2 Fair Isle is the UK's most remote community and is facing serious challenges in terms of economic and social sustainability. The island has been owned by the National Trust for Scotland since 1954. Fair Isle is renowned for its wildlife and cultural heritage. The current ferry is estimated to reach the end of its serviceable life by 2026 and must be replaced as a matter of growing urgency. The ferry link is the single most important feature in supporting a sustainable future for the island. This redevelopment will provide improved transport links between Fair Isle and Shetland mainland by increasing the resilience of both the vessel and the ferry terminal infrastructure at both ends of the ferry route. A separate planning application (2023/066/PPF) / Marine License application (00010318) has been prepared for the Grutness Pier Improvement Works (and was submitted 22nd March 2023.

1.1.3 The Proposed Development description is to replace the existing vessel, which will also result in the berthing site at Fair Isle to be upgraded to facilitate this new ferry and an enhancement of the existing ferry port. The details of the works required are described below:

- A new quay structure to be formed between the northern end of the existing quay and the existing breakwater;
- A new linkspan to facilitate the new roll on – roll off (Ro-Ro[1]) vessel and associated control hut;
- The existing breakwater is to be increased in size and height to provide greater shelter to the new quay structure and linkspan berth;
- Dredging to provide a sufficient water depth for new vessel around the proposed pier extension and linkspan;
- Repairs and re-fendering of the existing finger pier aligning structure;
- Substantial enlargement of existing noust, with room for access up one side of the parked vessel, and a steel access steps;
- Replacement of the existing cradle, slipway and winch to accommodate the increased size of the new vessel.
- New lighting will extend along the rear of the extended quay to the north of the existing quay.

1.1.4 This Environmental Impact Assessment Report (EIAR) has been prepared with due regard to the EIA Regulations (Scotland) and Marine EIA Regulations (Scotland) and presents the findings of the EIA and identifies the likely significant environmental effects of the Proposed Development during construction and operation.

[1] Roll-on, Roll-off ferry service, by which is meant a ship that is designed to carry wheeled cargo, such as cars, that are driven on and off the boat on their own wheels.

1.2 Terms and Definitions

1.2.1 For ease of reference, the following terms have been used throughout the EIAR (unless the context dictates otherwise):

- '**the Applicant'** – Shetland Islands Council (SIC);
- '**the Proposed Development'** – the development for which planning permission is sought, as described in **Chapter 3**;
- '**the Site'** – the area within the red line planning Application Boundary, as shown in **Appendix A.1**;
- '**the Local Planning Authority (LPA)**' – the determining body of the Application, Shetland Island Council;
- **'MS-LOT'** – Marine Scotland – Licensing Operations Team;
- **'Embedded Mitigation'** – measures which are designed to be an inherent part of the Proposed Development;
- **'Further Mitigation'** – measures which require further activity to be achieved, and do not form an inherent part of the Proposed Development;
- **'Impact'** – in relation to the outcome of the project (e.g., the removal of habitat); and
- **'Effect'** – the consequent implication of an impact in environmental terms (e.g., the loss of a potential breeding or foraging habitat for a protected species).

1.3 The Environmental Impact Assessment Report and Other Documents

1.3.1 The process of EIA is governed by the Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017 as amended ("the EIA Regulation (Scotland)") for works on land and to the mean low water springs mark, and The Marine Works (Environmental Impact Assessment) (Scotland) Regulations 2017 (as amended), for the Marine Scotland Act 2010 (Marine Licenses) to be consented by Marine Scotland for the deposit or removal of a substance or object below the mean high water springs mark. The EIA will consider the likely significant environmental effects resulting from the Proposed Development, as well as the cumulative effects from the wider area and other approved developments in the local area. This approach is intended to provide comprehensive and robust environmental information on the likely significant effects of the Proposed Development.

1.3.2 Under the EIA Regulations (Scotland), EIA is a mandatory requirement for those applications listed under Schedule 1. Applications listed in the first column of Schedule 2 may need to be screened by the Local Planning Authority (LPA) to determine whether significant environmental effects are likely and hence whether an EIA is required.

1.3.3 The Proposed Development falls within:

- Schedule 2 Part 10 of the EIA Regulations (Scotland), (g) Construction of harbours and port installations including fishing harbours (unless included in Schedule 1).
- Schedule 2 Part 10 of The Marine Works (Environmental Impact Assessment) (Scotland) Regulations 2017 (as amended), (g) Construction of harbours and port installations including fishing harbours (unless included in Schedule 1).

1.3.4 Given the location, scale and nature of the Proposed Development, notwithstanding the selection criteria within Schedule 3 of the EIA Regulations (Scotland), it was considered that the Proposed Development may have the potential to give rise to significant effects on the environment and therefore, it was screened by both the SIC and MS-LOT to determine

whether the Proposed Development would be classed as EIA development and require an EIAR to be submitted with the planning application.

1.3.5 The Scoping Opinions of both the SIC and MS-LOT are presented in **Appendix A.2.**

1.3.6 Running concurrently with the design process, the EIA has sought to identify any likely significant environmental effects, to identify appropriate design and construction measures and apply good practice, both to mitigate any significant adverse environmental effects and to maximise the environmental opportunities which might arise as a consequence of the construction and operation of the Proposed Development. The EIA has also sought to determine the residual beneficial and adverse environmental effects remaining after mitigation measures have been incorporated.

1.3.7 This EIAR should be read in conjunction with the following detailed planning drawings which are appended to the ES (**Appendix A.1**):

- Location Plan;
- Site Plan;
- Existing Site Plan;
- Proposed Development Plan; and
- Plan to show Statutory Designations.

1.3.8 The other principal documents submitted as part of the planning application are:

- Application Form;
- Planning Statement;
- Design and Access Statement (DAS);
- Pre Application Consultation Report (PAC);
- Habitats Regulations Assessment (HRA); and
- Historic Environment Desk Based Assessment (HEDBA).

1.4 Report Structure

1.4.1 The ES comprises the following separate volumes:

- **Volume 1:** Main Report and Figures (this document);
  - **Chapter 2**: Description of the Site and Surrounding Area
  - **Chapter 3**: Summary of the Proposed Development
  - **Chapter 4**: Summary of Construction and Site Management
  - **Chapter 5**: Methodology adopted to undertake the EIA
  - **Chapter 6**: Summary of the Planning and Policy Context
  - **Chapter 7-13**: Technical Chapters which document the Assessments of Likely Significant Effects of the Proposed Development
  - **Chapter 14**: Other Considerations
  - **Chapter 15**: Assessment of Impact Interactions

- **Chapter 16**: Schedule of Mitigation and Monitoring

- **Volume 2:** EIAR Appendices; and
- **Volume 3:** Non-Technical Summary.

1.4.2 This approach is intended to provide comprehensive and robust environmental information on the likely significant effects of the Proposed Development.

1.5 Project Team

1.5.1 This EIAR was prepared by Stantec, with input from ABP Marine Environmental Research Ltd in regard to marine environment detailed in **Chapter 12** and **13** of this ES.

1.5.2 Regulation 14 of the EIA Regulations (Scotland) requires that: "*(5) In order to ensure the completeness and quality of the EIA report—*

(a)the developer must ensure that the EIA report is prepared by competent experts; and

(b)the EIA report must be accompanied by a statement from the developer outlining the relevant expertise or qualifications of such experts."

1.5.3 In accordance with Regulation 14 of the EIA Regulations (Scotland), a statement outlining the relevant expertise and qualifications of competent experts appointed to prepare the EIAR is provided in **Appendix A.3.**

2 Site Description

2.1 Introduction

2.1.1 This chapter outlines the key environmental characteristics of the Site of the Proposed Development and the surrounding area. This chapter is supported by the Site Location Plan, presented in **Appendix A.1.**

2.2 Site Location and Description

2.2.1 The Fair Isle ferry berth is located within the harbour at North Haven[2], on the north-east of the island. The nearest post code is ZE2 9JU and the central grid reference is HZ 22498 72527.

2.2.2 The existing pier is approximately 40m in length, to allow the ferry to moor alongside. The pier is connected to hardstanding and a berth to the north which is approximately 60m in length.

2.2.3 The harbour is sheltered from the east and west by high rocky cliffs, and notionally sheltered from the south by an isthmus (narrow strip of land between North Haven and Bu Ness), and to the north by a rock armoured breakwater approximately 80m in length and 25m in width, made up of Norwegian rock. However, northerly conditions cause significant wave motion at the berth and therefore a noust (refer to **Insert 1** below) is used to house the vessel overnight.

2.2.4 The noust consists of a cutting in the rock cliff, at the top of the existing slipway to provide shelter to the ferry when it is slipped. A winch is used to raise and the lower the ferry (on its cradle) up and down the slipway. The cradle runs on two slipway mounted rails that extend alongside the pier and is connected to the winch which then pulls the cradle and ferry into the noust. Currently the noust is approximately 30m x 10m.

[2] Grid reference 59 32' N 01 36' W and Admiralty Chart 3299

Figure 2-1 Existing Noust at Fair Isle

2.2.5 There are seven buildings within 250m of the Site which are all uninhabited and used for storage. Existing harbour facilities comprise of the following:

- 60m long berthage with 3.60m water depth (at Mean Low Water Springs MLWS);
- 14m wide general cargo apron and storage building behind;
- single track access road with limited space for parking;
- finger pier aligning structure, slipway (1:10 nominal slope), cradle, noust and winch-house; and
- fresh water and waste disposal at facilities behind the pier.

2.3 Existing Ferry and Passenger Accessibility to the Island

2.3.1 The Site is within the SIC administrative area and is connected to mainland Shetland by two lifeline transport links: air service by means of an eight seat Britten-Norman BN-2 Islander aircraft; and the existing ferry service operated by the MV Good Shepherd IV which provides the critically important supply chain and freight link as well as capacity for 12 passengers per sailing.

2.3.2 The existing ferry, the MV Good Shepherd IV is:

- over 35-years old, having entered service on the Fair Isle route in 1986;
- an 18-metre vessel broadly similar to a traditional fishing vessel;
- limited to 12 passengers; and
- delivers cargo using a vessel mounted crane; it can carry cargo in a below deck hold and on the weather deck.

2.3.3 Whilst the primary mode of travel to / from Fair Isle for both visitors and residents is the air service via Fair Isle Airport, the ferry predominantly fulfils the supply-chain needs of the island. Nonetheless, the ferry is used by passengers when: (i) the air service is fully booked

or disrupted; or (ii) there is a requirement to take equipment / goods which cannot be carried on the air service.

2.3.4 Between 2010 and 2018 1,703 sailings were completed, with the median number of yearly sailings being 184.[3]

2.4 Environmental Context and Constraints

2.4.1 A summary of the environmental setting of the Site is set out in this section. Further information is presented in each of the topic chapters of this EIAR (**Chapters 7-14**), as well as within the accompanying technical appendices in **Volume 2** of the ES.

2.4.2 The main environmental sensitivities associated with the Proposed Development relate to disturbance of ecologically sensitive habitats and important species, impacts on landscape character and visual amenity and impacts on archaeological features which are in close proximity to the Site.

2.4.3 The habitats present within the Site comprise of vegetated sea cliffs, dry heath, marine and arable land. There is limited vegetation within the Site, there are no trees present and the majority of the ground condition are made of hardstanding of the existing pier.

2.4.4 The Site is however located within environmental designations including Special Protection Areas (SPA) and a Special Area of Conservation (SAC) and Site of Special Scientific Interest (SSSI).

2.4.5 There is one scheduled monument within the Site boundary which is the North Haven Crane (SM6589). The monument consists of a small hand-operated crane of iron construction. The monument is considered of national importance as a rare survivor of a once-ubiquitous type of pre-mechanisation harbour furniture. However, during the surveys conducted to accompany the Scoping Report (2022), it was identified that the crane had been removed from the pier, and subsequent enquiries have confirmed that this occurred in the last 2-3 years on Health and Safety grounds, as it was collapsing and a potential risk to shipping in the harbour. The whereabouts of the crane was not confirmed, although it is believed the crane was scrapped. This event has now been reported to Historic Environment Scotland by SIC, and at the time of writing resolution of this issue has not been confirmed. Despite the removal of the crane, the Scheduling details that the crane itself '*and the surface of the pier into which it is set*' forms part of the Scheduling, which includes a notional circle of 5m from the centre of the Scheduled Monument. Therefore, despite the absence of the crane, the Scheduled Monument remains a significant constraint.

2.4.6 The Site is not located within an Air Quality Management Area (AQMA).

2.5 The Surrounding Area

2.5.1 Fair Isle is the most geographically remote inhabited island in the United Kingdom. It lies 24 miles from the Shetland Mainland and 27 miles from North Ronaldsay, the most northerly of the Orkney islands. It is administratively part of Shetland. The island has been owned by the National Trust for Scotland since 1954. Fair Isle is renowned for its wildlife and cultural heritage.

2.5.2 There is a permanent population of around 60 people, who mostly live at the south end of the island. There are no dwellings present within the Site, the nearest is located approximately 1.5km southwest.

2.5.3 Although there are no Public Rights of Way (PRoW) within the Site or Surrounding Area. However, as the Site is within Scotland, it comes under the Land Reform (Scotland) Act

[3] Shetland Inter-Island Transport Study – Fair Isle Outline Business Case 2018

2003 which is an Act of the Scottish Parliament to establish statutory public rights of access to land for recreational and other purposes.

2.5.4 The Fair Isle Airport is located approximately 1.15 km west of the Site. Fair Isle Airport serves the island with flights to Tingwall Airport near Lerwick.

2.5.5 There are limited roads surrounding the Site, only the road leading to the Fair Isle Airport to the west and also one connecting the pier to the Fair Isle North Lighthouse.

2.5.6 There is one Category C Listed Building approximately 150m west of the Site which is a Shetland böd, a building used to house fishermen and their gear during the fishing season but is currently uninhabited.

2.5.7 Approximately 330m to the southwest of the Site is the Fair Isle Bird Observatory (FIBO). Fair Isle Bird Observatory is run by an independent charity, FIBO Trust (Registered Charity No. SCO 11160), which owns the building and a small area of land. The FIBO burnt down in March 2019 however prior to this, it was the main provider of accommodation on the island and also a significant source of income and employment. In October 2021 the FIBO charity won a bid for investment to re-build the observatory. The newly built facility is due for completion and re-opening in Summer 2023.

2.5.8 In 2016, the seas around Fair Isle were designated as a Marine Protected Area (MPA). As of 2019 it is the only MPA in Scotland to be designated specifically as a "Demonstration and Research" MPA. The aims of this MPA designation are defined as, to demonstrate and research the use of an ecosystem approach, which includes the following:

a) The environmental monitoring of seabirds and of other mobile marine species;

b) The environmental monitoring of the factors which influence the populations of seabirds and of other mobile species;

c) The development and implementation of a local sustainable shellfish fishery;

d) The development of a research programme into local fisheries which includes research on species composition, size, distribution and temporal and spatial changes in fish stocks; and

e) Based upon the research undertaken under sub-paragraph (d), the development of a sustainable-use management programme for local fisheries.

3 The Proposed Development

3.1 Introduction

3.1.1 This chapter sets out the description of the Proposed Development for which planning permission is sought, which is as follows:

3.1.2 It provides an overview of the design strategy and the key characteristics of the Proposed Development. The Proposed Development description should be read in conjunction with the Plans which are provided at **Appendix A.1.**

3.2 Description of the Development

3.2.1 SIC is progressing the Fair Isle Ferry Replacement Project to replace the existing vessel, which is approaching the end of its life and does not meet modern standards. The berthing site at Fair Isle will be upgraded to facilitate this new ferry.

3.2.2 SIC intends to submit a full planning application and associated marine license applications seeking approval to enhance the existing ferry port at Fair Isle by:

- A new quay structure to be formed between the northern end of the existing quay and the existing breakwater, and returning along the length of the breakwater;
- A new linkspan[4] to facilitate the new roll on – roll off (Ro-Ro) vessel, and associated control hut;
- The existing breakwater is to be increased in size and height to provide greater shelter to the new quay structure and linkspan berth;
- Dredging to provide a sufficient water depth for new vessel around the proposed quay extension and linkspan;
- Repairs and re-fendering of the existing finger pier aligning structure to accommodate the new vessel;
- Substantial enlargement of existing noust, with room for access up one side of the parked vessel, and a steel access steps;
- Construction of a new winch house building to accommodate a new winch and standby winch;
- Replacement of the existing cradle and slipway to accommodate the increased size of the new vessel; and
- New lighting will extend along the rear of the extended quay to the north of the existing quay.

3.2.3 Key construction activities (not in chronological order) will include the following:

- Noust expansion, existing winch house demolition;
- New slipway construction;
- New winch house construction, winch installation and commissioning;
- Pier structure repaired;
- Breakwater extended and height increased;
- Solid quay constructed to form new linkspan berth; and

[4] a A linkspan or link-span is a type of drawbridge used mainly in the operation of moving vehicles on and off a roll-on/roll-off (RO-RO) vessel or ferry, particularly to allow for tidal changes in water level.

- Linkspan installed and commissioned.

3.3 Embedded Mitigation

3.3.1 In accordance with Schedule 4 (7) of the EIA Regulations (Scotland) and guidance from the Institute for Environmental Management and Assessment (IEMA), assessments within each topic section have taken account of embedded mitigation which is inherent in the design of the Proposed Development. Each topic chapter (Chapters 7-14) will include details of embedded mitigation relevant to that topic.

3.3.2 The embedded mitigation which forms part of the Proposed Development includes:

- A first iteration of the Environmental Management Plan (fiEMP) will be prepared prior to the commencement of construction works at the Site. The fiEMP sets out the principles, controls and management measures which would be implemented during construction to manage potential significant impacts (**Appendix A.4**). Measures that will reduce GHG emissions during construction include, for example, no unnecessary idling of engines, maintenance of plant equipment to check they are operating optimally and efficient use of materials to reduce waste.
- The design minimises the volume of sediment to be dredged and potential changes to hydrodynamics, only dredging the necessary volume to prepare the seabed for construction and to accommodate the proposed vessel draft.
- The design minimising direct loss of SAC habitats to facilitate expansion of the Noust and breakwater.
- The design of breakwater minimising direct loss of fulmar nesting habitat (further details in **Chapter 13**).
- Following expansion, the sides of the Noust will be left rough to accelerate recolonisation by local vegetation.
- The phasing of the project will be designed to ensure that the ferry can operate to and from the island (even if Lerwick is the harbour temporarily to be used if Grutness cannot be used, or the crew is based off island if Fair Isle is unable to house the boat overnight during construction of the noust, slipway or winch house).
- Inclusion of Passive Infrared (PIR) sensors on lighting to reduce visibility of these features in the night time environment.
- The Proposed Development will be built to the following design standards: Eurocodes + UK national annexes, and BS 6349 Maritime works. These standards require the design to take account of sea level rises and changes in storm intensity due to climate change. An allowance for these effects is included in the wave model.
- The size and direction of waves is taken from the wave model which includes sea level rise and climate change effects. All elements of the Proposed Development will be appropriately sized for the wave climate predicted by this model, according to current standards and best practice guidelines. Breakwater geometry and composition will be according to BS 6349-7 and CIRIA C683 The Rock Manual, Chapter 6.
- Any land stability issues will be addressed through a desk based Ground Conditions Assessment (previously called a Phase 1) and a detailed ground investigation (GI). (**Appendix A6**) The GI will be controlled via a range of mitigation measures including SEPA's Guidance for Pollution Prevention (GPP's) and Pollution Prevention Guidance (PPGs) (if applicable), and a ballast water management plan. The GI will be cognisant of NatureScot's guidance for the prevention of the introduction of Invasive Non Native Species (INNS). Based on the absence of SOPC, sensitive human health receptors, and with the implementation of the primary mitigation to protect the water environment, it is considered that there will be no potentially significant effects from ground conditions,

including instability, and contamination. Ground conditions and land contamination are not included within the scope of this EIA.

- The cement combination comprises Fly Ash which provides greater cold weather resistance. Dredged material is to be stockpiled on land nearby and used hopefully within the harbour extension backfill. Some may be used for backfilling the quayside. Additionally, scour protection will be provided where appropriate around the base of structures and concrete cover to steel reinforcement will be suitably large to achieve the 60 year design life of the structure in this aggressive marine environment, according to BS 6349-1-4.
- GHG mitigation is best achieved by taking a planned and focused approach following the IEMA GHG Management Hierarchy principles (IEMA, 2020a) which aims to eliminate and prevent GHG emissions in the first instance, reduce emissions further, substitute with renewables and lower intensity energy uses and then finally compensate for unavoidable emissions. The Proposed Development has implemented mitigation throughout the design of the Proposed Development as set out below.
- Additionally, a Site Waste Management Plan (SWMP) (**Appendix A5**) will be implemented to manage waste during construction. The SWMP aims to ensure that the waste produced during the construction phase and other phases of the Proposed Development are dealt with in accordance with the duty of care provisions in the Environmental Protection Act (1990). The adoption of the principles of the waste management hierarchy will be implemented throughout. This will help to reduce GHG emissions associated with waste management. Reduces waste because just bringing what you need.
- All materials required for construction will be transported to the site on a boat rather than via aviation. Whilst this does release GHGs, it is the only feasible way to get materials onto the Island and it is less GHG intensive than HGVs and planes.
- Prefabrication is the practice of assembling structural components off site and transporting them to the site of construction where they can be assembled. This practice will therefore reduce the amount of on-site fabrication, reduce the amount of diesel being burnt on-site and result in less direct emissions burnt on site.
- The detailed design will take cognisance of locally available materials, manufacturing capability and labour resource. This will minimise the number of shipments required to construct the Fair Isle harbour and reduce the indirect GHG emissions of the Proposed Development.
- The quay wall will be constructed from prefabricated concrete elements. These could be manufactured at Kirkwall, Lerwick, UK mainland, Ireland or the Continent. The cement for these elements is likely to be sourced from mainland UK or Ireland, reducing the distance it has to travel to the Site and the indirect GHG emissions produced. It is assumed that aggregate for the concrete will be sourced local to the manufacturing site and where possible aggregate for backfilling structures will be sourced locally to Fair Isle. The steel elements of the proposed development are likely to be shipped from mainland UK, Ireland, or the continent. The rock armour that will be used to construct the breakwater can be source from one of several local quarries on Shetland. This would require early engagement with the quarries to allow stockpiling and it is possible that due to the volume required it may need to be sourced from Norwegian quarries.
- Consideration has been given to embodied carbon when selecting the materials that will be used for the Proposed Development. Local precast manufacturers at Lerwick have advised they can manufacture elements with CEM II. CEM II is less carbon intensive compared to CEM I, resulting in less GHG emissions. CME II is a cement combination type that substitutes 6-20% of the Portland cement with fly ash or Ground Granulated Blast Furnace Slag (GGBS). Fly ash is an environmentally sustainable component of concrete because it is a by-product of another process that has a low energy content and therefore reduces CO_2 emissions and waste and exhibits cold weather resistance. A durable concrete suitable for the marine environment will be specified, with some

degree of Ordinary Portland Cement (OPC) substitution in the design cement combination type. This will be finalised at detailed design stage.

- It is recommended that recycled materials will be utilised where possible, with the consideration of using materials that go through less energy-intensive processes and that can be sourced locally. There are a number of UK organisations promoting the review and reduction of embodied carbon and supply chain emissions associated with construction as part of their sustainability initiatives. Material excavated from hollowing the existing noust is anticipated to be re-used within the Proposed Development. This will reduce the volume of new materials required for construction and will also reduce waste stored on site and exported off island.

3.3.3 Standard environmental mitigation measures to be included in the FIEMP could include, but are not limited to:

- The site supervisor will give toolbox talks prior to work commencing. These talks will highlight any sensitive features, including the designated sites (SPA, SAC and SSSI) and qualifying features;
- In line with standard good practice, the contractor will follow the updated and relevant GPPs including GPP 5 (Works and maintenance in or near water). PPGs will be followed if no corresponding GPP is available;
- Oils, fuels and chemicals will be stored in fully bunded areas;
- Spill kits will be available on site and workers trained in their use;
- The contractor will produce a contingency plan for dealing with spills or environmental incidents;
- Any waste generated will be removed from site and either recycled or disposed of in compliance with Waste Management Regulations;
- The successful Contractor will ensure vessels and plant involved in the operational activities for the works adhere to the industry recommended guidelines for preventing the introduction of INNS;
- Prior to and during construction activities, appropriate staff will be informed of relevant marine and terrestrial INNS and will follow the procedures established within the BMP. These staff will also be cognisant of guidance produced by NatureScot for the prevention of introduction of non-native species (Cook *et al.*, 2014) and draft guidance on biosecurity for the Outer Islands (RSPB, 2021);
- The Contractor will produce a Ballast Water Management Plan (if relevant) to prevent the risk of introducing invasive non-native species into Fair Isle;
- Prior to use, all equipment will be washed and cleaned to ensure that no contaminants are brought into contact with the marine or terrestrial environment;
- Vehicle numbers and movement on the vegetation will be kept to a minimum;
- Vessels used for the works will adhere to the general principles in the Scottish Marine Wildlife Watching Code;
- The Contractor will contact the Fair Isle warden prior to works commencing in each year and inform the warden once works have finished in each year;
- The Contractor will ensure a suitably qualified Environmental Clerk of Works (EcOW) is present during the construction phase in both years (2024 and 2025) to ensure compliance with the good practice and management measures outlined above;
- The EcOW will be on site at all times during both years to ensure that Fulmar nests are not damaged by construction work, specifically the placement of rock armour around the breakwater. They will also monitor the impact of the works on nearby breeding birds

(primarily Fulmar, but also Puffin) to establish whether there are any detectable responses of the birds to the different construction activities to inform future work in the area. The EcOW will also liaise with the FIBO warden to ensure that the Arctic Tern colony is not negatively impacted;

- Well maintained and serviced plant and equipment;
- Dampening down any stockpiled materials; and
- Hooded lighting.

3.4 Consideration of Alternatives

3.4.1 The EIAR must contain the information specified in Part II, and such relevant information in Part I of Schedule 4 to the EIA Regulations. Where alternative approaches have been considered, paragraph 4 of Part II requires the Applicant to include in the EIAR an outline of the main alternatives, and the reasoning behind the choice. Although a full description of alternatives and a full assessment of their likely environmental effects are not required, sufficient detail should be provided to allow for a meaningful comparison between the alternatives and the Proposed Development.

3.4.2 It is a matter for the Applicant to decide whether to consider alternatives and which alternatives it intends to consider. The Directive and the EIA Regulations do not expressly require the Applicant to study alternatives, the nature of certain developments and their location may make the consideration of alternative sites a material consideration. Due to the nature of the Proposed Development and the need for it to be located at the Site, consideration of alternative sites is not regarded a material consideration.

3.4.3 Alternatives should only be considered where they are feasible, realistic and genuine. This may depend on various factors, including planning policy, land ownership, financial viability, technical feasibility and design quality. Options which are unlikely to be acceptable or deliverable are not realistic alternatives and so do not need to be considered.

No Development

3.4.4 The need for the Proposed Development is driven primarily by the need to improve the ferry port at North Haven to facilitate a new ferry. As noted earlier in this EIAR, the current ferry is estimated to reach the end of its serviceable life by 2026 and must be replaced by a matter of growing urgency. The community of Fair Isle would face serious challenges in terms of economic and social sustainability under a ‘no development’ scenario.

3.4.5 It is therefore considered that a no development scenario is not a reasonable alternative.

Alternative Sites and Forms of Development

3.4.6 The nature of the Proposed Development is such that the objective is to redevelop the Site to allow continued use of the ferry port at North Haven, and as a result, no alternative sites have been considered.

3.4.7 Within the Shetland Inter-Island Transport Study Fair Isle Outline Business Case (Stantec May 2021), three options emerged following review by Strategic Business Case:

- Do minimum: Replace the MV Good Shepherd IV with a like-for -like, but materially faster vessel.
- Option 1: Replace the MV Good Shepherd IV with a bespoke Ro-Ro vessel.
- Option 2: Bespoke mainland-based Lo-Lo ferry service.

3.4.8 In conclusion the do minimum and Option 2 solutions identified above are creating restrictions posed by Lo-Lo operations on Fair Isle and would lock in the transport and supply chain problems of the island for several decades. The primary purpose of moving to Ro-Ro is to facilitate the handling of goods, the intention is not to encourage regular car travel, and car-based tourism and it is likely a permit system will be in place for travelling on the ferry to the Island. Therefore, replacing the ferry with a like for like or similar Lo-Lo ferry was eliminated from further consideration.

Fixed Ramp

3.4.9 A 'fixed ramp' would accommodate a vessel's vehicle ramp over a restricted tidal window. Whilst this is an effective means of ship to shore interface for Ro-Ro vessels at some ports, the resulting tidal constraints would further reduce the times at which the vessel could operate at both Fair Isle and Grutness creating a tidal timetable and impacting on flexibility with regard to weather windows. Having the shoreside infrastructure place further restrictions on the service is unacceptable and for this reason a fixed ramp solution was excluded from further consideration.

Slipway

3.4.10 A slipway would provide a more flexible ship to shore interface option for Ro-Ro vessels compared to a fixed ramp. Using a typical slipway gradient of 1 in 8, the slipway at Fair Isle would need to be approximately 80m in length. The existing harbour infrastructure at Fair Isle is spatially constrained by the requirement for protection within the harbour provided by the breakwater and the available water depths within the harbours at Fair Isle. Therefore the slipway solution was excluded from further consideration.

Linkspan

3.4.11 By the introduction of Ro-Ro capabilities to the Fair Isle route would increase the resilience of the service and improve safety in terms of passenger access and good handling. Operating from linkspans would allow the service to remain flexible as it would not be restricted by the tidal state as would be the case with a fixed ramp. The provision of a linkspan would significantly improve the Fair Isle supply chain through simplifying goods handling and removing the current crane capacity restrictions. It would also provide a major improvement in terms of passenger access ad egress allowing those with impaired mobility to board via the linkspan.

Preferred Option

3.4.12 The preferred option for the replacement of the Fair Isle ferry is Option 1 - replace the MV Good Shepherd with a bespoke RO-RO vessel. This option would offer the most significant benefits in terms of the objectives. The primary benefit is the ability to convey wheeled freight, which would remove the dependence on the weight limited crane, thus offering moderate capacity benefit. A modern and faster Ro-Ro vessel would also facilitate the operation of more connections through reducing both journey and turnaround time, allowing the service to operate within a tighter weather window.

3.4.13 The preferred option package can be summarised as follows:

- Procurement of a new and faster monohull Ro-Ro ferry, which will operate under the Workboat classification (i.e. less 24m length overall and a maximum of 12 passengers). The vessel will overnight in, and be crewed from, Fair Isle;
- The provision of crew training on the new vessel and joint development of a long-term crew Succession Plan by the Fair Isle community and the Council;

- Upgrading of the slipway and cradle and widening of the noust at Fair Isle, so as to provide a secure overnight berth for the ferry; and
- Construction of a new solid quay to form a linkspan berth at Fair Isle. This will be accompanied by increasing the height of the current breakwater.

Conclusion

3.4.14 The need for the Proposed Development is based on the social and economic requirements of the remote community of Fair Isle, taking into account environmental conditions. These requirements have therefore limited and shaped the opportunities for alternatives, with the design instead being based on an iterative process to respond to the constraints and opportunities of the Site.

4 Construction and Site Management

4.1 Introduction

4.1.1 This chapter provides information on the anticipated construction of the Proposed Development and the management of the construction phase on Site.

4.1.2 Likely significant environmental effects associated with the construction phase will be managed through a fiEMP that will be prepared prior to construction and set out the full details on the construction proposals and outline the approach to managing construction works to ensure any possible impacts that may arise have been identified, managed and minimised. An fiEMP has been prepared for this application and is provided as **Appendix A.4**. The technical chapters of this EIAR (Chapters 7-13) detail, as appropriate, the mitigation measures included in the fiEMP, and these are summarised in **Chapter 16.**

4.2 Construction Management and Programme

4.2.1 The Proposed Development will be constructed in accordance with the Plans submitted in support of the planning application (**Appendix A.1**).

4.2.2 The following activities will be undertaken during the construction phase of the Proposed Development:

- Erecting construction traffic signage;
- Erection of temporary construction compound;
- Erection of security fencing around the perimeter of the Site;
- Sustainable Drainage Systems (SuDS) installation;
- Noust expansion;
- New cradle and slipway;
- Existing winch house demolished and a new one constructed;
- Pier structure repaired;
- Breakwater extended and height increased; and
- Solid quay extended to form new linkspan berth;

4.2.3 Additional details in relation to the construction of the key features listed above:

- The linkspan will be a ‘Type A’ linkspan, the same as that used at various other ferry terminals operated by Shetland Islands Council. A Type A linkspan is typically 14m in length and 5.5m wide at the nose.
- The cradle will be dimensioned to suit the chosen vessel (vessel max. 24m in length and approximately 11m in width).
- The slipway length will be confirmed based on results of the bathymetry survey, and vessel specifications. The existing slipway will become obsolete, but it is anticipated that the concrete foundations for this will be left in place. The new slipway will overlap with the existing one. This will be wider to allow use by the larger vessel. The general location of the noust will be unchanged but it is being substantially enlarged in two directions.
- In order to upgrade the cradle and slipway, the existing cradle and associated mechanical equipment will be replaced. The extension to the slipway is likely to be a reinforced concrete structure above water, and steel structure below water. Existing substructure will be re-used where possible. The cradle will be a steel structure and will operate on steel

rails that will be positioned on the slipway, similar to existing. The centreline of the slipway and noust will be offset from its current position.

- The linkspan deck is a new structure and will be fabricated off-site. The linkspan deck will be delivered to site by vessel and installed on the newly constructed linkspan support structures alongside the quay once the new quay extension has been constructed.
- The dredging method will be determined from the results of the Ground Investigation and the materials that are encountered. Where sands / silts are to be dredged, an excavator will likely be used to dredge the seabed material to the required depth. If rock is to be dredged, the quality of the rock will determine whether an excavator can be used to 'rip' the rock from the seabed or if an alternative method will be used.

4.2.4 All of the construction operations carry with them a range of issues to be dealt with in their design, preparation and execution. Best practice in construction management will be required to minimise the potential environmental effects and disruption that could be caused by the construction works. This will minimise potential disruption to affected communities, services and habitats.

4.2.5 Although a detailed construction methodology is yet to be determined, it is reasonable to assume for the purposes of this assessment that the construction of the Proposed Development is likely to utilise excavators, dozers, cranes, dump trucks and possibly other small plant used during construction. The precise nature and quantity of plant employed during construction will vary with each stage of the Proposed Development.

4.2.6 Further information is provided in the fiEMP (**Appendix A.4**).

Programme and Hours of Operation

4.2.7 The construction process is expected to take place over two summer seasons due to the weather restrictions during winter months:

- North Haven Construction Phase 1 (Noust, winch house, slipway, cradle, access stairs, repairs to existing finger pier, fencing) – February to September 2024 (approximately 8 months); and
- North Haven Construction Phase 2 (Dredging, quayside, breakwater, linkspan, relocate pontoon, rock netting) – March to September 2025 (approximately 7 months).

4.2.8 Construction is expected to take place Monday – Friday 7am-7pm and Saturday 7am - 1pm, with no working on Sundays or Bank Holidays. Some construction activities may need to be undertaken outside these hours, for which agreement would be sought from SIC/MS-LOT.

4.2.9 During this period there will be a combination of construction vehicles and Light Goods Vehicles (LGVs) for construction staff.

4.2.10 Any additional traffic movements will likely be restricted to construction workers getting to site outside the hours stated above. The Construction workforce is likely to be approximately 8-10 workers and they are likely to car share from their accommodation so will not result in a significant amount of additional traffic on Fair Isle.

4.2.11 Works required in an emergency where there is the potential of harm or damage to personnel, plant, equipment or the environment may be undertaken, provided the Principal Contractor (yet to be appointed) retrospectively notifies SIC of such works within 24 hours of their occurrence.

4.3 Construction Traffic

4.3.1 Although traffic will be generated during the construction of the Proposed Development, it is not anticipated that the construction of the noust, quay and modification of the rock armour

or the operation of the ferry will significantly increase the minimal traffic movements to, from or within Fair Isle.

4.3.2 The current Fair Isle vessel, MV Good Shepherd IV can carry 54 tonnes of cargo. The vessel can accommodate two small vehicles in fair weather conditions and one vehicle in poor weather conditions (when a car is not permitted to be carried on the open-deck).

4.3.3 As the vessel only makes three return crossings per week during the summer season timetable and only one return crossing per week during the winter season timetable (and often fewer given weather conditions), vehicular traffic on the Fair Isle route is negligible. The air service is the main mode of transport for Fair Isle, with the ferry largely fulfilling a supply-chain role.

4.3.4 Given the limitations of the current vessel, little to no material for the Proposed Development will be shipped on the ferry. All materials are likely to be consolidated at an appropriate port or ports and shipped to Fair Isle on purpose-built vessels. There will be a small workforce that will be moving backwards and forwards to accommodation at the start and end of their shifts. Road traffic impacts associated with construction will therefore be negligible.

4.3.5 During the period of works, construction staff will likely travel home for long weekends on a Friday, returning to Fair Isle on a Monday morning. This will increase the pressure on aircraft seat capacity. Whilst there may be an opportunity to operate some additional off-timetable flights, the Fair Isle air service is highly constrained and thus the scope for service expansion is very limited. There are likewise significant constraints to any scaling-up of the ferry service.

4.4 Construction Waste

4.4.1 Waste generation during the construction phase is likely to result from enlargement of the noust which will generate a large volume of rock. This rock may be disposed of either at sea or on land, if an area can be identified where it may enhance coastal defences. The project hopes to be able to use the waste rock from the Noust within the backfill of the quayside, which will take place in Year 2 of construction. Therefore, an additional area of land has been identified that the rock will be temporarily placed (likely 1 year), close to the harbour to minimise associated traffic movements.

4.4.2 Dredging waste will be created during construction and a Best Practice Environmental Option has been undertaken to assess the best use of material before resolving the disposal at an offshore licensed disposal site Appendix A18 BPEO Report.

4.4.3 Concrete, hardstanding and other made ground materials are expected to be excavated to enable the development of foundations.

4.4.4 The existing winch house will be demolished, and this should be subject to an asbestos survey beforehand.

4.4.5 There is not anticipated to be significant other demolition works. The existing pier is to be retained and repaired; however existing fenders are expected to be replaced.

4.4.6 The construction of the Proposed Development is likely to use energy intensive resources including fossil fuels to power mechanical excavators and other machinery. The construction phase will also utilise land and construction materials (potentially including pre made concrete blocks, cement, concrete, timber, etc.).

4.4.7 Construction waste expected to be generated by the Proposed Development includes non-hazardous construction materials such as off-cuts of timber, bricks, dredging arisings, wire, fibreglass, cleaning cloths, paper, materials packaging and similar materials.

4.4.8 During construction, materials recovered from any of the works may be suitable for reuse on site, reducing the costs of transportation and procurement of virgin materials. Any waste that is generated will be managed in accordance with national and local policy, looking to

reduce, reuse and recycle whenever possible. Such measures will ensure that the volume of waste likely to be generated by the Proposed Development during construction will be limited and will not significantly affect the capacity of local waste infrastructure.

4.4.9 The Local Development Plan 2014 Policy W5 'Waste Management Plans and facilities in all new developments' states that '*developers must submit an appropriate Site Waste Management Plan (SWMP), which demonstrates how the waste generated by the development during the construction phase will be dealt with, including how the materials will be reused, recycled and how any remaining waste will be disposed of, in accordance with the waste hierarchy. Adequate space must be provided for storage and collection of all waste and appropriate recycling facilities within the completed development.*'

4.4.10 A SWMP is an important way to help achieve sustainable waste management during the construction of developments. It is crucial to the delivery of the Scotland Zero Waste Plan (adopted June 2010). The Zero Waste Plan is a national plan that proposes to increase resource efficiency and waste prevention in order to reduce the amount of municipal and commercial waste. This proposes long term targets of recycling 70% of all Scotland's waste by 2025, and only 5% of remaining waste ending up in landfill by 2025.

4.4.11 A draft SWMP has been developed for the Proposed Development and submitted as part of the Application (Refer to **Appendix A.5**). This SWMP will help to ensure that the waste management principles set are followed appropriately.

4.4.12 The SWMP will incorporate consultation with SIC (as the Waste Collection Authority) to understand any policy or plans which should be considered as part of this Application.

4.4.13 Overall, the hierarchy of waste management will be adopted, in accordance with national policy requirements. The waste management methods in order of preference are as follows:

- **Prevention** – Through good design and procurement mechanisms;
- **Reuse** – To provide design features to the Proposed Development to use materials in their current state and form, this can occur either on or off site;
- **Recycle** – By using waste materials found on site and recycling / recovering them into an alternative form that can be used for construction purposes;
- **Recovery** – Energy recovery from biodegradable or combustible materials; and
- **Disposal** – The least preferred option where the waste stream would be subject to a final disposal route, such as landfill.

Waste Segregation and Storage

4.4.14 During the construction phase, a small area would be required for a temporary construction compound ("the laydown area") for the potential storage or materials, plant and equipment as well as providing site welfare. The location of the laydown area is presented in **Figure 1.1** of **Appendix A.1.**

4.4.15 A specific segregation area within the temporary construction compound will be identified where the separation of materials will take place during the construction phase. This area will allow for the separation of materials into those which can be reused, recycled or disposed. The Principal Contractor (yet to be appointed) will be responsible for ensuring any waste is disposed of responsibly and in line with the Waste Hierarchy outlined above.

4.4.16 All waste containers should be appropriate to the nature for the substances stored and should be secure to ensure no waste can escape. In addition, all waste containers should be appropriately labelled to ensure that it is clear to all construction staff what types of waste can be stored in each container. These containers should be located appropriately to reduce any potential hazards and to ensure no waste is released into the surrounding environment.

4.4.17 Mitigation against contamination from waste entering the soil, surface water and groundwater will be implemented in line with SEPA's GPPs, and where necessary, the older PPGs including GPP 2: Above ground oil storage tanks, GPP 5: Works and maintenance in or near water, PPG 6: Working at construction and demolition sites, GPP 8: Safe storage and disposal of used oils, GPP 13 Vehicle washing and cleaning, PPG 18: Managing fire water and major spillages, GPP 21: Pollution incident response planning, GPP 22: Dealing with spills and GPP 26 Safe storage - drums and intermediate bulk containers and through compliance with CAR. Further information is outlined in the fiEMP (**Appendix A.4**).

4.4.18 Relevant waste and resource management procedures will be communicated to all construction operatives during the initial site induction, which will be mandatory for all staff working on site. This will include instruction on the segregation, handling, re-use and return methods to be used by all parties at all appropriate stages of development.

5 Assessment Method

5.1 Introduction

5.1.1 This chapter describes the process by which the EIA has been carried out. It includes a discussion of the relevant regulations, the EIA process, consultations and the over-arching assessment methods applied. Details of the technical method followed for each topic are presented in each of the technical chapters (Chapters 7-14) as appropriate.

5.2 EIA Regulations

5.2.1 The process of EIA is governed by the Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017 as amended (the “EIA Regulations”) for works on land and to the mean low water springs mark, and The Marine Works (Environmental Impact Assessment) (Scotland) Regulations 2017 (as amended), for the Marine Scotland Act 2010 (Marine Licenses) to be consented by Marine Scotland for the deposit or removal of a substance or object below the mean high water springs mark.

5.2.2 The EIA Regulations transpose the provisions of European Council and Parliament Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment, as amended by Directive 2014/52/EU ("the EIA Directive").

5.2.3 To ensure that the provisions of the EIA Regulations would continue to be implemented in the same way or an equivalent way following the exit of the United Kingdom from the EU at the end of the transition period, appropriate amendments were made by The Environmental Assessments and Miscellaneous Planning (Amendment) (EU Exit) Regulations 2018. There has been no substantive change to EIA requirements as a result of the departure of the UK from the European Union.

5.2.4 The EIA Regulations set out the procedures for undertaking an EIA and the information which is required in an ES and such procedure has been followed in this assessment.

5.2.5 Marine licences under the Marine (Scotland) Act 2010 will be required and sought for several activities including the dredging activities (including the disposal of dredged materials as worst case and if reuse of the materials is not possible) and the construction of the new pier. These activities are strictly regulated through marine licence conditions.

5.3 EIA Process

5.3.1 In general terms the main stages in the EIA are as follows:

- **Screening** – determining whether a proposed project falls within the remit of the EIA Regulations;
- **Scoping** – determining the nature and extent of likely significant environmental effects of the Proposed Development and identifies the issues to be considered in the assessment and reported in the EIAR. Scoping also gives the relevant stakeholders an opportunity to express their views on the scope of the EIA;
- **Establishing Baseline** – drawing together and reviewing existing available data and undertaking surveys to determine the existing and future baseline conditions;
- **Assessment and Iteration** – assess likely significant effects of development, evaluate alternatives, provide feedback to design team on potential adverse impacts, modify development or impose parameters, incorporate mitigation, assess effects of mitigated development; and

- **Preparation of the ES**; and
- **Consultation and Decision Making**.

5.4 Screening

5.4.1 Under the EIA Regulations, 'Screening' is a procedure used to determine whether a development is likely to have significant effects on the environment and therefore whether a planning application requires an EIA.

5.4.2 Due to the nature of the Proposed Development, the Applicant has voluntarily undertaken an EIA and therefore no formal screening exercise was undertaken for the Proposed Development.

5.5 Scoping

5.5.1 The purpose of EIA Scoping is to document the scoping exercise that has been undertaken to identify the nature and extent of the likely significant environmental effects of a development. Scoping also allows for the issues identified to be subject to the appropriate level of assessment, thereby providing a focus for the EIA, and it gives relevant stakeholders an opportunity to express their views on a development and to comment on the scope of the EIA.

5.5.2 A request for a Scoping Opinion (supported by a Scoping Report) was submitted to SIC and MS-LOT on 12th April 2022. Following consultation with the relevant statutory consultees, a Scoping Opinion was received from SIC on 27th June 2022 (2022/108/SCO) and from MS-LOT on 3rd August 2022 and is provided in **Appendix A2.**

5.5.3 As a result, this EIAR has been prepared to fulfil the requirements of the Scoping Opinion and in compliance with Regulation 17 of the EIA Regulations which requires an EIAR to be based on the most recent scoping opinion issued.

5.5.4 The following disciplines were agreed to be 'scoped in' to the EIAR:

- Archaeology and Cultural Heritage
- Landscape / Seascape and Visual
- Marine Geomorphology
- Marine Ecology;
- Terrestrial Ecology;
- Climate Change; and
- Socio-Economics

5.5.5 A number of stand-alone assessment reports will accompany the planning application and are appended to the EIAR. These include:

- Phase 1 Ground Conditions Assessment.
- Draft Site Waste Management Plan (SWMP).
- First Iteration of the Environmental Management Plan (fiEMP).
- Historic Environment Desk Based Assessment (HEDBA).
- Wave Modelling.
- Hydrodynamic Modelling
- Benthic Survey Report

- Underwater Noise Report
- Airborne Noise Report
- Biosecurity Management Plan.
- Best Practicable Environmental Options Report for Dredging

5.6 Consultation

5.6.1 The Proposed Development has been progressed through an iterative process of design, assessment and review. In addition to consultation to agree the scope of the EIA, consultation with relevant statutory and non-statutory bodies has been undertaken throughout the EIA and design process. **Section X.3** of each of the technical discipline chapters (Chapters 7-13) provides a summary of consultation undertaken specifically in relation to that discipline.

5.6.2 The following consultees have been consulted to agree the detailed scope of the assessment, to provide information, to discuss assessment methods and findings, and/or agree mitigation measures and design responses:

- Shetland Islands Council;
- Shetland Islands Council (Harbour);
- Transport Scotland;
- Marine Scotland;
- Historic Environment Scotland;
- Marine Analytical Unit;
- Maritime and Coastguard Agency;
- NatureScot;
- Northern Lighthouse Board;
- Royal Society for the Protection of Birds (RSPB)
- Royal Yachting Association;
- Scottish Environmental Protection Agency (SEPA);
- Scottish Water; and
- United Kingdom Chamber of Shipping.

5.6.3 The Applicant also undertook public consultation in regard to the Proposed Development 5th and 6th December 2022 and also 6th and 7th February 2023. Further details are provided in the Pre-Application Consultation (PAC) Report.

5.6.4 The EIA has given due regard to the requirements of the consultees and the assistance of these consultees is gratefully acknowledged.

5.7 Assessment Assumptions

5.7.1 The following assumptions have been used to ensure that the EIA provides a robust assessment of likely significant effects of the Proposed Development:

- Suitable planning conditions will be imposed as identified in this EIAR to secure appropriate mitigation measures, noting the suite of planning conditions which applied to the extant planning consent;

- Baseline conditions are generally considered to be current conditions. Likely changes to the current situation (the baseline evolution) have been considered as appropriate; and
- The Proposed Development will be complete and implemented in accordance with the programme set out in **Chapter 3**.

5.8 Uncertainty and Limitations

5.8.1 The prediction of future effects inevitably involves a degree of uncertainty. Where necessary, the technical chapters describe the principal factors giving rise to uncertainty in the prediction of likely environmental effects and the degree of the uncertainty.

5.8.2 Confidence in the predictions has been achieved by employing accepted assessment methodologies, e.g., Guidelines for Ecological Impact Assessment in the UK. Uncertainty inherent within the prediction has been described. The ES has sought to provide a robust assessment of the likely significant effects of the Proposed Development.

5.8.3 Further limitations in preparing this ES are noted in each of the technical chapters (Chapters 7-14), as appropriate in **Section X.8** of each chapter.

5.9 Assessing Effects

Establishing Baseline Conditions

5.9.1 A range of site surveys and data collection exercises have been used to identify environmental conditions at the Site and in the surrounding area to provide a basis for the subsequent assessment work. The surveys undertaken are reported in each of the technical chapters (Chapters 7–14).

5.9.2 It should be noted however that some of the technical surveys and assessments on which the EIA is based are too detailed and lengthy for incorporation into Volume 1 of this EIAR (e.g., ecology survey reports). In such instances, the technical survey and assessment reports are provided in full as an appendix to this EIAR (**Volume 2**), with a relevant summary and the reference for the full survey or assessment provided in the EIAR. The geographical scope of these appended surveys and assessments has been based on the likelihood for significant effects.

5.9.3 The EIA has assessed the likely significant effects of the Proposed Development against baseline conditions in the same year (i.e., providing an assessment of ‘do something’ and ‘do nothing’).

5.9.4 As required by the EIA Regulations, each chapter has also considered as appropriate the likely evolution of current baseline conditions without implementation of the Proposed Development as far as natural changes from the baseline scenario can be assessed with reasonable effort on the basis of available environmental information and scientific knowledge. The EIA has therefore used these future baseline conditions within the assessment of effects.

Types of Effects

5.9.5 The EIA has sought to identify all likely significant effects associated with the Proposed Development and, where appropriate, makes the following distinctions in defining the type of effect:

- **Beneficial** - effects that have a positive influence on the environment;
- **Adverse** - effects that have a negative influence on the environment;

- **Direct** - effects that are caused by activities which are an integral part of the scheme;
- **Indirect** - effects that are due to activities that are not part of the scheme, but are attributable to it, e.g. regeneration benefits attributable to the direct socio-economic benefits of the scheme;
- **Combined** - effects due to two or more environmental topics that singly may not be significant, but when assessed together may be significant;
- **Cumulative** - effects due to one or more schemes that singly may not be significant, but when assessed together may be significant; and
- **Residual** - effects that remain after the benefits of mitigation measures are taken into account.

Duration of Effects

5.9.6 The duration of environmental effects is defined as follows:

- **Short-term** – less than one year;
- **Medium-term** – one to five years;
- **Long-term** – five to ten years; and
- **Permanent** – more than five years.

5.9.7 In addition, where environmental effects are episodic, the likely frequency of events has been noted.

Assessing Construction Effects

5.9.8 The EIA has assessed the likely environmental effects that could occur during construction. Given that a principal contractor has not yet been appointed it is not possible to be definitive about the construction works. Therefore, the assessment of likely environmental effects during the construction phases has been based on available information and reasoned judgements based on professional experience to enable the likely environmental effects to be identified.

5.9.9 Construction effects will be temporary and intermittent, i.e., works will not occur in one location throughout the entire duration of the construction works. The potential duration and intermittency of effects is identified as appropriate in the EIAR Chapters 7-14 based on the information provided in **Chapter 4**.

5.9.10 In judging the significance of construction effects, it has been assumed that a second iteration of the Environmental Management Plan (siEMP) that will be secured via a suitably worded condition will adequately address mitigation measures in relation to construction effects identified within Chapters 7-14. This siEMP will take forward measures set out in the fiEMP that has been prepared for this planning application (**Appendix A.4**)

Assessing Operational Effects

5.9.11 To provide an assessment that is generally consistent between topic chapters, the EIA has focused on assessing the likely environmental effects of the overall development. This approach ensures that the full environmental effects of the full planning application have been considered. Where worst case effects could occur during an earlier year then such an assessment has been undertaken and this is reported in the relevant topic chapter.

5.10 Mitigation and Enhancement

5.10.1 One of the most important functions of the EIA process is to identify ways to mitigate identified adverse environmental effects and identify opportunities that a proposed development may have for environmental improvements. The EIA Regulations (Scotland) and Marine Works (EIA) Scotland Regulations 2017 require an EIAR to contain: "*A description of the measures envisaged to prevent, reduce and where possible offset any significant adverse effects on the environment*". The embedded mitigation for the Site is set out in **Section X.6** and within each topic chapter.

5.10.2 As part of the design process suitable mitigation measures were incorporated into the Proposed Development to mitigate potentially significant environmental effects. This mitigation is termed "embedded mitigation" and standard environmental mitigation as well as good practice mitigation and has been considered within each of the topic chapter in this EIAR.

5.10.3 Further mitigation measures, compensation and opportunities for environmental enhancement have also been identified through the EIA process. Such mitigation and enhancement measures are identified in this EIAR along with how it is proposed that they be secured.

5.10.4 A hierarchy of methods for mitigating significant adverse effects will be followed; these are, in order of preference:

- **Avoidance** – designing a development in such a way that avoids effects on the environment (e.g., avoiding siting residents in areas that could be affected by flood risk);
- **Reduction** – design the Proposed Development or employ construction methodologies such that significant effects identified are reduced (e.g., employment of sustainable drainage to mitigate the effects of development on surface water run-off); and
- **Compensation** – providing off-site enhancement in order to compensate for where onsite mitigation has not been possible (e.g., providing off-site conservation farming area).

5.10.5 Environmental effects remaining after mitigation measures have been incorporated are termed "residual effects" and these are fully described in the EIAR.

Residual Effects

5.10.6 Residual effects are the likely environmental effects that remain after embedded mitigation and further mitigation measures have been secured.

5.10.7 It is these residual effects which should be considered when assessing the likely significance of the effects of the scheme, not the unmitigated effects. This is because the mitigation proposed by the Proposed Development will ensure that the identified unmitigated effects will not occur in practice.

5.10.8 To provide an objective assessment of residual effects, their significance has been determined and is identified in the EIAR. This allows for comparison of effects between topics and also strengthens the assessment of impact interactions.

5.11 Assessment of Cumulative Effects

5.11.1 Schedule 4, 5 (e) of the EIA Regulations require the assessment to consider the likely significant effects of the Proposed Development in the context of other existing and/or approved projects, as well as the cumulative effects that may result from the Development and these other developments.

5.11.2 'Committed developments' are considered to be planning permissions that are partially built out and extant planning permissions. Planning applications that have been submitted but not yet determined have also been considered where there is a likelihood that the application may be granted planning permission before this application is determined.

5.11.3 A review of 'committed developments' was undertaken to identify major developments within 2.5km of the edge of the planning application boundary of the Site that may lead to likely significant cumulative effects with the Proposed Development. It was considered that significant cumulative effects are unlikely with developments outside of these areas.

5.11.4 However due to the location of the island and the works at the harbour this will restrict any other major works happening on the island at the same time. The rebuilding of the Fair Isle Bird Observatory will be completed in 2023, there are no planned cumulative developments that are expected to happen on Fair Isle during construction.

5.11.5 The exception to this is the disposal of dredge arisings at the Scalloway disposal site which has considered cumulative effects from both Fair Isle and Grutness works. But as these two schemes are considered to be part of the same project, they have been considered together in terms of disposal in the assessment rather than in the cumulative assessment.

5.12 Impact Interactions

5.12.1 **Chapter 15** provides the assessment of impact interactions, i.e., receptors being affected by more than one environmental effect and therefore potentially being subject to a more significant combined effect than the individual effects reported in each of the topic chapters.

5.12.2 The approach adopted for the assessment is in accordance with the methodology set out above, with further details provided in **Chapter 15.**

5.12.3 **Chapter 15** therefore provides an overall summary of the effects of the Proposed Development during construction and operation.

5.13 Significance Criteria

5.13.1 The two principal criteria for determining significance of an environmental effect are the magnitude of the effect and the sensitivity of the receptor, in addition the likelihood of the effect occurring is also considered as appropriate.

5.13.2 The approach to assessing and assigning significance to an environmental effect has relied upon such factors as consideration of the EIA Regulations, guidelines, standards or codes of practice, the advice and views of statutory consultees and other interested parties, and professional judgement.

5.13.3 The following questions are relevant in evaluating the significance of likely environmental effects:

- Is the effect direct, indirect or cumulative?
- Does the effect occur over the short, medium or long term?
- Is the effect permanent or temporary?
- Is it positive, neutral or adverse effect?
- Is the effect reversible or irreversible?
- Does the effect increase or decrease with time?
- Is the effect of local, regional, national or international importance?
- Are health standards or environmental objectives threatened?

- Are mitigating measures available and is it reasonable to require these?

5.13.4 Specific significance criteria have been prepared for each specialist topic, based on the generic criteria, for adverse and beneficial effects, set out in **Table 5.1**.

Table 5-1: Generic Significance Criteria

Significance Level	Criteria
Substantial	Only adverse effects are assigned this level of significance as they represent key factors in the decision-making process. These effects are generally, but not exclusively, associated with sites and features of international, national or regional importance. A change at a regional or district scale site or feature may also enter this category.
Major	These effects are likely to be important considerations at a local or district scale but, if adverse, are potential concerns to the project and may become key factors in the decision-making process.
Moderate	These effects, if adverse, while important at a local scale, are not likely to be key decision-making issues. Nevertheless, the cumulative effect of such issues may lead to an increase in the overall effects on a particular area or on a particular resource.
Minor	These effects may be raised as local issues but are unlikely to be of importance in the decision-making process.
Negligible	No effect or effect which is negligible or beneath the level of perception, within normal bounds of variation or within the margin of forecasting error.

5.13.5 Effects that are described as 'substantial', 'major' or 'moderate' are determined to be *significant*; and effects that are described as 'minor' or 'negligible' are determined to be *not significant* in the context of the EIA Regulations.

5.13.6 The assessments reported in the EIAR, including judgements on significance, have been used within the Planning Statement to inform the planning balance for the application. A substantial or major adverse does not, in itself, indicate than an application should be refused, just as a substantial or major beneficial effect does not indicate that an application should be approved.

5.14 Monitoring

5.14.1 Article 8a(4) of the EIA Directive 2014/52/EU states the following:

"In accordance with the requirements referred to in paragraph 1(b), Member States shall ensure that the features of the project and/or measures envisaged to avoid, prevent or reduce and, if possible, offset significant adverse effects on the environment are implemented by the developer, and shall determine the procedures regarding the monitoring of significant adverse effects on the environment."

5.14.2 Each chapter of the EIAR therefore identifies the proposed monitoring arrangements for that topic. As stated in the EIA Regulations effort should be made to ensure that *"the type of parameters to be monitored and the duration of the monitoring are proportionate to the nature, location and size of the development and the significance of its effects on the environment."*

5.14.3 A summary of mitigation and monitoring requirements identified in each topic chapter is provided in **Chapter 16**.

6 Planning Policy and Context

6.1 Introduction

6.1.1 This chapter provides an overview of the key planning and marine legislation, policy, and other material considerations as they are relevant to the determination of this application and ensures that the likely environmental effects of the Proposed Development are properly assessed and understood.

6.1.2 The chapter is factual in nature and does not provide detailed policy analysis or an assessment of the Proposed Development against the development plan or other material considerations. A separate Consenting Statement assesses in detail how the proposal accords with relevant Development Plan policies and other material considerations. The purpose of this chapter is to identify all legislative and policy requirements considerations relevant to the technical assessments provided in **Chapters 7-14 of** the EIAR.

Relevant Statutory Provisions

6.1.3 The key planning and consenting legislation of relevance to this EIAR and the overall EIA process is:

- The Town and Country Planning (Scotland) Act 1997 (Section 35B)
- The Town and Country Planning (Development Management Procedure) (Scotland) Regulations 2013 (Regulations 4-7)
- The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017
- The Marine (Scotland) Act 2010
- The Marine Licensing (Pre-application Consultation) (Scotland) Regulations 2013

Marine Licensing

6.1.4 Section 20 of the Marine (Scotland) Act 2010 provides that no person may carry on a licensable marine activity except in accordance with a marine licence granted by Scottish Ministers. Activities which constitute a “licensable marine activity” are set out in Section 21 of the 2010 Act.

6.1.5 Section 21 specifies that licensable marine activities are all activities carried out either in the “Scottish marine area” or “at sea”. The “Scottish marine area” is defined in Section 1 of the 2010 Act as the area of sea within the seaward limits of the territorial sea of the United Kingdom adjacent to Scotland and including the bed and subsoil of the sea within that area. “Sea” is defined in Section 2 of the 2010 Act as including (a) any area submerged at mean high water spring tide, and (b) the waters of every estuary, river or channel, so far as the tide flows at mean high water spring tide.

6.1.6 A marine licence is therefore required for the Proposed Development as it relates to the carrying out of a licensable marine activity in the area of sea between the mean high water spring and the seaward limits of the UK territorial sea. Marine licence applications are determined by Scottish Ministers, under operation of Marine Scotland, a directorate of Scottish Government.

6.2 National Planning Policies

National Planning Framework 4

6.2.1 NPF4 provides a statutory framework around which to orientate Scotland's long-term spatial development. The Framework highlights the spatial planning implications of multiple national policy documents and commitments. NPF4 was formally adopted on 13th February 2023. The statutory development plan for any given area of Scotland consists of the National Planning Framework and the relevant Local Development Plan.

6.2.2 From adoption, NPF4 will:

6.2.3 Take precedence over the Development Plan where there are any conflicts or gaps due to age. When there is incompatibility between a provision of NPF4 and the LDP, whichever is latest (to be adopted) prevails.

6.2.4 Form part of the statutory development plan and have a 10-year lifespan (unless revised).

6.2.5 Replace NPF3, Scottish Planning Policy (SPP 2014), Strategic Development Plans and any supplementary guidance issued in connection with them.

6.2.6 The *National Spatial Strategy* for Scotland 2045 outlines six overarching spatial principles, including a just transition to net zero, supporting local living and rural revitalisation. Applying these principles will support the planning of delivery of sustainable, liveable and productive places. NPF4 also outlines 'Regional Spatial Priorities' for five broad regions of Scotland. With respect to Fair Isle and Grutness, this is contained within the North and West Coast and Islands Spatial Priorities. This part of Scotland will be at the forefront of efforts to reach net zero emissions by 2045. Island and coastal ecosystems, and the communities they support are naturally more vulnerable to the effects of climate change, sea level rise and extreme events. The need to improve transport and ensure island communities are served with good facilities is also a priority but recognised as a significant challenge to deliver.

6.2.7 Subject specific provisions with NPF4 of relevance to the proposed development are outlined in the **Table 6.1** below.

Table 6.1 Subject specific provisions with NPF4 of relevance to the proposed development

Subject Policy	Relevance/summary
Tacking the Climate and Nature Crises (Policy 1)	The intention of this policy is to encourage, promote and facilitate development that addresses the global climate emergency and nature crisis. When considering all development proposals, significant weight will be given to the global climate and nature crises
Climate Mitigation and Adaption (Policy 2)	The intention of this policy is to encourage, promote and facilitate development that minimises emissions and adapts to the current and future impacts of climate change. Development proposals will be sited and designed to minimise lifecycle greenhouse gas emissions as far as possible and to adapt to current and future risks from climate change.
Biodiversity (Policy 3)	To protect biodiversity, reverse biodiversity loss, deliver positive effects from development and strengthen nature networks. Development proposals will contribute to the enhancement of biodiversity, including where relevant, restoring degraded habitats and building and strengthening nature networks and the connections between them. Development that requires an Environmental Impact Assessment will only be supported where it can be demonstrated that the proposal will conserve, restore, and enhance biodiversity, including nature networks so they are in a demonstrably better state than without intervention. Any potential adverse impacts, including cumulative impacts on biodiversity, nature networks and the natural environment will be minimised through careful planning and design
Natural Places (Policy 4)	To protect, restore and enhance natural assets making best use of nature-based solutions. Development proposals which by virtue of type, location or scale will have an unacceptable impact on the natural environment, will not be supported. Development proposals likely to have a significant effect on a Special Area of Conservation or Special Protection area are required to be subject to an “appropriate assessment” of the implications for the conservation objectives. Development affecting a National Park, National Scenic Area, Site of Special Scientific Interest or a National Nature Reserve will only be supported where the objectives of designation and overall integrity of the areas will not be compromised or any significant adverse effects are clearly outweighed by social, environmental or economic benefits of national importance.

Table 6.1 Subject specific provisions with NPF4 of relevance to the proposed development

Subject Policy	Relevance/summary
	For development proposals affecting a site designated as a local nature conservation site or landscape area in the LDP the requirements of the previous paragraph are also applicable but the social, environmental or economic benefits are required to be of at least local importance.
Historic Assets and Places (Policy 7)	To protect and enhance historic environment assets and places, and to enable positive change as a catalyst for the regeneration of places. Detailed policy provisions are set out in order to protect and enhance different types of historical assets such as listed buildings, conservation areas, World Heritage Sites, scheduled monuments, Gardens and Designed Landscapes, Historic Marine Protected Areas and non-designated historic environment assets such as buried archaeological remains.
Coastal Development (Policy 10)	To protect coastal communities and assets and support resilience to the impacts of climate change. Development proposals in undeveloped coastal areas will only be supported where they are necessary to support the blue are necessary to support the blue economy, net zero emissions or to contribute to the economy or wellbeing of communities whose livelihood depend on marine or coastal activities, or is for essential infrastructure, where there is a specific locational need and no other suitable site. Development should not result in the ned for further coastal protection measures taking into feature sea level change, coastal flood risk or coastal erosion. Development should also be anticipated to be supportable in the long-term, taking into account projected climate change.
Sustainable Transport (Policy 13)	This policy intends to encourage, promote and facilitate developments that prioritise walking, wheeling, cycling and public transport for everyday travel and reduce the need to travel unsustainably. Proposals to improve, enhance or provide public transport infrastructure will be supported.
Design, Quality and Place (Policy 14)	To encourage, promote and facilitate well designed development that makes successful places by taking a design-led approach and applying the Place Principle. Development proposals will be designed to improve the quality of an area whether in urban or rural locations and regardless of

Table 6.1 Subject specific provisions with NPF4 of relevance to the proposed development

Subject Policy	Relevance/summary
	Scale. Development proposals will be supported where they are consistent with the qualities of successful places (healthy, pleasant, connected, distinctive, sustainable and adaptable).
Flood Risk and Water Management (Policy 22)	To strengthen resilience to flood risk by promoting avoidance as a first principle and reducing the vulnerability of existing and future development to flooding. Development should not increase the risk of surface water flooding or itself be at risk. Development proposals at risk of flooding or in a flood risk area will only be supported under certain criteria, such as essential infrastructure where the location is required for operational reasons.
Rural Development (Policy 29)	Encourages rural economic activity, innovation and diversification whilst ensuring that the distinctive character of the rural area and the service function of small towns, natural assets and cultural heritage are safeguarded and enhanced. Development proposals that contribute to the viability, sustainability and diversity of rural communities and local rural economy will be supported, including: essential community services and essential infrastructure. Development proposals in remote rural areas, where new development can often help to sustain fragile communities, will be supported where the proposal will support local employment supports and sustains existing communities and is suitable in terms of location, access, siting design and environmental impact.

National planning advice and circulars

6.2.8 National planning policy is supported by a variety of Scottish Government Planning Circulars, Planning Advice Notes (PANs), Advice Sheets, Ministerial/Chief Planner Letters to Planning Authorities, as well as guidance documents prepared by Key Agencies of the Scottish Government. Annexe A to the Scottish Government Planning Circular 3/2022: Development Management Procedures confirms that amongst other considerations. The types of documents listed above are all potential material considerations in the determination of a planning application depending on the individual context of the case.

6.2.9 The following guidance and advice documents are considered to be of relevance to the proposed development and have been considered where appropriate in undertaking this EIAR.

- Planning Circular 1/2017: Environmental Impact Assessment Regulations
- Planning Circular 1/2015: Relationship Between The Statutory Land Use Planning System And Marine Planning And Licencing
- Planning Advice Note 75: Planning For Transport
- Planning Advice Note 60: Natural Heritage
- Planning Advice Note 51: Planning, Environmental Protection And Regulation
- Scottish Government Flood Risk: Planning Advice
- Planning Advice Note 2/2011: Planning And Archaeology
- Planning Advice Note 3/2010: Community Engagement

Marine Licensing Guidance

6.2.10 The Scottish Government has published several documents providing guidance on Marine Licensing, Marine Licensable Activity and activities subject to pre-application consultation. The key guidance document, “Marine Scotland – General Guidance For Applicants” is designed to help anyone who plants to carry out a licensable marine activity within Scottish waters and can help to determine if a marine licence is required for an activity. It also describes other relevant permits and assessment requirements.

6.2.11 The following guidance and advice documents are considered to be of relevance to the proposed development and have been considered where appropriate in undertaking this EIAR.

- Marine Scotland – Guidance for Marine Licence Applicants (2015)
- Guidance on Marine Licensable Activities subject to Pre-Application Consultation
- Advertising Marine Licence Applications

6.3 Other National Policies, Advice and Guidance

Transport Scotland National Transport Strategy 2

6.3.1 The National Transport Strategy 2 (NST2) was first published in February 2020, with the first NS2 Delivery Plan published in December 2020. These plans create an ambitious vision for Scotland’s transport system covering the next two decades and focuses on investment in public transport and supporting active travel. The strategies seek to address the four priorities of reducing inequalities taking climate action, delivering inclusive economic growth and improving health and wellbeing.

Scotland's National Marine Plan (2015)

6.3.2 The *Scotland National Marine Plan* provides a comprehensive overarching framework for all marine activity. The plan covers the management of both Scottish inshore waters (out to 12 nautical miles) and offshore waters (12 to 200 nautical miles) and was adopted in 2015.

6.3.3 This Plan does not replace or remove existing regulatory regimes or legislative requirements. Rather it provides a consistent framework for their continued operation. This plan should be applied proportionately, taking account of the potential scale of impact of any proposal as well as the sensitivity of the environment and/or any potential social or economic effect under consideration. Marine and terrestrial planning processes are both intended to deliver the Scottish Government's 'Purpose' of creating a more successful country, with opportunities for all to flourish through increasing sustainable economic growth. Most development and use which takes place in the marine environment also has an onshore component or implication. Alignment between marine and terrestrial planning is important and should be achieved through consistency of policy guidance, plans and decisions.

6.3.4 Marine licenses are required for certain activities in the marine area, such as most deposits in, and removal from the sea and seabed; construction works; dredging and the use of explosive require a marine license. This plan and regional plans must be taken into account when licensing applications are considered.

6.3.5 Scotland's vision for the marine environment is "clean, healthy, safe, productive and diverse seas; managed to meet the long term needs of nature and people". Chapter 13 Shipping, Ports, Harbours and Ferries outlines several objectives and policies. Notably Objective 3 is "safeguarded essential maritime transport links to islands and remote mainland communities". Objective 2 is "Sustainable growth and development of ports and harbours as a competitive sector, maximising their potential to facilitate cargo movement, passenger movement and support other sectors."

Historic Environment Policy for Scotland 2019

6.3.6 Historic Environment Policy (HEP) is a policy statement directing decision-making that affects the historic environment. It is relevant to a wide range of decision-making at national and local levels. It is supported by detailed policy and guidance. HEPS is a material consideration for planning proposals that might affect the historic environment, and in relation to listed building consent and scheduled monument consent.

6.4 The Development Plan

Shetland Local Development Plan (2014)

6.4.1 The Shetland Local Development Plan (LDP) 2014 was adopted by Shetland Islands Council on 26th September 2014 and is the established planning policy for Shetland. The council is currently drafting the next Local Development Plan 'LDP2' which is expected to be adopted by the end of the year. At present, alongside NPF4, the Local Development Plan is a key document for determining all types of development in Shetland.

6.4.2 The LDP 2014 outlines the vision for Shetland:

6.4.3 "*Work together for a future that is better and brighter. In particular, we aim to create a secure livelihood, look after our stunning environment and care well for our people and our culture."* Shetland Resolution (2004)

6.4.4 The LDP notes land use planning can assist in achieving the Shetland Resolution by means such as;

- *Enhancing existing communities throughout Shetland by encouraging sustainable economic development to create strong, healthy, vibrant communities where diversity is recognised and celebrated, ensuring they are attractive and inclusive places to live*
- *Supporting new and existing sustainable economic opportunities, including employment, housing, transport, communications and community facilities.*
- *Supporting better access across the Islands, in particular supporting sustainable and active transport solutions, such as by foot, cycle and public transport, and enabling people to access services, employment and other opportunities.*

6.4.5 The LDP 2014 has three general policies which provides high level guidance in respect of assessing all development within Shetland:

GP1 Sustainable Development:

6.4.6 Development will be planned to meet the economic and social needs of Shetland in a manner that does not compromise the ability of future generations to meet their own needs and to enjoy the area's high quality environment. Tackling climate change and associated risks is a major consideration for all development proposals. New residential, employment, cultural, educational and community developments should be in or adjacent to existing settlements that have basic services and infrastructure in order to enhance their viability and vitality and facilitate ease of access for all. This will be achieved through Allocations, Sites with Development Potential and Areas of Best Fit.

GP2 General Requirements for All Development Applications

6.4.7 Development for new buildings or for the conversion of existing buildings should meet a range of general requirements, such as

- Not adversely affecting the integrity or viability of sites designated for their landscape and natural heritage value
- Minimising use of energy and adapting to impacts arising from climate change
- Providing suitable surface water drainage
- Ensuring the development does not adversely areas, buildings or structures of archaeological, architectural or historic interest
- Being consistent with National Planning Policy, other Local Development Plan policies and Supplementary Guidance

GP3 All Development: Layout and Design

6.4.8 All new development should be sited and designed to respect the character and local distinctiveness of the site and its surroundings. The proposed development should make a positive contribution to:

- maintaining identity and character
- ensuring a safe and pleasant space
- ensuring ease of movement and access for all
- a sense of welcome
- long term adaptability, and
- good use of resources

6.4.9 The table below outlines the other key policies within the Shetland LDP 2014 relevant to the proposal:

LDP Policy	Summary
NH1 International and National Designations	Requires that any development likely to have a significant effect on an internationally important site, (Special Area of Conservation (SAC), Special Protection Areas (SPA) or Ramsar Sites) are subject to an assessment of the implications for the site's conservation objectives. Development affecting these areas will only be permitted if it not will adversely affect the integrity of the site, there are no alternative solutions and any adverse effects are clearly outweighed by social, environmental or economic benefits of national importance.
NH2 Protected Species	Requires that development does not have any significant detrimental impact on protected species and that a plan is provided to avoid or mitigate any adverse impacts on the species. Development likely to have an adverse effect on protected species will only be permitted in exceptional circumstances.
NH4 Local Designations	Development affecting a local Nature Conservation Site or Local Landscape area will only be permitted if it does not adversely affect the integrity of the area or any such effects are clearly outweighed by social, environmental or economic benefits.
NH7 Water Environment	Development will only be permitted where appropriate measures are taken to protect the marine and freshwater environments to an extent that is relevant and proportionate to the scale of development. Development adjacent to a watercourse or water body must be accompanied by sufficient information to enable a full assessment of the likely effects. Where there is potential for the development to have an adverse impact the applicant/developer must demonstrate that: • There will be no deterioration in the ecological status of the watercourse or water body; • It does not encroach on any existing buffer strips and that access to these buffer strips has been maintained; and • Both during the construction phase and after completion it would not significantly affect: o Water quality flows in adjacent watercourses or areas downstream o Natural flow patterns and sediment transport processes in all water bodies or watercourses. It is a key objective of the Scottish River Basin Management Plan and the Shetland Area Management Plan that water bodies and watercourses achieve good ecological status and that there is no deterioration in the current ecological status. The water environment includes burns, rivers, ponds, lochs, wetlands, standing, tidal or coastal waters as well as

LDP Policy	Summary
	ground water. A water body is generally defined as still water e.g. lochs and ponds and a watercourse as moving water e.g. burns and rivers.
HE1 Historic Environment	The Council should presume in favour of the protection, conservation and enhancement of all elements of Shetland's historic environment, which includes buildings, monuments, landscapes and areas
HE2 Listed Buildings	Development affecting a listed building, or its setting, should preserve the building, its setting, and any features of special architectural or historic interest that it possess. The layout, siting and design of any should development should be appropriate to the character and appearance of the listed building and its setting.
HE4 Archaeology	Scheduled monuments and other identified nationally important archaeological resources should be preserved in situ, and within an appropriate setting. Developments should not be permitted if it would have an adverse effect on scheduled monuments or the integrity of their settings unless there are exceptional circumstances. Where preservation is not possible, developments must undertake appropriate excavation, recording, analysis, publication and archiving in advance of or during development.
CST1 – Coastal development	Proposals for developments and infrastructure in the coastal zone (above Mean Low Water Mark of Ordinary Spring Tides) will only be permitted where the proposal does not have a significant impact on the water environment, marine resources and ecology. The location, scale and design of the development must be appropriate. All proposals will be assessed against the Shetland Islands Marine Spatial Plan
TRANS1 – Integrated Transport	The Council will support proposals that sustain and development the economy of Shetland through maintaining an appropriate level of accessibility by sea and support the provision and improvement of public transport services.
TRANS2 – Inter Island Links	The council is committed to supporting and safeguarding Shetland's ferry services and associated infrastructure. Developments that could prejudice a transport route, or access to it, or its operation will not be permitted.

LDP Adopted Supplementary Guidance

Shetland Island's Marine Spatial Plan (2015)

6.4.10 The Shetland Island's Marine Spatial Plan (SIMSP) was adopted as supplementary guidance to the Shetland Local Development Plan 2014. It sets out policies for the marine environment, marine related developments and activities. It is to read in conjunction with the policies in the LDP and any other relevant supplementary guidance. The SIMSP policies and maps are a material consideration in any marine applications made to Shetland Islands Council and Marine Licence Applications. Any development proposal with a land-based element must consider the impacts on the terrestrial environment, its infrastructure and local community, as well as the implications on the marine environment.

6.4.11 The planning area includes all territorial waters seaward of the mean high water of the spring tide (MHWS), out to 12 nautical miles but also includes terrestrial and coastal habitats / ecological processes that are clearly affected by marine use. The LDP policies for land-based planning extend to mean low water springs (MLWS), while the SIMSP policies extend seaward from mean high water springs (MHWS) therefore physically overlapping over the coastal zone. This overlap ensures that marine and land planning will address the whole of the marine and terrestrial environments respectively, and not be restricted by an artificial boundary at the coast.

6.4.12 Policy MSP TRANS1 recognises the positive impacts created by port and harbour-related development in respect of local, regional and national economic and social benefits. This policy will consider port and harbour related development favourably if it is compliant with all the policies outlined within the SIMSP framework and has addressed the individual and cumulative effects of the proposed development.

Shetland Island's Regional Marine Plan (Amended draft, 2021)

6.4.13 The Shetland Islands Regional Marine Plan (SIRMP) (2021) was submitted as an amended draft in April 2021 to Scottish Ministers for adoption and publication. The plan is currently with Scottish Ministers but is yet to be adopted. This plan builds upon the 4th edition of SIMSP which was adopted as supplementary guidance to Shetland Islands' Council Local Development Plan in 2015. Once adopted the SIRMP 2021 will the replace the SIMSP 2015 and will form a stand-alone Plan for Shetland's marine environment. It will be a material consideration in the determination of applications and work licenses.

6.4.14 The Shetland Islands' Marine Spatial Plan (SIMPSP, 2015) was previously incorporated in the Local Development Plan as supplementary guidance, As such, the SIMSP policies and maps continues to be a material consideration in any marine planning and works license applications made to Shetland Islands Council.

6.4.15 Scotland's National Marine Plan seeks to maintain efficient and economically viable vessel movements within and around Scotland's marine area and supports essential maritime links to and from island and remote mainland communities. The SIMRP will facilitate the objectives of the National Marine Plan by supporting the sustainable development of ferry links and associated infrastructure.

6.5 Habitats Regulation Appraisal

6.5.1 Article 6(3) of the EC Habitats Directive requires that any plan (or project), which is not directly connected with or necessary to the management of a European site, but would be likely to have a significant effect on such a site, either individually or in combination with other plans or projects, shall be subject to an 'appropriate assessment' of its implications for the European site in view of the site's conservation objectives. The plan-making body (in this case Shetland Islands Council) shall agree to the plan only after having ascertained that it

will not adversely affect the integrity of the sites concerned, unless in exceptional circumstances whereby the provisions of Article 6(4) are met.

Local Nature Conservation Sites

6.5.2 The purpose of Local Nature Conservation Sites (LNCS) is to highlight sites with important natural heritage to developers and the Council. In identifying LNCS the Council does not seek to prohibit development; they provide more information to ensure that development takes into account the important and sensitive features of these sites. However, there may be occasions where development would be considered inappropriate and would not be permitted.

6.5.3 The introduction of an LNCS system will help to protect Shetland's natural heritage and contribute to natural heritage and other important objectives, such as those of the tourism sector. This guidance is intended as a tool in helping an applicant navigate their way through the requirements of Policy NH4 Local Designations, with regard to LNCS.

6.6 Summary

6.6.1 This chapter has set out the relevant national and local planning policy context as well as the planning and marine consenting regimes against which the Proposed Development will be assessed. Policy assessments relevant to each EIA discipline are presented in **Chapters 7-14**.

6.7 References

- Historic Environment Scotland, 2019, Historic Environment Policy for Scotland
- Great Britain Parliament, 1997, The Town and Country Planning (Scotland) Act 1997 (Section 35B)
- Scottish Parliament, 2010, The Marine (Scotland) Act 2010
- Scottish Parliament, 2013, The Marine Licensing (Pre-application Consultation) (Scotland) Regulations 2013
- Scottish Parliament, 2013, The Town and Country Planning (Development Management Procedure) (Scotland) Regulations 2013 (Regulations 4-7)
- Scottish Parliament, 2017, The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017
- Shetland Islands Council, 2014, Shetland Islands Council Local Development Plan (adopted September 2014)
- Shetland Islands Council, 2015, Local Nature Conservation Sites (adopted 2015)
- Shetland Islands Council, 2015, The Shetland Islands' Marine Spatial Plan (adopted 2015)
- Shetland Islands Council, 2015, The Shetland Islands' Marine Spatial Plan – Habitats Regulation Appraisal (adopted 2015)
- Shetland Islands Council, 2021, The Shetland Islands' Regional Marine Plan (amended draft, 2021)
- The Scottish Government, 2000, Planning Advice Note 60: Natural Heritage
- The Scottish Government, 2005, Planning Advice Note 75: Planning for transport
- The Scottish Government, 2006, Planning Advice Note 51: planning, environmental protection and regulation
- The Scottish Government, 2010, Planning Advice Note 3/2010: Community engagement
- The Scottish Government, 2011, Planning Advice Note 2/2011: Planning and archaeology

- The Scottish Government, 2015, Planning Circular 1/2015: relationship between the statutory land use planning system and marine planning and licencing
- The Scottish Government, 2015, Scottish Government Flood risk: planning advice
- The Scottish Government, 2015, Scotland's National Marine Plan
- The Scottish Government, 2017, Planning Circular 1/2017: Environmental Impact Assessment regulations
- The Scottish Government, 2022, National Planning Framework 4
- Transport Scotland, 2020, National Transport Strategy 2
- The Scottish Government, 2015, Marine Scotland – General Guidance for Applicants
- The Scottish Government 2015, Marine Scotland – Guidance on Activities Subject to Pre-Application Consultation

7 Archaeology and Heritage

7.1 Introduction

7.1.1 This chapter is to consider the potential effects on cultural heritage and archaeology associated with the Proposed Development (the Fair Isle Harbour Improvement Works, centred on National Grid Reference HZ 22498 72527), and will be structured as follows:

- An overview of legislation, national and local planning policies in relation to the historic environment that are considered relevant to the Proposed Development.
- A statement on methodology outlining the study area, the baseline data collection, the assessment undertaken and its limitations.
- A description of the Site, the surrounding area and baseline evolution.
- The embedded mitigation strategy.
- Assessment of likely effects on designated and non-designated heritage assets according to construction, operation and demolition.
- A description of the further mitigation and enhancement measures proposed.
- The potential residual effects to the historic environment according to construction and operation, and if appropriate, the monitoring of significant adverse effects should any be identified.
- An assessment of any potential cumulative effects arising as a result of the Proposed Development.
- A summary of the consultation undertaken with the Regional Archaeologist for Shetland Amenity Trust to discuss requirements for further archaeological work.
- A chapter summary.

7.1.2 This assessment has been carried out by members of the Archaeology and Heritage Team at Stantec (Emily Carroll, Archaeology and Heritage Consultant, and Matthew Town, Principal Archaeologist). In accordance with Regulation 18(5) of the Town and Country Planning (Environmental Impact Assessment) Regulations 2017, as amended, a statement outlining the relevant expertise and qualifications of competent experts appointed to prepare this ES is provided in **Appendix A.3**. This chapter is also supported by a Historic Environment Desk-Based Assessment (HEDBA), which is included in the Planning Application Documents. All heritage assets referred to in the text include asset numbers, which also relate to the gazetteer in the HEDBA (**Appendix A.7**).

7.2 Policy Context, Legislation, Guidance and Standards

7.2.1 The following section sets out legislation, national and local planning policies in relation to the historic environment, which have been taken into consideration during this assessment and are considered relevant to the Proposed Development.

Legislation

- Ancient Monuments and Archaeological Areas Act (1979);
- Planning (Listed Buildings and Conservation Areas) (Scotland) Act (1997);
- Marine (Scotland) Act (2010); and
- Historic Environment (Scotland) Act (2014).

Planning Policy

- Historic Environment Policy for Scotland (HEPS) (2019);
- Scottish Planning Policy (SPP) (2020): Valuing the Historic Environment Paragraphs 135-151; and
- Shetland Islands Council Local Development Plan (adopted 2014): Historic Environment (HE1 to HE6).

7.2.2 The SPP defines the historic environment as the physical evidence for human activity that connects people with place linked with the associations we can see, feel, and understand. It states that '*the historic environment is a key cultural and economic asset and a source of inspiration that shall be seen as integral to creating successful places*'. Paragraphs 135 to 151 deal with the historic environment, which includes ancient monuments; archaeological sites and landscape; historic buildings; townscapes; parks, gardens and designed landscapes; and other features.

7.2.3 The Historic Environment Policy for Scotland (HEPS) (2019) sets out how the Scottish Government's policy for decision making that affects the historic environment should be interpreted and implemented. The policies for managing the historic environment favour protection, understanding and promotion of the historic environment, as well as the preservation of the benefits of the historic environment for future generations. The following policies are relevant to this assessment:

- HEP1: Decisions affecting any part of the historic environment should be informed by an inclusive understanding of its breadth and cultural significance;
- HEP2: Decisions affecting the historic environment should ensure that its understanding and enjoyment as well as its benefits are secured for present and future generations;
- HEP3: Plans, programmes, policies and strategies, and the allocation of resources should be approached in a way that protects and promotes the historic environment. If detrimental impact on the historic environment is unavoidable, it should be minimised. Steps should be taken to demonstrate that alternatives have been explored and mitigation measures should be put in place;
- HEP4: Changes to specific assets and their context should be managed in a way that protects the historic environment. Opportunities for enhancement should be identified, where appropriate. If detrimental impact on the historic environment is unavoidable, it should be minimised. Steps should be taken to demonstrate that alternatives have been explored, and mitigation measures should be put in place; and
- HEP5: Decisions affecting the historic environment should contribute to the sustainable development of communities and places.

7.2.4 Shetland Islands Council Local Development Plan (adopted 2014) contains six historic environment policies, and states that "*Shetland Island Council is in favour of the protection, conservation and enhancement of all elements of Shetland's historic environment, which includes ancient monuments, archaeological sites and landscapes, historic buildings, townscapes, gardens and designed landscapes and marine heritage.*" Proposals that have an adverse effect on Scheduled Monuments and designated wrecks or the integrity of their settings should not be permitted unless there are exceptional circumstances. All other significant archaeological resources should be preserved *in situ* wherever feasible. Where preservation *in situ* is not possible the planning authority should ensure that developers undertake appropriate archaeological excavation, recording, analysis, publication and archiving in advance of and/ or during development.

Standards and Guidance

- Chartered Institute for Archaeologists (CIfA) 'Standards and Guidance for Historic Environment Desk-Based Assessments (as revised 2020);
- Design Manual for Roads and Bridges (DMRB) 'LA 106 - Cultural Heritage Assessment' (2020);
- Historic Environment Scotland 'Managing Change in the Historic Environment: Asset Management' (2019);
- Historic Environment Scotland 'Managing Change in the Historic Environment: Setting' (2020); and
- Historic Environment Scotland 'Managing Change in the Historic Environment: Works on Scheduled Monuments' (2020).

7.2.5 Historic Environment Scotland's *'Managing Change in the Historic Environment: Setting'* (2020) provides guidance for managing change within the settings of heritage assets, including archaeological remains and historic buildings, sites, areas, and landscapes. It defines setting as *'the way the surroundings of a historic asset or place contribute to how it is understood, appreciated, and experienced'* (HES, 2020). The guidance further notes that '*planning authorities must take into account the setting of historic assets or places when drawing up development plans and guidance, when considering various types of environmental and design assessments/statements, and in determining planning applications*' (*ibid*).

7.2.6 The extent of setting is not fixed, and elements of setting can provide both positive and negative contributions to the significance of an asset. Views are often referred to when describing an asset's setting, which allows for a relatively concise way of articulating the asset's physical surroundings and how the setting is experienced or appreciated. These are not the only factors in identifying how the setting contributes to an asset, however, other considerations include the asset's physical elements as well as perceptual and associational attributes relating to its surroundings.

7.2.7 This chapter assesses the effects of the Proposed Development upon designated and non-designated heritage assets and their settings. The surroundings of each heritage asset or heritage asset group is described, considering aspects such as location and orientation of the heritage asset, obvious views or vistas, additional screening through small scale topographic variation and vegetation, how much change to the historic setting has occurred, integrity of the setting, topography, land-use, and inter-visibility to other contemporaneous and related heritage assets. All these aspects are considered in relation to how they affect the understanding, appreciation and experience of the heritage asset. This chapter also assesses the potential impact that the Proposed Development may have upon archaeological remains where present and sets out an approach to mitigate these impacts.

Consultation

7.2.8 The Regional Archaeologist for Shetland Amenity Trust was consulted by the Stantec Archaeology and Heritage Team for comment regarding the identified designated and non-designated built heritage assets that have the potential to be affected by the Proposed Development, as part of the assessments undertaken for the Scoping Report in 2022 (**Appendix A2** Stantec, 2022).

7.3 Methodology

Study Area

7.3.1 A 1km study area around the Site has been used to identify designated and non-designated heritage assets, which might be affected by the Proposed Development and to inform the historic and archaeological background of this chapter.

Baseline Data Collection

7.3.2 Information concerning designated and non-designated heritage assets, as well as previous archaeological investigations, within the 1km study area was ascertained from the following sources:

- National Record of the Historic Environment (NRHE - Canmore) as maintained by Historic Environment Scotland for all designated and non-designated heritage assets.
- Historic Environment Record (HER) data maintained by Shetland Amenity Trust (SAT).
- Historic Environment Scotland online Search for a Scheduled Monument tool.
- Marine Scotland Historic Marine Protected Areas (HMPAs).
- National Library of Scotland First and Second Edition Ordnance Survey maps.
- Other freely available online repositories including Archaeological Data Service, Britain from Above, LiDAR finder, Google Earth and Heritage Gateway.
- Relevant primary and secondary sources, including published and unpublished reports relating to previous archaeological investigations and ground investigation works considered relevant.

Site Visit

7.3.3 The assessment was also informed by a site visit that was carried out in July 2022 by Stantec. Photographs from this are included within the HEDBA and were used to inform settings assessments.

Assessment of Likely Effect

7.3.4 An assessment of likely effect has been undertaken as part of the assessment for this chapter. The assessment includes an understanding of the value of the heritage assets within the proposed study area, undertaken on a five-point scale (Very High, High, Medium, Low, Negligible). Heritage assets are given weight through the designation process. Designation ensures that sites and places are recognised by law through the planning system and other regulatory processes. The level of protection and how a site or place is managed varies depending on the type of designation and its laws and policies. Assessment of value was therefore based mainly upon existing designations but allowed for professional judgement where features were found, which did not have any formal national or local designation. Heritage significance is the sum of the heritage interests (historic, architectural, artistic and archaeological) that are recognised within an asset, including the contribution of the setting of an asset to that significance. An assessment of the nature and extent of this significance is established through the collection and collation of baseline data, followed by consideration of each heritage asset's significance through professional judgement and experience.

7.3.5 The assessment of the setting of cultural heritage assets, including contribution to their historic legibility and capacity for change, was undertaken based on the guidance contained in Historic Environment Scotland 'Managing Change in the Historic Environment: Setting' (2020). The criteria used to assess the value of cultural heritage assets is presented in Table

7.1. This was derived from Table 3.2N in DMRB (LA 104) and incorporates more detailed descriptions used in the previous version of DMRB (HA 208/07) (Highways Agency, 2007) specific to cultural heritage. Whilst this was created specifically for road schemes, the criteria provide the means to gauge and assign value to cultural heritage assets affected by any type of development in a consistent way. Whilst the revised version of DMRB (2020) supersedes the previous version, the criteria tables used in the former version (2007) provide a greater level of detail specific to cultural heritage and have therefore been adopted in this assessment.

Table 7-1: Criteria for Grading the Value of Heritage Assets

Value (sensitivity) of receptor/ resource	Archaeological remains	Built heritage	Historic landscapes
Very High (international)	▪ World heritage sites ▪ Archaeological sites of acknowledged internal importance ▪ Assets that can contribute significantly to acknowledged international research objectives	▪ Structures inscribed as being of universal importance as world heritage sites ▪ Other buildings recognised as internationally important	▪ World heritage sites inscribed for their historic landscape qualities ▪ Historic landscapes of international value, whether designated or not ▪ Extremely well-preserved historic landscapes with exceptional coherence, time depth or other critical factor(s)
High (national)	▪ Scheduled Monuments (including proposed sites) ▪ Undesignated archaeological remains of schedulable quality and importance ▪ Assets that can contribute significantly to acknowledge national research objectives	▪ Scheduled Monuments with standing remains ▪ Grade A and B listed buildings ▪ Other listed buildings that can be shown to have exceptional qualities in their fabric or historical associations not adequately reflected in the listing grade ▪ Conservation areas containing very important buildings	▪ Designated historic landscapes of outstanding interest ▪ Undesignated landscapes of outstanding interesting ▪ Undesignated landscapes of high quality and importance and of demonstrable national value. ▪ Well preserved historic landscapes exhibiting considerable coherence, time-depth or other critical factors
Medium (national/regional)	▪ Archaeological remains that contribute towards regional research objectives	▪ Grade C listed buildings ▪ Historic unlisted buildings that can be shown to have exceptional qualities in their fabric or historical associations ▪ Conservation areas containing buildings that contribute significantly to the historic character	▪ Designated special historic landscapes ▪ Undesignated historic landscapes that would justify special historic landscape designation, landscapes of regional value ▪ Averagely well-preserved historic landscapes with reasonable coherence, time-

Value (sensitivity) of receptor/ resource	Archaeological remains	Built heritage	Historic landscapes
		▪ Historic townscape or built-up areas with important historic integrity in their buildings or built settings (e.g., including street furniture and other structures)	depth or other critical factors
Low (regional/local)	▪ Archaeological remains of local importance. ▪ Archaeological remains compromised by poor preservation and/or poor survival of contextual associations ▪ Archaeological remains of limited value, but with potential to contribute to local research objectives	▪ 'Locally listed' buildings ▪ Historic unlisted buildings of modest quality in their fabric or historical association ▪ Historic townscape or built-up areas of limited historic integrity in their buildings or built settings (e.g., including street furniture and other structures)	▪ Robust undesignated historic landscapes ▪ Historic landscapes with importance to local interest groups ▪ Historic landscapes whose value is limited by poor preservation and/or poor survival of contextual associations
Negligible (local)	▪ Assets with very little or no surviving archaeological interest	▪ Buildings of no architectural or historical note; buildings of an intrusive character	▪ Landscapes with little or no significant archaeological interest

Magnitude of Impact

7.3.6 Magnitude of impact is the degree of change that would be experienced by a cultural heritage asset and its setting during the construction and operation of the Proposed Development, as compared with a *'do nothing'* scenario. Magnitude of impact is assessed without reference to the value of the cultural heritage asset and could include physical impacts upon the cultural heritage asset or impacts on its setting. Direct is used where the impact could cause a physical change to an asset through removal, disturbance or material change of the asset's fabric (which could impact heritage significance). Indirect is used where the impact could cause a non-physical change to a heritage asset through an alteration to its setting, which could impact heritage significance. Effects may be temporary or permanent, direct, or indirect and may be adverse, beneficial or may result in no change.

7.3.7 This chapter assessed the magnitude of impact using a five-point scale (Major, Moderate, Minor, Negligible and No Change). The assessment has been based on professional judgement and follows criteria provided in DMRB (LA 104). Factors in the assessment of the magnitude of impact for all cultural heritage assets are presented in Table 7.2.

Table 7-2: Magnitude of Impact and Typical Descriptors

Magnitude of impact (change)		Typical description
Major	Adverse	▪ Change to most or all key historic landscape elements, parcels or components; extreme visual effects; gross change of noise or change to sound quality; fundamental changes to use or

Magnitude of impact (change)		Typical description
		access; resulting in total change to historic landscape character unit ▪ Change to most or all key archaeological materials, such that the resource is totally altered. Comprehensive changes to setting ▪ Change to key historic building elements, such that the resource is totally altered. Comprehensive changes to the setting
	Beneficial	▪ Large scale or major improvement of resource quality; extensive restoration; major improvement of attribute quality
Moderate	Adverse	▪ Changes to many key historic landscape elements, parcels or components, visual change to many key aspects of the historic landscape, noticeable differences in noise or sound quality, considerable changes to use or access; resulting in moderate changes to historic landscape character ▪ Changes to many key archaeological materials, such that the resource is clearly modified. Considerable changes to setting that affect the character of the asset ▪ Change to many key historic building elements, such that the resource is significantly modified. Changes to the setting of a historic building, such that it is significantly modified
	Beneficial	▪ Benefit to, or addition of, key characteristics, features or elements; improvement of attribute quality
Minor	Adverse	▪ Changes to few key historic landscape elements, parcels or components, slight visual changes to few key aspects of historic landscape, limited changes to noise levels or sound quality; slight changes to use or access: resulting in limited changes to historic landscape character ▪ Changes to key archaeological materials, such that the asset is slightly altered. Slight changes to setting ▪ Change to key historic building elements, such that the asset is slightly different. Change to setting of an historic building, such that it is noticeably changed
	Beneficial	▪ Minor benefit to, or addition of, one (maybe more) key characteristics, features or elements; some beneficial impact on attribute or a reduced risk of negative impact occurring
Negligible	Adverse	▪ Very minor changes to key historic landscape elements, parcels or components, virtually unchanged visual effects, very slight changes in noise levels or sound quality; very slight changes to use or access; resulting in a very small change to historic landscape character ▪ Very minor changes to archaeological materials or setting ▪ Slight changes to historic buildings elements or setting that hardly affect it

Magnitude of impact (change)		Typical description
	Beneficial	▪ Very minor benefit to or positive addition of one or more characteristics, features or elements
No change		▪ No loss or alteration of characteristics, features or elements; no observable impact in either direction

Significance of Effect

7.3.8 The significance of effect for the heritage assets has been determined as a combination of the assessment of the value of the heritage asset (Table 6.1) and the magnitude of impact. This is achieved using professional judgement informed by the matrix illustrated below in Table 7.3. Five levels of significance (Substantial, Major, Moderate, Minor or Negligible) are defined, which apply equally to adverse and beneficial impacts. Where two significances of impacts are given in the table (for example neutral or slight) professional judgement has been used and fully explained to suggest the most likely significance of impact in addition to the worst-case scenario. A significance of effect of Moderate or above is taken to be significant in the context of EIA Regulations.

Table 7-3: Significance of Effect Matrix

		Magnitude of impact (degree of change)				
		No change	***Negligible***	***Minor***	***Moderate***	***Major***
Environmental value (sensitivity)	***Very High***	Negligible	Minor	Moderate or Major	Major or Substantial	Substantial
	High	Negligible	Minor	Minor or Moderate	Moderate or Major	Major or Substantial
	Medium	Negligible	Negligible or Minor	Minor	Moderate	Moderate or Major
	Low	Negligible	Negligible or Minor	Negligible or Minor	Minor	Minor or Moderate
	Negligible	Negligible	Negligible	Negligible or Minor	Negligible or Minor	Minor

Cumulative Effects

7.3.9 Cumulative impacts may occur where archaeological heritage assets also have the potential to be impacted by other existing, consented and/or proposed developments or activities. It is necessary to consider whether the effects of other schemes in conjunction with the Proposed Development would result in additional cumulative change upon heritage assets, beyond the levels predicted for the Proposed Development within this chapter. Only those assets judged to have potential to be subject to significant cumulative effects will be included in the assessment.

Mitigation

7.3.10 Planning policies and guidance express a general presumption in favour of preserving heritage remains *in situ* with any mitigation response being designed to acknowledge the potential impacts to heritage assets by the Proposed Development and to avoid, minimise or offset such impacts where possible.

7.3.11 A statement of the proposed mitigation applicable to the identified impacts follows the assessment. The main mitigation would be through design. Direct impacts may also be mitigated by means of '*preservation by record*' (archaeological excavation and recording), probably through a watching brief. This, however, would be a less desirable alternative to preservation *in situ* (SPP 2020, paras 137, 150).

Assumptions and Limitations

7.3.12 Data used to compile this report consists of secondary information derived from a variety of sources. The assumption is made that this data, as well as that derived from other secondary sources, is reasonably accurate.

7.3.13 The records held by the SAT HER are not a record of all surviving heritage assets, but a record of the discovery of a wide range of archaeological and historical components of the historic environment, usually driven by development in a particular area. The information held within them is not complete and does not preclude the subsequent discovery of further heritage assets that are, at present, unknown, notably buried assets.

7.4 Baseline Conditions

Designated Heritage Assets

7.4.1 The designated heritage assets are examined in reference to three sub-topics, which are defined as:

- Built Heritage: Architectural, designed or other structures with a significant historical value (Listed Buildings);
- Archaeological Remains: The material remains of human activity from the earliest periods of human evolution to the present (Scheduled Monuments); and
- Historic Landscapes: The current landscape, whose character is the consequence of the action and interaction of natural and/or human factor (Registered Parks and Gardens of Special Historic Interest, Conservation Areas, or World Heritage Sites).

Built Heritage

7.4.2 Listed buildings in Scotland are graded as follows:

- Category A: Buildings of special architectural or historical interest, which are outstanding examples of a particular period, style or building type;
- Category B: Buildings of special architectural or historic interest, which are major examples of a particular period, style or building type; and
- Category C: Buildings of special architectural or historic interest, which are representative examples of a period, style or building type.
- There is one Category C Listed Building, a Shetland böd (LB44541, HER 7897, NRHE 232125) within the study area. The building was used to house fishermen and their gear during the fishing season and is a rare survivor of this traditional Shetland building practice.

Archaeological Remains

7.4.3 Scheduled Monuments in Scotland are nationally important sites or monuments that are given legal protection by being placed on a list by Historic Environment Scotland. Four Scheduled Monuments were identified within the study area:

- A small hand-operated crane of iron construction (SM6589);
- Landberg fort, South Haven (SM2082);
- Burn of Furse to Homis Dale, settlement and burnt mounds (SM6588) – part; and
- Burn of Gilsetter, burnt mound and mills (SM6590) – part;

7.4.4 The crane lies within the Site boundary. During the surveys conducted to accompany the Scoping Report (2022), it was identified that the crane had been removed from the pier, and subsequent enquiries have confirmed that this occurred in the last 2-3 years on Health and Safety grounds, as it was collapsing and a potential risk to shipping in the harbour. The whereabouts of the crane was not confirmed, although it is believed the crane was taken off the Island. This event has now been reported to Historic Environment Scotland by Shetland Islands Council, and at the time of writing resolution of this issue has not been confirmed. Despite the removal of the crane, the Scheduling details that the crane itself '*and the surface of the pier into which it is set*' forms part of the Scheduling, which includes a notional circle of 5m from the centre of the Scheduled Monument. Therefore, despite the absence of the crane, the Scheduled Monument remains a significant constraint. The latter two Scheduled Monuments are screened from view by low rises in the topography, and therefore no impact on their setting and significance is predicted; these are accordingly scoped out from further assessment.

Historic Landscapes

7.4.5 Historic landscapes refer to Registered Parks and Gardens of Special Historic Interest, Conservation Areas, or World Heritage Sites. There are no Historic Landscapes identified within the study area and Historic Landscapes are accordingly scoped out from further assessment.

Non-Designated Heritage Assets

Prehistoric Period (700,000 BC – AD 43)

7.4.6 Fair Isle is roughly equidistant between Orkney and Shetland, lying 43km north-east of North Ronaldsay, and therefore served as an important staging post for the northerly transmission of cultural influences from one island group to the next (Hunter ,1996, p.4). The earliest archaeological find recorded on Fair Isle is a Mesolithic flint core axe (3568) discovered in 1945 near North Haven. The SAT HER notes another flint core (1358) uncovered at Eas Brecks, while a lithic scatter was found at Bu Ness (1728), although these are recorded as undated.

7.4.7 Neolithic evidence on Shetland includes houses, field systems and burial cairns, indicating a well-organised society (Hunter, 1996, p.4). Long earthen boundaries have been identified winding across the landscape, and similar land divisions have been identified on Fair Isle, confirming a clear shift towards animal husbandry and cultivation on the island, although none were identified in the Study Area.

7.4.8 At Eas Brecks, Bronze Age evidence includes two-celled houses at Ferny Cup (1329; 1333; 1342), which are associated with a complex landscape of dykes and lynchets, some forming enclosures (1318; 1319; 1321; 1323), clearance cairns, burnt mounds, and possible burial cairns (Hunter, 1996, p.49). The burnt mounds at Ferny Cup (1295; 1296; 1327) and Burn Furse (5630) comprise small burnt stones piled in kidney- or crescent-shaped arrangements, produced because of the quenching of fire-heated stones in an earthfast tank, suggested to have been employed for cooking, tanning, preparing cloth or even used as primitive saunas (Hunter, 1996, p.57).

7.4.9 Some of the burnt mounds had a secondary use as burial monuments. Definitive burial monuments are scarce on Fair Isle, but possible examples were recorded at Gilsetter (1289), Eas Brecks (1338; 1339; 1340), Ruskilie (1347; 1679), and Bu Ness (1732; 1735). Bu Ness promontory was traditionally associated with burial practices (Hunter, 1996, p.83), where a cist (1741) measuring 2.5m by 1.5m has been identified close to the Site. Cists are typically small, stone boxes or ossuaries in which human remains are buried. Often found in association with funerary monuments or accompanied by graves goods, these features have also been recorded at neighbouring Orkney and were most common during the Bronze Age period when funerary customs moved away from megalithic sites to small cist burials (Dalland *et al*., 1999).

7.4.10 Few Iron Age sites are recorded on Fair Isle, and no broch sites known, the local geology being unsuitable for their construction. Iron Age sites that have been recorded include Landberg fort at North Haven (SM2082, HER 1740, NRHE 3815), a small promontory fort that dates to the middle-late Iron Age (c. 100 BC to c. 500 AD). It is situated 250m south-east of the development boundary and was excavated between 1996 and 1997. The fort is defined by ramparts with medial ditches that cut off the base of an elongated triangle, the other two sides being defined by the edges of cliffs. Access to the interior was by means of a narrow causeway leading through to the interior of the fort. Recent archaeological investigations in advance of the rebuilding of the Fair Isle Bird Observatory in 2020, also uncovered Iron Age remains (Val Turner *pers. comm.*).

7.4.11 On the basis of the current evidence, there is considered to be a moderate potential for archaeological remains of a prehistoric date to survive within the Site.

Romano-British Period (AD 43 – 410)

7.4.12 The SAT HER does not record any Roman or Romano-British sites or finds within the study area, and the potential for these to be recovered during the works are low to negligible.

Medieval Period (AD 410 – 1600)

7.4.13 In the mid-9th century, Fair Isle, along with Shetland and Orkney, came under Viking influence. Norse settlers referred to Fair Isle as '*Fridarey*' meaning the island of peace (Hunter, 1996, p.108). According to the *Orkneyinga Saga* a beacon was placed on Fair Isle, most likely on Ward Hill, and would have been used to raise the alarm when invaders were spotted, with corresponding beacons at Sumburgh and North Ronaldsay to pass the message onward (Hunter, 1996, p.27). The Saga suggests the island was largely uninhabited at this time, and whilst some farming communities would have been likely on the island, these remain archaeologically invisible (Hunter, 1996, p.114), The SAT HER does not record any medieval finds, features or deposits within the study area, and the likelihood of archaeological remains of this date to exist within the Site is low to negligible.

Post-Medieval Period (AD 1600 – 1901)

7.4.14 Fair Isle remained as a Norse Earldom until 1469, when it was absorbed into the Kingdom of Scotland. In 1588 there were only 16 households recorded on the island (Hunter, 1996, p.119). Following the end of Scandinavian rule, Fair Isle, along with much of Scotland, was bought up by Scottish Lairds, who extracted rent from tenants, and in the 18th century, fishing was included in the rental agreements, with the lairds receiving fish in return for necessities, thus introducing debt and ensuring dependency. This tied system led to a combination of poverty, famine, and disease, especially where bad harvests resulted in poor returns, and in Scotland this eventually led to the Highland Clearances in the 18th century.

7.4.15 In the late 19th century, with the introduction of the Crofter's Act of 1886, the situation improved, with crofters provided with individual crofts typically measuring 2-5 hectares in size. Better quality lands were reserved for forage, arable and vegetable production, while

poorer hill ground crofts were usually employed as common grazing for cattle and sheep. Fish remained hugely important to the economy and were dried in skeos (from the Scandinavian *skja*(*a*) meaning shed or shelter), small loose stone structures through which the wind could blow. Bu Ness is identified as the location of two skeos through place-name evidence (Hunter, 1996, p.147). Evidence for agricultural activity on the isle takes the form of several planticrubs (1301; 1302), small, square enclosures typically built from stone that were used for growing root crops (Canmore, 2022). Extensive rigg and furrow, as well as field systems (1742; 1745) are also recorded, undated but typical of medieval and post-medieval farming practices.

7.4.16 By the post-medieval period, Fair Isle was a firmly established shipping port between the Northern Isles, Scotland, and Norway. Fair Isle's dangerous coastline and volatile weather conditions resulted in many shipwrecks. Upwards of 1500 ships and boats have been recorded as lost in territorial waters around Shetland and Fair Isle, almost 9% of the Scottish total, and the remains of more than 180 wrecks are known to survive on the seabed.

7.4.17 Accounts of the island dating to the 18th and 19th centuries suggest that the harbour at North Haven was secondary to South Harbour on the south side of the island, and significantly undeveloped, only really being used by small boats, probably due to the strength of the north-east wind (Hunter, 1996, p.32). The development of the harbour is unclear, but very little is shown in terms of infrastructure until the early 20th century, when a 'pier' is depicted on Ordnance Survey mapping, which corresponds with the concrete harbour south of the current pier structure, incorporating the post-medieval hand crane (Scheduled Monument SM6589 – see Section 4. Baseline Conditions – Designated Heritage Assets). The pier structure itself was opened in 1959, and the harbour then developed through the 20th century with the addition of a further concrete harbour north of the pier structure. The noust, and breakwater were constructed in the later 20th century.

7.4.18 On the basis of the current evidence, there is judged to be a moderate to high potential for archaeological remains of a post-medieval date to survive within the Site.

Modern (1901 – Present)

7.4.19 Fair Isle also played an important role in the First and Second World Wars, with troops from both navy and army stationed there. In the First World War the islands were a staging post for North Sea convoys and played a vital role in the blockade of Germany. During the Second World War, the Royal Air Force built a radar station on top of Ward Hill during the Battle of the Atlantic. Military installations are recorded around Bu Ness (HER 1733, NRHE 330297) and North Haven (HER 1680, HER 1681, HER 1682), most are now little more than earthworks. A military camp was located just south of the harbour (NRHE 174319) at the west end of the narrow isthmus between Bu Ness and the rest of Fair Isle, recorded on RAF aerial photographs from 1945. The camp consisted of at least 16 huts and was presumably built to accommodate military personnel based at Ward Hill. None of these sites lie within the development boundary and are likely to be affected by the development, although the camp lies close to the south-western edge of the boundary and its exact extent is not known.

7.4.20 On the basis of the current evidence, there is judged to be a moderate potential for archaeological remains of a modern date to survive within the Site.

Undated

7.4.21 The SAT HER returned a total of 60 undated records, including 14 linear earthworks that appear to have functioned as small boundaries to headlands or peninsulas. This was done usually through the setting of large stones where gaps were infilled with turf and small stones, sometimes reworking the positions of earlier boundaries. At Bu Ness (1737), an earthwork cuts across a natural constriction within the landscape. The suggestion is that the linear earthworks served as enclosures for livestock, with some form of stockading on top,

but this explanation is not suitable for every earthwork recorded, and some of the boundaries show a less functional origin or purpose, however, and are more enigmatic.

7.5 Assessment of Likely Effects

7.5.1 The EIA Scoping report (Stantec, 2022) identified six heritage assets, which had the potential to receive effects from the Proposed Development, which was confirmed following the completion of the HEDBA and this assessment. These are listed in the following table and discussed below:

Table 7-4: Identified heritage assets which will receive effects

Heritage Asset Number	Name	Designation	Importance
SM2082	Landberg Fort	Scheduled Monument	High (national)
SM6589	North Haven Crane	Scheduled Monument	High (national)
LB44541	Shetland böd	Category C Listed Building	Medium (national/regional)
1732	Cist	Non-designated	Medium (national/regional)
174319	WWII camp	Non-designated	Low (regional/local)
96475	Pier	Non-designated	Low (regional/local)

7.5.2 Assessments of importance are based on the criteria set out in Table 7.1.

Embedded Mitigation

7.5.3 The assessment of effects has been based on the final Proposed Development, which has evolved through a number of design iterations in response to environmental and technical constraints. The final Proposed Development has therefore embedded design-based mitigation in order to avoid heritage assets wherever possible and to reduce the magnitude of direct impacts where heritage assets cannot be completely avoided.

Built Heritage

7.5.4 One designated built heritage asset (Category C listed building) was identified within the 1km Study Area and located 150m west of the development boundary. The building, a Shetland böd (LB44541, HER 7897, NRHE 232125), is a rare survivor of this traditional Shetland building practice. The Site will form part of the building's setting, and consideration will need to be given as to how the Proposed Development affects its significance during construction and operation phases.

7.5.5 Several non-designated built heritage assets have also been identified within the Site. Non-designated built heritage assets include the pier, which dates to the 19th century, and a crane, which is a Scheduled Monument (SM6589) (nationally designated, see Archaeological Remains section below).

Construction

7.5.6 The designated built heritage asset (Shetland böd) has the potential to receive indirect effects resulting from the construction phase of the Proposed Development. Potential indirect impacts that could arise include:

- The introduction of construction activities and infrastructure in key views from/towards the building; and

- An increase in activities, light, pollution and movement within the setting of the building from construction.
- The non-designated built heritage asset (the pier - 96475) has the potential to be directly affected (demolished or damaged) by the construction phase of the Proposed Development.

Operation

7.5.7 The designated built heritage asset (Shetland böd LB44541, HER 7897, NRHE 232125) has the potential to receive direct effects resulting from the operation phase of the Proposed Development. Potential impacts that could arise include:

7.5.8 Movement and vibrations from increased traffic affecting the material integrity and setting of the heritage asset.

7.5.9 Any of the potential non-designated built heritage assets, not already impacted during the construction phase have the potential to be directly affected (demolished or damaged) by the operation phase of the Proposed Development.

7.6 Archaeological Remains

7.6.1 There are designated archaeological remains (Scheduled Monuments) within the Site, a small hand-operated crane of iron construction (SM6589, HER 1957, NRHE 122228, possibly also NRHE 96474), which will be directly affected by the Proposed Development (the crane itself has been removed, but the position of the crane remains a Scheduled Monument). The setting of further archaeological remains (Scheduled Monuments) at Landberg fort (SM2082, HER 1740, NRHE 3815), a small promontory fort 250m south-east of the development boundary, could be affected by the development and consideration will need to be given as to how the Proposed Development affects its significance during construction and operation phases.

7.6.2 Several non-designated archaeological remains are recorded within the vicinity of the Site, and there is also a potential for parts of the Site to contain, as yet unknown, below-ground archaeological deposits. These archaeological remains could date from the prehistoric to modern periods. Within close proximity to the Site is a prehistoric kerbed cairn (HER 1732, NRHE 330299) and a WWII camp (NRHE 174319); the extent of the latter is unknown, and it may encroach on the development boundary. Several non-designated shipwrecks are also located close to the harbour, albeit poorly located, and could be affected by dredging within the harbour around the proposed pier extension and linkspan, or marine boreholes and vibrocores.

Construction

7.6.3 Any ground-breaking works associated with construction of the Proposed Development, or activities resulting in ground disturbance, have the potential to disturb or destroy heritage assets including buried archaeological remains. Other activities, such as vehicle movements or the storage of construction materials within the Site's working areas also has the potential to cause direct, adverse, permanent, and irreversible effects on heritage assets. Potential impacts on the designated assets that could arise include:

- Direct – the Scheduled crane (SM6589, HER 1957, NRHE 122228, possibly also NRHE 96474) could be demolished or damaged by the construction phase of the Proposed Development. The setting of the crane could also be directly affected, damaging its significance.
- Indirect – the setting of the promontory fort (SM2082, HER 1740, NRHE 3815) could be affected by changes caused by the construction phase of the Proposed Development.

- Potential impacts on the non-designated assets that could arise include:
- Direct - groundworks associated with the construction phase of the Proposed Development, including for any temporary infrastructure, will remove any archaeological remains/deposits present within their footprint, resulting in a permanent direct adverse effect upon the archaeological resource.

Operation

7.6.4 Potential impacts on the designated assets that could arise include:

- Direct – the Scheduled crane (SM6589, HER 1957, NRHE 122228, possibly also NRHE 96474) could be affected by increased vibration and pollution (dust, fumes) during the operational phase of the Proposed Development. The setting of the crane could also be directly affected, damaging its significance.
- Indirect – the setting of the promontory fort (SM2082, HER 1740, NRHE 3815) could be affected by the operational phase of the Proposed Development.

Scale and Significance of Impact

Landberg Promontory Fort and the Böd

7.6.5 The Site, as it currently exists, is part of the historic undeveloped landscape forming part of the wider setting of the listed Shetland böd (LB44541) and Landberg fort (SM2082) and, as such, is considered to make a slight positive contribution to their heritage significance. The proposed changes to the noust, quayside and breakwater will result in very minor changes to the existing uniformly low-lying landscape. However, they will not obscure any key views, for example, between the monuments and/or the coastline and will only affect a small part (relatively) of a much wider vista.

7.6.6 The Proposed Development will not have any direct impact upon the monuments. The construction of the Proposed Development will have an indirect, slight adverse impact upon the setting of the monument, resulting from visual changes/intrusion to their wider settings. However, it is considered that any permanent visual impact will be negligible. It is not expected that there will be any audible impact associated with the construction of the Proposed Development, due to the distance between the monuments and the Site. It is therefore considered that there will be an overall indirect, slight temporary adverse effect and indirect negligible permanent adverse effect upon the heritage significance of the monuments.

North Haven Crane

7.6.7 The Site includes the position of the former North Haven Crane (SM6589, HER 1957, NRHE 122228, possibly also NRHE 96474), a Scheduled Monument. As such, the harbour and quayside are considered to contribute to the heritage significance of this asset. The proposed refurbishment of the quayside and breakwater will result in changes to the form of the harbour itself; however, the legibility of this historic structure has already been compromised by its removal. Despite this, the position of the crane remains Scheduled, and construction works could result in the alteration of associated harbour infrastructure, although it is acknowledged that any tangible physical connection between the remains of the crane and the harbour itself have already been lost.

7.6.8 It is not anticipated that the position of the crane will be directly impacted as a result of the Proposed Development (providing appropriate precautionary measures are taken to avoid any accidental damage during works). However, the construction of the Proposed Development will have an indirect, moderate permanent adverse impact upon the setting of the crane resulting from the enlargement of the breakwater, noust, and alterations to the

quayside. Temporary construction works may also be visible from the position of the crane; however, this will have no more than a negligible impact. Overall, it is considered that there will be an indirect, moderate permanent adverse effect upon the heritage significance of the crane.

Archaeological Remains

7.6.9 The Site, specifically the southern half, has an identified potential to contain buried stratified archaeological remains. Construction activities associated with the Proposed Development have the potential to have a direct permanent adverse impact (damage or remove) on any archaeological remains present within their footprint, including:

- Removal of topsoil and subsoil associated with temporary compound facilities, temporary and permanent access routes, and any other areas of associated infrastructure;
- Alterations to the historic harbour, including repairs to the pier, increase in the size of the existing cradle, noust, slipway, and winch to accommodate larger vessels, as well as increasing the existing breakwater; and
- Any other intrusive groundworks.

7.6.10 The potential for major, permanent effects associated with the damage to and/or removal of archaeological remains will be offset by mitigative works appropriate to the scale of the Proposed Development, as determined by further evaluative works and in agreement with the Shetland Amenity Trust (SAT) (see Archaeological Mitigation section below).

Mitigation

7.6.11 DMRB guidance describe mitigation as a hierarchy of measures: avoidance and prevention, reduction, compensatory/remediation (offset) measures. Avoidance, prevention, and reduction measures can be achieved through design, whilst compensatory/remediation measures offset impacts that have not been prevented or reduced. National planning policies and planning guidance, as well as local planning policies require that account be taken of the potential effects upon heritage assets by proposed developments and where possible such effects be avoided. Where avoidance is not possible effects should be minimised or offset.

Development Design

7.6.12 The Proposed Development has been designed to give due consideration to environmental constraints, including technical effects. Direct physical impact on all sites of cultural heritage interest identified in this assessment will be avoided where possible. Effects to setting will be minimised through careful design of the proposed works to minimise the effects on the promontory fort, and an exclusion zone can be included to minimise direct impacts to the site of the crane.

7.7 Archaeological Mitigation

7.7.1 Discussions with the Regional Archaeologist for Shetland Amenity Trust confirmed the requirement for a full desk-based assessment (covered in the HEDBA) and walkover survey, the results of which would inform a Written Scheme of Investigation for mitigation of the works. A subsequent meeting confirmed that the walkover survey was for the land surrounding the noust, in particular, to examine the location of a cist (1741) located on the edge of the redline boundary, which is much wider than the extent of the proposed works. As the works on the noust are to be excavated from the interior it was agreed that a walkover survey of the Site could be shelved due to the logistics of getting to the island in the autumn and winter months, provided the redline boundary was brought in tight to the edges of the works, which was agreed with the design engineers.

7.7.2 The mitigation for noust is likely to include a watching brief during excavation, and any other intrusive groundworks as part of the Proposed Development. A WSI will be prepared for the works to set out procedures for managing any features that appear to be of archaeological importance that are discovered in the course of construction works to the noust. The WSI will ensure compliance with the relevant legislation and will be finalised and agreed in consultation with SAT prior to construction works.

7.8 Residual Effects

7.8.1 The residual effect is defined as what remains following the application of mitigation and management measures, and construction has been completed. It is thus the final level of impact associated with the Proposed Development.

Construction

7.8.2 The Proposed Development has been designed to avoid direct impacts on known heritage assets where possible. The completion of the programme of archaeological mitigation works set out above would offset the loss of any archaeological remains associated with the non-designated cist (1741) that could be directly impacted by the construction of the noust. The completion of the archaeological mitigation programme outlined above would minimise the loss of the archaeological resource that could occur as a result of the construction of the Proposed Development through preservation by record of the archaeological resource and the dissemination of archaeological knowledge, and the residual effect on the cist and other potential buried remains that may survive within the development area would be direct and of minor adverse significance, not significant. No significant residual effects are anticipated in relation to direct effects from the construction of the Proposed Development.

Operation

7.8.3 As mitigation measures will be taken to reduce impacts on designated assets through development design, no operational impacts are anticipated.

Cumulative Effects

7.8.4 No cumulative effects are anticipated from the construction and operation of the Proposed Development. Any potential effects are considered to be low to negligible, and therefore not significant.

7.9 Summary

7.9.1 This Chapter has identified the archaeological and heritage value of the Study Area and has assessed the likely significant effects on archaeological features and heritage assets resulting from the construction and operation of the Proposed Development. This Chapter has also identified measures that should be taken to mitigate predicted likely significant adverse effects and reports on the residual effects of the Proposed Development on heritage assets. The Chapter is supported by a Historic Environment Desk-Based Assessment (HEDBA) which is included within the Planning Application Documents and will be used as the primary document for further consultation with the Regional Archaeologist for Shetland Amenity Trust to discuss requirements for further archaeological work.

7.9.2 Impacts upon the setting of designated heritage assets have generally been mitigated through the design process. A review of the Shetland Amenity Trust Historic Environment Record (SAT HER) database within 1km of the Site (the study area) has identified four scheduled monuments and one Category C Listed Building. It has been established that the Proposed Development will have an indirect, slight adverse impact upon the setting of the Scheduled Monument, Landberg Promontory Fort (SM2082, HER 1740, NRHE 3815) and the Category C listed Böd (LB44541, HER 7897, NRHE 232125). It is anticipated that the

works will also result in an indirect, moderate permanent adverse effect upon the heritage significance of the hand-operated Scheduled crane (SM6589, HER 1957, NRHE 122228, possibly also NRHE 96474) previously located at North Haven Harbour ahead of removal. The removal of the Scheduled Monument has been reported to Historic Environment Scotland by Shetland Islands Council, and at the time of writing resolution of this issue has not been confirmed. No other impacts on designated heritage assets are anticipated.

7.9.3 Non-designated heritage assets within the Study Area range from prehistoric to post-medieval or modern in date. Where possible, the Proposed Development has been designed to avoid direct impacts upon known heritage features within the Site. Within close proximity to the Site is a prehistoric kerbed cairn (HER 1732, NRHE 330299) and a WWII camp (NRHE 174319); the extent of the latter is unknown, and it may encroach on the development boundary. Discussions with the Regional Archaeologist for Shetland Amenity Trust confirmed a watching brief would be required during any intrusive groundworks as part of the Proposed Development. A WSI will be prepared for the works to ensure compliance with the relevant legislation and will be finalised and agreed in consultation with SAT prior to construction works.

7.9.4 The possibility of cumulative effects has been assessed. No significant cumulative effects were identified.

7.9.5 Overall, this assessment has not identified any overriding historic environment constraints that would prohibit or substantially impact the Proposed Development. The Site is considered to have low to moderate potential for significant archaeology remains, although the possibility for further non-significant finds, features and/or deposits to be present cannot be ruled out.

7.10 References

British Geological Survey (BGS) *Geology of Britain 3D Viewer* http://mapapps.bgs.ac.uk/geologyofbritain3d/ [Accessed November 2022].

Canmore, 2022. Planticrub. Available at: PLANTICRUB | Canmore [Accessed December 2022].

Crash Site Orkney, 2022. Radar and Anti-Aircraft defences of Fair Isle. Available at: Radar and Anti Aircraft defences on Fair Isle - CRASHSITEORKNEY [Accessed December 2022].

Dalland, M., Barber, J., Carter, S., Clarke, A., Dixon, D., Lorimer, A.H., Kibble, H., McKinley, J.I., Macsween, A., Mills, A.M., Powers, A.H., Tipping, R., Tomlinson, P., Watson, P., Wiltshire, P., 1991. Sand Fiold: The Excavation of an Exceptional Cist in Orkney. *Proceedings of the Prehistoric Society*, 65, 373-413.

Fair Isle, 2022. Fair Isle. Available at: About - Fair Isle. [Accessed December 2022].

Hunter, JR (1996). Fair Isle: The Archaeology of an Island Community. National Trust for Scotland.

Kerrie, M (2016) The Romans in Shetland. Unpublished document. Available at: https://radioshetland.co.uk/docs/The_Romans_in_Shetland.pdf [Accessed November 2022].

Shetland Heritage, 2022. Fair Isle. Available at: Fair_Isle.pdf (shetland-heritage.co.uk) [Accessed December 2022].

Stantec, 2022. Fair Isle Harbour Improvement Works: Environmental Impact Assessment Scoping Report. Unpublished Report.

Guidance

Chartered Institute for Archaeologists (CIfA) ‘Standards and Guidance for Historic Environment Desk-Based Assessments (as revised 2020).

Design Manual for Roads and Bridges (DMRB) ‘LA 106 - Cultural Heritage Assessment’ (2020)

Historic Environment Policy for Scotland (HEPS) (2019).
Historic Environment Scotland ‘Managing Change in the Historic Environment: Asset Management’ (2019);

Historic Environment Scotland ‘Managing Change in the Historic Environment: Setting’ (2020); and

Historic Environment Scotland ‘Managing Change in the Historic Environment: Works on Scheduled Monuments’ (2020).

Scottish Planning Policy (SPP) (2020).

Shetland Islands Council Local Development Plan (adopted 2014).

Legislation

Ancient Monuments and Archaeological Areas Act (1979).

Historic Environment (Scotland) Act (2014).

Marine (Scotland) Act (2010).

Planning (Listed Buildings and Conservation Areas) (Scotland) Act (1997).

8 Terrestrial Biodiversity

8.1 Introduction

8.1.1 This chapter presents the findings of the assessment of the construction and operation of the Fair Isle Harbour Improvement Works (hereafter referred to as the Proposed Development) on terrestrial biodiversity. This chapter outlines legislative, policy framework and guidance, describes the assessment methodology, study area, baseline conditions. An overview of potential impacts is provided, along with mitigation measures, likely residual effects, monitoring and a summary of the main issues and steps taken to avoid them.

8.1.2 The Proposed Development is located within land encompassed by the planning application boundary, hereafter referred to as 'the Site'.

8.1.3 This chapter has been prepared by Stantec. In accordance with Regulation 18(5) of the Town and Country Planning (Environmental Impact Assessment) Regulations 2017, as amended, a statement outlining the relevant expertise and qualifications of competent experts appointed to prepare this ES is provided in **Appendix A.3**.

8.1.4 This chapter should be read in conjunction with Environmental Statement (ES) **Figures A8.1 – A8.2** within **Appendix 8** of the ES.

8.2 Policy Context, Legislation, Guidance and Standards

8.2.1 This assessment has been undertaken considering current legislation, together with national, regional and local plans and policies. A list is provided below and further detail regarding policy can be found in the Chapter 6 – Planning and Policy Context.

- Conservation (Natural Habitats, &c) Regulations 1994
- Wildlife and Countryside Act 1981
- Nature Conservation (Scotland) Act 2004 (as amended)
- Wildlife and Natural Environment (Scotland) Act 2011

8.3 Consultation

8.3.1 Consultation and engagement has informed the biodiversity assessment. Responses to the *Fair Isle Harbour Improvement Works Environmental Impact Assessment Scoping Report* (Stantec 2022) are set out in the *Scoping Opinion on the Environmental Impact Assessment (EIA) to upgrade the existing harbour* (Shetland Islands Council, June 2022). Other relevant consultation / engagement undertaken is set out below in **Table 8.1.**

Table 8-1:Summary of Consultation

Reference	Summary of discussion	Response from NatureScot
Meeting with NatureScot 05 July 2022	The proposed widening of the 'Noust', needed to house the larger boat, is likely to result in unavoidable loss of 'vegetated sea cliffs', an Annex 1 habitat and qualifying feature of the Fair Isle SAC. Effects to the cliff vegetation will be temporary and vegetation will recolonise. Loss of clifftop habitats will be permanent. As such, the HRA Stage 1 screening is likely to conclude 'likely significant effects' and the HRA will move to 'Stage 2 Appropriate Assessment'. Loss of habitats during construction will be minimised as far a practical, with construction methodology influenced by the known ecological sensitivities. Vegetated sea cliffs is not a rare habitat and can be found across much of Shetland. Given the small area of permanent loss, this loss unlikely to result in an adverse impact on the integrity of the Fair Isle SAC. In addition, Stantec will explore potential options for mitigation/offset e.g through removal of wartime structures and reestablishment of semi-natural vegetation. Rock faces of the widened Noust should be left rough to allow recolonisation of vegetation.	Although there is no definitive definition of 'adverse impacts on site integrity' you should try and avoid (or at least confine any losses to absolute bare minimum) any net loss of qualifying habitat. The assessment should take into consideration whether or not it is a 'priority habitat', as well as the factors we discussed and that you've outlined below.
Email to NatureScot 25 August 2022	Within the EIA Scoping Opinion (2022), NatureScot requested 'a vegetation survey of the area likely to be affected'. Stantec undertook a habitat survey of terrestrial habitats likely to be affected by the Proposed Development in July 2022. This survey provided information sufficient to classify habitats in accordance with Phase 1 and UKhab methodologies, and confirms habitats constitute qualifying habitat of the Fair Isle SAC. Stantec also have desk study data including a floristic survey of Fair Isle from 2016. It is assumed this level of information is sufficient to inform the EIA and HRA, and that no further detailed botanical surveys are required.	Within an email reply on 25 August 2022 NatureScot confirmed that this data should be sufficient to inform the EIA and HRA.

Reference	Summary of discussion	Response from NatureScot
Meeting with NatureScot 03 March 2023	Discussed expansion of noost would result in overall loss of 0.1ha of SAC habitat. This has been reviewed in context of SAC Conservation Objectives, and given overall habitat loss relative to the SAC as a whole is negligible (0.08%) and likely to be smaller than fluctuations in overall SAC habitat area attributed to natural processes such as grazing and coastal erosion, it is not considered that this loss would either: prevent the achievement of maintaining conservation status, or prevent the overall maintenance of site integrity of the Fair Isle SAC. NatureScot comfortable with overall approach to assessment, but would need to review final assessment and review internally before providing NatureScot approval for the HRA. Potential for temporary storage of rock generated from expansion of Noost adjacent to buildings in North Haven. Stantec to arrange habitat survey to further understand quality of habitats in this area. Fair Ilse wren – potential effects and approach to avoidance/mitigation set out in previous emails. Mitigation measures will be summarised in the HRA and ES, and set out in full with a Construction Bird Management Plan to be secured through planning condition.	Within an email reply on 03 March 2023 NatureScot confirmed that they were in agreement with the summary.

8.4 Methodology

Study Area

8.4.1 Due to differing zones of influence (ZoI) over which biodiversity receptors may be subject to impacts and subsequent effects, both during construction and operation, a range of study areas has been used. Selection of the study areas has been informed by and is in accordance with the Guidelines for Ecological Impact Assessment in the UK and Ireland (CIEEM, 2018).

8.4.2 For the desk study, the following study areas from the Site have been used:

- 1km radius for protected or notable species records
- 1km radius for notable habitats
- 2km radius for designated areas
- 10km radius for internationally designated areas such as Special Areas of Conservation (SAC), Special Protection Areas (SPAs), and Ramsar sites

8.4.3 The study area used to collect terrestrial habitat data comprised all land within the Site, and up to 100m from the Site where appropriate.

8.4.4 These study areas are considered sufficient to fully understand the baseline conditions to appropriately inform the assessment of potential effects to biodiversity receptors.

Baseline Data Collection

8.4.5 Data in relation to the Proposed Development was requested from Shetland Biological Records Centre (SBRC) in September 2022. This included biological records in relation to notable habitats and species.

8.4.6 In addition to data from the local records centre, the following data sources have been used to inform the desk study:

- The Multi Agency Geographic Information for the Countryside (MAGIC), Joint Nature Conservation Committee (JNCC), and NatureScot websites[5] were used to provide information on statutory designated nature conservation areas
- Ordnance Survey mapping and aerial imagery[6] to identify broad habitat types
- Fair Isle Bird Observatory website[7] was reviewed for information on birds and other wildlife

8.4.7 A Preliminary Ecological Appraisal (PEA) was undertaken within the Site and all accessible land within a 100m radius, on the 12 and 13 July 2022. The survey was undertaken in line with Guidelines for Preliminary Ecological Appraisal (CIEEM, 2017). The PEA was extended to give particular consideration to the potential of the habitats present to support protected or otherwise notable species. Effort was also made to search for and record incidental evidence of protected/notable species where possible (e.g. bird species using the Site at the time of survey).

8.4.8 Habitats were identified and mapped following the United Kingdom Habitat Classification Assessment (UKHab) system. UKHab is a comprehensive habitat classification system which was developed due to changes over time in habitat categorisation, recording and analyses. It is best practice to map and classify habitats using standard habitat correspondence tables and covers terrestrial, freshwater and coastal ecosystems. The assessment was carried out in in accordance with The UK Habitat Classification: Habitat User Manual (Butcher, B., Carey, P., Edmonds, B., Norton, L., and Treweek, J. (2020)).

8.4.9 Due to a subsequent extension to the Site a follow up habitat survey was undertaken of grassland adjacent to buildings in North Haven on 07 April 2023.

Valuation of Ecological Features and Determining Importance

8.4.10 This Chapter is guided by best practice guidance for ecological impact assessment (EcIA) set out by the Chartered Institute of Ecology and Environmental Management (CIEEM 2018 (Version 1.1 Updated September 2019)).

[5] www.magic.gov.uk, www.jncc.gov.uk, www.naturrescot.scot, (accessed December 2022)

[6] www.bing.com/maps, www.google.co.uk/maps (accessed December 2022)

[7] https://www.fairislebirdobs.co.uk/ (accessed December 2022)

8.4.11 As detailed in **Sections 8.4.5 – 8.4.8**, the baseline conditions within the Site have been determined through data gathering undertaken during 2022 and 2023. Information obtained has been reviewed and used to inform baseline evaluation, where relevant.

8.4.12 EcIA requires an assessment of likely significant effects on important biodiversity features, and as such, does not require consideration of effects on every species or habitat that may be present. To determine whether there are likely to be significant effects, it is first necessary to identify whether an ecological feature is 'important', and therefore whether an effect upon it could be significant, and thus, material in decision-making.

8.4.13 The CIEEM Guidelines recognise that determining importance is a complex process, which is a matter of professional judgement guided by the importance and relevance of a number of factors. These include legislative protection as well as biodiversity value, potential value and secondary/supporting value. Consideration of each ecological feature having regard to these factors allows their importance to be determined, with reference to the geographic context set out below:

- International (European or Worldwide)
- National (Scotland)
- County (Shetland Islands)
- Local (Fair Isle)
- Site
- Negligible (or likely absent)

8.4.14 Only those features of Local value or above and identified as being of sufficient value to be material to decision-making, will be classified as being ‘Important Ecological Features’ and taken forward assessment. Those ecological features that require legal compliance, irrespective of their importance, will also be considered. A general duty to conserve all biodiversity where possible (CIEEM 2018) will form part of the approach to mitigation.

Assessment

8.4.15 This Chapter is guided by best practice guidance for ecological impact assessment (EcIA) set out by the Chartered Institute of Ecology and Environmental Management (CIEEM 2018 (Version 1.1 Updated September 2019)).

8.4.16 In accordance with the CIEEM guidelines the terminology used within this Chapter draws a clear distinction between the terms ‘impact’ and ‘effect’, as the terms are often used synonymously and this can lead to confusion. For the purposes of this Chapter these terms will be defined as followed:

- Impacts: Actions resulting in changes to an ecological feature. For example, the construction activities of a development removing a hedgerow.
- Effects: Outcome to an ecological feature from an impact. For example, the effects on a dormouse population from a loss of a hedgerow.

8.4.17 This Chapter examines effects on important ecological features with regard to the positive (beneficial) or negative (adverse) nature, extent, magnitude, duration, timing, frequency, and reversibility of the impacts, taking account of the embedded mitigation included within the application. For each ecological feature identified as being important, relevant impacts have been characterised; effects defined (in light of any embedded ecological mitigation or standard working measures) and their significance assessed. Further mitigation has then been identified and residual effects have also been reported.

8.4.18 The potential for significant effects arising from construction and operation of the Proposed Development, will be addressed in the assessment. The CIEEM Guidelines state that: 'a sequential process should be adopted to avoid, mitigate and compensate negative ecological impacts and effects'. This is often referred to as the 'Mitigation Hierarchy':

8.4.19 Minimising direct impacts arising from land-take and managing construction and operation in order to avoid or minimise indirect effects will reduce the potential for likely significant impacts on ecological features.

8.4.20 Mitigation and enhancement and/or monitoring, and if required compensation, will be determined in the light of the baseline information and the identified likely effects arising from the proposed development, and having regard to planning policy requirements and/or the legislative protection afforded to the ecological feature.

8.4.21 The design of the Proposed Development has been developed with the existing ecological features in mind, balancing effects on particular species or habitats through an iterative process.

8.4.22 Whilst the wider EIA uses generic criteria, the CIEEM Guidelines encourage the expression of significance of ecological effects within the geographic frame of reference relevant to the Site, as described above.

Limitations

8.4.23 This assessment is informed by a data collection exercise undertaken during 2022, which has provided a robust data set sufficient to inform this assessment. Data supplied by records centres provides useful baseline information on the species and habitats that have been recorded within a local area. This data can include surveys undertaken by third parties on an 'ad hoc' basis so may be incomplete. Absence of species records may not therefore indicate absence of that species from an area. However, Fair Isle is extremely well surveyed through the permanent presence of the observatory and ranger service, although detailed record collection was interrupted by Covid 19 and the observatory being destroyed by fire. Therefore, the assessment has been supported by variable but generally good quality desk study information.

8.4.24 Ecological surveys are limited by factors which affect the presence of plants and animals such as the time of year, migration patterns and behaviour, and therefore, the ecological survey undertaken to inform this assessment may not produce a complete list of plants and animals. The absence of evidence of any particular species should not be taken as conclusive proof that the species is not present or that it would not be present in the future. However, July is within the optimum survey period for many habitats and species and it is considered the survey is sufficient to inform the assessment.

8.5 Baseline Conditions

8.5.1 The following sections describe the baseline terrestrial conditions. Data is displayed on **Figures 8.1 – 8.2**.

Designated Areas

8.5.2 The Proposed Development is located within the Fair Isle SAC, Fair Isle SPA, and Fair Isle Site of Special Scientific Interest (SSSI), as shown on **Figure 8.1.**

Fair Isle SAC

8.5.3 The Fair Isle SAC is designated for the presence of the qualifying features 'European dry heaths' and 'vegetated sea cliffs of the Atlantic and Baltic coasts'. The sea cliff vegetation of

Fair Isle is principally oceanic and varies from spray-influenced maritime grassland swards to sub-maritime heather *Calluna vulgaris* moorland. Prostrate juniper *Juniperus communis* ssp. *nana*, now rare throughout the rest of Shetland, remains common over extensive areas of the moorland (JNCC, 2021). The SAC encompasses all terrestrial areas within the Site, excluding the existing wharf and breakwater, along with all terrestrial habitats surrounding the Site.

8.5.4 Semi-natural terrestrial habitat is present at a number of locations within the Site. Sparse vegetation is present on steep natural cliffs bordering the wharf, on artificial cliff faces created during construction of the noust, and on the rocky outcrop which forms part of the breakwater. Species were consistent with their coastal location and included thrift *Armeria maritima,* sea campion *Silene uniflora*, sea plantain *Plantago maritima*, sheep's-bit *Jasione Montana*. More common species included Yorkshire fog *Holcus lanatus*, yarrow *Achillea millefolium*, daisy *Bellis perenis* and silverweed *Potentilla anserina*. This habitat aligns with the description for UKhab habitat **Vegetated Sea Cliffs.**

8.5.5 On flatter ground above the cliffs surrounding the Noust, a similar assemblage of species created a similar although less sparse and more uniform habitat. The habitat description for UKhab habitat **Vegetated Sea Cliffs** includes the cliff top habitat where this is influenced by exposure to the sea and sea spray, as is the case in this location.

8.5.6 Two areas of grassland are also present at the west of the Site to the north and south of the access road. These habitats also closely algin with the description for UKhab habitat **Vegetated Sea Cliffs**. Whilst some indicator species of coastal grasslands, including dominant red fescue *Festuca rubra, thrift,* sea plantain, and bird's-foot trefoil *Lotus corniculatus*, it should be acknowledged that other indicator species found elsewhere in coastal grassland on Fair Isle, such as wild thyme *Thymus praecox*, spring squill *Scilla verna* and kidney vetch *Anthyllis vulneraria* were not recorded. This suggests that these areas of grassland are not of the highest quality compared to other sites within the Fair Isle SAC. Furthermore, key indicator species were found to be most abundant in a narrow zone close to the cliff edge.

8.5.7 The UKhab habitat **Vegetated Sea Cliffs** aligns with and the SAC qualifying habitat **Vegetated sea cliffs of the Atlantic and Baltic Coasts**.

8.5.8 No evidence of species assemblages that typically comprise European dry heath were identified within the Site.

8.5.9 The Fair Isle SAC is of **international** nature conservation importance.

Fair Isle SPA

8.5.10 The Fair Isle SPA is designated for a range of qualifying bird species, predominantly breeding seabirds along with one terrestrial species, the Fair Isle wren *Troglodytes troglodytes fridariensis*. The Fair Isle wren is only found on Fair Isle, and is a subspecies of the Eurasian/winter wren *Troglodytes troglodytes* commonly found across the UK.

8.5.11 The Standard Data Form for the Fair Isle SPA records a population of 33 calling males on the island. According to the Fair Isle Bird Observatory website; *the population is surveyed by counts of territorial males, and between 1950 and 2010 numbers have varied from a peak of 52 in 1964 to a low of just 10 in 1981. Between 2011 and 2017, the population has increased slightly and averaged 39 singing males.*

8.5.12 According to the Fair Isle Bird Observatory website the breeding territories of Fair Isle wren's are almost entirely confined to the island's cliffs, nesting down steep cliffs and inaccessible gullies. Very few nest inland. However, desk study records show that a territory is regularly present at North Haven where the harbour is located. Historical data and consultation with

local specialists suggest the nest location moves, but is often within the harbour behind a gabion wall, or on the Noust itself.

8.5.13 Further details on the qualifying seabirds of the Fair Isle SPA are provided within **Chapter 13 Marine Biodiversity**.

8.5.14 The Fair Isle SPA is of **international** nature conservation importance.

Fair Isle SSSI

8.5.15 The Fair Isle SSSI comprises the whole of the northern three-quarters of the island, plus the rest of the coastline, including offshore stacks. Biological reasons for designation include:

- Moorland juniper. Prostrate dwarf juniper *Juniperus communis nana*, now scarce throughout the rest of Shetland, remains common over extensive areas of the moorland. No prostrate dwarf juniper was identified within or adjacent the Site during surveys in 2022 and 2023.
- Colonies of breeding seabirds.

8.5.16 The SSSI is also notified for its plant fossils (Palaeozoic Palaeobotany) although NatureScot confirmed there would be no effects to this feature from the Proposed Development (Shetland Islands Council, June 2022) and so this is not considered further within this ES.

8.5.17 The Fair Isle SSSI is of **national** nature conservation importance. However as none of the terrestrial features of the SSSI are present within the Site, Fair Isle SSSI is not considered further within this chapter. Further details on the qualifying seabirds of the Fair Isle SSSI are provided within **Chapter 13 Marine Biodiversity**.

Terrestrial Habitats

8.5.18 Terrestrial habitats within the Site are shown on **Figure 8.2**

Notable habitats and notable plants

8.5.19 The UKhab habitat **Vegetated Sea Cliffs** / SAC qualifying habitat **Vegetated sea cliffs of the Atlantic and Baltic Coasts** is present within the Site. A description of this habitat can be found in **Section 8.5.4**.

8.5.20 Whilst the overall area of this qualifying feature of the Fair Isle SAC (129.04 ha) is of international importance, the area within the site (0.77 ha) only forms 0.59 % of the overall Fair Isle SAC habitat. This habitat is present around all coastlines of Fair Isle and much of the adjacent cliff tops, indicating it is a relatively common habitat on the island. It is also a relatively widespread habitat across Shetland[8].

8.5.21 Although a qualifying feature of the SAC, within a purely habitat context, given the extent of the habitat within Fair Isle and the wider Shetland Isle region, the area of the habitat within the Site is of **local** importance only.

8.5.22 The following records of notable plants were received from SBRC:

- Small Adder's Tongue *Ophioglossum azoricum.* Listed as Nationally Scarce, occurring in the short turf coastal grassland. Shetland and western Scotland appears to be a

[8] Meeting with NatureScot 05 July 2022

stronghold for this species in the UK with records from Fair Isle and Shetland since 2010[9].

- Frog Orchid *Coeloglossum viride*. Listed as Vulnerable and also occurring in the short coastal turf. This species is distributed across much of northern Britain, with numerous records from Fair Isle and Shetland[10].
- Oysterplant *Mertensia maritima*. Listed as Near Threatened but no longer present at this site.
- Corn Spurrey *Spergula arvensis*. Listed as Vulnerable although this is generally an arable weed. A widespread species across the UK, although has seen declines through arable intensification.
- Allseed *Radiola linioides*. Listed as Near Threatened although relatively common on Fair Isle.
- Eelgrass *Zostera marina*. Listed as Near Threatened. Record of a washed-up specimen of unknow origin.

8.5.23 Whilst none of these species were recorded within the Site during the site visits, the semi-natural habitats (**Vegetated sea cliffs of the Atlantic and Baltic Coasts)** within the site may support some of these species, although this will be restricted across much of the Site given the prevalence of hard engineered habitats. The cliff top habitats in particular may support some of these species, however given their status across Shetland and the UK, the assemblage of notable plants within the Site is considered to be of **local** importance.

Other habitats

8.5.24 Other terrestrial habitats within the Site include those that make up the access track, pier, wharf, and buildings. These align with UKhab habitats **other hard surfaced areas** and **buildings**.

8.5.25 An area of land in the west of the site includes an area of **ruderal / ephemeral** habitat in a disturbed area in front of storage buildings.

8.5.26 These habitats are considered to be of **negligible** importance.

Terrestrial Species

Bats

8.5.27 Due to it's isolated location bats are only infrequently recorded on Fair Isle. SBRC provided the following records: two records of Nathusis' pipistrelle *Pipistrellus nathusii* a single record of common pipistrelle *Pipistrellus pipistrellus*, and an unidentified bat species. All records were considered to relate to migrant bats. No bat species are known to breed on Fair Isle[11].

8.5.28 Within the Site a single permanent building is present, the winch house at the back of the Noust. This was a single-story masonry structure with a concrete slab roof. Large steel doors are present to allow access to the machinery. This building was considered to have negligible potential for roosting bats.

[9] Ophioglossum azoricum | Online Atlas of the British and Irish Flora (brc.ac.uk)

[10] Coeloglossum viride | Online Atlas of the British and Irish Flora (brc.ac.uk)

[11] www.fairislebirdobs.co.uk/bats

8.5.29 In light of the lack of regular bat records, absence of known breeding bats, and lack of potential within the site, bats are considered **likely absent** from the Site and are not considered further.

Breeding Birds

8.5.30 Fair Isle is famous for its birdlife, and according to the Fair Isle Bird Observatory website '*More species of bird have been recorded on Fair Isle than on any other piece of land of the same size in the British Isles*'. This is predominately due its isolated location resulting in the island being used as a stop off for migrating or transient birds throughout the year. In addition, the unique habitats within the island also provide breeding habitat for many notable species. The coastal habitats support thousands of breeding seabirds such as arctic tern and fulmar, whereas inland moorland habitat supports many pairs of Arctic skua and great skua.

8.5.31 Within and surrounding the Site, terrestrial habitats such as cliff faces, buildings and coastal vegetation have potential to support a range of breeding birds including rock pipit *Anthus petrosus*, pied wagtail *Motacilla alba*, starling *Sturnus vulgaris*. Starling is on the Scottish Biodiversity List of species of principal importance for biodiversity conservation in Scotland due to recent declines. However, all these species are relatively common on Fair Isle and the Site population is of **site** importance only for these species due to the very low numbers present.

8.5.32 Records indicate that a Fair Isle wren territory is regularly present at North Haven. Historical data and consultation with local specialists suggest the nest location moves, but is often within the harbour behind the gabion wall, or on the Noust. The population of Fair Isle wren is surveyed by counts of territorial males. Between 1950 and 2010 numbers have varied from a peak of 52 in 1964 to a low of just 10 in 1981. Between 2011 and 2017, the population has increased slightly and averaged 39 singing males. The SPA citation cites 33 singling males. Using the lower estimate of the SAC citation, the pair which breed within the Site constitute 3% of the SAC population and is therefore considered to be of **international** importance.

8.5.33 Further information in relation to the seabird assemblage within the Site and surrounding Study Area can be found in **Chapter 13 Marine Biodiversity**.

Invertebrates

8.5.34 Three hundred and twenty-three records of ninety six species of invertebrates were received from SBRC. These were predominantly associated with moths recorded during trapping at the Bird Observatory approximately 300m southwest of the Site. Interpretation provided by SBRC indicates none of these are noteworthy invertebrate records.

8.5.35 Semi-natural habitats within the site are likely to support an assemblage of invertebrates common to the local area, although this will be restricted across much of the Site given the prevalence of hard engineered habitats. As such the assemblage of terrestrial invertebrates within the Site is considered to be of **site** importance.

Reptiles and amphibians

8.5.36 Three records of common frog *Rana temporaria* were received from SBRC, all from a water body approximately 300m southwest of the Site. Common frog has been introduced to Fair Isle, although habitats within the Site are largely unsuitable for amphibians.

8.5.37 No records of reptiles were received from SBRC, and no reptiles are known to occur on Fair Isle.

8.5.38 As such reptiles and amphibians are considered **likely absent** from the Site and are not considered further.

Summary of Baseline

8.5.39 A summary of baseline terrestrial biodiversity receptors and their ecological importance is provided in Table 8.2 below.

Table 8-2: summary of baseline terrestrial biodiversity receptors and their ecological importance

Terrestrial Biodiversity Receptor	Ecological Importance
Fair Isle SAC	**International**
Fair Isle SPA (Fair Isle wren)	**International**
Fair Isle SSSI	**National**[12]
Notable habitats and notable plants	**Local**
Other habitats	Negligible
Bats	Likely absent
Breeding birds	**Fair Isle wren – international** Other non-seabird species – site
Invertebrates	Site
Reptiles and amphibians	Likely absent

8.5.40 As set out in **Section 8.4**, only those features of Local value or above, and so which are identified as being of sufficient value to be material to decision-making, have been classified as being 'Important Ecological Features', and are taken forward for the assessment of effects.

8.5.41 The information gained on habitats and species of site level importance is still relevant in helping meet legal and broader biodiversity policy requirements and informs the approach to mitigation.

[12] Palaeozoic palaeobotany and moorland juniper elements of the SSSI are not present within the ZoI. Fulmar and other seabird qualifying features are addressed in Chapter 13 Marine Biodiversity. As such, Fair Isle SSSI is not considered further within this chapter.

Baseline Evolution

8.5.42 The baseline provided in the above sections describes the biodiversity features as they were in 2022 and 2023. The following describes the anticipated future biodiversity baseline at the assumed start date of construction (February 2024).

8.5.43 The majority of the terrestrial habitats within the Application Boundary are either semi-natural coastal habitats or developed land. Due the unique environmental conditions there is unlikely to be any change to seminatural habitats, as the presence of these are determined by the coastal location and climate. No changes are planned for the areas of developed land.

8.5.44 At present there are no cumulative developments planned on the Island and therefore are not considered further within this ES.

8.6 Embedded Mitigation

8.6.1 In line with the mitigation hierarchy the current design has been subject to review to enable potential effects to important biodiversity receptors to be avoided where possible. This has resulted in:

- The design minimising direct loss of SAC habitats to facilitate expansion of the Noust and breakwater
- The design of breakwater minimising direct loss of fulmar nesting habitat (further details in **Chapter 13**)
- Following expansion, the sides of the Noust will be left rough to accelerate recolonisation by local vegetation

8.7 Assessment of Likely Effects

8.7.1 This section presents the assessment of effects on important terrestrial biodiversity features set out in **Section 8.5** with regard to the positive (beneficial) or negative (adverse) nature, extent, magnitude, duration, timing, frequency, and reversibility of the impacts, taking account of the embedded mitigation set out in **Section 8.6**. Impacts have been determined following a review of the description of the Proposed Development set out in **Chapter 3**.

8.7.2 For each ecological feature identified as being important, relevant impacts have been characterised; effects defined (in light of any embedded ecological mitigation or standard working measures) and their significance assessed.

8.7.3 Where, following embedded mitigation, significant effects remain, further mitigation is set out in **Section 8.8**. The significance of residual effects is then set out in **Section 8.9**.

Construction

8.7.4 The majority of potential effects are predicted to arise during the construction phase. These are described in the following sections.

Fair Isle SAC

8.7.5 Potential impacts to the Fair Isle SAC associated with the construction phase would be:

- Habitat loss or gain
- Habitat degradation

8.7.6 The expansion of the Noust required to accommodate the new larger vessel will result in the direct temporary loss of approximately 90m length of artificial cliff face within the Noust supporting SAC qualifying habitat **Vegetated sea cliffs of the Atlantic and Baltic Coasts**. Based on an approximate average cliff height of 6m this equates to approximately 540m^2 of habitat temporarily lost. The habitat here has developed on the artificial cliff faces within the Noust. As such it can be assumed that following construction, and the embedded mitigation measures set out in **Section 8.6,** the new cliff face within the Noust will also be colonised by the same vegetation and will in time support the same habitat type currently present. Given the extreme environment, new habitat is likely to take 5-10 years to fully recolonise and so this loss would result in a long-term temporary negative impact.

8.7.7 The expansion of the Noust will result in the direct loss of 1,947m^2 (0.2 ha) of SAC qualifying habitat **Vegetated sea cliffs of the Atlantic and Baltic Coasts** that is present on the clifftop.

8.7.8 The expansion of the Noust will also result in a direct increase of approximately 56m of artificial cliff face. It is assumed that the same cliff face habitat currently present within the Noust will develop here. Based on the current design the expanded Noust will have an average cliff height of approximately 10m, and an average 1:1 slope. As such this will result in a permanent increase of 790m^2 of habitat present on the cliff face.

8.7.9 The construction of the extended wharf will also result in the direct permanent loss of approximately 100m^2 (0.01ha) of SAC qualifying habitat **Vegetated sea cliffs of the Atlantic and Baltic Coasts** that is present on the stack within North Haven.

8.7.10 Overall, the balance of the direct habitat and loss verses direct habitat gain will result in a direct negative permanent impact through loss of approximately 1,257m^2 (0.1 ha). This is a small loss when considered in the context of the 129.04 ha of this habitat within the SAC. The effect of this is that the overall area of **Vegetated sea cliffs of the Atlantic and Baltic Coasts** present within the Fair Isle SAC will be reduced by 0.08%.

8.7.11 The impacts described above are incurred in an area already disturbed by the historical construction of the existing harbour and Noust, and therefore these habitats are less natural and of lower ecological value than other areas of more natural habitat within the SAC. The condition of the overall area of habitat within Fair Isle SAC is currently assessed as 'Favourable Maintained' (NatureScot 2020). The small losses described above attributed to the Proposed Development, in an area subject to historical disturbance, will not alter the condition of the overall habitat parcel within the SAC.

8.7.12 As well as habitat losses and gains, construction works (including earthworks, and spoil storage) have potential to result in short-term temporary impacts through habitat degradation. One of the options for expansion of the Noust would involve a drilling rig being present on the cliff top vegetation to drill holes in which explosives would be placed. This trafficking of a drilling rig could result in degradation of retained SAC habitat adjacent to the work. Given the localised nature of the construction work, only areas adjacent to the Noust would be at risk, likely to be less than 100m^2. Spoil storage at the west of the Site would be focused on areas of hardstanding or ephemeral vegetation, however some areas of coastal grassland may also be used.

8.7.13 In addition, construction would result in an increased risk of pollutants such as silt, dust, or petrochemical degrading retained SAC habitat adjacent to the work.

8.7.14 Whilst these short-term or medium-term temporary impacts could result in direct negative impacts, the quantum of overall habitat degraded within the SAC would be negligible and likely to be smaller than fluctuations in overall SAC habitat area attributed to natural processes such as grazing and coastal erosion.

8.7.15 A full assessment of effects on the integrity of the Fair Isle SAC is set out in a separate **Report to Inform Appropriate Assessment for Harbour Improvement Works at North Haven Bay, Fair Isle.** This concludes that there would be no adverse effect on integrity to Fair Isle SAC.

8.7.16 In light of the assessment set out above, and the conclusions of the HRA, the effects from habitat loss and habitat degradation to Fair Isle SAC of **international** importance are not significant. However further mitigation is set out within **Section 8.8** below to ensure construction is undertaken in line with best environmental practice and impacts through habitat degradation are avoided.

Fair Isle SPA (Fair Isle wren only)

8.7.17 The sections below provide an assessment of potential impacts and subsequent effects to the Fair Isle wren qualifying feature of the Fair Isle SPA. Further information in relation to potential impacts the SPA seabird assemblage can be found in Chapter 13 Marine Biodiversity.

8.7.18 Potential impacts to Fair Isle wren associated with the construction phase would be:

- Damage or destruction of active Fair Isle wren nests within the Site
- Disturbance to Fair Isle wren nesting within or adjacent to the Site
- Introduction of predatory mammals to Fair Isle

8.7.19 Fair Isle wren are known to nest behind gabion wall at the harbour, and within the Noust itself. Therefore, construction activities, particularly the expansion of the Noust, could result in damage or destruction of an active Fair Isle wren nest within the Site, if present at that time.

8.7.20 Nesting Fair Isle wrens potentially present within or adjacent to the Site could also be subject to disturbance. Given the choice of these birds to nest within an active harbour it is likely they are habituated to existing background levels of noise and visual disturbance associated with harbour activities and the movement of the boat in an out of the Noust. However, given the elevated levels of noise and visual disturbance during construction, there remains a residual risk that construction activities could disturb the birds to a point where they abandon their nest, resulting in a failed nesting attempt.

8.7.21 Given the extreme environmental weather on Fair Isle, construction work will need to be undertaken during the period March – October, which overlaps with the typical nesting period of wrens typically April – July. It is hoped that construction within the Noust will commence in March before breeding commenced, and as such this may encourage birds to nest in an alternative location outside the Site. However, this cannot be guaranteed. If a nest was damaged or destroyed, or the adults were disturbed to the extent that they abandoned the nest, the birds are likely to nest again in a different location, or certainly during the subsequent year. As such this potential direct negative impact would be short-term and temporary.

8.7.22 Construction of the Proposed Development has potential to introduce predatory mammals, such as rats, stoats or weasels to Fair Isle, if transported on boats bringing equipment or personnel to the island. If the mammals became established on the island, this impact would potentially be permanent unless they could be eradicated. Non-native predatory mammals can have severe negative effects to populations of wild birds, and if introduced on Fair Isle would have the potential to reduce the already small population of Fair Isle wrens.

8.7.23 Given the small population of Fair Isle wrens which nest within the SPA (approximately 33 pairs), effects to the Fair Isle SPA of **international** importance through damage or

destruction of active Fair Isle wren nests, disturbance of nesting adults resulting in nest abandonment, or introduction of predatory mammals to Fair Isle, would be **significant**. As such further mitigation is set out in **Section 11.8**.

8.7.24 A full assessment of effects on the integrity of the Fair Isle SPA is set out in a separate **Report to Inform Appropriate Assessment for Harbour Improvement Works at North Haven Bay, Fair Isle.** This concludes that, with the addition of secured mitigation measures, there would be no adverse effect on integrity of the Fair Isle SPA.

Notable habitats

8.7.25 Potential construction impacts to notable habitats (**Vegetated sea cliffs of the Atlantic and Baltic Coasts)** would be:

- Habitat loss or gain
- Habitat degradation

8.7.26 Impacts to this habitat type through habitat loss and gain, and habitat degradation are described fully in **Sections 8.7.5-8.7.10**. In summary, construction will result in the following direct impacts to notable habitats:

- temporarily loss of 522m^2
- permanent loss of 324m^2

8.7.27 Whilst permanent and temporary habitat loss will result in direct negative impacts, the quantum of overall habitat loss are small in the context of the Site, this is unlikely to affect the conservation status of the habitat. A such, effects from habitat loss to notable habitats of **local** importance are considered to be **not significant**.

8.7.28 As well as habitat losses and gains, construction works (including earthworks, and spoil storage) have potential to result in short-term or medium-term temporary impacts through habitat degradation. Potential impacts are described fully in **Sections 8.7.11-8.7.12**.

8.7.29 Whilst these short-term temporary impacts could result in direct negative impacts, the quantum of overall notable habitat degraded would be small. As such, effects from habitat degradation to notable habitats of **local** importance are considered to be **not significant**. However further mitigation is set out within **Section 8.8** below to ensure construction is undertaken in line with best environmental practice and impacts through habitat degradation are avoided.

Notable plants

8.7.30 Potential construction impacts to notable plants could arise through:

- loss or gain of habitats supporting notable plants
- degradation of habitats supporting notable plants

8.7.31 Impacts through habitat loss and gain and habitat degradation are described fully in **Sections 8.7.5-8.7.9**. In summary, construction will result in the following direct impacts:

- temporarily loss of 522m2 possibly containing notable plants
- permanent loss of 324m2 possibly containing notable plants

8.7.32 Whilst permanent and temporary habitat loss could result in direct negative impacts to notable plants if present, the quantum of overall habitat losses are small in the context of the Site. As such, effects to notable plants of **local** importance are considered to be **not significant**.

8.7.33 As well as loss or gain of habitats supporting notable plants, construction works (including earthworks, and spoil storage) have potential to result in short-term or medium-term temporary impacts through degradation of habitats supporting notable plants. Potential impacts are described fully in **Sections 8.7.10-8.7.11**.

8.7.34 Whilst these short-term temporary impacts could result in direct negative impacts, the quantum of overall habitat degraded would be small. As such, effects from habitat degradation to notable plants of **local** importance are considered to be **not significant**. However further mitigation is set out within **Section 8.8** below to ensure construction is undertaken in line with best environmental practice and impacts through habitat degradation are avoided.

Fair Isle wren

8.7.35 Potential impacts to Fair Isle wren associated with the construction phase would be:

- Damage or destruction of active Fair Isle wren nests within the Site
- Disturbance to Fair Isle wren nesting within or adjacent to the Site
- Introduction of predatory mammals to Fair Isle

8.7.36 Fair Isle wren are known to nest behind gabion wall at the harbour, and within the Noust itself. Therefore, construction activities, particularly the expansion of the Noust, could result in damage or destruction of an active Fair Isle wren nest within the Site, if present at that time.

8.7.37 Nesting Fair Isle wrens potentially present within or adjacent to the Site could also be subject to disturbance. Given the choice of these birds to nest within an active harbour it is likely they are habituated to existing background levels of noise and visual disturbance associated with harbour activities and the movement of the boat in an out of the Noust. However, given the elevated levels of noise and visual disturbance during construction, there remains a residual risk that construction activities could disturb the birds to a point where they abandon their nest, resulting in a failed nesting attempt.

8.7.38 Given the extreme environmental weather on Fair Isle, construction work will need to be undertaken during the period March – October, which overlaps with the typical nesting period of wrens which is typically April – July. It is planned that construction within the Noust will commence in March/April 2024 prior before breeding commenced, and as such this may encourage birds to nest in an alternative location outside the Site. However, this cannot be guaranteed. If a nest was damaged or destroyed, or the adults were disturbed to the extent that they abandoned the nest, the birds are likely to nest again in a different location, or certainly during the subsequent year. As such this potential direct negative impact would be short-term and temporary.

8.7.39 Construction of the Proposed Development has potential to introduce predatory mammals, such as rats, stoats or weasels to Fair Isle, if transported on boats bringing equipment or personnel to the island. If the mammals became established on the island, this impact would potentially be permanent unless they could be eradicated. Non-native predatory mammals can have severe negative effects to populations of wild birds, and if introduced on Fair Isle would have the potential to reduce the already small population of Fair Isle wrens.

8.7.40 Given the small population of Fair Isle wrens which nest on Fair Isle (approximately 33 pairs), effects to the Fair Isle wren of **international** importance through damage or destruction of active nests, disturbance of nesting adults resulting in nest abandonment, or introduction of predatory mammals to Fair Isle, would be **significant**. As such further mitigation is set out in **Section 8.8**.

Operation

Fair Isle SAC

8.7.41 There is potential risk of degradation of SAC habitats from pollution related to operational activities (e.g., boat maintenance) or vehicle trafficking associated with harbour operations. However, these risks are associated with ongoing harbour operations and are not attributable to the Proposed Development. As such there will be no operational impacts or subsequent effects to the Fair Isle SAC from the Proposed Development.

8.7.42 A full assessment of effects on the integrity of the Fair Isle SAC is set out in a separate **Report to Inform Appropriate Assessment for Harbour Improvement Works at North Haven Bay, Fair Isle**. This concludes that there would be no adverse effect on integrity to Fair Isle SAC.

Fair Isle SPA

8.7.43 This section provides an assessment of potential impacts and subsequent effects to the Fair Isle wren qualifying feature of the Fair Isle SPA. Further information in relation to potential impacts the SPA seabird assemblage can be found in Chapter 13 Marine Biodiversity.

8.7.44 There is potential risk of disturbance of Fair Isle wren from operational activities (e.g., boat maintenance) or vehicle trafficking associated with harbour operations. However, these risks are associated with ongoing harbour operations and are not attributable to the Proposed Development. As such there will be no operational impacts to the Fair Isle SPA from the Proposed Development.

8.7.45 A full assessment of effects on the integrity of the Fair Isle SPA is also set out in a separate **Report to Inform Appropriate Assessment for Harbour Improvement Works at North Haven Bay, Fair Isle**. This concludes that there would be no adverse effect on integrity to Fair Isle SPA.

Notable habitats

8.7.46 There is potential risk of degradation of notable habitats from pollution from operational activities (e.g., boat maintenance) or vehicle trafficking associated with harbour operations. However, these risks are associated with ongoing harbour operations and are not attributable to the Proposed Development. As such there will be no operational impacts to notable habitats from the Proposed Development.

Notable plants

8.7.47 There is potential risk of degradation of habitat containing notable plants from pollution from operational activities (e.g., boat maintenance) or vehicle trafficking associated with harbour operations. However, these risks are associated with ongoing harbour operations and are not attributable to the Proposed Development. As such there will be no operational impacts to notable plants from the Proposed Development.

Fair Isle wren

8.7.48 There is potential risk of disturbance of Fair Isle wren from operational activities (e.g., boat maintenance) or vehicle trafficking associated with harbour operations. However, these risks are associated with ongoing harbour operations and are not attributable to the Proposed Development. As such there will be no operational impacts to Fair Isle wren from the Proposed Development.

8.8 Further Mitigation and Enhancement

Fair Isle SAC / Notable habitats / Notable plants

8.8.1 Further mitigation measures will be set out in a fiEMP. The fiEMP would be secured through planning condition, and drafted in consultation with statutory bodies including NatureScot, and regular contact would be had with these parties through the subsequent detailed design and delivery (construction) phases.

8.8.2 The fiEMP will include a comprehensive package of pollution prevention measures to avoid accidental pollution events during construction. Measures could include source control, settlement tanks, silt fencing, and dust suppression. The fiEMP would be informed by Construction Industry Research and Information Association (CIRIA) guidance, in particular C532 Control of water pollution from construction sites, and C650 Environmental Good Practice on Site.

8.8.3 The fiEMP will include details of measures which will be used to protect grassland underneath temporary stockpile areas, such as geotextile membrane.

8.8.4 The fiEMP will include details on fencing of all designated areas and retained important habitat to ensure protection of from accidental damage.

Fair Isle SPA

8.8.5 Measures to protect SPA bird species (including Fair Isle wren) along with other breeding birds during the construction phase will be set out within a Construction Bird Mitigation Plan and a Biosecurity Management Plan.

8.8.6 The Construction Bird Mitigation Plan will be secured through planning condition in agreement with consultees including Nature Scot and SIC, and will include details of:

- all bird species likely to be found on site and their legal status
- construction activities which could affect birds
- pre-construction bird surveys to identify presence of nests within and adjacent to the site
- protection of nest sites during construction, including the establishment of exclusion zones where required
- ongoing monitoring of active nest sites within and adjacent to the Site and actions to be taken to avoid damage or destruction of nests, or unlawful disturbance

8.8.7 The Biosecurity Management Plan is included with **Appendix A.17**.

8.9 Residual Effects

8.9.1 As set out in **Section 8.7**, in the absence of further mitigation measures, potential construction impacts to the Fair Isle SPA of international importance and Fair Isle wren of international importance, through damage or destruction of active Fair Isle wren nests, or disturbance of nesting adults resulting in nest abandonment, would result in a significant effect to these receptors of international importance. Further mitigation measures set out in **Section 8.8** will ensure significant impacts to nesting Fair Isle wren are avoided.

8.9.2 The mitigation described in **Section 8.8** will be sufficient to reduce all effects to non-significant levels. No residual effects on important ecological features are anticipated.

8.10 Monitoring

8.10.1 Monitoring requirements will be set out in the fiEMP, Construction Bird Mitigation Plan, and the Biosecurity Management Plan **Appendix A.17**. These will be secured through planning condition in agreement with consultees including Nature Scot and SIC.

8.10.2 Key monitoring requirements during construction phase and subsequent operation will include:

- Monitoring of Fair Isle wren nests within and adjacent to the Site and actions to be taken to avoid damage or destruction of nests, or unlawful disturbance
- Monitoring for Invasive Non-native Species
- The ECoW would be present on site during key periods of the construction phase and would be required to make certain that all committed mitigation measures are adhered to.

8.11 Cumulative Effects

8.11.1 As set out in **Section 5.11**, a review of 'committed developments' was undertaken to identify major developments within 2.5km of the edge of the planning application boundary of the Site that may lead to likely significant cumulative effects with the Proposed Development. There are no planned cumulative developments that are expected to happen on Fair Isle during construction, and no mechanism for cumulative effects have been identified.

8.12 Summary

8.12.1 This chapter presents the findings of the assessment of the construction and operation of the Fair Isle Harbour Improvement Works (hereafter referred to as the Proposed Development) on terrestrial biodiversity. This chapter is guided by best practice guidance for ecological impact assessment (EcIA) set out by the Chartered Institute of Ecology and Environmental Management (CIEEM 2018 (Version 1.1 Updated September 2019)).

8.12.2 Data collection has included a desk study and field surveys undertaken between 2022 and 2023. A number of important biodiversity receptors have been identified within the study area. These include various designated areas such as the Fair Isle SAC/SPA/SSSI, and notable habitats.

8.12.3 Potential impacts from construction, and operation of the Proposed Development that could relate to important biodiversity receptors include: habitat loss and gain, habitat degradation, and damage of bird nests and disturbance to species.

8.12.4 The mitigation hierarchy has been embedded within the assessment process, whereby the design has sought to avoid adverse impacts in the first instance through an iterative approach to design, e.g. the design minimising direct loss of SAC habitats to facilitate expansion of the Noust and breakwater. In areas where avoidance is not possible, measures have been included to prevent or reduce potentially significant negative effects. Mitigation measures have been provided, as set out in **Section 8.6** and **Section 8.8**.

8.12.5 The assessment identifies a number of adverse impacts to biodiversity receptors, however in all cases the residual effects are not significant.

8.13 References

Butcher, B., Carey, P., Edmonds, B., Norton, L., and Treweek, J. (2020). The UK Habitat Classification: Habitat User Manual.

CIEEM, 2018. Guidelines for Ecological Impact Assessment in the UK and Ireland

CIEEM, 2017. Guidelines for Preliminary Ecological Appraisal.

JNCC, 2015. Fair Isle SAC Standard Data Form.

JNCC, 2022. Fair Isle SPA Standard Data Form

NatureScot. Fair Isle SSSI Citation.

Shetland Islands Council, June 2022. Scoping Opinion on the Environmental Impact Assessment (EIA) to upgrade the existing harbour.

Stantec, 2022. Fair Isle Harbour Improvement Works: Environmental Impact Assessment Scoping Report. Unpublished Report.

Weblinks

www.bing.com/maps

www.fairislebirdobs.co.uk

www.google.co.uk/maps

www.magic.defra.gov.uk

www.nature.scot/

www.plantatlas2020.org/

www.sac.jncc.gov.uk/site/UK0030149

9 Climate Change

9.1 Introduction

9.1.1 This chapter provides an overview of the proposed scope and initial baseline assessment for carbon and climate change. This includes identification of the scale and scope of the Proposed Development's initial design and its potential impact on the receiving environment, taking into account how this will be affected by a changing climate.

9.1.2 This chapter presents the findings of an assessment of the likely significant effects of the Proposed Development on:

- the impact of the Proposed Development on climate change ('Greenhouse Gas Emissions Assessment'); and
- the impact of climate change on the Proposed Development ('Climate Change Risk Assessment').

9.1.3 These assessments have different policy contexts, guidance documents, methodologies, baseline conditions, potential impacts and mitigation measures. This Chapter therefore presents the Greenhouse Gas Emissions Assessment and Climate Change Risk Assessment separately. Following this introduction, this Chapter is structured as follows:

- **Part 1: Greenhouse Gas (GHG) Emissions Assessment** – a qualitative assessment of the Proposed Development's impacts on climate change by it's potential to emit GHGs. This section also outlines what mitigation measures have been embedded within the Proposed Development to reduce GHG emissions during construction and operation.
- **Part 2: Climate Change Risk Assessment (CCRA)** – outlines the projected climatic changes in the region, identifies receptors vulnerable to climate change, and the mitigation measures to address climate change, embed adaptation measures and improve resilience.
- Summary and References.

9.1.4 This chapter should be read in conjunction with Chapter 7 Archaeology and Heritage, Chapter 8 Terrestrial Ecology, Chapter 10 Socio-economics, Chapter 11 Landscape, Seascape and Visual, Chapter 12 Marine Geomorphology and Chapter 13 Marine Ecology. Where information from reporting outside the ES has been considered, all relevant information to inform the climate change assessments has been summarised within this chapter.

9.1.5 The associated appendices for this chapter are:

- **Appendix A9.1**: Climate Change Policy and Guidance
- **Appendix A9.2**: Climate Projections Data and Figures

9.1.6 This Chapter has been prepared by Stantec. In accordance with Regulation 5(5) of the Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017, as amended, a statement outlining the relevant expertise and qualifications of competent experts appointed to prepare this ES is provided in **Appendix A3.**

9.2 Policy Context, Legislation, Guidance and Standards

National Legislation and Policy

9.2.1 The following legislation and policy has informed the assessment of effects within this section. Further details are provided in **Appendix 9.1**.

- The Paris Agreement, 2015
- Climate Change (Scotland) Act (CCA) 2009
- Climate Change (Emissions Reduction Targets) (Scotland) Act 2019
- Scottish Budget 2022 to 2023: carbon assessment
- The Glasgow Climate Pact 2021 (COP26 Pact)
- Town and County Planning (Environmental Impact Assessment) (Scotland) Regulations 2017
- National Planning Policy Framework (NPPF) 2021
- Planning Practice Guidance (PPG) 2021
- Update to the Climate Change Plan 2018 – 2031: securing a Green Recovery on a Path to Net Zero.
- Decarbonising the Scottish Transport Sector

Local Policy

9.2.2 **Table 9.1** demonstrates how the Proposed Development has addressed local policy requirements and taken additional measures to mitigate against climate change, where appropriate.

Table 9-1 Key GHG Policy and How the Policies are Addressed within the Chapter

Key Policy	Response
Shetland Local Development Plan 2014: Policy GP1: Sustainable development	Policy GP1 and GP2 require climate change to be considered within the design of all developments, both in relation to reducing GHG emissions and to adapt to climate change. This chapter provides an assessment of likely significant effects in relation to the proposed development and climate change, and sections 9.6 -9.16 set out the climate mitigation that is embedded into the proposed development.
Shetland Local Development Plan 2014: Policy GP2: General Requirements for all development	

Climate Emergency

9.2.3 Following the Government's declaration of a Climate Emergency in May 2019, Shetland Islands Council recognised the global climate emergency with a new strategic programme in January 2020. The purpose of the Climate Change Strategic Outline Programme is to provide an overview of the strategy, governance arrangements, target development and action planning required to address, adapt to, and mitigate, Climate Change in Shetland, as well as contribute to an effective Scotland, UK and international response. It will inform the

identification of issues and options, assist in evidence-based planning and decision making so that environmental, economic and social needs are recognised, balanced and met.

Guidance

9.2.4 Several standards and guidance documents have been used to inform the GHG and CCRA assessment methodologies and potential mitigation measures. Full details of how the following documents have been considered is provided in **Appendix 9.1**:

- Environmental Impact Assessment (EIA) Guidance on assessing greenhouse gas emission and significance (IEMA, 2022).
- Publicly Available Standard (PAS) 2080:2016 Carbon management in Infrastructure (British Standards Institute (BSI), 2016).
- World Business Council for Sustainable Development (WBCSD) and World Resources Institute (WRI) Greenhouse Gas Protocol guidance (WBCSD and WRI, 2004).
- EIA Guidance on Climate Change Resilience & Adaptation (IEMA, 2020b)
- UK Climate Change Projections 2018 (UKCP18) Guidance: How to use the UKCP18 Land Projections (Met Office, 2018a)

9.3 Consultation

9.3.1 The EIA Scoping Report (Stantec, 2021) identified the proposed scope and approach of the GHG emissions assessment. The Shetland Islands Council provided its EIA Scoping Opinion on 27/06/2022 (**Appendix A.2**). The Shetland Islands Council provided no additional comments regarding the climate resilience and adaptation methodology.

Part 1: GHG Emissions Assessment

9.4 GHG Methodology

9.4.1 IEMA guidance (IEMA, 2022), identifies six key steps that a GHG assessment should incorporate, with the aim to deliver a robust, proportionate, appropriate and consistent assessment. The six steps are set out below, along with where this has been undertaken within this Chapter:

1) Set the scope and boundaries of the GHG assessment. **Section 9.4.2 Study Area**

2) Develop the baseline. **Section 9.4.9 Baseline Data Collections** and **Section 9.5 Baseline Conditions**

3) Decide upon the methodologies. **Section 9.4.12 Assessment Methodology**

4) Data collection. **Section 9.7 Assessment of likely Effects**

5) Calculate/determine the GHG emissions inventory **Section 9.7 Assessment of likely Effects**

6) Consider mitigation opportunities and repeat steps 4 & 5. **Section 9.6 Embedded Mitigation and Section 9.8 Further Mitigation.**

Study Area

9.4.2 The GHG emissions assessment study area includes the Site and extends to include activities that occur beyond the Site boundary, such as the production of materials off site. As GHG impacts are global and cumulative with all other sources of emissions, no specific

geographical study area is defined for the identified GHG emission sources that are set out in **Table 9.3**.

9.4.3 The GHG Protocol (WBCSD and WRI, 2019) has been used to set the boundaries of the GHG assessment. The GHG Protocol categorises direct and indirect emissions into three broad scopes:

- Scope 1: all direct GHG emissions;
- Scope 2: indirect GHG emissions from the generation of purchased electricity, heat, or steam; and
- Scope 3: other indirect emissions, such as the extraction and production of purchased materials and fuels, electricity-related activities not covered in Scope 2, outsourced activities, waste disposal, etc.

9.4.4 In addition, PAS 2080 (BSI, 2016) defines life cycle modules which are shown in **Figure 9.1** below. IEMA guidance (IEMA, 2022), states that EIAs should report using the modular approach.

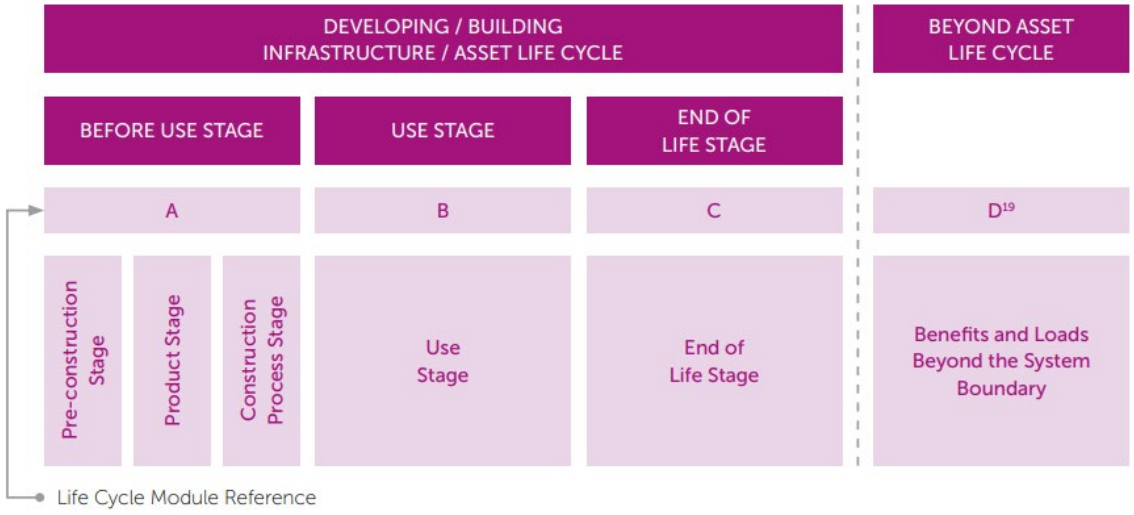


Figure 9-1:Life Cycle Modules (IEMA, 2022, adapted from PAS 2080 (BS, 2016))

9.4.5 The scope of the GHG Emissions assessment using the GHG Protocol and PAS 2080 life cycle modules is set out in **Table 9.2** below.

Table 9-2 GHG Emissions Sources and Qualitative Scope

Stage of Development	GHG Protocol	Activity Assessed
Before Use Stage (Module A) - Construction	Scope 1	Enabling activities, land clearance and construction processes such as emissions resulting from the combustion of fuels for vehicles, plants or equipment used for construction of the Proposed Development and emissions released by soil movement
	Scope 2	Emissions associated with electricity needed for lighting, plant and welfare facilities.
	Scope 3	Emissions associated with primary raw material extraction, manufacturing and transportation within the supply chain of purchased materials required for construction, employee commuting to and from the site and outsources activities such as waste disposal.

9.4.6 GHG emissions from the Proposed Development during operation are anticipated to be emitted as a result of burning fossil fuels to run the ferry service and from any electricity required for lighting and the noust and winch house. These emissions are not anticipated to increase substantially from the existing baseline emissions of the current ferry service. The use of the new larger ferry will likely increase GHG emissions although also it is anticipated that the new vessel will be more efficient than the existing vessel. Therefore, no significant effects as result of GHG emissions during the operational phase are anticipated. As set out in the EIA Scoping Report (Stantec, 2022), the operational phase was therefore scoped out of the GHG assessment.

9.4.7 Due to the nature of the Proposed Development, it has not been designed with a fixed lifetime and therefore the end-of-life stage (Module C), or demolition, is difficult to define. In addition, it is anticipated that the construction of the Proposed Development will have the greatest potential to emit GHGs compared to the end-of-life stage, particularly when considering the trend of national decarbonisation over time and the legislative requirement for Scotland to meet carbon neutral targets by 2045. It is therefore anticipated that, when the Proposed Development will reach end-of-life, there will be a zero-carbon economy and principles for a circular economy will be utilised. Emissions associated with the end-of-life stage of the Proposed Development are therefore scoped out of the assessment.

9.4.8 IEMA guidance (IEMA, 2022) states Module D 'beyond asset life cycle' refers to wider impacts that may not be appropriate to attribute (in part of whole) to a project when calculating net impacts within the study boundary but are relevant to consider. Examples include benefits of a project sending waste materials for recycling rather than disposal. This assessment has considered Module D elements where appropriate.

Baseline Data Collection

9.4.9 A high-level review of existing land use and associated activities on Site has been undertaken to identify the baseline GHG emissions. This includes a review of the Scotland Carbon Budgets and UK local authority GHG inventory data (DBEIS, 2021a and DBEIS, 2021b).

9.4.10 The Future Baseline takes into consideration the carbon budgets for this time period, which the Scottish Government is legally bound to achieve. In addition, technological advances which are extremely likely to come forward are considered, including the progressive decarbonisation of the National Grid, and increased uptake of Electric Vehicles. However, it is acknowledged under **Limitations** section of this chapter that it is not possible to anticipate all technological advances which may come forward and result in changes to GHG emissions.

Sensitive Receptors

9.4.11 GHG emissions have a global effect rather than directly affecting specific local receptors to which levels of sensitivity can be assigned. The global atmosphere has therefore been treated as a single receptor. Given the global scale and severe consequences of climate change and limited recoverability, the receptor sensitivity is considered to be high. This is in keeping with IEMA guidance (IEMA, 2022).

Assessment Methodology

9.4.12 There is no nationally adopted method for assessing climate change within EIA and therefore the assessment approach draws upon IEMA guidance (IEMA, 2022). It identifies that all new GHG emissions contribute to a negative environmental impact and contribute to climate change, thus might be considered significant. It therefore suggests the impact of a development on climate should be based on its potential to emit GHGs.

9.4.13 The GHG emissions assessment has been based on the design drawings of the Proposed Development and information provided by the project design team. Where information from reporting outside the ES has been considered, all relevant information to inform the assessment of likely significant effects on the environment has been summarised within this Chapter.

9.4.14 IEMA guidance emphasises the need for proportionality in the context of national, sector and local GHG emissions. The guidance recognises that qualitative assessments are acceptable, particularly where mitigation measures are agreed early on in the design stage and is agreed during the EIA scoping stage with stakeholders. Taking a qualitative approach has been agreed with The Shetland Islands Council as appropriate and proportionate for the Proposed Development at scoping. The Proposed Development has embedded several measures to reduce GHG emissions associated with the design and construction, outlined in **Section 9.6** below.

Determining Significance

9.4.15 There is an absence of a defined threshold for determining the significance of effects resulting from GHG emissions in EIA. Significance of effects have therefore been determined using professional judgement, and consideration of the following elements:

- IEMA EIA Guide to Assessing Greenhouse Gas Emissions and Evaluating their Significance (IEMA, 2022).
- Appraisal of the Proposed Development's emissions in the context of national, regional and local emissions through establishing the current and future baseline.
- How the Proposed Development has embedded design features to reduce GHG emissions and identified opportunities for further mitigation in the Proposed Development's design and delivery.

9.4.16 IEMA guidance (IEMA, 2022) identifies three underlying principles to inform the assessment of significance and conclude that:

- "The GHG emissions from all projects will contribute to climate change, the largest interrelated cumulative environmental effect
- The consequences of a changing climate have the potential to lead to significant environmental effects on all topics in the EIA Directive (e.g. human health, biodiversity, water, land use, air quality)
- GHG emissions have a combined environmental effect that is approaching a scientifically defined environmental limit; as such any GHG emissions or reductions from a project might be considered to be significant."

9.4.17 Key to determining significance is setting a context for the magnitude of GHG emissions. The relevant context here are the national carbon budgets which defines a level of GHG emissions that would result in dangerous climate change. Scotland has set a legally binding GHG reduction target for 2045 which, according to the Climate Change Committee (CCC), is compatible with the magnitude and rate of GHG emission reductions required in the UK to meet the goals of the Paris Agreement.

9.4.18 Given this, IEMA guidance states that "*the crux of significance is not whether a project emits GHG emissions, nor even the magnitude of GHG emissions alone, but whether it contributes to reducing GHG emissions relative to a comparable baseline consistent with a trajectory towards net zero by 2050.*"

9.4.19 **Appendix 9.1** sets out the background to significance with regards to policy requirements including the Paris Agreement and 2045 Target.

9.4.20 This assessment has applied the following significance criteria set out in **Table 9.3** that is set out in the IEMA guidance (IEMA, 2022). Major or moderate adverse effects and beneficial effects are considered to be 'significant'. Minor adverse and negligible effects are considered to be 'not significant'.

Table 9-3: GHG Significance (IEMA, 2022)

Significance	Measure of Impact
Major Adverse	the project's GHG impacts are not mitigated or are only compliant with do-minimum standards set through regulation, and do not provide further reductions required by existing local and national policy for projects of this type. A project with major adverse effects is locking in emissions and does not make a meaningful contribution to the UK's trajectory towards net zero.
Moderate Adverse	the project's GHG impacts are partially mitigated and may partially meet the applicable existing and emerging policy requirements but would not fully contribute to decarbonisation in line with local and national policy goals for projects of this type. A project with moderate adverse effects falls short of fully contributing to the UK's trajectory towards net zero.
Minor Adverse	the project's GHG impacts would be fully consistent with applicable existing and emerging policy requirements and good practice design standards for projects of this type. A project with minor adverse effects is fully in line with measures necessary to achieve the UK's trajectory towards net zero.
Negligible	the project's GHG impacts would be reduced through measures that go well beyond existing and emerging policy and design standards for projects of this type, such that radical decarbonisation or net zero is achieved well before 2050. A project with negligible effects provides GHG performance that is well 'ahead of the curve' for the trajectory towards net zero and has minimal residual emissions
Beneficial	the project's net GHG impacts are below zero and it causes a reduction in atmospheric GHG concentration, whether directly or indirectly, compared to the without-project baseline. A project with beneficial effects substantially exceeds net zero requirements with a positive climate impact.

Cumulative Effects

9.4.1 IEMA guidance (IEMA, 2022) identifies that all global cumulative GHG sources are relevant to the effect on climate change. This is taken into account in defining the receptor as being of high sensitivity to further emissions. For this reason, the guidance recommends that effects of GHG emissions from specific cumulative projects should not be individually assessed, as there is no basis for selecting particular cumulative projects that have GHG emissions over others. By its nature, the contextualisation of GHG emissions to the national carbon budgets incorporates cumulative contributions of other GHG sources which make up that context. Therefore, a separate cumulative assessment has not been undertaken for the GHG assessment.

Limitations and Assumptions

9.4.2 Using the information provided, a qualitative approach to assessing the GHGs of the Proposed Development has been undertaken.

9.4.3 The trajectory of GHG emissions into the future is dependent on influences outside of the Applicant's control, for example Government policy and global technology and economic shifts, which are difficult to predict. The UK/Scotland carbon budgets are legally binding and the Government have an array of policies and levers to be deployed if the carbon budgets are not likely to be met.

9.5 Baseline Conditions

Current State of the Environment

National and Regional Emissions

9.5.1 This section establishes the existing GHG emissions at a national and regional level.

9.5.2 **Table 9.4** sets out the UK carbon budgets from 2008 to 2022. Both the first and second carbon budgets were met, culminating in a 31% reduction below 1990 carbon emissions. The period for the third carbon budget is up to the end of 2022 and therefore emissions over this time are not yet available.

Table 9-4: 2008-2022 UK Carbon Budget

UK Budget	Carbon budget level (million tonnes carbon dioxide equivalents - $MtCO_2e$)	Reduction below 1990 levels	UK Emissions
1st carbon budget (2008 to 2012)	3,018 $MtCO_2e$	25%	2,982 $MtCO_2e$
2nd carbon budget (2013 to 2017)	2,782 $MtCO_2e$	31%	2,398 $MtCO_2e$
3rd Carbon Budget (2018-2022)	2,544 $MtCO_2e$	37%	N/A*

*The UK emissions associated with the 3rd carbon budget will be published in 2023.

9.5.3 From a national perspective, in 2020 UK total GHG emissions were estimated to be 414.4 million tonnes carbon dioxide equivalents ($MtCO_2e$), a decrease of 10.7% compared to 2019 (DBEIS, 2021a). National GHG emissions in 2020 had decreased by 48.8% since 1990 (DBEIS, 2021a). The decrease of emissions in 2020 is primarily due to the large reduction in the use of road transport during the nationwide lockdowns and the reduction in business activity (DBEIS, 2021a).

9.5.4 From a Scottish perspective, in 2020 Scotland total GHG emissions were estimated to be 40.0 MtCO2e, a decrease of 12.0% from 2019 and 58.7% from the baseline period (1990). This decrease of emissions in 2020 meets the interim target of a 56.0% reduction specified in The Climate Change (Emissions Reduction Targets) (Scotland) Act 2019.

9.5.5 The Department for Business, Energy & Industrial Services (DBEIS, 2021b) sets out the CO_2 emissions estimates from a number of sources for 2005-2019 and is the most up to date available figures for the UK, Scotland and Shetland Islands. The CO_2 estimates for 2019 is presented in **Table 9.5** below.

Table 9-5: National, Scotland and Shetland Island CO2 estimates for 2020

	Industry and Commercial ($ktCO_2$)	Public Sector ($KtCO_2$)	Domestic ($ktCO_2$)	Transport ($ktCO_2$)	Land Use, Land Use Change, Forestry, and Agriculture ($ktCO_2$)	Total ($ktCO_2$)
UK	96,949.3	12,254.8	93,624.1	106,671.4	53,575.3	377,680.0
[Scotland**]**	,8668.8	1,208.0	8,236.2	8,495.6	9,858.7	37,944.7
[Shetland Islands]	23.7	3.1	35.2	40.8	530.7	636.4

9.5.6 The Shetland Islands accounts for approximately 1.68% of the total CO_2 emissions in Scotland, and 0.17% of the total UK emissions.

Local Emissions

9.5.7 The habitats present within the Site comprise of vegetated sea cliffs, dry heath, marine and arable land. There is limited vegetation within the Site, there are no trees present and the majority of the ground condition are made of hardstanding of the existing pier. Therefore, there are currently limited GHG emissions from the site. The vegetated sea cliffs across the Site may provide a limited amount of carbon sequestration on site. The majority of GHG emissions from the site come from the operation of the existing ferry. Current GHG emission sources relate to the fuel burnt by the running of the existing ferry service, as well as from the operation of the noust (which is either via electricity or a diesel generator as back up). There are also a small number of lights and welfare facilities on site that require electricity from either a generator or purchased electricity when in use. There are no other existing uses within the site boundary.

Future Baseline

National and Regional Emissions

9.5.8 As set out in **Appendix 9.1**, the Climate Change Act (Scotland) 2009, as amended, requires the government to set yearly carbon budgets.

9.5.9 The carbon budgets enable net increases in emissions to be managed within the carbon budgets by balancing with performance in other sectors. Governments can use an array of policies and levers to achieve the net reductions necessary to meet the carbon budgets whilst taking an economy wide and national approach to securing overall emissions reductions whilst facilitating other objectives including economic growth, energy security and levelling up.

9.5.10 As a result of the international Paris Agreement, the Climate Change (Scotland) Act 2009 was amended by the Climate Change (Emissions Reductions Targets (Scotland) 2019, changing Scotland's ambition of achieving emission reductions targets to net zero in 2050 to 2045.The Scottish Government has set targets for annual emissions, and interim targets of 56.% and 90% GHG emissions reductions from the baseline year (1990) for 2020 and 2040 respectively, which can be found in **Table 9.6** below.

Table 9-6: Climate Change (Emissions Reduction Targets) (Scotland) 2019

Year	Annual target reduction from 1990 baseline
2018	54.0%
2019	55.0%
2020 (interim target)	**56.0%**
2021	57.9%
2022	59.8%
2023	61.7%
2024	63.6%
2025	65.6%
2026	67.4%
2027	69.3%
2028	71.2%
2029	73.1%
2030	75.0%
2040 (interim target)	**90.0%**
2045	100.0% (net-zero emissions)

9.5.11 The UK and Scottish Governments have published several national strategies that are intended to aid the reduction of UK emissions in line with the legally binding carbon budgets and the respective 2050 and 2045 net zero targets. The strategies that are considered to have relevance to the Proposed Development are set out in further detail in **Appendix 9.1.**

Local Emissions

9.5.12 The existing Ferry reaches its end of life in 2026 and will be decommissioned, therefore, there will be a large reduction in GHG emissions from the site as most of the emissions come from this ferry, should the Proposed Development not be implemented.

9.6 Embedded Mitigation

9.6.1 GHG mitigation is best achieved by taking a planned and focused approach following the IEMA GHG Management Hierarchy principles (IEMA, 2020a) which aims to eliminate and prevent GHG emissions in the first instance, reduce emissions further, substitute with renewables and lower intensity energy uses and then finally compensate for unavoidable

emissions. The Proposed Development has implemented mitigation throughout the design of the Proposed Development as set out below.

9.6.2 A fiEMP will be prepared prior to the commencement of construction works at the Site. The fiEMP will include mitigation measures covering transport, materials, waste and air quality during construction. Measures that will reduce GHG emissions during construction include, for example, no unnecessary idling of engines, maintenance of plant equipment to check they are operating optimally and efficient use of materials to reduce waste.

9.6.3 Additionally, a Site Waste Management Plan (SWMP) (**Appendix A5**) will be implemented to manage waste during construction. The SWMP aims to ensure that the waste produced during the construction phase and other phases of the Proposed Development are dealt with in accordance with the duty of care provisions in the Environmental Protection Act (1990). The adoption of the principles of the waste management hierarchy will be implemented throughout. This will help to reduce GHG emissions associated with waste management. Reduces waste because just bringing what you need.

9.6.4 All materials required for construction will be transported to the site on a boat rather than via aviation. Whilst this does release GHGs, it is the only feasible way to get materials onto the Island and it is less GHG intensive than HGVs and planes.

9.6.5 Prefabrication is the practice of assembling structural components off site and transporting them to the site of construction where they can be assembled. This practice will therefore reduce the amount of on site fabrication, reduce the amount of diesel being burnt on site and result in less direct emissions burnt on site.

9.6.6 The detailed design will take cognisance of locally available materials, manufacturing capability and labour resource. This will minimise the number of shipments required to construct the Fair Isle harbour and reduce the indirect GHG emissions of the project.

9.6.7 The quay wall will be constructed from prefabricated concrete elements. These could be manufactured at Kirkwall, Lerwick, UK mainland, Ireland or the continent. The cement for these elements is likely to be sourced from mainland UK or Ireland, reducing the distance it has to travel to the site and the indirect GHG emissions produced. It is assumed that aggregate for the concrete will be sourced local to the manufacturing site and where possible aggregate for backfilling structures will be sourced locally to Fair Isle. The steel elements of the proposed development are likely to be shipped from mainland UK, Ireland, or the continent. The rock armour that will be used to construct the breakwater can be source from one of several local quarries on Shetland. This would require early engagement with the quarries to allow stockpiling and it is possible that due to the volume required it may need to be sourced from Norwegian quarries.

9.6.8 Consideration has been given to embodied carbon when selecting the materials that will be used for the Proposed Development. Local precast manufacturers at Lerwick have advised they can manufacture elements with CEM II. CEM II is less carbon intensive compared to CEM I, resulting in less GHG emissions. CME II is a cement combination type that substitutes 6-20% of the Portland cement with fly ash or Ground Granulated Blast Furnace Slag (GGBS). Fly ash is an environmentally sustainable component of concrete because it is a by-product of another process that has a low energy content and therefore reduces CO2 emissions and waste and exhibits cold weather resistance. A durable concrete suitable for the marine environment will be specified, with some degree of Ordinary Portland Cement (OPC) substitution in the design cement combination type. This will be finalised at detailed design stage.

9.6.9 It is recommended that recycled materials will be utilised where possible, with the consideration of using materials that go through less energy-intensive processes and that can be sourced locally. There are a number of UK organisations promoting the review and reduction of embodied carbon and supply chain emissions associated with construction as

part of their sustainability initiatives. Material excavated from hollowing the existing noust is anticipated to be re-used within the Proposed Development. This will reduce the volume of new materials required for construction and will also reduce waste stored on site and exported off island.

9.7 Assessment of Likely Effects

Construction

Scope 1

9.7.1 During construction, direct GHG emissions will be emitted from activities such as the combustion of fuels for vehicles, plant or equipment used for construction.

9.7.2 The implementation of the fiEMP will help to manage and reduce GHG emissions associated with construction vehicles, plant and equipment.

9.7.3 The enabling activities and land clearance activities required for the construction of the Proposed Development will result in direct GHG emissions released from movement and disturbance of soil on Site. However, land clearance is only required for the expansion of the noust. Most of the construction is to build the harbour itself, meaning there will be limited GHG emissions as a result of the movement and disturbance of soil on Site.

Scope 2

9.7.4 Fair Isle is not connected to the National Grid, instead it is powered by three wind turbine generators, ground-mounted solar panels and battery storage. Therefore, there will also be emissions from generators or purchased electricity needed for plant and welfare facilities. An area of the Site would be required for a temporary construction compound ("the laydown area") for the potential storage of materials, plants and equipment as well as providing site welfare. Temporary work accommodation will also be present at Fair Isle so the work force will not have to vacate the island each day.

9.7.5 Additionally, a fiEMP will help to manage and control the use of electricity on Site.

Scope 3

9.7.6 The main source of Scope 3 emissions during construction will be via purchased goods and services, including the embodied carbon emissions within the construction supply chain for purchased materials. Outsourced activities such as waste disposal as well as indirect emissions from the production of purchased materials and the transportation of these materials to site during construction will further contribute to GHG emissions.

Significance

9.7.7 It is considered that the Proposed Development meets the applicable adopted policy during construction and contributes to decarbonisation in line with the 2045 net zero trajectory. Given that most of the materials are prefabricated and construction is short term (2 years) and with consideration of the GHG emission sources noted above alongside the embedded mitigation, including, consideration of embodied carbon through the choice of cement combination elements, and consideration to local sourcing of materials and the distance they will be transported to get to site, as set out in **Section 9.6**, it is considered that emissions have been appropriately mitigated, Proposed Development will have a **Minor Adverse,** and therefore **Non-Significant,** and thus does not require further mitigation.

9.8 Further Mitigation and Enhancement

9.8.1 No significant effects have been identified and therefore no further mitigation is required.

9.9 Residual Effects

Construction

9.9.1 The assessment identified a minor adverse non-significant effect resulting from Scope 1, Scope 2 and Scope 3 emissions, which include emissions from the combustion of fossil fuels on Site during construction activities, the small area of land clearance and enabling activities and purchased electricity for welfare facilities and lighting, and transportation and production of materials. Mitigation will be provided by the prefabrication of structures, precast manufacturing of cement which reduces embodied carbon, and reduced transportation distance of materials. All materials will be brought in on a boat rather than via aviation as identified in **Section 9.6**. Embedded mitigation has been applied to mitigate against all the likely effects of construction on GHG emission and it is therefore considered that the effect will remain as **Minor Adverse** and **Non-Significant**, in keeping with IEMA guidance.

9.10 Monitoring

9.10.1 The likely effects identified were all mitigated through the embedded mitigation and therefore no significant residual effects are identified through construction and monitoring is not required. The fiEMP will be updated to ensure the document continues to fulfil its objectives to reduce environmental effects. This will include a review of current legislation, standards, plant, processes, etc. Revised copies of the fiEMP will be available to The Shetland Islands Council as appropriate.

Part 2: Climate Change Risk Assessment

9.11 Introduction

9.11.1 This section presents the assessment of likely significant effects of climate change upon the Proposed Development. Assessing climate change resilience and adaptation aims to determine the vulnerability of key environmental receptors to climate change, the likely significant effects climate change would have on these receptors and outline the mitigation measures that the Proposed Development takes to adapt to the projected climate change effects.

9.12 Methodology

Study Area

9.12.1 The CCRA uses the UKCP18 data provided by the UK Met Office (Met Office, 2018) for the 25 km grid cell within which the Site is located (SP 437500 1137500), although the area of influence for potential climate vulnerability impacts is expected to be limited to the Site and the immediate area around this. It is of note that this is the closest grid square to the site provided by the met office, but it does not actually cover the site. It covers Lerwick and Scalloway on the Island of Shetland, just North East of Fair Isle. This grid square was chosen as it is the closest grid square to Fair Isle, with the most similar climate.

Baseline Data Collection

9.12.2 The following data sources were reviewed to establish the baseline conditions:

- Met Office historic climate data (Met Office, N.Da) – to identify the historic trends of relevant climatic factors for the geographic area of the Scheme.
- UKCP18 (Met Office, 2018b) – to identify the climate projections for the geographic area, including the future baseline, and appropriate temporal scope of the Proposed Development.
- A literature review of relevant publications which are referenced where relevant within **Part 2** of this chapter, for variables for which UKCP18 does not provide information (for example, wind direction)

9.12.3 In addition, a review was undertaken of the following chapters within this ES, which directly feed into the CCRA:

- Chapter 8: Terrestrial Ecology.
- Chapter 10: Socio-economics.
- Chapter11: Landscape, Seasonal and Visual.
- Chapter 12: Marine Geomorphology.
- Chapter 13: Marine Ecology.

UKCP18

9.12.4 The UKCP18 produced by the UK Met Office (Met Office, 2018b) is the main source of information for the future baseline. UKCP18 uses observations of weather and climate combined with climate models to create a range of climate projections for different emissions scenarios. UKCP18 builds upon previous projections to provide information on how the climate of the UK may change over the rest of this century, describing how climatic conditions, long term seasonal averages and extreme weather conditions may change over

future decades. The baseline data is complemented a literature review of relevant publications for variables for which UKCP18 does not provide information (for example, wind direction).

9.12.5 UKCP18 uses Representative Concentration Pathways (RCPs) to develop projections and consider factors such as economic activity, population growth and land use change, which will result in a different range of global mean temperature increases until 2099. RCP8.5 is the most conservative, highest-impact scenario. The scenario reflects an average increase in global mean surface temperature compared to the pre-industrial period of 4.3˚C by 2081-2099. IEMA guidance (IEMA, 2020b) generally recommends that the high emission scenario, RCP8.5, is used for climate change risk assessments. This is also considered the most appropriate scenario for assessing the impact of climate change on the Proposed Development based on policy and legislation for Scotland to achieve net zero carbon by 2045, which is in line with limiting global temperature increases to 1.5˚C.

9.12.6 IEMA guidance recommends that the climatic baseline should consider extremes in short-term weather events, such as heatwaves; long-term climatic variability, such as seasonal changes in precipitation; and average climate norms, such as ambient temperature.

9.12.7 A review of the following data from this projection has been undertaken:

- Average Summer Precipitation (% change);
- Average Winter Precipitation (% change);
- Average Annual Precipitation (% change);
- Maximum Average Summer Temperature;
- Minimum Average Winter Temperature; and
- Annual Mean Temperature.

9.12.8 The projections (**Appendix 9.2**) show the potential change in temperature or precipitation above or below the observed temperature/precipitation for 1981-2000.

9.12.9 The CCRA considers the completion year (2026) as well as 25-year intervals up to 2099, as this is the last date available in the UKCP18 data.

Assessment Methodology

9.12.10 In accordance with IEMA guidance, the vulnerability and resilience of the Proposed Development to climate change has been identified by undertaking a risk assessment that includes:

- “Identifying potential climate change risks to a scheme or project;
- Assessing these risks (potentially prioritising to identify the most severe); and
- Formulating mitigation actions to reduce the impact of the identified risks.” (IEMA, 2020b)

9.12.11 The risk assessment considers the likelihood of a hazard occurring that could result in an impact on sensitive receptors. In addition, the magnitude of effects on the Proposed Development will depend on the severity of the consequence of the impact, and the vulnerability of the receptor itself. The definitions of these terms can therefore be summarised as follows (IEMA, 2020b):

- **Hazard** is an effect of climate change which has the potential to cause an impact on sensitive receptors associated with the Proposed Development;

- **Magnitude** is the likelihood of impact occurring and the consequence of the impact of a hazard; and
- **Vulnerability** is the degree to which receptors are susceptible to adverse impacts and is influenced by sensitivity, adaptive capacity, and exposure to climate hazards.

Identification of Receptors

9.12.12 Receptors that may be affected by climate change have been identified with consideration of both extreme weather events and gradual climatic changes in the study area for the Proposed Development. In accordance with IEMA guidance, the sensitivity of receptors to climate change effects during operation is described in **Table 9.7**. In ascribing the sensitivity of receptors in relation to potential climate change effects, the susceptibility of the receptor (e.g., ability to be affected by a change) and the vulnerability of the receptor (e.g., potential exposure to a change) must be taken into account. These are defined in IEMA guidance (IEMA, 2020b) as follows:

"*The susceptibility of the receptor can be determined using the following scale:*

- High susceptibility = receptor has no ability to withstand/not be substantially altered by the projected changes to the existing/prevailing climatic factors (e.g., lose much of its original function and form).
- Moderate susceptibility = receptor has some limited ability to withstand/not be altered by the projected changes to the existing/prevailing climatic conditions (e.g., retain elements of its original function and form).
- Low susceptibility = receptor has the ability to withstand/not be altered much by the projected changes to the existing/prevailing climatic factors (e.g., retain much of its original function and form).
- The vulnerability of a receptor can be defined using the following scale:
- High vulnerability = receptor is directly dependent on existing/prevailing climatic factors and reliant on these specific existing climate conditions continuing in future (e.g., river flows and groundwater level) or only able to tolerate a very limited variation in climate conditions.
- Moderate vulnerability = receptor is dependent on some climatic factors but able to tolerate a range of conditions (e.g., a species which has a wide geographic range across the entire UK but is not found in southern Spain).

Low vulnerability = climatic factors have little influence on the receptors."

Table 9-7: Receptor Sensitivity

Receptor	Sensitivity	Reasoning
Operation		
Future users of the Site/Ferry (residents, employees,)	Moderate to High	Some future users of the Site will be more susceptible to climate change than others, depending on a range of factors such as age (children, young people and the elderly) and existing poor health. Fair Isle has an ageing population and therefore those users are the most susceptible to climate change.
Infrastructure including the harbor and ferry	Moderate	Infrastructure across the Proposed Development is considered to be of moderate susceptibility given that the harbor is located in a particularly vulnerable location. While it can tolerate some changes in climate, the breakwater is critical for protecting the harbour and for the operation of the Proposed Development. Additionally, if the harbor or ferry does sustain damage as a result of climate change, this will significantly effect its

Receptor	Sensitivity	Reasoning
		operation and result in less transport of goods and services between Fair Isle and the mainland/Shetland Islands.

9.12.13 During the construction phase, it is anticipated that the risk of climate hazards (e.g. heatwaves or periods of heavy precipitation) may increase, however it is expected that these will be managed through standard construction and health and safety practices, such as securing material/equipment and not undertaking works during periods of extreme rainfall. Therefore, the vulnerability of the Proposed Development to climate change during construction has been scoped out of the assessment for the ES. Due to the extreme winter weather conditions on Fair Isle, construction will take place in the summer months (February to September) over two years (2024 and 2025) and will be ready for use in April 2026.

9.12.14 Ecology, landscaping and planting were not identified as receptors in the scoping report. However, no proposed planting is included as part of the scheme and the part of the SAC that will be reappropriated to enable expansion of the noust will no longer be part of the site during the operational phase of the proposed development. Therefore, no further consideration has been given to these receptors.

Assessment of Significance

9.12.15 There is an absence of significance criteria for determining the significance of effects resulting from climate change. IEMA guidance states that receptor vulnerability and uncertainties must be considered. Significance has therefore been determined by IEMA guidance and professional judgement.

9.12.16 Effects that are described as ‘minor’ or ‘negligible’ are determined to be ‘Not Significant’ and effects that are described as ‘moderate’, ‘major’ or ‘substantial’ are determined to be ‘Significant’.

Limitations

9.12.17 Scientific evidence shows that our climate is changing. However, there are significant uncertainties in the magnitude, frequency and spatial occurrence within the climate projections utilised in this assessment. The UKCP18 are not predictions or forecasts but simulations of potential scenarios of future climate under a range of hypothetical emissions scenarios and assumptions, and therefore cannot be treated as exact or factual, but projection options. The projections are dependent on future global GHG emissions and, while several different scenarios are provided, it cannot be reliably predicted which (if any) emission scenario will occur over the next 80 years (Fung et al., 2018).

9.12.18 Additionally, projections after the 2040s increasingly diverge between scenarios and provide greater confidence for long-term climate averages than extreme events. For example, there is greater confidence around changes in temperature than there is in relation to wind. Levels of confidence and certainty are considered when assessing the likelihood and consequence of climate hazards.

9.12.19 This ES chapter reports the climate change risk assessment which has used the latest information sources available at the time prior to submission (January 2023). New climate information is published regularly as more in-depth analysis of climate changes is completed, which may supersede the information used to inform this assessment.

9.12.20 There is often uncertainty in the relationship between changes in climate hazards and the respective response in terms of scheme performance. This uncertainty has been assessed qualitatively.

9.12.21 The assessment assumes that mitigation will be effectively implemented.

9.13 Baseline Conditions

Current State of the Environment

UK Observations

9.13.1 Observed climate changes over the UK include:

- The most recent decade (2009-2018) has been on average 0.3 °C warmer than the 1981-2010 average and 0.9 °C warmer than 1961-1990. All of the top ten warmest years have occurred since 2002 (Lowe et al., 2019);
- In the past few decades there has been an increase in annual average rainfall over the UK. However, natural variations are also seen in the longer observational record (Lowe et al., 2019);
- The period since 2000 accounts for two-thirds of hot-day records, and close to half of wet-day records, in monthly, seasonal, and annual observations since 1910 (Kendon, 2014);
- The frequency of severe autumn and winter wind storms increased between 1950 and 2003 (Alexander et al., 2005), although storminess in recent decades is not unusual in the context of longer European records dating back to the early 20th century (Metulla et al., 2008); and
- Widespread and substantial snow events have occurred in 2018, 2013, 2010 and 2009, but their number and severity have generally declined since the 1960s (Met Office, N.Db).

Regional Observations

9.13.2 Historic climate averages during the period 1991-2020 for the closest climate station to the site (Fair Isle), obtained from the Met Office website (Met office, N.Da), indicates the following:

- Average annual maximum temperature was 9.95°C;
- Warmest month on average was August (mean maximum temperatures of 14.34°C);
- Coldest month on average was February (mean minimum temperature of 6.41°C);
- Average total annual rainfall was 928.52 mm;
- Wettest month on average was November (average monthly rainfall of 108.31 mm); and
- Driest month on average was May (average monthly rainfall of 43.63 mm).

9.13.3 Flood risk in the area is only driven by coastal water with high tides being able to cause flooding in the area. Other factors that may influence flood risk are fluvial (watercourse) flooding, pluvial (surface water) flooding and groundwater flooding. None of these are considered capable of affecting flood risk, with only a couple of minor spots of surface water identified on the SEPA surface water flood map (SEPA 2021). Essentially these amount to puddles and of limited concern. Tidal inundation is the clear source of flood risk presently. Reference scoping report. (**Appendix A2** Scoping Report)

9.13.4 It's noted that North-east Scotland experienced thunderstorms and torrential downpours in mid August 2020. In places 30 to 50mm or more of rain fell within 3 hours or less, causing flash flooding and disruption to road and rails networks. The UK experienced a short but exceptional heatwave in late July 2019. Minimum temperatures were also 18 °C or more

across parts of western Scotland with 20.9 °C at Achnagart (Highland) setting a new Scotland daily minimum temperature record for any month.

9.13.5 It should be noted that in recent years there have been significant weather events that are cause for concern. Storms Malik and Corrie, both arriving in January 2022 brought damaging north-westerly winds (gusts reaching 80Kt) to northern Scotland and north-east England. In February 2021 Storm Darcy brought snow and low temperatures to many areas across the UK. Scotland was affected by deep lying snow, with transport disruption and school closures.

Future Baseline

9.13.6 This section presents the future climate simulations extracted from UKCP18 up to 2099. **Figures A9.2.1 – A9.2.6** in **Appendix 9.2** show the grid square projections for average summer, winter and annual precipitation, maximum average summer temperature, minimum average winter temperature and annual mean temperature. A summary of the projections is provided below. This is supported by data extracted from the probabilistic projections which is also presented in **Appendix 9.2**, a summary of which is provided in **Table 9.8** below.

Table 9-8: 50th Percentile Climate Projections at 25 km grid square 437500, 1137500 using baseline 1981-2000 scenario RCP 8.5

Year	Climate Variable at 50th Percentile					
	Mean air temperature anomaly at 1.5 m (Â°C)	Annual Precipitation rate anomaly (%)	Maximum Summer air temperature anomaly at 1.5 m (Â°C)	Average Summer Precipitation rate anomaly (%)	Minimum Winter air temperature anomaly at 1.5 m (Â°C)	Average Winter Precipitation rate anomaly (%)
2022	0.60	3.15	0.57	-2.39	0.67	7.19
2026	0.67	3.47	0.63	-2.65	0.75	8.58
2030	0.74	3.88	0.70	2.9	0.84	9.93
2040	0.94	5.2	0.88	-3.37	1.05	12.85
2050	1.18	6.57	1.08	-3.71	1.28	15.30
2075	1.96	8.35	2.00	-10.10	1.99	23.64
2099	3.14	10.96	3.40	-22.15	3.02	31.04

*Anomaly refers to the change compared to the baseline. The projections are not absolute values.

9.13.7 The projections show an almost continuous increase in annual average temperature over the next 80 years (**Figure 9.2.1** in **Appendix 9.2**). Annual precipitation also shows a continues increase over the next 80 years (**Figure 9.2.2** in **Appendix 9.2**).

9.13.8 The projections suggest that summers will become warmer and drier, with an expected increase in maximum summer temperatures and overall decline in summer precipitation (**Figures 9.2.3** and **9.2.4** in **Appendix 9.2**). Natural variations may mean that some cooler and/or wet summers will occur.

9.13.9 Winters may become milder and wetter, with an overall increase in both minimum winter temperature and winter precipitation. Natural variations may mean that some cold and/or dry winters may still occur (**Figure 9.2.5** and **9.2.6** in **Appendix 9.2**).

9.13.10 In the UK, the heaviest snowfalls tend to occur when the air temperature is between zero and 2°C (Met Office, N.Dd). There is less certainty in the magnitude of change to snow occurrence and amount, although climate models do show a downward trend in both falling and lying snow over time.

Extreme Weather Events

Heatwaves

9.13.11 A heatwave is an extended period of hot weather relative to the expected conditions of the area at that time of year, which may be accompanied by high humidity. For the UK, the Met Office defines a heatwave as "*when a location records a period of at least three consecutive days with daily maximum temperatures meeting or exceeding the heatwave temperature threshold*" (Met Office, 2022). The threshold varies by county, which for the Site is 25°C (Met Office, 2022). As outlined in **Table 9.8** above, temperatures are projected to increase by 3.14°C by 2099, which could result in the heatwave threshold being met more frequently.

9.13.12 Research has found that the likelihood of heatwave events in the UK is about 10 times higher due to climate change (Vautard R. *et al*., 2019). As discussed above, the maximum

summer air temperature and annual average air temperature is expected to increase over the next 80 years, which could result in more intense and more frequent heatwaves.

Extreme Cold Snaps

9.13.13 The number of icing days (when the daily maximum temperature stays below 0 °C) has been decreasing since the 1960s. These long-term trends point to a long-term warming trend of the UK's climate and a reduction in cold events (Kendon et al, 2021).

9.13.14 The projections in **Table 9.8** show that winters may become increasingly milder, with minimum temperatures set to rise to over 3°C by 2099. Natural variations may mean that some cold extremes may still occur.

Heavier Rainfall

9.13.15 Heavy rainfall that may lead to flooding is hard to predict in the long term. A study has shown that an extended period of extreme winter rainfall in the UK is now about seven times more likely due to human-induced climate change (Christidis and Stott, 2015), and the largest changes in heavy rainfall since 1961 have occurred in Scotland and northern England.

9.13.16 The climate projections for the Site show there will be an increase in average winter precipitation (**Figure 9.2.6** in **Appendix 9.2**).

9.13.17 While projections indicate a trend that summers will become dryer toward the end of the century, there is also evidence that summer rainfall events may become more intense when they do occur.

Low Rainfall and Drought

9.13.18 Droughts are natural events which occur when a period of low rainfall creates a shortage of water. The UKCP18 projections show a trend toward drier summers on average, although the uncertainties of these are wide ranging. Research on the influence of climate change on drought in the UK is limited and given the several different factors that influence droughts (meteorological, hydrological, and societal), it is challenging to identify whether drought events will become more common and prolonged in the future.

High Winds

9.13.19 On average throughout the year, near-surface wind speeds are projected to decrease. However, during the winter season, where more significant impacts of winds are experienced (Met Office, 2019), near-surface winds speeds are projected to rise towards the second half of the 21st Century.

9.13.20 However, these projections are modest compared to natural variability from month to month and season to season. Projections of future wind and storm occurrence and intensity are uncertain and confidence in projections is low. Research has shown that there are no compelling trends in maximum gust speeds over the last four decades (Kendon *et al*., 2019) and therefore there is no evidence that link climate change and storms.

Storm Surges and Rising Sea Levels

9.13.21 According to information obtained from the Met Office Website, UK (Met Office, 2022b) sea levels will continue to rise well beyond 2100 under all future emissions scenarios and the severity is largely dependent on future GHG emissions. Under low and high emissions scenarios, the approximate projected ranges at 2300 are 0.0 – 1.7 m and 0.7 – 3.6 m respectively, for Edinburgh.

9.13.22 However, according to the Met Office Website and UKCP18 data, there are potential for changes in future severity of storms, but it is not confirmed yet whether storms will become more severe or not. Nonetheless, the location of the proposed development is in an area at high risk of storms already and it is likely that this threat will only worsen with climate change.

9.13.23 Due to this evidence that storms may increase in frequency or severity as a result of climate change, likely significant effects resulting from storms and rising sea levels have been considered.

Summary of Projected Climatic Changes

9.13.24 In summary, it is anticipated that the Proposed Development will experience the following climatic changes:

- An increase in average annual temperature.
- An increase in maximum temperature, particularly in the summer.
- More extreme rainfall events.
- An increase in winter rainfall.
- A reduction in summer rainfall.

9.13.25 The projected climatic changes outlined above may have a direct impact on the Proposed Development, or result in secondary impacts which may impact the performance or integrity of the Proposed Development i.e., a 'climate hazard'. As a result of the projected climatic changes, there is an increased risk of:

- Long term changes to climate norms.
- Heatwaves.
- Low rainfall and drought.
- Heavy rainfall and flooding.
- Rising sea levels and potential increase in storms.

9.14 Embedded Mitigation

9.14.1 The Proposed Development has been designed to incorporate mitigation and adaptation measures to address climate change. This section provides a summary of these measures below, many of which have been addressed in full in other discipline chapters within this ES:

- **Design Standards:** The proposed development will be built to the following design standards: Eurocodes + UK national annexes, and BS 6349 Maritime works. These standards require the design to take account of sea level rises and changes in storm intensity due to climate change. An allowance for these effects is included in the wave model.
- **Wave Modelling:** The size and direction of waves is taken from the wave model which includes sea level rise and climate change effects. All elements of the Proposed Development will be appropriately sized for the wave climate predicted by this model, according to current standards and best practice guidelines. Breakwater geometry and composition will be according to BS 6349-7 and CIRIA C683 The Rock Manual, Chapter 6.
- **Land Stability**: Any land stability issues will be addressed through a desk based Ground Conditions Assessment (previously called a Phase 1) and a detailed ground investigation (GI). (**Appendix A6**) The GI will be controlled via a range of mitigation measures including SEPA's GPPs and PPGs (if applicable), a ballast water

management plan. The GI will be cognisant of NatureScot's guidance for the prevention of the introduction of native species (INNS). Based on the absence of SOPC, sensitive human health receptors, and with the implementation of the primary mitigation to protect the water environment, it is considered that there will be no potentially significant effects from ground conditions, including instability, and contamination. Ground conditions and land contamination are not included within the scope of this EIA.

- **Materials:** The cement combination comprises Fly Ash which provides greater cold weather resistance. Dredged material is to be stockpiled on land nearby and used hopefully within the harbour extension backfill. Some may be used for backfilling the quayside. Additionally, scour protection will be provided where appropriate around the base of structures and concrete cover to steel reinforcement will be suitably large to achieve the 60 year design life of the structure in this aggressive marine environment, according to BS 6349-1-4.

9.15 Assessment of Likely Effects

Future users of the site

9.15.1 Increased temperatures and drier summers may affect human behaviour with. The predicted increase in heatwaves may affect the health of future users of the Ferry during its operation. However, as noted in **Chapter 10 Socio Economic** extreme conditions will have the greatest adverse impacts on health. The warmer winters and reduced risk of cold snaps may have potentially positive outcomes for those with circulatory and respiratory impacts. However, extreme conditions may have adverse impacts on human health, with most vulnerable to heatwaves likely to be those with circulatory and respiratory conditions. Nonetheless, due to the cool climate at the location of the proposed development, it is unlikely that these temperature rises/heatwaves will result in any significant negative effects on the future users of the site.

9.15.2 Rainfall is likely to increase in winter months and decrease in summer months. On Fair Isle, mains water is provided by Scottish Water from a 73 m deep well near the airstrip. In the past, there were a number of wells scattered around the island. Water is also pumped to the small Vaadal reservoir which provides storage for some three days' supply of water. Therefore, even with the predicted reduction in rainfall in the summer months, it is unlikely to result in droughts and effect future users of the site.

9.15.3 Sea level rise and storms have the potential to isolate future users of the Site, disrupt service provision, and increase risk to human health, in particular mental health. For example, sea level rise, flooding, and storms could result in the ferry being out of use and no longer able to transport goods, services and residents to and from the Island.

Infrastructure including the harbour and ferry

9.15.4 Infrastructure may require more maintenance and repair as changes to climatic norms may cause increased stress on, for example, increased stress on the noust.

9.15.5 Due to the location of the proposed development and the severe weather conditions that are experienced, there is potential for storms to cause damage to the ferry and harbor.

9.15.6 Extremes in temperatures have the potential to damage infrastructure, for example causing tarmac to soften, melt and be more susceptible to damage. As a result, additional maintenance and emergency repairs may be required.

9.15.7 Reduction in rainfall could cause soil moisture deficits, which may affect soil stability. This may increase risk of damage to infrastructure.

9.15.8 Increased precipitation during the winter and more intense rainfall events are likely to increase flood risk and surface water run-off. This could prevent the use of and/or damage infrastructure and also adversely affect water quality.

In-Combination Effects

9.15.9 There is potential for in-combination climate change effects to exacerbate other environmental effects identified in other topic chapters without mitigation. There is a need to deliver a co-ordinated approach to the climate change mitigation measures to provide climate resilience within the Proposed Development. The proposed embedded mitigation measures have been outlined in **Section 9.16**. It is considered that, with the implementation of these embedded mitigation measures and careful consideration of climate change mitigation and adaptation measures at the design stages, the effects identified within the topic chapters will not be

exacerbated as a result of climate change. In-combination effects are therefore **Negligible** and **Not Significant**.

9.16 Further Mitigation

All potential effects of climate change on the proposed development have been mitigated against using wave modelling and ground investigations. Therefore, no further mitigation is required.

9.17 Residual Effects

9.17.1 The minor adverse effect on future users of the site, and infrastructure as a result of future climate change has been mitigated as far as possible with embedded mitigation. Mitigating these effects further is reliant on aspects outside the scope of the Proposed development, such as increasing the resilience of health services and availability of emergency services. Therefore, these effects remain as **Minor Adverse**, which is considered to be **Not Significant**.

9.18 Monitoring

9.18.1 No significant effects have been identified in relation to climate vulnerability and resilience, therefore no monitoring is proposed.

9.19 Summary

9.19.1 This Chapter has assessed the likely significant effects of the Proposed Development on climate change, and the likely significant effects of climate change on the Proposed Development, with due regard to IEMA guidance.

GHG Emissions Assessment

9.19.2 The GHG emissions assessment provided a qualitative description of the anticipated GHG emissions arising during the construction phase of the Proposed Development.

9.19.3 The Department for Business, Energy & Industrial Services (DBEIS, 2021b) sets out the CO_2 emissions estimates from a number of sources for 2005-2020 and is the most up to date available figures for the UK, Scotland and Shetland Islands. The Shetland Islands accounts for approximately 1.68% of the total CO_2 emissions in Scotland, and 0.18% of the total UK emissions

9.19.4 The Scottish Government has set targets for annual emissions. These Annual Targets align with Scotland's Climate Change Act 2019 which commits Scotland to net-zero emissions of all greenhouse gases by 2045 and has interim targets for 2020 and 2040 which require Scotland to reduce annual emissions by 56% and 90% respectively, compared to the baseline year.

9.19.5 During construction, direct GHG emissions will be emitted from activities such as the combustion of fuels for vehicles, plant or equipment used for construction (scope 1). There will also be emissions from generators or purchased electricity needed for plant and welfare facilities (Scope 2). Outsourced activities such as waste disposal as well as indirect emissions from the production of purchased materials and the transportation of these materials to site during construction will further contribute to GHG emissions (Scope 3).

9.19.6 Prefabrication of the majority of materials used will reduce the amount of diesel being burnt on site during construction. All materials will be brought on to site on a boat as opposed to aviation and the use of pre-cast blocks will reduce the amount of material required to be

transported to the site. Consideration has been given to sourcing material locally (including the breakwater stone), and material excavated from hollowing the existing noust is anticipated to be re-used within the proposed development, thus reducing waste. Additionally, a FIEMP will include mitigation measures that will reduce GHG emissions during construction. All embedded mitigation will reduce both direct and indirect GHG emissions of the Proposed Development during the construction phase.,.

9.19.7 The likely effects identified were all mitigated through the embedded mitigation and therefore the residual effects are **Minor Adverse** and **Not Significant** in line with the IEMA guidance.

Climate Change Risk Assessment

9.19.8 This Climate Change Risk Assessment provided a description of the anticipated effects of climate change on the Proposed Development during its operational phase.

9.19.9 UKCP18 climate projections were used to establish evolving baseline climate conditions up to 2099. It is expected that the Proposed Development may experience warmer, drier summers and milder, wetter winters, along with an increase in frequency and intensity of extreme weather events such as droughts or heatwaves as well as rising sea levels and possible increase in storm severity and frequency. This has the potential to adversely affect receptors within the Proposed Development, including future users of the Site, and infrastructure (including the harbour and the boat),

9.19.10 The Climate Change Risk Assessment provided a description of the anticipated effects of climate change on the proposed development during the operational phase.

9.19.11 Historic climate averages during the period 1991-2020 for the closest climate station to the site (Fair Isle), obtained from the Met Office website (Met office, N.Da) (Met Office, 2022b), indicates the following:

- An increase in average annual temperature
- An increase in maximum temperature, particularly in the summer
- More extreme rainfall events
- An increase in winter rainfall
- A reduction in summer rainfall
- A rise in sea levels.

9.19.12 The projected climatic changes outlined above may have a direct impact on the Proposed Development, or result in secondary impacts which may impact the performance or integrity of the Proposed Development i.e. a ‘climate hazard’. As a result of the projected climatic changes, there is an increased risk of long-term changes to climate norms, heatwaves, low rainfall and drought, and heavy rainfall and flooding, as well as increased sea levels and possible increased storm surges.

9.19.13 To mitigate against the effects of climate change on the Proposed Development, design standards (Eurocodes + UK national annexes and BS6349 Maritime works) have been adhered to in the design and wave modelling has been undertaken, incorporating sea level rise and climate change effects to design the elements to be appropriately sized for the future wave climate. Also, concrete cover to steel reinforcement will be suitably large to achieve the 60 year design life of the structure in this aggressive marine environment, according to BS 6349-1-4.Additionally, land stability issues will be addressed through a desk-based Ground Conditions Assessment and a detailed ground investigation (GI) Finally,, dredged material is to be stockpiled on land nearby and used locally for shore protection in the intertidal zone as desired by the community and some may be used for backfilling the quayside.

9.19.14 The likely effects of climate change on the proposed development were all mitigated through the embedded mitigation and therefore the residual effects are **Minor Adverse** and **Not Significant** in line with the IEMA guidance.

9.20 Referencing

British Standards Institute (BSI) (2016). 'PAS 2080:2016 Carbon management in Infrastructure'. BSI Standards Limited.

British Standards Institute (BSI) (2014). 'PAS 2060:2014 'Specification for the demonstration of carbon neutrality'. BSI Standards Limited.

CCC (2021) 'Independent Assessment of UK Climate Risk' Climate Change Committee [online]: https://www.theccc.org.uk/publication/independent-assessment-of-uk-climate-risk/ Accessed: 17/02/2022

Christidis, N., and P. A. Stott. (2015) "Extreme rainfall in the United Kingdom during winter 2013/2014: The role of atmospheric circulation and climate change [in "Explaining Extremes of 2014 from a Climate Perspective"]." Bull. Amer. Meteor Soc., 96 (12), S46-S50, doi: 10.1175/BAMS-D-15-00094.1.

Department for Environment, Food & Rural Affairs (DEFRA) (2018a). 'A Green Future: Our 25 Year Plan to Improve the Environment' [online] Available here: https://www.gov.uk/government/publications/25-year-environment-plan#full-publication-update-history Accessed: 17/02/2022

Department for Environment, Food & Rural Affairs (DEFRA) (2018b). 'Climate change: second national adaptation programme (2018 to 2023)'. [online] Available here: https://www.gov.uk/government/publications/climate-change-second-national-adaptation-programme-2018-to-2023 Accessed: 17/02/2022

Department for Business, Energy & Industrial Strategy (DBEIS) (2018). 'Clean Growth Strategy'. [online] Available here: https://www.gov.uk/government/publications/clean-growth-strategy Accessed: 17/02/2022

Department for Business, Energy & Industrial Strategy (DBEIS) (2020a). 'The ten point plan for a green industrial revolution'. [online] Available here: https://www.gov.uk/government/publications/the-ten-point-plan-for-a-green-industrial-revolution Accessed: 17/02/2022

Department for Business, Energy & Industrial Strategy (DBEIS) (2020b). 'Energy white paper: Powering our net zero future'. [online] Available here: https://www.gov.uk/government/publications/energy-white-paper-powering-our-net-zero-future Accessed: 17/02/2022

Department for Business, Energy & Industrial Strategy (DBEIS) (2021a) 2019 UK Greenhouse Gas Emissions, Final figures, Department for Business, energy & Industrial Strategy, National Statistics [Online] Available at: https://www.gov.uk/government/statistics/final-uk-greenhouse-gas-emissions-national-statistics-1990-to-2019 Accessed: 17/09/2021

Department for Business, Energy & Industrial Strategy (DBEIS) (2021b). 'UK local authority and regional carbon dioxide emissions national statistics: 2005 to 2019', Department for Business, Energy & Industrial Strategy, National Statistics [online]: https://www.gov.uk/government/statistics/uk-local-authority-and-regional-carbon-dioxide-emissions-national-statistics-2005-to-2019 Accessed: 17/09/2021

Department for Business, Energy & Industrial Strategy (DBEIS) (2022). 'Net Zero Strategy: Build Back Greener'. https://www.gov.uk/government/publications/net-zero-strategy Accessed: 17/02/2022

Department for Levelling Up, Housing and Communities (DfLUHC) (2022). 'Building Regulations in England: circular 01/2022'. [online] Available here: https://www.gov.uk/government/publications/building-regulations-in-england-circular-012022 Accessed: 17/02/2022

Department for Transport (DfT) (2020). 'Government takes historic step towards net-zero with end of sale of new petrol and diesel cars by 2030', Department for Transport, Office for Low Emission Vehicles, Department for Business, Energy & Industrial Strategy, The Rt Hon Alok Sharma MP, and The Rt Hon Grant Shapps MP [online]: https://www.gov.uk/government/news/government-takes-historic-step-towards-net-zero-with-end-of-sale-of-new-petrol-and-diesel-cars-by-2030 Accessed: 17/09/2021

Department for Transport (DfT) (2021). 'Transport decarbonisation plan'. [online] Available here: https://www.gov.uk/government/publications/transport-decarbonisation-plan Accessed: 17/02/2022

Fung F, Lowe J, Mitchell JFB, Murphy J, Bernie D, Gohar L, Harris G, Howard T, Kendon E, Maisey P, Palmer M and Sexton D (2018). "UKCP18 Guidance: Caveats and Limitations." Met Office Hadley Centre, Exeter.

House of Commons (HOC) (2021). 'Electric vehicles and infrastructure.' [online] available here: https://researchbriefings.files.parliament.uk/documents/CBP-7480/CBP-7480.pdf Accessed: 17/02/2022

Institute of Environmental Management & Assessment (IEMA) (2020a). 'Pathways to Net Zero using the IEMA GHG Management Hierarchy'. IEMA, Lincoln.

Institute of Environmental Management & Assessment (IEMA) (2020b) 'Environmental Impact Assessment Guide to: Climate Change Resilience & Adaptation':

Institute of Environmental Management & Assessment (IEMA) (2022) 'Assessing Greenhouse Gas Emissions and Evaluating their Significance' 2nd Edition.

Kendon M., (2014) "Has there been a recent increase in UK weather records?" Weather. RMetS. Volume 69 Issue 12: 327-332 https://doi.org/10.1002/wea.2439 Accessed: 17/09/2021

Kendon M, McCarthy M, Jevrejeva S, Matthews A, Legg T. (2019) "State of the UK climate 2018". Int J Climatol. 39 (Suppl. 1):1–55. https://doi.org/10.1002/joc.6213 Accessed: 17/09/2021

Kendon M., McCarthy M., Jevrejeva S., Matthews A., Sparks T., and Garforth J. (2021). 'State of the UK Climate 2020 *International Journal of Climatology*, 41 (suppl.2) 1-76.

Lowe, J.A., Bernie, D., Bett, P., Bricheno, L., Brown, S., Calvert, D., Clark, R., Eagle, K., Edwards, T., Fosser, G., Fung, F., Gohar, L., Good, P., Gregory, J., Harris, G., Howard, T., Kaye, N., Kendon, E., Krijnen, J., Maisey, P., McDonald, R., McInnes, R., McSweeney, C., Mitchell, J.F.B., Murphy, J., Palmer, M., Roberts, C., Rostron, J., Sexton, D., Thornton, H., Tinker, J., Tucker, S., Yamazaki, K. and Belcher, S. (2019) "UKCP18 Science Overview Report" Met Office Hadley Centre, Exeter.

Met Office (2018a). 'UKCP18 Guidance: How to use the UKCP18 land projections'. Available here:

https://www.metoffice.gov.uk/binaries/content/assets/metofficegovuk/pdf/research/ukcp/ukcp18-guidance---how-to-use-the-land-projections.pdf Accessed: 17/09/2021

Met Office (2018b). 'About UKCP18' [online] available here: https://www.metoffice.gov.uk/research/approach/collaboration/ukcp/about Accessed: 17/09/2021

Met Office (2019) "UKCP18 Factsheet: Wind" [online] available here: https://www.metoffice.gov.uk/binaries/content/assets/metofficegovuk/pdf/research/ukcp/ukcp18-fact-sheet-wind.pdf Accessed 17/09/2021

Met Office (2019) "UK sea level projections to 2300" [online] available here: https://www.metoffice.gov.uk/research/news/2019/uk-sea-level-projections-to-2300

Met Office (N.Da) "UK Climate Averages" Fair Isle (Shetland Islands) UK climate averages - Met Office Accessed: 17/09/2021

Met Office (N.Db) "UKCP18 Factsheet: Snow" [online] available here: https://www.metoffice.gov.uk/binaries/content/assets/metofficegovuk/pdf/research/ukcp/ukcp18-factsheet-snow.pdf Accessed: 17/09/2021

Met Office (N.Dc) "How does snow form?" [online] available here: https://www.metoffice.gov.uk/weather/learn-about/weather/types-of-weather/snow/how-does-snow-form Accessed: 17/09/2021

Met Office (2022a). "What is a Heatwave?" [online] available here: https://www.metoffice.gov.uk/weather/learn-about/weather/types-of-weather/temperature/heatwave Accessed: 17/09/2021

Met Office (2022b) "Past weather events" [online] available here: https://www.metoffice.gov.uk/weather/learn-about/past-uk-weather-events Accessed: 17/09/2021

Metulla C., Schroner W., Alexandersson H., Von Storch, H., Wang X. L. (2008) "European storminess: Late nineteenth century to present" Climate Dynamics 31(2):125-300

Ministry of Housing, Communities & Local Government (MHCLG) (2021a) 'National Planning Policy Framework'. [online] Available here: https://www.gov.uk/government/publications/national-planning-policy-framework--2 Accessed: 17/02/2022

Ministry of Housing, Communities & Local Government (MHCLG) (2021b). 'Planning practice guidance'. [online] Available here: https://www.gov.uk/government/collections/planning-practice-guidance Accessed: 17/02/2022

Ministry of Housing, Communities & Local Government (MHCLG) (2021c). 'The Future Homes Standard: changes to Part L and Part F of the Building Regulations for new dwellings'. [online] available here: https://www.gov.uk/government/consultations/the-future-homes-standard-changes-to-part-l-and-part-f-of-the-building-regulations-for-new-dwellings Accessed: 17/02/2022

Office for Low Emission Vehicles and Office for Zero Emission vehicles (OLEV and OZEV) (2018) 'Reducing emissions from road transport: Road to Zero Strategy', Department for Transport, , [online] available here: https://www.gov.uk/government/publications/reducing-emissions-from-road-transport-road-to-zero-strategy Accessed: 17/02/2022

UK Climate Risk (2021). 'UK Climate Risk Independent Assessment (CCRA3)'. [online] Available here: https://www.ukclimaterisk.org/independent-assessment-ccra3/technical-report/ Accessed: 17/02/2022

UK Government (2017). 'The Town and Country Planning (Environmental Impact Assessment) Regulations 2017'. [online] Available here: https://www.legislation.gov.uk/uksi/2017/571/contents/made Accessed: 17/02/2022

UK Government (2019). 'Climate Change Act 2008' [online] Available here: https://www.legislation.gov.uk/ukpga/2008/27/contents Accessed: 17/02/2022

United Nations (UN) (2015). 'Paris Agreement' [online] Available here: https://unfccc.int/files/essential_background/convention/application/pdf/english_paris_agreement.pdf Accessed: 14/04/2022

United Nations Framework Convention on Climate Change (UNFCCC) (2021). 'Glasgow Climate Pact' [online] Available here: https://unfccc.int/sites/default/files/resource/cop26_auv_2f_cover_decision.pdf Accessed: 14/04/2022

Vautard, R., Boucher, O., Jan van Oldenborgh, G., Otto, F., Haustein, K., Vogel, M., Seneviratne, S., Soubeyroux, J-M., Schneider, M., Drouin, A.., Ribes A., Kreienkamp, F., Stott, P. and Aalst M. (2019) "Human contribution to the record-breaking July 2019 heat wave in Western Europe". Available here https://www.worldweatherattribution.org/wp-content/uploads/July2019heatwave.pdf Accessed: 17/09/2021

WBCSD and WRI (2004). 'The GHG Protocol: A Corporate Accounting and Reporting Standard.' WBCSD, Geneva and WRI, Washington DC

10 Socio-economics

10.1 Introduction

10.1.1 This Chapter assesses the likely significant socio-economic effects of the Proposed Development. In particular, the Chapter considers the direct effects of the Proposed Development on employment and the indirect effects on depopulation, health and well-being, economic development, living costs and tourism and recreation.

10.1.2 This chapter has been prepared by Barton Willmore, now Stantec's Development Economics Team. In accordance with Regulation 18(5) of the Town and Country Planning (Environmental Impact Assessment) Regulations 2017, as amended, a statement outlining the relevant expertise and qualifications of competent experts appointed to prepare this ES is provided in **Appendix A.3**.

10.1.3 This Chapter is supported by the following appendices:

- Appendix A10 – Figure A10.1 –Wider and Local Study Area.

10.2 Policy Context, Legislation, Guidance and Standards

10.2.1 The Islands (Scotland) Act 2018 introduces measures to support and help meet the unique needs of Scotland's islands now and in the future. It will also seek to help create the right environment for sustainable growth and empowerment. Relevant policies to the socio-economic chapter are:

- Section 1 of the Act defines how the legal basis for greater decision making at a local level within the Scottish Islands and increasing economic prosperity for island communities can be achieved through 'island proofing' legislation, policy and strategic decisions by taking account of the special circumstances of island communities and ensuring no disadvantage to people living and working on islands. Within the Final Island Communities Impact Assessment, Stantec UK Ltd have utilised island specific surveys, consultations and research to identify the socio-economic circumstances specific to residents on Fair Isle. These circumstances have been taken into account when formulating the details of the ferry project.
- Section 7 states that a 'relevant authority' must have regard to island communities in carrying out its functions (Shetland Island Council and 'ZetTrans) are 'Relevant Authorities' with regards to Section 7(2) of the Islands (Scotland) Act 2018.
- Section 8 of the Act requires relevant public bodies to undertake an Island Communities Impact Assessment (ICIA) "in relation to a policy, strategy or service which, in the authority's opinion, is likely to have an effect on an island community which is significantly different from its effect on other communities (including other island communities) in the area in which the authority exercises its functions. The Final Island Communities Impact Assessment has been completed by Eyland Skyn in partnership with Stantec UK Ltd, utilising a framework-based approach to summarise the ways in which the preferred solution addresses the island specific challenges and opportunities.
- Section 8(3) states that an island communities impact assessment prepared under subsection (1) must – (a) describe the likely significantly different effect of the policy, strategy or service and (b) assess the extent to which the authority considers the policy, strategy or service can be developed or delivered in such a manner as to improve or mitigate, for island communities, the outcomes resulting from it. The ICIA considers the impacts on Fair Isle (as well as Shetland as a whole) and validate that policies and actions contained within the project are fit for purpose for Fair Isle and Shetland, and the

ICIA should assist in shaping the ferry project implementation plan to address the factors that can disadvantage island communities.

- Section 10 of the Act sets out how a 'Relevant Authority' demonstrates compliance with the duty imposed by Section 7:
  a) By making such arrangements as it considers appropriate to review any policy, strategy or service (as the case may be) which it develops or delivers in carrying out its functions; and

  b) Either,

     i) In the case where the authority must prepare an Island Communities Impact Assessment under section 8(1), by preparing that assessment; or

     ii) In any other case, by making such an assessment or taking such other steps as the authority considers appropriate.

- Section 12 of the Act requires the 'Relevant Authority' to publish information about the steps it has taken to comply with section 7 of the Act during a reporting period.
- Annex C lists the following areas that are relevant considerations for islands and island communities:
  - Depopulation
  - Economic Development
  - Environmental protection
  - Health and wellbeing
  - Community empowerment
  - Transport
  - Digital Connectivity
  - Fuel Poverty
  - Land management
  - Biodiversity

10.2.2 The Fairer Scotland Duty (FSD) 2018, arising from the Equalities Act 2010 section 1, places a legal responsibility on named public bodies in Scotland to actively consider ('pay due regard' to) how they can reduce inequalities of outcome caused by socio-economic disadvantage, when making strategic decisions.

- An FSD assessment of the Fair Isle ferry project has been completed by Eyland Skyn in partnership with Stantec UK Ltd to ensure than socio-economic consideration and assessment has been at the core of developing the preferred option. This focusses on socio economic disadvantage (influenced by wealth, income, material and area deprivation and socio-economic background) and inequality of outcome (including education, skills, employment, health and wellbeing, living standards and poverty). Specific socio-economic issues facing the island such as transport and connectivity, access to employment, cost of living, type of work available are considered.

10.2.3 The 'Our Islands Our Future' initiative put forwards by Comhairle nan Eilean Siar (the Western Isles Council) in conjunction with the Shetlands Island Council and Orkney Island Council calls for a commitment that the needs and status of the island areas are clearly recognised in a new (post 2014 referendum) era for Scotland.

- Under this initiative, dialogue between the Shetland Island Council and the Scottish government began, establishing principles for the fair funding of transport services and infrastructure, on the basis that the financial burden placed upon the council in providing inter-island transport.

10.2.4 The National Islands Plan 2019 sets out 13 strategic objectives which seek to improve the quality of life for island communities. Fairness is one of four principles the plan is based on, it underpins a commitment to equality and human rights. The plan recognises that every member of society has a right to live with dignity and to enjoy high quality public services wherever they live.

- The National Islands Plan describes "transport (air, road, ferry, bus and other shared transport, active travel and mainland rail services) is of great importance to island communities and is a key factor in the ability of individual residents to, for example, access services and enjoy fundamental human rights." Further "without adequate transport links to and from an island or between an island and between islands, the island community will be in a disadvantaged position compared to similar mainland communities.. transport is, hence, a key part of an integrated and sustainable approach to island policy". The ferry project is relevant to this section of the Islands plan, as it seeks to increase transport availability for those residing on Fair Isle.

10.2.5 The Shetland Local Development Plan (LDP) 2014 was adopted by the Council on 26th September 2014 and is the established planning policy for Shetland.

10.3 Consultation

10.3.1 An EIA Scoping Report (Appendix A.2) was submitted to the Shetland Islands Council (SIC) on 12th April 2022. Following consultation with statutory consultees, a Scoping Opinion was received from SIC on 27 June 2022 (Appendix A.2). SIC's Scoping Opinion agreed with the proposed scope and approach to the assessment of effects relating to socio-economics and community set out in the submitted EIA Scoping Report.

10.4 Methodology

Study Area

10.4.1 Two Study Areas have been adopted within this assessment:

- A **Wider Study Area** defined as The Shetland Islands; and
- A **Local Study Area** defined as The Fair Isle.

10.4.2 Figure A1.10.1 of Appendix A1 provides the geographical context of the Study Areas.

Baseline Data Collection

10.4.3 To inform the assessment a desk-based review of publicly available data has been undertaken to establish relevant baseline socio-economic conditions across the identified Study Areas, as well as to consider how these conditions compare with the regional and national average. The following socio-economic indicators have been considered:

- Demographic characteristics, including population size and age structure.
- Labour market characteristics, including working age population profile (level of economic activity) and the workplace economy profile (employment by industry).
- Tourism and recreation characteristics including related facilities and visitor numbers.

Assessment

10.4.4 There are no specific standards against which the predicted impacts on socio-economic receptors can be assessed within the context of EIA. The assessment of effects is therefore based on professional judgement, the sensitivity of an individual receptor and the magnitude of change within the context of the baseline conditions.

Sensitivity of receptors

10.4.5 Receptor sensitivity is defined as either high, medium or low and has been determined with reference to the importance of the receptors established in the baseline conditions and the extent to which any change upon these could affect their performance or livelihood. The sensitivity of relevant receptors has therefore been defined on a case-by-case basis and is explained within the assessment for each individual receptor.

Magnitude of Change

10.4.6 The magnitude of change from the construction and operation of the Proposed Development on identified socio-economic receptors is determined using the criteria set out in **Table 10.1**. The assessment of predicted Magnitude of Change from the Proposed Development has been informed by all publicly available information sources at the time of this assessment.

Table 10.1: Magnitude of Change Criteria

Magnitude of Change	Type of Change	Criteria
High	Adverse	Employment changes: the number of jobs lost in the Study Area would be 250 or greater (based upon the EU definition of small and medium enterprises (European Commission, 2003)). Other socio-economic changes: adverse changes to identified receptors would be observed on an international, national or regional scale. Changes are likely to be experienced over the long term (i.e., 5+ years).
	Beneficial	Employment changes: the number of jobs created in the Study Area would be 250 or greater. Other socio-economic changes: beneficial changes to identified receptors would be observed on an international, national or regional scale. Changes are likely to be experienced over the long term (i.e., 5+ years).
Medium	Adverse	Employment changes: the number of jobs lost in the Study Area would be 50 or greater, but fewer than 250. Other socio-economic changes: Noticeable adverse changes, judged to be important at a local scale, to identified receptors. Changes are likely to be experienced over the medium term (i.e., 3-5 years).
	Beneficial	Employment changes: the number of jobs created in the Study Area would be 50 or greater, but fewer than 250. Other socio-economic changes: Noticeable beneficial changes, judged

Magnitude of Change	Type of Change	Criteria
		to be important at a local scale, to identified receptors. Changes are likely to be experienced over the medium term (i.e., 3-5 years).
Low	Adverse	Employment changes: the number of jobs lost in the Study Area would be greater than 10, but fewer than 50. Other socio-economic changes: Small scale adverse changes to identified receptors at the local level only. Changes are likely to be experienced over the short term (i.e., 1-2 years).
	Beneficial	Employment changes: the number of jobs created in the Study Area would be greater than 10, but fewer than 50. Other socio-economic changes: Small scale beneficial changes to identified receptors at the local level only. Changes are likely to be experienced over the short term (i.e., 1-2 years).
Negligible	Adverse	Employment changes: the number of jobs lost in the Study Area would be less than 10. Other socio-economic changes: very small-scale adverse changes to identified receptors at the local level only. Changes are likely to be experienced over the short term (i.e., less than 6 months).
	Beneficial	Employment changes: the number of jobs gained in the Study Area would be less than 10. Other socio-economic changes: very small-scale beneficial changes to identified receptors at the local level only. Changes are likely to be experienced over the short term (i.e., less than 6 months).
No Change		No change would be perceptible, either beneficial or adverse.

Source: Stantec (2022)

Significance Matrix of Socio-economic Effects

10.4.7 In line with standard EIA practice, a matrix-based approach was adopted to consider the sensitivity of identified receptors in tandem with the likely magnitude of change from the proposed development. This method allowed the level and significance in EIA terms of all predicted socio-economic effects to be determined. The EIA significance matrix adopted in this assessment is detailed in **Table 10.2**.

Table 10.2: Significance Matrix of Socio-economic Effects

Sensitivity	Magnitude of change			
	High	Medium	Low	Negligible
High	Substantial	Major	Moderate	Minor
Medium	Major	Moderate	Minor	Negligible
Low	Moderate	Minor	Minor/Negligible	Negligible

Source: Stantec (2022)

10.4.8 In line with the methodology outlined in **Chapter 5 – Assessment Method**, moderate, major, or substantial likely effects are considered significant within the context of EIA Regulations.

Limitations

10.4.9 The assessment relies on secondary survey data published by the Scottish Government and its official statistics authority (the NRS). Each data source has methodological limitations related to data collection and the data only represents the socio-economic context at a specific point in time.

10.4.10 There are no further limitations or assumptions made other than those covered in the topic specific paragraphs above.

10.5 Baseline Conditions

The Site

10.5.1 The Fair Isle ferry berth is located within the harbour at North Haven[13], on the north-east side of the Island. The nearest post code is ZE2 9JU and the central grid reference is HZ 22498 72527.

10.5.2 There are seven buildings within 250m of the site which are all uninhabited and used for storage. Existing harbour facilities comprise the following:

- 60m long berthage with 3.60m water depth (at Mean Low Water Springs MLWS);
- 14m wide general cargo apron and storage building behind;
- Single track access road with limited space for parking
- Finger pier aligning structure, slipway (1:10 nominal slope), cradle, noust and winch-house; and
- Fresh water and waste disposal at facilities behind the pier.

10.5.3 The Site is located on Fair Isle within the SIC administrative area.

10.5.4 The Site is located within environmental designations including Special Protection Areas (SPA) and a Special Area of Conservation (SAC) (North Haven, Fair Isle) and Site of Special Scientific Interest (SSSI).

The Surrounding Area

10.5.5 Fair Isle is the most geographically remote inhabited island in the United Kingdom. It lies 24 miles from Shetland Mainland and 27 miles from North Ronaldsay, the most northerly of the Orkney islands. It is administratively part of Shetland.

10.5.6 There is a permanent population of around 60 people, who mostly live at the south end of the island. There are no dwellings present within the Site, the nearest is located approximately 1.5km southwest.

10.5.7 There are no public Rights of way (PRoW) within the Site or surrounding area. However, as the Site is within Scotland, it comes under the Land Reform (Scotland) Act 2003 which is an Act of the Scottish Parliament to establish statutory public rights of access to land for recreational and other purposes.

[13] Grid reference 59 32’ N 01 36’ W and Admiralty Chart 3299

10.5.8 The Fair Isle Airport is located approximately 1.15 km west of the Site. Fair Isle Airport serves the island with flights to Tingwall Airport near Lerwick.

10.5.9 There are limited roads surrounding the Site, only the Fair Isle to Sumburgh Airport Road leading to the Fair Isle Airport to the west and also one connecting the pier to the Fair Isle North Lighthouse. There is one Category C Listed Building approximately 150m west of the Site which is a Shetland böd, a building used to house fishermen and their equipment during the season but is currently uninhabited.

10.5.10 Approximately 330m to the southwest of the Site is the Fair Isle Bird Observatory (FIBO). Fair Isle Bird Observatory is run by an independent charity, FIBO Trust (registered charity No. SCO 11160), which owns the building and a small area of land. The FIBO burnt down in March 2019 however prior to this, it was the main provider of accommodation on the island and also a significant source of income and employment. In October 2021 the FIBO charity won a bid for significant investment to re-build the observatory. The newly built facility is due for completion and re-opening in Autumn 2023.

10.5.11 The majority of Fair Isle is owned by the National Trusts Scotland who acquired the land in 1954.

Existing Ferry and Passenger Accessibility to the Island

10.5.12 Fair Isle is connected to mainland Shetland by two lifeline transport links; air service by means of an eight seat Britten-Norman BN-2 Islander aircraft; and the existing ferry service operated by the MV Good Shepherd IV which provides the critically important supply chain and freight link as well as capacity for 12 passengers per sailing.

10.5.13 The existing ferry, the MV Good Shepherd IV is:

- over 35 years old, having entered service on Fair Isle run in 1986;
- an 18-metre vessel broadly similar to that of a traditional fishing vessel;
- passenger numbers are limited to 12; and
- delivers cargo using a vessel mounted crane; it can carry cargo in a below deck hold and on the weather deck.

10.5.14 Whilst the primary mode of travel to/from Fair Isle for both visitors and residents is the air service via Fair Isle Airport, the ferry predominantly fulfils the supply chain needs of the island. Nonetheless, the ferry is used by passengers when: (i) the air service is fully booked or disrupted; or (ii) there is a requirement to take equipment/goods which cannot be carried on the air service.

10.5.15 Between 2010 and 2018, 1,703 sailings were completed, with the median number of yearly sailings being 184. [14]

Population

10.5.16 Scottish mid-year population estimates are not granular enough to provide population estimates for Fair Isle. Therefore, the most recent population data available for Fair Isle is from the 2011 Census which recorded 68 people living on Fair Isle [15].

10.5.17 Table 13.3 illustrates that Fair Isle has an older age profile than the Shetland Islands and Scotland with a higher proportion of people aged 65+ (22% compared to 16% and 17%

[14] Shetlands Inter-Island Transport Study – Fair Isle Outline Business Case 2018

[15] Search | Scotland's Census - Area Overview - Results for 2011 (scotlandscensus.gov.uk)

respectively). The Fair Isle also has a lower proportion of residents of working age (56%) than the Shetland Islands (64%) and Scotland (66%). However, Fair Isle has a larger proportion of people aged 0 to 15 years (22%) compared to the Shetland Islands (19%) and Scotland (17%).

Table 13.3: Age Profile by Broad Age Group (2011)

	Fair Isle	Shetland Islands	Scotland
Aged 0 to 15	22%	19%	17%
Aged 16 to 64	56%	64%	66%
Aged 65+	22%	16%	17%
All Ages	**100%**	**100%**	**100%**

Source: Scottish Census 2011. All figures have been individually rounded and may not sum

10.5.18 More recent mid-year population estimates (for the year 2021) are available for defined data zones. These zones are designed to have roughly standard populations of 500 to 1,000 household residents, nest within local authorities, have compact shapes that respect physical boundaries, and contain households with similar social characteristics[16]. The data zone that Fair Isle sits in is Shetland South - 01 Lower layer Super Output Area (LSOA). The 2011 data zone code is S01012387.

10.5.19 Table 13.4 shows the broad age profile of the data zone which encompasses Fair Isle, compared to the Shetland Islands and Scotland. The 2021 Mid-Year Population Estimates reveal that both the Shetland Islands and Scotland's age profile is now older than it was at the time of the 2011 Census, with a greater proportion of the population aged 65+ years in 2021 compared to 2011 and a slight reduction in the proportion of the population of working age. The proportion of the population aged 65 and over is greater in the Fair Isle data zone than in both the Shetland Islands and Scotland. The ageing demographic is also a trend that is likely to have been experienced on Fair Isle.

Table 13.4: Age Profile by Broad Age Group (2021)

	Shetland South 01	Shetland Islands	Scotland
Aged 0 to 15	17%	18%	17%
Aged 16 to 64	60%	62%	65%
Aged 65+	23%	20%	18%
All people	**100%**	**100%**	**100%**

Source: National Records Scotland: Mid-Year Population Estimates 2021. All figures have been individually rounded and may not sum

10.5.20 Fair Isle is owned by the National Trust for Scotland. Anyone who wishes to move to the Island must apply to the National Trust. In 2005, the National Trust for Scotland advertised two vacant crofts and received 94 applications[17].

Housing Market

10.5.21 The 2011 Census reported that there were 26 households on the Fair Isle. Table 13.5 shows the household composition for the Fair Isle compared to the Shetland Islands and Scotland.

[16] Data Zone Boundaries 2011 (spatialdata.gov.scot)

[17] lerwick-bressay-gulberwick-south-mainland-fair-isle-and-skerries (shetland.gov.uk)

Table 13.5: Household composition

	Fair Isle	Shetland Islands	Scotland
Single person household under 65	8%	20%	22%
Single person household 65 +	8%	12%	13%
Other 65+	23%	8%	8%
Lone parent with dependent children	-	5%	7%
Lone parent with non-dependent children	-	4%	4%
Married or civil partnership couple with dependent children	31%	16%	14%
Married or civil partnership couple with no dependent children	19%	20%	18%
Cohabiting couple with dependent children	4%	5%	4%
Cohabiting couple no dependent children	8%	6%	6%
All full-time students	-	-	1%
Other	-	4%	4%
Total number of households	26	9,950	2,372,777

Source: Scottish Census 2011. All figures have been individually rounded and may not sum

10.5.22 Table 13.5 indicates that 31% of households on Fair Isle are married or civil partnership couples with dependent children. In contrast, such households represent a much smaller proportion for the Shetland Islands (16%) and Scotland (14%). A further 4% of households on Fair Isle have children (cohabiting couple with dependent children). In total therefore, only 35% of households on Fair Isle have children (totalling 9 households). Therefore, 65% of households on Fair Isle are adult households with 31% of these households headed by a person over the age of 65 years. In contrast, only 20% of households in the Shetland Islands and 21% of households in Scotland are headed by a person over the age of 65 years.

10.5.23 The most recent year for which data on dwelling type was available, to the granularity of Scottish data zones was 2017. Table 13.6 shows the dwelling type for the data zone encompassing Fair Isle, compared to the Shetland Islands and Scotland.

Table 13.6: Dwelling by type

	Shetland South 01	Shetland Islands	Scotland
Detached	85%	58%	22%
Semi-detached	14%	26%	20%
Terraced	1%	7%	21%
Flat	1%	9%	38%
Other	0%	0%	1%
Total	100%	100%	100%

Source: National Records Scotland, Mid-2017 Small Area Population Estimates. All figures have been individually rounded and may not sum

10.5.24 Table 13.6 shows that there is a greater proportion of detached and semi-detached homes in the data zone encompassing Fair Isle (85%) than in the Shetland Islands (58%) or Scotland (22%), and a lower proportion of semi-detached and terraced houses, and flats.

Labour Market

Economic Activity

10.5.25 **Table 10.7** displays key metrics of economic activity for Fair Isle in comparison to the Shetland Islands and Scotland, including the economic activity rate which measures the percentage of the population either in employment or unemployed, which represents the available resident labour supply.

Table 10.7: Key economic activity metrics

	Fair Isle	Shetland Islands	Scotland
Economic Activity Rate	67%	78%	69%
Of which are full time employees	24%	48%	40%
Of which are part time employees	14%	17%	13%
Of which are self employed	29%	9%	8%
Of which unemployed	0%	2%	5%
Economic Inactivity Rate	33%	20%	26%
Of which are retired	16%	13%	15%

Source: Scottish Census 2011. All figures have been individually rounded and may not sum

10.5.26 **Table 10.7** shows that in 2011, 67% of Fair Isle residents were economically active which is a lower proportion than compared to the average for the Shetland Islands (78%) and Scotland (69%). However, all economically active residents on Fair Isle were in employment and there was no unemployment recorded on Fair Isle, whereas 2% of residents of the Shetland Islands were unemployed and 5% of Scottish residents. The proportion of people on Fair Isle that were self-employed (29%) is much higher than was seen in the Shetland Islands (9%) and Scotland (8%).

10.5.27 33% of Fair Isle residents were economically inactive, which is higher than was seen in the Shetland Islands (20%) and Scotland (26%). The retirement rate was also greater in Fair Isle (16%) compared to the Shetland Islands (13%) and Scotland (15%).

Industrial Profile

10.5.28 **Table 10.8** shows in 2021, there are 420 employed people working in the data zone containing Fair Isle, 14,545 in the Shetland Islands, and 2,617,000 in Scotland.

10.5.29 Examining employment by industry, the greatest proportion of employment in Shetland South 01 is within Transport & Storage (31%) representing a much higher proportion of employment than in the Shetland Islands (7%) and Scotland (4%). Other sectors representing a higher proportion of employment in Shetland South 01 in comparison to the Shetland Islands and Scotland are: Public Administration and Defence (12%); Education (11%); Retail (11%); and Business Administration & Support Services (10%).

Table 10.8: Employment by industry

	Shetland South 01	Shetland Islands	Scotland
1: Agriculture, forestry & fishing (A)	1%	8%	3%
2: Mining, quarrying & utilities (B, D and E)	2%	2%	2%

	Shetland South 01	Shetland Islands	Scotland
3: Manufacturing (C)	0%	9%	7%
4: Construction (F)	7%	10%	6%
5: Motor trades (Part G)	0%	1%	2%
6: Wholesale (Part G)	0%	2%	3%
7: Retail (Part G)	11%	10%	10%
8: Transport & storage (inc. postal) (H)	31%	7%	4%
9: Accommodation & food services (I)	7%	6%	8%
10: Information & communication (J)	0%	1%	3%
11: Financial & insurance (K)	0%	0%	3%
12: Property (L)	0%	1%	2%
13: Professional, scientific & technical (M)	0%	3%	6%
14: Business administration & support services (N)	10%	5%	8%
15: Public administration & defence (O)	12%	7%	6%
16: Education (P)	11%	9%	8%
17: Health (Q)	2.4%	16%	15%
18: Arts, entertainment, recreation & other services (R, S, T and U)	6.0%	6%	4%
Total Employed	420	14,545	2,617,000

Source: Business, Register and Employment Survey, 2021. All figures have been individually rounded and may not sum

Tourism and Recreation

10.5.30 Tourism is one of the most important economic drivers for the Shetland Islands. The Islands receive more than 75,000 visits per year from leisure and business visitors[18]. Data from Visit Scotland shows that in 2017, 5% of all those who visited the Shetland Islands visited Fair Isle. However, this fell to 2% in 2019.

10.5.31 By trip purpose, Fair Isle commands a 1% share of Shetland business travel, 2% of those visiting the Shetland Islands to see friends and relatives (VFR), and 3% of the Shetland Islands leisure travel[19]. In 2019, 1% of all leisure visitors to the Shetland Islands visited the Fair Isle Bird Observatory.

10.5.32 In 2019, Visit Scotland found that there were 80,128 total visits to the Shetland Islands, 22,436 for business, 16,827 for visiting family and relatives, and 40,865 for leisure, with average spends of £402, £327, and £520 respectively[20].

10.5.33 Visit Scotland statistics indicate that in 2019, Fair Isle received at total of 1,787 visitors. This group is comprised of 224 business trips, 337 VFR trips and 1,226 trips for leisure, as displayed in Table 10.9.

[18] PowerPoint Presentation (visitscotland.org)

[19] PowerPoint Presentation (visitscotland.org)

[20] PowerPoint Presentation (visitscotland.org)

Table 10.9: Visitors to the Shetlands and Fair Isle by visitor type, 2019

	Business	VFR	Leisure	Total
Shetlands	22,436	16,827	40,865	**80,128**
Fair Isle	224	337	1,226	**1,787**

Source: Visit Scotland 2019, VFR refers to visits to friends and relatives

10.5.34 Expenditure from visitors to Fair Isle has been estimated by multiplying the average expenditure for the Shetland Islands for each type of trip in 2019 (given by Visit Scotland) by the number of each type of visitor to Fair Isle (Table 10.9) respectively. The underlying assumption is that the average spend of visitors to Fair Isle is equivalent to that of the Shetland Islands. Table 10.10 illustrates that expenditure from visitors to Fair Isle in 2018 totals £837,735, of which £637,494 was generated from leisure trips, £110,049 from visiting friends and relatives, and £90,193 from business trips.

Table 10.10: Expenditure generated in Fair Isle from visitors to the Island, 2019

	Business	VFR	Leisure	Total
Average spend Shetlands	£402	£327	£520	**£448**
Expenditure in Fair Isle	£90,193	£110,049	£637,494	**£837,735**

Source: Visit Scotland 2019. Figures may not sum due to rounding

10.5.35 Approximately 330m to the southwest of the Site is the Fair Isle Bird Observatory (FIBO). Fair Isle Bird Observatory is run by an independent charity, FIBO Trust (registered charity No. SCO 11160), which owns the building and a small area of land. The FIBO burnt down in March 2019 however prior to this, it was the main provider of accommodation on the island and also a significant source of income and employment. In October 2021 the FIBO charity won a bid for significant investment to re-build the observatory. The newly built facility is due for completion and re-opening in Autumn 2023.

10.5.36 Two light houses are situated on Fair Isle (Fair Isle North Lighthouse and Fair Isle South Lighthouse). Built in 1892, they are both of historical significance to the island. Fair Isle South Lighthouse is publicly accessible and is listed as one of Scotland's Outstanding Lighthouses. Scotland's Outstanding Lighthouses an initiative that aims to promote and drive tourism to Scotland's coastal communities and increase awareness of the role and history of the Northern Lighthouse Board's unique heritage[21].

10.5.37 The George Waterston Memorial Centre and Museum is open on Mondays, Wednesdays, and Fridays in the summer, and at other times by arrangement[22]. The museum contains collections that cover Fair Isle's social history, fishing and crofting culture, natural history, and archaeology. Fair Isle's knitting traditions and patterns, the abundance of sea birds and rarities that visit its shores and its many shipwrecks are all in evidence in the displays[23].

10.5.38 Fair Isle is home to a range of coastal and inland walks, where tourists spot birds, marine animals, and other local wildlife. FIBO provides a free ranger service to all visitors to the island from May through to the end of October, offering a number of free guided walks.

[21] Scotland's Outstanding Lighthouses - Northern Lighthouse Board (nlb.org.uk)

[22] Things to do - Fair Isle

[23] George Waterston Memorial Centre & Museum | Shetland.org

10.5.39 The knitting technique 'Fair Isle', named after and traditional to the Fair Isle is another source of attraction for tourists who visit the island to buy merchandise and attend workshops run by local knitters.

Education

10.5.40 There is one primary school located on the island for boys and girls aged 3 to 12, and as of 2021 there were three pupils.[24]. There are two classrooms, an early learning and childcare (ELC) and multi-composite primary class[25].

10.5.41 The islanders of secondary school age are generally educated on Shetland Mainland at either Sandwick Junior High School or Anderson High School in Lerwick. The children live in hostel accommodation and return to the island every three weeks or so[26].

Healthcare

10.5.42 There is no GP surgery or chemist on the island. Medical cover for Fair Isle is provided by the Levenwick Health Centre, which can dispense medicines prescribed by the doctors there[27].

10.5.43 There is a resident district nurse on Fair Isle. In the event of accident and emergency the community nurse provides first aid until casualties can be removed to Shetland Mainland, usually by helicopter air ambulance[28].

10.5.44 There are no dentists on Fair Isle, however Shetland NHS dental staff visit once a year – otherwise Fair Isle residents use the dental services available on the Shetland Mainland[29].

Future Baseline

Population

10.5.45 The population of Scotland is expected to increase marginally from now until the end of the construction period, in September 2025.

Table 13.11: Scotland population projections by age

	2022	2025	% Change
0 - 15	899,900	862,000	-4.2%
16 - 64	3,482,400	3,468,900	-0.4%
65+	1,088,600	1,147,900	5.4%
Total	5,470,800	5,478,900	0.1%

Source: National Records Scotland. Figures have been rounded to the nearest one hundred and may not sum.

10.5.46 As illustrated by **Table 13.11**, Scotland's population is expected to continue aging over the three years to the end of the construction period. Only the population aged 65+ is projected

[24] Scotland's most remote school seeks new headteacher - BBC News
[25] https://blogs.glowscotland.org.uk/sh/fairisleprimaryschool/
[26] Stantec (2022) Island Community Impact Assessment & Fairer Duty Scotland Assessment
[27] NHS Shetland: Community Healthcare Services - Fair Isle (scot.nhs.uk)
[28] Fair Isle - Wikipedia
[29] NHS Shetland: Community Healthcare Services - Fair Isle (scot.nhs.uk)

to increase over this period (+5.4%), with both the child and working age population projected to decline (by -4.2% and -0.4% respectively).

10.5.47 Whilst projections by age are available for Scotland, only projections for the total population are available for the Shetland Islands as reported in Table 13.12.

Table 10.12: Shetland Islands population projections

	2022	2023	2024	2025
Projected pop	22,980	22,970	22,960	22,900
% Change from 2022	0.0%	0.0%	-0.1%	-0.3%

Source: Shetland Islands Council. Figures have been rounded to the nearest ten and may not sum.

10.5.48 **Table 10.12** shows that the total population of the Shetland Islands is projected to decline marginally over the three years to 2025, by 0.3%.

10.5.49 No population projections are available for Fair Isle. **However, the data presented in the current baseline conditions illustrates a natural ageing of the population which is a trend expected to continue in future years without any intervention.**

Tourism and recreation

10.5.50 The FIBO burnt down in March 2019 however prior to this, it was the main provider of accommodation on the island and a significant source of income and employment. In October 2021 the FIBO charity won a bid for significant investment to re-build the observatory. The newly built facility is due for completion and re-opening in Autumn 2023.

10.5.51 Before the fire, the FIBO averaged approximately 650-700 individual guests per annum, a similar number are expected after the it is reopened. Non bird watchers averaged stays of three nights, bird watchers and researchers averaged stays of seven nights.

10.5.52 The new building will be comprised of 40 modules. So far only 14 have been built due to adverse weather conditions. The remaining modules are likely to be completed in the spring and early summer of 2023, with a planned re-opening in Autumn 2023.

10.5.53 In 2019, visitor numbers to the Shetland Islands were 9.4% lower than in 2017, however visitor numbers to Fair Isle in 2019 were 45% lower than in 2017 according to Visit Scotland data[30]. The disproportionate fall in visitors to Fair Isle compared to the wider Shetlands area from 2017 to 2019 is likely to be at least partially caused by the absence of the FIBO for most of 2019.

10.5.54 Despite a 41% increase in the average visitor spend from 2017 to 2019, the decline in visitor numbers means that visitor expenditure in Fair Isle is estimated to have fallen by 21.8% from 2017 to 2019. This is expected to rise again as the rebuilt FIBO attracts a greater number of visitors to the island from Spring 2024 onwards.

10.6 Embedded Mitigation

10.6.1 The phasing of the construction will be designed to ensure that the ferry can operate to and from the island (even if Lerwick is the harbour temporarily to be used if Grutness is out of action, or the crew is based off island if Fair Isle is unable to house the boat overnight during construction of the noust, slipway or winch house). Maintaining the operation of the ferry

[30] PowerPoint Presentation (visitscotland.org)

during construction has always been a key constraint to ensure supplies and deliveries can be undertaken.

10.7 Assessment of Likely Effects

Construction

10.7.1 The proposed construction includes:

- **North Haven, Fair Isle:** Construction of a new quay, linkspan, lighting and dredging. The existing breakwater is to be increased in size and repairs are to be carried out on the pier. The existing cradle, noust, slipway and winch will be replaced.
- **Ferry:** A new 24m roll-on roll off ferry will be built, with a 12-passenger capacity.

10.7.2 The construction programme for North Haven is expected to take place in two phases:

- **Phase 1 (Feb – Sept 2024):** Construction of noust slipway, cradle, and pier. 8-month duration.
- **Phase 2 (March – Sept 2025):** Construction of the breakwater and linkspan. 7-month duration.

10.7.3 The final completion date for the Proposed Development including procurement of the new vessel is April 2026.

Labour Market Effects

10.7.4 **Direct effects:** The Applicant advises that the construction phase will generate 8 to 10 full time jobs directly employed to construct the new ferry port.

10.7.5 **Indirect effects:** In addition to jobs created as a direct effect of the construction of the Proposed Development, further jobs will be created indirectly through the supply chain spending of the construction team, generating demand for the goods and services of other industries. Data published by the Scottish government in supply, use, and input - output tables[31] show the most recent type 1 Scottish employment multiplier for construction is 1.55. Applying this multiplier to the number of jobs directly supported by the construction phase of the proposed ferry upgrade, gives a lower bound of 12 and upper bound of 16 jobs that are supported both directly and indirectly by the construction phase. This means that, with a range of 8 to 10 workers employed directly, there will be between 4 and 6 jobs supported indirectly, through supply chain spending during the construction phase.

10.7.6 **Induced effects** refers to effects in the wider economy as additional employment supported via direct and indirect effects leads to greater spending and demand for goods and services, supporting further jobs. The employment multiplier for direct, indirect and induced effects in the Scottish construction industry is 1.76 as published within the Scottish government's supply, use and input-output tables[32]. Applying this multiplier to the number of jobs supported directly by the construction phase indicates that between 14 and 18 jobs will be created through direct, indirect and induced effects. Taking into account those jobs supported through direct and indirect effects, this means between 1 and 2 jobs are expected to be supported through induced effects, during the construction phase of the Proposed Development.

[31] Supply, Use and Input-Output Tables: 1998-2019 - gov.scot (www.gov.scot)

[32] Supply, Use and Input-Output Tables: 1998-2019 - gov.scot (www.gov.scot)

10.7.7 It is anticipated that construction workers will stay on Fair Isle during the construction works, either at the FIBO, or if that is not available, with residents of Fair Isle, if possible. Expenditure by those employed directly during the construction phase of the Proposed Development is likely to be concentrated on Fair Isle. As a result, the induced jobs created from the construction phase of the project are likely to be concentrated on Fair Isle itself or on the area of the Shetland Island closest geographically to Fair Isle.

10.7.8 The sensitivity of the labour market effects during the construction phase is considered to be medium. Jobs in the construction industry account for 7% and 10% of employment in Shetlands South 01 and the Shetland Islands respectively (see **Table 10.8**). This makes the construction sector joint 6th largest industry in terms of employment in Shetlands South 01, and joint second largest within the wider study area of the Shetland Islands.

10.7.9 Whilst the actual number of construction workers is expected to be fairly low in comparison to other development projects, the number represents a large proportional increase to the number of workers on Fair Isle. The magnitude of change is therefore expected to be high.

10.7.10 On this basis, there is likely to be a **temporary, major beneficial effect** on employment in Fair Isle during the construction phase which is considered significant.

Operation

Labour Market Effects

10.7.11 **Direct effects:** Once operational, the proposed ferry project will protect the employment of the seven permanent crew members residing on Fair Isle who are currently employed to operate the existing ferry service.

10.7.12 **Indirect effects** are those that occur through supply chain spending. Using figures from the Scottish Government published supply, use and input-output tables[33], the type I water transport employment multiplier for Scotland, which shows direct and indirect employment effects is 1.64 This means that with seven FTE jobs protected in Fair Isle once the new ferry is operational, approximately 11.5 FTE jobs are protected both directly and indirectly. Therefore 4.5 FTE jobs will be protected through indirect supply chain activities of the operational ferry.

10.7.13 **Induced effects** refers to effects in the wider economy as additional employment via direct and indirect effects leads to greater spending in the wider economy. The employment multiplier published by the Scottish government for direct, indirect and induced effects in the Scottish water transport industry is 2.18[34]. Given that seven FTE jobs will be supported through the ferry operation, 15 FTE jobs will be supported through direct, indirect and induced effects. This means that 3.5 FTE jobs will be supported through the spending of those employed through the direct and indirect activities of the ferry operation.

10.7.14 The sensitivity of the Fair Isle labour market to these labour market effects is high. The population of Fair Isle is estimated at 60 people, while in 2021, the 60% of residents of the data zone in which Fair Isle lies were of working age. Assuming the demography of Fair Isle is very similar to that of the wider data zone it lies in, approximately 36 people on the island are of working age. The seven jobs directly supported by the ferry operations represents 19% of Fair Isles working age population.

[33] Supply, Use and Input-Output Tables: 1998-2019 - gov.scot (www.gov.scot)

[34] Supply, Use and Input-Output Tables: 1998-2019 - gov.scot (www.gov.scot)

10.7.15 The seven jobs directly supported by the ferry operations will be in the transportation industry which already accounts for 31% of jobs at the baseline, making it the islands biggest industry in terms of employment.

10.7.16 The magnitude of the effect is expected to be low. The Proposed Development is not expected to create additional jobs in Fair Isle, just protect those which already exist. Therefore, the operational phase of the ferry project is likely to have a **long term, moderate beneficial effect** on employment in Fair Isle which is considered significant.

General Indirect effects

Preventing Depopulation

10.7.17 The population of Fair Isle is trending downwards, with 68 people residing on Fair Isle in 2011 according to Census data, but an estimated 60 residents today.

10.7.18 The ferry project will make journeys between Fair Isle and Shetland mainland faster, more reliable and more accessible, creating greater mobility for Fair Isle residents and increasing their ability to access goods and services only available on the Shetland mainland. This is expected to increase the quality of life of residents, making Fair Isle a more attractive place to live, and may also have the effect of attracting more people to the Island.

10.7.19 The sensitivity of depopulation to the greater mobility for residents that the ferry project will provide is expected to be medium. The magnitude of change will be low as only a small number of people are likely to move to the island. Therefore, there is likely to be a **long term, minor beneficial effect** on depopulation in Fair Isle.

Health and well-being

10.7.20 Transportation and connectivity has an underpinning role in tackling health inequalities as barriers to transport place limitations on people's access to health services.

10.7.21 The introduction of a Roll-on Roll-off (Ro-Ro) service (compared to the present Lift-on Lift-off (Lo-Lo) service) will make the ferry service more accessible to those with physical restrictions. This is particularly important for Fair Isle, as the Island's population profile is older than that of the Shetland Islands and Scotland. The new ferry will enable greater access to mainland health services for residents.

10.7.22 The new ferry will have greater seafaring capabilities, allowing it to travel more reliablyuytr, and in a greater variety of weather conditions. This will ensure a more regular service, providing Fair Isle residents with more regular access to health services which do not exist on the island, for example their GP or dentist.

10.7.23 The new ferry will have shorter crossing times. A quicker, more reliable ferry services will enable residents to access health services within a shorter time frame. This is likely to have a positive impact on their health, as ailments can be treated more quickly.

10.7.24 The sensitivity of the health and well-being of Fair Isle residents to the ferry project is expected to be low. While a faster and more regular service will increase ease of access to health services on the mainland, this will not have an effect on underlying health conditions. The magnitude of change is expected to be low. Therefore, there are likely to **be long term, minor beneficial effects** to health and well-being of residents.

Economic development

10.7.25 People living in rural island areas are likely to have reduced access to employment and essential services. The affordability and integration of transport to people facing socio-economic disadvantages through low incomes and wealth is a key equalities issue.

10.7.26 The FSDA associated with this ferry project states that part time work is more prevalent in Fair Isle, as are instances, of island residents holding multiple smaller and often unpaid roles.

10.7.27 As characterised by the dominance of agriculture, fishing, aquaculture and tourism, island economies are typified by under employment, low wages and a seasonal economy. However, there is strength in the economies in island locations that see bases for the public sector, for ferry operations, and growth around some specialisms. These include crafts such as the Fair Isle knitting technique developed on the island, and the production of food and drink traditional to the Scottish isles.

10.7.28 The seven crew members who will be operating the ferry also perform other roles on the island such as providing fire cover at the airfield. The protection of their jobs will enable them to continue living on the island and performing other tasks which benefit all residents of Fair Isle.

10.7.29 The sensitivity of the economic development of Fair Isle to the ferry project is expected to be medium. The increased speed, reliability and accessibility that the new vessel will provide will increase mobility of Fair Isle residents, enabling them greater access to economic opportunities on the mainland. In addition, it will boost the economic development of local businesses as potential customers will have greater access to goods and services available on the island.

10.7.30 The magnitude of change is likely to be medium as the number and speed of journeys will be improved. Therefore, there is expected to be a **long term, moderate beneficial effect** on the economic development of Fair Isle.

Living costs

10.7.31 The cost of living is higher on the Shetland Islands generally according to a 2013 HIE study[35], which found that the budgets required by households to reach a minimum acceptable standard of living in remote rural Scotland were typically 10% to 40% higher than elsewhere in the UK. The study also found that for households in more remote island locations, these additional costs could exceed 40%.

10.7.32 Further research conducted by HIE in 2016[36] found identified key drivers of increased costs:

- **Higher prices in supermarkets and other stores.** This is likely because the cost of transporting goods to the island and higher than to less remote areas, and these additional costs are incorporated into the retail price of products sold on the island.
- **Longer commuting distances** compounded by higher fuel prices and additional ferry costs.
- **Higher heating costs.** This is driven by lack of access to mains has, the severe climate and in some cases older houses.
- **Lifestyle costs.** This included additional trips to the Scottish mainland to access goods and services not available locally.

10.7.33 Higher prices in supermarkets on remote island locations are caused by the cost of transporting goods. Transportation costs are higher for remote areas because of the

[35] Hirsch, D., B., A. (2013) A Minimum Standard of Income for Remote Rural Scotland. Inverness: Highlands and Islands Enterprise.

[36] Hirsch, D., B., A. (2016) A Minimum Standard of Income for Remote Rural Scotland: A Policy Update. Inverness: Highlands and Islands Enterprise.

increased distance travelled pushing up fuel prices and labour costs, which then gets incorporated into the retail price of the goods sold.

10.7.34 The new vessel will have a higher deadweight capacity and will therefore be able to transport a higher quantity of goods to Fair Isle in each trip. Transportation costs are therefore spread out over a larger quantity of goods, leading to lower prices for each individual item. This is likely to lower costs for supermarket goods sold in Fair Isle.

10.7.35 The sensitivity of the cost of living on Fair Isle to the effects of the ferry project is likely to be low. Despite increased connectivity that the new vessel will provide Fair Isle is still a remote rural location which requires time and money to access physically. The magnitude of change is likely to be low as the number and speed of journeys will be improved but not dramatically increased. Therefore, there is likely to be a **long-term, minor beneficial/negligible effect** on cost of living on the island.

Tourism and Recreation

10.7.36 Tourism and recreation is an important part of the Fair Isle economy, generating an estimated £637,494 in 2019 as established in the baseline conditions.

10.7.37 The new vessel will have greater seafaring capabilities, increasing the range of weather conditions it is capable of sailing in. This in turn will reduce weather related journey delays and cancellations, improving compliance with the timetable. A more regular and reliable transportation system is likely to encourage more tourists to the island, generating greater income for Fair Isle businesses in the tourism and recreation industry.

10.7.38 The average length of stay on Fair Isle is likely to vary among different visitors. Therefore, a more regular ferry service is likely to enable a greater range of visitors to travel to Fair Isle, including those who want short stays only.

10.7.39 The improved harbour facilities and enhanced protection within North Haven will improve the harbouring abilities for visiting recreational, fishing and commercial vessels. Once completed and operational the use of the harbour (albeit improved) will resort to the existing operational conditions.

10.7.40 The new vessel will comply with modern standards of passenger accessibility. The conversion to Roll-on Roll-off (Ro-Ro) from the current Lift-on Lift-off (Lo-Lo) service will enable a greater variety of tourists to visit the island, including those that are wheelchair bound, supporting inclusivity.

10.7.41 The sensitivity of the Fair Isle tourism and recreation industry to the ferry project is likely to be medium. Tourists represented 69% of all visitors to the island in 2019, representing 76% of visitor expenditure on Fair Isle (see tables 13.3 and 13.4). Many tourists are likely to value ease of access and reliability of transport when planning trips, given the multitude of locations available to visit. Therefore, a reliable and quick transportation service to Fair Isle is likely to have a significant effect on increasing tourism to the island. The magnitude of change is expected to be low/medium as the number of visitors may not increase significantly, however the proportional increase in relation to current tourism numbers may be moderate. Therefore, there is likely to be a long term **moderate beneficial effect** on tourism and recreation.

10.8 Further Mitigation and Enhancement

10.8.1 No significant adverse effects have been identified and therefore no further mitigation or enhancement is required.

10.9 Residual Effects

Table 10.13 reports the residual effect on each identified socio-economic receptor.

Table 10.13: Residual socio-economic effects

Description of effects	Sensitivity	Magnitude of change	Effect before mitigation	Mitigation measure	Residual effect	Residual significance
Construction phase						
Employment	Medium	High	Major beneficial	None required	Major beneficial	Significant
Tourism, Recreational and commercial vessels	Medium			Maintain us		
Operational Phase						
Employment	High	Low	Moderate beneficial	None required	Moderate beneficial	Significant
Depopulation	Medium	Low	Minor beneficial	None required	Minor beneficial	Not significant
Health and well-being	Low	Low	Minor beneficial	None required	Minor beneficial	Not significant
Economic development	Medium	Medium	Moderate beneficial	None required	Moderate beneficial	Significant
Living costs	Low	Low	Minor beneficial/negligible	None required	Minor beneficial /negligible	Not significant
Tourism and recreation	Medium	Low/medium	Moderate beneficial	None required	Moderate beneficial	Significant

10.10 Monitoring

10.11 No significant adverse residual effects have been identified and therefore there is no requirement for monitoring socio-economic effects in accordance with the EIA regulations.

10.12 Cumulative Effects

10.12.1 There are no identified committed developments for which to provide a cumulative assessment.

10.13 Summary

10.13.1 An assessment has been made of the likely significant socio-economic effects of the Proposed Development during the construction and operational phase; particularly the direct

impact on employment and the indirect effect on depopulation, health and well-being, economic development, living costs and tourism and recreation.

10.13.2 Construction of the Proposed Development will create between 8 to 10 FTE jobs directly associated with the construction of the Proposed Development, supporting 4 to 6 indirect FTE jobs through supply chain linkages and a further 1 to 2 FTE jobs through induced effects (effects from direct and indirect employment leading to greater spending and demand for goods and services). Whilst the actual number of construction workers is expected to be fairly low in comparison to other development projects, the number represents a large proportional increase to the number of workers on Fair Isle. On this basis, there is likely to be a temporary, major beneficial effect on employment in Fair Isle during the construction phase which is considered significant.

10.13.3 The operational phase of the Proposed Development will protect the employment of the existing seven permanent crew members who reside on Fair Isle and operate the ferry service. It is estimated that a further 4 FTE indirect jobs are supported through supply chain linkages and a further 1 FTE job through induced effects. Therefore, whilst the Proposed Development is not expected to create additional jobs, it will protect employment for existing workers who represent 19% of Fair Isle's working age population. On this basis, the Proposed Development is considered to provide a long term, moderate beneficial effect on employment which is considered significant.

10.13.4 The Proposed Development will increase the frequency, speed, reliability and accessibility of the ferry service for residents of the Fair Isle and visitors to Fair Isle. A number of indirect socio-economic effects will therefore be realised as a result of the Proposed Development including:

- Preventing Depopulation – as the Proposed Development will increase the mobility of residents make Fair Isle a more attractive place to live, in turn, improving people's quality of life and may also have the effect of attracting more residents to the Island. A long-term minor beneficial effect on preventing depopulation is expected;
- Health and well-being - transportation and connectivity has an underpinning role in tackling health inequalities as barriers to transport place limitations on people's access to health services. The introduction of a Roll-on Roll-off (Ro-Ro) service (compared to the present Lift-on Lift-off (Lo-Lo) service) will make the ferry service more accessible to those with physical restrictions. This is particularly important for Fair Isle, as the Island's population profile is older than that of the Shetland Islands and Scotland. The Proposed Development will enable greater access to mainland health services for residents. A long-term minor beneficial effect on health and well-being is expected;
- Economic development - people living in rural island areas are likely to have reduced access to employment and essential services. The affordability and integration of transport to people facing socio-economic disadvantages through low incomes and wealth is a key equalities issue. The Proposed Development will provide greater access to economic opportunities on the mainland and could allow growth in the economy of local businesses as potential customers will have greater access to goods and services available on the island. A long-term moderate beneficial effect on economic development is expected;
- Living costs – the Proposed Development will allow a higher volume of goods to be transported to Fair Isle, potentially leading to lower prices for individual items reducing living costs for residents. A long-term minor beneficial/negligible effect on living costs is expected; and

10.13.5 Tourism and recreation – the Proposed Development will provide for a more regular and reliable transportation system that is likely to encourage more tourists to Fair Isle sustaining and enhancing a very important sector of Fair Isle's economy. A long-term moderate beneficial effect on tourism and recreation is expected.

10.14 References

Scottish Government (Dec 2022). Community Empowerment, under the Covid Recovery and Public Service Reform Directorate and the Local Government and Housing Directorate. Available at: Empowering our island communities - Community empowerment - gov.scot (www.gov.scot)

Scottish Government (August 2022). Fairer Scotland Duty: guidance for public bodies. Available at: Fairer Scotland Duty: guidance for public bodies - gov.scot (www.gov.scot)

Scottish Government (March 2021) Local place plans - proposals for regulations: consultation. Annex C. Available at: https://www.gov.scot/publications/proposals-regulations-local-place-plans-consultation/pages/6/
Our Islands, Our Future. Comhairle nan Eilean Siar (the Western Isles Council). Available at: Our Islands Our Future (cne-siar.gov.uk)

Scottish Government (Dec 2019). The National Plan for Scotland's Islands. Available at: A Fair, Integrated, Green and Inclusive Plan - The National Plan for Scotland's Islands - gov.scot (www.gov.scot)

Fair Isle Community Association (June 2015). Fair Isle Development Plan. 'Securing Fair Isle's Future, a Plan for Action'.

Shetland Local Development Plan 2014 (Sept 2014). Development Plans & Heritage. Shetland Islands Council. Available at: The Local Development Plan – Shetland Islands Council

11 Landscape, Seascape and Visual

11.1 Introduction

11.1.1 The Landscape, Seascape and Visual Impact Assessment (LSVIA) identifies and assesses the negative and positive effects and significance of change arising from the Scheme on the landscape as an environmental resource in its own right and on people's views and visual amenity.

11.1.2 The assessment follows the methodology set out in Guidelines for Landscape and Visual Impact Assessment, Third Edition (Landscape Institute and Institute of Environmental Management and Assessment, 2013, referred to as GLVI3 in this assessment, and relevant guidance including Landscape Institute and NatureScot publications.

11.1.3 The LSVIA was carried out by chartered landscape architects at Stantec UK Limited, a Registered Practice with the Landscape Institute and a corporate member of the Institute of Environmental Management and Assessment (IEMA).

11.1.4 In accordance with Regulation 18(5) of the Town and Country Planning (Environmental Impact Assessment) Regulations 2017, as amended, a statement outlining the relevant expertise and qualifications of competent experts appointed to prepare this ES is provided in **Appendix A.4**.

11.2 Policy Context, Legislation, Guidance and Standards

Legislation

11.2.1 The European Landscape Convention (2000, Convention of the Council of Europe) is the first international treaty dedicated to the protection, management, and planning of all landscapes in Europe. Signed by the UK government in 2006 and introduced in March 2007, the European Landscape Convention provides a people-centred and forward-looking way to reconcile management of the environment with the social and economic challenges of the future and aims to help people reconnect with place. The European Landscape Convention contains 18 articles which, collectively, promote landscape protection, management and planning and organising European cooperation on landscape issues.

11.2.2 The Landscape Institute / Institute of Environmental Management and Assessment 'Guidelines for Landscape and Visual Impact Assessment', (3rd Edition, 2013) notes in paragraph 1.17, page 9, in reference to the European Union Directive 2011/92/EU:

> *'The Directive is clear that the emphasis is on the identification of likely significant environmental effects. This should embrace all types of effect and includes, for example, those that are positive/beneficial and negative/adverse, direct and indirect, and long and short term, as well as cumulative effects. Identifying significant effects stresses the need for an approach that is in proportion to the scale of the project that is being assessed and the nature of its likely effects. Judgement needs to be exercised at all stages in terms of the scale of investigation that is appropriate and proportional. This does not mean that effects should be ignored, or their importance minimised but that the assessment should be tailored to the particular circumstances in each case.'*

11.2.3 On the 31st of December 2020 the UK left the European Union. The European Union (Withdrawal) Act 2018 provides the new constitutional framework for continuity of retained EU law in the UK. This Directive is retained and in UK law achieved through the Town and Country Planning (Environmental Impact Assessment) Regulations 2017.

Policy

Scottish Planning Policy (December 2020) and National Marine Plan (2015)

11.2.4 **Table 11.1** below identifies Scottish Planning Policy (SPP), including policies within Scotland's National Marine Plan (SNMP), of relevance to this chapter.

Table 11-1: Scottish Planning Policy and National Marine Plan

Reference	Planning policy
Valuing the Historic Environment (SPP)	**Listed Buildings** – Paragraph 141: *"Where planning permission and listed building consent are sought for development to, or affecting, a listed building, special regard must be given to the importance of preserving and enhancing the building, **its setting,** and any features of special architectural or historic interest."* **Scheduled Monuments** – Paragraph 145: *"Where there is potential for a proposed development to have an adverse effect on a schedule monument or on the **integrity of its setting**, permission should only be granted where there are exceptional circumstances."*
Valuing the Natural Environment (SPP)	**National Designations** – Paragraph 212: Development that affects a National Park, **National Scenic Area**, Site of Special Scientific Interest, or a National Nature Reserve should only be permitted where: *"The objectives of the designation and the overall integrity of the area will not be compromised; or* *Any significant adverse effects on the qualities for which the area has been designated are clearly outweighed by social, environmental, or economic benefits of national importance."*
Ensuring a strong, healthy and just society (SNMP)	**GEN 6 Historic Environment: "***Development and use of the marine environment should protect and, where appropriate, enhance heritage assets in a manner proportionate to their significance."* **GEN 7 Landscape/seascape: "***Marine planners and decision makers should ensure that development and use of the marine environment take seascape, landscape and visual impacts into account."*

Shetland Local Development Plan (2014)

11.2.5 The Shetland Local Development Plan (LDP) was adopted in September 2014 and provides policy guidance on the local authority's land use strategy until 2034. Policies relevant to this chapter are illustrated in **Table 11.2** below.

Table 11-2: Shetland Local Development Plan Policies

Reference	Planning policy
NH1: International and National Designations	Development that affects a National Scenic Area (NSA) will only be permitted where: *"It will not adversely affect the integrity of the area or the qualities or protected features for which it has been designated, or* *Any such adverse effects are clearly outweighed by social, environmental, or economic benefits of national importance."*

Reference	Planning policy
HE2: Listed Buildings	*"Development affecting a Listed Building, or **its setting**, should preserve the building, **its setting**, and any features of special architectural or historic interest that it possesses."*
HE4: Archaeology	*"Development that have an adverse effect on scheduled monuments and designated wrecks or the **integrity of their settings** should not be permitted unless there are exceptional circumstances."*
CST1: Coastal Development	Proposals for developments and infrastructure in the coastal zone (above Mean Low Water Mark of Ordinary Spring Tides) will only be permitted where the proposal can demonstrate that: *"It will not have a significant impact, either individually or cumulatively, on the natural, built environment and cultural heritage resources either in the sea or on land;* *The location, scale and design are such that it will not have a significant adverse impact; and* *There is no significant adverse impact on other users of main resources, and/or neighbouring land."*

Shetland Island Regional Marine Plan (Amended Draft – May 2021)

11.2.6 The draft Shetland Island Regional Marine Plan (SIRMP) provides a "*comprehensive picture of the marine environment around Shetland*" (Shetland Marine Planning Partnership, 2021) and is set for adoption following inspection by Scottish Ministers. Relevant policies to this chapter are set out below in **Table 11.3.**

Table 11-3: Shetland Island Regional Marine Plan Policies

Reference	Planning policy
Policy MP VIS1: Safeguarding National Scenic Area (NSA) and Local Landscape Areas (LLAs)	Development that affects the NSA or a LLA will only be permitted where: *"It will not adversely affect the integrity of the area or the qualities or protected features for which it has been designated, or* *Any such adverse effects are clearly outweighed by social, environmental, or economic benefits of national importance for the NSAs and local importance for LLAs."*
Policy MP VIS2: Safeguarding Seascape Character and Visual Amenity	Any development or activity must demonstrate: *"How the proposal takes into account existing character and quality of local landscape/seascape; how it is valued; and its capacity to accommodate change specific to any development;* *A high standard of design, in terms of siting, scale, colour, materials and form to ensure the various types of development or coastal use change might best be accommodated within particular landscape and seascape types."*
Policy MP HIS2: Safeguarding Nationally Important Heritage Assets	*"Development which results in substantial loss or harm to a scheduled monument, or the integrity of **its setting** should not be permitted unless there are exceptional circumstances."*

11.3 Consultation

11.3.1 A Scoping Report was submitted to Shetland Islands Council on April 12th, 2022, outlining the overall approach proposed by Stantec as part of the Fair Isle Harbour Improvement Scheme.

11.3.2 A Scoping Opinion was subsequently received on June 27th, 2022. The response from the Planning Officer outlined the local authority's opinion on the Proposed Development in addition to a number of other relevant stakeholders.

11.3.3 With regards to landscape and visual, it was agreed that the Proposed Development would not result in any significant landscape or visual effects during operation, and therefore only potential effects during construction should be assessed.

11.3.4 The Scoping Opinion also outlined that the NatureScot Landscape Character Types (2019) should be used within the LSVIA to assess the landscape character of the Site and surrounding area and should also take cognisance of The Shetland Coastal Character Assessment (2021).

11.3.5 Stakeholder comments and consultation responses are outlined in full within **Table 2.1** within **Appendix A11.2** LSVIA Methodology.

11.4 Methodology

Study Area

11.4.1 The assessment follows the general approach described in Chapter 5: Assessment Method. This section provides topic-specific information regarding the methodology used for establishing the baseline, and the methods used for the assessments. It should be read alongside **Appendix A11.2** which provides further detail on the methodology.

11.4.2 The proposed methodology for the LSVIA has been devised to address the specific effects likely to result from the Proposed Development. The methodology draws upon the following established best practice guidance:

- Guidelines for Landscape and Visual Impact Assessment, Third Edition. (Landscape Institute and Institute of Environmental Management and Assessment, 2013), referred to as GLVIA3 in this assessment.
- GLVIA3 Statement of Clarification 1/13 (Landscape Institute, 2013).
- Guidance Note Coastal Character Assessment (NatureScot, 2018).
- Landscape Institute Technical Information Note 08/2015 'Landscape Character Assessment'.
- An Approach to Landscape Character Assessment (Natural England, 2014).
- Landscape Institute Technical Guidance Note 06/19: Visual Representation of Development Proposals (Landscape Institute, 2019).

11.4.3 Following consideration of the nature of the Proposed Development, current use of the Site, and relatively contained nature of the proposals within the wider setting, a study area extending up to 2km from the Site has been identified. It is not considered that any significant landscape or visual impacts will occur beyond 2km.

Baseline Data Collection

11.4.4 Baseline landscape and visual amenity information has been gathered from publicly available publications and an extensive site visit undertaken by Landscape Architects

employed by Stantec. The Scheme is covered by three Landscape Character Types (LCTs) as identified by NatureScot (SNH, 2019).

11.4.5 In addition, The Shetland Coastal Character Assessment identifies one landscape character area (LCA) which extends beyond the entire Fair Isle coastline for approximately 12 nautical miles.

11.4.6 Further information regarding these landscape assessments are included within this LSVIA at Section **11.5 Baseline Conditions.**

Assessment

11.4.7 The proposed methodology for the landscape and visual impact assessment has been devised to address the specific effects likely to result from the Proposed Development.

11.4.8 The LSVIA considers the effects on landscape (including landscape character, seascape character, and landscape / seascape features) and on people's views (visual amenity); these are presented as separate elements of the assessment. The LSVIA has been undertaken with an emphasis on the identification of likely significant landscape and visual effects as a result of the Proposed Development, using an approach which is in proportion to the project and nature of likely effects.

11.4.9 The planning context with respect to landscape / seascape character and visual amenity is also considered, taking into account relevant international, national, regional, and local planning policies. The baseline study forms the basis of the assessment of the predicted landscape and visual effects of the Proposed Development.

11.4.10 The assessment of landscape and visual effects makes comparisons with the baseline year and will include assessment during the construction period only.

11.4.11 A Zone of Visual Influence (ZVI) plan was produced using the Google viewshed tool as a indicator of potential visibility (see **Figure 11.3, Appendix A11.1**).

11.4.12 View locations have been identified through review of the ZVI analysis and agreed with the Planning Authority. View location photography prepared to support the LSVIA, is in accordance with Type 1 Annotated Viewpoint Photography as detailed in TGN 06/19 Visual Representation of development proposals, which is considered appropriate to support EIA development and be proportionate to this development.

11.4.13 No visualisations have been prepared as part of the LSVIA as this is not considered appropriate due to the nature of the assessment, with construction phase only being assessed.

11.4.14 A three-stage assessment process has been adopted for the LSVIA, in accordance with GLVIA3. Firstly, the nature of receptors (sensitivity) has been assessed. Secondly the nature of effects (magnitude) likely to result from the Proposed Development has been assessed. Lastly, the significance of the identified landscape and visual effects on receptors has been assessed, as required by the EIA (Scotland) Regulations (2017).

Assessment of Landscape and Seascape Effects

11.4.15 Landscape effects assess how the Proposed Development will affect the components of the environment and the key characteristics which contribute to its character. A methodical consideration of each effect upon each identified landscape receptor has been undertaken, in order to determine the significance of effects, as a combination of the sensitivity of the landscape receptors and the magnitude of the effect.

11.4.16 The assessment of landscape receptors' sensitivity has combined judgements on the 'value' attributed to the landscape receptor and the 'susceptibility to change' of that receptor to the specific type of development proposed.

11.4.17 The value of potentially affected landscape receptors has been determined, including character and the individual elements or features which contribute to that landscape character. Susceptibility of landscape receptors to change arising from the Proposed Development is a judgement of the ability for the Proposed Development to be accommodated without undue consequences for the maintenance of the baseline landscape and/or the achievement of regeneration planning policies and strategies.

11.4.18 The magnitude of a landscape effect has been assessed in terms of its size or scale, the geographical extent of the area influenced and its duration and degree of reversibility.

Assessment of Effects on People's Views and Visual Amenity

11.4.19 This has assessed how the Proposed Development will affect the views available to people and their visual amenity. A methodical consideration of visual effects upon each identified visual receptor has been undertaken in order to determine the significance of effects, as a combination of sensitivity of the visual receptor, or viewer and magnitude of the visual effect.

11.4.20 The assessment of visual receptor sensitivity has combined judgements on the value attributed to the visual receptor and the 'susceptibility to change' of the receptor to the specific type of development proposed. The value assigned to views has given regard to a number of factors, including recognition through planning or heritage assets and/or the popularity of the view location, its appearance in guidebooks, literature or art, on tourist maps, and the facilities provided to enable enjoyment of the view. Susceptibility of people to changes in views is a function of the occupation or activity of the view at a given location and the extent to which a person's attention or interest may therefore be focused on a particular view, and the visual amenity experienced.

11.4.21 The magnitude of a visual effect has been assessed in terms of its size or scale, the geographical extent of the area influenced and its duration and degree of reversibility. The assessment has considered the Proposed Development's contribution to the view composition, its enhancement, or contrast to the view, and whether it is a positive or negative variation to the scale and form, and the creation of, or contrast in, visual identity.

Landscape and Visual Mitigation Measures

11.4.22 Embedded mitigation measures and standard construction practices, proposed for preventing/avoiding, reducing or, where possible, offsetting or compensating for significant adverse landscape or visual effects, have been described in the LSVIA and project description in the ES.

11.4.23 Secondary (further) landscape and visual mitigation measures, if required, would also be described in the LSVIA.

Assessment of Significance of Landscape and Visual Effects

11.4.24 Significance of landscape and visual effects vary with the location, context, and type of Proposed Development.

11.4.25 A full methodology of the assessment procedure and criteria used within the LSVIA is outlined in **Appendix A11.2**.

Limitations & Assumptions

11.4.26 The following limitations are of relevance to this chapter:

- The methodology for the assessment of landscape and visual effects is in accordance with GLVIA3 as detailed in **Appendix A11.2**.

- Landscape and visual effects are assessed through professional judgement on the sensitivity of landscape elements, landscape character and visual receptors, combined with the predicted magnitude of effect arising from the Site to determine the significance of effect.
- Potential effects on people's views or visual amenity, as experienced from within the local area, have been assessed from a series of view locations. These have been selected to represent the range of visual receptors present within the study area, and baseline photography for each has been captured to represent typical summer views. In accordance with GLVIA3 these are not intended to show every possible view towards the Site. View location photography has been taken from publicly accessible areas. No private views were assessed.
- Information on construction activity has been taken from the evolving fiEMP produced by Stantec. This document provides basic aspects on the construction of the Proposed Development taking into consideration any environmental concerns.

11.5 Baseline Conditions

Landscape

Designations

11.5.1 Relevant designations for the Site and surrounding area are set out in full in **Table 3.1 within Appendix A11.2**. In summary the Site is located within the **Shetland National Scenic Area (NSA).** The Shetland NSA includes Fair Isle as one of its seven separate areas of designation. Special qualities associated with the NSA include:

- The stunning variety of the extensive coastline;
- Coastal views both close and distant;
- Coastal settlement and fertility within a large hinterland of unsettled moorland and coast;
- The effects and co-existence of wind and shelter;
- A sense of remoteness, solitude, and tranquillity; and
- The distinctive cultural landmarks.

11.5.2 In addition, there are two listed buildings within the study area, and several Scheduled Monuments (SM), including the Landberg fort, South Haven SM located approx. 300m south west of the Site.

Landscape Character

Published Landscape Character

11.5.3 Details of relevant landscape character types or areas are set out in **Table 11.4** below.

Table 11-4: Published Landscape Character Types / Areas within the Study Area

Landscape Character Assessment	Key Characteristics
NatureScot Landscape Character Types (2019)	**355 Coastal Edge LCT:** Narrow indented coastal edge of rocky headlands, inlets and promontories on exposed parts of the coast. Mainly high to moderately high cliffs with frequent features of coastal erosion including stacks, arches, blowholes, caves and storm beaches.

Landscape Character Assessment	Key Characteristics
	Short, colourful swards of maritime heath and grasslands on cliff tops and some sheltered cliffs, with bare, scoured rock in exposed locations. Undeveloped and uninhabited, and mostly inaccessible by road. Modern man-made structures limited to a few lighthouses and a radar station. Many prehistoric and wartime archaeological relics revealed in short grassy landcover. Diverse and dramatic coastal scenery with a variety of coastal views.
	349 Major Uplands LCT: Rounded hills, occurring either in series connected by high level rounded ridges along a linear band, or as isolated single hills or hill groups. Exposed, frost shattered rock and boulder fields in Ronas Hill. Mainly uninhabited and often difficult to access on foot or by road, with roads mainly absent on higher land. In some areas tracks ascend to hillside or hilltop features such as masts, wind turbines, isolated farms and peat cuttings. Exposed high land with panoramic views, forming landmark features which themselves are often visible for miles.
	353 Farmed and Settled Lowlands & Coast LCT: Mainly narrow tracts of low lying, gently sloping or undulating landform adjoining the sea, with some areas of flat coastal plain and occasional small, rounded hillocks. Predominantly farmed and settled with a high proportion of traditional croft land. Many archaeological sites and historic buildings providing visible evidence of the history of settlement since prehistoric times. The field and settlement patterns from human intervention in some traditional crofting areas, enhanced by the contrasting coastal and upland setting. Open, windswept landscapes with little shelter and constant views of the coastline, and across voes and sounds to other land.
The Shetland Coastal Character Assessment (2021)	**8 - Fair Isle Coastal Character Area (CCA):** High Cliffs. No Aquaculture and limited commercial inshore fishing. Views back to Shetland mainland and down to North Ronaldsay, Orkney. Teeming with summer seabird colonies, with associated experiential value. Fair Isle is one of the most important monitoring sites for seabird populations in the UK with a bird observatory on the island. The Fair Isle CCA is further divided into Coastal Character Types (CCTs) with the Site lying wholly within CCT 11: Small Harbour. Key characteristics associated with this CCT include:

Landscape Character Assessment	Key Characteristics
	Low to moderate level of activity, less suitable for larger commercial vehicles. Used by small inshore fishing vessels. Often used for water based recreational activities. Small area of protected water usually with some human intervention e.g. rock armour. Important setting for adjacent settlements. Often a small settlement around the pier.

Landscape / Seascape Character and Features of the Site

Character of the Site

11.5.4 The character of the Site is one of a typical small bay with associated harbour infrastructure such as a pier, quay, breakwater, and boat launching equipment. North Haven is exposed to the north, but the rugged cliffs of the inlet, and to an extent the breakwater, provide a level of enclosure and tranquillity, with little in the way of development present. The sandy beach which wraps around the southern edge of the bay also adds to the overall tranquil character and contains remnants of an old slipway.

11.5.5 Land surrounding the bay tends to comprise undulating grassland which is openly grazed by sheep. Further inland on high ground there are fields of pasture. The single-track road which leads into the bay runs from the south of the island, having split from the road heading north towards the Fair Isle North Lighthouse some 450m further south.

11.5.6 Within the Site itself, the harbour infrastructure dominates, including the existing noust for the MV Good Shepherd IV, breakwater, finger pier, and quay which is used by recreational boats. The existing noust is nestled within the cliff face in the south-eastern part of the bay and houses the vessel when it is not in use for protection against northerly conditions which can cause significant wave motion at the berth.

People's Views and Visual Amenity

11.5.7 Potential visual receptors within the study area include:

- People living in, working in, or visiting the island, including recreational sailboat users;
- People using the road network within the island.

11.5.8 A range of visual receptors and view locations were identified for the assessment of effects on people's views and visual amenity. These view locations are set out below in **Table 11.5** and are assessed in **Appendix A11.4** Schedule of Visual Effects.

Table 11-5: View Locations

View Location Reference	Reasoning for Selection
VL1a	Representative of views experienced by visitors, boat workers and people living on the island who are approaching the Fair Isle by sea.
VL1b	
VL2	Representative of views experienced by visitors, residents and maritime workers arriving to Fair Isle by

View Location Reference	Reasoning for Selection
	boat. Receptors predominantly onboard the ferry vessel but also infrequent private vessels and cruise ship shuttle boats.
VL3	Representative of views experienced by visitors and residents visiting North Haven Beach
VL4	Representative of views experienced by visitors and walkers accessing Bu Ness Head
VL5	Representative of views experienced by visitors and walkers accessing headland to the west of North Haven
VL6	Representative of views experienced by visitors of the Bird Observatory, walkers and users of the road accessing North Haven to the north and the rest of the island to the south
VL7	Representative of views experienced by visitors and walkers using the footpath along the headland heading towards Sheep Rock, one of Fair Isle's landmark features
VL8	Representative of views experienced by visitors and walkers on the west side of the southern part of Bu Ness

Baseline Evolution

11.5.9 Without the Proposed Development, the baseline scenario for landscape and visual receptors is judged to be as if there were no development taking place, and therefore the landscape and visual baseline would remain broadly as the baseline described above. Given the finite life of the current ferry service however, the 'no change' scenario could potentially result in limited landscape and visual change as the provision falls into a state of disrepair and any currently managed landscape is returned to nature.

11.5.10 There are no other known relevant future changes proposed which would have an effect on the future baseline scenario.

11.6 Potential Impacts

11.6.1 This section sets out the potential impacts resulting from the Proposed Development and the potential impacts on the landscape and visual receptors as a result. It also identifies and landscape or visual receptors which have been discounted from the assessment.

Construction Impacts

11.6.2 The construction phase is programmed to last over a 15-month short-term period across two summers, and the principal construction impacts of relevance to the landscape and visual impact assessment can be summarised as:

- The erection of temporary security lighting to the working site perimeter where required.

- The erection of a temporary construction compound with associated construction traffic signage.
- Movements of large construction vehicles including bulldozers.
- Expansion of the existing noust which will require removal of a section of rockface.
- Installation of new rails, cradle and winch, solid quay to form a new linkspan berth, repair and extension of existing pier structure, and permanent lighting to extend along the rear of the extended quay.
- Existing breakwater extended and heightened.
- Dredging of the existing seabed to provide sufficient water depth for the new vessel.
- Restoration of areas disturbed during construction.
- The removal of construction compounds.

11.7 Embedded Mitigation

11.7.1 Embedded mitigation as part of the Proposed Development is limited to standard construction practices which this LSVIA assumes will be adhered to. Construction is proposed to take place over two summer seasons due to weather restrictions over the winter months.

11.7.2 Works will be restricted to the hours of 7am – 7pm Monday to Friday, and 7am – 1pm on Saturdays, therefore it is unlikely task lighting will be required.

11.7.3 Additional construction mitigation measures are outlined in the fiEMP.

11.8 Assessment of Likely Effects

11.8.1 This section presents a summary of the assessment of likely significant effects on landscape and visual receptors resulting from the construction phase of the Site. This is based on the design of the Site and considers the embedded mitigation as presented in Section 11.7 above.

Landscape

11.8.2 Full details of the landscape effects are presented in the **Schedule of Landscape Effects table in Appendix A11.3**.

11.8.3 The landscape assessment identified short-term reversible / partially reversible / permanent effects during construction. Effects were identified as being significant or not significant.

11.8.4 The LSVIA found that **direct, medium-term, reversible / permanent effects which are moderate adverse,** which is considered **significant** on the following landscape receptors during construction:

- The landscape character of the Site; and
- CCT 11: Small Harbour.

11.8.5 This was as a result of general changes to the existing harbour infrastructure in addition to dredging of navigational lanes and widening of the existing noust to accommodate the new, larger vessel.

11.8.6 The LSVIA found that no further significant landscape effects would be incurred as a result of the Proposed Development. Direct, medium-term reversible / permanent effects which are minor adverse, on **LCT 355: Coastal Edge** during construction.

11.8.7 This was as a result of the Proposed Development incurring a very localised change to the existing coastline which would not result in notable change to the wider extents of the landscape receptors.

11.8.8 The **Shetland NSA** and **LCT 349: Major Uplands** were predicted to experience negligible, indirect medium-term reversible effects as a result of the construction works, whilst **LCT 353: Farmed and Settled Lowlands** was predicted to experience no change.

Visual

11.8.9 Figure 8.4 View Locations Plan within Appendix H.1 identifies the View Locations, location, and receptor. Full details of the assessed visual effects are presented in the **Schedule of Visual Effects table in Appendix A11.4.**

11.8.10 The visual assessment identified direct, medium-term, partially reversible/permanent effects which are **major adverse**, which is considered **significant**. This is generally due to the high sensitivity of the Site, being within a National Scenic Area, and the changes taking place at relatively short distance. The view locations considered to experience these effects are:

- VL2: North Haven Pier; and
- VL5: Headland west of North Haven.

11.8.11 Direct, medium-term partially reversible/permanent effects which are **moderate adverse**, and considered **significant**, were identified for the following view locations:

- VL1a and 1b: North Haven approach (from sea);
- VL3: North Haven Beach;
- VL4: Bu Ness Head (east of North Haven); and
- VL6: Fair Isle Bird Observatory.

11.8.12 Although the overall magnitude of effect was considered Slight for these receptors given the potentially limited visibility of construction, the high sensitivity of the NSA results in a moderate adverse effect.

11.8.13 Direct, medium-term, and partially reversible/permanent effects were predicted for view location (VL7: Headland north of Sheep Rock) which are **minor adverse**, and not considered significant. This is generally as a result of overall distance, which would reduce the overall effect of construction works across the expansive views available at this location.

11.8.14 Direct, medium term and partially reversible/permanent effects were predicted for the remaining view location (VL8: Bu Ness Head [south of North Haven]) which are **negligible**, and not considered significant. Similarly to VL7 the overall distance and scale of the proposed works in relation to the wider aspects of the view would be reduce visual impacts.

11.9 Further Mitigation and Enhancement

11.9.1 Further mitigation measures are proposals to address adverse effects which remain after embedded measures and standard construction practices have been incorporated into the Site.

11.9.2 No further mitigation or enhancement measures are identified because achievable landscape mitigation within the Site extents has already been included in the embedded mitigation measures and it is reasonably assumed that standard construction practices would apply.

11.10 Residual Effects

11.10.1 Residual effects are those that are predicted to remain following implementation of the further mitigation and enhancement measures described above. As no further mitigation measures are proposed, the assessment of likely effects presented above in Section 8.8 identifies the residual effects of the Proposed Development.

11.10.2 The **Schedule of Landscape Effects table in Appendix A11.3** and the **Schedule of Visual Effects table in Appendix A11.4** set out the detailed effects assessments upon landscape and visual receptors.

11.11 Monitoring

11.11.1 Given that there will be no soft landscape proposals as part of the Proposed Developments mitigation there will be no requirement for monitoring of the Scheme following completion.

11.12 Summary

11.12.1 This chapter provides assesses the potential effects associated with the Fair Isle Harbour Improvement Works, on Landscape / Seascape receptors and on visual receptor and visual amenity. The assessment considers the potential effects during the construction period only, as given the nature of the improvement works; i.e. general improvements to the existing conditions, there would be no significant operational effects.

11.12.2 The Landscape, Seascape and Visual Impact Assessment (LSVIA) considered an overview of international, national, regional, and local policy. The island lies within a nationally designated area, specifically the Shetland National Scenic Area (NSA), and as a result policies such as NH1: International and National Designations (Shetland Local Development Plan, 2014) were considered. Policy NH1 aims to protect the integrity and quality of the features for which the land was designated.

11.12.3 Consultation was undertaken with various stakeholders, including the Shetland Islands Council, NatureScot and Historic Environment Scotland in April 2022 following the submission of a Scoping Report which outlined the overall approach to the assessment, including the methodology to be adopted. Overall, the approach to the assessment was approved, including the assessment of construction effects only.

11.12.4 The assessment was undertaken following guidance within the Guidelines for Landscape and Visual Impact Assessment (Landscape Institute / Institute of Environmental Management and Assessment, 3rd Edition, 2013) (GLVIA3), combined with our professional experience and judgement.

11.12.5 The Proposed Development will comprise improvements to the current conditions within North Haven Harbour which aim to ensure the island maintains and improves connections with the surrounding islands. The existing ferry, the Good Shepherd IV, would be replaced with a larger boat capable of meeting modern standards. This in turn would require a larger docking space in addition to general improvements to the existing quay structure, linkspan, breakwater, and finger pier.

11.12.6 In addition to the island being designated as an NSA, it contains several Listed Buildings and Scheduled Monuments. Although there are no designated Core Paths or long-distance footpaths within the island, it is a known tourist destination, with visitors including walkers, recreational boat-users, and birdwatchers, with the bird observatory currently being rebuilt following a fire in 2019.

11.12.7 The assessment found that significant adverse landscape effects during construction would be limited to the landscape character of the Site and the character of the Small Harbour

Coastal Character Type (CCT 11). This is broadly due to the proximity and nature of construction activity which would include changes to harbour infrastructure in addition to the dredging of navigational lanes and widening of the existing noust to accommodate the new vessel. These effects would however be moderate, medium-term, and reversible/permanent and would not significantly alter the current conditions beyond construction given that the harbour would be reinstated to very similar conditions to that of the current baseline. All other potential landscape effects were considered to be minor or negligible, including those associated with the Shetland NSA.

11.12.8 Given the sensitivity of the island to development as a result of its national designation (NSA), significant adverse visual effects were predicted across the majority of the proposed View Locations (VLs). VL2 and VL5 were predicted to experience direct, medium-term major adverse effects, whilst VL1a and VL1b, VL3, VL4 and VL6 were predicted to experience direct, medium-term moderate adverse effects. This is broadly as a result of a combination of the high sensitivity of receptors whilst on the island, and the proximity of views which look directly towards the harbour.

11.12.9 VL7: Headland north of Sheep Rock was predicted to experience a minor adverse effect, which is not considered significant, whilst VL 8: Bu Ness Head (South of North Haven) was predicted to experience negligible effects, also not considered significant.

11.12.10 Overall, the significant effects sustained as a result of construction of the Proposed Development are mainly visual and medium-term, with significant medium-term landscape effects being confined to the extents of the Site and its immediate context. The Proposed Development would provide the island with an essential lifeline which will allow those who live and work on it to prosper and maintain the island's unique identity with no lasting effects. As a result, it is our considered opinion that the Proposed Development should therefore be permitted on landscape and visual grounds.

11.13 References

- Council of Europe (2000). Guidelines for the Implementation of the European Landscape Convention. https://www.coe.int/en/web/landscape/guidelines-for-the-implementation-on-the-european-landscape-convention
- Landscape Institute (2013). GLVIA3 Statement of Clarification 1/13. https://www.landscapeinstitute.org/technical/glvia3-panel/glvia3-clarifications/
- Landscape Institute and Institute of Environmental Management and Assessment (2013). Guidelines for Landscape and Visual Impact Assessment. Third Edition (GLVIA3). Oxfordshire: Routledge
- Landscape Institute (2019). Landscape Institute Technical Guidance Note 06/19: Visual Representation of Development Proposals. https://landscapewpstorage01.blob.core.windows.net/www-landscapeinstitute-org/2019/09/LI_TGN-06-19_Visual_Representation.pdf
- Landscape Institute (2017). Technical Information Note on Townscape TIN 05-2017 Updated April 2018
- Landscape Institute (2015). Technical Information Note 08/2015 'Landscape Character Assessment
- Landscape Institute (2021). Draft Technical Guidance Note 02/21: Landscape value and valued landscapes
- NatureScot (2019). Landscape Character Types (LCTs) SNH 2019. LANDSCAPE CHARACTER TYPES (LCTs) SNH 2019 (arcgis.com)
- NatureScot (2010). The Special Qualities of the Shetland National Scenic Area
- NatureScot (extract from Scotland's Scenic Heritage, 1978). Shetland National Scenic Area

- Shetland Islands Council and the NAFC Marine Centre University of the Highlands and Islands (2015). Supplementary Guidance Shetland Islands, Marine Spatial Plan, Fourth Edition 2015
- The Scottish Government (2014). Scottish Planning Policy
- The Scottish Government (2015). Scotland's National Marine Plan – A Single Framework for Managing Our Seas
- Town and Country Planning (Environmental Impact Assessment) Regulations (2017). https://www.legislation.gov.uk/uksi/2017/571/made
- University of the Highlands and Islands Shetland and the Shetland Marine Planning Partnership (2021). Shetland Coastal Character Assessment: Second Edition 2021

12 Marine Geomorphology

12.1 Introduction

12.1.1 This chapter presents the findings of the assessment of the construction and operation of the Fair Isle Harbour Improvement Works (hereafter referred to as the Proposed Development) on coastal processes and marine geomorphology. This topic covers the hydrodynamic (water levels, flows and waves) and sediment transport regimes of the study area. Consideration has also been given to the potential sediment plume resulting from dredging in the study area and disposal at a licenced disposal site. Marine water and sediment quality were not scoped in as a standalone topic (see Scoping Report, **Appendix A.2**). However, a baseline and assessment for these receptors is presented here as indirect effects from potential changes to marine water and sediment quality are considered in the marine ecology chapter (Chapter 13).

12.1.2 Alternative and beneficial use of the dredged material has been considered through a Best Practicable Environmental Options (BPEO) report submitted alongside the marine licence application for dredging activities related to the Proposed Development. The BPEO has been informed by the results of the geotechnical investigations. Disposal of all dredged material at the nearest licensed disposal site (Scalloway (FI095)) has been considered as a worst case in this assessment (Appendix A18 BPEO Report).

12.1.3 This chapter outlines legislative and policy framework and guidance, describes the assessment methodology, study area and baseline conditions. An overview of potential impacts is provided, along with any mitigation measures required, likely residual effects, monitoring and a summary of the main issues and steps taken to avoid them.

12.1.4 The Proposed Development is located within the area encompassed by the planning application boundary, hereafter referred to as 'the Site'.

12.1.5 This geomorphology assessment has been carried out by ABPmer. In accordance with Regulation 18(5) of the Town and Country Planning (Environmental Impact Assessment) Regulations 2017, as amended, a statement outlining the relevant expertise and qualifications of competent experts appointed to prepare this ES is provided in **Appendix A.3**.

12.1.6 This chapter is also supported by wave modelling (Mott Macdonald 2023a; **Appendix A.12**), hydrodynamic and sediment transport modelling (Mott Macdonald 2023a; **Appendix A.13**) and Particle Size Analysis (PSA) results presented in the Benthic Survey Report (ABPmer, 2023; **Appendix A.14**).

12.2 Policy Context, Legislation, Guidance and Standards

12.2.1 This assessment has been undertaken considering current legislation, together with national, regional and local plans and policies. A list is provided below and further detail regarding policy can be found in the Chapter 6 – Planning and Policy Context.

Legislation

- The Marine (Scotland) Act 2010;
- The Marine Licensing (Pre-application Consultation) (Scotland) Regulations 2013;
- Water Environment (Shellfish Waters Protected Area Designation) (Scotland) Order (2013); and
- Water Environment and Water Services (Scotland) Act 2003' (WEWS Act).

Planning Policy

- UK Marine Policy Statement;
- UK Marine Strategy;
- Scotland's National Marine Plan (2015);
- Shetland Islands' Marine Spatial Plan (2015); and
- Shetland Islands Regional Marine Plan (SIRMP) (Amended Draft, 2021).

Standards and Guidance

- Pre-disposal Sampling Guidance (Marine Scotland, 2017).

12.3 Consultation

12.3.1 Consultation and engagement has informed the geomorphology and water and sediment quality assessment. Responses to the *Fair Isle Harbour Improvement Works Environmental Impact Assessment Scoping Report* (Stantec, 2022) are set out in the *Scoping Opinion on the Environmental Impact Assessment (EIA) to upgrade the existing harbour*; both of these documents are provided as Appendix A.2 and summarised in Table 12-1.

Table 12-1:Summary of Consultation

Consultee	Summary of comment	How comments have been addressed
MSS	In agreement with chapter 7.4 of the scoping report covering hydrodynamics and sediment transport regimes (marine geomorphology).	Noted, in agreement.
MSS	Advise both hydrodynamic modelling and field data to be collected, if possible.	Numerical modelling of hydrodynamics, waves, sediment transport and dredge plume has been undertaken on behalf of the project (Mott Macdonald, 2023a, Appendix A.12 and Mott Macdonald, 2023b, Appendix A.13). Survey data has been collected to inform bed material composition (surface grab samples). Borehole samples have also been collected
MSS	The hydrodynamic model needs appropriate validation, details of the model, boundary conditions and forcing, including sensitivity analysis, is to be provided. If field studies are possible to collect data for model validation this is strongly encouraged.	The numerical modelling reports include detail of all calibration, validation exercises, along with description of model setup (boundary conditions, bathymetry, bed roughness etc.).
MSS	Scope in marine geomorphology as the proposed project will have an impact on sedimentation, and hydrodynamics around the study area during both the construction	Geomorphology has been scoped in and assessment is included in this chapter

Consultee	Summary of comment	How comments have been addressed
	and operation phase. Encourage the development of a CEMP.	A fiEMP is included as Appendix A.4.
MSS	Confirm if a CEMP has been developed?	A fiEMP is included as Appendix A.4.

12.4 Methodology

Study Area

12.4.1 The study area for this assessment is the area over which potential direct and indirect effects of the Proposed Development are predicted to occur during construction and operation.

Coastal processes and marine geomorphology

12.4.2 The direct effects on coastal processes and geomorphology are those that may arise due to sediment plume releases during construction (dredging and disposal) and impacts on hydrodynamics and waves arising as a result of the scheme elements. Indirect effects are those on sediment transport pathways that may arise due to direct changes to the driving hydrodynamic or wave forcing.

12.4.3 The study area for the coastal processes and marine geomorphology topic is considered to be North Haven (for impacts arising from dredging and operation) and the Scalloway disposal site (for impacts arising from the disposal of dredged material) (Appendix A18 provide BPEO for Disposal site).

Marine water and sediment quality

12.4.4 The direct effects on water and sediment quality are those that may arise due to accidental releases during construction. Indirect effects are those that may arise due to sediment that is disturbed into the water column during the marine works resulting in changes in water quality through changes in the levels of dissolved oxygen or the release of sediment-bound contaminants.

12.4.5 The study area for the marine water and sediment quality topic is considered to be North Haven and the Scalloway licensed disposal site.

Baseline Data Collection

Marine geomorphology

12.4.6 The assessment of potential impacts on coastal processes and marine geomorphology has been undertaken with input from a range of project-specific surveys and numerical modelling studies. Data used to inform the assessment includes:

- Project-specific numerical modelling of hydrodynamics, waves, sediment transport and dredge plume, assessing likely impacts arising from the proposed scheme (Mott Macdonald, 2023a, Appendix A.12 and Mott Macdonald, 2023b, Appendix A.13);
- Benthic survey campaign (including seabed grab sampling) (ABPmer, 2023; Appendix A.14)

- Existing third-party data, including:
  - Environment Agency (EA) extreme sea level;
  - National Tide and Sea Level Facility (NTSLF) measured water level and meteorological surge;
  - UK Climate Projections (UKCP); and
  - UK Hydrographic Office harmonic tidal data.

Marine water and sediment quality

12.4.7 A desktop study was undertaken, this included the following sources:

- Scottish Environment Protection Agency (SEPA) Water Classification Hub; and
- National Marine Plan Interactive (NMPi) database.

Assessment

12.4.8 To facilitate the impact assessment process and ensure consistency in the terminology of significance, a standard assessment methodology has been applied, as described in the Assessment Method (Chapter 5).

12.4.9 To assess the significance of effects, the magnitude of the change and the probability of it occurring is evaluated to understand the exposure to change, and this is assessed against the sensitivity of a receptor/feature to understand its vulnerability. Finally, this is compared against the importance of a receptor/feature to generate a level of significance for effects resulting from each impact pathway.

12.4.10 With specific regards to the coastal processes and marine geomorphology assessment, rather than being defined as receptors (with associated 'vulnerability' and 'significance'), physical processes, namely waves, tides and sediment transport, constitute the primary effect 'pathways'. Changes to these pathways may subsequently lead to an impact on a receptor within a different assessment topic (i.e. benthic ecology, water quality etc.). Consequently, the assessment of impact in the coastal process and marine geomorphology topic considers the magnitude and extent (both spatially and temporally), in the context of the existing (baseline) environment to make a judgment on impact significance. These pathway assessments can then be used by other EIA topics to feed into their studies.

Limitations

12.4.11 It should be noted that, whilst the regional wave model benefitted from comparison against historic measured data at Lerwick, the local wave model was not calibrated; therefore, there will always be some uncertainty in the absolute magnitude of predicted wave conditions until model calibration is performed. However, it is considered that relative differences in wave parameters (between baseline and scheme scenarios) are well-represented by the modelling tools and, hence, provide a useful guide to the performance of the proposed scheme concerning impacts on the local wave climate.

Impact assessment guidance tables

12.4.12 The matrices in Table 12-2 to Table 12-4 have been used to help assess significance (see below). Table 12-2 has been used as a means of generating an estimate of exposure to change for each impact pathway. Magnitude of change needs to be considered in spatial and temporal terms (including duration, frequency and seasonality), and against the background environmental conditions in a study area. Once a magnitude has been

determined, this should be combined with the probability of occurrence to arrive at an exposure score which can then be used for the next step of the assessment, which is detailed in Table 12-3. For example, an impact pathway with a medium magnitude of change and a high probability of occurrence would result in a medium exposure to change.

Table 12-2: Exposure to change, combining magnitude and probability of change

Probability of Occurrence	Magnitude of Change			
	Large	Medium	Small	Negligible
High	High	Medium	Low	Negligible
Medium	Medium	Medium	Low	Negligible
Low	Low	Low	Negligible	Negligible
Negligible	Negligible	Negligible	Negligible	Negligible

12.4.13 Table 12-3 has then been used to score the vulnerability of the features/receptors of interest based on the sensitivity of those features and their exposure to a given change. Where the exposure and sensitivity characteristics overlap then vulnerability exists, and an adverse effect may occur. For example, if the impact pathway previously assessed with a medium exposure to change acted on a receptor which had a high sensitivity, this would result in an assessment of high vulnerability. Sensitivity can be described as the intolerance of a receptor to an environmental change and essentially considers the response characteristic of the receptor. Thus, if a single or combination of environmental changes is likely to elicit a response then the receptor under assessment can be considered to be sensitive. Where an exposure or change occurs for which the receptor is not sensitive, then no vulnerability can occur. Similarly, vulnerability is always 'none' no matter how sensitive the feature is, if the exposure to change had been assessed as 'negligible'.

Table 12-3: Estimation of vulnerability based on sensitivity and exposure to change

Sensitivity of Feature	Exposure to Change			
	High	Medium	Low	Negligible
High	High	High	Moderate	None
Moderate	High	Moderate	Low	None
Low	Moderate	Low	Low	None
None	None	None	None	None

12.4.14 The vulnerability has then been combined with the importance of the feature of interest using Table 12-4 to generate an initial level of significance. The importance of a feature is based on its value and rarity (e.g. to either ecosystem or economy), such as the levels of protection, whilst recognising that importance should be determined having regard to geographic context (i.e. international/European, national, regional, and local). For an example of estimating significance, if a high vulnerability was previously given to a feature of low importance, an initial level of significance of minor would be given.

Table 12-4: Estimation of significance based on vulnerability and importance

Importance of Feature	Vulnerability of Feature to Impact			
	High	Moderate	Low	None
High	Major	Moderate	Minor	Negligible

Importance of Feature	Vulnerability of Feature to Impact			
	High	Moderate	Low	None
Moderate	Moderate	Moderate	Minor	Negligible
Low	Minor	Minor	Negligible	Negligible
None	Negligible	Negligible	Negligible	Negligible

12.5 Baseline Conditions

The Site and surrounding area

12.5.1 The Proposed Development on Fair Isle is to upgrade the existing ferry terminal with works to the breakwater, a new extended quay and the dredging of a berth pocket, as described in Chapter 3. The embayment at Fair Isle is orientated with its mouth at an alignment of approximately north-northeast, with a width of around 130 m. Along the eastern side of the bay, the existing breakwater is located, along with Fair Isle Pier, slipway and quay wall.

12.5.2 Along the southern edge of the embayment is a sandy beach, which is effectively divided into two by a concrete slipway. The beach to the east of this structure is generally wider than the beach to the west. Just offshore of the western beach is a small rocky outcrop. Away from the beach and the existing infrastructure, the east and west coastlines are characterised by rocky hinterland with a general lack of intertidal foreshore.

12.5.3 The local bathymetry within the embayment slopes gently from the sandy beach at the base, reaching around 5 m below Chart Datum (mCD) at around the end of the existing breakwater, before deepening further to around 12-15 mCD at the mouth. Further offshore, the bed slope continues, reaching around 20 mCD approximately 100 m offshore of the mouth. Across the wider approaches to Fair Isle, within the northern North Sea, water depths reach upwards of 80 mCD.

12.5.4 An overview of the embayment at North Haven, Fair Isle showing existing infrastructure, rocky cliff hinterland and beach is shown in Figure 12-1.

Figure 12-1: Overview of the embayment at Fair Isle showing existing infrastructure, rocky cliff hinterland and beach (view looking approximately southwest)

12.5.5 A description of the local hydrodynamics, geology and sediment transport regimes, across the wider study area, is provided in the following sections.

Tides and water levels

12.5.6 The embayment at Fair Isle is macro tidal with a mean spring tidal range of 1.6 m and a mean neap tidal range of 0.7 m. Tides are semi diurnal with standard tidal levels at Fair Isle provided in Table 12-5.

Table 12-5: Standard tide levels for Fair Isle

Tide level	Elevation	
	mCD	mOD
Highest Astronomical Tide (HAT)	2.70	1.78
Mean High Water Spring (MHWS)	2.20	1.28
Mean High Water Neap (MHWN)	1.70	0.78
Mean Sea Level (MSL)	1.37	0.45
Mean Low Water Neap (MLWN)	1.00	0.08
Mean Low Water Spring (MLWS)	0.60	-0.32
Lowest Astronomical Tide (LAT)	0.10	-0.82
	Range (m)	
Astronomical Tide Range	2.60	
Mean Spring Range	1.60	
Mean Neap Range	0.70	

Source: UKHO Tide Tables 2022

Surge

12.5.7 In addition to the astronomical tides, the influence of meteorological surge events will affect the actual water levels experienced on site. These surges can be both positive and negative (increasing or decreasing the tidal elevations, respectively).

12.5.8 The closest medium- to long-term record of measured water level data for Fair Isle is available from the NTSLF Class A Tide Gauge at Lerwick (Shetland, around 70 km to the north of Fair Isle). Whilst this will not provide levels specific to the study area, it does provide a useful regional overview of the potential for surge events to affect local tidal levels.

12.5.9 The Lerwick data has been analysed to assess the influence of the meteorological surge component across the wider region. Table 12-6 provides the total, predicted and surge components for each of the ten highest total water levels and the ten highest surge events at Lerwick (since 1990).

12.5.10 The results of the tide gauge analysis indicate that the largest water level events are primarily driven by a high predicted tidal elevation coincident with a moderate meteorological surge. By contrast, the largest surge events in the tidal record tend to occur alongside smaller predicted tidal heights.

Table 12-6: Top 10 total water level and surge events at Lerwick (1990 to 2022)

Date Time	Top 10 largest **total water levels**		
	Total **(mOD)**	Predicted **(mOD)**	Surge **(m)**
11/01/1993 13:00	1.934	1.358	0.576
27/02/1990 12:00	1.866	1.255	0.611
12/01/2005 12:00	1.802	1.316	0.486
25/12/1999 00:44	1.777	1.239	0.538
12/01/2009 11:30	1.763	1.341	0.422
04/01/2014 12:45	1.756	1.372	0.384
01/02/1995 11:29	1.747	1.303	0.444
02/01/1991 12:00	1.731	1.329	0.402
25/11/2011 11:00	1.728	1.216	0.512
25/01/2008 12:45	1.724	1.273	0.451
Date Time	Top 10 largest surge levels		
	Total (mOD)	Predicted (mOD)	Surge (m)
29/01/2016 20:45	0.522	-0.338	0.860
11/01/1993 03:00	1.276	0.495	0.781
25/12/2013 01:15	1.107	0.377	0.730
12/01/2015 20:15	0.63	-0.082	0.712
19/02/1990 22:00	0.912	0.202	0.710
12/06/2001 23:15	0.802	0.096	0.706
25/12/1999 03:29	0.983	0.291	0.692
25/02/1997 11:30	1.596	0.905	0.691
01/01/1992 12:00	0.903	0.223	0.680
08/12/1994 12:44	1.455	0.778	0.677

Source: NTSLF Class A Tide gauge data from Lerwick (1990 to 2022)

Extreme water levels

12.5.11 Current extreme predictions determined by the Environment Agency for Fair Isle are the most up-to-date and appropriate for this review (Environment Agency, 2018). These are provided in Table 12-7 for a baseline year of 2017.

Table 12-7: Predicted extreme water levels offshore of Fair Isle

Return Period (Years)	Annual Exceedance Probability (%)	Extreme Water Level (mOD)
1	100	1.67
2	50	1.71
5	20	1.77
10	10	1.81
20	5	1.86
25	4	1.87

Return Period (Years)	Annual Exceedance Probability (%)	Extreme Water Level (mOD)
50	2	1.91
75	1.3	1.93
100	1	1.95
150	0.67	1.97
200	0.5	1.99
250	0.4	2.00
300	0.33	2.01
500	0.2	2.04
1,000	0.1	2.07
10,000	0.01	2.18

Source: EA Coastal Flood Boundary Dataset (CFBD) 2018

Sea level rise

12.5.12 The above data do not allow for sea level rise in the future. In order to take account of future sea level rises from 2023, the latest UKCP18 relative sea level research (Met Office, 2018) (assuming a Representative Concentration Pathway (RCP) 8.5, 95%ile scenario) will add 0.96 m to the water levels provided in Table 12-7 by 2100.

Flows

12.5.13 Flow conditions within and offshore of the embayment at Fair Isle are available from the hydrodynamic numerical modelling undertaken to assess the proposed scheme (Motts Macdonald, 2023b; Appendix A.13). Summary information on the local flow regime is provided below.

12.5.14 Peak flood and ebb current speeds, during a mean spring tide across the study area, are shown in Figure 12-2. This figure shows that the maximum currents in the bay of 0.02 to 0.03 m/s are small. Isolated locations around the existing structures in the bay show higher maximum current speeds of up to 0.05 to 0.08 m/s. The flow regime inside the bay is generally very low, with velocities typically 0.01 m/s.

12.5.15 The spatial distribution of current speeds at the site for peak flood and ebb flows during the spring tides indicates that flood speeds are slightly higher than those on the ebb. However, current speeds in the bay are generally small, with higher and more variable current speeds in the outer bay, on the northern side of the breakwater. In general, current speeds in the middle of the bay are around 0.01 to 0.015 m/s during the flood tide, while during the ebb phase, peak currents do not exceed 0.01 m/s. Flows during mean neap tides generally show the same patter as springs, but the magnitude of the currents is approximately halved.

12.5.16 The flood and ebb spring tide vectors shown in Figure 12-2 also show that the bay tends to have a flow circulation. This circulation is attributed to the existing breakwater obstructing tidal flows entering and leaving the embayment.

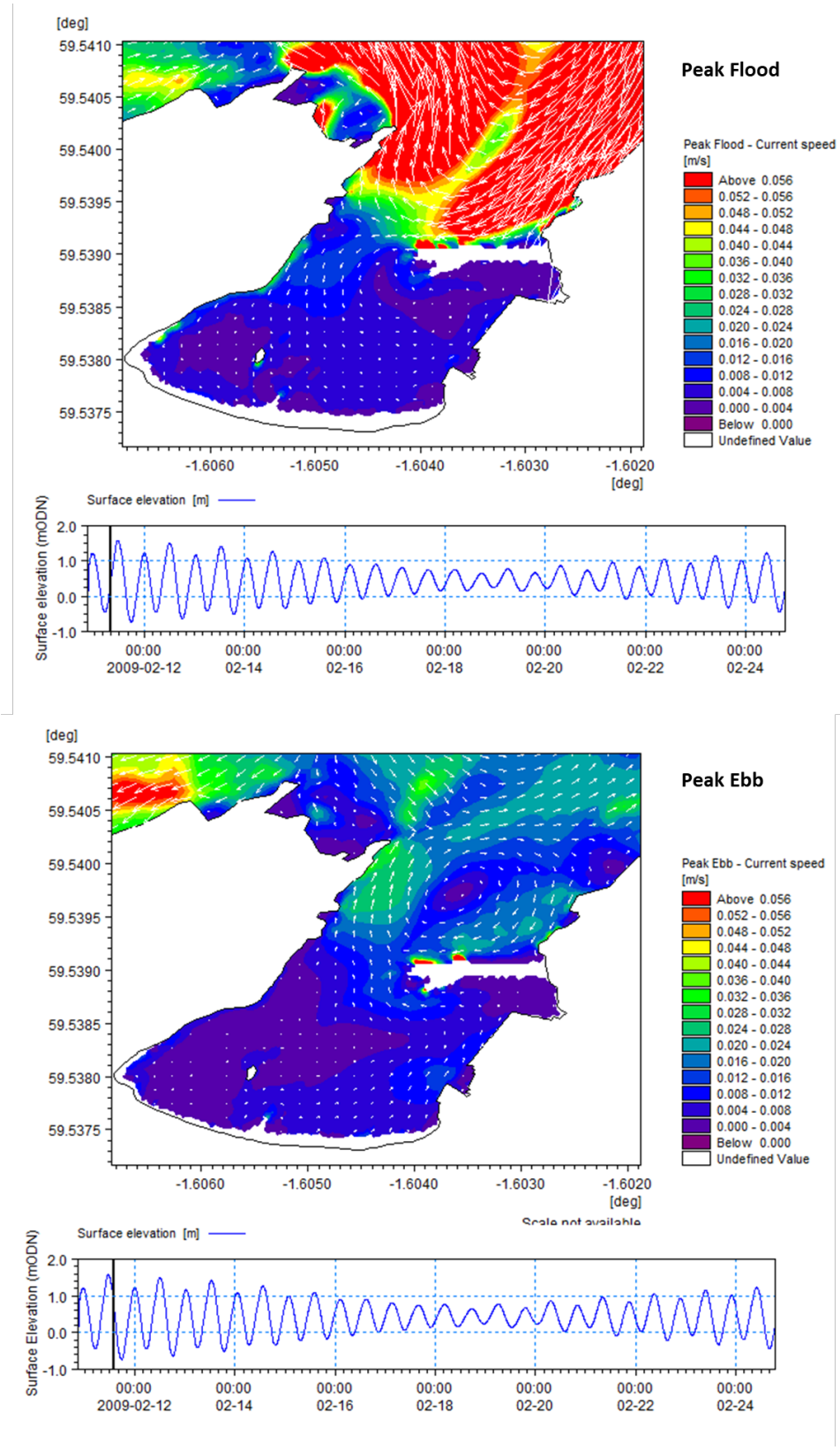


Figure 12-2: Peak flood and peak ebb depth-averaged current speeds at North Haven, Fair Isle, under spring tide conditions

Waves

12.5.17 The Fair Isle embayment is exposed to waves approaching from a range of directions across the northern North Sea. The mouth of the embayment is oriented such that long fetch lengths exist from north-north-easterly through to north-easterly directions.

12.5.18 Modelled hindcast wave data from a point offshore (east) of the approaches to Fair Isle has been used to provide the wave rose shown in Figure 12-3. This reveals that the offshore wave regime at the proposed site is dominated by waves approaching from a range of directions (coincident with the longest offshore fetch lengths). Largest waves tend to approach from the northwest and southeast, although the orientation of the North Haven embayment is such that the wave climate at the Site will be dominated by generally north-northeast and north-easterly wave directions.

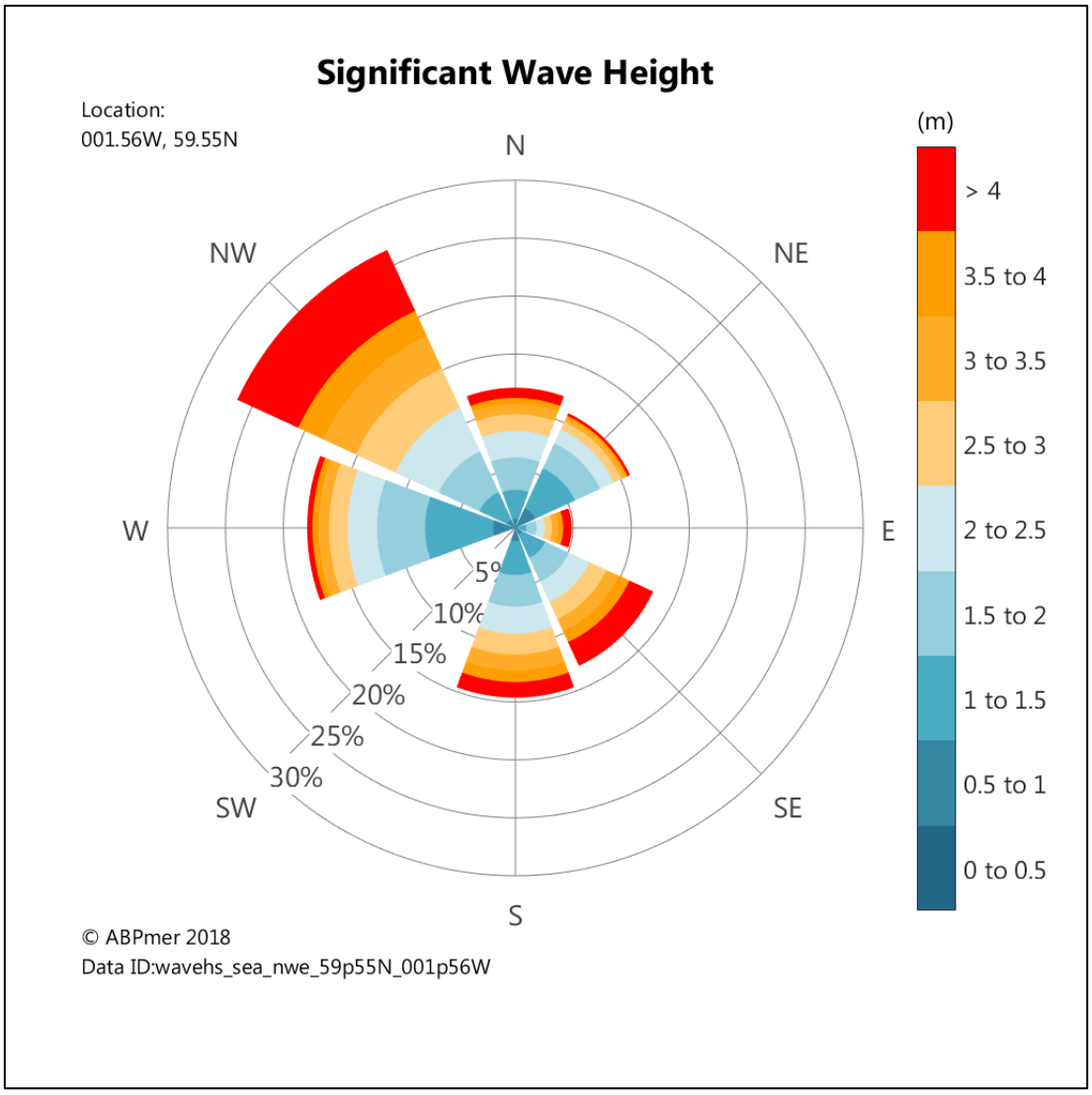


Figure 12-3: Wave rose offshore (east) of Fair Isle

12.5.19 An example of the modelled wave event during a peak storm period measured at Lerwick during May 1985 is shown in Figure 12-4. This also provides the comparison of significant wave height (Hs) between the model and the measurements during the storm event. Peak heights measured over this period reached around 2 m at the Lerwick wave buoy, increasing to >4 m on the approaches to Fair Isle.

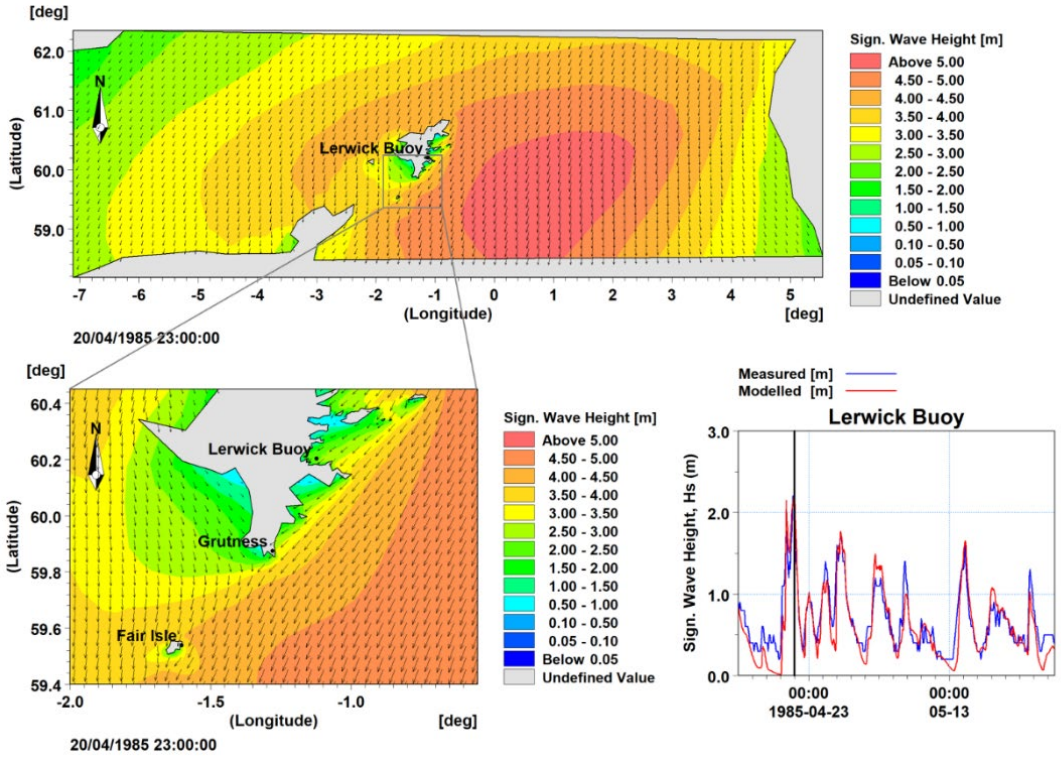


Figure 12-4: An example of the modelled wave event during a peak storm period measured at Lerwick during May 1985. Source: Mott Macdonald, 2023a

12.5.20 An extreme value analysis of offshore wave conditions has been carried out as part of the Fair Isle wave modelling study (Mott Macdonald, 2023a). The results of this analysis are provided in Table 12-8 and indicate N and NE offshore extreme wave heights for the 1 in 100-year event of around 7 to 8 m.

Table 12-8: Summary of extreme offshore wave conditions applied within the wave modelling study

Sector	Item	AEP (%)			
		100	50	10	1
W (247.5-292.5°N)	Hs (m)	7.70	8.40	9.90	11.70
	Tp (s)	13.6	14.5	16.2	18.3
	WS (m/s)	18.1	19.1	21.2	23.6
NW (292.5-337.5°N)	Hs (m)	6.77	7.36	8.74	10.65
	Tp (s)	11.7	12.4	13.9	16.0
	WS (m/s)	17.4	18.3	20.3	22.8
N (337.5-22.5°N)	Hs (m)	5.61	6.15	7.11	8.11
	Tp (s)	10.6	11.3	12.5	13.6
	WS (m/s)	15.6	16.5	18.0	19.4
NE (22.5-67.5°N)	Hs (m)	4.17	4.60	5.46	6.81
	Tp (s)	9.0	9.5	10.4	11.8
	WS (m/s)	13.8	14.6	16.0	18.1

Sector	Item	AEP (%)			
		100	50	10	1
E (67.5-112.5°N)	Hs (m)	4.53	5.17	6.61	8.79
	Tp (s)	9.4	10.1	11.6	13.6
	WS (m/s)	13.6	14.6	16.5	19.0
SE (112.5-157.5°N)	Hs (m)	6.35	7.12	8.48	9.83
	Tp (s)	11.4	12.1	13.4	14.5
	WS (m/s)	17.2	18.2	19.9	21.4
S (157.5-202.5°N)	Hs (m)	6.10	6.64	7.71	9.06
	Tp (s)	10.8	11.3	12.3	13.4
	WS (m/s)	18.5	19.4	21.1	23.1
SW (202.5-247.5°N)	Hs (m)	6.26	6.73	7.62	8.59
	Tp (s)	9.7	10.2	11.0	11.8
	WS (m/s)	17.4	18.3	19.8	21.5

Source: Mott Macdonald, 2023a

Geology and Sediments

12.5.21 Local seabed and foreshore sediment cover across the Fair Isle embayment is dominated by rock armour protection (of the existing breakwater), rocky outcrops and sandy sediment.

12.5.22 Along the southern end of the bay, the nearby beach is formed of fine, clean sand, broken up by the existing concrete slipway extending form the centre of the beach. To the western extent of the beach, boulders and rock within the lower shore are present. Images of the range in sediment cover along the beach are shown in Figure 12-5.

Figure 12-5: Example of range in sediment cover along the southern embayment beach, showing fine, clean sand (A), concrete slipway (B), outcropping rock (C and D)

12.5.23 Offshore, in the subtidal region across the bay, the local seabed is a combination of rocky outcrops and sandy sediment. Of the four grab samples targeted, only two could be collected (ABPmer, 2023). This was due to the presence of rocks and cobbles to the north of the existing breakwater. The particle size distribution of the successful grab samples, within the inner bay, is shown in Table 12-9. The analysis results show that there is little evidence of any significant coarse (gravel) or fine (mud) component at either location, with the seabed in both sites being dominated by sand. Mean grain diameter (D50) of the samples is also provided, ranging between 0.2 and 0.3 mm.

Table 12-9: Particle size distribution from subtidal Fair Isle grab samples. FIG indicates 'Fair Isle Grab'.

Station	FIG03	FIG04
Textural Group	Sand	Sand
% Gravel	0.0	0.0
% Sand	94.0	96.7
% Mud	6.0	3.3
D10 (µm)	88.8	176.7
D50 (µm)	240.0	311.4
D90 (µm)	497.7	491.3

12.5.24 Along the east and west sides of the bay, the hinterland is dominated by rocky cliffs, with sea caves identified to the north of the existing breakwater and on the southwest edge of the inner bay (Figure 12-6).

Figure 12-6: Sea caves at North Haven, Fair Isle

Sediment Quality

12.5.25 There are no historic records of any dredging activities in North Haven bay; Marine Scotland has confirmed that no dredging has taken place within the harbour for many years (if ever) (Marine Scotland Licensing Operations Team, *pers comm*. 07/02/2023). Therefore, no historic baseline sediment quality data exists for the area of the Proposed Development.

12.5.26 As part of the project survey campaign, subtidal grab samples were collected from North Haven Harbour in July 2022. Only two of four planned grab samples were obtained (see above). Particle size analysis (PSA) of the retrieved grab samples indicated the presence of medium and fine sands. The full PSA results are shown in the Benthic Survey Report (ABPmer, 2023, see Appendix A.14).

12.5.27 Sediment sampling has been carried out to support this marine licence application. Samples were obtained during the geotechnical investigations undertaken for the proposed works between 28 February and 09 March 2023, from five locations across the proposed dredge areas as shown in Figure 1. The pre-dredge sampling plan (submitted on 03 February 2023) was agreed with the Marine Scotland Licensing and Operations Team (MS-LOT) prior to the surveys and subsequent sample analysis. Samples were either collected using a Van Veen grab or sub-sampled from the cores collected at each location. Table 1 details the percentage of each material type for the different samples obtained.

Table 10 Sediment sample characteristics

Sample ID	Type of sample	Sample depth (m)	Gravel (>2 mm) (%)	Sand (63-2000 µm) (%)	Silt (<63 µm) (%)
Navigational dredge area at end of pier (Zone 1)					
BH101SeaBedA	Grab	0	0	91.73	8.29
Navigational and construction dredge area adjacent to extended quay (Zone 2)					
BH102SeaBedA	Grab	0	0.16	42.69	57.32
BH104SeaBedA	Grab	0	0.39	49.79	49.83
BH105SeaBed	Grab	0	1.43	42.33	56.31
BH105@0.2-0.9	Core	0.2-0.9	0.26	43.13	56.54
BH108SeaBed	Grab	0	0.36	40.58	59.17
BH108@0-0.80	Core	0.0-0.8	1.17	46.47	52.42

12.5.28 Sediment within the navigational dredge area (sample BH101) at the end of the pier comprises predominantly sand. Sediments within the navigational and construction dredge pockets (sample BH102 and samples BH104, BH105 and BH108, respectively) comprise roughly equal parts sand and silt. Geotechnical investigations showed that sediment was no more than 1 m in thickness across the dredge footprint of the proposed dredge areas, with an average of 0.5 m thickness across both dredge areas. As such it is anticipated that the total volume of the dredged material will comprise 47% sediment and 53% rock. The dredge material characteristics for the two dredge areas, accounting for the bedrock within the >2mm fraction, are shown in Table 2.

Table 11 Dredge material characteristics

Dredge area	Pebbles, cobbles and boulders (including bedrock) (>2 mm) (%)	Sand (63-2000 µm) (%)	Silt (<63 µm) (%)
Navigational dredge area at end of pier (Zone 1)	53%	43%	4%
Navigational and construction dredge area adjacent to extended quay (Zone 2)	53%	21%	26%

Water Quality

12.5.29 The area of the Proposed Development is within the Scotland river basin district and overlaps the Fair Isle coastal water body (ID: 200245). The Fair Isle coastal water body is currently (2020) at 'good' overall status with water quality assessed as 'good' (SEPA, 2023a).

12.5.30 Dredged material will most likely be disposed at the closest licensed disposal site, Scalloway (FI095), which is situated approximately 65 km to the northeast. Scalloway disposal site is within the Scotland river basin district and overlaps the Sumburgh Head to Kettla Ness coastal water body (ID: 200508). The Sumburgh Head to Kettla Ness coastal water body is currently (2020) at 'good' overall status with water quality assessed as 'good' (SEPA, 2023b).

12.5.31 There are no designated bathing waters in the vicinity of the Proposed Development or Scalloway disposal site, the closest being Dunnet bathing water located more than 140 km to the southwest.

12.5.32 The closest classified shellfish harvesting area to the Proposed Development is Clift Sound Houss situated approximately 58 km northeast, on the west coast of Shetland. There are a number of classified shellfish harvesting areas within 3 km of the Scalloway disposal site, including West of Langa, Stream Sound: Ux Ness and others, though all are separated from the disposal site by land.

12.5.33 No historic baseline water quality data exists for the area of the Proposed Development; however, it is expected that SSC are low due to the coarse nature of the seabed. The SEPA water classification data (2020) indicate physicochemical, dissolved inorganic nitrogen and water quality status for the Isle of Noss to Sumburgh Head coastal water body are assessed as 'good'.

Baseline Evolution

12.5.34 With or without the proposed upgrade works, the hydrodynamic and sedimentary processes across the study area will continue to be influenced by natural and human-induced variability, ongoing cyclic patterns and trends.

12.5.35 The future baseline will also be influenced by climate change and, in particular, increased rates of mean sea level rise. Projections of change for Fair Isle up to the year 2100 are of sea level increase (from 2023 levels) by 0.96 m (based on UKCP18 RCP 8.5 95%ile climate change scenario, (Met Office, 2018)). Water levels in the future, as now, will also be affected by unpredictable meteorological surge and weather-related events.

12.5.36 Similarly, water and sediment quality will continue to be influenced by the same natural and human-induced variability, ongoing cyclic patterns and trends (e.g., ongoing vessel movements within the Site). The future baseline will also be influenced by climate change, such as changes in sea pH and temperature, which in turn can have an impact on water quality (e.g., dissolved oxygen concentrations).

12.6 Embedded Mitigation

12.6.1 The following embedded mitigation is relevant to the Marine Geomorphology topic chapter, as well as the Marine Water and Sediment Quality included in this chapter:

- Provision of an fiEMP that sets out the principles, controls and management measures which would be implemented during construction to manage and reduce potential significant impacts (**Appendix A.4**);

- The design minimises the volume of sediment to be dredged and potential changes to hydrodynamics, only dredging the necessary volume to prepare the seabed for construction and to accommodate the proposed vessel draft.

12.7 Assessment of Likely Effects

Coastal Processes and Geomorphology

12.7.1 The following impact pathways have been considered with respect to coastal processes and geomorphology as a result of the construction and subsequent operation of the Proposed Development:

Construction

- Changes to the suspended sediment concentrations (SSC) and sediment deposition as a result of dredging activity and associated dredge disposal; and
- Changes to local hydrodynamics at the disposal site as a result of changes to local water depth.

Operation

- Changes to hydrodynamics (flow speeds and wave conditions) and associated sediment transport pathways as a result of the upgraded breakwater, extended quay and newly dredged berth pocket;
- Changes to the suspended sediment concentrations (SSC) and sediment deposition as a result of maintenance dredging activity and associated dredge disposal.

12.7.2 Assessment of the potential effects has been informed by bespoke numerical hydrodynamic, wave and sediment transport modelling studies (Mott Macdonald, 2023a, Appendix A.12 and Mott Macdonald, 2023b, Appendix A.13), the baseline characterisation and desk-based calculation methods.

Construction

Changes to the suspended sediment concentrations (SSC) and sediment deposition as a result of dredging activity and associated dredge disposal

12.7.3 The construction phase elements considered include the proposed on-site dredging activity and the resultant disposal of any dredged material at the nearest licensed disposal site (assumed to be Scalloway (FI095)).

12.7.4 The proposed dredging activity alongside the proposed upgraded breakwater has the potential to result in the development and dispersion of a dredge plume, as the bed material is disturbed. The characteristics of this dredge plume will be determined by the particle size distribution of the bed material, the local flow conditions and the dredging methodology.

12.7.5 Regional flow conditions and local seabed sediment cover are described above in the baseline section. The assessment of dredging activity assumes a backhoe dredger is used, with disturbed bed material being input throughout the water column, related to:

- Impact of the bucket on the bed;
- Disturbance of the bed during initial removal of the bucket;
- The material spilt from the bucket;
- The material washed from the outer surface of the bucket;
- Leakage and dripping during slewing; and

- Washing of residual adhering material during lowering.

12.7.6 Consequently, any subsequent calculation of potential plume dispersion considers a realistic possible water depth over which disturbed sediment can settle (related to the source location). As a result of the activity, the bed disturbance (and input of material into the sediment plume) is likely to be mostly constrained to within around 2 m of the bed, meaning the material will tend to settle out of suspension relatively quickly.

12.7.7 Local flow conditions across the embayment are described in the baseline section. The relatively sheltered nature of the site suggests local flows will be relatively low, with limited potential to move suspended material over any significant distance. Mean grain diameter information from the local grab sampling (as described in the baseline section) has also been used in the assessment.

12.7.8 Within the numerical modelling assessment, the approximate dredged volume required for the proposed development is around 1,163 m^3. To be conservative, an increase of 10% of the overall sediment volume has been applied in the model (total of 1,279 m^3). Furthermore, the following assumptions have been made within the model:

- From the total volume to be dredged (1,279 m^3), only the fine fractions are included in the model, corresponding to 11% of the total volume;
- The backhoe dredging (BHD) operation will start at the west of the dredge area and will move to the east towards the area next to the existing breakwater;
- The BHD will use a 2.5 m^3 bucket;
- The BHD will dredge continuously, with no downtime (worst case);
- Each bucket load will dredge 1.75 m^3 of sediment (*in situ* volume), assuming an average bucket efficiency of 70%, and the BHD works at a rate of 25 bucket loads per hour. The BHD will therefore have a production rate of approximately 43.75 m^3 (*in situ* volume) per hour;
- The modelled dredging starts on a spring tide when tidal range and current speeds are at their highest; and
- Dredging will start at high water.

12.7.9 Based on the above assumptions, dredging would be completed in 29.2 hours. In reality, downtime resulting from weather, vessel movements and/or plant maintenance will result in a longer dredge period. The above assumptions provide a worst-case assessment in relation to changes in SSC and sediment deposition, yielding a high release intensity and the greatest potential for higher plume concentrations.

12.7.10 Results of the modelling assessment for dredge plume dispersion are provided in Figure 12-7, for suspended sediment concentrations (SSC) (top) and associated sedimentation (bottom). The results indicate that, for the full dredge volume, peak excess SSC values are typically between 200 and 300 mg/l across much of the dredge area. Peak values of up to 1,000 mg/l are limited to the extreme eastern end of the dredge. Associated sedimentation after the completion of dredging is typically less than 0.04 m (4 cm) and is predicted only to occur close to the dredge footprint. Any material that settles within the dredge footprint is considered likely to be re-dredged as part of the construction dredging campaign (noting this is assumed also true for any subsequent operational maintenance dredging that may be required). Overall, excess sedimentation of up to 1 mm only extends approximately 50 m from the dredge pocket.

12.7.11 Any potential effects arising from the construction of the pier and the dredging of the berth pocket are expected to be highly temporary in nature and highly localised in extent, only extending up to around 50 m from the berth pocket. Once the dredging is completed, local

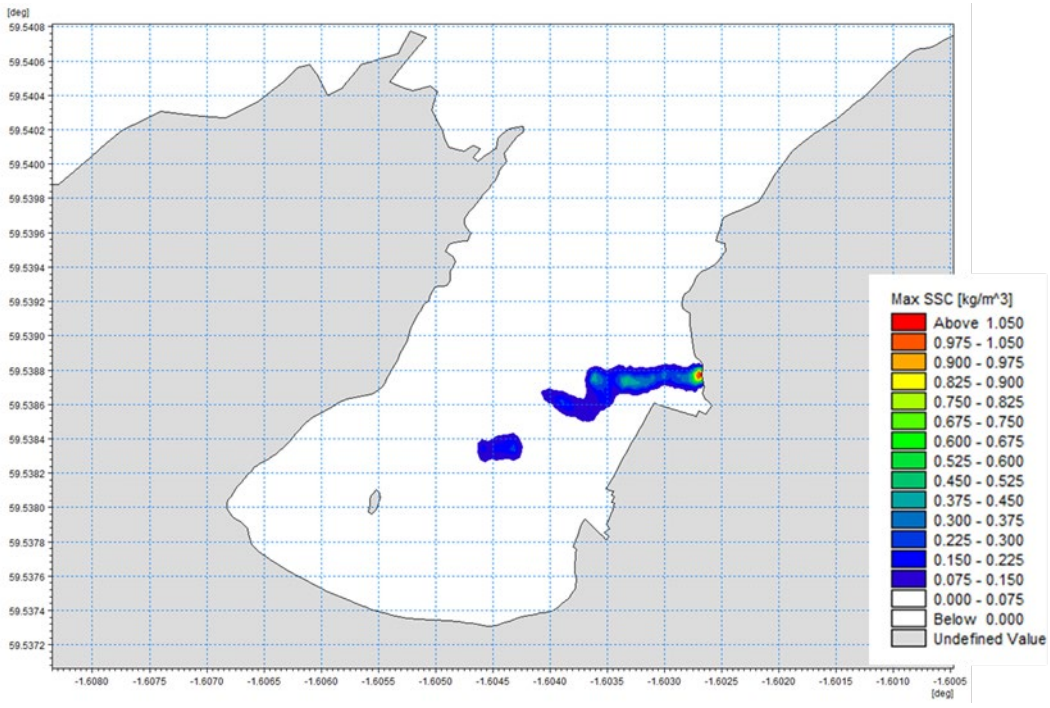
SSC conditions will revert quickly to their existing (baseline) values. Figure 12-8 shows the modelled timeseries of excess SSC, which shows peak values within the dredge pocket as the activity is underway, rapidly reducing (within a matter of a few hours) once the activity ceases.

12.7.12 Overall, the impacts associated with the dredging activity are considered to be limited in extent to the berth pocket itself and short-term in nature (continuing for only as long as the dredging activity is underway). Consequently, across the wider Fair Isle embayment, including offshore areas, the western coastline, within and around the sea cave features and across the sand beach to the south, any changes to SSC and sediment deposition as a result of the proposed dredging activities are considered likely to be **negligible** and not significant.

12.7.13 Following on from the proposed dredge activity, it is likely that dredged material will be disposed of at sea at a licensed disposal site (assumed to be Scalloway). Similar to the dredge itself, this activity also has the potential to result in a sediment plume and material settling through the water column at the disposal site Appendix A18 provides the Best Practicable Environmental Option for disposal.

12.7.14 The local character of any disposal site (water depth, flow conditions etc.), will ultimately influence any plume characteristics. However, given the sandy nature of the seabed sediment at the proposed dredge site, any disposal of material will be dominated by particles, with a (relatively) high settling velocity. Consequently, any soft sediment material deposited at sea would be expected to settle to the bed within a matter of minutes to a few hours, with the spatial extent of any plume likely to be constrained to within a few hundred metres of the disposal site.

12.7.15 Overall, the impacts associated with the dredge disposal activity are considered to be limited in extent to the region around the disposal site itself and short-term in nature (continuing for only as long as the disposal activity is underway. Taking account of the scale of the disposal volume, the nature of the dredge material and the local conditions at the Scalloway disposal site, the spatial and temporal magnitude of change in SSC is considered **negligible** and not significant.



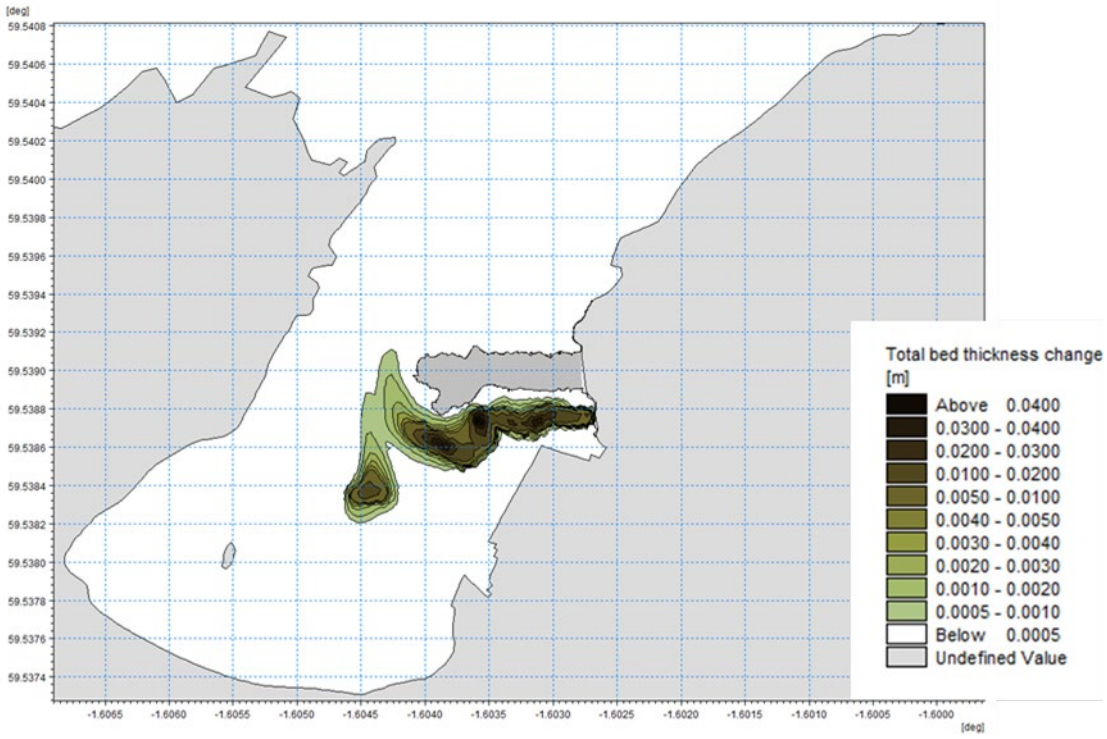


Figure 12-7: Maximum modelled SSC over a spring-neap cycle (top) and excess deposition 6 hours after the end of the dredging operation (bottom)

Source: Mott Macdonald, 2023b

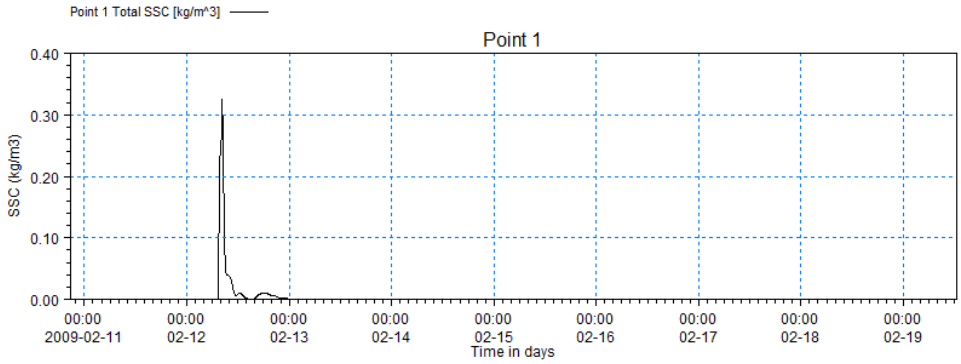


Figure 12-8: Timeseries of excess SSC within the dredge pocket as a result of the BHD activities

Source: Mott Macdonald, 2023b

Changes to local hydrodynamics at the disposal site as a result of changes to local water depth

12.7.16 Should there be any rock material required for disposal offshore (Scalloway) site, this is likely to remain *in situ* and could potentially result in a change to the local hydrodynamics as a result of changes to local water depth. However, given the volume of the dredge material (1,270 m^3), a worst case (conservative) assumption that all the material is rock, would only shallow the bed across the disposal site by an average of less than 0.05 m. In a water depth of 62 m, that would equate to a change in depth of <1%. This relative change in depth would remain the same (<1%) even when considering disposal of rock from both Fair Isle and Grutness, as a result of the combined volumes.

12.7.17 Overall, predicted changes to local hydrodynamics at the disposal site are expected to be very small in magnitude and highly localised in extent. Consequently, any changes in hydrodynamics at the disposal site as a result of changes to local water depth are considered to be **negligible** and not significant.

Operation

Changes to hydrodynamics (flow speeds and wave conditions) and associated sediment transport pathways as a result of the upgraded breakwater, extended quay and newly dredged berth pocket

12.7.18 The operational phase elements appraised include the upgraded breakwater, the extended quay and the potential deepening of bed levels following the dredging of the berth pocket.

12.7.19 The upgrade of the existing breakwater has limited potential to result in local changes to hydrodynamics (flow speeds and wave conditions) and associated sediment transport pathways, since the overall size and make-up remains relatively unchanged. The numerical modelling assessment has considered the scheme, with regards to potential changes to hydrodynamics and sediment transport.

12.7.20 The results of the local hydrodynamic model, for both the baseline and the proposed layout, in terms of current speeds, are shown (together, for comparison) in Figure 12-9 and Figure 12-10, for peak flood and ebb spring tidal conditions, respectively. These figures provide a direct comparison of the results and identify the potential impacts of the new layout on the local hydrodynamic regime.

12.7.21 Figure 12-9 shows the peak spring tide flood current speed and direction for the baseline and the layout simulations. The figure shows that it is difficult to distinguish any differences in the peak flood current speed and direction between the baseline and the scheme. Small differences that can be seen show:

- A small change in flow velocity at the western end of the breakwater, where the flood flows tend to create a circulation;
- A small change in the current speed in front of the new quay attributable to the new dredged pocket; and
- No changes in peak current speeds in the inner bay and close to the shore and no increase in peak flood current speeds.

12.7.22 The impact of the Proposed Development on the local hydrodynamic regime is therefore predicted to be insignificant.

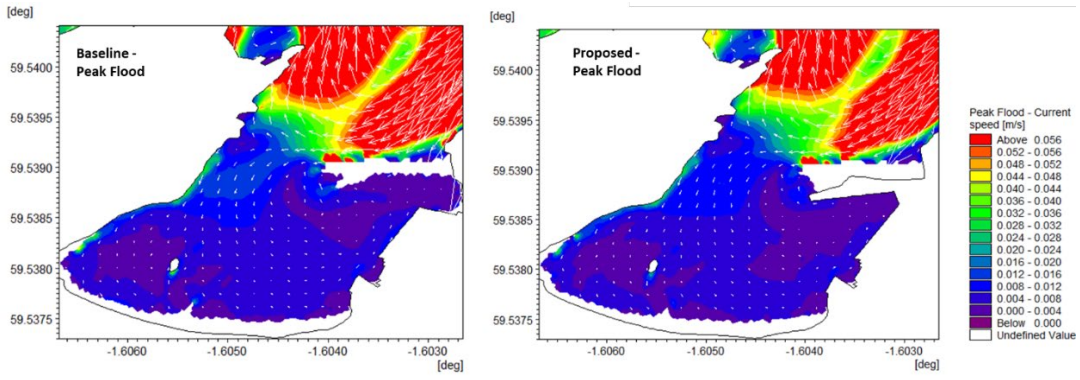


Figure 12-9: Comparison of spring tide peak flood current speed for baseline (left) and proposed layout (right)

Source: Mott MacDonald, 2023b

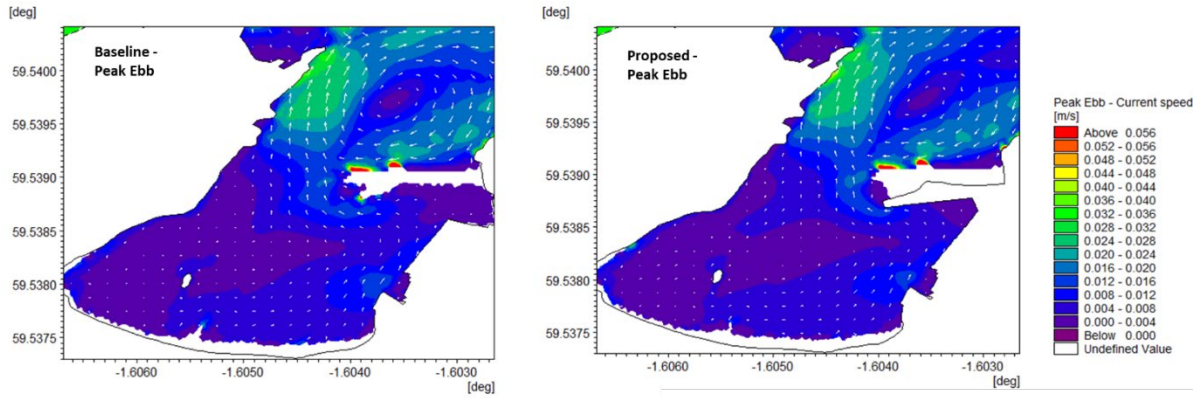


Figure 12-10: Comparison of spring tide peak ebb current speed for baseline (left) and proposed layout (right)

Source: Mott MacDonald, 2023b

12.7.23 Figure 12-10 shows the spring tide peak ebb flows for the baseline and the layout simulations. As with the flood tide, the figure shows only a small change in the current distributions in the inner bay, potentially due to the new dredged pocket and the new quay. There is no detected increase in peak ebb current speeds. These results add further evidence to show that the impact of the Proposed Development on local hydrodynamics is negligible and not significant.

12.7.24 Overall, with regards to the local hydrodynamics, the results of the modelling shown in Figure 12-9 and Figure 12-10 predict that the new layout has **negligible** effects on the hydrodynamic regime in North Haven. This result is unsurprising since the scheme only involves raising the breakwater's elevation and adding a new quay to an area that is already extremely sheltered.

12.7.25 The upgraded breakwater and dredge berth has also been the subject of a local wave modelling study (Mott Macdonald, 2023a). This study applied a range of extreme and typical annual wave conditions, modelled both the existing (baseline) scenario and the proposed new pier extension and dredge. Analysis of wave conditions at a range of locations behind and off the end of the pier extension was then conducted. The results of the study indicated that:

- Significant wave height (Hs) values decreased slightly at locations behind the upgraded breakwater as a result of the increased sheltering offered by the structure to waves approaching the embayment from the dominant north-easterly direction.
- Closest to the shore, in areas already sheltered by the existing breakwater, changes to Hs as a result of the new structure are minimal (baseline Hs values for the range of wave events range from 0.3 to 0.5 m and reduce by up to 0.1 to 0.2 m as a result of the proposed scheme).
- In offshore areas, off the end of the upgraded breakwater, baseline wave heights are only slightly reduced, by up to 0.1 m from a baseline Hs ranging from 1.0 to 2.1 m. To the north of the existing breakwater, similar levels of change are predicted, with Hs reductions by up to 0.1 m on baseline wave heights of between 1.3 and 2.7 m.
- Further offshore (within the approaches to the embayment) and further inshore (towards the southern beach), including at the locations of the local sea caves, no changes to the baseline wave climate are predicted.

12.7.26 The proposed scheme has also been subject to sediment transport modelling, in order to consider the potential impact of the works on the local regional sediment pathways. Given the very low tidal current speeds across the embayment, it is understood that waves contribute to any potential sediment transport processes. Accordingly, the sediment transport

modelling has included both waves and currents. Given the negligible changes predicted to hydrodynamics and wave conditions, as a result of the scheme, it is not surprising that the numerical modelling assessment has concluded that changes to the wave-current driven sand transport in North Haven are small. Furthermore, the assessment considers that any changes arising as a result of the scheme will have a virtually undetectable impact on the baseline conditions and coastal morphology, including the sedimentary composition of the beach.

12.7.27 Overall, any changes to hydrodynamics, wave and associated combined sediment transport arising from the upgraded breakwater and the newly dredged berth pocket are expected to be small in magnitude and highly localised in extent, only covering the area around the breakwater and berth pocket themselves. Consequently, across the wider Fair Isle embayment, including offshore areas, the eastern and western coastlines and the sand beach to the south, changes to hydrodynamics and associated sediment transport as a result of the proposed works is considered to be **negligible** and not significant.

Changes to the suspended sediment concentrations (SSC) and sediment deposition as a result of maintenance dredging activity and associated dredge disposal

12.7.28 There are no historic records of any dredging activities in the bay; Marine Scotland has confirmed that no dredging has taken place within the harbour for many years (if ever) (Marine Scotland Licensing Operations Team, *pers comm*. 07/02/2023). Considering there has been no requirement for capital or maintenance dredging at Fair Isle in the past, it is anticipated that minimal maintenance dredging will be required during the operational phase, if any. Therefore, any effects arising as a result of potential maintenance dredging would be smaller in magnitude compared to those of the construction phase and, as such, are considered **negligible** and not significant. As a result, any effects relating to potential maintenance dredging will not be considered further for other receptors.

Marine Water and Sediment Quality

12.7.29 This section identifies the potential likely effects on water and sediment quality receptors as a result of the construction and subsequent operation of the Proposed Development. The following impact pathways have been assessed.

Construction phase

- Potential changes to dissolved oxygen (DO) as a result of increased SSC during construction activities;
- Potential changes to levels of chemical contaminants (including accidental spillages) in water; and
- Potential effects from redistribution of sediment-bound chemical contaminants.

Operation phase

12.7.30 There are no potential effects anticipated on water and sediment quality during the operational phase.

12.7.31 As a worst-case scenario, when considering effects on water and sediment quality, it has been assumed that all dredged material will be comprised of soft sediment and will be disposed of at the Scalloway licenced disposal site.

Construction

Potential changes to dissolved oxygen (DO) as a result of increased SSC during construction activities

12.7.32 The increase in chemical and biological oxygen demand associated with elevated SSCs in the water column during dredging may have the potential to reduce dissolved oxygen (DO) concentrations. This is most relevant when organic rich material is present in the sediment to be dredged. The material within the proposed dredge areas (including side slopes) comprise sands and cobbles and it is anticipated that rock is underlying this superficial layer of coarse sediment (to be confirmed by the geotechnical investigations). Therefore, it is anticipated that there is no to very little organic rich surface layer present within the dredge area that could contribute to oxygen depletion.

12.7.33 Sediment within the navigational dredge area (sample BH101) at the end of the pier comprises predominantly sand. Sediments within the navigational and construction dredge pockets (sample BH102 and samples BH104, BH105 and BH108, respectively) comprise roughly equal parts sand and silt. Geotechnical investigations showed that sediment was no more than 1 m in thickness across the dredge footprint of the proposed dredge areas, with an average of 0.5 m thickness across both dredge areas. As such it is anticipated that the total volume of the dredged material will comprise 47% sediment and 53% rock. It is anticipated that either a backhoe or cutter suction dredger will be used to dredge soft sediment. The use of a backhoe reduces the surface area of material exposed to the water column and transfers the material quickly and directly to a barge with little time in the water column, minimising the potential resuspension and deposition of sediment. Furthermore, most of the sediment disturbance from the cutter suction will be from near the bed and most of the disturbed material will re-deposit local to the dredge (see Figure 12-7).

12.7.34 Considering the coarse nature of the sediment (see Table 12-9), the small dredge volume and the dredging methodology, it is anticipated that any change to DO will be minimal, localised and highly temporary. It is anticipated that any reduction in DO concentration will be short-lived and replenished over the subsequent tidal cycle. The probability of a localised reduction in DO concentrations in the water column is, therefore, medium to high, but the magnitude of change is considered to be small, leading to a low exposure to change. Therefore, while the sensitivity is moderate, based on the direct influence of dredging on water quality, and importance is high, given that changes in water quality is an impact pathway for other receptors as well as in its own right, the impact significance is assessed as **minor adverse** and not significant.

12.7.35 During the placement of dredged material at Scalloway disposal site, the potential for reduction in DO concentrations in the water column is low given the anticipated negligible proportion of organic material present in the dredge arisings (see paragraph 12.7.32). Due to its coarse nature the dredged material is predicted to settle quickly and within a short distance (see Figure 12-7). Any changes in DO would be localised and very short-lived given the dynamic nature of the site and the water depth, which would rapidly be re-oxygenated. The probability of a localised reduction in DO concentrations in the water column is likely to be low and the magnitude of change is likely to be negligible, leading to a negligible exposure to change. Therefore, while the sensitivity is moderate based on the direct influence of disposal activities on water quality and importance is high, the impact significance is assessed as **negligible** and not significant.

Potential changes to levels of chemical contaminants (including accidental spillages) in water

12.7.36 As sediment is disturbed and re-distributed into the water column, any sediment-bound contaminants may be partitioned from the solid phase (i.e. bound to sediments or suspended matter), to the dissolved or aqueous phase (i.e. dissolved in pore water or overlying water) (Luoma, 1983).

12.7.37 The main source of sediment disturbance during construction will be capital dredging. The material within the proposed dredge areas (including side slopes) comprises sands and cobbles and it is anticipated that rock is underlying this superficial layer of coarse sediment. Coarse sediments are generally associated with low levels of sediment-bound contaminants and therefore concentrations of such contaminants are anticipated to be low in the area of the proposed works. Consequently, any changes in water contaminant concentrations as a result of sediment disturbance during dredging are expected to be small.

12.7.38 The disturbance of sediments during dredging and disposal can remobilise contaminants, which are absorbed to the finer sediment particles and create oxygen depleting substances. However, the overall low level of contamination, low organic content and the localised nature of the redeposition or disposal are considered to have an insignificant impact on water quality which will be of a temporary nature during the period of the dredge and disposal. Sediment contamination sampling showed a single sample containing concentrations of mercury above Action Level 2 (only within the depth integrated sample, no contamination was detected at the surface sample); this is considered to be a very localised hot spot of contamination as mercury concentrations are well below Action Level 1 in all other samples. The very localised sediment containing high concentration of mercury which is present within the construction dredging area (see sampling results) will mostly be transferred onto the dredger and mixed with the remaining sediments containing no contaminants, resulting in overall low contamination sediments which will be suitable for disposal. Any contaminants that get released into the water column during dredging will quickly be diluted due to the fairly energetic nature of the site as a result of prominent wave action. Any sediment that gets redistributed across the dredge area (modelling showed excess sedimentation of up to 1 mm to only extend approximately 50 m from the dredge pocket) will have lower contamination levels as they will be spread over a larger surface area. Reduced water quality from accidental spills during the dredging operations or from the dredger in transit is also unlikely to insignificant with normal good practice employed for the dredging operations.

12.7.39 Standard good practice measures, such as the updated and relevant Guidance for Pollution Prevention (GPPs) including GPP 5 (Works and maintenance in or near water), will be used to prevent/reduce the potential for accidental spillages throughout construction and therefore, the proposed works will not directly introduce contaminants to the marine environment. Additionally, the rock used for the rock armour (as well as the pre-cast concrete units which will form the new quay wall) will be free of contaminants and consist of a suitably inert material.

12.7.40 The probability of a localised change to levels of chemical contaminants in the water during construction is low and the magnitude of change is considered to be small, leading to a negligible exposure to change. Therefore, while the sensitivity is moderate and importance is high, any impact is considered to be **negligible** and not significant.

12.7.41 The levels of contaminants present in the dredge deposits are likely to be low (see paragraph 12.5.27). It is assumed that sediment contamination sampling and analysis (as carried out through the geotechnical investigations) will confirm the low levels of contaminants, with the material thus being suitable for disposal at sea. Furthermore, the total volume of the dredge is small. Due to the highly dispersive nature of the likely disposal site (Scalloway), and water depth at this location, the deposits are unlikely to cause a measurable change in the levels of chemical contamination in the water at or around the disposal site. Furthermore, the disposal of the dredge material will be subject to a Marine Licence which would only be granted if the dredge material meets the criteria for acceptable sea disposal.

12.7.42 Overall, the probability of a localised change to levels of chemical contaminants in the water during disposal of dredge deposits is considered to be low and the magnitude of change is considered to be small, leading to a negligible exposure to change. Therefore, while the sensitivity is moderate and importance is high, any impact is likely to be **negligible** and not significant.

Potential effects from redistribution of sediment-bound chemical contaminants

12.7.43 The potential to impact the marine environment as a result of any sediment-bound contaminants arises primarily when the sediment that is released into the water column disperses and deposits elsewhere.

12.7.44 The material within the proposed dredge areas (including side slopes) comprises sands and cobbles and it is anticipated that rock is underlying this superficial layer of coarse sediment. It is anticipated that concentrations of sediment-bound contaminants will be low due to the coarse nature of the sediments. This has been confirmed by the sediment contamination sampling and analysis which was undertaken as part of the geotechnical investigations. It is, therefore, unlikely that redistribution and deposition of dredged material will result in exceedance of sediment quality criteria elsewhere. Additionally, sediment dispersion and deposition is anticipated to be highly localised to the dredge site.

12.7.45 Overall, the probability of a localised effect from the redistribution of sediment-bound chemical contaminants at the dredge site is considered to be low and the magnitude of change is likely to be small, leading to a negligible exposure to change. Therefore, while the sensitivity is moderate and importance is high, any impact is likely to be **negligible** and not significant.

12.7.46 It is estimated that approximately 2,730 m of capital dredge material will need to be disposed at the Scalloway disposal site, as a worst-case scenario. During disposal, any sediment-bound contaminants will initially concentrate over the deposit ground and then in reduced concentrations over the areas where material finally settles following redistribution by currents and waves, which will potentially be over a wide area.

12.7.47 Contaminated material is generally associated with the finest sediments, which will have the most widespread dispersal and the greatest dilution. Due to the coarse nature of the sediments present in the dredge area and anticipated low levels of contaminants, the deposits are unlikely to cause a measurable change to the chemical quality of sediments at and around the disposal site. Furthermore, the disposal of this material will be subject to a Marine Licence which would only be granted if the dredge material meets the criteria for acceptable sea disposal.

12.7.48 Overall, the probability of a localised effect from the redistribution of sediment-bound chemical contaminants at the disposal site is considered to be small and the magnitude of change is likely to be negligible, leading to a negligible exposure to change. Therefore, while the sensitivity is moderate and importance is high, any impact is likely to be **negligible** and not significant.

Operation

12.7.49 There are no potential effects anticipated on water and sediment quality during the operational phase. Ferry operations are anticipated to remain largely the same as pre-construction, with perhaps a small increase in crossings as a result of the larger new vessel being able to sail in conditions considered too adverse for the existing vessel.

12.8 Further Mitigation and Enhancement

12.8.1 Further mitigation measures are proposals to address adverse effects which remain after embedded measures and standard construction practices have been incorporated into the Proposed Development.

12.8.2 No further mitigation or enhancement measures are identified because achievable mitigation within the Site extents has already been included in the embedded mitigation measures and it is reasonably assumed that standard construction practices would apply.

12.9 Residual Effects

12.9.1 Residual effects are those that are predicted to remain following implementation of the further mitigation and enhancement measures described above. As no further mitigation measures are proposed, the assessment of likely effects presented above in Section 12.7 identifies the residual effects of the Proposed Development.

12.10 Monitoring

12.10.1 There will be no requirement for monitoring of the Scheme following completion.

12.11 Cumulative Effects

12.11.1 As set out in Section 5.11 a review of 'committed developments' was undertaken to identify major developments within 2.5 km of the edge of the planning application boundary of the Site that may lead to likely significant cumulative effects with the Proposed Development. There are no planned cumulative developments that are expected to happen on Fair Isle during construction, and no mechanism for cumulative effects has been identified

12.11.2 The only project/plan in the area is the proposal to rebuild the bird observatory which is planned to take place during summer and autumn 2023. It would, therefore, not overlap with the proposal construction activities for the ferry replacement and upgrade which would not begin until end of Spring 2024. Furthermore, operation of the observatory and ferry upgrade would not vary significantly from baseline operations.

12.12 Summary

12.12.1 The assessment of potential scheme impacts on coastal processes and marine geomorphology has been undertaken, providing a description of the existing (baseline) situation and applying a suite of numerical modelling tools to inform the assessment.

12.12.2 The embayment at Fair Isle is orientated with its' mouth at an alignment of approximately north-northeast, with a width of around 130 m. Along the eastern side of the bay, the existing breakwater is located, along with Fair Isle Pier, slipway and quay wall. Along the southern edge of the embayment is a sandy beach, which is effectively divided in to two by a concrete slipway. The beach to the east of this structure is generally wider than the beach to the west. Just offshore of the western beach is a small rocky outcrop. Away from the beach and the existing infrastructure, the east and west coastlines are characterised by rocky hinterland with a general lack of intertidal foreshore.

12.12.3 The embayment at Fair Isle is macro tidal with a mean spring tidal range of 1.6 m and a mean neap tidal range of 0.7 m. Tidal water levels are influenced by meteorological surge and storm conditions. Current speeds inside the bay are generally very low, with velocities typically 0.01 m/s. The flood and ebb spring tide vectors reveal that the bay tends to have a flow circulation, which is attributed to the existing breakwater obstructing tidal flows entering and leaving the embayment. The Fair Isle embayment is exposed to waves approaching from a range of directions across the northern North Sea. The mouth of the embayment is oriented such that long fetch lengths exist from north-north-easterly through to north-easterly directions.

12.12.4 Local seabed and foreshore sediment cover across the Fair Isle embayment is dominated by rock armour protection (of the existing breakwater), rocky outcrops and sandy sediment. Along the southern end of the bay, the nearby beach is formed of fine, clean sand, broken up by the existing concrete slipway extending form the centre of the beach. To the western extent of the beach, boulders and rock within the lower shore are present. Along the east and west sides of the bay, the hinterland is dominated by rocky cliffs, with sea caves identified to the north of the existing breakwater and on the southwest edge of the inner bay.

12.12.5 The range of activities associated with Proposed Development have been assessed, to consider the potential impact on a range of pathways. Potential increased SSC and sedimentations from the capital (and any subsequent maintenance) dredging is considered to be small in extent and limited in duration to the period of time the activity is occurring. Consequently, the assessment considers the impacts from dredging (and disposal) to be negligible.

12.12.6 Potential impacts on the local hydrodynamic and wave regimes within the embayment, as a result of the scheme, are shown to be very small (in both absolute and relative terms) and limited in extent to the area of the upgraded breakwater and dredged berth pocket. Consequently, the impacts of the new layout are considered to have negligible effects on the hydrodynamic and wave regime in North Haven. This result is unsurprising since the scheme only involves raising the breakwater's elevation and adding a new quay and berth pocket to an area that is already extremely sheltered.

12.12.7 Potential impacts throughout construction and operation are assessed as small in magnitude and limited in extent. Associated potential changes to local and regional sediment transport pathways are also assessed as negligible. Consequently, there are not anticipated to be any significant impacts on the North Haven embayment or the wider area with respect to local hydrodynamic, wave regimes, and sediment transport, including the beach to the south and the sea caves to the northeast and southwest.

12.12.8 Changes to marine water and sediment quality including dissolved oxygen, chemical contaminants and redistribution of sediment-bound chemical contaminants as a result of construction and operation of the scheme are also assessed to be not significant.

12.13 References

ABPmer, (2023). Fair Isle Ferry Upgrade. Benthic Survey Report, ABPmer Report No. R.4064. ABPmer for Stantec, February 2023.

Environment Agency, (2018). Coastal flood boundary conditions for the UK: update 2018. Technical summary report. SC060064/TR6.

Luoma, S. N., (1983). Bioavailability of trace metals to aquatic organisms—a review. Science of the Total Environment, 28, 1-22.

Marine Scotland, (2017). Pre-disposal Sampling Guidance. Version 2 – November 2017.

Met Office, (2018). UK Climate Projections 2018, available from https://ukclimateprojections-ui.metoffice.gov.uk/ui/home. Accessed: January 2023.

Mott Macdonald, (2023a). Fair Isle wave modelling. January 2023.

Mott Macdonald, (2023b). Fair Isle OBC Refinement: Hydrodynamic and sediment transport modelling. March 2023.

NTSLF, (2023). National Tide and Sea Level Facility, available from https://ntslf.org/. Accessed January 2023.

SEPA (2023a). Water classification data for Fair Isle coastal water body (ID: 200245). Available at: Water Classification Hub (sepa.org.uk) [Accessed May 2023].

SEPA (2023b). Water classification data for Sumburgh Head to Kettla Ness coastal water body (ID: 200508). Available at: Water Classification Hub (sepa.org.uk) [Accessed May 2023].

Stantec, (2022). Fair Isle Harbour Improvement Works. Environmental Impact Assessment Scoping Report.

UKHO, (2022). UK Hydrographic Office Tide Tables 2022.

13 Marine Ecology

13.1 Introduction

13.1.1 This chapter presents the findings of the assessment of the construction and operation of the Fair Isle Harbour Improvement Works (hereafter referred to as the Proposed Development) on marine ecology. This chapter outlines legislative and policy framework and guidance, describes the assessment methodology, study area and baseline conditions. An overview of potential impacts is provided, along with any mitigation measures, likely residual effects, monitoring and a summary of the main issues and steps taken to avoid them.

13.1.2 The Proposed Development is located within the area encompassed by the planning application boundary, hereafter referred to as 'the Site'.

13.1.3 This assessment has been carried out by ABPmer. In accordance with Regulation 18(5) of the Town and Country Planning (Environmental Impact Assessment) Regulations 2017, as amended, a statement outlining the relevant expertise and qualifications of competent experts appointed to prepare this ES is provided in **Appendix A.3**.

13.1.4 This assessment has drawn information from the Marine Geomorphology chapter (Chapter 12), which also includes a brief assessment of marine water and sediment quality (the latter was not scoped into the EIA as a standalone topic). The marine ecology assessment is also supported by the following reports and studies:

- Benthic Survey report (ABPmer 2023a, Appendix A.14);
- Underwater Noise report (ABPmer 2023b, Appendix A.15); and
- Airborne Noise modelling study (Appendix A.16).

13.2 Policy Context, Legislation, Guidance and Standards

13.2.1 This assessment has been undertaken considering current legislation, together with national, regional and local plans and policies. A list is provided below and further detail regarding policy can be found in the Chapter 6 – Planning and Policy Context.

Legislation

- The Marine (Scotland) Act 2010;
- The Marine Licensing (Pre-application Consultation) (Scotland) Regulations 2013;
- Water Environment (Shellfish Waters Protected Area Designation) (Scotland) Order (2013);
- Water Environment and Water Services (Scotland) Act 2003' (WEWS Act);
- The Conservation (Natural Habitats, &c) Regulations 1994;
- Wildlife and Countryside Act 1981;
- Nature Conservation (Scotland) Act 2004 (as amended), and
- Wildlife and Natural Environment (Scotland) Act 2011.

Planning Policy

- UK Marine Policy Statement;
- UK Marine Strategy;
- Scotland's National Marine Plan (2015);

- Shetland Islands' Marine Spatial Plan (2015); and
- Shetland Islands Regional Marine Plan (SIRMP) (Amended Draft, 2021).

13.3 Consultation

13.3.1 Consultation was carried out with NatureScot (NS) on 09 April 2021, in relation to preliminary investigative works (Geotechnical Investigations) to inform the ferry replacement proposal, specifically a Report to Inform Appropriate Assessment.

13.3.2 Consultation with regard to the outcomes of the formal scoping process and whether there are any likely significant effects of the Proposed Development was carried out with Marine Science Scotland (MSS) and NS. A Scoping Report was submitted to MSS and NS for review in June 2022. In response to this scoping report, a Scoping Opinion was received from NS on 11 July 2022 and from Marine Scotland Science on 22 July 2022.

13.3.3 Additionally, further consultation was carried out with NS on 30 November 2022 to present information on the steps taken to minimize potential impacts on sensitive bird features, including embedded mitigation to minimize habitat loss, and to discuss NS's preferred approach to the timing of construction elements which could potentially disturb birds in the vicinity of the proposed works. Specific advice was sought in relation to NS's position on the use of deterrent devices to prevent fulmars from nesting on the stack, and in relation to the possibility that fulmars may be unintentionally disturbed by construction activity.

13.3.4 Table 13-1 summarises the scoping opinion responses relevant to the marine ecology topic received from MSS and NS, as well as the feedback received at the other consultation meetings with NS, and the action taken to address each comment.

Table 13-1 : Summary of consultation to date

Consultee	Reference, Date	Summary of comment	How Comments have Been Addressed in this Chapter
Benthic habitats and species			
MSS	Scoping Opinion, 22 July 2022	Include sea caves, if possible, with reference to the results of the recent surveys of the sea caves on Fair Isle by Heriot-Watt university.	Results of this study are not yet published but information acquired from the authors (Daniel Harries, *pers. comm*.) has been discussed in the baseline section (paragraphs 13.5.16 - 13.5.18) and assessment section (paragraphs 13.7.61 to 13.7.70).
MSS	Scoping Opinion, 22 July 2022	In agreement with benthic species and habitat records in the area and potential significant effects identified in the Scoping Report.	Noted, in agreement.
Fish and shellfish			
MSS	Scoping Opinion, 22 July 2022	MSS advise that robust information on the presence of diadromous fish in the waters around Fair Isle is lacking, but there is no evidence that diadromous fish including salmon are present in any significant numbers. MSS therefore advise that specific consideration of diadromous fish can be scoped out.	Diadromous fish have been scoped out and no further detailed assessment has been included in this EIAR with respect to this receptor.
MSS	Scoping Opinion, 22 July 2022	Include information on any fish spawning or nursery areas within the vicinity of the proposed development area.	This information has been incorporated in the baseline for fish and shellfish, paragraphs 13.5.26 to 13.5.37.
MSS	Scoping Opinion, 22 July 2022	In agreement with the impacts scoped in and scoped out of the EIA with regards to marine fish species.	Noted, in agreement.

Consultee	Reference, Date	Summary of comment	How Comments have Been Addressed in this Chapter
Marine Mammals			
MSS	Scoping Opinion, 22 July 2022	Scope in Grey Seals in list of marine mammals under consideration.	Grey seals have been added in the list of marine mammals under consideration (paragraphs 13.5.45 to 13.5.47)
MSS	Scoping Opinion, 22 July 2022	MSS broadly agree with the list of marine mammal species occurring around Fair Isle, whilst noting that not all the species described are migratory.	Noted
MSS	Scoping Opinion, 22 July 2022	Include a more detailed baseline characterisation of which marine mammals are likely to be affected, including Risso's dolphin and white-beaked dolphin. Include Hague *et al.* 2020 as a recent summary of marine mammal baselines in Scottish waters, Sea Watch Foundation's marine mammal sightings data, and quantitative seal distribution maps from Carter *et al.*, 2022).	A more detailed baseline characterisation, including the suggested marine mammal species and literature has been included in the baseline section (paragraphs 13.5.38 to 13.5.55)
MSS	Scoping Opinion, 22 July 2022	Include any potential impacts during preconstruction (e.g., geophysical and geotechnical surveys).	Potential impacts from ground investigation (GI) works at North Haven, which were completed in spring 2023 were considered within a Report to Inform Appropriate Assessment (RIAA) (ABPmer, 2022). This RIAA concluded that acknowledging the good practice and management measures adopted by the successful contractor and implementation of mitigation (additional measures) specific to reducing the potential for disturbance effects on seabirds, the proposed GI works would not adversely affect the integrity of either the Fair Isle SAC or the Fair Isle SPA. Thus, potential impacts during GI works

Consultee	Reference, Date	Summary of comment	How Comments have Been Addressed in this Chapter
			will not be considered further in this EIAR.
MSS	Scoping Opinion, 22 July 2022	Consider the position of the dredge deposit site and vessel traffic to and from this area, if required.	As a worst case (from a marine ecology perspective) it has been assumed that dredge material will be disposed of at the nearest licensed disposal site (Scalloway). Disturbance to marine mammals as a result of dredge disposal has been considered in the assessment section (paragraphs 13.7.97 and 13.7.113).
MSS	Scoping Opinion, 22 July 2022	Any noisy activities that might be used, such as pile driving and dredging, will need to be addressed in the underwater noise assessment. A quantitative assessment of numbers of seals and cetaceans potentially injured or disturbed may be required, which will inform any appropriate mitigation measures.	This has been considered within the Underwater Noise Assessment (ABPmer, 2023b; see Appendix A.15) and discussed in the assessment section (paragraphs 13.7.97 and 13.7.106).
MSS	Scoping Opinion, 22 July 2022	In agreement that injury and disturbance due to underwater noise is the primary impact pathway of concern and has been scoped in.	Noted, in agreement.
Seabirds and Coastal Waterbirds			
NS	Consultation, 09 April 2021	The consultation confirmed the presence of breeding Fulmar within the bay, on the stack, and an Arctic Tern colony nearby at Bu Ness. It also confirmed that the vegetated sea cliff feature was present along the adjacent cliffs.	Noted and considered within assessment section (paragraphs 13.7.114 to 13.7.183).

Consultee	Reference, Date	Summary of comment	How Comments have Been Addressed in this Chapter
NS	Consultation, 09 April 2021	Sensitive bird features will be present and breeding in the bay between 1 May – 1 August (Arctic Tern) and between 15 April and 1 August (Fulmar).	Noted and considered within assessment section (paragraphs 13.7.114 to 13.7.183).
NS and MSS	Scoping Opinion, 11 & 22 July 2022	As the proposal is likely to have a significant effect on the bird qualifying interests of the Fair Isle SPA the EIA should include an assessment of impacts on birds during construction and how these impacts will be mitigated.	Noted and considered within assessment section (paragraphs 13.7.114 to 13.7.183).
NS and MSS	Scoping Opinion, 11 & 22 July 2022	Consider the potential for effects (e.g. airborne noise) on all birds from the development beyond the North Haven bay area and species identified in that context in the report.	Noted and considered within assessment section (paragraphs 13.7.114 to 13.7.183).
NS and MSS	Scoping Opinion, 11 & 22 July 2022	Consider the presence and impacts to Arctic Terns and Fulmars beyond the general breeding season dates provided as these dates may not strictly be adhered to.	Presence addressed in baseline (paragraphs 13.5.56 to 13.5.95) and within the assessment section (paragraphs 13.7.114 to 13.7.183).
MSS	Scoping Opinion, 22 July 2022	Ornithology should be considered as part of the scoped-in underwater noise impact during construction.	This has been considered within the Underwater Noise Assessment (see Appendix A.15) and discussed within the assessment section (paragraphs 13.7.142 to 13.7.152).
MSS	Scoping Opinion, 22 July 2022	Changes in bird foraging habitat should be included in parallel with the scoped in impacts of changes to benthic habitats and water quality/sediment impact pathways. Areas stated as likely to experience “no significant effects” (i.e. inner bay south of breakwater and small intertidal area south of the bay are recommended to be scoped in. Even	Noted and considered within assessment section (paragraphs 13.7.114 to 13.7.183).

Consultee	Reference, Date	Summary of comment	How Comments have Been Addressed in this Chapter
		though it is stated that these areas are not important for foraging birds, evidence that this is indeed the case would be valuable as such recommendation is to survey the above areas.	
NS	Scoping Opinion, 11 July 2022	Clarify the inaccuracies in paragraphs 7.5.14 and 7.5.30 of the Scoping Report that are: ▪ Arctic tern does not generally nest at North Haven, but there is a colony on the east side of Bu Ness. ▪ The fulmar nesting period extends beyond 1 August (but the most sensitive period is before then). ▪ Fulmars are not absent from Fair Isle outside the key breeding period. They are present for most of the year.	These have been clarified in the baseline section (paragraphs 13.5.56 to 13.5.95).
NS	Scoping Opinion, 11 July 2022	Impacts on seabirds should be addressed in the SPA assessment.	Impacts on seabirds have been assessed in the HRA which was submitted as part of the Planning Application
MSS	Scoping Opinion, 22 July 2022	Broadly satisfied with the content of the scoping report. In agreement with scoping in above-water noise and visual disturbance effects during construction for birds, as well as the potential for the introduction of INNS as potential significant effects.	Noted, in agreement.

Consultee	Reference, Date	Summary of comment	How Comments have Been Addressed in this Chapter
NS	Consultation via MS Teams, 30 November 2022	Advice provided by NatureScot by email following the meeting was as follows: ▪ NS do not advocate the use of deterrents to prevent fulmars from nesting on the stack. ▪ Potential unintentional disturbance of fulmars due to construction activity would not be considered as 'intentional' or 'reckless' disturbance as defined within the W&C Act 1981.	Noted and considered within assessment section (paragraphs 13.7.114 to 13.7.183).
Biosecurity			
NS and MSS	Scoping Opinion, 11 & 22 July 2022	Include how risks of introducing mammalian predators through the movement of vessels and importing of materials during construction, as well as the risk of introducing marine INNS will be minimised. All of which should be covered in a Biosecurity Management Plan (BMP).	This has been addressed in assessment section of this document (paragraphs 13.7.163 to 13.7.177) and in supporting BMP (ABPmer, 2023c, Appendix A.17).

13.4 Methodology

Study Area

13.4.1 The study area is the area over which potential direct and indirect effects of the Proposed Development may occur during construction and operation. The direct effects on marine ecology receptors are those that occur within the footprint of the proposed development, such as the direct disturbance to benthic habitats and associated species as a result of the dredge works and the proposed quay and breakwater extension works. Indirect effects are those that may arise outside this footprint, such as the potential noise and visual disturbance effects on seabirds during construction.

13.4.2 The study area for the marine ecology topic is considered to be:

- All intertidal and subtidal areas within North Haven bay;
- Subtidal areas extending just beyond the mouth of the bay are also considered for mobile species that may be present in the general area (marine mammals and fish);
- Subtidal areas in the vicinity of Scalloway disposal site; and
- Maritime area including the cliffs around the bay and the stack in the middle of the bay which provide nesting and other functional habitat for nesting seabirds and other coastal waterbirds.

Baseline Data Collection

13.4.3 Benthic ecology surveys to characterise the benthic habitats and species present at the Site were completed in July 2022 and have informed the baseline. A desk-based review of publicly available data has also been undertaken to support a detailed understanding of baseline nature conservation and marine ecology features in the study area. This has included a review of benthic habitats and species, fish and shellfish, marine mammals and coastal waterbirds.

13.4.4 The main desk-based sources of information that have been reviewed to inform the current baseline description within the vicinity of the Proposed Development include:

Designations

- Marine Scotland NMPi database;
- JNCC – Fair Isle SAC site details;
- JNCC - Fair Isle SPA citation;

Benthic ecology

- Marine Scotland NMPi database;
- Relevant published literature (e.g. Widing *et al.*, 2005);
- National Biodiversity Atlas (NBN) Atlas and GB Non-native Species Secretariat (NNSS) website – invasive non-native species (INNS) data;
- Benthic baseline survey report 2022 (ABPmer, 2022) commissioned for this project; and
- Relevant NatureScot reports such as the 2021 Fair Isle sea cave survey – this report was still in draft at the time of writing but personal communication with one of the key authors (Daniel Harries) has provided sufficient information for the purposes of this EIAR.

Fish

- Cefas spawning and nursery ground data (Coull *et al.*, 1998; Ellis *et al.*, 2012); and
- GeMS datasets – Scottish Priority Marine Features (PMFs).

Marine mammals

- Fair Isle Bird Observatory (FIBO) 2014 to 2020 annual reports and website[37];
- National Biodiversity Atlas (NBN) Atlas – marine mammal sightings data;
- Sea Watch Foundation – marine mammal sightings data;
- Shetland Records Centre (SRC) – marine mammal sightings data;
- Marine Scotland NMPi database and Sea Mammal Research Unit (SMRU) Special Committee on Seals (SCOS) Reports – location of seal haul-out sites;
- ORCA – marine mammal sightings data; and
- Recent academic literature: Carter *et al.* 2022, Hague *et al.* 2020.

Ornithology

- FIBO 2014 to 2020 annual reports and website;
- SRC – seabird counts split by JNCC count section;

Assessment

13.4.5 To facilitate the impact assessment process and ensure consistency in the terminology of significance, a standard assessment methodology has been applied, as described in the Assessment Method (Chapter 5).

13.4.6 The marine ecology impact assessment follows a well-established approach that has been developed specifically for this topic and has been applied in numerous marine EIAs and accepted by relevant stakeholders. It is considered, therefore, the most appropriate methodology to use in the marine ecology assessment of the proposed development.

13.4.7 To assess the significance of effects, the magnitude of the change and the probability of it occurring is evaluated to understand the exposure to change, and this is assessed against the sensitivity of a receptor/feature to understand its vulnerability. Finally, this is compared against the importance of a receptor/feature to generate a level of significance for effects resulting from each impact pathway.

13.4.8 The manner in which the magnitude of change, sensitivity and importance of receptor/feature and significance of criteria have been applied to the nature conservation and marine ecology assessment is described in the following sections.

Magnitude of change

13.4.9 This initial stage involves understanding the magnitude or scale of any potential change in baseline conditions.

13.4.10 Magnitude of change needs to be considered in spatial and temporal terms (including duration, frequency and seasonality), and against background environmental conditions in a study area. The assessment of magnitude should also be carried out taking account of any inherent design mitigation that forms part of the development description.

13.4.11 The following criteria has been used to assess the magnitude of change:

- Negligible: Changes that are barely discernible from existing baseline conditions;

[37] Fair Isle Bird Observatory & Guesthouse

- Small: Relatively localised changes that are often temporary in nature and / or a receptor has limited exposure to change;
- Medium: Receptors are subject to changes that occur over a large spatial area but the effects are considered temporary; and
- High: Receptors are subject to changes over a large spatial area with effects that are considered permanent / long-term duration.

13.4.12 Once a magnitude has been assessed, this should be considered in terms of the probability of occurrence (i.e. likelihood that the impact will occur) to derive an overall level of exposure.

Sensitivity of receptors

13.4.13 Sensitivity can be described as the intolerance of a habitat, community or individual of a species to an environmental change and essentially considers the response characteristic of the feature. The sensitivity of a marine habitat or species is considered to be a product of the following (Tyler-Walters *et al.*, 2018):

- The likelihood of damage (termed intolerance or resistance) due to a pressure. This could include behavioural effects, physiological damage or even mortality of individuals or populations; and
- The rate of (or time taken for) recovery (termed recoverability, or resilience) of marine species once the pressure has abated or been removed.

13.4.14 The following criteria have been used to assess sensitivity:

- Negligible: Pressures in which there is unlikely to be any damage to individuals or populations;
- Low: Pressures in which the likelihood of damage to individuals or populations is low with recoverability expected to occur over short timescales;
- Moderate: Pressures in which damage to individuals or populations could occur but recoverability is expected to occur over short to moderate timescales; and
- High: Pressures in which damage to individuals or populations is highly likely with either no recoverability or recoverability expected to occur over longer timescales.

13.4.15 Table 13-2 summarises the sensitivity level that has been assigned to different receptors considered in this assessment based on consideration of the criteria highlighted above. Further rationale for the sensitivity levels that have been assigned are included for each pathway in the impact assessment section of this chapter (Section 13.7).

Table 13-2: Assessed sensitivity of marine ecology receptors

Receptor	Sensitivity
Benthic habitats and species	The benthic habitats and species in the dredge footprint (and disposal sites) are considered to have a low sensitivity to seabed disturbance and low sensitivity to sediment deposition (due to relatively high recoverability). Intertidal rocky habitats are considered to have medium sensitivity to increased sediment deposition. Sensitivity of intertidal and subtidal habitats within the vicinity of the proposed works to smothering as a result of dredging is considered to be low. Sensitivity of benthic habitats and species within the vicinity of the Proposed Development to increases in SSC is considered to be low. Sensitivity of subtidal habitats and species to contaminants is assessed as low to moderate. The sensitivity of all intertidal and subtidal receptors to invasive non-native species introductions is expected to range from low to high. The sensitivity of

Receptor	Sensitivity
	species to direct habitat loss due to quay extension is considered to be high for all marine habitats and species (given the lack of recoverability following reclamation). However, sensitivity of species to direct habitat loss due to enhancement of the breakwater is considered to be moderate (due to the potential for recolonization of the new rock armour).
Fish and shellfish	Fish and shellfish species in the study area are considered to have a low to moderate sensitivity to changes in water quality and underwater noise (depending on the species).
Marine mammals	Marine mammal species present in the study area are considered to have a low sensitivity to the anticipated level of underwater noise generated by the Proposed Development activities (i.e. dredging and vessel movements). Hauled out seals present in the vicinity of the Proposed Development are considered to have a low sensitivity to anticipated levels of airborne noise and visual disturbance.
Seabirds and Coastal Waterbirds	Sensitivities of seabird and coastal waterbird species range between low to moderate for airborne noise and disturbance (depending on species), moderate for underwater noise disturbance (Arctic Tern only - assigned on precautionary basis), high for all species in relation to changes to the value of habitat for foraging (construction and operation) and high for introduction of mammalian predators.

Receptor importance

13.4.16 In considering the magnitude of impacts and sensitivity of the receptor, it is also necessary to identify whether an ecological feature is 'important'. As such, where possible, habitats, species and their populations have been valued on the basis of a combination of their conservation status, rarity and ecological/socioeconomic value using contextual information, where it exists.

13.4.17 The CIEEM (2018) guidelines recognise that determining ecological importance is a complex process, which is a matter of professional judgement guided by the importance and relevance of a number of factors. These include designation and legislative protection, as well as biodiversity value and secondary / supporting value (e.g. where habitats may function as a buffer or resource associated with an adjacent designated area).

13.4.18 The importance of each ecological receptor has been determined, based on the following criteria:

- Low: The receptor is not protected or designated and is considered to be of low to moderate biodiversity or supporting value;
- Moderate: Statutory protection / designation afforded to a receptor but it is considered to be of low to moderate biodiversity / supporting value or the receptor does not receive statutory protection but is considered to be of high biodiversity or supporting value; and
- High: Statutory protection / designation afforded to a receptor and the receptor is considered to be of high biodiversity or supporting value.

13.4.19 The importance of a receptor has also been considered with regard to the marine geographic frame of reference defined below as recommended in the CIEEM (2018) guidelines:

- International and European;
- National;
- Regional (Fair Isle); and
- Local (North Haven bay).

13.4.20 Table 13-3: summarises the importance level that has been assigned to the different receptors that have, to date, been assessed based on the criteria highlighted above.

Table 13-3: Assessment of the importance of marine ecology receptors

Receptor	Importance
Benthic habitats and species	Intertidal habitats in the study area are considered to be of **low** importance as they are commonly occurring and of low conservation concern and considered to be of moderate biodiversity. Additionally, the intertidal area is not considered to comprise important foraging ground for birds with only a small number of birds foraging within the bay and along the tideline. Importance of subtidal habitats in the vicinity of the proposed development is considered to be **low to moderate**. This is because subtidal species in the area are considered to be commonly occurring and of low conservation concern. The subtidal mixed substrata habitat supporting kelp communities is not protected or designated at this location and does not represent a good example of the kelp PMF; it is however recognised that it supports high biodiversity. On this basis, importance of this subtidal kelp habitat is considered to be **moderate**. The sea cave habitat to the north of the existing breakwater (CI04) is a relatively poor example of this feature in Fair Isle. However, acknowledging that sea caves are an Annex I feature, importance for this habitat is considered to be **moderate**. Sea cave habitat directly to the south of the existing breakwater (CI05) does not represent a good example of the Annex I feature representing a surge gully rather than a true sea cave and is not protected or designated at this location; therefore, importance of this sea cave/ surge gully feature is considered to be **low**.
Fish and shellfish	**Low to high** importance: Species that are commonly occurring and not protected are considered to be of low importance. Species which are commercially important species (e.g. whiting, cod, skate and commercial shellfish species) are considered to be of **moderate** importance. Diadromous migratory species which are of conservation interest are considered to be of **high** importance (however, these have not been considered further in the assessment following consultation advice by MSS).
Marine mammals	**High** importance: All species are of conservation interest and protected.
Seabirds and Coastal waterbirds	**High** importance: All species are of conservation interest and protected.

Significance criteria

13.4.21 Determination of the significance of the predicted ecological effects is based on professional judgement having regard to the positive (beneficial) or negative (adverse) nature of a potential impact.

13.4.22 The CIEEM (2018) guidelines state that an effect should be determined as being significant when it "*either supports or undermines biodiversity conservation objectives for important ecological features*". It relates to the weight that should be afforded to effects when decisions are made, and to the consequences, in terms of legislation, policy and / or development control. So, a significant adverse effect on a feature of importance (as defined in Table 13-4) would require mitigation and the possible need for development control mechanisms, such as a marine licence condition.

13.4.23 Whilst this assessment adopts an Ecological Impact Assessment (EcIA) approach and, therefore, expresses the significance of ecological effects with reference to a geographic frame of reference (as advocated in the CIEEM Guidelines), significance is also expressed using a generic EIA significance criteria. The generic criteria used throughout this report is based on an expression of severity, to describe the significance of environmental impacts.

13.4.24 For ease of reference, Table 13-4 provides a means of relating the two approaches and is provided in order to allow the EcIA to be integrated into the wider EIA framework without compromising the CIEEM best practice approach.

13.4.25 To ensure transparency in the impact assessment, it is important to make clear the evidence-based or value-based judgments used at each stage of the assessment, and how they have been attributed to a level of significance. This is presented in the impact assessment section of this chapter for each impact pathway.

13.4.26 As shown in Table 13-4, effects that are identified as being moderate or major adverse / beneficial are classified as significant effects and those as minor or negligible as not significant.

Table 13-4: Significance Criteria

Significance level		Criteria	CIEEM geographical criteria
Significant	Major	These effects are likely to be important considerations at a local or district scale but, if adverse, are potential concerns to the project and may become key factors in the decision-making process.	Ecological impacts assessed as being significant at the regional scale and that have triggered a response in development control terms are considered to represent impacts that overall, within this assessment, are of major significance.
	Moderate	These effects, if adverse, while important at a local scale, are not likely to be key decision-making issues. Nevertheless, the cumulative effect of such issues may lead to an increase in the overall effects on a particular area or on a particular resource.	Ecological impacts assessed as being significant at the county/metropolitan scale, and that have triggered a response in development control terms, will be considered to represent impacts that overall, within this assessment, are of moderate significance.
Not significant	Minor	These effects may be raised as local issues but are unlikely to be of importance in the decision-making process. Nevertheless, they may be of relevance in enhancing the subsequent design of the project and consideration of mitigation measures.	Ecological impacts assessed as being significant at the local scale, and that have triggered a response in development control terms, will be considered to represent impacts that overall, within this assessment, are of minor significance.
	Negligible	No effect or effect which is beneath the level of perception, within normal bounds of variation or within the margin of forecasting error.	Ecological impacts that have been assessed as not being significant at any geographic level.

Impact assessment guidance tables

13.4.27 The matrices in Table 13-5 to Table 13-7 have been used to help assess significance (see below). Table 13-5 has been used as a means of generating an estimate of exposure to change for each impact pathway. Magnitude of change needs to be considered in spatial and temporal terms (including duration, frequency and seasonality), and against the background environmental conditions in a study area. Once a magnitude has been assessed, this should be combined with the probability of occurrence to arrive at an exposure score which can then be used for the next step of the assessment, which is detailed in Table 13-6. For example, an impact pathway with a medium magnitude of change and a high probability of occurrence would result in a medium exposure to change.

Table 13-5: Exposure to change, combining magnitude and probability of change

Probability of Occurrence	Magnitude of Change			
	Large	Medium	Small	Negligible
High	High	Medium	Low	Negligible
Medium	Medium	Medium	Low	Negligible
Low	Low	Low	Negligible	Negligible
Negligible	Negligible	Negligible	Negligible	Negligible

13.4.28 Table 13-6 has then been used to score the vulnerability of the features/receptors of interest based on the sensitivity of those features and their exposure to a given change. Where the exposure and sensitivity characteristics overlap then vulnerability exists, and an adverse effect may occur. For example, if the impact pathway previously assessed with a medium exposure to change acted on a receptor which had a high sensitivity, this would result in an assessment of high vulnerability. Sensitivity can be described as the intolerance of a receptor to an environmental change and essentially considers the response characteristic of the receptor. Thus, if a single or combination of environmental changes is likely to elicit a response then the receptor under assessment can be considered to be sensitive. Where an exposure or change occurs for which the receptor is not sensitive, then no vulnerability can occur. Similarly, vulnerability is always 'none' no matter how sensitive the feature is, if the exposure to change had been assessed as 'negligible'.

Table 13-6: Estimation of vulnerability based on sensitivity and exposure to change

Sensitivity of Feature	Exposure to Change			
	High	Medium	Low	Negligible
High	High	High	Moderate	None
Moderate	High	Moderate	Low	None
Low	Moderate	Low	Low	None
None	None	None	None	None

13.4.29 The vulnerability has then been combined with the importance of the feature of interest using Table 13-7 to generate an initial level of significance. The importance of a feature is based on its value and rarity (e.g. to either ecosystem or economy), such as the levels of protection, whilst recognising that importance should be determined having regard to geographic context (i.e. international/European, national, regional, and local). For an example of estimating significance, if a high vulnerability was previously given to a feature of low importance, an initial level of significance of minor would be given.

Table 13-7: Estimation of significance based on vulnerability and importance

Importance of Feature	Vulnerability of Feature to Impact			
	High	Moderate	Low	None
High	Major	Moderate	Minor	Negligible
Moderate	Moderate	Moderate	Minor	Negligible
Low	Minor	Minor	Negligible	Negligible
None	Negligible	Negligible	Negligible	Negligible

13.5 Baseline Conditions

The Site

The Surrounding Area

13.5.1 A detailed description of the Site and the surrounding area is provided in the Marine Geomorphology chapter (Chapter 12).

Designated Sites

13.5.2 All of Fair Isle and the surrounding waters is designated a Special Protection Area (SPA) with a total area of 6825.1 ha. The marine extension was classified in September 2009 and the seaward extension extends approximately 2 km into the marine environment to include the seabed, water column and surface (see Figure A1.1).

13.5.3 Qualifying features of the Fair Isle SPA are:

- Arctic skua (Stercorarius parasiticus);
- Arctic tern (Sterna paradisaea);
- Fair Isle wren (Troglodytes troglodytes fridariensis);
- Fulmar (Fulmarus glacialis);
- Gannet (Morus bassanus);
- Great skua (Stercorarius skua);
- Guillemot (Uria aalge);
- Kittiwake (Rissa tridactyla);
- Puffin (Fratercula arctica)
- Razorbill (Alca torda);
- Shag (Phalocrocorax aristotelis); and
- Seabird assemblage

13.5.4 The boundary of Fair Isle SPA is coincident with Fair Isle Site of Special Scientific Interest (SSSI). Fair Isle SSSI comprises the whole of the northern three-quarters of the island, plus the rest of the coastline, including offshore stacks. It is notified for its plant fossils, moorland juniper, and colonies of breeding seabirds.

13.5.5 Fair Isle was designated a Demonstration and Research (DR) MPA in November 2016 prompted by decades of declining natural resources, primarily seabird and inshore fish populations (Fauna and Flora International, 2020). This designation sets out an ecosystem approach which includes: monitoring of seabirds and other mobile species; development and implementation of a local sustainable shellfish fishery; and development of a research programme into local fisheries including species composition, size, distribution and temporal/spatial changes in fish stocks. The Fair Isle DR MPA is a rectangular region surrounding the island at a distance of 2-3 nautical miles, within which lies the smaller rectangular Fair Isle SPA (Figure A1.1).

13.5.6 The Fair Isle DR MPA differs from NS's nature conservation MPAs in that rather than specifically protecting species of European Importance it is specifically targeted toward carrying out research to demonstrate sustainable marine management approaches. As such, the MPA has been developed in collaboration with the local fishing industry and has been developed in accordance with the aim of long-term sustainability.

13.5.7 The next nearest SPAs to North Haven Bay are Seas off Foula SPA (~34 km) and Sumburgh Head SPA (Shetland) (~36 km).

13.5.8 Seas off Foula SPA is designated for its important feeding grounds to a range of breeding and non-breeding seabirds:

- Great Skua *(Stercorarius skua)* breeding and non-breeding
- Fulmar *(Fulmarus glacialis)* breeding and non-breeding
- Arctic Skua *(Stercorarius parasiticus)* breeding
- Guillemot *(Uria aalge)* breeding and non-breeding
- Puffin *(Fratercula arctica)* breeding
- Assemblage of seabirds breeding and non-breeding

13.5.9 Sumburgh Head SPA is designated for breeding seabirds:

- Arctic tern (Sterna paradisaea)
- Fulmar (Fulmarus glacialis)*
- Guillemot (Uria aalge)*
- Kittiwake (Rissa tridactyla)
- Seabird assemblage

(*Indicates assemblage qualifier only)

13.5.10 A Report to Inform an Appropriate Assessment (RIAA) under the Habitats Regulations has been submitted as part of the Planning Application. This provides an assessment of the potential impact of the proposed works on European and Ramsar designated sites and their interest features. The RIAA concluded that the Proposed Development will not lead to an adverse effect on site integrity on any European/Ramsar site.

Benthic Habitats and Species

Regional and site overview

13.5.11 Around Fair Isle, subtidal sediments are relatively sparse, other than coarse shell-gravels. Closer to the coast in sheltered regions, the finer sediments are characterised by species such as the lugworm *Arenicola marina* and the sandmason *Lanice conchilega* (Wilding *et al.* 2005). North Haven Bay is predominantly shallow, and the Marine Scotland NMPi database shows no PMFs recorded within the bay. The PMF biotope '*Laminaria hyperborea* and foliose red seaweeds on moderately exposed infralittoral rock' is recorded outside the bay and kelp is dominant around much of the infralittoral rocky coastline of the island. The Kelp bed PMF is also recorded approximately 700 m southwest of the Scalloway disposal site. The next closest records of this and other PMFs are more than 1.5 km away from the proposed disposal site.

13.5.12 The intertidal beach at the south end of the bay is moderately exposed to wave and swells. As such the substrata consist of relatively impoverished coarse sands. There are rock pools present in the bay with a number of invertebrate species present, including sea stars, sea urchins, sea hares, small shore crabs and a variety of gastropods.

13.5.13 Project specific benthic surveys were completed in July 2022; the results of these surveys are summarised later in this section (paragraphs 13.5.19 to 13.5.25).

Non-native species

13.5.14 In Scotland, marine INNS are of growing concern and specific acknowledgement is given to the following species which have all been found in Scottish waters (NBN Atlas; and NNSS website): 'Wakame' (*Undaria pinnatifida*); 'Wireweed' (*Sargassum muticum*); the red alga (*Heterosiphonia japonica*); 'Orange-striped anemone' (*Haliplanella lineata*); 'Darwin's barnacle' (*Eliminius modestus*); 'Striped barnacle' (*Balanus amphitrite*); 'Japanese skeleton shrimp' (*Caprella mutica*); 'Slipper limpet' (*Crepidula fornicata*); 'Leathery sea squirt' (*Styela clava*); 'Carpet sea squirt' (*Didemnum vexillum*); 'Pacific oyster' (*Crassostrea gigas*); 'Chinese mitten crab' (*Eriocheir sinensis*). The NBN Atlas indicates no INNS sightings of the species listed above within 5 km of Fair Isle.

13.5.15 The exposed nature of North Haven bay does not lend itself to colonisation by a number of marine INNS such as those commonly found in marinas. While the bay does receive some recreational boat traffic in the summer it is very low in volume. Data from the NBN Atlas indicates that the red alga *Bonnemaisonia hamifera* has been previously recorded at Fair Isle, mainly off the east coast of the isle.

Sea caves

13.5.16 Sea caves are an Annex I feature and are found all along the Fair Isle coastline. Although these features are not a feature of any designations on Fair Isle, they provide important habitat for various surge resilient biotopes characterised by sponges, cnidarians, barnacles and algae (Wilding *et al.* 2005). Examples of sea caves includes both submerged sea caves as well as partially submerged caves only exposed to the sea at high tide.

13.5.17 A sea cave study commissioned by NatureScot, the first of its kind on Fair Isle, is the most recent source of data to inform a baseline understanding of sea caves on the island. In this study surveys were completed in July 2021 and documented approximately 70 caves on the isle. Although the full set of findings are yet to be published, personal communication with the authors (Daniel Harries, Heriot-Watt University) has yielded sufficient information for the purpose of this EIAR.

13.5.18 This study identified a number of sea caves (n=6) within the North Haven bay. Of these, only two were categorised as 'light reduced'[38], and therefore represented a good example of a sea cave; one located on the north-eastern side of the bay, approximately 50 m north from the existing breakwater (CI04), and the other located on the south-western side of the bay approximately 120m from the breakwater (CI01). Sea cave CI04 is 81 m long and the closest to the Proposed Development; however, it is a relatively poor example in terms of cave fauna and flora present due to extreme scouring wave action. The remaining four caves found within the bay were categorised as 'light not reduced'[38] and therefore were not considered to represent good examples of the sea cave feature at Fair Isle. One of these 'light not reduced' caves is located just south of the existing breakwater and within the footprint of the Proposed Development (CI05); this is a quite short, narrow and shallow cave and was considered to be 'insignificant' and thus was not surveyed further during the sea cave study. The insignificance of cave CI05 is also mirrored in the species present, with *Laminaria digitata* on the floor at the cave entrance and *Semibalanus balanoides* and *Patella vulgata* present on the lower walls.

Project specific benthic surveys

13.5.19 Project specific benthic ecology surveys were undertaken in North Haven in July 2022 to characterise the benthic habitats and species present within the study area. The detailed survey report is provided in Appendix A.14. An intertidal walk over survey was completed to map the biotopes surrounding the pier/ quay and at the nearby beaches of the Proposed Development. The subtidal surveys consisted of grab and underwater video operations,

[38] Absence of light is the main biologically relevant parameter that distinguishes 'caves' from 'overhangs' or 'surge gullies'. For a cave-like feature to qualify as a proper cave in terms of biology, it needs to at least get sufficiently dark to require a torch at the back.

carried out in the marine environment within and around the footprint of the Proposed Development.

Intertidal habitats

13.5.20 At North Haven the upper-mid intertidal section of the rock armour surrounding the pier/ quay consisted of a mosaic of bladder wrack *Fucus vesiculosus* (*Fucus vesiculosus* on full salinity moderately exposed to sheltered mid eulittoral rock) and serrated wrack *Fucus serratus* (*Fucus serratus* on full salinity sheltered lower eulittoral rock). The lower part of the rock armour was characterised by kelp/ oarweed *L. digitata* (*Laminaria digitata* and under-boulder fauna on sublittoral fringe boulders), alongside a variety of red seaweeds and a rich faunal community including the presence of juvenile edible crab *Cancer pagurus.*

13.5.21 The majority of the nearby beach at North Haven was formed of fine, clean sand with *Arenicola sp.* worm casts at approximately 10-15 per m^2 within the mid shore. As such this area was classified as polychaetes in littoral fine sand. The area above this was classified by barren littoral rock, no fauna was present within this zone. Within the centre of the beach a concrete slipway was present. On the mid-zone of the slipway barnacles dominated with the limpet *P. vulgata* and occasional *Fucus spiralis*, *Ulva sp*. and *Nemalion helminthoides*.

Subtidal habitats

13.5.22 The subtidal areas of the study area consisted of a mosaic of muddy sand and rocky kelp outcrops. The area south of the breakwater was characterised mainly by Infralittoral muddy sand and *Arenicola marina* in infralittoral fine sand or muddy sand biotopes. The more exposed area north of the breakwater, was characterised predominantly by *Laminaria hyperborea* forest and foliose red seaweeds on tide-swept upper infralittoral mixed substrata.

13.5.23 The *Laminaria hyperborea* forest and foliose red seaweeds on tide-swept upper infralittoral mixed substrata biotope is a component of the kelp bed PMF habitat. However, due to the very patchy and mosaic nature of the feature it is considered to be a relatively poor example of this PMF. This PMF was patchy in extent and presence, recorded primarily as a mosaic with non-PMF biotopes present.

13.5.24 Sediment grabs (n=2) were only obtained from the area south of the breakwater due to the presence of cobbles north of the breakwater which prevented successful grab sampling. Forty taxa were recorded in total from the grab samples including crustaceans, polychaetes, and annelids. The faunal assemblage from the grab sample collected south of the breakwater and close to the slipway, was predominantly characterised by polychaetes (*Malacoceros vulgaris*, *Capitella* spp. and *Spio martinensis*), the crustacea *Dexamine thea* and *Nototropis guttatus* and Nematoda, with a total count of 959 individuals per 0.1 m^2. The second grab sample was collected further north, to the west of the breakwater and was predominantly characterised by Nematoda, crustacean species (*Bathyporeia pelagica, Perioculodes longimanus* and *N. guttatus*) and the polychaete *Capitella* spp. with a total count of 407 individuals per 0.1 m^2. Biomass at both stations was dominated by Annelida.

13.5.25 No INNS were identified within the intertidal or subtidal areas at North Haven during the benthic surveys.

Fish and Shellfish

13.5.26 Consideration is given to those fish and shellfish species that could be present within 3 km of the Proposed Development. The comparatively more sheltered nature of the bay may provide some favourable conditions for juvenile fish; however, as indicated in Chapter 12, the bay experiences regular wave disturbance as is also evidenced from the substrata present.

13.5.27 Specific acknowledgement is given to those fish and shellfish with spawning grounds that overlap or are proximal to the Proposed Development, with additional consideration to those fish species with nursery areas in the vicinity.

13.5.28 Following consultation with Marine Scotland Science (see Table 13-1) specific consideration to diadromous fish species has been scoped out of further detailed assessment due to no evidence that diadromous fish (including Atlantic salmon) are present in any significant numbers around Fair Isle.

13.5.29 Species present around Fair Isle are likely to include the PMFs whiting, cod, skate, halibut, mackerel, scabbard and ling. Deep water fish such as black scabbard and halibut would be absent from shallow inshore areas. While the sandy substrata could support sandeels, given the degree of wave exposure and swells which the bay experiences, it is unlikely that any significant numbers would exist in the shallow waters.

13.5.30 To understand the utilisation of the wider area by fish and shellfish species a number of data sources were interpreted including published Cefas reports (i.e. Coull *et al.,* 1998; Ellis *et al.,* 2012). Both of these reports contain information on the geographical locations of spawning and nursery grounds of many fish and shellfish species around the UK. The Coull *et al.* (1998) data was updated by Ellis *et al.* (2012) with data collected in 2010. Spawning and nursery grounds were assigned a level of intensity by Ellis *et al.,* (2012) (high or low), depending on the level of activity thought to occur at each location; no intensity levels were assigned in the earlier work by Coull *et al.* (1998), except for Norway pout and blue whiting, therefore this is described here as 'undetermined'.

13.5.31 Of the fish and shellfish investigated within the Cefas reports, seven have spawning grounds that overlap (are within 3 km) with Fair Isle and are therefore proximal to the proposal. These taxa are cod (*Gadus morhua*), sandeel (*Ammodytidaes* spp.), whiting (*Merlangius merlangus*), lemon sole (*Microstomus kitt*), herring (*Clupea harengus*), sprat (*Sprattus sprattus*), and Norway pout (*Trisopterus esmarki*). The spawning intensities for these species are low (cod, sandeel, whiting and Norway pout) or undetermined (lemon sole, herring and sprat) within the spawning grounds surrounding Fair Isle. Considering the regular wave disturbance within North Haven it is considered unlikely that it constitutes important spawning ground for any of these species. Additionally, the species with undetermined spawning intensity (lemon sole, herring and sprat) have extensive spawning grounds around the UK and therefore the area that overlaps with the development represents a very small proportion.

13.5.32 In terms of nursery areas the Cefas reports identified 14 species that have nursery grounds that overlap (within 3 km) with the waters near to North Haven including cod, sandeel, whiting, lemon sole, herring, sprat, Norway pout, mackerel (*Scomber scombrus*), blue whiting (*Micromesistius poutassou*), ling (*Molva molva*), anglerfish (*Lophius piscatorius*), spurdog (*Squalus acanthias*), spotted ray (*Raja montagui*) and European Hake (*Merluccius merluccius*).

13.5.33 From the selected species studied by Coull *et al.* (1998) and Ellis *et al.* (2012) only blue whiting and anglerfish have high intensity nursery grounds in close vicinity of the development. However, both of these species are uncommon in shallow areas such as North Haven with anglerfish considered to inhabit and spawn in waters deeper than 18 m and blue whiting inhabiting deeper waters of the continental slope and shelf (Reeve, 2008; Barnes, 2008)). Additionally, both species have extensive nursery grounds over the UK and therefore the area that overlaps with the development represents a very small proportion. This is also valid for the species with undetermined nursery ground intensity (lemon sole, sprat and Norway pout) which also have extensive nursery grounds around the UK.

13.5.34 Numerous of the species discussed are PMFs, and this information together with spawning and nursery intensity (either low, undetermined or high) are summarised in Table **13-8** below.

Table 13-8: Fish species with spawning and nursery grounds in the vicinity (within 3 km) of the Proposed Development. Spawning periods are given where relevant. All data is derived from Ellis *et al.*, (2012) unless otherwise specified.

Species PMF	Spawning ground intensity	Spawning period	Nursery ground intensity
Cod (*Gadus morhua*) PMF	Low	January to April	Low
Sandeel (*Ammodytidaes* spp.) PMF	Low	November to February	Low
Whiting (*Merlangius merlangus*) PMF	Low	February to June	Low
Lemon sole (*Microstomus kitt*)	Undetermined *	April to September *	Undetermined *
Herring (*Clupea harengus*) PMF	Undetermined *	August to September (Buchan/ Shetland) *	Low
Sprat (*Sprattus sprattus*)	Undetermined *	May to August *	Undetermined *
Norway Pout (*Trisopterus esmarki*) PMF	Low *	January to April (shelf) *	Undetermined *
Mackerel (*Scomber scombrus*) PMF	N/A	N/A	Low
Blue Whiting (*Micromesistius poutassou*) PMF	N/A	N/A	High
Ling (*Molva molva*) PMF	N/A	N/A	Low
Anglerfish (*Lophius piscatorius*) PMF	N/A	N/A	High
Spurdog (*Squalus acanthias*)	N/A	N/A	Low
Spotted ray (*Raja montagui*)	N/A	N/A	Low
European Hake (*Merluccius merluccius*)	N/A	N/A	Low

* data from Coull *et al.*, (1998)

13.5.35 Other species present in the waters surrounding Fair Isle include basking shark (*Cetorhinus maximus*) and European eel (*Anguilla anguilla*) which are sighted in low numbers. Data from the FIBO indicate egg-cases of the small-spotted catshark (*Scyliorhinus canicula*) and spotted ray (*R. montagui*) recorded in low numbers on a less than yearly basis.

13.5.36 Shellfish composition is not known for North Haven Bay. Being a shallow inshore location with a mosaic of sandy seabed and rocky kelp outcrops it is likely comprised mainly of infaunal species within the sediments as well as larger megafauna such as edible and other crab species on the rocky substrate. The breakwater may also provide some suitable habitat for larger megafauna such as lobster and crab. Coull *et al.* (1998) data show no spawning or nursery grounds for Norway lobster (*Nephrops norvegicus*) within the vicinity (10 km radius) of the proposed development. The nearest shellfish fishing activity (landings of edible and velvet crab in 2013-2017; Marine Scotland NMPi database) is approximately 25 km away from the Proposed Development, between Fair Isle and Shetland.

13.5.37 NMPi data show no PMF shellfish species, shellfish protected areas or classified shellfish harvesting areas within several kilometres from the Sites or 1 km from Scalloway disposal site. Scallops are present approximately 1.5 km from Scalloway disposal site.

Marine Mammals

13.5.38 A variety of marine mammal species are regularly sighted in the waters around Fair Isle, with 16 cetacean species sighted over the last few years. Marine mammal sightings are most likely to be recorded between May and October when many species move into coastal

waters as food supplies increase; however, some species are not migratory and can be seen year-round. The most common ceteacean species observed from Fair Isle are harbour porpoise, minke whale and orca. Passing pods of Risso's, white-beaked and white-sided dolphins are also possible.

13.5.39 Fair Isle has a small breeding population of grey seals, which can be easily viewed in North Haven and the area around South Harbour and the South Light, pupping from October on the isolated beaches along the north and west coasts. Harbour seals may also be seen, normally in South Harbour, but they do not breed on the island[39].

13.5.40 Marine mammal sightings data has been reviewed in a desk study to provide a baseline description of marine mammal diversity in the waters surrounding Fair Isle. Table 13-9 summarises sightings from the sources listed in paragraph 13.4.4, which are derived from a range of methods including land watches, vessel-based watches and aerial surveys.

13.5.41 Species are classified semi-quantitively based on frequency of occurrence. Categories are defined as follows:

- Very rare – only 1 recorded sighting to date;
- Rare – a low number of sightings (1 to 3) recorded over multiple years;
- Infrequent seasonal visitor – a low number of sightings (generally less than 10), with years of absence; and
- Regular – several sightings recorded every year.

Table 13-9: Marine mammal sightings from Fair Isle.

Species	Frequency	Sighting description
Minke Whale (*Balaenoptera acutorostrata*)	Regular	Numerous sightings annually (approximately 2 to 10). Pod sizes from 1 to 3 individuals (SRC). Sighted April-October, with most records from September & October
Harbour Porpoise (*Phocoena phocoena*)	Regular	Several sightings (5 to 10) every year, seen all year round.
Risso's dolphin (*Grampus griseus*)	Regular summer visitor	Sighted all year round in groups of generally 4 – 10,
Grey seal (*Halichoerus grypus*)	Regular	Approximately 45-55 pups are born on Fair Isle each year (based on data from 2014 to 2020). Sightings of adults are common at many locations all year round.
Harbour seal (*Phoca vitulina*)	Infrequent	Occasionally individuals are sighted in North Haven and South Haven bay (max count 3)
Orca (*Orcinus orca*)	Infrequent summer visitor	Several sightings every year of this species in groups of 1 to ~12, many of which include calves and bulls.
White-beaked dolphin (*Lagenorhynchus albirostris*)	Infrequent summer visitor	Sighted most years more often from June to September, large range of pod size.
Atlantic white-sided dolphin (*Lagenorhynchus acutus*)	Rare summer visitor	Small number of sightings from August to September (3 sightings in 8 years). Groups size varies from 1 to ~30, sightings include from Bu Ness.

[39] Fair Isle Bird Observatory & Guesthouse

Species	Frequency	Sighting description
Humpback whale *(Megaptera novaeangliae)*	Rare	Four sightings since 1994, last sighting 2016 (Fair Isle Bird Observatory report, 2016).
Long-finned pilot whale (*Globicephala melas*)	Rare summer visitor	Six sightings in the last 30 years including in 2010 a sighting of a pod of at least 60 travelling. Sightings peak during August to September.
Bottlenose dolphin (*Tursiops truncatus*)	Very rare	One confirmed sighting recorded by ORCA onboard a cruise in 2016-2017 between Fair Isle and Grutness (Hague *et al.*, 2020).

13.5.42 Although both harbour and grey seals have large offshore foraging ranges, both can be considered as resident on the basis that Fair Isle supports regularly used haul out locations, although harbour seals sightings indicate that only very small numbers are present (see paragraphs 13.5.46 and 13.5.49 below). Harbour porpoise may also be loosely described as resident on the grounds that they are sighted regularly throughout the year, including on occasion with calves. Equally, it is acknowledged that harbour porpoise may routinely move between regularly used areas and therefore may not be present all of the time. Minke whale is a regularly observed seasonal visitor, with sightings occurring primarily during summer and into autumn.

13.5.43 Further detail is provided below for the species that occur either infrequently or regularly within North Haven bay itself, including the three species likely to be resident: grey seal, harbour seal and harbour porpoise[40].

Harbour Porpoise

13.5.44 Harbour Porpoise occur around Fair Isle often in small pods of 1-5 individuals, although they can occur in larger aggregations (>11, including two calves seen in 2016, FIBO). Most sightings from Fair Isle (90 over nine years) submitted to Shetlands Records Centre are from Bu Ness or North Light. It is anticipated that the number of records from Bu Ness is due in part due to observation effort and its proximity to the FIBO. Although southern and eastern Shetland has been identified as an area where there is persistent harbour porpoise activity (Evans *et al.* 2015), there is no indication from either this study or other work (such as Heinänen and Skov 2015, Paxton *et al.* 2016 and Hague *et al.* 2020) that Fair Isle and the surrounding waters is of any particular special value to harbour porpoise. Indeed Hammond *et al.* (2013) shows a redistribution of harbour porpoise from northern waters southwards. There are no nearby areas to the Proposed Development designated for harbour porpoise.

Grey Seal

13.5.45 Seals are protected under The Conservation of Seals Act 1970, The Seal Products Regulations 2010 and the Conservation of Offshore Marine Habitats and Species Regulations 2017 and the Wildlife and Countryside Act 1981. The Protection of Seals (Designated Sea Haul-out Sites) (Scotland) Order 2014 introduced additional protection for seals at 194 designated haul-out sites[41]. However, there are no protected haul out sites on Fair Isle, the closest being on Shetland well over 40 km away.

13.5.46 Although there are no designated seal haul out sites on Fair Isle, there is small colony of grey seals, which are regularly seen hauled out in many locations all year round[37].

[40]Although minke whale is regularly sighted from the bay, the animals are offshore, and not in the bay itself. Therefore, they are not included within the assessment.

[41] https://marine.gov.scot/maps/1585

Approximately 45-55 pups are born on Fair Isle every year from late September[37] (SRC data, 2014-2020). The most common pupping locations on Fair Isle are Gunnawark (approximately 15 each year), Gorsens' Geo (6) and Kroga Geo (5) all of which are >2 km from North Haven. One colony is recorded at north of Reeva (also >2 km from North Haven). The nearest haul out site for grey seal to the Scalloway disposal site is more than 8 km away.

13.5.47 Although grey seals are known to be present around Fair Isle, at-sea densities are low in comparison to the waters around Orkney and other UK hot-spots, such as the Isle of May, the Farne Isles and Donna Nook (Carter *et al.* 2020, 2022).

Harbour Seal

13.5.48 Harbour Seals are smaller than Grey Seals, and with a smaller foraging range.

13.5.49 There are no designated haul out sites on Fair Isle for harbour seal, although individuals are routinely sighted. Sightings of harbour seals by FIBO have become less frequent since 2017[37]. Similarly, SRC recorded only 5 individuals from 2013-2015 in North Haven, South Haven and Bu Ness. Recent sightings have been documented by the FIBO in 2021 include 2 individuals at North Haven (1 hauled on North Haven slipway) 2 at South Haven and 2 at Hesti Geo. The nearest haul out site for harbour seal to the Scalloway disposal site is more than 4 km away.

13.5.50 Although harbour seals are known to be present around Fair Isle, at-sea densities are very low in comparison to the waters around Orkney, Shetland and the west coast of Scotland (Carter *et al.* 2020, 2022).

Minke whale

13.5.51 The majority of minke whale sightings from the UK are from within Scotland and occur mainly over the continental shelf in waters of <200m depth.[42] Like other ceteaceans they have European Protected Species status. They are also on the IUCN Red List (Least Concern) and are a Priority Species under the UK Post-2010 Biodiversity Framework.

13.5.52 Minke Whales are recorded every year from Fair Isle, with sightings including larger groups of five individuals in 2018[37]. More recent sightings include in 2021 off Bu Ness, South Light and North Light and in 2022 off Easter Lother. Data from the SRC shows that minke whale sightings follow the seasonal pattern typically observed in Scottish waters, with animals recorded through the summer months but increasing in August and September (Paxton *et al.,* 2014). It is thought minke whale sightings are closely related to areas with likely sandeel habitat in June and areas thought to be important pre-spawning habitat for herring in August (Paxton *et al.* 2014).

Orca

13.5.53 Several sightings of this species have involved individuals potentially hunting grey seals in the mouth of North Haven bay (Daniel Harries, *pers. comm.*; 2022; SRC data). Recent sightings in 2021 include three individuals seen on 23 August of South Light (Shetland Record Centre) and three on the 3 December (Seawatch Foundation).

Risso's dolphin

13.5.54 The largest group size recorded from Fair Isle (North Light) was of 20 individuals including a calf in 2019 (SRC). Other sightings to note include repeat observations of a group of 19 individuals including a maximum of 3 calves during 2015. These animals were sighted 14

[42] Minke whale | NatureScot

times between 27 August to 4 October[37]. Most frequent locations noted are Bu Ness and North Light (Shetland Record Centre, 2011-2020). Several sightings in 2021 included eight off Bu Ness and 10 off South Light.

White-beaked dolphin

13.5.55 A small number of sightings of this species are recorded most years, most commonly in the summer months between June to September. Pod sizes range from two to ~40. A sighting to note is in 2014 of a pod of ~20 individuals including calves that were seen bowriding the God Shepherd[37].Most other sightings are recorded from Bu Ness and North Light (SRC, 2010-2020).

Other species

13.5.56 Other species seen include sperm whales (*Physeter macrocephalus*) which have previously been sighted from the Good Shepherd IV although no confirmed sightings have been recorded from the FIBO. It is therefore possible for this species to be present in the offshore area, but the limited data prevents further consideration. One fin whale (*Balaenoptera physalus*) was recorded in 2020 from North Light as unconfirmed (the only features of the sighting was surface blows). There are two records of washed-up Cuvier's beaked whale (*Ziphius cavirostris*), therefore it is possible for these species to occur in wider offshore area.

Seabirds and Coastal Waterbirds

13.5.57 This section has been structured as follows:

- Overview of seabirds and coastal waterbirds present on Fair Isle - Provides background information on Fair Isle and its seabird and coastal waterbird populations;
- Seabird and coastal waterbird usage of North Haven Bay and the surrounding area - Summarises data describing populations in the local area in and around North Haven bay; and;
- Seabird and coastal waterbird populations directly overlapping the Proposed Development footprint - Summarises data which describes seabird and coastal waterbird populations specifically occurring in or within proximity to the Proposed Development footprint.

13.5.58 A table summarising the species present, the number of pairs, nesting locations and other usage of the area is included at the end of this section.

Overview of seabirds and coastal waterbirds present on Fair Isle

13.5.59 Fair Isle supports some of the largest seabird colonies in northern Britain, with many species occurring in internationally important numbers. It is also of significant importance to many migrant and vagrant species, as it is the first point of landfall for many migrants moving across both the North Sea and the Atlantic Ocean. Fair Isle has recorded a greater diversity of bird species per unit area than anywhere else in Britain and Ireland, and its remote location means that it is a key stop-over location for many passage migrants.

13.5.60 Fair Isle has been one of the JNCC's long-term monitoring sites since 1986, and bird records extend back to 1969. Considerable data is held by both the JNCC and the FIBO , which conducts regular monitoring of seabird populations on the island and keeps records of other sightings of interest. FIBO's monitoring is summarised in annual reports, which are available to download from their website (Fair Isle Bird Observatory & Guesthouse).

13.5.61 Fair Isle supports breeding colonies of Arctic Tern, Arctic Skua, Fulmar, Gannet, Guillemot, Great Skua, Kittiwake, Puffin, Razorbill and Shag, all of which are qualifying features of the

Fair Isle SPA. Other seabird species which breed on Fair Isle, but which are not included on the SPA designation, but which are protected under other legislation, include Common Gull (birds of conservation concern – hereafter BoCC - amber list), Great Black-backed Gull (BoCC – amber list), Herring Gull (Scottish Biodiversity List, BoCC – red list), Lesser Black-backed Gull (BoCC – amber list), Black Guillemot (BoCC – amber list) and European Storm Petrel (Scottish Biodiversity List, BoCC – amber list). Fair Isle also supports smaller populations of breeding coastal waterbirds, many of which are protected.Seabirds

13.5.62 Many of Fair Isle's breeding seabird populations have suffered significant declines due to sandeel failures associated with warming seas, with the total number of seabirds on Fair Isle falling from ~250,000 in the 1980s to just over 100,000 in 2002, with Kittiwakes, Arctic Skuas, Puffins, Shags and Arctic Terns showing the most rapid declines[43]. Sandeel and other fisheries may exacerbate declines, and for this reason the sustainable management of local fisheries is a primary aim of the DR MPA. Avian influenza has recently emerged as a significant threat to seabird colonies with particularly virulent strain resulting in significant mortality to breeding seabirds during the breeding seasons of 2021 and 2022. Although the losses are as yet unquantified the species most impacted include Great Skua and Gannet.

13.5.63 Following extensive declines over the past three decades, the only monitoring plot where breeding Kittiwakes are left is at Green Holms and Dog Geo in the south of the island (FIBO 2019)[39].

13.5.64 Other breeding gull species on Fair Isle include Herring Gull, with 52 Apparently Occupied Nests (AON) at Goorn and one pair at Green Holm (FIBO 2020), Lesser Black-backed Gull (five pairs at Goorn) and Great Black-backed Gull (three pairs: one each at Goorn, Dronger and Green Holm) (FIBO 2020)[37]. These locations are all 1 km or more away from North Haven Bay.

13.5.65 Arctic tern started breeding on Fair Isle in the 1980s and their numbers fluctuate greatly between years, although numbers have declined greatly since sandeel failures in the noughties. In 2020, 248 AON were recorded. Since Arctic terns are ground-nesting, creating shallow scrapes on bare ground, they are highly vulnerable to predation both from feral cats and from other avian species such as gulls and skuas. Most pairs (70-99%)[44] nest at Bu Ness, which is ~200 m away from the Proposed Development, although small colonies also intermittently occur at Busta, Rippack and South Light. These southern colonies suffer greater predation pressure from feral cats than those nesting at Bu Ness (Douglas Barr, FIBO, *pers. comm.*). Productivity is very variable between years, with total failure in years of poor prey availability.

13.5.66 Both Great and Arctic Skua occur on Fair Isle. Prior to avian influenza (see paragraph 13.5.61) Great Skua had been increasing with numbers reaching 520 pairs in 2018. Great Skuas currently nest in the area around the airstrip, Easter Lother and Eas Brecks (FIBO 2020[39]).

13.5.67 By contrast, Arctic Skua has been in decline, falling from a peak of 180 pairs in the late 1960s to just 19 pairs in 2013[45]. Whilst Great Skua is a predator of other seabirds, Arctic Skua kleptoparasitises other species (i.e. steals fish from them) and therefore when sandeel availability is poor, Arctic Skuas also suffer. On Fair Isle Arctic Skua nest in Johnny Arcus Park and Ward Hill.

13.5.68 Four species of auk breed on Fair Isle: Guillemot, Black Guillemot, Razorbill and Puffin. The most abundant auk is Guillemot. Although numbers halved due to sandeel failures, in recent

[44] Generated from data from wardens reports 2014-2020.

[44] Generated from data from wardens reports 2014-2020.

[45] Fair Isle Bird Observatory & Guesthouse

years conditions appear to be ameliorating. Guillemots are distributed around Fair Isle's coastline with monitoring plots at various locations including Dog Geo, Pietron and Kristal Kame. Black Guillemot is also distributed around Fair Isle's coastline, though in much smaller numbers. Counts of Black Guillemot are conducted along the east coast of Fair Isle from North Light to South Light. In 2019 the highest number of adults counted was 199 (FIBO 2019)[37].

13.5.69 Puffin numbers were at their highest in the late 1990s at around 23,000, falling to between 5,000-10,000 following sandeel failures, although a recent count of 17,500 (FIBO 2020[37]) are encouraging[45]

13.5.70 Razorbill have also been badly impacted by sandeel failures declining from 5,000 birds in the late 80s to just 1,920 in 2015

13.5.71 Fair Isle also supports breeding Storm Petrels, which leave and return to their burrows under the cover of darkness due to their small size and vulnerability to predation. Therefore, counting these birds is challenging and relies on call playback conducted at night. A study carried out in 2019 confirmed the presence of 60 burrows in different locations around Fair Isle although the actual number of pairs is considered likely to be in the low hundreds[46].

13.5.72 Fulmars remain the most abundant breeding seabird on Fair Isle. Whilst there were 43,000 pairs in 1996, by 2016 this had dropped to 32,061 pairs[47]. The fall in numbers observed on Fair Isle since the mid-90s may be associated with sandeel failures but could also be associated with declines in discards.

13.5.73 There are several gannetries around Fair Isle's cliffs, including Sheep Rock in the south and several along the north-west coastline between Yellow Head and Lerness (including offshore stacks). Although Gannet numbers have previously been increasing, they have been severely impacted by avian influenza at many colonies although losses from Fair Isle remain unquantified.

13.5.74 Although numbers of Shags nesting on Fair Isle have experienced significant declines, remaining nesting sites include Maver's Geo, Lericum, Easter Lother, North and South Ramnigeo, Sout Naavergill and South Gunnawark.

13.5.75 Fair Isle is also a regularly used stop-over spot for several migrant seabird species which do not breed on the island. These include Black-headed Gull (Scottish Biodiversity List, BoCC – amber list), Glaucous Gull (BoCC – amber list), Little Auk, Sooty Shearwater and Cormorant.

Coastal Waterbirds

13.5.76 In addition to seabirds, Fair Isle also supports a range of coastal waterbirds, nearly all of which are protected. Other protected bird species, such as raptors and passerines are considered within Chapter 11 Terrestrial Ecology.

13.5.77 With regards to ducks, geese and swans, the only breeding species that occur on Fair Isle are Eider and Mallard (both BoCC - amber list). Eider nest in a small colony at Stensi Geo. Mallards breed in small numbers in several locations including Da Water, the Vaadal and Kirki Mere (FIBO 2018, 2019 and 2020)[37]. Other protected ducks, geese and swan species that regularly occur as migrants[48]include Barnacle Goose, Greylag Goose, Pink-footed

[46] Stormie nights on Fair Isle | Scotland's Nature (scotlandsnature.blog)

[47] Fair Isle Bird Observatory & Guesthouse

[48] Defined as those classified as either 'common migrant' or 'frequent migrant' on the Systematic checklist of the birds of Fair Isle (see Fair Isle Bird Observatory & Guesthouse). Common migrants are defined as species with >500 records p.a., frequent migrants are species with 41-500 records p.a.

Goose, Whooper Swan, Red-breasted Merganser, Wigeon, Teal, Common Scoter, Long-tailed Duck and Whooper Swan.

13.5.78 Several wader species breed in small numbers on Fair Isle including Oystercatcher, Ringed Plover, Curlew Dunlin Snipeand Red-necked Phalarope.

13.5.79 Breeding species are joined by a range of migrants. Regularly occurring migrant species include Turnstone, Knot Ruff Sanderling Dunlin (Purple Sandpiper Common Sandpiper Green Sandpiper Red-throated Diver and Great Northern Diver.

Seabird and coastal waterbird usage of North Haven Bay and the surrounding area

13.5.80 North Haven Bay is the only sandy bay on Fair Isle, the rest of the island being cliffs and rocky shores. The bay to the south of the breakwater is shallow at 6-8 m, whilst the northern section reaches depths of 12 m. The bay is partially bisected by a breakwater, which incorporates a small offshore stack. The bay is sheltered, and as such is regularly visited by small numbers of migratory birds stopping temporarily to rest and is also used by birds to shelter from poor weather. Overall, the bay is not heavily used by breeding birds as it is an active port and subject to reasonable levels of disturbance from people and vessels (A. Penn & D. Barr, FIBO, *pers. comm.*). The ferry service operates to/from North Haven three times per week, with cranes regularly used to unload cargo. It is also visited by other yachts and leisure craft.

13.5.81 The locations of nesting birds were derived from conversations with both the current FIBO warden Alex Penn and Douglas Barr (Chairman of FIBO Trust). A map detailing the approximate number and location of nests based on the 2022 breeding season is included within the airborne noise modelling study (Appendix A.16).

13.5.82 Both the cliffs and the stack are used by nesting Fulmars, although the Fulmars do not nest on the breakwater itself. In 2022, a maximum of 40 pairs of Fulmar were estimated to be nesting on the stack. Within the rest of North Haven bay it is estimated that there are around 100 Fulmar nests on the west side and around 50 nests on the east side. The east side supports fewer birds as the cliff above the existing pier is netted. Therefore, the birds nesting on the east side of North Haven bay nest on the cliffs level with the breakwater and to the north (Alex Penn, FIBO, *pers. comm.*).

13.5.83 Routine monitoring carried out by FIBO shows that numbers of nesting Fulmar in North Haven bay are declining faster than in other locations around the rest of the island (A. Penn, FIBO*, pers.comm.*). This may be because of disturbance associated with human activity. However, overall Fulmars on Fair Isle have declined from 43,000 in 1996 to 32,061 in 2016. Therefore, suitable nesting habitat on various cliff faces around the island is available, and it is presumed that birds can redistribute if disturbed (although it is acknowledged that Fulmars are highly site faithful). However, any Fulmars nesting within North Haven Bay and the surrounding area are habituated to a reasonable level of human activity.

13.5.84 Puffins nest on the north-western edge of North Haven bay, where there are around 30-40 Apparently Occupied Burrows (AOB). They also nest on the north end of Bu Ness, just outside of the bay. There are 50-100 AOB in this area (A. Penn, FIBO, *pers. comm.*). Nearby, Puffins also nest in South Haven bay and Furse. Individuals may be sighted on occasion within the bay.

13.5.85 In terms of the other auk species, there are no Guillemots nesting either within or close to North Haven bay (A. Penn, FIBO, *pers. comm.*), although they do nest in South Haven bay (392 AON in 2015[49]). Razorbills do not nest within North Haven bay either, although they nest nearby in sheltered sea caves on the eastern side of Bu Ness. Black Guillemot also

[49] Counts undertaken as part of seabird 2000. Count data by section accessed from SRC.

nests in these caves, although dispersed and in smaller numbers. Due to the inaccessible nature of the habitat, it is difficult to know how many Razorbills and Black Guillemot utilise this area. However, 34 Razorbill nests were counted during a boat-based survey of the island between North Haven Bay and South Haven bay in 2015[50]. The number of Black Guillemots using this area is likely to be relatively small. During surveys conducted between North Haven and South Haven bay in 1999 a total of 15 adults were counted, indicating around eight pairs may use this area.

13.5.86 Furse (the bay to the west of North Haven) is an important loafing area for Guillemot, Black Guillemot, Razorbill, Puffin and Fulmar, with some rafts extending at times into the northernmost edge of North Haven Bay (D. Barr, FIBO, *pers. comm.*). However, there is very little usage of the inner area of North Haven Bay, with observations generally limited to a few birds only (A. Penn, FIBO, *pers. comm.*).

13.5.87 Although Kittiwakes have formerly nested in this area, due to the decline of this species, they are no longer present in number, although a count conducted between North Haven and South Haven in 2021 showed there to be 10 AON within this area. These birds are believed to nest within the same sheltered sea caves on the eastern side of Bu Ness used by Razorbill and Black Guillemot (A. Penn, FIBO, *pers. comm.*).

13.5.88 Shag also breeds nearby, with 28 AON in Maver's Geo in 2020 (located 300-400m from North Haven Bay). However, no birds breed within the bay itself.

13.5.89 Although Arctic Terns do not nest within North Haven Bay, the colony at Bu Ness is relatively close at ~150m away from North Haven and in 2020 numbered 247 AON. Although Bu Ness is relatively close to North Haven, it does not experience the same level of human activity and is primarily visited by birdwatchers (D. Barr, FIBO, *pers. comm.*). Arctic Terns show some level of aggression if approached directly by people but show very little if no change to foraging when people are present on shorelines. The Bu Ness colony itself is relatively dispersed with birds nesting within the square enclosure, but also to the south and east. After breeding, individuals may rest on undisturbed beaches around the island. Small numbers of birds are occasionally observed foraging within North Haven bay.

13.5.90 Oystercatcher and Ringed Plover [Redacted] Although the exact number of nests is not known, they occur in relatively small numbers (<30 Oystercatcher nests and <20 Ringed Plover nests). Ringed plovers are often observed foraging along the tide line at North Haven Bay (D. Barr, FIBO, *pers. comm.*), as are Oystercatcher, Turnstone, and Redshank, although the latter two species do not breed on Fair Isle. However, numbers of foraging waders generally are low, numbering just tens of birds. During passage period the bay is a stop-over spot for Dunlin, Sanderling and Purple Sandpiper. However, these species do not stay in the area for any significant length of time. Later in the autumn Great Northern Divers often appear in the bay, though their appearance is unpredictable and short-lived (D. Barr & A.Penn, FIBO, *pers. comm.*).

Seabird and coastal waterbird populations directly overlapping the proposed development footprint

13.5.91 The Proposed Development footprint (as described in Section 2.2) can be loosely defined as the area occupied by the noust, the extended quay and breakwater, and the site of the new linkspan. It also includes the area that would require dredging to ensure the replacement ferry is able to access the new pier and linkspan.

13.5.92 Of the species described above, the only species using the bay for nesting that overlaps directly with the proposed development footprint is Fulmar, which nests on the stack in the middle of the breakwater and on the adjacent cliffs. Based on counts from 2022, there are

[50] Counts undertaken as part of seabird 2000. Count data by section accessed from SRC.

~40 pairs of Fulmar nesting on the stack. Fulmars have an extended breeding period which lasts from mid-April to mid-September[51] . The first eggs are usually seen between 15-20h May (FIBO 2018, 2019), with the first fledged juveniles typically sighted around 20 August (FIBO, 2018, 2019). For the first 10-15 days the chicks will always be attended by an adult. It is during this period that they are most vulnerable to exposure should adults be displaced. After this period, the adults will both undertake foraging trips leaving the chick unattended.

13.5.93 Although Fulmars are the only breeding species that directly overlaps with the Proposed Development footprint, other species including Arctic Tern, Puffin, Guillemot, Black Guillemot, and Razorbill may use the bay for foraging and/or loafing. However, as mentioned above, North Haven is less well-used than Furse, the next bay to the west, with birds only occurring in North Haven bay in small numbers.

13.5.94 Ringed Plovers and Oystercatchers breeding [Redacted] are regularly observed foraging within the tideline. Although this area itself is not under development, it is possible that these species could be deterred by noise, and other construction related impacts.

13.5.95 Other species, including migratory birds such as Great Northern Diver, Dunlin, Sanderling and Purple Sandpiper, are known to use the bay on occasion to shelter from poor weather. However, their appearance is temporary and unpredictable. Therefore, they are not considered specifically in assessment.

13.5.96 The bird species that will be considered within the assessment of likely effects are shown in Table 13-10.

Table 13-10: Avian species present in North Haven and around North Haven Bay that will be considered in assessment

Species	Status on Fair Isle	Occurrence within North Haven Bay	Potential overlap with development footprint	Use of North Haven bay
Fulmar	Resident and common migrant	Breeds on stack (~40 AON) and adjacent cliffs in bay (150 AON). Individuals frequently observed loafing within bay	Nests on stack overlapping with development footprint, nests on adjacent cliffs range from a few meters - ~150m from development footprint	Nesting (cliffs, stack), loafing (bay)
Arctic Tern	Frequent summer visitor, breeding in small numbers	Small numbers observed foraging within bay from Bu Ness colony (247 AON) ~120-150m away from works area	Individuals/small groups foraging in the bay may overlap with the development footprint	Foraging (bay)
Puffin	Common summer visitor, breeds in large numbers	Small numbers observed loafing in bay, nearby nesting areas 100~ m away (30-40 AOB) and ~250m away (50-100 AOB)	Individuals/small groups loafing within bay may overlap with the development footprint	Loafing (bay)
Guillemot	Common summer visitor, breeds	Small numbers observed loafing in bay, nearest nesting	Individuals/small groups loafing within bay may overlap	Loafing (bay)

[51] A303080 - Bird Breeding Season Dates in Scotland.pdf (nature.scot)

Species	Status on Fair Isle	Occurrence within North Haven Bay	Potential overlap with development footprint	Use of North Haven bay
	in large numbers	area ~250m away at South Haven Bay (392 AOB)	with the development footprint	
Black Guillemot	Resident, breeds in moderate numbers	Small numbers observed loafing in bay, ~8 pairs thought to nest ~300m away in Bu Ness	Individuals/small groups loafing within bay may overlap with the development footprint	Loafing (bay)
Razorbill	Common summer visitor, breeds in large numbers	Small numbers observed loafing in bay, nearest nesting area ~300m away in Bu Ness (34 AON)	Individuals/small groups loafing within bay may overlap with the development footprint bay	Loafing (bay)
Kittiwake	Common passage migrant, breeds in moderate numbers	Nearest nesting area ~300m away in Bu Ness (~10 AON)	Included based on proximity of nesting area to bay	May occasionally occur
Ringed Plover	Frequent spring and autumn migrant, breeds in small numbers	Small numbers of birds regularly forage along tideline, [Redacted]	Tideline is ~120m from works area	Foraging (tideline)
Oystercatcher	Frequent spring and autumn migrant, breeds in small numbers	Small numbers of birds regularly forage along tideline, nearest nests (<30) are in Bu Ness ~200-300m away	Tideline is ~120m from works area	Foraging (tideline)

Baseline Evolution

13.5.97 If the proposed development were not to take place, nature conservation and marine ecology receptors, namely protected sites, benthic ecology, fish and shellfish, marine mammals, seabirds and coastal waterbirds, will continue to be influenced by natural and human-induced variability, ongoing cyclic patterns and trends. The future baseline will also be influenced by climate change, ocean acidification and increases in non-native species. These could lead to changes in distribution, abundance, health and reproduction in marine species, potentially affecting future populations.

13.6 Embedded Mitigation

13.6.1 A range of good/standard practice and management measures will be adopted by the successful contractor to minimise the potential for environmental effects and any disruption that could be caused by the construction works. These will include:

- The site supervisor will give toolbox talks prior to work commencing. These talks will highlight any sensitive features, including the designated sites (SPA, Special Area of Conservation (SAC) and SSSI) and qualifying features.
- In line with standard good practice, the contractor will follow the updated and relevant Guidance for Pollution Prevention (GPPs) including GPP 5 (Works and maintenance in or near water). Pollution Prevention Guidance (PPGs) will be followed if no corresponding GPP is available.
- Oils, fuels and chemicals will be stored in fully bunded areas.
- Spill kits will be available on site and workers trained in their use.
- The contractor will produce a contingency plan for dealing with spills or environmental incidents.
- Any waste generated will be removed from site and either recycled or disposed of in compliance with Waste Management Regulations.
- The successful Contractor will ensure vessels and plant involved in the operational activities for the works adhere to the industry recommended guidelines for preventing the introduction of Invasive Non-Native Species (INNS).
- Prior to and during construction activities, appropriate staff will be informed of relevant marine and terrestrial INNS and will follow the procedures established within the BMP. These staff will also be cognisant of guidance produced by NatureScot for the prevention of introduction of non-native species (Cook *et al.*, 2014) and draft guidance on biosecurity for the Outer Islands (RSPB, 2021).
- The Contractor will produce a Ballast Water Management Plan (if relevant) to prevent the risk of introducing invasive non-native species into Fair Isle.
- Prior to use, all equipment will be washed and cleaned to ensure that no contaminants are brought into contact with the marine or terrestrial environment.
- Vehicle numbers and movement on the vegetation will be kept to a minimum.
- Vessels used for the works will adhere to the general principles in the Scottish Marine Wildlife Watching Code.
- The Contractor will contact the Fair Isle warden prior to works commencing in each year and inform the warden once works have finished in each year.
- The Contractor will ensure a suitably qualified Environmental Clerk of Works (EcOW) is present during the construction phase in both years (2024 and 2025) to ensure compliance with the good practice and management measures outlined above.
- The EcOW will be on site at all times during both years to ensure that Fulmar nests are not damaged by construction work, specifically the placement of rock armour around the breakwater. They will also monitor the impact of the works on nearby breeding birds (primarily Fulmar, but also Puffin) to establish whether there are any detectable responses of the birds to the different construction activities to inform future work in the area. The EcoW will also liaise with the FIBO warden to ensure that the Arctic Tern colony is not negatively impacted.

13.7 Assessment of Likely Effects

13.7.1 This section identifies the potential likely effects on marine ecology receptors as a result of the construction and subsequent operation of the Proposed Development.

13.7.2 The marine geomorphology assessment and water and sediment quality assessment (Chapter 12), and underwater noise assessment (Appendix A.15), and airborne noise assessment (Appendix A.16) have informed the outcomes of the marine ecology assessment.

13.7.3 Potential impacts on features of Protected Sites (SACs, SPAs and Ramsar sites) have also been assessed within the HRA which has been submitted as part of the Planning Application.

13.7.4 Based on an understanding of the nature and scale of the proposed development, together with the environmental baseline and stakeholder comments from the Scoping Opinion, the potential effects during the construction and operational phase that are considered to be potentially relevant are reviewed in Table 13.11 and Table 13.12, respectively. This includes the rationale for scoping in or out individual pathways for further assessment.

Table 13-11: Potential effects during construction scoped in and out of further detailed assessment

Receptor	Impact pathway/ potential effect during construction	Included in assessment (Yes/No)	Justification
Benthic habitats and species	Changes to benthic habitats and species during construction	Yes	Dredging causes the direct physical removal of marine sediments from the dredge footprint, resulting in the modification of existing marine habitats. The fauna associated with the dredged material is damaged, killed or relocated to a disposal site. Capital dredging of the berth, dredged material disposal (if required) and some construction methods (such as rock placement)) also have the potential to result in localised physical disturbance and smothering of seabed habitats and species (where the sediment settles out of suspension back onto the seabed). This potential impact is, therefore, scoped into the EIAR.
	Indirect effects from changes in water quality and sediment quality during construction	Yes	Changes in water quality during capital dredging, dredged material disposal and construction activities (such as ground preparation of the seabed prior to installation of pre-cast concrete blocks) could potentially impact benthic habitats and species, by increasing SSCs and releasing any sediment bound contaminants. This potential impact is, therefore, scoped into the EIAR.
	Introduction and spread of non-native species	Yes	Non-native species have the potential to be transported as a result of construction activity. In addition, the extension of the pier would introduce a new surface in the marine environment which has the potential to facilitate the colonisation, establishment and spread of invasive non-native species. This will require further assessment and has therefore been scoped into the EIAR.
	Indirect impacts from release of contaminants in the water from accidental spillages	No	The proposed works will not directly introduce contaminants to the marine environment and good practice measures will be used to localise and mitigate the potential for accidental spillages during dredging and disposal. The potential risk of spillages will be sufficiently reduced through the application of environmental best practice management measures. This impact pathway has, therefore, been scoped out of further assessment.
Fish and shellfish	Indirect effects from changes in water quality and sediment quality during construction	Yes	Changes in water quality during capital dredging, dredged material disposal and construction activities (such as ground preparation of the seabed prior to installation of pre-cast concrete blocks) could potentially impact fish species, by increasing SSCs and releasing any sediment bound contaminants. This potential impact is, therefore, scoped into the EIAR.
	Underwater noise and vibration disturbance	Yes	Construction activities have the potential to result in underwater noise disturbance to fish. Currently it is not considered that piling will be required. However, preparation of the seabed, prior to installation of concrete blocks, will generate underwater noise and vibration. Underwater noise can cause injury effects in fish species at close range and behavioural reactions at greater distances. Other underwater noise sources during construction include dredging activity and vessel movements, which may result in behavioural effects. This potential impact is, therefore, scoped into the EIAR for further consideration.

Receptor	Impact pathway/ potential effect during construction	Included in assessment (Yes/No)	Justification
	Indirect impacts from release of contaminants in the water from accidental spillages	No	The proposed works will not directly introduce contaminants to the marine environment and good practice measures will be used to localise and mitigate the potential for accidental spillages during dredging and disposal. The potential risk of spillages will be sufficiently reduced through the application of environmental best practice management measures. This impact pathway has, therefore, been scoped out of further assessment.
Marine mammals	Underwater noise and vibration disturbance	Yes	Construction activities have the potential to result in underwater noise disturbance to marine mammals. Currently it is not considered that piling will be required. However, preparation of the seabed, prior to installation of concrete blocks, will generate underwater noise and vibration. Underwater noise can cause injury effects in marine mammal species at close range and behavioural reactions at greater distances. Other underwater noise sources during construction include dredging activity and vessel movements, which may result in behavioural effects. This potential impact is, therefore, scoped into the EIAR for further consideration.
	Airborne noise and visual disturbance	Yes	Construction activities have the potential to result in noise and visual disturbance to seals (hauled out). This potential impact is, therefore, scoped into the EIAR for further consideration
	Increased risk of vessel collision	No	The scale of the works and requirements for vessels (including dredgers) will be minimal and highly localised to the area around the existing pier. Considering the negligible increase in vessel traffic during construction, this impact pathway has been scoped out.
Seabirds & Coastal Waterbirds	Airborne noise and visual disturbance	Yes	Construction activities have the potential to result in noise and visual disturbance to seabird and coastal waterbirds. This potential impact is, therefore, scoped into the EIAR for further consideration.
	Underwater noise disturbance	Yes	Diving birds (e.g. Terns) have the potential to be disturbed by underwater noise during construction activities. This potential impact is, therefore, scoped into the EIAR for further consideration.
	Introduction of mammalian predators	Yes	There is a risk of introducing mammalian predators (i.e. rats) through the movement of vessels and importing of materials during construction. As Fair Isle is presently rat free any introduction could impact on existing bird populations. This potential impact is, therefore, scoped into the EIAR for further consideration
	Changes in bird foraging habitat during construction	Yes	This impact pathway was originally scoped out based on the following justification (see Scoping Report, Appendix A.2). During the dredging activity and construction of the pier extension, birds will be prevented from foraging from a highly localised area of water within the inner bay (south of the breakwater). The relatively exposed nature of the bay to wave action and the coarse sediments are unlikely to support significant prey (fish). Disturbance of coarse sediments will be highly temporary with rapid settling occurring. The dredging campaign will be very short term in nature and considering the extensive area of more suitable foraging areas available to seabirds would not result in a significant adverse effect on these birds. Similarly, there will not be a significant effect from construction activities on birds that forage on the

Receptor	Impact pathway/ potential effect during construction	Included in assessment (Yes/No)	Justification
			small intertidal area to the south of the bay. Any suspension of sediment will be very limited in duration due to the predominantly coarse substrata. However, MSS in their scoping opinion requested for this pathway to be considered further in the assessment and therefore this pathway has been scoped in.

Table 13-12: Potential effects during operation scoped in and out of further detailed assessment

Receptor	Impact pathway/ potential effect during operation	Included in assessment (Yes/No)	Justification
Benthic habitats and species	Direct loss of benthic habitat	Yes	While direct loss of seabed habitat is anticipated to be minimal, some loss of intertidal and subtidal habitat will occur through the footprint of the pier extension and the addition of rock armouring. This potential impact is, therefore, scoped into the EIAR for further consideration.
	Changes to benthic habitats and species due to maintenance dredging	Yes	It is anticipated that maintenance dredging in the operation phase, if required at all, would be minimal in frequency and magnitude. This potential impact is, therefore, scoped into the EIAR for further consideration.
	Indirect changes to benthic habitat as a result of changes to wave reflection	Yes	The proposed upgrade to the existing breakwater may result in additional wave reflection back out to the mouth of the bay. This may cause changes to sea cave habitats, specifically the cave closest to the breakwater on the eastern side of the bay. This potential impact is, therefore, scoped into the EIAR for further consideration.
	Indirect changes to benthic habitats and species during operation	No	The highly localised changes to hydrodynamics and sediment transport (see Marine Geomorphology assessment, Chapter 12) as a result of the proposal are unlikely to be discernible against background natural processes and would not lead to any meaningful changes in erosion or accretion. Therefore, this pathway has been scoped out of the EIAR.
	Indirect impacts from release of contaminants in the water from accidental spillages	No	Operations will not directly introduce contaminants to the marine environment and standard good practice measures will be used to localise and mitigate the potential for accidental spillages during the operational phase of the Proposed Development. The potential risk of spillages will be sufficiently reduced through the application of environmental best practice management measures. This impact pathway has, therefore, been scoped out of further assessment.

Receptor	Impact pathway/ potential effect during operation	Included in assessment (Yes/No)	Justification
	Indirect impacts from changes to water quality and sediment quality	No	The highly localised changes to hydrodynamic processes (see Geomorphology section) will not result in significant changes to water or sediment quality, therefore this impact pathway has been scoped out.
Fish and shellfish	Changes in habitat for fish	No	The pier extension and dredge footprint is considered unlikely to provide important nursery or spawning functions for fish species as a result of the disturbed and exposed nature of this habitat. The current rock armouring does not contain a supporting core and regularly experiences waves/swells which pass through the existing rock armour. Thus, the rock armour is unlikely to provide important nursery or spawning functions for fish species. In addition, the proposed pier extension and associated dredging footprint constitutes a minimal area of the known ranges of local fish populations. These species will easily be able to move away from the affected area and return following the cessation of dredging activity. On this basis, this pathway has been scoped out of the EIAR.
	Indirect impacts from release of contaminants in the water from accidental spillages	No	Operations will not directly introduce contaminants to the marine environment and standard good practice measures will be used to localise and mitigate the potential for accidental spillages during the operational phase of the Proposed Development. The potential risk of spillages will be localised and mitigated through the application of environmental best practice management measures. This impact pathway has, therefore, been scoped out of further assessment.
	Indirect impacts from changes to water quality and sediment quality	No	The highly localised changes to hydrodynamic processes (see Geomorphology section) will not result in significant changes to water or sediment quality, therefore this impact pathway has been scoped out.
Marine mammals	Changes in habitat for marine mammals	No	In addition, the proposed pier extension and associated dredging footprint constitutes a minimal area of the known ranges of local marine mammal populations. Marine mammal species will easily be able to move away from the affected area and return following the cessation of dredging activity. On this basis, this pathway has been scoped out of the EIAR.
	Collision risk to marine mammals	No	Ferry operation will not vary significantly from baseline operation. Hence, this impact pathway has been scoped out.
Seabirds & Coastal Waterbirds	Changes in bird foraging habitat during operation	Yes	MSS in their scoping opinion requested for this pathway to be considered further in the assessment and therefore this pathway has been scoped in.

Receptor	Impact pathway/ potential effect during operation	Included in assessment (Yes/No)	Justification
All receptors	Potential effects as a result of vessel operations	No	The proposal is an extension of the jetty and replacement of the ferry. It is not anticipated that the scale of ferry operations will change to a level that would have a significant bearing on marine ecology features as compared with baseline operations. Therefore, potential impacts on marine ecology as a result of vessel movements (such as collision risk, underwater noise, seabed disturbance, visual disturbance, airborne noise, pollution effects and the introduction of non-native species) is predicted to be the same as baseline. On this basis, this pathway has been scoped out of the EIAR.

Benthic habitats and species

13.7.5 This section assesses the potential for impacts on benthic ecology receptors as a result of the proposed development during construction and operation. The following impact pathways have been assessed:

Construction

- Changes to benthic habitats and species as a result of removal of seabed material during dredging operations;
- Changes to benthic habitats and species as a result of sediment deposition during dredging and disposal operations;
- Indirect effects from changes in water quality and sediment quality; and
- Introduction and spread of non-native species.

Operation

- Direct loss of benthic habitat;
- Changes to benthic habitats and species due to maintenance dredging; and
- Indirect changes to benthic habitat as a result of changes to wave reflection.

Construction

Changes to benthic habitats and species as a result of removal of seabed material during dredging operations

General scientific context

13.7.6 Capital dredging causes a direct physical removal of subtidal sediments, causing a modification to the existing subtidal habitat. The impacts to benthic fauna associated with the dredged material include changes to abundance and distribution through damage or mortality.

13.7.7 The speed of recovery of the temporarily disturbed areas is dependent on the scale and timing of the disturbance, the life histories of species and the stability and diversity of the benthic community present. For example, while the opportunistic polychaete *Capitella* spp. is vulnerable to substrate removal, the species is considered to have a high recoverability due to many reproductions per year, high recruitment and high death rates (Tillin, 2016). Similarly, the polychaete *Arenicola marina* is thought to recover rapidly due to high fecundity and synchronous spawning within a given area (Tyler-Walters and Garrard, 2019). Furthermore, a regularly disturbed sedimentary habitat with a low diversity benthic assemblage is likely to recover more quickly (i.e. return to its disturbed or 'environmentally-stressed' baseline condition) than a stable habitat with a pre-existing mature and diverse assemblage (Johnson *et al.*, 2017).

13.7.8 In general, where studies have been undertaken to understand the effects of physical disturbance, they have shown recolonisation of deposited sediments by benthic species to be quite rapid. Sites are initially colonised by short lived, fast growing, opportunistic species ('r-selected') that are tolerant of high levels of disturbance; infaunal species dominate, particularly polychaetes worms. In time, these are succeeded by longer lived, slower growing species with a lower tolerance for disturbance (Tillin *et al.*, 2011). Rates of recovery reported in reviewed literature suggest that a recovery time of six to 24 months is characteristic of many mobile sands where frequent disturbance of the deposits precludes the establishment of long-lived communities (Tillin *et al.*, 2019). Specific to the *Arenicola marina* in infralittoral fine sand or muddy sand biotope found in the study area, recovery from physical disturbance is reported to be rapid and directly related to recovery of the *Arenicola*

marina population. However, should a population be severely reduced it may take some time (2-10 years) for recolonization to occur from other populations especially if it is isolated with limited possibility of recolonisation from surrounding areas (Tyler-Walters and Garrard, 2019).

Project impact assessment

13.7.9 There are two elements to dredging operations during the construction phase; navigational and construction dredging.

13.7.10 Construction dredging will be required for the new quay structures and linkspan support structures. This area will be lost under the footprint of the new structures (and not available to be recolonised and recover unlike the navigational dredge areas) and as such this impact is assessed under operational impacts of the development (see paragraphs 13.7.55 to 13.7.65). Not all of the area dredged for the linkspan structures will be actually covered by the structures and therefore the area that will remain uncovered has been included in the assessment below.

13.7.11 Navigational dredging will be required to a sufficient water depth for the new vessel around the proposed pier extension and linkspan. Navigational dredging will also be required in the approach to the new slipway to accommodate the increased size of the new vessel. The navigational dredge areas will need to be dredged to a maximum depth of - 4.5 m CD; the maintained dredge level is - 4.0 m CD.

13.7.12 The dredging method has been determined from the results of the Ground Investigation. It is anticipated that a backhoe excavator will likely be used to dredge the sediment within the dredge pockets. If rock is present within the dredge pockets, rock breaking and 'ripping' below water will be achieved using a large barge-mounted excavator.

13.7.13 A maximum volume of 2,730 m^3 of soft and rock material is anticipated to be dredged. The dredging (navigational area and linkspan area which will not be covered by the supporting structure) will result in changes to approximately 0.2 ha of subtidal habitat as a direct result of the physical removal of subtidal sediment. These habitat changes are assessed in this section.

13.7.14 Following the capital dredge, the dredge pockets will provide a similar habitat to that occurring under pre-dredge conditions which would then be expected to be recolonised by a similar assemblage to the baseline environment.

13.7.15 Recolonisation of the benthic habitat is expected to occur over a relatively short period of time based on an understanding of the benthic community present in the area and the life history strategies of the species. The project-specific subtidal survey (see paragraphs 13.5.22 to 13.5.25 and Appendix A.14) recorded a moderately diverse benthic community characterised by relatively high numbers of the polychaetes *M. vulgaris*, *Capitella* spp. and *S. martinensis*; nematodes; and the amphipods *D. thea*, *B. pelagica*, *P. longimanus* and *N. guttatus*. These characterising taxa dominated the assemblage and contributed almost entirely to the total abundances of organisms recorded at the two sites. Even though the polychaete *Arenicola marina* was not recorded in the grab samples, drop down video footage showed this species to be abundant in the inner bay.

13.7.16 Amphipods of the genus *Bathyporeia* are short-lived, reaching sexual maturity within 6 months. Adult amphipods are highly mobile in the water column and recolonization by the adults is likely to be a significant recovery pathway. The life-history traits of rapid sexual maturation and production of multiple broods annually support rapid local recolonization of disturbed sediments where some of the adult population remains (Ashley, 2016). Similarly, polychaetes of the genus *Spio* are short-lived with a life-span of about 1 year. Sexual maturity is achieved at 2-3 months. The dispersal potential is high, and the relatively short

generation time and rapid growth rate suggests that recoverability is high and restoration of the biomass is achieved soon after settlement (Marine Ecology Surveys Ltd, 2008).

13.7.17 These species are typically fast growing and/or have rapid reproductive rates which allow populations to fully re-establish in typically less than 1 to 2 years and for some species within a few months (Ashley, 2016; Tillin, 2016; Tyler-Walters and Garrard, 2019). Additionally, the surrounding area supports similar habitats and species and therefore recolonisation of the dredge footprint is expected to occur relatively quickly. All the species recorded are also considered commonly occurring and not protected.

13.7.18 Based on the evidence provided, the magnitude of the change to the subtidal habitats and associated benthic species is considered to be small. Therefore, while the probability of occurrence is high, the overall exposure to this impact is assessed as low for subtidal habitats. The sensitivity of subtidal habitats to seabed disturbance within the dredge footprint is considered to be low given the high recoverability rates. Subtidal species in the area are commonly occurring and of low conservation concern with no designated or protected features present. Importance is, therefore, considered to be low. Overall, the potential effect is assessed as **negligible** and not significant for subtidal habitats.

Changes to benthic habitats and species as a result of sediment deposition during dredging and disposal operations

General scientific context

13.7.19 Sediment suspended and dispersed during dredging has the potential to resettle over the seabed. This potential blanketing or smothering of benthic species may cause stress, reduced rates of growth or reproduction and in the worst cases the effects may be fatal (Pineda *et al.*, 2017; Bolam *et al.*, 2016).

13.7.20 Habitats within coastal environments experience highly fluctuating conditions including the resuspension and deposition of sediments on a daily basis (through tidal action), lunar cycles (due to the differing influences of spring and neap tides) and on a seasonal basis (due to storm activity and conditions of extreme waves). Subtidal and intertidal habitats are, therefore, characterised by such perturbations and the biological communities of these environments are well adapted to survival under fluctuating conditions.

13.7.21 If the amount of sediment deposited is too great to allow species to survive burial, then recovery occurs via re-colonisation and/or migration to the new sediment surface (Bolam *et al.*, 2006a; 2006b). In general, the rate of recovery is dependent upon just how stable and diverse the assemblage was in the first place. A regularly disturbed sedimentary habitat with a low diversity benthic assemblage is likely to recover more quickly (i.e. return to its disturbed or 'environmentally-stressed' baseline condition) than a stable habitat with a pre-existing mature and diverse assemblage. Furthermore, in cases where the quantity and type of sediment deposited does not differ greatly from natural sedimentation, e.g. it is of similar particle size, the effects are likely to be relatively small as many of the species are capable of migrating up through the deposited sediments (Budd, 2004).

13.7.22 The Marine Evidence based Sensitivity Assessment (MarESA) approach (Tyler-Walters *et al.*, 2018) found that benthic communities in both sandy and muddy sediments are typically considered to be tolerant to the deposition of up to 5 cm of fine material in a single event with burrowing species considered able to relocate to preferred depths through this level of deposition. Deposition of greater depths of fine sediment could result in some mortality although evidence suggests that some characterising species are likely to be able to reposition. Bivalve and polychaete species have been reported to migrate through depositions of sediment greater than 30 cm (De-Bastos, 2016a; De-Bastos, 2016b; Ashley, 2016; Tillin, 2016). A previous review by the University of Hull also concluded that benthic invertebrates in sediments are able to adapt and readjust if sediment laid is placed as thin

veneers over several days although they can also tolerate moderate amounts (20 cm) of material being deposited at one time (IECS, 2001).

Project impact assessment

Capital dredging

13.7.23 Sediment deposition changes that are predicted to occur as a result of the capital dredging and dredge disposal are considered in more detail in the physical processes assessment (Chapter 12). In summary, sedimentation after the completion of dredging is predicted to typically be less than 0.04 m (4 cm) and is predicted only to occur close to the dredge footprint. Overall, excess sedimentation (assuming all dredge volume is soft sediments) of up to 1 mm is predicted to only extend approximately 50 m from the dredge pocket and will be limited to the south and directly to the west of the breakwater (see Figure 12-7).

13.7.24 The majority of habitat located in close proximity to the proposed dredge footprint within the inner bay consists of infralittoral muddy sand and the biotope *Arenicola marina* in infralittoral fine sand or muddy sand. Polychaetes (*M. vulgaris*, *Capitella* spp. and *S. martinensis*) and nematodes were abundant in the study area along with moderate numbers of amphipod crustaceans (*D. thea*, *N. guttatus*, *B. pelagica* and *P. longimanus*).

13.7.25 The burrowing infaunal species present in the study area are considered tolerant to some sediment deposition (e.g. *Arenicola marina*, *Spio* spp.) or can recover quickly and therefore their sensitivity to sediment deposition is considered to be low (e.g. *Capitella* spp.) (Tyler-Walters, 2008; Tillin, 2018). The predicted millimetric changes in deposition are negligible and therefore, considered unlikely to cause smothering effects as described in the scientific review above. In addition, the species recorded in the benthic invertebrate surveys are fast growing and/or have rapid reproductive rates which allow populations to typically rapidly recolonise disturbed habitats, many within a few months following the disturbance events (Ashley, 2016; Marine Ecology Surveys Ltd, 2008; Tillin, 2016; Tyler-Walters and Garrard, 2019).

13.7.26 Deposition of sediment as a result of dredging will be highly localised and similar to background variability. Magnitude of change is, therefore, assessed as negligible. Probability of occurrence is high and, thus, the overall exposure to change is negligible. Based on the evidence provided above, sensitivity of intertidal and subtidal habitats within the vicinity of the proposed works to increased smothering is considered to be low given that these species are well adapted to survival under fluctuating sediment conditions and have high recoverability rates. Vulnerability is, therefore, assessed as none. Subtidal species in the area predicted to be affected by increased sediment deposition are considered to be commonly occurring and of low conservation concern. Importance is, therefore, considered to be low. Taking all these considerations into account, the overall potential impact of deposition during dredging on benthic features is assessed as **negligible** and not significant.

Dredge disposal

13.7.27 It is assumed that all 2,730 m³ of the dredged material, both sediment and rock, will be disposed of at the Scalloway licensed disposal site. This disposal site is located approximately 38 km from the Site. The water depth is 62 m and the site covers an area of approximately 3.1 ha[52], i.e. approximately 15 times the size of the dredge footprint. Two scenarios are considered below, where all dredged material comprises either: 1) sediment or 2) rock.

13.7.28 The scenario where all dredged material comprises sediment has the highest potential for effects from sediment dispersal on benthic habitats and species outside the disposal site.

[52] www.gov.scot.xlsx (live.com)

However, due to the predominantly coarse nature of the material to be dredged (medium to fine sand), sediment will quickly settle out of suspension within the boundaries of the disposal site with the spatial extent of any plume likely to be constrained to within a few hundred metres of the disposal site (see 12.7.14). The small dredge volume is unlikely to result in significant sediment deposition within the disposal site or within the extent of any sediment plume. Considering the water depth at the disposal site and its exposed nature, sediment deposition in the wider area surrounding the disposal site is expected to be minimal. Consideration is also given to any cumulative effects from disposal of dredge material arising from the Grutness dredging operations. The maximum dredge volume arising from the Grutness proposed works is approximately 16,500 m^3; this is a relatively small volume and when considered alongside the maximum dredge volume arising from the Fair Isle proposed works (2,730 m^3) it is unlikely to change the above conclusions.

13.7.29 The scenario where all dredged material comprises rock has the highest potential for effects from physical changes to the substrata at the disposal site. Disposed rock will fall through the water column directly onto the seabed at the location it is disposed. Considering the relatively small dredge volume of rock (even cumulatively alongside dredged rock from Grutness) it will result in a mosaic of rock and sediment within the footprint of the disposal site. This will result in some habitat loss under the footprint of the disposed rock. However, as a historic and open disposal site it is considered that any habitats therein will not be of high value. Therefore, the small area of habitat loss at the disposal site under the disposed rock footprint is considered to be **negligible** and not significant.

13.7.30 In both scenarios, it is considered unlikely that there will be any significant bathymetric changes at the disposal site due to the small volume of the dredge material and the considerable depth at the disposal site (see paragraphs 12.7.16 to 12.7.17). If dredged rock from both Grutness and Fair Isle was to equally cover the whole area of the disposal site this would result in a reduction in water depth by approximately <1%, which is negligible when considering the existing water depth of 62 m (see paragraphs 12.7.16 to 12.7.17). In reality, it is unlikely that the dredged rock material will be distributed equally over the disposal site, but it is also unlikely that all of the dredged material will comprise rock, with the maximum rock volume from both sites combined estimated to be no more than 10,000 m^3.

13.7.31 The subtidal habitats and species within the disposal site have been subject to changes brought about by ongoing disposal activities. These benthic communities, therefore, will be tolerant to sediment deposition and capable of rapid recoverability. On this basis, any effects from sediment deposition at the disposal site are considered to be temporary and short term. Any habitat loss under the disposed rock is also considered negligible, when taking into account the likely low value of the existing habitats within the disposal site and their widespread occurrence in the surrounding area.

13.7.32 The magnitude of the change from sediment deposition as a result of dredge disposal is considered to be negligible in the context of background variability. Probability of occurrence is high and the overall exposure is, therefore, negligible. Given that habitats and species within and around the disposal site are likely to be well adapted to disturbed conditions with high recoverability rates, sensitivity is considered to be low and thus vulnerability is considered to be none. Importance is, therefore, considered to be low. The overall potential impact of sediment deposition as a result of dredge disposal on benthic features at the disposal site is assessed as **negligible** and not significant.

Changes in water and sediment quality during capital dredging, seabed preparation and dredge disposal

General scientific context

Elevated suspended sediment concentrations

13.7.33 Dredging and disposal activities and construction activities such as seabed preparation result in the suspension of disturbed sediment (Newell *et al.*, 1998).

13.7.34 Greater energetic costs for benthic species could occur as a result of higher particle loads due to elevated suspended sediments stimulating the secretion of mucus to protect branchial or feeding structures of filter feeding organisms (Perry, 2016). Suspended sediment concentrations have been found to have a negative linear relationship with sub-surface light attenuation. Light availability and water turbidity are principal factors in determining depth range at which kelp and other algae are recorded. In addition, certain mobile epistrate feeders (such as the amphipod *Bathyporeia* spp.) feed on diatoms within the sand grains and an increase in suspended solids that consequently reduces light penetration could alter food supply (Tillin *et al.*, 2019). However, longer-term changes in turbidity levels rather than temporary elevations are likely to be required to elicit any measurable changes in these species.

13.7.35 Elevated suspended sediment levels can also cause increased scouring and damage of epifaunal species due to the potentially abrasive action of the suspended sediment in flowing water.

13.7.36 Increased suspended sediments may favour the development of suspension feeders such as bivalves over other species. However, it should be noted that many benthic invertebrates can switch feeding modes depending on environmental conditions. The negative effects of suspended sediment may be particularly important during larval settlement in spring, with settling stages potentially being more sensitive to effects such as scour. However, this is generally thought to be of less concern where fauna are adapted to naturally high levels of suspended sediments (Boyd *et al.*, 2004).

Dissolved oxygen

13.7.37 The resuspension of sediments containing organic material can cause oxygen depletion within the water column and the subsequent settling of this organic rich sediment can deplete sediment oxygen levels, potentially affecting benthic species. Reductions in dissolved oxygen from suspended sediments as a result of dredging are generally considered to be minimal and short-lived.

Release of contaminants

13.7.38 Benthic habitats and species are sensitive to toxic contamination (where concentrations of contaminants exceed sensitivity thresholds). Toxic contamination during construction can occur as a result of the release of synthetic contaminants such as fuels and oils or through the resuspension of sediment as a result of the disturbance of the seabed, which can lead to the release and mobilisation of sediment-bound contaminants into the water column. These include both toxic contaminants, such as heavy metals, pesticides and hydrocarbons, and non-toxic contaminants, such as nutrients. In particular, there is a risk that any uncontrolled releases of materials or sediments into the water column could make contaminants temporarily available for uptake by marine organisms. Over the longer-term any such releases could also become stored in the surface sediments of benthic habitats for future benthic uptake.

13.7.39 Suspension-feeding organisms may be particularly vulnerable to pollutants in the water column due to their dependence on filtration (Tillin *et al.*, 2019). Sub-lethal effects of chemical contamination on marine invertebrates can reduce the fitness of individual species. Lethal effects may allow a shift in community composition to one dominated by pollution-tolerant species such as oligochaete worms (Elliott *et al.,* 1998). A reduction in community species richness is associated with elevated levels of pollutants. Contamination with PAHs, for example, leads to high levels of mortality in amphipod and shrimp species, and decreased benthic diversity (Long *et al.,* 1995). Similar reductions in diversity are linked with heavy metal contamination (Dauvin, 2008). Polychaete worms are thought to be quite

tolerant of heavy metal contamination, whereas crustaceans and bivalves are considered to be intolerant (Rayment, 2002).

Project impact assessment

13.7.40 Chapter 12 considered the potential for increases in SSC and changes to water and sediment quality.

Capital dredging

13.7.41 As described in Chapter 12, any changes to SSC and DO will be temporary, lasting the period of the soft sediment dredging, which as a worst case would last approximately 1 month, assuming dredging for 10 hours per day at a dredge rate of 4 m^3 per hour (though in terms of SSC, plume modelling has assumed a worst case of continuous dredging over 29 hours at 44 m^3 per hour). In reality, allowing for weather downtime and acknowledging that dredging would not be continuous, dredging activities would take a maximum of 7 months. Overall, the spatial and temporal magnitude of change in SSC is considered to be negligible locally and further afield (see paragraphs 12.7.10 to 12.7.12). Any changes in DO are expected to be localised and very short-lived, and considered negligible (see paragraphs 12.7.32 to 12.7.36). The potential changes to levels of chemical contaminants in the water and the potential redistribution of sediment-bound chemical contaminants are also considered negligible (see paragraphs 12.7.37 to 12.7.48).

13.7.42 Thus, in physical terms, any plumes resulting from dredging are expected to have a minimal and very localised effect on water and sediment quality at the Site. The benthic communities present within and adjacent to the dredge area, would be tolerant to the minimal changes in water and sediment quality that will occur during dredging operations. Specifically with regards to increased SSC, the benthic communities recorded within the inner bay (predominantly muddy sand habitats), where SSC increases are predicted to occur, are considered highly tolerant and not sensitive to changes is suspended sediments (Tyler-Walters and Garrard, 2019). Furthermore, standard best practice pollution prevention guidelines will be followed to minimise the risk of accidental spillages and the risk of introduction of contaminants throughout construction.

13.7.43 The magnitude of the change in water and sediment quality during construction is assessed to be negligible. Probability of occurrence is high and the overall exposure is, therefore, negligible. Given that habitats and species within the area of the predicted sediment plume have no sensitivity to changes in suspended sediments, vulnerability is considered to be none. Subtidal species in the area are considered to be commonly occurring and of low conservation concern. Importance is, therefore, considered to be low. The overall potential impact of changes to water and sediment quality during dredging and other construction activities on benthic features at the Site is assessed as **negligible** and not significant.

Dredge disposal

13.7.44 Taking account of the scale of the disposal volume at the Scalloway disposal site, the spatial and temporal magnitude of change in SSC is considered to be negligible (see paragraphs 12.7.13 to 12.7.15). In turn, the potential changes to DO at the disposal sites are considered to be negligible (see paragraph 12.7.36). Due to the highly dispersive nature of the site and the coarse nature of the dredged material, the deposits are unlikely to cause a measurable change to the chemical quality of sediments within and around the area of the disposal site. The potential changes to levels of chemical contaminants in the water as a result of the disposal of dredge arisings and the potential redistribution of sediment-bound chemical contaminants are assessed to be negligible (see paragraphs 12.7.42 and 12.7.48).

13.7.45 Overall, the potential impact to benthic habitats and species arising as a result of changes in water and sediment quality at the disposal site is considered to be **negligible**.

13.7.46 The magnitude of the change in water and sediment quality as a result of dredge disposal is considered to be negligible in the context of background variability. Probability of occurrence is high and the overall exposure is, therefore, negligible. Given that habitats and species within and around the disposal site are likely to be well adapted to high SSC with high recoverability rates, sensitivity is considered to be low and thus vulnerability is considered to be none. The subtidal habitats and species within and around the disposal site are likely of low value due to ongoing disposal activities over the course of the years, and widespread in the surrounding area. Importance is, therefore, considered to be low. The overall potential impact of changes in water and sediment quality as a result of dredge disposal on benthic features at the disposal site is assessed as **negligible** and not significant.

Introduction and spread of non-native species

13.7.47 Non-native species have the potential to be transported as a result of construction activity. In addition, the extension of the pier would introduce a new surface in the marine environment which has the potential to facilitate the spread of invasive non-native species.

General scientific context

13.7.48 Non-native, or invasive, species are described as 'organisms introduced into places outside of their natural range of distribution, where they become established and disperse, generating a negative impact on the local ecosystem and species' (International Union for Conservation of Nature (IUCN, 2011). The ecological impacts of such 'biological invasions' are considered to be the second largest threat to biodiversity worldwide, after habitat loss and destruction. In the last few decades marine and freshwater systems have been impacted by invasive species, largely as a result of increased global shipping (Carlton and Geller, 1993).

13.7.49 The introduction and spread of non-native species can occur either accidentally or by intentional movement of species as a consequence of human activity. The main pathway for the potential introduction of non-native species is via fouling of vessels' hulls, transport of species in ballast or bilge water and the accidental imports from materials brought into the system during development activities. Pathways involving vessel movements (fouling of hulls and ballast water) have been identified as the highest potential risk routes for the introduction of non-native species (Carlton, 1992; Pearce *et al.,* 2012), particularly from different biogeographical regions, which agrees with the fact that areas with a high volume of shipping traffic are hotspots for non-native species in British waters (Pearce *et al.,* 2012).

13.7.50 The fouling of a vessel hull and other below-water surfaces can be reduced through the use of protective coatings. Maintenance of hulls through regular cleaning will minimise the number of fouling organisms present.

13.7.51 Non-native invasive species also have the potential to be transported via ship ballast water. Seawater may be drawn into tanks when the ship is not carrying cargo, for stability, and expelled when it is no longer required. This provides a vector whereby organisms may be transported long distances. In 2004 the International Maritime Organisation (IMO) adopted the 'International Convention for the Control and Management of Ships' Ballast Water and Sediments', which introduced two performance standards seeking to limit the risk of non-native invasive species being imported (including distances for ballast water exchange and standards for ballast water treatment). The Convention came into force internationally in September 2017.

13.7.52 The UK is bound by international agreements such as the Convention on Biological Diversity, the United Nations Convention on the Law of the Sea, the Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention 1979), the Convention on the Conservation of European Wildlife and Natural Habitat (Berne Convention 1979) and the Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019 (the former Habitats and Birds Directives). All of these include provisions requiring measures to

prevent the introduction of, or control of, non-native species, especially those that threaten native or protected species (JNCC, 2004). Additionally, Section 14(1) of the Wildlife and Countryside Act (WCA) (1981) makes it illegal to release, or allow to escape into the wild, any animal which is not ordinarily resident in Great Britain and is not a regular visitor to Great Britain in a wild state, or is listed in Schedule 9 to the Act.

Project impact assessment

13.7.53 As discussed above, non-native species have the potential to be transported into the study area on vessels' hulls during capital dredging and transport of materials by sea. Non-native invasive species also have the potential to be transported via ship ballast water. Seawater may be drawn into the dredger tanks or hopper when the ship is not carrying cargo, for stability, and expelled when it is no longer required. This provides a vector whereby organisms may be transported long distances.

13.7.54 The vessels to be used for the construction of the proposed development will in the main originate from Scotland. Vessels operating in Scottish waters are advised against discharging water ballast in order to avoid causing an impact on the marine environment and to minimise the risk of transferring non-native species in ship's ballast water and sediments. NatureScot's guidance for the prevention of the introduction of native species will be followed when developing biosecurity control measures to minimise the risk of the introduction and spread of non-native species during construction. These measures will be included within the fiEMP (see Embedded Mitigation Chapter 3). Additionally, a BMP has been developed which outlines the measures which will be taken in order to minimise introduction of INNS during construction (ABPmer, 2023c, Appendix A.17). On this basis, the probability of the introduction and spread of non-native species (occurrence) from the construction phase is considered to be negligible. However, given that the magnitude of change is unknown, magnitude ranges from negligible to large depending upon the scale and nature of any non-native species introduction, thus the exposure is negligible. The sensitivity of all intertidal and subtidal receptors to non-native species introductions is expected to range from low to high. Vulnerability is, therefore, considered to be none. In addition, importance is considered to range from low to moderate depending on the conservation concern, rarity, structure/form and function of the habitat. The overall impact is, therefore, considered to be **negligible** and not significant**.**

Operation

Direct loss of intertidal and subtidal habitats and species as a result of the new quay and rock armouring

General scientific context

13.7.55 The impact of direct habitat loss (e.g. land reclamation) mainly relates to the temporary or permanent physical removal of substratum and associated organisms from the seabed.

13.7.56 Both intertidal and subtidal habitats are sensitive to physical loss at locations where new structures are introduced onto the seabed (i.e. within the development 'footprint' of these structures). The significance of such losses will vary on a site by site basis in response to differences in the extent and duration of the losses as well as the relative value of the habitats in question. The value of the habitats is, in turn, reflected by the species that are present and level of statutory and non-statutory protection afforded to them. As any effects are very much dependent upon site specific considerations, a generic scientific review is not appropriate in this case and the focus of the impact assessment is based on site-specific considerations.

Project impact assessment

13.7.57 The proposed development will involve an area of reclamation behind the new quay wall and additional rock armour placed around the existing breakwater (see Section 3.2 in The Proposed Development Chapter 3). Based on the latest available bathymetry data (2022), the new quay wall and reclamation will result in the physical loss of approximately 0.16 ha of marine habitat, of which approximately 0.14 ha consists of subtidal habitat with the remaining approximately 0.03 ha consisting of intertidal habitat. Additionally, the increase to the breakwater footprint will result in the physical loss of 0.13 ha of marine habitat, of which approximately 0.11 ha consists of subtidal habitat with the remaining approximately 0.02 ha consisting of intertidal habitat. Finally, the permanent linkspan supporting structures will result in the loss of an additional 0.1 ha of subtidal habitat.

13.7.58 The area that would be lost under the new quay wall, reclamation area and linkspan supporting structures consists of the following habitats:

- Intertidal hard substrate habitat (0.03 ha): The upper-mid section of the intertidal area currently present between the existing quay and breakwater was characterised by the biotope *Fucus serratus* on full salinity sheltered lower eulittoral rock. Extending below this zone the kelp *L. digitata* predominated with a diversity of red seaweeds and epifaunal species, most appropriately classified as *Laminaria digitata* and under-boulder fauna on sublittoral fringe boulders (IR.MIR.KR.Ldig.Bo).
- Subtidal fine sand or muddy sand habitat (0.14 ha): The area which will be lost under the footprint of the new quay wall, reclamation area and linkspan supporting structures is thought to be similar to the adjacent habitats of the inner bay. These consisted of muddy sand habitats including the following biotopes: *Arenicola marina* in infralittoral fine sand or muddy sand (SS.SSa.IMuSa.AreISa) and Infralittoral muddy sand (SS.SSa.IMuSa). The faunal assemblage in the inner bay was predominantly characterised by polychaetes, amphipods and nematodes. In reality it is most likely that some of the subtidal area lost under the footprint of the new quay consists of the existing rock armour, though it is difficult to quantify this as survey operations maintained a minimum distance of 20 m from the breakwater to prevent disturbance to the nesting sites.

13.7.59 The area that would be lost under the extended breakwater footprint, consists of the following habitats:

- Intertidal hard substrate (rock armour) habitat (0.02 ha): The species on the upper-mid section of the rock armour surrounding the pier/ quay at North Haven consisted of a mosaic of bladder wrack *F. vesiculosus* (LR.LLR.F.Fves.FS: *Fucus vesiculosus* on full salinity moderately exposed to sheltered mid eulittoral rock) and serrated wrack *F. serratus* (LR.LLR.F.Fserr.FS: *Fucus serratus* on full salinity sheltered lower eulittoral rock). The lower part of the rock armour in this area was characterised by a zone of kelp/ oarweed *L. digitata* (IR.MIR.KR.Ldig.Bo *Laminaria digitata* and under-boulder fauna on sublittoral fringe boulders). Beneath the canopy a variety of red seaweeds such as false Irish moss *Mastocarpus stellatus*, *Palmaria palmata* and *Ceramium* spp. were present alongside a rich faunal community including the presence of juvenile edible crab *C. pagurus.*
- Subtidal mixed substrata habitat (0.11 ha): On the exposed side of the breakwater, where the additional rock armour will be placed, the habitats present are thought to be similar to those recorded nearby in the outer bay. These consisted of dense kelp of *L. hyperborea* with *L. digitata* and *Saccharina latissima* on mixed cobble, pebble substrate, with foliose red seaweeds also present on kelp stipes. This habitat was identified as *Laminaria hyperborea* forest and foliose red seaweeds on tide-swept upper infralittoral mixed substrata (IR.MIR.KR.LhypTX) which is a component biotope of the kelp bed PMF. This PMF was patchy in extent and presence, recorded primarily as a mosaic with non-PMF biotopes. As with the inner bay, in reality it is most likely that some of the subtidal area lost under the footprint of the extended breakwater consists of the existing rock armour.

13.7.60 These habitats are described in more detail in Section 13.5 and Appendix A.14.

13.7.61 In addition to the above habitats, the new quay wall and reclamation area will result in covering the entrance to the sea cave located just south of the existing breakwater (sea cave CI05). As described in section 13.5.18, sea caves are an Annex I feature and are found numerously in Fair Isle, although are not a qualifying feature of any designations on Fair Isle. The sea cave study commissioned by NatureScot found sea cave CI05 to be 'light not reduced'[38]. Therefore, CI05 is not considered to represent a proper sea cave but rather a surge gully; it was considered to be 'insignificant' and thus was not surveyed further during the sea cave study. The insignificance of cave CI05 is also mirrored in the species present, with *L. digitata* on the floor at the cave entrance and *S. balanoides* and *P. vulgata* present on the lower walls. These species will be lost behind the new quay wall and reclamation area.

13.7.62 All the species recorded from the baseline surveys and the NatureScot sea cave study (specific to sea cave CI05) are considered commonly occurring, not protected and are typical of the habitat types recorded at the site. A small area of a component biotope of the kelp PMF is likely to be lost under the extended breakwater. Scottish records of this biotope are of national importance as most of the UK's records of this biotope occur in Scotland. However, due to the very patchy extent and presence of this feature, and it being found primarily as a mosaic with non-PMF biotopes at the site, this is considered a relatively poor example of this PMF. Additionally, sea cave CI05 is also considered to be 'insignificant' and a poor example of the sea cave feature.

13.7.63 Based on the evidence provided above, the magnitude of potential impacts is considered to be negligible for all intertidal habitats and muddy sand habitat and small with respect to the subtidal mixed substrata habitat (kelp mosaic) and sea cave feature. Therefore, while the probability of occurrence is high, the overall exposure is assessed as negligible for intertidal and muddy sand habitats and low for the subtidal mixed substrata habitat (kelp mosaic) and sea cave feature. The sensitivity of species to direct habitat loss due to reclamation for the new quay is considered to be high for all marine habitats and species (given the lack of recoverability following reclamation). However, sensitivity of species to direct habitat loss due to extension of the breakwater is considered to be moderate as the new rock armour will eventually be recolonised by kelp and other algal species within a few years (Stamp, 2015; Tillin and Stamp, 2016).

13.7.64 The importance of the intertidal hard substrate habitat present on the breakwater and in the area between the breakwater and the existing quay is considered to be low as it is not protected or designated and is considered to be of moderate biodiversity (in addition to the breakwater habitat being artificial). Additionally, the intertidal area is not considered to comprise important foraging ground for birds with only a small number of birds foraging within the bay and along the tideline. The subtidal fine sand or muddy sand habitat is considered to be of low importance as it is not protected or designated and is considered to be of moderate biodiversity. The subtidal mixed substrata habitat supporting kelp communities is not protected or designated at this location and does not represent a good example of the kelp PMF; it is however recognised that it supports high biodiversity. On this basis, importance of this subtidal kelp habitat is considered to be moderate. Sea cave/ surge gully CI05 is not protected or designated at this location and does not represent a good example of the Annex I feature. On this basis, importance of this sea cave/ surge gully feature is considered to be low.

13.7.65 Based on the standard impact assessment matrix, the impact of direct habitat loss as a result of the new quay wall and reclamation on intertidal and subtidal habitats (including sea cave CI05) is assessed as **negligible** and not significant. The impact of direct habitat loss as a result of the breakwater extension is assessed as **negligible** for intertidal habitats and **negligible to minor adverse** for subtidal habitats (kelp mosaic) and thus not significant.

Changes to benthic habitats and species due to maintenance dredging

13.7.66 The general scientific context with regards to impacts of dredging on benthic habitats and species has been provided for the respective construction impact pathway (paragraphs 13.7.6 to 13.7.8) and is not repeated here.

Project impact assessment

13.7.67 There are no historic records of any dredging activities in the bay; Marine Scotland has confirmed that no dredging has taken place within the harbour for many years (if ever) (Marine Scotland Licensing Operations Team, *pers comm*. 07/02/2023). Considering there has been no requirement for capital or maintenance dredging at Fair Isle in the past, it is anticipated that minimal maintenance dredging will be required during the operational phase, if any. Therefore, any effects arising as a result of potential maintenance dredging would be smaller in magnitude compared to those of the construction phase with benthic communities able to recover in between very infrequent (if any) and small in scale maintenance dredging events. As such, impacts are considered **negligible** and not significant.

Indirect changes to sea cave benthic habitats as a result of changes to wave reflection

13.7.68 The proposed upgrade to the existing breakwater may result in additional wave reflection back out to the mouth of the bay. This may cause changes to sea cave habitats, specifically the cave closest to the breakwater on the eastern side of the bay. Sensitivity of the habitats and species present will depend on the existing wave exposure of the sea caves which is dependent on their depth and the cave aspect to incoming waves.

Project impact assessment

13.7.69 Wave modelling results (see 12.7.25 and Appendix A.12) show that there is no predicted change in the existing wave climate along the northeast of the breakwater or inshore of the breakwater, along the western edge of the embayment, where the two sea caves representing good examples of this feature are. Additionally, the NatureScot cave study showed the cave to the north of the breakwater (CI04) to already be subject to extreme scouring wave action with the habitats and species present adapted to such wave conditions.

13.7.70 Overall, the magnitude of the change to wave conditions in the vicinity of the sea caves is considered to be negligible. Probability of occurrence is high and the overall exposure is, therefore, negligible. Given the existing wave climate it is considered that sensitivity of habitats to changes in wave action is low and thus vulnerability is considered to be none. The flora and fauna present within the sea cave closest to the Site is a relatively poor example of this feature. However, acknowledging that sea caves are an Annex I feature, importance is considered to be moderate. The overall potential impact of changes to wave climate on sea cave benthic features is assessed as **negligible** and not significant.

Fish and Shellfish

13.7.71 This section assesses the potential for impacts on fish and shellfish receptors as a result of the proposed development during construction and operation. The following impact pathways have been assessed:

Construction

- Indirect effects from changes in water quality and sediment quality; and
- Underwater noise and vibration disturbance.

13.7.72 None of the potential effects identified for the operational phase within the scoping report with respect to fish and shellfish receptors were considered to require further detailed assessment within this EIAR.

Construction

Indirect effects on fish and shellfish from changes in water quality and sediment quality

General scientific context

13.7.73 Changes in water quality during capital dredging, dredged material disposal and construction activities (such as ground preparation of the seabed prior to installation of pre-cast concrete blocks) could potentially impact fish species, by increasing SSC, resulting in changes to DO and releasing toxic contaminants bound in sediments. These changes could either impact fish directly or indirectly by resulting in the displacement of fish from the area.

13.7.74 Increased suspended sediments can lead to physiological effects in adult finfish resulting from the abrasion of sediment particles on gill tissues, causing reduced gill function and possible mortality (Wenger *et al.*, 2017; Kjelland *et al.*, 2015). Such effects on fish are considered to occur at suspended sediment levels of around 10,000 mg/l (Britwell, 2000). High SSC levels may also impact spawning and nursery grounds through damage to eggs and planktonic larvae, as well as causing abrasion or clogging of the fragile gills of larval and juvenile fish, resulting in mortality or reduced growth rates.

13.7.75 Because turbidity often impairs visual acuity, activities and processes that require vision can be inhibited, leading to behavioural responses. For example, foraging in both planktivorous and piscivorous fish can be negatively affected by suspended sediments. Piscivores are especially sensitive to increasing turbidity because many are visual hunters that detect prey from a distance. An increase in suspended sediment reduces both light and contrast, decreasing encounter distances between predator and prey (Wenger *et al.*, 2017).

13.7.76 Elevated suspended sediments can also influence the movements of fish. However, such responses can cease if fish become acclimatised. Fish in high latitude coastal areas typically have to contend with variable turbidity and often poor visual conditions, resulting from fluctuations in ambient light levels, suspended sediments and in the light transmission properties of the water. The mobile nature of fish species generally allows avoidance of areas of adverse conditions which are unlikely to significantly affect a population provided such conditions are temporary.

Project impact assessment

13.7.77 Assuming a worst case of all dredge material being sediment rather than rock, any changes to SSC will be limited to the immediate vicinity of the proposed dredge area and disposal site (see paragraphs 12.7.10 to 12.7.12 and 12.7.13 to 12.7.15). The resultant changes in DO are also considered to be localised and short-lived and overall negligible (see paragraphs 12.7.32 to 12.7.36 and 12.7.36). The increase in dissolved concentrations of contaminants from redistribution of sediment-bound chemical contaminants during dredging and disposal is also expected to be negligible (see paragraphs 12.7.37 to 12.7.48).

13.7.78 Overall, fish are not considered to be sensitive to the negligible changes in water quality predicted, and the proposed dredging and disposal will, therefore, not result in significant displacement of fish. Construction is expected to take place Monday – Friday 7am-7pm and Saturday 7am - 1pm, with no working on Sundays or Bank Holidays. Therefore, any increase in SSC will be restricted to these times and quickly decrease after operations cease. Therefore, any potential displacement of fish will only be short-lived and intermittent. Furthermore, fish feed on a range of food items and, therefore, their sensitivity to a temporary change in the availability of a particular food resource is considered to be low. Their high mobility enables them to move freely to avoid areas of adverse conditions and to

use other prey resources in the local area. Best practice pollution prevention guidelines will also be followed to minimise the risk of accidental spillages and the risk of introduction of contaminants throughout construction (see 12.7.39).

13.7.79 There are no PMF shellfish species, shellfish protected areas or classified shellfish harvesting areas within several kilometres from the Site or 1 km from Scalloway disposal site. Scallops are present approximately 1.5 km from Scalloway disposal site. The plumes generated during dredging and disposal are predicted to be localised to the dredge and disposal sites and do not overlap with any commercial shellfish beds or the distribution of sensitive shellfish species.

13.7.80 The overall effect of changes in water quality on fish and shellfish species during both dredging and disposal is, therefore, considered negligible.

13.7.81 Therefore, while the probability of a localised and temporary change during dredging at the Site and during dredge disposal a the Scalloway disposal site is high, magnitude of change will be negligible and consequently exposure to change is assessed as negligible. Sensitivity of fish and shellfish species is assessed as low to moderate and vulnerability is assessed as none. Therefore, while the overall importance of certain fish species is high (i.e. for PMF fish species), the impact is assessed as **negligible** and not significant.

Effects due to underwater noise and vibration on fish and shellfish receptors

General scientific context

13.7.82 Elevated underwater noise and vibration levels during construction activities can potentially disturb fish by causing physiological damage and/or inducing adverse behavioural reactions.

13.7.83 The dredging process involves a variety of sound generating activities which can be broadly divided into sediment excavation, transport and placement of the dredged material at the disposal site (CEDA, 2011; WODA, 2013; Jones and Marten, 2016). For most dredging activities, the main source of sound relates to the vessel engine noise.

13.7.84 A detailed Underwater Noise Assessment has been undertaken for the proposed works (ABPmer, 2023b, see Appendix A.15) and is briefly summarised in this section. Engine noise associated with the operation of construction vessels has also been considered in the Underwater Noise Assessment.

Project impact assessment

Dredging

13.7.85 Dredging activity at North Haven is anticipated to involve the dredging of rock (rock breaking) and the dredging of soft material (sand/silts). It is assumed that there will be up to 10 hours of dredging per day. Considering both rock and soft sediment dredging and allowing for weather downtime the maximum duration of dredging activities would take a maximum of 7 months, between April and October, acknowledging that this would not be continuous dredging operations. The dredging activities are likely to involve the use of a large barge-mounted excavator.

13.7.86 The relative risk and distances at which potential mortality/injury and behavioural effects in fish are predicted to occur as a result of dredging associated with the proposed works at North Haven are included in Table 6 of the Underwater Noise Assessment (ABPmer, 2023b, see Appendix A.15).

13.7.87 Overall, there is considered to be a low risk of any injury in fish as a result of the underwater noise generated by dredging, although recoverable injury could potentially occur in very close proximity to the dredger in fish where the swim bladder is involved in hearing (e.g.

herring). The level of exposure will depend on the position of the fish with respect to the source, the propagation conditions which will be influenced by the tidal state, and the individual's behaviour over time. However, it is unlikely that a fish would remain in the vicinity of a dredger for extended periods. Behavioural responses are anticipated to be spatially negligible in scale and fish will be able to move away and avoid the source of the noise as required. Furthermore, the proposed dredging activities involved during construction will be temporary and could take place over a period of approximately 7 months (thought this is likely to be shorter), acknowledging that this would not be continuous dredging operations.

13.7.88 In summary, there is not considered to be a risk of significant injury or disturbance to fish and shellfish from the proposed dredging activities at Fair Isle.

13.7.89 Based on the above considerations, the overall magnitude of the change in underwater noise due to dredging is considered to be negligible. Probability of occurrence is high and thus the overall exposure to change is negligible. While sensitivities of fish to underwater noise range from low (fish with no swim bladder) to moderate (fish with swim bladder which may or may not be involved in hearing) depending on the Popper *et al.* (2014) category within which the fish species falls, vulnerability is assessed as none. The importance of fish ranges from moderate for commercially important fish and shellfish to low for resident fish with no protected status and which are not of commercial value. Overall, therefore, the impact of underwater noise during dredging on fish is considered to be **negligible** and not significant.

Vessel movements

13.7.90 Rock armour for the breakwater may be delivered by vessel or could be brought by road if this is sourced from a local quarry. As it is yet to be determined how much of the work will be carried out from sea and the likely requirements for vessel movements during construction, a worst-case scenario has been adopted which assumes the following for marine based vessel activity:

2024

- Vessel movement for delivery of materials/equipment/plant (maximum, on average, two vessels per week from March to September).

2025

- One dredger (on site for 7 months); and
- Vessel movement for delivery of materials/equipment/plant (maximum, on average, two vessels per week from March to September).

13.7.91 Disposal of dredged material at the Scalloway disposal site has also been considered.

13.7.92 The relative risk and distances at which potential mortality/injury and behavioural effects in fish are predicted to occur as a result of the vessel movements associated with the construction and operation of the upgraded ferry facility at North Haven are included in Table 7 of the Underwater Noise Assessment (ABPmer, 2023b, see Appendix A.15).

13.7.93 In summary, there is considered to be a negligible risk of any injury in fish as a result of the underwater noise generated by the vessels involved during construction. Behavioural responses are anticipated to be spatially negligible in scale and fish will be able to move away and avoid the source of the noise as required.

13.7.94 Based on the above considerations, the overall magnitude of the change in underwater noise due to vessel movements is considered to be negligible. Probability of occurrence is high and thus the overall exposure to change is negligible. While sensitivities of fish to underwater noise range from low to moderate, vulnerability is assessed as none. The importance of fish

ranges from moderate for commercially important fish and shellfish to low for resident fish with no protected status and which are not of commercial value. Overall, therefore, the impact of underwater noise from vessel movements on fish is considered to be **negligible** and not significant.

Marine mammals

13.7.95 This section assesses the potential for impacts on marine mammal receptors as a result of the proposed development during construction and operation. The following impact pathways have been assessed:

Construction

- Underwater noise and vibration disturbance; and
- Airborne noise and vibration disturbance.

13.7.96 None of the potential effects identified for the operational phase within the scoping report with respect to marine mammal receptors were considered to require further detailed assessment within this EIAR.

Construction

Effects due to underwater noise and vibration on marine mammal receptors

General scientific context

13.7.97 Marine mammals are particularly sensitive to underwater noise at higher frequencies and generally have a wider range of hearing than other marine fauna, namely fish (i.e. their hearing ability spans a larger range of frequencies). The hearing sensitivity and frequency range of marine mammals varies between different species and is dependent on their physiology.

13.7.98 As described in the impact assessment for fish and shellfish (paragraphs 13.7.82 to 13.7.94), the proposed works include a number of underwater noise generating activities, including dredging and engine noise associated with the operation of construction vessels.

13.7.99 A detailed Underwater Noise Assessment has been undertaken for the proposed works (ABPmer, 2023b, see Appendix A.15) and is briefly summarised in this section. Descriptions of dredging activities as well as vessel movements considered in the underwater noise assessment have been described in the fish and shellfish assessment section (paragraphs 13.7.82 to 13.7.94) and are not repeated here.

Project impact assessment

Dredging

13.7.100 The distances at which PTS and TTS in marine mammals are predicted to occur during dredging associated with the construction of the proposed works are shown in Table 9 of the Underwater Noise Assessment (ABPmer, 2023b, see Appendix A.15).

13.7.101 There is predicted to be no risk of PTS in any of the key marine mammal species found in the study area. The risk of TTS in minke whale is limited to within 25 m from the dredging activity, and within 44 m in harbour porpoise and 23 m in seals.

13.7.102 Overall, there is not considered to be any risk of injury or significant disturbance to marine mammals from the proposed dredging activities at Fair Isle. Furthermore, the proposed dredging activities will be temporary and take place over a period of 7 months.

13.7.103 The probability of a change in underwater noise occurring during dredging is high. However, hearing damage is unlikely to occur and the main effect that could be expected in the vicinity of the dredge vessels would be short-term mild behavioural avoidance. Based on these factors, the magnitude of the change due to dredging noise is considered to be negligible and the sensitivity of marine mammals to dredging noise is considered to be low. Taking these factors into account, the overall exposure and vulnerability of marine mammals will be negligible and none respectively. Overall, therefore, the impacts of dredging noise on all marine mammals is considered to be **negligible** and not significant.

Vessel movements

13.7.104 The distances at which PTS and TTS in marine mammals are predicted to occur during vessel movements associated with the construction phase and operation of the new ferry terminal are shown in Table 11 of the Underwater Noise Assessment (ABPmer, 2023b, see Appendix A.15).

13.7.105 There is predicted to be no risk of PTS or TTS in any of the marine mammal species found in the study area. Overall, there is not considered to be any risk of injury or significant disturbance to marine mammals from underwater noise resulting from the proposed vessel activities at Fair Isle or at the disposal site even if the vessel movements were to take place continuously (24 hours per day, 7 days per week).

13.7.106 The probability of a change in underwater noise due to vessel movements is high. However, hearing damage is unlikely to occur and the main effect that could be expected in the vicinity of the dredge vessels would be short-term mild behavioural avoidance. Based on these factors, the magnitude of the change due to dredging noise is considered to be negligible and the sensitivity of marine mammals to underwater noise due to vessel movements is considered to be low. Taking these factors into account, the overall exposure and vulnerability of marine mammals will be negligible and none respectively. Overall, therefore, the impacts of underwater noise due to vessel movements on all marine mammals is considered to be **negligible** and not significant.

Effects due to airborne noise and visual disturbance on marine mammal receptors

General scientific context

13.7.107 Construction activities may result in airborne noise and visual disturbance to hauled out seals. Seals which are hauled out on land, either resting or breeding, are considered particularly sensitive to visual disturbance (Hoover-Miller *et al*, 2013). The level of response of seals is dependent on a range of factors, such as the species at risk, age, weather conditions and the degree of habituation to the disturbance source. Hauled out seals have been recorded becoming alert to powered craft at distances of up to 800 m although seals generally only disperse into the water at distances <150 to 200 m (Wilson, 2014; Mathews, *et al.*, 2016; Henry and Hammill, 2001; Strong and Morris, 2010). For example, in a study focusing on a colony of grey seals on the South Devon coast, vessels approaching at distances between 5 m and 25 m resulted in over 64 % of seals entering the water, but at distances of between 50 m and 100 m only 1 % entered the water (Curtin *et al.*, 2009). Recent disturbance research has also found no large-scale redistribution of seals after disturbance with most seals returning to the same haul out site within a tidal cycle (Paterson *et al.*, 2019).

Project impact assessment

13.7.108 Construction activities which may results in noise and visual disturbance of hauled out seals include landside works such as (but not limited to) peckering for the noust expansion, construction of the new quay and placement of rock for extension of the breakwater.

13.7.109 As described in the baseline section (paragraphs 13.5.45 to 13.5.47) although there are no designated seal haul out sites on Fair Isle there is a small colony of grey seals on the island. The most common pupping locations at more than 2 km away from North Haven. Harbour seals do not breed on Fair Isle.

13.7.110 Grey seals are frequently seen within North Haven bay and occasional harbour seal are also sighted hauled out on intertidal rock in the southwest corner of North Haven bay (e.g. FIBO recorded 2 individuals in North Haven in 2021).

13.7.111 Seals visiting North Haven bay are accustomed to disturbance from the presence of people and vessels using the existing harbour. In spring 2023, observations from the GI works, carried out at North Haven to inform detailed design of the Proposed Development, noted that grey seals indicated curiosity to the presence of either the personnel or drilling equipment, rather than displacement.

13.7.112 The nearest designated seal haul out site to the Scalloway disposal site is 4 km away and therefore there is no pathway to impact hauled out seals as a result of dredge disposal activities.

13.7.113 The probability of a change in noise and visual disturbance due to construction activity is high. However, significant displacement of hauled out seals is unlikely to occur with seals being accustomed to people and vessels using North Haven harbour and exhibiting curiosity rather than avoidance. Based on these factors, the magnitude of the change due to noise and visual disturbance is considered to be negligible and the sensitivity of hauled out seals present in North Haven to noise and visual disturbance is considered to be low. Taking these factors into account, the overall exposure and vulnerability of hauled out seals will be negligible and none respectively. Overall, therefore, the impacts of noise and visual disturbance due to construction activity on hauled out seals is considered to be **negligible** and not significant.

Seabirds and Coastal Waterbirds

13.7.114 This section assesses the potential for impacts during the construction phase on seabirds and coastal waterbirds as a result of the proposed development. The following impact pathways have been assessed:

Construction

- Airborne noise and visual disturbance; and
- Underwater noise disturbance; and
- Changes to value of habitat for foraging; and
- The introduction of mammalian predators.

Operation

- Changes to the value of habitat for foraging;
- Disturbance of Fulmars nesting on stack; and
- The introduction of mammalian predators.

Construction

Airborne noise and visual disturbance

General scientific context

13.7.115 Construction activities have the potential to result in noise and visual disturbance to seabird and coastal waterbirds that routinely utilise North Haven bay.

13.7.116 Disturbance often occurs though a combination of visual and noise stimuli simultaneously, although some occurrences may be through separate visual or noise stimuli (Wright *et al.* 2013).

13.7.117 The responses of birds to noise and disturbance may vary depending on a range of factors, such as the nature of the site, the nature of the noise and disturbance (intensity and duration), and even seasonal factors, such as where the birds are from, e.g. sensitive arctic breeding birds migrating south in the winter may be more responsive to noise than a local population that is habituated to routine human activity. Birds typically show a dispersive response to disturbance with prolonged disturbance causing displacement (Goss-Custard, 2020; Dwyer, 2010; Navedo and Herrera, 2012). Where disturbance causes birds to take flight, it can increase energy demands and may increase food consumption (Goss-Custard, 2020; Linssen *et al.*, 2019; Stillman *et al.*, 2007).

13.7.118 Studies into the distances from activities that evoke a disturbance response suggest that for most coastal works and other foreshore activity, disturbance behaviour is not typically observed when activities occur more than 200 to 300 m away from a source with the reactions of many species occurring between 20 and 100 m (ABPmer, 2002; IECS, 2009a; Wilson, 2009; IECS, 2009b; Dwyer, 2010; IECS, 2013; Ross and Liley, 2014; Collop *et al.*, 2016; Goodship and Furness, 2019; Goodship and Furness, 2022; ABPmer, 2013). It is also important to consider habituation: birds may habituate to continual noises as long as there is no large amplitude 'startling' component (Hockin *et al.*, 1992). Although construction activity has the potential to result in negative impacts on birds, it is notable that responses to construction activity in many cases are similar or less to responses to human presence on the foreshore (e.g. recreation) (ERM, 1996; ABPmer, 2013; IECS, 1997; IECS, 2013).

13.7.119 Many studies on bird disturbance have focussed on coastal waterbirds, and the impacts of disturbance on breeding seabirds are less well-studied, presumably because many species nest in inaccessible locations on cliff faces and are therefore less obviously impacted. However, heart-rate monitors attached to Kittiwakes nesting near the path at St Abbs National Nature Reserve (NNR) showed that birds experienced a rise in heart rate as a consequence of stress when visitors were close, even though no external behavioural response was observable (Beale & Monaghan 2004). Although there are few studies on the impacts of construction noise and disturbance on breeding seabirds, studies on visitor-related disturbance indicate that even in remote locations nestling success can be negatively impacted, even when visitor numbers are small (Watson *et al.* 2014, Allbrook & Quinn 2020).

13.7.120 If breeding adults are displaced from nests for a significant period of time, then the consequences of disturbance can at worst result in death of young chicks or egg failure due to exposure and/or starvation. The time taken for small chicks to suffer from exposure may be accelerated by other factors such as adverse weather conditions. Unexpected, repeated disturbance of a colonially nesting species such as Arctic Tern may, in a worst-case scenario, lead to colony abandonment.

13.7.121 Conversely, species such as Fulmar and Kittiwake may rarely respond to human approach but may still be adversely affected (Beale & Monaghan2004). Fulmars may choose not to return to a nesting site the following year if they have experienced a disturbed breeding season previously.

13.7.122 Sensitivity of key species to noise and visual disturbance stimuli are described in Table 13-13. Where available, Flight Initiation Distances (FID) have been used from Goodship & Furness (2022).

Table 13-13 : Sensitivity of different key species to noise and visual disturbance stimuli

Species	Sensitivity to disturbance	Sensitivity level[1]
Fulmar	No FID data. Birds approached directly by ringers rarely flush and will instead spit foul smelling oil to ward off intruders. It is considered likely that Fulmars will continue to nest even in the presence of noise and visual disturbance from construction work, although some may choose to nest elsewhere in following years.	Low/ Moderate
Arctic tern	Arctic Terns demonstrate aggression to humans approaching the colony on foot, dive bombing and pecking at them to defend their nesting area. Mean FID values for a surveyor walking towards an Arctic tern colony in Canada ranged from 37-92m, with a maximum FID of 160m. FID values for approach by helicopter were 1 km (Mallory 2016). Goodship & Furness (2022) classify Arctic Tern as being of medium sensitivity. Since the impacts of the works will relate to noise only and will not involve approaching the colony or be visible to birds nesting in the colony, a sensitivity of Low/Moderate is assigned.	Low/ Moderate
Puffin	Puffins typically nest on remote island where people are not present, although they are often a focal point for tourist visits. It is not clear how Puffin respond to human disturbance or to construction work. Moderate sensitivity is assumed on a precautionary basis.	Moderate
Guillemot	No data on response to construction activity, but visitors may have strong effect on nesting success (Beale & Monaghan 2004), therefore Moderate sensitivity is assumed on a precautionary basis.	Moderate
Black Guillemot	No data on response to construction activity, and data gap on disturbance impacts identified previously (Johnston *et al.* 2018). Early studies in the Gulf of St Lawrence showed that disturbed nesting areas had reduced hatching rates (Cairns 1980). Moderate sensitivity is assumed on a precautionary basis.	Moderate
Razorbill	Few studies available, though daily monitoring of Razorbill nests was shown to reduce breeding success (Lyngs 1994). A study of tourist boat traffic in Canada showed that boat visits resulted in incubating Razorbills leaving eggs/chicks unattended (Hearne 1999). Since data is lacking a Moderate sensitivity is assumed.	Moderate
Kittiwake	No data on response to construction activity, but visitors may have strong effect on nesting success (Beale & Monaghan 2004), therefore Moderate sensitivity is assumed on a precautionary basis.	Moderate
Ringed Plover	Goodship & Furness (2022) assess Ringed Plover as being of high sensitivity to human disturbance, although the mean FID distances in the literature for the breeding period varied considerably between 9-100m. Since this project is concerned with individuals foraging along the tideline, but nesting outside of the bay, then the risk is considered Low/Moderate only.	Low/ Moderate
Oystercatcher	Goodship & Furness (2022) assessed Oystercatcher as being of moderate sensitivity to disturbance stimuli with a mean FID of 26-136 m for approach by people, with motorised vessels having a mean FID of 74 m and motorised vehicles a mean FID of 106 m. However, since the oystercatchers are not breeding in the bay, the sensitivity level in this situation is assessed as Low/Moderate.	Low/ Moderate

Project Impact Assessment

13.7.123 The assessment considers:

- The potential impacts of noise and disturbance on birds in North Haven bay and the surrounding area (as described in Table 13-10) resulting from the expansion of the noust (to be conducted between February to September 2024).
- The potential impacts of noise and disturbance on birds in North Haven bay and the surrounding area (as described in Table 13-10) utilising North Haven bay resulting from other construction work, namely the construction of the cradle and pier (February to September 2024) and construction of the breakwater and linkspan (March to September 2025).

13.7.124 The expansion of the noust, scheduled for February to September 2024, will result in the greatest level of airborne noise during the excavator activity, and for this reason is assessed separately. The other work/activities required, namely the construction of the new quay and linkspan, repairs to the existing pier, and enhancement of the breakwater, will be comparatively less noisy than the excavator activity and are therefore assessed separately. Some of the nests closest to the works area, for example the Fulmars nesting on the stack, may be affected by all activities, whilst other birds nesting further away may only be affected by the noise from the excavator, and are not likely to be impacted by other less disturbing activities. The locations of different species and their nesting areas is shown in Appendix A.16.

13.7.125 A number of disturbance monitoring studies have investigated the effects of pile driving on coastal waterbirds. Research suggests that irregular construction noise at levels typically above 70 dB can cause behavioural responses in some waterbird species with flight responses generally occurring above 80 dB (IECS, 2009; Xodus, 2012; Wright *et al.*, 2013; ABPmer, 2002; IECS, 2013). Since the excavator required to expand the noust has a similar noise output to pile driving[53] then similar behavioural and flight responses are anticipated.

13.7.126 Noise modelling was carried out to model the projected noise contours associated with the noust expansion, assuming use of a 45T excavator with a Sound Power Level (SPL) of128 dB (L_{max}) (Appendix A.16).

13.7.127 The normal hours of construction will take place Monday – Friday 7am-7pm and Saturday 7am-1pm, with no working on Sundays or Bank Holidays. The intention is that the works commence early in the spring, so that the excavator noise is underway when the birds are choosing nesting locations

13.7.128 It is possible that some birds, particularly the Fulmars that are very close to the works area and which are therefore considered most vulnerable to potential impacts, may elect to nest elsewhere if the works are underway early in the spring. This would be a potentially positive outcome, as there is alternative habitat available on Fair Isle and if birds breed elsewhere successfully, they would not be negatively impacted by the works.

13.7.129 However, Fulmars are highly site faithful and assuming that they utilise their usual nesting areas, then based on the noise modelling (presented as Appendix A.16), in a worst-case scenario (i.e. works being carried out on the west of the pier) the Fulmars nesting on the stack 15 m away would be exposed to 74.9 dB. When the works are located on the east side of the pier then noise levels are predicted to reduce to 61.4 dB. The Fulmars on the opposite cliff faces (~100 AON) would experience similar noise levels of 71.0-72.7dB. The Fulmars nesting on the cliffs further to the north of the pier (~50 AON) would be exposed 66.8 dB when the works are on the west of the pier, reducing to 54.6dB when the works are located on the east of the pier.

13.7.130 Therefore, the Fulmars nesting on the stack (~40 AON) will experience noise levels within the region where behavioural impacts could occur, although only when the works are being undertaken on the west of the pier. Similarly, although the noise levels will be less, the

[53] 128 dB L_{max} Sound Power Level (SWL)

construction activities close to the stack, i.e., the construction of the breakwater and linkspan, will be so close to the Fulmars nesting on the stack (in some cases just metres away) that the magnitude of change is considered to be high for these birds.

13.7.131 It is possible that Fulmars nesting close to the works area on the opposite cliffs would also be affected. There are ~100 pairs of Fulmar that nest in this area, although the nests are distributed along the stretch of cliffs right up to the mouth of the bay. Therefore, whilst the closest birds may experience noise levels that would be loud enough to result in behavioural impacts, some nests towards the mouth of the bay are likely to fall outside of this zone (see Appendix A.16 Noise Modelling, Figures 1 and 2).

13.7.132 In a worst-case scenario, a maximum of 140 AON could be negatively impacted by construction noise, representing 0.44% of the SPA population of 32,061 pairs. Disturbance would be temporary in nature, being limited to the duration of the works, although it is possible that some pairs may choose to nest elsewhere in subsequent years if they suffer disturbance impacts. However, should this occur, there is plenty of suitable habitat available on Fair Isle that would provide alternative nesting locations. As a result, the exposure to change is considered low. The sensitivity of Fulmar to construction noise/disturbance is considered low to moderate, resulting in a predicted low vulnerability. Fulmar is of high conservation value, but low vulnerability suggesting that the noust expansion would result in a **Minor adverse** and not significant impact on this species.

13.7.133 Of the other breeding species present within North Haven bay and the surrounding area, the only other species that may be exposed to noise levels exceeding 70 dB is Puffin. There are 30-40 Puffin burrows on the western clifftops near the mouth of the bay. The closest burrows could receive noise levels of 71-71.6 dB. However, many of the burrows are located between the position utilised for the modelling exercise (see Appendix A.16) and the mouth of the bay. Therefore, it is anticipated that far fewer than 40 nests would actually be affected. It is also possible that, since Puffins nests in burrows, the noise levels received within the burrow could be less than the 70dB behavioural impact threshold. However, even assuming a maximum of 40 AOB are negatively affected by construction noise, this would represent 0.46% of the SPA population of 17,500 birds. Disturbance would be temporary in nature, being limited to the duration of the works. As a result, the exposure to change is considered low, and taking into account the moderate sensitivity of Puffin to noise and disturbance, the predicted vulnerability is low. Puffin is of high conservation value, but low vulnerability, resulting in a **Minor adverse** and not significant impact on this species.

13.7.134 Although the Arctic Tern colony is relatively dispersed, nests are not anticipated within any of the areas where noise could exceed 70 dB (Figures 1 and 2 in Appendix A.16). Therefore, the exposure to change is negligible, and therefore Arctic Tern is not considered vulnerable to noise impacts from the construction of the noust, and overall significance of noise/disturbance impacts is considered **negligible** and not significant**.**

13.7.135 With the exception of Puffin, the other auks (namely Razorbill, Black Guillemot and Guillemot) do not nest in areas where noise levels would exceed 70 dB (Figures 1 and 2 in Appendix A.16[54]). Kittiwake is also similar in this respect, with the closest nest in the same caves as Black Guillemot and Razorbill around the north-east coastline of Bu Ness. Therefore, the exposure to change for all of these species is also negligible, and they are not considered vulnerable to noise impacts from the construction of the noust, and overall significance of noise/disturbance impacts is considered **negligible** and not significant**.**

13.7.136 All the auk species (including Puffin) may at times utilise North Haven Bay for loafing. The birds typically raft in Furse, although on occasion these rafts of auks may extend into the mouth of North Haven Bay (D. Barr, FIBO). If the excavator is located on the east of the pier then the noise levels around the stack and to the north are less than 70 dB. However, if the

[54] Guillemot nests in South Haven bay, outside of the area shown in Figures 1 and 2 (Noise Modelling Appendix A.16).

excavator is located on the west of the pier then the noise levels are projected to reach 70 dB across much of the bay (Figures 1 and 2 in Appendix A.16). It is considered highly likely that rafting auks would be displaced from the bay when the excavator is located on the west of the pier (the worst-case scenario). However, since the number of auks utilising North Haven bay is typically low then the magnitude of impact and exposure to change is considered negligible**.** Although auks are considered of moderate sensitivity, any impacts are of small scale, temporary and reversible, and therefore the auks are not considered vulnerable in this context. Overall impacts on these species due to temporary displacement are assessed as **negligible** and not significant**.**

13.7.137 Other coastal waterbird species such as Ringed Plover, Oystercatcher and Arctic Tern [Redacted] but regularly forage within the works area. Oystercatcher and Ringed Plover forage along the tideline, and Arctic Terns forage in the bay itself. For all species, the numbers of birds typically observed are low. However, it is considered likely that these birds would be displaced from foraging within the bay during the excavation of the noust as the noise outputs from the excavator are expected to exceed 70dB and in some areas 80dB. However, the numbers of birds affected will be low and the impacts of noise from the excavator will be of temporary duration, being limited to February to September 2024 (over a single breeding season only). Therefore, exposure to change is considered low. Since these species are of low or moderate sensitivity, vulnerability is considered low, and overall significance is **minor adverse** and not significant**.**

13.7.138 Although the expansion of the noust is the loudest of the planned construction activities, the expansion of the breakwater and the construction of the new quay may also result in potential disturbance impacts on the Fulmars that are nesting both on the stack and where the cliff adjoins the breakwater. These works are scheduled to take place between February and September in 2025. In a worst-case scenario, 40-50 AON could be negatively impacted by construction work, representing 0.16% of the SPA population of 32,061 pairs. Disturbance would be temporary in nature, being limited to the duration of the works, although it is possible that some pairs may choose to nest elsewhere in subsequent years if disturbed. As a result, the exposure to change is considered low. The sensitivity of Fulmar to construction noise/disturbance is considered low to moderate, resulting in a predicted low vulnerability. Fulmar is of high conservation value, but low vulnerability suggesting that the expansion of the breakwater and the construction of the quay would result in a **minor adverse** and not significant impact on this species.

13.7.139 It is possible that Puffin may also experience disturbance impacts due to the expansion of the breakwater and construction of the new quay between February to September 2025, as the nearest nests may be ~65m away from the end of the breakwater. However, the magnitude of change would be small as the number of birds affected would be low (likely to be limited to a few nests only), with impacts of temporary duration only. The probability of occurrence is considered to be medium, giving a low exposure to change. Although Puffin has a moderate sensitivity to disturbance, vulnerability is low and, although Puffin is of High conservation concern, overall impacts are assessed as **minor adverse** and not significant impact.

13.7.140 For the auks using North Haven bay as a loafing area, the probability of disturbance is considered high for both years of the works. Although the noust expansion is the noisiest activity, it is anticipated that increased vessel traffic and the other construction activities planned for 2025 have the potential to increase disturbance. However, the magnitude of change is negligible given that only small numbers of birds use the area, there is other available habitat very close by, and that any impacts are expected to be temporary and reversible. As the magnitude of change is considered negligible, the exposure to change is negligible. On this basis the impact is assessed as **negligible** and not significant**.** Impacts on Kittiwake are also considered **negligible** and not significant as they do not specifically use North Haven bay, although small numbers nest nearby at Bu Ness.

13.7.141 It is possible that Oystercatcher and Ringed Plover may also be displaced, although (apart from the noust expansion) this is considered most likely to occur during the dredging, which is closer to the tideline than the other construction work, which is centred around the stack and the breakwater. Typically, the area is only used by a few individuals and on this basis the magnitude of change is considered negligible so although the probability of occurrence is considered high to there is a negligible exposure to change. Sensitivity of these species is considered as low or moderate, resulting in negligible vulnerability and an overall assessment of **negligible** and not significant**.**

Underwater noise disturbance

General scientific context

13.7.142 In general, there is limited evidence on the effects of underwater noise on seabirds. However, 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).

13.7.143 Several 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). The response criteria for low frequency cetaceans and phocid pinnipeds have, therefore, been applied to the underwater noise assessment as a worst-case approximation for considering potential effects on seabirds (see Underwater Noise Assessment; ABPmer, 2023b, see Appendix A.15).

13.7.144 There are a number of activities associated with the proposed works that are expected to generate underwater noise levels which may affect marine fauna. These are dredging, rock armour placement and vessel movements.

13.7.145 Other potential sources of underwater noise during construction of the upgraded ferry facility at North Haven include installing various steel dowels into the rockhead, placing precast concrete units underwater to form the quay wall, back filling the quayside with granular fill, removing sections of the existing slipway, drilling and ‘silent’ non-explosive methods of rock breaking either using a ‘Cardox’ CO2 rock-breaking system, expanding concrete or similar. These activities generate considerably lower levels of noise than dredging or and are not anticipated to result in any significant effects on marine fauna. They have, therefore, not been considered further in this assessment.

13.7.146 The Underwater Noise Assessment (ABPmer, 2023b, Appendix A.15) concluded that, of the scheduled construction activities, the highest unweighted sound levels were associated with non-concurrent dredging of rock or soft sediments and vessel movements. Therefore, the following assessment focuses on these two activities.

Project Impact Assessment

13.7.147 For dredging, the National Oceanic Atmospheric Administration’s user spreadsheet tool (NOAA, 2022) has been used to predict the range at which the weighted cumulative SEL acoustic thresholds (NOAA, 2018) for PTS and TTS are reached during the proposed dredging at North Haven. The methods are described in further detail in the Underwater Noise Assessment (ABPmer, 2023b, see Appendix A.15).

13.7.148 The distances at which PTS and TTS in low frequency cetaceans and phocid pinnipeds (a worst case approximation for considering potential effects on seabirds) are predicted to occur show that there is no risk of PTS in diving birds (Underwater Noise Assessment ABPmer, 2023b, see Appendix A.15). The risk of TTS is limited to within 12 to 25m but

assumes that diving birds were to remain within the water column for 24 h which is far from realistic.

13.7.149 Arctic Tern is the only species that is consistently, although only in low numbers, observed actively foraging within the waters of the bay itself and is therefore the only species considered at any risk from underwater noise disturbance. (Loafing auks do not dive underwater, and neither do shorebirds foraging within the tideline). When foraging, Arctic Terns dive only for a few seconds at most, and on this basis, impacts are not anticipated. Since North Haven bay is not a key foraging area for Arctic Terns, and only small numbers are typically observed, then exposure to change is considered negligible, vulnerability is also considered negligible, and impacts are therefore expected to be **negligible** and not significant.

13.7.150 The impacts of vessel movements were assessed using the NOAA's user spreadsheet tool (NOAA, 2022). The methods are described in greater detail within the Underwater Noise Assessment (ABPmer, 2023b, see Appendix A.15).

13.7.151 The distances at which PTS and TTS in low frequency cetaceans and phocid pinnipeds (a worst-case approximation for considering potential effects on seabirds) were calculated. The results showed that there is no predicted risk of either PTS or TTS to diving birds.

13.7.152 Overall, there is not considered to be any risk of injury or significant disturbance to diving birds from the proposed vessel activities at North Haven even if the vessel movements were to take place continuously 24 hours a day and 7 days a week.

Changes to the value of the habitat for foraging during construction

General scientific context

13.7.153 It is possible that dredging could affect the value of the habitat for foraging birds during the construction phase. The mechanisms behind potential changes in habitat value differ between Arctic Tern, which forages on pelagic shoaling fish within the bay, and the shorebirds that forage for invertebrates along the tideline. Therefore, these groups are discussed separately.

13.7.154 In the Northern Isles, Arctic Tern feed predominantly on sandeels. Other fish species that have spawning grounds within 3 km of Fair Isle and which are likely to be suitable prey for Arctic Terns include herring, sprat and whiting. Foraging may take place far offshore, although it also can occur along edges of sandy or rocky shores, tidal flats or shoals, tending to concentrate over tide rips or along drift lines. Foraging mainly takes place where prey is within 20 cm of the surface, and areas with strong water currents are thought to be important in bringing prey to the top of the water column (Eglington & Perrow 2014).

13.7.155 Oystercatchers typically feed on bivalves, especially large cockles *Cerastoderma edule*, mussels *Mytilus edulis* and tellins *Limecola* spp., although they may also take polychaete worms and earthworms from wet fields. North Haven bay supports rock pools containing a variety of gastropods and small shore crabs, as well as limpets (on the slipway) and a range of polychaete worms, all of which are suitable prey items (see Benthic Habitats and Species). Ringed Plovers feed on polychaete worms, crustaceans (such as *Corophium* spp.) and molluscs (such as *Peringia ulvae*). In North Haven bay Ringed Plovers are likely to forage on polychaetes, along with smaller crustaceans and gastropods (see Benthic Habitats and Species section).

Project impact assessment

13.7.156 Arctic Terns take relatively small fish, which are transported into North Haven bay by larval drift from spawning grounds further offshore and therefore their occurrence is likely to be patchily distributed both spatially and temporally. Since only a small number of birds are

observed within the bay at any time, then it is assumed that although prey may be present, it is not particularly abundant.

13.7.157 Increased suspended solids and turbidity are likely to decrease the detectability of prey. Noise and disturbance associated with dredging may, in a worst-case scenario, result in temporary displacement of fish from the local area, although this is considered unlikely (see 13.7.78).

13.7.158 Assuming a worst-case scenario that Arctic Terns were unable to use North Haven bay for foraging during the construction period (whether the cause be suspended sediments or simply a lack of prey due to disturbance), the consequences of this temporary habitat loss were considered. Tagging studies carried out on Arctic Terns (n=22) from the southern Reykjanes Peninsula (Iceland) between 2019-2021 show that they have a foraging range of 4,308-68,477 km^2 (using 95% kernel areas – see Morten *et al.* 2022). Assuming a worst-case scenario that forage fish are displaced from the whole of North Haven bay (0.04 km^2) then this would constitute 0.001% of their home range. Therefore, even if behavioural effects for more sensitive fish species extended well beyond North Haven bay, it is considered unlikely to have a significant effect on the Arctic Terns which are able to exploit a range of areas well beyond this distance. Furthermore, the proposed dredging activities involved during construction will be temporary and take place over a period of approximately 7 months, and during this time dredging operations would not be expected to be undertaken continuously.

13.7.159 The magnitude of this temporary displacement of fish is considered negligible, as only a small number of birds would be affected and the bay constitutes a very small proportion of total foraging area available to the birds, resulting in overall negligible exposure to change. Displacement would be temporary and reversible, with fish returning once the works are complete. Increased suspended sediments due to dredging alone are likely only to affect a limited area and not the whole bay and may dissipate relatively rapidly following cessation of work. Therefore, the overall significance of impacts are assessed as **negligible** and not significant.

13.7.160 Since both Oystercatcher and Ringed Plover forage around the tide line, whilst the dredge areas are offshore, impacts on prey species for these birds will principally be through indirect pathways, such as changes in water quality and sediment quality.

13.7.161 Sediment suspended and dispersed during dredging has the potential to resettle over the seabed. Once on the bed, the deposited material returns to the background system to be put back into suspension on subsequent peak flood or ebb tides to be further dispersed. The impacts of additional sediment are not expected to extend far beyond the dredge footprint (see Benthic Habitats and Species assessment). Therefore, impacts on species along the tideline would not be anticipated. In fact, increased suspended sediments may favour the development of suspension feeders such as bivalves, which could be of potential benefit to Oystercatcher.

13.7.162 Significant impacts resulting from changes in dissolved oxygen concentrations, and suspension of contaminated sediments are not anticipated (see Benthic Habitats and Species Assessment), and therefore changes in the abundance of gastropods, small crustaceans, polychaetes and molluscs that constitute prey for Oystercatchers and Ringed Plovers are also not expected. The probability of impacts is therefore considered low, and since the area is not highly used, any impacts would only be small in magnitude, meaning that exposure to change is negligible. Therefore any impacts are considered **negligible** and not significant**.**

Introduction of mammalian predators

General scientific context

13.7.163 Eradication of non-native mammalian predators from seabird islands and establishing biosecurity measures to prevent recolonisation has become a focus in the UK following its success in other locations around the world and its role in reducing extinction risk of several seabird species. In the UK, eradication of rats from islands, where they have been introduced by humans, has been particularly successful at improving the breeding success of burrow (and crevice) nesting species such as Manx shearwater *Puffinus puffinus*, Storm Petrel and Puffin (Thomas *et al.* 2017).

13.7.164 Fair Isle has always been free of rats (black and brown), presumably due to its distance from and lack of connectivity to other islands and the mainland. It has also never had feral ferret *Mustela furo*, red fox *Vulpes vulpes*, dtoat *Mustela erminea* or American mink *Neovison vison*. However, it does have a small number of feral cats and domestic cats. The former are known predators of the Arctic Terns nesting in the south of the island, and it is likely that Storm Petrel, Black Guillemot and Puffin are also negatively impacted by cats. Fair Isle also has both field mouse *Apodemus sylvaticus* and house mouse *Mus domesticus*. Although not a separate species, it is of note that field mice on Fair Isle (and other Scottish islands) look different to those on the mainland, being much larger in size[55]. Both field mouse and house mouse may predate seabird eggs when other food is scarce.

13.7.165 The EU Biosecurity for LIFE Project has the aim of eliminating invasive mammalian predators from 42 islands in the UK that are designated as SPAs by carrying out monitoring to detect rats and other predators and by putting biosecurity measures in place to ensure they remain free of these invasive species into the future. Although it is acknowledged that mice may predate seabird eggs, the focus of the LIFE project has primarily been on rat eradication, and eradication of larger and more impactful non-native mammalian predators such as stoat and mink. One of the other aims of the project is to ensure that maintaining biosecurity becomes part of routine SPA colony management.

13.7.166 Biosecurity planning involves the identification of risk species and potential 'pathways', such as boats, helicopters, visitors, lighthouse boards and construction work. Prevention measures are required to ensure that invasive species are not transported via these potential pathways.

13.7.167 Biosecurity planning also involves surveillance to monitor for the presence of rats or other predators, and an incursion response plan should the presence of non-native mammalian predators be detected. If incursions do occur, it is essential that response is rapid. It is easier to carry out removal operations if only a few animals are involved, and species such as rats can reproduce rapidly (Thomas & Varnham 2016).

13.7.168 The measures taken to reduce the risks of introducing mammalian predators through the movement of vessel and importing of materials during construction are discussed in detail within the BMP (ABPmer, 2023c Appendix A.17).

13.7.169 The project impact assessment below assumes that the measures recommended within the BMP (ABPmer, 2023c Appendix A.17) are implemented.

Project impact assessment

13.7.170 The species considered to pose the greatest risk to birds is Brown Rat (*Rattus Norvegicus)* as it is abundant on both Shetland and the mainland around any human habitation and around ports. It is also a known predator of seabird eggs, with many seabird islands showing significant improvements in populations once Brown Rats are removed (Thomas *et al.* 2017). Although all invasive mammalian predators have the potential to result in detrimental impacts on seabirds, Mink is also notable as a particularly voracious bird predator, although it is not

[55] http://www.fairislebirdobs.co.uk/mice.html

present on Shetland. Ferret and Polecat-Ferret[56] *Mustela putorius x Mustela furo* are both present on Shetland, and incursion of either could be very damaging for birds. Unlike rats, which only predate nests/chicks, these larger mammal species are capable of predating the adults of some species (e.g., Ringed Plover, Oystercatcher).

13.7.171 The seabird species that are most vulnerable to egg/nest predation are smaller ground or burrow nesting species. On Fair Isle, these include Puffin, Storm Petrel and Arctic Tern. Razorbill and Black Guillemot may also nest in boulders and at the bottom of cliffs, in areas that may be easily accessible to rats. Rats also predate the nests of ground nesting shorebirds such as Oystercatcher and Ringed Plover, both of which nest nearby at Bu Ness. Since rats are highly capable climbers, there is also some risk to the endemic Fair Isle Wren *Troglodytes troglodytes fridariensis*, even though it nests almost exclusively on cliffs.

13.7.172 Rats may also impact on cliff nesting species, especially if the cliff faces are relatively accessible, as rats are highly capable climbers. In some locations rat removal has resulted in significant benefits to Kittiwake[57] and Razorbill (Thomas *et al.* 2017, Brooker *et al.* 2018).

13.7.173 Guillemots are at less risk from rats as they typically nest on steep cliffs. Fulmars are large and considered very capable of defending nests against a rat, so would be less severely impacted.

13.7.174 The assessment is carried out based on two worst-case scenarios: i) accidental introduction of rat, and ii) accidental introduction of mink/ferret/Polecat-ferret. However, even Hedgehogs can predate tern eggs, so all of the invasive mammalian predators present some level of risk.

13.7.175 It is important to differentiate between the risk of accidental transfer of rats to Fair Isle, which, as is the case with any seabird island, is a major concern (as is reflected by the risk assessment within the BMP) and the small increase in risk due to the harbour replacement works and new ferry service, which is evaluated below.

13.7.176 With the biosecurity measures described in the Biosecurity Plan in place, the risk of rat incursion occurring is reduced. Although rats may impact on productivity, they are not predators of birds, and therefore any changes are limited to a reduction in nesting success. The construction work itself will result in increased vessel traffic and human visitors to Fair Isle, which in turn does increase the risk of accidental transfer of rats. However, other leisure craft and people routinely transit to and from Fair Isle, and with the measures in the BMP in place (see Appendix A.17), then the risks posed by additional vessels and staff from construction work are considered minimal. On this basis the magnitude of change is considered medium, and therefore overall exposure to change would be negligible. Although these species are all highly sensitive to nest predation by rats, vulnerability is considered negligible, and overall impacts are considered **negligible** and not significant.

13.7.177 Although they are voracious predators, the potential incursion of Mink/Ferret/Polecat-ferret is considered much less likely to occur than a rat incursion as these species (when feral) are shy and would typically avoid humans, and therefore are unlikely stowaways. They are also larger, and therefore more likely to be detected during the checks described in the Biosecurity Plan. With the measures described in the BMP in place the risk of incursion is considered negligible and therefore overall impacts are considered **negligible** and not significant**.**

[56]The polecat-ferret is the hybrid offspring of a polecat and a ferret, which may interbreed successfully producing fertile young. Polecat-ferrets look like a ferret but have the markings of a polecat (although many animals are virtually impossible to differentiate without genetic testing).

[57] The Seabird Group (2019). Newsletter 142. Canna. Accessible online at: http://www.seabirdgroup.org.uk/newsletters/

Operation

Changes to the value of the habitat for foraging

General scientific context

13.7.178 Long term changes in the value of the habitat for foraging relate either to changes in the abundance of prey due to direct and/or indirect impacts resulting from construction work or due to changes in the nature of the habitat caused by the works, which may mean that it is no longer suitable for a particular species.

Project impact assessment

13.7.179 Changes to the value of the habitat for foraging are assessed for Arctic Tern, which forages on pelagic shoaling fish within the bay, and for Ringed Plover and Oystercatcher, which forage along the tideline.

13.7.180 The 0+ sandeels that form the mainstay of the Arctic Terns' diet are brought to Fair Isle from offshore spawning areas by tidal currents. Furthermore, impacts on fish are anticipated to be negligible (see 13.7.78). Therefore, effects extending beyond the construction period are not anticipated.

13.7.181 The impact of changes in suspended sediment, dissolved oxygen and potential contamination on benthic habitats and species are not considered significant either in the short or longer term, and as therefore any resulting impacts on the abundance of sandeels would also be limited to the construction period only. On this basis, the magnitude of change is considered negligible and, overall the impacts of the work in the long-term are considered **negligible** and not significant**.**

13.7.182 Since the dredging will take place offshore and both Oystercatcher and Ringed Plover forage around the tide line, impacts on prey species will principally be through indirect pathways, such as changes in water quality and sediment quality.

13.7.183 The impact of changes in suspended sediment, dissolved oxygen and potential contamination of benthic habitats and species are not considered significant, either during construction or during operation, and therefore impacts on the abundance and quality of bird prey are not anticipated. As exposure to change is negligible then so is magnitude. This results in an assessment of negligible for this potential impact.

Disturbance to Fulmars nesting on the stack

General scientific context

13.7.184 Since the Fulmars nesting on the stack are in close proximity to the new quay, potential impacts on these birds are considered in an operational context. The general scientific context around disturbance impacts is summarised above (see 13.7.115).

Project Impact Assessment

13.7.185 Although the new pier has been designed to minimize the loss of nesting habitat for the Fulmars, based on the distribution of nests in 2022, it is anticipated that habitat to support seven nesting pairs would be lost due to the footprint of the proposed new quay.

13.7.186 The construction of the new quay will also increase disturbance of the Fulmars nesting on the stack. The new quay abuts the stack, which will no longer be isolated, and the area will

routinely be used by people and vessels. It is thus unavoidable that people will be brought into close proximity to the Fulmars nesting area.

13.7.187 The quay will be fenced to ensure that the public (children, dogs etc) are physically separated from the Fulmars to maintain a safe environment for any pairs that continue to nest on the stack, understanding that this species is highly site faithful and acknowledging that some birds are likely to continue nesting even in adverse conditions. The design of the fence will be agreed with NatureScot to ensure that visual impacts are minimized, but that the fence completely restricts access onto the stack from the quay extension.

13.7.188 In a worst-case scenario it is anticipated that the Fulmars will ultimately be displaced from the stack. This may not necessarily happen immediately, but over several years. It is also acknowledged that a small number of pairs may persist and potentially experience reduced productivity. For example, birds further away from the new quay may not be displaced, although birds nesting near the new quay are more likely to suffer displacement. A small amount of nesting habitat will also be directly lost to the development of the quay itself.

13.7.189 Therefore, it is assumed that there will be some level of displacement of nesting Fulmars from the stack, and that in a worst case-scenario this could affect all birds nesting in this location (~40 pairs). However, since Fulmars have declined on Fair Isle from 43,000 pairs in 1996 to 32,061 pairs in 2016, then available suitable habitat is not lacking, and it is considered likely that any displaced Fulmars will find alternative high quality nesting habitat available elsewhere around Fair Isle's coastline. Overall, the number birds affected is very small (0.12% of the SPA population) and the consequences of displacement are not anticipated to be particularly detrimental.

13.7.190 Therefore, the probability of occurrence is high, but the magnitude of change is low, giving a low exposure to change. Since sensitivity of Fulmars to loss of nesting habitat (in this circumstance) is low as there is abundant alternative habitat available on Fair Isle, then vulnerability is considered low resulting in a **minor adverse** impact on this species.

Introduction of mammalian predators

General scientific context

13.7.191 The general scientific context around the introduction of mammalian predators is explained above (see 13.7.163). The potential for the introduction of invasive mammalian predators during the operational life of the replacement ferry is considered below.

Project Impact Assessment

13.7.192 Since there is already a ferry service to Fair Isle, the replacement ferry will only result in a very minimal increase in risk as it is expected to potentially have a greater number of operational days than the old ferry. However, the new ferry will adopt the biosecurity procedures described in the BMP (see Appendix A.17),

13.7.193 With these measures in place the probability of accidental transfer of any invasive mammalian predator is considered negligible, and therefore overall impacts are considered negligible and not significant.

13.8 Further Mitigation and Enhancement

13.8.1 Further mitigation measures are proposals to address adverse effects which remain after embedded measures and standard construction practices have been incorporated into the Proposed Development.

13.8.2 No further mitigation or enhancement measures are identified because achievable mitigation within the Site extents has already been included in the embedded mitigation measures and it is reasonably assumed that standard construction practices would apply.

13.9 Residual Effects

13.9.1 Residual effects are those that are predicted to remain following implementation of the further mitigation and enhancement measures described above. As no further mitigation measures are proposed, the assessment of likely effects presented above in Section 13.7 identifies the residual effects of the Proposed Development.

13.10 Monitoring

13.10.1 There will be no requirement for monitoring of the Proposed Development following completion.

13.11 Cumulative Effects

13.11.1 As set out in Section 5.11 a review of 'committed developments' was undertaken to identify major developments within 2.5 km of the edge of the planning application boundary of the Site that may lead to likely significant cumulative effects with the Proposed Development. There are no planned cumulative developments that are expected to happen on Fair Isle during construction, and no mechanism for cumulative effects has been identified.

13.11.2 The only project/plan in the area is the proposal to rebuild the bird observatory which is planned to take place during summer and autumn 2023. It would, therefore, not overlap with the proposal construction activities for the ferry replacement and upgrade which would not begin until end of Spring 2024. Furthermore, operation of the observatory and ferry upgrade would not vary significantly from baseline operations.

13.12 Summary

13.12.1 This chapter presents the assessment findings of the construction and operation of the Fair Isle Harbour Improvement Works (the Proposed Development) on marine ecology receptors, specifically benthic habitats and species, fish and shellfish, marine mammals, seabirds and coastal waterbirds.

13.12.2 Data collection has included a desk study and a benthic survey programme carried out in 2022. The assessments, as relevant, have drawn upon the results of the marine geomorphology assessment.

13.12.3 Potential impact pathways from construction, and operation of the Proposed Development assessed in this chapter both at the Site and the disposal site include habitat loss and changes to benthic habitats and species, indirect effects from changes in water and sediment quality, introduction and spread of invasive non-native species and mammalian predators, underwater and airborne noise and vibration disturbance and changes to value of bird foraging habitat.

13.12.4 The mitigation hierarchy has been embedded within the assessment process, whereby the design has sought to avoid adverse impacts in the first instance through an iterative approach to design.

13.12.5 All of the potential impacts on marine ecology receptors are assessed as negligible or minor adverse and therefore are not significant.

13.13 References

ABPmer. (2002). ABP Teignmouth Quay Development Environmental Statement. ABP Marine Environmental Research Ltd, Report No. R.984a.

ABPmer. (2013). Bury Marsh Bird Monitoring 2012-2014: Interim Report. ABP Marine Environmental Research Ltd, Report No. R.2123.

ABPmer, (2022). Fair Isle Replacement Ferry, Report to Inform Appropriate Assessment for GI works at North Haven Bay, Fair Isle, ABPmer Report No. R.3746. A report produced by ABPmer for Stantec, March 2022.

ABPmer, (2023a). Fair Isle Ferry Upgrade, Benthic Survey Report, ABPmer Report No. R.4064. A report produced by ABPmer for Stantec, November 2022.

ABPmer, (2023b). Fair Isle Ferry Upgrade, Underwater Noise Assessment, ABPmer Report No. R.4174. A report produced by ABPmer for Stantec, March 2023.

ABPmer, (2023c). ABPmer, (2023). Fair Isle Harbour Improvement Works, A Biosecurity Management Plan, ABPmer Report No. R.4243. A report produced by ABPmer for Stantec UK Ltd for Shetland Islands Council, May 2023.

Allbrook, D. & Quinn, J. (2020). The effectiveness of regulatory signs in controlling human behaviour and Northern Gannet (*Morus bassanus*) disturbance during breeding: an experimental test. *Journal for Nature Conservation* 58, 125915.

Ashley, M., (2016). Polychaetes in littoral fine sand. In Tyler-Walters H. and Hiscock K. Marine Life Information Network: Biology and Sensitivity Key Information Reviews, [on-line]. Plymouth: Marine Biological Association of the United Kingdom. [cited 15-12-2022].

Barnes, M.K.S. 2008. Micromesistius poutassou Blue whiting. In Tyler-Walters H. and Hiscock K. Marine Life Information Network: Biology and Sensitivity Key Information Reviews, [on-line]. Plymouth: Marine Biological Association of the United Kingdom. [cited 23-05-2023]. Available from: https://www.marlin.ac.uk/species/detail/56

Beale, C.M., & Monaghan, P. (2004). Human disturbance: people as predation-free predators? *Journal of Applied Ecology* 41:335-343.

Bolam, S.G., Schratzberger, M. and Whomersley, P. (2006a). Macro- and meiofaunal recolonization of dredged material used for habitat enhancement: Temporal patterns in community development. Mar. Pollut. Bull. 52: 1746-1755.

Bolam, S.G., Rees, H.L., Somersfield, P., Smith, R., Clarke, K.R., Warwick, R.M., Atkins, M. and Garnacho, E. (2006b). Ecological consequences of dredged material disposal in the marine environment: A holistic assessment of activities around the England and Wales coastline. Marine Pollution Bulletin. 52, 415-426.

Bolam, S.G., McIlwaine, P.S.O. and Garcia, C. (2016). Application of biological traits to further our understanding of the impacts of dredged material disposal on benthic assemblages. Marine Pollution Bulletin, 105(1), pp.180-192.

Boyd, S.E., Cooper, K.M., Limpenny, D.S., Kilbride, R., Rees, H.L., Dearnaley, M.P., Stevenson, J., Meadows W.J., and Morris, C.D. (2004). Assessment of the Re-Habilitation of the Seabed Following Marine Aggregate Dredging. Sci. Ser. Tech. Rep., CEFAS Lowestoft, 121, p. 154.

Britwell, I.K. (2000). Effects of sediment on fish and their habitat, DFO Pacific Region, Habitat status report 2000/01 E, Canada.

Brooker, H., Slader, P., Price, D., Bellamy, A.J., & Frayling, T. (2018). Cliff nesting seabirds on Lundy: Population Trends from 1981 to 2017. Journal of the Field Society of Lundy 6: 65-76.

Budd, G.C. (2004). Burrowing amphipods and Eurydice pulchra in well-drained clean sand shores. Marine Life Information Network: Biology and Sensitivity Key Information Sub-programme [on-line].

Cairns, D. (1980). Nesting density, habitat structure and human disturbance as factors in black guillemot reproduction. *Wilson Bulletin* 92(3), pp. 352-361.

Carlton, J.T. (1992). Marine Species Introductions by Ships' Ballast Water: An Overview. In: Proceedings of the Conference and Workshop on Introductions and Transfers of Marine Species: Achieving a Balance Between Economic Development and Resource Protection, Hilton Head Island, South Carolina October 30 – November 2, 1991, ed. By M.R. De Voe. pp.23-25. South Carolina Sea Grant Consortium.

Carlton, J.T., and Geller, J.B. (1993). Ecological Roulette: The Global Transport of Nonindigenous Marine Organisms. Science. 261, pp. 78-82.

Carter MID, Boehme L, Cronin MA, Duck CD, Grecian WJ, Hastie GD, Jessopp M, Matthiopoulos J, McConnell BJ, Miller DL, Morris CD, Moss SEW, Thompson D, Thompson PM and Russell DJF (2022) Sympatric Seals, Satellite Tracking and Protected Areas: Habitat-Based Distribution Estimates for Conservation and Management. Frontiers in Marine Science.9:875869.

Centre for Environmental Data Analysis (CEDA). (2011). Underwater sound in relation to dredging. CEDA Position Paper - 7 November 2011.

Chartered Institute of Ecology and Environmental Management (CIEEM). (2018). Guidelines for Ecological Impact Assessment in the UK and Ireland. [Online] Available at: https://cieem.net/wp-content/uploads/2018/08/ECIA-Guidelines-2018-Terrestrial-Freshwater-Coastal-and-Marine-V1.1Update.pdf

Collop, C., Stillman, R.A., Garbutt, A., Yates, M.G., Rispin, E. and Yates, T. (2016). Variability in the area, energy and time costs of wintering waders responding to disturbance. Ibis, 158(4), pp.711-725

Cook, E.J., Payne, R.D. & Macleod, A., (2014). Marine biosecurity planning – Identification of best practice: A review. Scottish Natural Heritage Commissioned Report No. 748.

Coull, K.A., Johhnstone, R., and Rogers, S.I. (1998). Fisheries Sensitivity Maps in British Waters. Published and distributed by UKOOA Ltd., v + 58 pp.

Curtin, S., Richards, S., Westcott, S. (2009). Tourism and grey seals in South Devon: management strategies, voluntary controls and tourists' perception of disturbance. Current Issues in Tourism, 12(1), 59-81.

Dauvin, J-C. (2008). Effects of heavy metal contamination on the macrobenthic fauna in estuaries: The case of the Seine estuary. Marine Pollution Bulletin. 57: 160-169.

De-Bastos, E.S.R. (2016a). [Kurtiella bidentata] and [Abra] spp. in infralittoral sandy mud. In Tyler-Walters H. and Hiscock K. (eds) Marine Life Information Network: Biology and Sensitivity Key Information Reviews, Plymouth: Marine Biological Association of the United Kingdom. [Online] Available at: https://www.marlin.ac.uk/habitat/detail/1094.

De-Bastos, E.S.R. (2016b). [Nephtys hombergii] and [Tubificoides] spp. in variable salinity infralittoral soft mud. In Tyler-Walters H. and Hiscock K. (eds) Marine Life Information Network: Biology and Sensitivity Key Information Reviews, Plymouth: Marine Biological Association of the United Kingdom. [Online] Available at: https://www.marlin.ac.uk/habitat/detail/200.

Dwyer, R.G. (2010). Ecological and anthropogenic constraints on waterbirds of the Forth Estuary: population and behavioural responses to disturbance. Thesis submitted as candidature for the degree of Doctor of Philosophy Centre for Ecology and Conservation.

Eglington, S. M. & Perrow, M.R. (2014). Literature review of tern (*Sterna & Sternula* spp.) foraging ecology. Report prepared for JNCC. Contract ref. C13-0204-0686.

Ellis, J.R., Milligan, S.P., Readdy, L., Taylor, N. and Brown, M.J. (2012). Spawning and nursery grounds of selected fish species in UK waters. Science Series Technical Report, Cefas Lowestoft, 147: 56 pp.

Elliott, M., Nedwell, S., Jones, N.V., Read, S.J., Cutts, N.D. and Hemmingway, K.L. (1998). Intertidal sand and mudflats & subtidal mobile sandbank Volume II. An overview of dynamics and sensitivity characteristics for conservation management of marine SACs. Scottish Association of Marine Science UK Marine SACs Project 151pp.

ERM. (1996). South Humber Power Station, Pyewipe, Bird Monitoring Study, April 1996.

Evans, P.G.H., Pierce, G.J., Veneruso, G., Weir, C.R., Gibas, D., Anderwald, P. & Begoña Santos, M. (2015). Analysis of long-term effort-related land-based observations to identify whether coastal areas of harbour porpoise and bottlenose dolphin have persistent high occurrence & abundance (revised June 2015). JNCC Report No. 543, JNCC, Peterborough ISSN 0963-8091.

Fauna and Flora International (2020). A Case Study of Demonstration & Research Marine

Protected Area Development in Scotland. Available online at: https://www.faunaflora.

org/app/uploads/2021/01/FFI_2020_Fair-Isle-DR-MPA-development-in-Scotland-.pdf

Goodship, N. and Furness, R.W. (2019). Seaweed hand-harvesting: literature review of disturbance distances and vulnerabilities of marine and coastal birds. Scottish Natural Heritage Research Report No. 1096.

Goodship, N.M. and Furness, R.W. (MacArthur Green) (2022). Disturbance Distances Review: An updated literature review of disturbance distances of selected bird species. NatureScot Research Report 1283.

Goss-Custard, J.D., Hoppe, C.H., Hood, M.J. and Stillman, R.A. (2020). Disturbance does not have a significant impact on waders in an estuary close to conurbations: importance of overlap between birds and people in time and space. Ibis, 162(3), pp.845-862.

Hague EL, Sinclair RR and Sparling C E (2020) Regional Baselines for Marine Mammal Knowledge Across the North Sea and Atlantic areas of Scottish waters, Scottish Marine and Freshwater Science Vol 11 No 12.

Hammond, P.S., Macleod, K., Berggren, P., Borchers, D.L., Burt, L., Cañadas, A., Desportes, G., Donovan, G.P., Gilles, A., Gillespie, D., Gordon, J., Hiby, L., Leaper, R., Lehnert, K., Leopold, M., Lovell, P., Øien, N., Paxton, C.G.M., Ridoux, V., Vázquez, J.A. (2013). Cetacean abundance and distribution in European Atlantic shelf waters to inform conservation and management. Biological Conservation 164, 107-122,

Hansen, K. A., Maxwell, A., Siebert, U., Larsen, O. N., and Wahlberg, M. (2017). Great cormorants (*Phalacrocorax carbo*) can detect auditory cues while diving. The Science of Nature, 104(5-6), 45.

Hearne, Edmund P. (1999). Effect of tour boat activity within an ecological reserve on the behaviour of three Atlantic alcids : common murres (*Uria aalge*), razorbills (*Alca torda*), and Atlantic puffins (*Fratercula arctica*). Masters thesis, Memorial University of Newfoundland.

Heinänen, S. & Skov, H (2015). The identification of discrete and persistent areas of relatively high harbour porpoise density in the wider UK marine area, JNCC Report No.544 JNCC, Peterborough.

Henry, E., & Hammill, M. O. (2001). Impact of small boats on the haulout activity of harbour seals (Phoca vitulina) in Metis Bay, Saint Lawrence Estuary, Quebec, Canada. Aquatic Mammals, 27(2), 140-148.

Hockin, D., Ounsted, M., Gorman, M., Keller, V., and Barker, M.A. (1992). Examination of the effects of disturbance of birds with reference to its importance in ecological assessments. Journal of Environmental Management. 36, pp.253-286

Hoover-Miller, A., Bishop, A., Prewitt, J., Conlon, S., Jezierski, C., & Armato, P. (2013). Efficacy of voluntary mitigation in reducing harbor seal disturbance. The Journal of Wildlife Management.

Institute of Estuarine and Coastal Studies (IECS). (2009a). Construction and Waterfowl: Defining, Sensitivity, Response, Impacts and Guidance. Institute of Estuarine and Coastal Studies Report to Humber INCA. IECS. (2009b). Ornithological Monitoring, Saltend: Summary Trend Report #33 January 2007 to March 2007 Late Winter. Report to ABP Port of Hull. IECS, University of Hull.

Institute of Estuarine and Coastal Studies (IECS). (2009b). Ornithological Monitoring, Saltend: Summary Trend Report #33 January 2007 to March 2007 Late Winter. Report to ABP Port of Hull. IECS, University of Hull.

Institute of Estuarine and Coastal Studies (IECS). (2013). Waterbird Disturbance Mitigation Toolkit Informing Estuarine Planning and Construction Projects.

International Union for Conservation of Nature (IUCN). (2011). Invasive Species. [Online] Available at: http://www.iucn.org/about/union/secretariat/offices/iucnmed/iucnmedprogrammes/species/invasivespecies (accessed May 2023).

Johnston, .D.T., Furness, R.W., Robbins, A.M.C., Tyler, G., Taggart, M., Masden, E.A. (2018). Black guillemot ecology in relation to tidal stream energy generation: An evaluation of current knowledge and information gaps. *Marine Environmental Research* 134: 1210129. ISSN 0141-1136. https://doi.org/10.1016/j.marenvres.

JNCC. (2004). Common Standards Monitoring Guidance for Lowland Wetland, Version.

Johnson, G.E.L., Caneco, B., Latto, P., Warner, I., Kaiser, M.J., and Donovan, C. (2017). Towards an understanding of the physical effects of natural disturbance and demersal fishing on UK mobile sediment MPAs. Defra contract ME6001.

Jones, D. and Marten, K. (2016). Dredging sound levels, numerical modelling and EIA. Terra et Aqua, 144, pp.21-29.

Kjelland, M.E., Woodley, C.M., Swannack, T.M. and Smith, D.L. (2015). A review of the potential effects of suspended sediment on fishes: potential dredging-related physiological, behavioural, and transgenerational implications. Environment Systems and Decisions, 35(3), pp.334-350.

Linssen., H., Van De Pol, M., Allen, A.M., Jans, M., Ens, B.J., Krijsveld, K.L., Frauendorf, M and Van der Kolk, H.J. (2019). Disturbance increases high tide travel distance of roosting shorebird but only marginally effects daily expenditure. Avian Research, 10(1), pp.1-11.

Long, E. R., MacDonald, D. D, Smith, S. L. and Calder, F. D. (1995). Incidence of Adverse Biological Effects Within Ranges of Chemical Concentrations in Marine and Estuarine Sediments. Environmental Management. 191: 81-97.

Lyngs, P. (1994). The effects of disturbance on growth rate and survival of young Razorbills *Alca torda*. *Seabird* 16: 46-49.

Mallory, M. (2016). Reactions of ground-nesting marine birds to human disturbance in the Canadian Arctic. *Arctic Science*. 2(2): 67-77. https://doi.org/10.1139/as-2015-0029

Marine Ecology Surveys Ltd (2008). Marine Macrofauna Genus Trait Handbook.

Mathews, E. A., Jemison, L. A., Pendleton, G. W., Blejwas, K. M., Hood, K. E., & Raum-Suryan, K. L. (2016). Haul-out patterns and effects of vessel disturbance on harbor seals (Phoca vitulina) on glacial ice in Tracy Arm, Alaska. Fishery Bulletin, 114(2).

Morten, J.M., Burgos, J.M., Collins, L., Maxwell, S.M., Morin, E.J., Parr, N., Thurston, W., Vigfúsdóttir, F., Witt, M.J. and Hawkes, L.A. (2022). Foraging behaviours of breeding Arctic Terns Sterna paradisaea and the impact of local weather and fisheries. Frontiers in Marine Science, 8, p.1977.

Navedo, J.G., and Herrera, A.G. (2012). Effects of recreational disturbance on tidal wetlands: supporting the importance of undisturbed roosting sites for waterbird conservation. Journal of Coastal Conservation, 16(3), pp.373-381.

Newell, R.C., Seiderer, J.L. & Hitchcock, D.R. (1998). The Impact of Dredging Works in Coastal Waters: A Review of Sensitivity to Disturbance and Subsequent Recovery of Biological Resources on the Seabed. Oceanography and Marine Biology: an Annual Review, 36:127-78.

NOAA (2018). 2018 Revisions to: Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (Version 2.0): Underwater Thresholds for Onset of Permanent and Temporary Threshold Shifts. U.S. Dept. of Commer., NOAA. NOAA Technical Memorandum NMFS-OPR-59, 167p.

NOAA (2022). User Manual and User Spreadsheet Tool - 2018 Acoustic Technical Guidance. [Online] Available at: https://www.fisheries.noaa.gov/action/user-manual-optional-spreadsheet-tool-2018-acoustic-technical-guidance (accessed June 2022).

Paterson , W D , Russell , D J F , Wu , G-M , McConnell , B , Currie , J I , McCafferty, D J & Thompson , D. (2019). ' Post-disturbance haulout behaviour of harbour seals ' , Aquatic Conservation: Marine and Freshwater Ecosystems , vol. 29, no. S1 , pp. 144-156.

Paxton, C.G.M., Scott-Hayward, L.A.S. & Rexstad, E. (2014). Statistical approaches to aid the identification of Marine Protected Areas for minke whale, Risso's dolphin, white-beaked dolphin and basking shark. Scottish Natural Heritage Commissioned Report No. 594

Paxton, C.G.M, Scott-Hayward, L., Mackenzie, M, Rexstad, E and Thomas, L. (2016) Revised Phase III Data Analysis of Joint Cetacean Protocol Data Resource JNCC Report No.517

Pearce, F., Peeler, E. and Stebbing, P. (2012). Modelling the Risk of the Introduction and Spread of Non-Indigenous Species in the UK and Ireland. Cefas Report.

Perry, F. (2016). [Sabella pavonina] with sponges and anemones on infralittoral mixed sediment. In Tyler-Walters H. and Hiscock K. (eds) Marine Life Information Network: Biology and Sensitivity Key Information Reviews, [on-line]. Plymouth: Marine Biological Association of the United Kingdom. [Online] Available at: https://www.marlin.ac.uk/habitat/detail/1088 (accessed March 2022).

Pineda, M.C., Strehlow, B., Sternel, M., Duckworth, A., Den Haan, J., Jones, R. and Webster, N.S. (2017). Effects of sediment smothering on the sponge holobiont with implications for dredging management. Scientific Reports, 7(1), pp.1-15.

Popper, A.N., Hawkins, A.D., Fay, R., Mann, D., Bartol, S., Carlson, Th., Coombs, S., Ellison, W.T., Gentry, R., Halvorsen, M.B., Lokkeborg, S., Rogers, P., Southall, B.L., Zeddies, D.G. and Tavolga, W.N. (2014). Sound exposure guidelines for fishes and sea turtles: A technical report prepared by ANSI-Accredited standards committee S3/SC1 and registered with ANSI. Springer, ASA Press. ISBN 2196-1212. (e-book ISBN 978-2-219-06659-2).

Rayment, W.J., (2002). Semi-permanent tube-building amphipods and polychaetes in sublittoral mud or muddy sand. Marine Life Information Network: Biology and Sensitivity Key Information Sub-programme [on-line]. Plymouth: Marine Biological Association of the United Kingdom. Available from: http://www.marlin.ac.uk/habitatbenchmarks.php?habitatid=136&code=2004 (accessed April 2022).

Reeve, A. (2008). Lophius piscatorius Angler fish. In Tyler-Walters H. and Hiscock K. Marine Life Information Network: Biology and Sensitivity Key Information Reviews, [on-line]. Plymouth: Marine Biological Association of the United Kingdom. [cited 23-05-2023]. Available from: https://www.marlin.ac.uk/species/detail/2123

Ross, K and Liley, D. (2014). Humber Winter Bird Disturbance Study. Unpublished report for the Humber Management Scheme by Footprint Ecology.

RSPB (2021) In Draft. Island Biosecurity Manual. Shiants LIFE13 NAT/UK/000209 project. Annexes 2-4 of Thomas, S. & Varnham, K. (2016). Current Recommended Procedures for UK (bait station) rodent eradication projects. (Version 3.0) Royal Society for the Protection of Birds, Sandy, Bedfordshire.

Special Committee on Seals (SCOS) (2021), Scientific Advice on Matters Related to the Management of Seal Populations: 2021. Downloaded on 5th December 2022 from: SCOS Reports | SMRU (st-andrews.ac.uk).

Stamp, T.E. (2015). *Laminaria hyperborea* forest and foliose red seaweeds on tide-swept upper infralittoral mixed substrata. In Tyler-Walters H. Marine Life Information Network: Biology and Sensitivity Key Information Reviews, [on-line]. Plymouth: Marine Biological Association of the United Kingdom. [cited 17-01-2023]. Available from: https://www.marlin.ac.uk/habitat/detail/1046

Stillman, R.A., West, A.D., Caldow, R.W., and Durell, S.E.L.V. (2007). Predicting the Effect of Disturbance on Coastal Birds. Ibis, 149(s1), 73-81.

Strong P and Morris SR. (2010). Grey seal (Halichoerus grypus) disturbance, ecotourism and the Pembrokeshire Marine Code around Ramsey Island. J. Ecotourism 9(2): 117–132.

Teachout, E. (2012). Evaluating the effects of underwater sound from pile driving on the marbled murrelet and the bull trout. Prepared by the U.S. Fish and Wildlife Service's Washington Fish and Wildlife Office.

Thomas, S., & Varnham, S. (2016). Island Biosecurity Manual. Seabird Island Restoration Project, RSPB. RSPB, Sandy, Bedfordshire.

Thomas, S., Brown, A., Bullock, D., Lock, L. Luxmoore, R., Roy, S., Stanbury, A., & Varnham, K. (2017). Island restoration in the UK – past, present and future. *British Wildlife* 28:4, p.231-243.

Tillin, H. M., Houghton, A. J., Saunders, J. E. and Hull, S. C. (2011). Direct and Indirect Impacts of Marine Aggregate Dredging. Marine ALSF Science Monograph Series No. 1. MEPF 10/P144. (Edited by R. C. Newell & J. Measures). P. 41.

Tillin, H.M. (2016). Capitella *capitata* in enriched sublittoral muddy sediments. In Tyler-Walters H. and Hiscock K. (eds) *Marine Life Information Network: Biology and Sensitivity Key Information Reviews*, [on-line]. Plymouth: Marine Biological Association of the United Kingdom. [cited 15-12-2022]. Available from: https://www.marlin.ac.uk/habitat/detail/106

Tillin, H.M. & Stamp, T. (2016). Laminaria digitata and under-boulder fauna on sublittoral fringe boulders. In Tyler-Walters H. and Hiscock K. Marine Life Information Network: Biology and Sensitivity Key Information Reviews, [on-line]. Plymouth: Marine Biological Association of the United Kingdom. [cited 17-01-2023]. Available from: https://www.marlin.ac.uk/habitat/detail/97

Tillin, H.M., Tyler-Walters, H. & Garrard, S. L. (2019). Infralittoral mobile clean sand with sparse fauna. In Tyler-Walters H. and Hiscock K. (eds) Marine Life Information Network: Biology and Sensitivity Key Information Reviews, [on-line]. Plymouth: Marine Biological Association of the United Kingdom. [cited 03-12-2020]. [Online] Available at: https://www.marlin.ac.uk/habitat/detail/262 (accessed December 2022)

Tyler-Walters, H. (2008). Arenicola marina Blow lug. In Tyler-Walters H. and Hiscock K. Marine Life Information Network: Biology and Sensitivity Key Information Reviews, [on-line]. Plymouth: Marine Biological Association of the United Kingdom. [cited 17-01-2023]. Available from: https://www.marlin.ac.uk/species/detail/1402

Tyler-Walters, H., Tillin, H.M., d'Avack, E.A.S., Perry, F., Stamp, T. (2018). Marine Evidence-based Sensitivity Assessment (MarESA) – A Guide. Marine Life Information Network (MarLIN). Marine Biological Association of the UK, Plymouth, p. 91. [Online] Available at: https: / / www.marlin.ac.uk/publications (accessed December 2020).

Tyler-Walters, H. & Garrard, S.L., (2019). Arenicola marina in infralittoral fine sand or muddy sand. In Tyler-Walters H. and Hiscock K. Marine Life Information Network: Biology and Sensitivity Key Information Reviews, [on-line]. Plymouth: Marine Biological Association of the United Kingdom. [cited 15-12-2022]. Available from: https://www.marlin.ac.uk/habitat/detail/1118

Watson, H., Bolton, M., Monaghan, P. (2014). Out of sight but not out of harm's way: Human disturbance reduces reproductive success of a cavity-nesting seabird. *Biological Conservation* 174:127-133.

Wenger, A.S., Harvey, E., Wilson, S., Rawson, C., Newman, S.J., Clarke, D., Saunders, B.J., Browne, N., Travers, M.J., Mcilwain, J.L. and Erftemeijer, P.L. (2017). A critical analysis of the direct effects of dredging on fish. Fish and Fisheries, 18(5), pp.967-985.

Wilding, T.A., Hughes, D.J. and Black, K.D. (2005). The benthic environment of the North and West of Scotland and the Northern and Western Isles: sources of information and overview. Report 1 to METOC. Scottish Association for Marine Science, Oban, Scotland, PA37 1QA.

Wilson, S. (2009). Estuarine Bird Monitoring (05 Dec 2008-19 Jan 2009) - TERRC Facility. Prepared for Hartlepool Borough Council.

Wilson, S.C. (2014). The impact of human disturbance at seal haul-outs. A literature review for the Seal Conservation Society.

World Organisation of Dredging Associations (WODA). (2013). Technical Guidance on: Underwater Sound in Relation to Dredging.

Wright, M.D., Goodman, P., and Cameron, T.C. (2013). Exploring behavioural responses of shorebirds to impulsive noise. Wildfowl, 60(60), pp.150-167.

Xodus. (2012). Grimsby River Terminal Construction Pile Noise Monitoring and Bird Behaviour Observations. Associated British Ports.

14 Other Considerations

14.1 Introduction

14.1.1 During the Environmental Impact Assessment process, additional topics (which had originally been Scoped Out within the Scoping Report, Stantec 2022) were requested to be Scoped In and considered as it was identified that the Proposed Development may give rise to other environmental effects in addition to those described in Chapters 7-13. These include effects relating to the following topics:

- Users of North Haven, commercial and recreational users; and
- Risk of Major Accidents and Disasters.

14.1.2 In the Scoping Report (Stantec, 2022), it was proposed to scope out Major Accidents and Disasters (MA&D) and users of North Haven from consideration in the EIAR. However, in the Scoping Opinion Marine Scotland (MS-LOT) requested that the EIAR contains an assessment of any likely significant effects of MA&D and the users of North Haven.

14.1.3 This chapter therefore presents a description of potentially major accidents and disasters and considers the users of the harbour and how they will be managed during construction to ensure that there will be no significant effects arising. It should be read in conjunction with the project description provided in Chapter 3.

14.1.4 The EIA Regulations (Scotland), under Schedule 4, part 8 and Marine EIA Works Regulations (Scotland) Schedule 4, part 5 require the EIAR to provide:

'A description of the expected significant adverse effects of the development on the environment deriving from the vulnerability of the development to risks of major accidents and/or disasters which are relevant to the project concerned'.

14.1.5 Where appropriate, this should include measures envisaged to prevent or mitigate the significant adverse effects of such events on the environment and details of the preparedness for and proposed response to such emergencies.

14.1.6 Within this section we are also considering the users of North Haven to ensure that safety and use of the harbour during construction can be managed.

14.2 Risk of Major Accidents and Disasters

Scope of the Assessment

14.2.1 The Scoping Report proposed to scope out major accidents and disasters on the basis that they were adequately controlled. MS-LOT requested that a description of any likely significant effects resulting from major accidents and disasters in relation to construction is included in the ES. The operational phase of the Proposed Development has therefore not been considered further within this chapter, as the usage of the harbour is expected to largely return to the existing situation albeit a slightly larger facility. The information within this EIAR is intended to demonstrate that the risk of major accidents and disasters will be managed and reduced through the application of embedded environmental measures and other statutory controls to ensure that there are no significant effects as a result of the Proposed Development.

Table 14.1 defines the receptors that are considered which can be affected by a MA&D.

Receptor Group	Receptors included within Group
Population and Human Health	Construction workers, operations and maintenance workers, residential settlements and vulnerable receptors such as hospitals, schools and care homes.
Designated Sites (International, National and Other)	Special Areas of Conservation (SACs), Special Protection Areas (SPAs), Ramsar

Receptor Group	Receptors included within Group
	Sites, Sites of Special Scientific Interest (SSSIs), National Nature Reserves (NNRs), Marine Conservation Zones (MCZs), National Parks, Environmentally Sensitive Areas (ESAs), Areas of Outstanding Natural Beauty (AONBs), Green Belt Land, Local Nature Reserves (LNRs), Local Wildlife Sites (LWSs) also known locally as County Wildlife Site, Sites of Importance for Nature Conservation (SINCs), and Sites of Nature Conservation Importance (SNCIs).
Scarce Habitats	Biodiversity Action Plan (BAP) habitats and Habitats of Principal Importance (HPI).
Particular Species	Particular species covers all species, both plant and animal, found in the UK and includes common species, red data book species and other protected or priority species, including rare species.
Marine Environment	Non-estuarine marine waters, sub-littoral zones, benthic community adjacent to the coast and fish spawning grounds.
Groundwater source (drinking water and non-drinking water)	Drinking water sources (Source Protection Zones (SPZs)) in or under the soil. Non-drinking water sources such as aquifers under the soil.
Built Environment (designated buildings / sites	Grade I/II* listed buildings, Scheduled Monuments and Conservation Areas.
Soil or sediment	Soil and sediments in the top metre of ground or under the water column not otherwise considered above.

Major Accident Criteria

14.2.2 Table 14.2 provides the level of harm which is considered to represent a major accident or disaster where the harm is anything other than short term. So, any levels of harm which is less than that given in Table 14.2 is discounted as it is not considered to be a major accident or disaster under commonly accepted major accident criteria drawn from standard industry practice endorsed by the HSE. The criteria are set at different levels based upon the relative sensitivity and scarcity of the receptors.

Table 14.2 Level of harm which is considered to represent a major accident or disaster.

Receptor Type	Major Accident / Disaster Threshold
Population and Human Health - Human populations (public)	Substantial number (5+) of people requiring medical attention or any serious/life-changing injuries.
Population and Human Health - Human populations (workers)	Multiple life changing injuries or fatalities.
Designated land or water sites (internationally important)	>0.5 ha or 5-25% of site area or 5-25% of associated linear feature or population.
Designated land or water sites (nationally important)	>0.5 ha or 10-50% of site area, associated linear feature or population.
Other designated land	10-100 ha or 10-50% of land.
Widespread habitat – non designated land	Contamination of aquatic habitat which prevents fishing or aquaculture or renders it inaccessible to the public.

Marine	2-20ha littoral or sub-littoral zone, 100-1,000ha of open sea benthic community, 100-1,000 dead sea birds (500-5,000 gulls), 5-50 dead or significantly impaired sea mammals.
Groundwater source of drinking water	Interruption of drinking water supplied from a ground or surface source (where persons affected x duration in hours [at least 2] >1,000)
Soil or sediment (i.e., as receptor rather than purely a pathway)	Contamination of 10-100ha of land etc. as per widespread habitat; contamination sufficient to be deemed environmental damage (Environmental Liability Directive).
Built environment (designated buildings/sites)	Damage sufficient for designation of importance to be withdrawn.

Key Receptors and Activities

14.2.3 Based on the criteria above the key receptors at North Haven will be:

- Construction workers;
- Visitors and users of North Haven Harbour during the construction period;
- Marine Environment; and
- Designated Land.

14.2.4 The main activities that will be undertaken during construction that are highest risk to those receptors will be:

- Marine/vessel based activities e.g. transporting equipment, plant, vehicles good etc and its transition onto shore / quayside.;
- Enlarging the noust;
- Placing rock armour on the breakwater;
- Placing the large pre cast sections of quay wall;
- Dredging and preparing the seabed to receive the new quay wall;
- Diving operations associated with construction of slipway and preparation of seabed to receive quay wall;
- Demolition and removal of the winch house; and
- Storage, movement and reuse of the noust rock.

Embedded Environmental Mitigation Measures

14.2.5 Key environmental risks have been described within the EIAR technical chapters and provide sufficient information upon which the assessment of such issues can take place. Topic chapters within the EIAR (Chapters 7-13) consider foreseeable risks during the construction period, from accidents such as fuel spillages and identify how the risk of such events will be minimised, and identified within the CEMP.

14.2.6 A number of embedded mitigation measures have been included within Chapter 3.3 and form part of the Proposed Development, those specific to aiming to reduce the risk of MA&D.

14.2.7 The embedded mitigation which forms part of the Proposed Development includes:

- A first iteration of the Environmental Management Plan (fiEMP) will be prepared prior to the commencement of construction works at the Site. The fiEMP sets out the principles,

controls and management measures which would be implemented during construction to manage potential significant impacts (**Appendix A.4**).

- The design minimises the volume of sediment to be dredged and potential changes to hydrodynamics, only dredging the necessary volume to prepare the seabed for construction and to accommodate the proposed vessel draft.
- The design minimising direct loss of SAC habitats to facilitate expansion of the noust and breakwater.
- The design of breakwater minimising direct loss of fulmar nesting habitat (further details in **Chapter 13**).
- The phasing of the project will be designed to ensure that the ferry can operate to and from the island (even if Lerwick is the harbour temporarily to be used if Grutness cannot be used, or the crew is based off island if Fair Isle is unable to house the boat overnight during construction of the noust, slipway or winch house).
- Any land stability issues have been addressed through a desk based Ground Conditions Assessment (previously called a Phase 1) and a detailed ground investigation (GI). (**Appendix A6**) The GI was controlled via a range of mitigation measures including SEPA's Guidance for Pollution Prevention (GPP's) and Pollution Prevention Guidance (PPGs) (if applicable), and a ballast water management plan. The GI was cognisant of NatureScot's guidance for the prevention of the introduction of Invasive Non Native Species (INNS). Based on the absence of sources of potential contamination, sensitive human health receptors, and with the implementation of the primary mitigation to protect the water environment, it is considered that there will be no potentially significant effects from ground conditions, including instability and contamination. Ground conditions and land contamination are not included within the scope of this EIA.

14.2.8 Standard environmental mitigation measures to be included in the fiEMP could include, but are not limited to:

- The site supervisor will give toolbox talks prior to work commencing. These talks will highlight any sensitive features, including the designated sites (SPA, SAC and SSSI) and qualifying features;
- In line with standard good practice, the contractor will follow the updated and relevant GPPs including GPP 5 (Works and maintenance in or near water). PPGs will be followed if no corresponding GPP is available;
- Oils, fuels and chemicals will be stored in fully bunded areas;
- Spill kits will be available on site and workers trained in their use;
- The contractor will produce a contingency plan for dealing with spills or environmental incidents;
- Any waste generated will be removed from site and either recycled or disposed of in compliance with Waste Management Regulations;
- The successful Contractor will ensure vessels and plant involved in the operational activities for the works adhere to the industry recommended guidelines for preventing the introduction of INNS;
- Prior to and during construction activities, appropriate staff will be informed of relevant marine and terrestrial INNS and will follow the procedures established within the Biosecurity Management Plan. These staff will also be cognisant of guidance produced by NatureScot for the prevention of introduction of non-native species (Cook *et al.*, 2014) and draft guidance on biosecurity for the Outer Islands (RSPB, 2021);
- The Contractor will produce a Ballast Water Management Plan (if relevant) to prevent the risk of introducing invasive non-native species into Fair Isle;

- Prior to use, all equipment will be washed and cleaned to ensure that no contaminants are brought into contact with the marine or terrestrial environment;
- Vehicle numbers and movement on the vegetation will be kept to a minimum;
- Vessels used for the works will adhere to the general principles in the Scottish Marine Wildlife Watching Code;
- The Contractor will ensure a suitably qualified Environmental Clerk of Works (EcOW) is present during the construction phase in both years (2024 and 2025) to ensure compliance with the good practice and management measures outlined above;
- The EcOW will be on site at all times during both years to ensure that Fulmar nests are not damaged by construction work, specifically the placement of rock armour around the breakwater. They will also monitor the impact of the works on nearby breeding birds (primarily Fulmar, but also Puffin) to establish whether there are any detectable responses of the birds to the different construction activities to inform future work in the area. The EcOW will also liaise with the FIBO warden to ensure that the Arctic Tern colony is not negatively impacted;
- Well maintained and serviced plant and equipment; and
- Dampening down any stockpiled materials.

Assessment of Likely Effects

14.2.9 Following the introduction of the embedded mitigation measures and further discussions with SIC Ferry Operations and Ports Operations to ensure there are no additional likely effects during construction.

Further Mitigation and Enhancement

14.2.10 Further mitigation measures have been set out in other technical chapters 7- 13 which have been included below where relevant to risks of MA&D and additional measures following discussions with SIC Marine team presented below.

14.2.11 Further mitigation measures will be set out in the second iteration Environmental Management Plan (siEMP). The siEMP would be secured through planning conditions and drafted in consultation with statutory bodies, when the contractor has been awarded the contract and during the subsequent detailed design and delivery (construction) phases.

14.2.12 The SiEMP will include a comprehensive package of pollution prevention measures to avoid accidental pollution events during construction. Measures could include source control, settlement tanks, silt fencing, and dust suppression. The siEMP would be informed by Construction Industry Research and Information Association (CIRIA) guidance, in particular C532 Control of water pollution from construction sites, and C650 Environmental Good Practice on Site.

14.2.13 The siEMP will include details of measures which will be used to protect grassland underneath temporary stockpile areas such as geotextile membrane. Work areas will also be minimised by fencing to ensure minimal damage is caused to all designated areas and retained important habitat to ensure protection from accidental damage.

14.2.14 Measures to protect SPA bird species (including Fair Isle wren) along with other breeding birds during the construction phase will be set out within a Construction Bird Mitigation Plan and a Biosecurity Management Plan (Appendix A.17).

14.2.15 The Construction Bird Mitigation Plan will be secured through planning condition in agreement with consultees including Nature Scot and SIC planning authority, and will include details of:

- all bird species likely to be found on site and their legal status
- construction activities which could affect birds
- pre-construction bird surveys to identify presence of nests within and adjacent to the site

- protection of nest sites during construction, including the establishment of exclusion zones where required.
- ongoing monitoring of active nest sites within and adjacent to the Site and actions to be taken to avoid damage or destruction of nests, or unlawful disturbance.

14.2.16 The Construction works will also be undertaken in reference to the:

- SIC Major Emergency Plan (October 2015)
- Marine Pollution Contingency Plan (2015)
- Diving at Work Regulations 1997 and the HSE Approved Code of Practice and Guidance

14.2.17 Prior to construction the contractor will discuss the construction works with the Emergency Services teams within Shetland to ensure that they are aware of the works that are undertaken and the number of construction workers that will be on Fair Isle and that the works are complaint with the Emergency Services Plan for evacuation of the island if required.

14.2.18 Given the particularly remote location of Fair Isle consultation with the HSE Diving Operation Strategy Team will be undertaken to ensure all diving operations are undertaken in line with all recommendations and best practice.

14.2.19 The Project Team will also be in constant discussions with the SIC Ferry Operations and Port Operations teams to ensure that all parties are aware of construction progress and future activities to allow sufficient Notice to Mariners to be kept up to date with the construction programme and planned activities.

14.2.20 A Risk Register will be produced and discussed and kept up to date to ensure all relevant parties are aware of the potential risks and what measures are being taken to ensure that those risks are reduced.

14.3 Users of North Haven Harbour

Baseline Conditions

14.3.1 North Haven harbour is operated and managed by Shetland Islands Council. The harbour is designated as a Statutory Harbour with Shetland Islands Council the Statutory Harbour Authority under the Harbours Act 1964. Therefore the harbour has statutory jurisdiction limits or powers to give direction for management of navigation.

14.3.2 Shetland Islands Council as the Harbour Authority operate to the standard required in the Port Marine Safety Code (PMSC) and in accordance with the guidance provided in the Guide to Good Practice for Port Marine Operations. Shetland Island Council's Small Ports Marine Safety Management System provides the system by which the Small Ports & Harbours comply with the requirements of the PMSC.

14.3.3 In addition to the existing ferry operation, North Haven harbour is also used as a stopover for recreational and commercial vessels travelling between Orkney and Shetland who often berth for the night and also to visit the island itself. There are also Cruise that stop off to visit the island (though they moor offshore and only the small tender vessels enter North Haven to discharge passengers) and other vessels that make deliveries to the island ensuring supplies and building supplies to the community are maintained.

14.3.4 Whilst there is relatively little berthing space at North Haven harbour, if a skipper of a vessel on a passage north plans to berth at Fair Isle and is unable to do so then the next anchorage is at Grutness Voe which is approximately 25 nautical miles away across challenging seas.

14.3.5 North Haven is listed within the Marine Safety Management System (MSMS) as one of sixteen Ferry Terminals & Piers inside and outside the Statutory Harbour Authority areas of jurisdiction. The Executive Manager – Ferry & Airport Operations & Port Infrastructure takes executive management responsibility for the running of all ferry terminals and they, or the appointed deputy, meet regularly with the Harbour Master to provide updates on any operational marine safety issues. The Duty Holder receives regular reports from the Executive Manager – Ferry * Airport Operations & Port Infrastructure and Executive Manger - Harbour

Master and quarterly reports are sent to their Designated Person, which provides proportional compliance with the PMSC.

14.3.6 Navigation in the waters around and adjacent to the harbour falls within UK Territorial Waters and fall within the Maritime and Coastguard Agency's area for navigational oversight.

14.3.7 Following discussions with SIC Harbourmaster (July 2023) the following Tables 14.3-5 show the numbers of users at North Haven.

14.3.8 Table 14.3 Total number of Cruise boats in 2023 and booked so far in 2024 (note even though they are booked they only come ashore if the weather is favourable)

Table 14.3 Total Number of Cruise Ships in 2023 and 2024 (booked so far)

Cruise 2023	
Month	Number
Jan-23	0
Feb-23	0
Mar-23	0
Apr-23	0
May-23	9
Jun-23	7
Jul-23	5
Aug-23	3
Sep-23	1
Oct-23	1
Nov-23	0
Dec-23	0
Total 2023	26
Cruise 2024 (bookings to date)	
Month	Number
May	4
June	4
July	1
sept	1
Total 2023	10

14.3.9 In addition to the cruise ship there are also the recreational and commercial vessels that use North Haven as shown in Table 16.4 & 16.5 (Please note, these numbers are approximate only and have been gathered using data from Marine Traffic. As such actual vessel visits to North Haven may differ to the numbers in the tables)

Table 14.4 Cargo visits over last 12 months Table

Cargo visits over the last 12 months	
Month	Number
Aug-22	0
Sep-22	0

Cargo visits over the last 12 months	
Oct-22	3
Nov-22	0
Dec-22	0
Jan-23	2
Feb-23	0
Mar-23	0
Apr-23	7
May-23	5
Jun-23	4
Jul-23	4
Total	25

14.5 Pleasure Craft visits over last 12 months

Pleasure craft visits over the last 12 months	
Month	Number
Aug-22	25
Sep-22	3
Oct-22	0
Nov-22	0
Dec-22	0
Jan-23	0
Feb-23	0
Mar-23	0
Apr-23	1
May-23	27
Jun-23	75
Jul-23	37
Total	168

Assessment of Likely Effects

14.3.10 The following potential navigation effects have been considered for the construction and operational phase.

Construction phase

Potential increase in hazards to navigation

14.3.11 Ferry operations will continue during the construction phase to maintain the lifeline service to the community, there may be short periods of time when the ferry cannot be berthed overnight at Fair Isle and the ferry would be required to relocate to a different harbour (potentially Scalloway or Lerwick, depending on suitability). However it is also key to ensure that there is de-confliction between ferry and other users at North Haven and the vessels involved in

construction activities. This includes timing of works and alternative arrangement for mooring vessels at different locations along the quay or finger pier. Any operations should be included in the procedures for maintaining safe navigation within the Marine Safety Management System by Shetland Island Council.

14.3.12 As it is yet to be determined how much of the work will be carried out from floating plant and the likely requirements for vessel movements, a worst-case scenario has been adopted which assumes the following for marine based vessel activity:

- **Phase 1 (Feb – Sept 2024):** Construction of slipway, pier repairs and bed preparation for the quay wall. 8-month duration.
- **Phase 2 (March – Sept 2025):** Construction of the breakwater and linkspan. 7-month duration.

14.3.13 De-confliction of operations may need to be considered if the barge is working on the breakwater and dredging vessel are working simultaneously, however they will be situated on either side of the breakwater whilst working. Rock armour for the breakwater will be delivered by vessel. It is anticipated a crane will be used to place each individual rock for the armouring, from the vessel. The rock armouring activity will take place in 2025 and therefore is anticipated to coincide with the construction of the new Quay, with the potential to also coincide with dredging although not both as the dredging needs to be complete before the new Quay is constructed.

14.3.14 Navigation will be potentially affected by the dredging process due to vessels working within North Haven, thus increasing the risk for collision with vessels entering or leaving the harbour. This impact is considered to be of minor to moderate significance. The impact can be reduced by mitigation measures such as controls offered by Local Ports Services (LPS) provided by SIC Marine & Air Operations and Port Operations teams, the issuing of Notices to Mariners and active communications between LPS and the dredge vessels. Transport to and from the disposal ground is not considered to have a significance effect on navigation, given the existing background traffic levels and the availability of navigable waters.

14.3.15 The additional operations of the dredger and other vessels are considered to increase the hazard to navigation significantly and information in relation to other users will be updated regularly through Notice to Mariners to allow those interested in using North Haven to understand availability of berths and maintain segregation of construction and recreational vessels. The management and control of harbour works is a requirement under the PMSC and would be addressed within the Shetland Islands Council Small Ports & Harbour Safety Management System (daily liaison and radio contact). There may also be a requirement to assess the risk of navigational impact on working within proximity of each other if works are undertaken at the same period of time. This will be undertaken with the contractor and the SIC Port Operations team to ensure potential risks and management of these risks are assessed and controlled.

Operational phase

Potential increase in hazards to navigation

14.3.16 The improvements to the harbour, changes to linkspan and operation of larger vessel (similar draft) may have a possible impact on the current route taken to and from the quay and noust. Given the lack of interaction with vessel traffic in the area, this would not be viewed as an increased hazard to navigation. The improvements to the facility and changes to navigation for the ferry and local craft are expected to be considered as part of the ongoing management as outlined in Shetland Island Councils Small Ports Marine Safety Management System.

14.3.17 In summary, it considered that neither the introduction of the larger vessel, nor the changes to the harbour layout would significantly affect the navigation of other vessels using the area. The improvements to the pier are to facilitate the berthing of the larger vessel and as such it is viewed that this will not negatively affect navigation for this operation.

Mitigation and Enhancement Measures

14.3.18 Further mitigation measures are proposals to address adverse effects which remain after embedded measures and standard construction practices have been incorporated into the Proposed Development.

14.3.19 No further mitigation or enhancement measures are identified because achievable mitigation within the Site extents has already been included in the embedded mitigation measures and it is reasonably assumed that standard construction practices would apply.

Residual Effects

14.3.20 Residual effects are those that are predicted to remain following implementation of the further mitigation and enhancement measures described above.

14.3.21 As no further mitigation measures are proposed, the assessment of likely effects presented above identifies no residual effects of the Proposed Development.

Monitoring

14.3.22 There will be no requirement for monitoring of the Proposed Development following completion.

Cumulative Effects

14.3.23 No cumulative effects are anticipated from the construction and operation of the Proposed Development. Any potential effects are considered to be low to negligible, and therefore not significant.

14.4 Summary

14.4.1 As much as possible North Haven harbour will need to be maintained to protect the lifeline services to this community and provide shelter for visiting vessels and visitors to the island. Any periods when the North Haven is closed to traffic will be scheduled to be as short as possible and Notice to Mariners will be published informing of when access to berths is restricted.

14.4.2 Similar to other ports, there is potential for accidents to occur, however SIC operate a Marine Safety Management System / Standard Operating Procedures to promote safe and efficient harbour operations and is compliant with the Port Marine Safety Code. The SIC Ferry Operations and Port Operations teams and ultimately the SIC Harbour Master ensures that all operations under their jurisdiction are done in such a manner so as to keep safe its users, the public, the harbour area and the environment. These procedures will be introduced at this extended facility once operational thereby reducing the likelihood of accidents occurring. The proposed development is not located within an area of significant seismic activity, nor is it subject to climatic factors prone to creating disasters such as tsunamis, hurricanes or catastrophic flooding. Accordingly consideration of accidents and natural disasters is not expected to result in a significant impact during construction.

15 Impact Interactions

15.1 Introduction

15.1.1 Significant environmental effects can result from incremental changes caused by the interactions between effects resulting from a development.

15.1.2 The direct and indirect effects of the Proposed Development have been assessed within the relevant topic chapters of the ES prepared by suitable technical specialists. Environmental effects are assessed relative to the topic under consideration. This approach can lead to the interaction of effects being reported in separate chapters but the collective effect on the same environmental resource(s) not being considered.

15.1.3 In response, this chapter, prepared by Stantec, summarises the principal findings of each topic chapter of the ES to enable assessment of the potential for impact interactions.

15.2 Methodology

15.2.1 The assessment methodology (as further discussed in **Chapter 5**) involves the identification of impact interactions associated with the construction and operational phases of the Proposed Development upon one or more environmental resources. This is undertaken using a qualitative appraisal process. Receptors have been grouped into 'Natural Resources' and 'Human Beings and Society' categories.

15.2.2 A summary of further mitigation measures is provided in **Table 16.1** which has been used to help identify where there is a likelihood for potential significant adverse impact interactions to occur. This has been determined by considering the capacity of the receptors to accommodate the changes likely to occur as a result of the identified impacts.

15.3 Construction Effects

15.3.1 As set out in **Chapter 4**, careful management of the construction works is proposed, including through the implementation of a first iteration Environmental Management Plan (FIEMP) (**Appendix A.4**). The fiEMP will implement proven industry standard construction practices. With effective mitigation applied through the Framework FIEMP, adverse effects of construction will be minimised.

15.3.2 As a result, the majority of the construction effects identified in **Chapters 7-14** are not significant. The following sections discuss, in more detail, impact interactions and effects associated with the construction phase.

Natural Resources

15.3.3 The interactions of construction impacts from habitat loss, dust pollution, changes to noise levels, dust, and lighting on ecological receptors are considered. The implementation of the fiEMP reduces the effect on many sensitive receptors during construction to minor adverse or negligible, which is not significant. These receptors include seabirds, marine mammals, benthic communities, Fair Isle Wren. The biodiversity assessment inherently considers impact interactions on ecological receptors as it deals with noise, dust, lighting and human presence. A fiEMP will be prepared for each phase of the development to mitigate adverse effects on retained receptors that are both on and off site during any activities associated with construction and will be secured through a consent condition. This includes careful timing of noisy works to begin prior to the bird breeding season to encourage birds to nest elsewhere on the island, pollution prevention from run off, encroachment of vehicles and personnel into restricted areas and protection of the SAC, and the control of other

environmental pollutants such dust, noise, light and litter to reduce impacts. For example, night work will be limited to reduce lighting, lighting strategies will be designed to reduce light spill and methods to prevent dust such as spraying, vegetation planting or covering of soil storage will be implemented.

15.3.4 GHG emissions have the potential to impact the global atmosphere. All GHG emissions should be considered significant and therefore, even with the further mitigation outlined above, the residual effect of the Proposed Development on climate change during construction remains as moderate adverse. Emissions during construction are associated with emissions from the combustion of fossil fuels on Site during construction activities, land clearance and enabling activities and purchased electricity for welfare facilities and lighting. The Proposed Development will implement mitigation measures to reduce these emissions through responsible and sustainable construction practices. Construction activities, including transport, energy consumption and plant emissions will be monitored and managed through a fiEMP. The ES has also documented how a changing climate could affect the Proposed Development.

Human Beings and Society

15.3.5 Existing local residents, including those already living within the Site, are the most sensitive human receptors to potential temporary impact interactions during the construction phase of the Proposed Development. Local residents may be impacted through noise and vibration, air quality, visual and transport effects. However, none of these effects are likely to be significant during construction. Implementation of FIEMPs will mitigate these short-term effects, for example, through measures to control dust and noise activities, and to control construction working hours and lighting of construction activities.

15.3.6 The socio-economics assessment identified beneficial labour market effects to the population, as the construction phase will generate 8-10 full time jobs. Although this number is expected to be fairly low in comparison to other development projects, the number represents a large proportional increase to the number of workers in Fair Isle.

15.3.7 The main sources of direct GHG emissions during construction relate to the combustion of fossil fuels during the transportation of building materials and waste to and from the Site, powering construction plant engines and equipment as well as emissions from land clearance. The temporary construction office and welfare facilities for construction workers and temporary lighting on the Site will require electricity purchased from the National Grid. This will result in indirect GHG emissions generated from the burning of fossil fuels to deliver electricity to the National Grid. The FIEMP will include mitigation measures to reduce GHG emissions during construction, for example, no unnecessary idling of engines and maintenance of plant equipment.

15.3.8 There is anticipated to be an increase of average annual temperature and decrease in average annual precipitation over the construction period which may disrupt or delay the construction programme. The risk of an increase in climate hazards, will be managed through standard construction and health and safety practices outlined in the FIEMP, such as securing material/equipment and not undertaking works during periods of extreme rainfall. The effect of climate change on the Proposed Development during the construction phase is therefore likely to be negligible and not significant**.**

15.3.9 No further impact interactions have been identified for these receptors.

15.4 Operation Effects

Natural Resources

15.4.1 Following construction of the Proposed Development the operational running of the harbour and there is not expected to be any operational impacts as a result of the scheme.

Human Beings and Society

15.4.2 There will be residual beneficial effects to the population, housing and economy as a result of the provision of the improved ferry service which will result in new housing, jobs, community services, schools and commercial development.

15.4.3 No further impact interactions have been identified for these receptors.

Table 15.1: Significance Table

Topic	Stage of Development	Residual Effects	Duration of Effect	Significance of Residual Effect
Archaeology and Heritage	Construction	Loss of archaeological resource – the non-designated cist and other potential buried archaeological remains (as yet unknown)	Permanent	Minor adverse
Landscape, Seascape and Visual	Construction	**Landscape and Seascape**		
		The landscape character of the Site	Permanent	Moderate adverse
		CCT 11: Small Harbour	Permanent	Moderate adverse
		LCT 355: Coastal Edge	Permanent	Minor adverse
		Shetland NSA	Reversible	Negligible
		LCT 349: Major Uplands	Reversible	Negligible
		LCT 353: Farmed and Settled Lowlands	No change	Negligible
		Visual		
		VL2: North Haven Pier	Permanent	Major adverse
		VL5: Headland west of North Haven	Permanent	Major adverse
		VL1a and 1b: North Haven approach (from sea)	Permanent	Moderate adverse
		VL3: North Haven Beach	Permanent	Moderate adverse
		VL4: Bu Ness Head (east of North Haven)	Permanent	Moderate adverse
		VL6: Fair Isle Bird Observatory	Permanent	Moderate adverse
		VL7: Headland north of Sheep Rock	Permanent	Minor adverse
		VL8: Blu Ness Head (south North Haven)	Permanent	Negligible
Marine Geomorphology	Construction	**Coastal Processes and Geomorphology**		
		Changes to the SCC and sediment deposition as a result of dredging activity and associated dredge disposal	Temporary	Negligible

Topic	Stage of Development	Residual Effects	Duration of Effect	Significance of Residual Effect
		Changes to the local hydrodynamics at the disposal site as a result of changes to local water depth	Temporary	Negligible
		Marine Water and Sediment Quality		
		Potential changes to dissolved oxygen as a result of increased SSC during construction activities	Temporary	Minor adverse / negligible
		Potential effects from redistribution of sediment-bound chemical contaminants	Temporary	Negligible
	Operation	**Coastal Processes and Geomorphology**		
		Changes to hydrodynamics and associated sediment transport pathways as a result of the upgraded breakwater, extended quay and newly dredged berth pocket	Permanent	Negligible
		Changes to the SCC and sediment deposition as a result of maintenance dredging activity and associated dredge disposal	Permanent	Negligible
Marine Ecology	Construction	**Benthic Habitats and Species**		
		Changes to benthic habitats and species as a result of removal of seabed material during dredging operations	Temporary	Negligible
		Changes to benthic habitats and species as a result of sediment deposition during dredging and disposal operations	Temporary	Negligible
		Indirect effects from changes in water quality and sediment quality	Temporary	Negligible
		Introduction and spread of non-native species	No change	Negligible
		Fish and Shellfish		
		Indirect effects from changes in water quality and sediment quality	Temporary	Negligible
		Underwater noise and vibration disturbance	Temporary	Negligible
		Marine Mammals		
		Underwater noise and disturbance	Temporary	Negligible

Topic	Stage of Development	Residual Effects	Duration of Effect	Significance of Residual Effect
		Airborne noise and vibration disturbance	Temporary	Negligible
		Seabirds and Coastal Waterbirds		
		Airborne noise and visual disturbance	Temporary	Minor adverse / negligible
		Underwater noise disturbance	Temporary	Negligible
		Changes to value of habitat for foraging	Temporary	Negligible
		The introduction of mammalian predators	Temporary	Negligible
	Operation	**Benthic Habitats and Species**		
		Direct loss of benthic habitat	Permanent	Negligible – minor adverse
		Changes to benthic habitats and species due to maintenance dredging	Temporary	Negligible
		Indirect changes to benthic habitat as a result of changes to wave reflection	No change	Negligible
		Seabirds and Coastal Waterbirds		
		Changes to the value of habitat for foraging	Permanent	Negligible
		Disturbance of Fulmars nesting on stack	Permanent	Minor adverse
		The introduction of mammalian predators	Permanent	Negligible
Climate Change	Construction	**GHG Emissions Assessment**		
		Increase in emissions on Site during construction	Temporary	Minor adverse
	Construction / Operation	**Climate Change Risk Assessment**		
		Future users of the site and infrastructure	Permanent	Minor adverse
Socio-economics	Construction	Employment	Temporary	Major beneficial
	Operation	Employment	Permanent	Moderate beneficial
		Depopulation	Permanent	Minor beneficial

Topic	Stage of Development	Residual Effects	Duration of Effect	Significance of Residual Effect
		Health and well-being	Permanent	Minor beneficial
		Economic development	Permanent	Moderate beneficial
		Living costs	Permanent	Minor beneficial / negligible
		Tourism and recreation	Permanent	Moderate beneficial

15.5 Summary

15.5.1 No significant adverse impact interactions have been identified for any sensitive receptors assessed within topic chapters of this ES during the construction and operational phases of the Proposed Development, and mitigation has been proposed where required to reduce effects as far as possible. Several beneficial effects have also been identified both during construction and operation of the Proposed Development.

16 Schedule of Mitigation and Monitoring

16.1 Introduction

16.1.1 This chapter provides a consolidated schedule of mitigation and monitoring measures proposed to avoid significant adverse effects and enhance beneficial effects from the Proposed Development. The chapter also sets out the monitoring arrangements relating to significant adverse effects.

16.2 Proposed Mitigation

16.2.1 Embedded mitigation measures which are inherent in the design of the Proposed Development and have been considered in the initial assessment of effects and are identified in each technical chapter. The fiEMP (**Appendix A.4**) is considered to be embedded mitigation and will be taken forward by the Principal Contractor(s) for each phase of development. The fiEMP contains construction mitigation measures related to archaeology and built heritage, landscape and visual, biodiversity, transport, air quality and dust, noise and vibration, soil resources and pollution.

16.2.2 **Tables 16.1** below outline 'further' mitigation measures which are required in addition to embedded mitigation measures to further reduce potential significant adverse effects (**Section 3.4**). **Table 16.1** details further mitigation and enhancement measures to be implemented during the construction phase of the Proposed Development. A summary of the nature of each measure is provided from the relevant technical assessment section of this ES. The technical discipline chapters (**Chapters 7-14**) should be referred to for additional details of the required measure(s).

16.3 Proposed Monitoring

16.3.1 Part 1(2) of the EIA Regulations defines a 'monitoring measure' as a *'provision requiring the monitoring of any significant adverse effects on the environment of Development including any measures contained in — (a) a condition imposed on the grant of planning permission; or (b) a planning obligation'.*

16.3.2 Monitoring requirements have been set out in the fiEMP, Construction Bird Mitigation Plan, and the Biosecurity Management Plan **Appendix A.17**. These will be secured through planning condition in agreement with consultees including Nature Scot and SIC.

16.3.3 Key monitoring requirements during construction phase and subsequent operation will include:

- Monitoring of Fair Isle wren nests within and adjacent to the Site and actions to be taken to avoid damage or destruction of nests, or unlawful disturbance.
- Monitoring for Invasive Non-native Species.
- The ECoW would be present on site during key periods of the construction phase and would be required to make certain that all committed mitigation measures are adhered to.

Table 16.1: Summary of Mitigation and Monitoring Measures

ES Chapter / Topic	Likely Significant Effects	Mitigation Measures
1) Measures to be incorporated into the Detailed Design		
Archaeology and Heritage	Impact on all sites of cultural heritage	• A WSI will be prepared for the works to set out procedures for managing any features that appear to be of archaeological importance that are discovered in the course of construction works to the noust. The WSI will ensure compliance with the relevant legislation and will be finalised and agreed in consultation with SAT prior to construction works. • Effects to setting will be minimised through careful design of the proposed works to minimise the effects on the promontory fort, an exclusion zone will be included to minimise direct impacts to the site of the crane.
Terrestrial Biodiversity	Impact on important biodiversity receptors	• Reduce potential effects where possible. • The design minimising direct loss of SAC habitats to facilitate expansion of the Noust and breakwater. • The design of the breakwater minimising direct loss of fulmar nesting habitat. • Following expansion, the sides of the Noust will be left rough to accelerate recolonisation by local vegetation.
Climate Change	Increase in GHG emissions	• All materials required for construction will be transported to the site on a boat rather than via aviation as it is less GHG intensive than HGVs and planes. • Prefabrication is the practice of assembling structural components off site and transporting them to the site of construction where they can be assembled. This practice will therefore reduce the amount of on site fabrication, reduce the amount of diesel being burnt on site and result in less direct emissions burnt on site. • The detailed design will take cognisance of locally available materials, manufacturing capability and labour resource. • Consideration has been given to embodied carbon when selecting the materials that will be used for the Proposed Development. Additionally, recycled materials will be used where possible.
	Climate Change	• Design Standards: The proposed development will be built to the following design standards: Eurocodes + UK national annexes, and BS 6349 Maritime works. These standards require the design to take account of sea level rises and changes in storm intensity due to climate change. An allowance for these effects is included in the wave model. • Wave Modelling: The size and direction of waves is taken from the wave model which includes sea level rise and climate change effects. All elements of the Proposed Development will be appropriately sized for the wave climate predicted by this model, according to current standards and best practice guidelines. • Land Stability: Any land stability issues will be addressed through a desk based Ground Conditions Assessment and a detailed ground investigation (GI).

ES Chapter / Topic	Likely Significant Effects	Mitigation Measures
		• Materials: The cement combination comprises Fly Ash which provides greater cold weather resistance. Dredged material is to be stockpiled on land nearby and used locally for shore protection in the intertidal zone as desired by the community. Some may be used for backfilling the quayside. Additionally, scour protection will be provided where appropriate around the base of structures and concrete cover to steel reinforcement will be suitably large to achieve the 60 year design life of the structure in this aggressive marine environment.
Socio-economics	Population and human health	• The phasing of the construction will be designed to ensure that the ferry and other vessels can operate to and from the island. Maintaining the operation of the ferry during construction will ensure that supplies and deliveries to Fair Isle can continue.
Landscape, Seascape and Visual	Landscape, seascape and visual	• Standard construction practices which the LSVIA assumed will be adhered to.
Marine Geomorphology	Marine geomorphology and hydrodynamics impacts	• The design minimises the volume of sediment to be dredged and potential changes to hydrodynamics, only dredging the necessary volume to prepare the seabed for construction and to accommodate the proposed vessel draft.
Marine Ecology	Impact on important biodiversity receptors	• In line with standard good practice, the contractor will follow the updated and relevant Guidance for Pollution Prevention (GPPs) including GPP 5 (Works and maintenance in or near water). Pollution Prevention Guidance (PPGs) will be followed if no corresponding GPP is available. • Appropriate staff will follow the procedures established within the Ballast Water Management Plan.
2) Mitigation Measures to be applied during construction		
Archaeology and Heritage	Direct physical impact on all sites of cultural heritage	• A watching brief is required during any intrusive groundworks.
Terrestrial Biodiversity	Fair Isle SAC / Notable habitats / Notable plants	• A FIEMP will be implemented during construction to include a comprehensive package of pollution prevention measures to avoid accidental pollution events during construction. • The FIEMP will include details on fencing of all designated areas and retained important habitat to ensure protection from accidental damage.

ES Chapter / Topic	Likely Significant Effects	Mitigation Measures
Terrestrial Biodiversity	Fair Isle SPA (including Fair Isle wren)	• Measures to protect SPA bird species along with other breeding birds during construction will be set out within a Construction Bird Mitigation Plan and an Invasive Non-native Species Control Plan
Climate Change	Increase in GHG emissions from construction activities	• The FIEMP will include mitigation measures covering transport, materials, waste and air quality during construction. • Measures that will reduce GHG emissions during construction include, no unnecessary idling of engines, maintenance of plant equipment to check they are operating optimally and efficient use of materials to reduce waste. • A SWMP will be implemented to manage waste during construction.
Socio-economics	Population and human health.	• A FIEMP will include mitigation measures covering local businesses, residents and landowners.
Landscape, Seascape and Visual	Changes to landscape, seascape and visual	• Hooded lighting to be incorporated to ensure light pollution is minimised. • Works will be restricted to the hours of 7am – 7pm Monday to Friday, and 7am – 1 pm on Saturdays, avoiding the need for task lighting.
Marine Geomorphology	Marine geomorphology impacts	• Provision of a fiEMP that sets out the principles, controls and management measures which would be implemented during construction to manage and reduce potential significant impacts.
Marine Ecology	Marine Ecology impacts	• A FIEMP will include mitigation measures covering disturbance prevention for breeding birds, preventing the introduction of invasive non-native species and best practice measures to ensure marine ecology impacts are reduced.
	Breeding birds disturbance	• The ECoW will be on site at all times during both years to ensure that Fulmar nests are not damaged by construction work, specifically the placement of rock armour around the breakwater. They will also monitor the impact of the works on nearby breeding birds (primarily Fulmar, but also Puffin) to establish whether there are any detectable responses of the birds to the different construction activities to inform future work in the area. The ECoW will also liaise with the FIBO warden to ensure that the Arctic Tern colony is not negatively impacted.
	Invasive Non-Native Species (INNS)	• Prior to and during construction activities, appropriate staff will be informed of relevant marine and terrestrial INNS and will follow the procedures established within the BMP. These staff will also be cognisant of guidance produced by NatureScot for the prevention of introduction of non-native species (Cook et al., 2014) and draft guidance on biosecurity for the Outer Islands (RSPB, 2021). • The Contractor will produce a Ballast Water Management Plan (if relevant) to prevent the risk of introducing invasive non-native species into Fair Isle.

ES Chapter / Topic	Likely Significant Effects	Mitigation Measures
3) Mitigation Measures to be applied post construction and during operation.		
Marine Ecology	INNS	• The successful Contractor will ensure vessels and plant involved in the operational activities for the works adhere to the industry recommended guidelines for preventing the introduction of Invasive Non-Native Species (INNS).