

Scapa Deep Water Quay
Volume 1: Environmental Impact Assessment



Note: The above image is indicative and provided for information purposes only

July 2023

Scapa Deep Water Quay

Volume 1: Environmental Impact Assessment Report

Client: Orkney Islands Council Harbour Authority

Document number: 13254

Project number: 674795

Status: Final

Author: Various

Reviewer: Dr C Fleming

Date of issue: July 2023

Filename: SDWQ EIAR.doc

EnviroCentre Limited Office Locations:

Glasgow

Edinburgh

Inverness

Banchory

Registered Office: Craighall Business Park 8 Eagle Street Glasgow G4 9XA

Tel 0141 341 5040 info@envirocentre.co.uk www.envirocentre.co.uk

This report has been prepared by EnviroCentre Limited with all reasonable skill and care, within the terms of the Contract with Orkney Islands Council Harbour Authority ("the Client"). The report is confidential to the Client, and EnviroCentre Limited accepts no responsibility of whatever nature to third parties to whom this report may be made known.

No part of this document may be altered without the prior written approval of EnviroCentre Limited.



PREFACE

This Environmental Impact Assessment Report (EIAR) has been prepared under the Town & Country Planning (Environmental Impact Assessment) (Scotland) 2017 Regulations (“the EIA Regulations”) and the Marine Works (Environmental Impact Assessment) (Scotland) Regulations 2017 (“the marine EIA Regulations”). The EIAR has been prepared to support an application for Planning Permission to Orkney Islands Council (OIC) as well as applications for a marine construction and dredging licence to Marine Directorate Licensing Operations Team (MD-LOT)¹.

The proposed site for Scapa Deep Water Quay is located on the Orkney mainland coast and is situated circa 4km south from Scapa Pier. It is currently undeveloped coastline comprising a gravelly and in places exposed rock bordered on the landside by a rock face circa 3m in height. Plate 0-1 shows an artist’s impression of what the quay may look like. The proposed development includes:

Phase 1

- Installation of an access road from the A961 to the site;
- Excavation of current landform along with reclamation of shore to form ~12Ha of laydown area bounded by bunds on the north and eastern edges;
- Creation of 450m of berthing by formation of a quay 300m x ~46m wide; and
- Dredging adjacent to the newly formed Phase 1 quay and proposed Phase 2 quay (i.e. one dredge campaign) to provide -15m CD water depth.

Phase 2

- Excavation of current landform along with reclamation of shore to form an additional 6Ha of laydown area to the south of Phase 1 laydown area. The bund on the eastern edge will be extended along the length of the new laydown area and partially along the southern edge; and
- Extension of the Phase 1 quay area by 275m x ~46m to the south.

Phase 3

- Dredging on the southern side of the newly formed quay extension to provide a berthing pocket with -20m CD water depth.

The main purpose of this facility would be to undertake multiple industrial activities that require both deep-water berthing and large laydown area. It is envisaged that the main activity will be the construction/assembly and maintenance of offshore wind turbines. It is also envisaged that the pilot and tugboats that currently operate out from Scapa Pier would be relocated to SDWQ.

This is also a potential location for the development of a storage and supply hub for future marine fuels.

This EIAR reports the findings of an Environmental Impact Assessment (EIA) which has been co-ordinated and written by EnviroCentre Ltd, with specialist input from technical co-consultants.

This EIAR comprises the following elements:

- Volume 1: Environmental Impact Assessment Report
 - Providing a detailed description of the proposed development and its potentially significant environmental effects, detailing alternative options where applicable, reporting the findings of the EIA, as well as any proposed mitigation measures and providing other relevant background information;
- Volume 2: Relevant figures and plans too large to be presented within Volume 1; and
- Volume 3: Technical Appendices

- Containing detailed technical reports and baseline studies which act as background reports to Volume 1.



Plate 0-1 – Scapa Deep Water Quay

Note: The above image is indicative and provided for information purposes only

The following documents have also been prepared to support the application. These form part of the overall consent application submissions, but they do not form part of the EIAR:

- Planning Application;
- Design and Access Statement;
- Planning Support Statement;
- Planning Application Consultation Report;
- Marine Construction Licence Application – the application for construction in the marine environment is required to consent activities up to Mean High Water Springs (MHWS); and
- Dredging Licence Application – the dredging application is required to consent the removal of sediment from the marine environment and disposal to a licensed sea disposal site (if sediment is unsuitable for beneficial reuse).

A Non-Technical Summary (NTS) has also been prepared which is a condensed synopsis of the EIAR. Members of the public can view a hardcopy of the full EIAR at the following locations during normal office hours whilst the applications are being consulted on:

- Customer Services, Council Offices, Kirkwall, Orkney KW15 1NY (10:00 to 13:00 and 14:00 to 16:00 Monday to Friday);
- Warehouse Buildings, 2-12 Victoria Street, Stromness, Orkney KW16 3AA (10:00 to 12:00 and 14:00 to 16:00 Monday to Friday and 12:00 to 15:00 on Saturdays); and

¹ Previously called Marine Scotland Licensing Operations Team (MS-LOT)

- Orkney Harbours, Kiln Corner Office (see local media and www.orkneyharboursmasterplan.com for public drop in opening times)

Hardcopies of the NTS will also be available free of charge at the above locations.

Electronic copies of the NTS and EIAR can also be downloaded from www.orkneyharboursmasterplan.com. Full hard copies of the EIAR can be supplied for £250 per copy by request to Orkney Islands Council Customer Services, Kirkwall.

Volume 1

Contents

Preface.....	iii
1 Introduction.....	1
1.1 Terms of Reference.....	1
1.2 Report Usage.....	1
1.3 The Applicant and Background.....	1
1.4 The Project Team.....	1
2 Proposed Development.....	3
2.1 Introduction.....	3
2.2 The Site and Surrounding Area.....	3
2.3 The Need for Development.....	3
2.4 Alternatives.....	4
2.5 The Proposed Development and Outline Design Principles.....	5
2.6 Construction Phase.....	5
2.7 Operational Phase.....	7
2.8 Decommissioning Phase.....	8
3 EIA Methodology and Scope.....	9
3.1 Introduction.....	9
3.2 EIA Objectives.....	9
3.3 EIAR Content.....	9
3.4 EIA Key Stages.....	9
3.5 Risk Assessment Approach.....	9
3.6 Screening as Part of the EIA Process.....	10
3.7 Scoping as Part of the EIA Process.....	11
3.8 Further Consultation.....	19
3.9 Final Content and Structure of the EIAR.....	19
3.10 Key Terms.....	21
4 Water Environment.....	22
4.1 Introduction.....	22
4.2 Scoping and Consultation.....	22
4.3 Policy, Legislation and Guidance.....	24
4.4 Methodology.....	25
4.5 Baseline.....	26
4.6 Receptor Sensitivity.....	29
4.7 Impact Assessment.....	29
4.8 Mitigation and Monitoring.....	32
4.9 Residual Effects.....	33
4.10 Statement of Significance.....	33
5 Biodiversity.....	36
5.1 Introduction.....	36
5.2 Scoping and Consultation.....	36
5.3 Policy, Legislation and Guidance.....	43
5.4 Methodology.....	43
5.5 Baseline.....	47
5.6 Impact Assessment.....	51
5.7 Cumulative Impact Assessment.....	56
5.8 Mitigation and Monitoring.....	56
5.9 Residual Effects.....	58
5.10 Statement of Significance.....	58
6 Archaeology and Cultural Heritage.....	61

6.1 Introduction.....	61
6.2 Scoping and Consultation.....	61
6.3 Policy, Legislation and Guidance.....	61
6.4 Methodology.....	62
6.5 Baseline.....	64
6.6 Impact Assessment.....	71
6.7 Mitigation and Monitoring.....	72
6.8 Residual Effects.....	72
6.9 Statement of Significance.....	73
7 Seascape, Landscape and Visual Impact Assessment.....	74
7.1 Introduction.....	74
7.2 Scoping and Consultation.....	74
7.3 Policy, Legislation and Guidance.....	76
7.4 Methodology.....	77
7.5 Baseline.....	80
7.6 Impact Assessment.....	85
7.7 Mitigation and Monitoring.....	86
7.8 Residual Effects.....	86
7.9 Statement of Significance.....	98
8 Socio-Economics.....	99
8.1 Introduction.....	99
8.2 Scoping and Consultation.....	99
8.3 Policy, Legislation and Guidance.....	99
8.4 Methodology.....	102
8.5 Baseline.....	104
8.6 Impact Assessment.....	109
8.7 Mitigation and Enhancement.....	111
8.8 Residual Effects.....	112
8.9 Statement of Significance.....	113
9 Airborne Noise.....	114
9.1 Introduction.....	114
9.2 Scoping and Consultation.....	114
9.3 Policy, Legislation and Guidance.....	114
9.4 Methodology.....	114
9.5 Baseline.....	115
9.6 Impact Assessment.....	116
9.7 Mitigation and Monitoring.....	117
9.8 Residual Effects.....	117
9.9 Statement of Significance.....	118
10 Supporting Assessments.....	119
10.1 Accidents and Natural Disasters.....	119
10.2 Air Quality.....	120
10.3 Carbon, Climate Change and Greenhouse Gas Emissions Assessment.....	122
10.4 Transport - Aviation.....	127
10.5 Transport - Roads.....	127
11 Schedule of Mitigation.....	130
11.1 Introduction.....	130
11.2 Mitigation Measures.....	130
11.3 Construction Environmental Management Document.....	137
12 Summary of Effects.....	138
12.1 Introduction.....	138
12.2 Water Environment.....	138
12.3 Biodiversity.....	138

12.4 Archaeology and Cultural Heritage.....	138
12.5 Seascape, Landscape and Visual.....	139
12.6 Socio-Economics.....	139
12.7 Terrestrial Noise.....	139
12.8 Other Issues.....	140

Tables

Table 1-1: Project Team and Competent Expertise.....	1
Table 2-1: List of Proposals Considered in the Draft Orkney Harbours Masterplan.....	4
Table 2-2: Dredging Area and Sediment Quantities.....	6
Table 2-3: Estimated Reclamation Material Volumes.....	6
Table 3-1: Summary of Scoping Responses.....	12
Table 3-2: Cumulative Schemes for Consideration in the EIAR (Council Recommendations).....	19
Table 3-3: Structure of the EIAR.....	20
Table 4-1: Summary of Consultation Responses.....	22
Table 4-2: Criteria for Assessing Receptor Sensitivity.....	25
Table 4-3: Criteria for Assessing Impact Magnitude.....	26
Table 4-4: Criteria for Assessing Effects.....	26
Table 4-5: Tidal water levels at St Mary's Scapa Flow.....	27
Table 4-6: UKCP18 RCP predictions over the 21 st century for carbon dioxide concentrations (left) and global mean surface temperature change resulting from carbon dioxide and other climate forcings (right).....	28
Table 4-7: UKCP18 time series of time-mean sea level change for RCPs based on average of UK ports (left) and the spatial pattern of change at 2100 (right).....	29
Table 4-8: Receptor Sensitivity.....	29
Table 4-9: Residual Effects.....	34
Table 5-1: Scoping Summary.....	38
Table 5-2: Legislation, Policy and Guidance Documents.....	43
Table 5-3: Geographical Level of IEFs.....	45
Table 5-4: Criteria for Describing Magnitude of Impact.....	46
Table 5-5: Sensitivity of Important Ecological Features.....	46
Table 5-6: Habitat Summary.....	48
Table 5-7: Evaluation of Important Ecological Features.....	50
Table 5-8 Summary of habitats lost.....	52
Table 5-9: Residual effects summary.....	59
Table 6-1: Summary of consultation responses in the Scoping Opinion specific to the historic environment.....	61
Table 6-2: Impacts Requiring Assessment.....	62
Table 6-3: Example Importance Criteria for Historic Environment Receptors.....	62
Table 6-4: Example Importance Criteria for Setting and Sensitivity to Change.....	63
Table 6-5: Example Criteria for the Assessment of Impacts on Historic Environment Assets.....	63
Table 6-6: Assessment of Impact Significance.....	64
Table 6-7: Definitions for Significance of Impact.....	64
Table 6-8 Summary of Key Datasets and Reports.....	65
Table 6-9: Overview of Identified Marine Historic Environment Assets.....	70
Table 6-10 Summary of Residual Effects for Archaeology and Cultural Heritage Receptors.....	73
Table 7-1: Preliminary Baseline Consideration of Residential Locations within 2km.....	83
Table 7-2: Assessment of Visual Effects on Selected Representative Residential Locations within Approximately 2km.....	95
Table 8-1: Significance matrix – significant effects highlighted in bold.....	103
Table 8-2: Population and demographics for Orkney Islands.....	104
Table 8-3: Scottish Index of Multiple Deprivation Scores.....	105
Table 8-4: Employment and unemployment levels.....	106
Table 8-5: Job Seeker Allowance and Universal Credit claimants for Orkney Islands and Scotland.....	106

Table 8-6: Employment by employment sector (2011).....	106
Table 8-7: Employment by industry (2021).....	107
Table 8-8: Qualifications for Orkney Islands and Scotland.....	107
Table 8-9: GVA share by sector 2018.....	108
Table 8-10: GDHI for Orkney Islands and Scotland.....	108
Table 8-11: Tourism sector statistics for Orkney Islands.....	109
Table 8-12: Construction impacts: employment impacts by year (full time job years).....	110
Table 8-13: Construction impacts: employment impacts by year (full time job years) – total employment.....	110
Table 8-14: Summary of the identified likely construction impacts.....	110
Table 8-15: Summary of the identified likely operation impacts.....	111
Table 8-16: Summary of the identified likely construction effects.....	112
Table 8-17: Summary of the identified likely operation effects.....	113
Table 9-1: Summary of Consultation Responses.....	114
Table 9-2: Significance Criteria for the Assessment of Construction Noise.....	114
Table 9-3: Significance of Effects; Operational Industrial Noise.....	115
Table 9-4: Noise Monitoring Locations.....	115
Table 9-5: Daytime Background Sound Measured Results.....	115
Table 9-6: Night-time Background Sound Measured Results.....	116
Table 9-7: Noise Sensitive Receptor Locations; Construction and Operational Noise.....	116
Table 9-8: Modelled Scenarios; Construction Noise.....	116
Table 10-1 Background pollutant concentrations at the Proposed Development site.....	120
Table 10-2: Capital Carbon Emissions Considered in the Assessment.....	123
Table 10-3: Total Emissions of Proposed Development (tCO ₂ e).....	124
Table 10-4: Emissions arising from the construction phase (A1-5).....	124
Table 10-5: Future Climate Projections for North of Scotland (2080s; RCP8.5).....	125
Table 10-6: Traffic Assessment Significance Criteria.....	129
Table 11-1: Schedule of Mitigation.....	131

Figures

Plate 0-1 – Scapa Deep Water Quay.....	iii
Figure 2-1: Site Location.....	3
Figure 2-2: Aerial View of Scapa Flow.....	6
Figure 5-1: Distribution of Reef and Kelp and seaweed beds on sublittoral sediments within the Orkney Isles. Image taken from the NMPI. Data is from the Geodatabase of Marine features adjacent to Scotland (GeMS) v10 (i26)....	49
Figure 6-1: Historic Environment Assets.....	65
Figure 6-2: ZTV.....	69
Figure 8-1: Population of Orkney Islands by age and gender (2021).....	104
Figure 8-2: Projected population profile for 2018 and 2028 – Orkney Islands.....	105
Figure 8-3: Scottish Index of Multiple Deprivation Ranks.....	105
Figure 9-1: Airborne Noise Monitoring Locations.....	115
Figure 9-2: Noise Sensitive Receptors.....	116
Figure 10-1 – PAS 2080 Life Cycle Modules.....	123
Figure 10-2: Emissions associated with lifecycle Stage A across all activities.....	124
Figure 10-3: Emissions associated with lifecycle Stage B across all activities.....	125
Figure 10-4: PAS 2080 Carbon Reduction Hierarchy.....	125
Figure 10-5: Diagram Showing Ability to Influence Carbon Reduction.....	126
Figure 10-6: Location of Traffic Counters.....	128
Figure 10-7: AADT Base Traffic Flows for Scapa.....	128
Figure 10-8: Scapa Construction Related Traffic Flows.....	129
Figure 10-9: Scapa Threshold Assessment.....	129

1 INTRODUCTION

1.1 Terms of Reference

EnviroCentre Ltd has been appointed by Orkney Islands Council Harbour Authority (OICHA) to undertake an Environmental Impact Assessment (EIA) of the proposed Scapa Deep Water Quay (SDWQ) at Deepdale, Scapa. This Environmental Impact Assessment Report (EIAR) comprises the written findings of the EIA process undertaken under both the Town & Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017 ('the EIA Regulations') and the Marine Works (Environmental Impact Assessment (Scotland) Regulations 2017 ('the Marine EIA Regulations').

1.2 Report Usage

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

If this report is to be submitted for regulatory approval more than 12 months following the report date, it is recommended that it is referred to EnviroCentre for review to ensure that any relevant changes in data, best practice, guidance or legislation in the intervening period are integrated into an updated version of the report.

Whilst the Client has a right to use the information as appropriate, EnviroCentre Ltd do not accept liability to any third party for the contents of this report unless written agreement is secured in advance, stating the intended use of the information. EnviroCentre accept no liability for use of the report for purposes other than those for which it was originally provided, or where EnviroCentre have confirmed it is appropriate for the new context.

1.3 The Applicant and Background

OICHA are the Applicant for the proposed development.

In August 2020, OICHA launched the Orkney Harbours Masterplan Phase 1 (after OIC Members approval in April 2020), a proposed ambitious £230 million infrastructure vision to be completed over a 20 year period. Proposals focus on harbour infrastructure enhancements that will generate jobs, additional revenue and attract new business. It represents the first step in a review of OICHA owned infrastructure to create a base for innovation and secure the long-term future for the community associated with maritime activities.

The Masterplan embraces and supports decarbonisation and transition away from fossil fuels. The infrastructure proposals have been designed to enable Orkney to manage this transition while continuing to generate social and economic benefit from the oil and gas industry while it slowly declines. Harbour users and key stakeholders were consulted from the outset to help gain an understanding of the issues, constraints and opportunities associated with the harbour infrastructure around Orkney through workshops and interviews. The range of stakeholders included local communities, harbour users, potential funders and environmental bodies such as NatureScot.

Phase 1 of the Masterplan considered five final main locations on the Orkney mainland, namely and in no priority:

1. Scapa Deep Water Quay;
2. Hatston Pier and Harbour;
3. Existing Scapa Pier;
4. Kirkwall Pier and Harbour; and
5. Stromness.

It is proposed that a future Phase 2 will address development of smaller harbours and piers across the archipelago.

Full details of the Masterplan can be found at <http://www.orkneyharboursmasterplan.com/>

1.4 The Project Team

The EIA carried out in relation to the proposed development has been undertaken by specialist environmental and technical consultants as provided in Table 1-1.

Table 1-1: Project Team and Competent Expertise

Project Role	Organisation	Lead Author & Reviewer	No. of Years' Experience	Qualifications & Professional Memberships
Inputs to EIA Process				
Project Director	EnviroCentre	Dr Campbell Fleming	33	PhD CGeol FGS
Project Manager	EnviroCentre	Emma Cormack	20	BSc (Hons), MIEEnvSc
Project Co-ordinator for SWECO	SWECO	Rebecca McLean	18+	BSc (Hons), CEnv, MIEMA
Engineering – Project Director	Arch Henderson	Andrew Sandison	37+	BSc (Hons) PG Dip CEng FICE FIES
Engineering – Project Manager	Arch Henderson	Shane Jamieson	10+	BEng (Hons) MSc CEng MICE
Volume 1: Environmental Impact Assessment Report				
Chapter 1, 2, 3, 9 & 10	EnviroCentre	Emma Cormack	20	BSc (Hons), MIEEnvSc
Water Environment	EnviroCentre	Martin Nichols	10+	BSc (Hons) MSc, C.WEM MCIWEM
Biodiversity	EnviroCentre	Gemma Nixon	9+	MSc CEcol MCIEEM
Ornithology	EnviroCentre	Matthew Sullivan	17+	MSc ACIEEM
Benthic Surveys	Seastar Survey Ltd	Steve Dewey	25+	MSc Oceanography
	Physalia	Dr Simon Foster	32+	BSc PhD
Underwater Noise Modelling	Irwin Carr	Shane Carr	20+	MSc PgDip CEnvH MIOA
		Rasmus Sloth Pedersen	8+	MSc PgDip MIOA
Archaeology & Cultural Heritage	ORCA	Paul Clark	20+	MCIfA

Seascape, Landscape & Visual	SWECO	Philip Black	20+	Ba (Hons) Landscape Architecture – Leeds Metropolitan University (1997) Graduate Diploma in Landscape Architecture – University College Dublin and Leeds Metropolitan University (1999) Chartered Member of the Landscape Institute (2002)
Air Quality	SWECO	Jen Simpson	29+	BSc in Industrial Chemistry (Sandwich 1990), ADMS URBAN, CERC (2002), ADMS, CERC (2008), ADMS ROADS, CERC (2008), MAPINFO, Pitney (2010), GASSIM, Golder Associates (2012), BOSIET, FALK (2012) Full Member of the IAQM/ Full Member of the IES EMAQ(+) Trainer Jennifer sits on the Environmental Protection Scotland (EPS) Air Quality Expert Group
Airborne Noise	EnviroCentre	Craig Cloy	11+	MA (Hons) MIOA
		Andrew Hood	8+	MSc Audio Acoustics, Salford University Meng (Hons) Electronics with Music, Glasgow University MIOA, Member of Institute of Acoustics
Carbon, Climate Change & Greenhouse Gas Assessment	SWECO	David Jackson	11+	BSc (Hons) Geography – University of St Andrews (2008), MSc Carbon management – University of Edinburgh (2016), PhD Carbon Management – University of Edinburgh (2021), Chartered Environmentalist (CEnv) and Full Member of IEMA. Associate Member ICE.
Socio-Economics	SWECO	Mark Murphy	10+	BSc (Geography, 2010) and MSc (Global Water Sustainability, 2011) Full member of IES Affiliate member of IEMA
Transport	SWECO	Ruth Mustard	21+	MEng, MSc, MCIHT

2 PROPOSED DEVELOPMENT

2.1 Introduction

Orkney Islands Council is the Statutory Harbour Authority responsible for the safe and efficient operation of the 29 piers and harbours located throughout the Orkney Islands.

The range of ports and harbours is diverse, in terms of size and nature of operational activity.

The major facilities of Orkney Logistics Base (Hatston), Kirkwall and Stromness accommodate a range of operational activity across many sectors – aquaculture, cargo, cruise, ferries, oil and gas, fishing, marine leisure and marine renewables.

The strategically located Scapa Flow, with its unique deep water sheltered anchorage, hosts multiple ship-to-ship (STS) transfer operations of crude oil, liquefied natural gas (LNG) and liquefied petroleum gas (LPG) as well as the Flotta Oil Terminal. Scapa Flow now also accommodates semi-submersible rigs and accommodation platforms at anchor for maintenance and stand-down.

There are numerous smaller piers and harbours throughout the North and South Isles of Orkney, as well as around the Orkney Mainland: many of these accommodate lifeline island ferry services, aquaculture, fishing and marine leisure activities. These piers are critical in ensuring the viability of small island communities.

The economy of Orkney is shaped by the marine environment and maritime activities taking place around the archipelago's coasts and harbours. There are many vessel movements within the Orkney archipelago each year, as well as circa 8,000 vessels passing through the Pentland Firth, with cargoes in transit between Europe and North America.

The proposed development includes the following key elements:

- Formation of an access road;
- Creation of a new deep-water quay and laydown area; and
- Dredging of areas adjacent to the new quay.

The remainder of this chapter describes the need for the development, alternatives considered, how the design has been developed, and activities associated with the construction and operational phases of the development as a whole.

2.2 The Site and Surrounding Area

2.2.1 The Site

Scapa Deep Water Quay will be situated circa 4km south from Scapa Pier – within the parish of Holm, round about the Bay of Deepdale. It is currently undeveloped coastline comprising a gravelly beach and in places exposed rock bordered on the landside by a rock face circa 3m in height. The land above the rock face comprises rough grazing which slopes upwards to the east and the A961. The Burn of Deepdale is to the north with a rocky promontory forming a natural barrier to the south. There is currently a rough track from the A961 to the coastline (Refer to Figure 2-1)

2.2.2 The Surrounding Area

The preferred location of the deep water quay is set within a rural area of the mainland island which is largely pastureland. Isolated residential dwellings and farmsteads are located along the extent of the A961. Gaitnip Hill Local Nature Conservation Site (LNCS) is located immediately to the north of the Burn of Deepdale. The Royal Oak designated war grave, and consequent Military Wreck exclusion zone is located ~1,200m to the northwest and Westerbister fish farm is situated ~835m to the south.

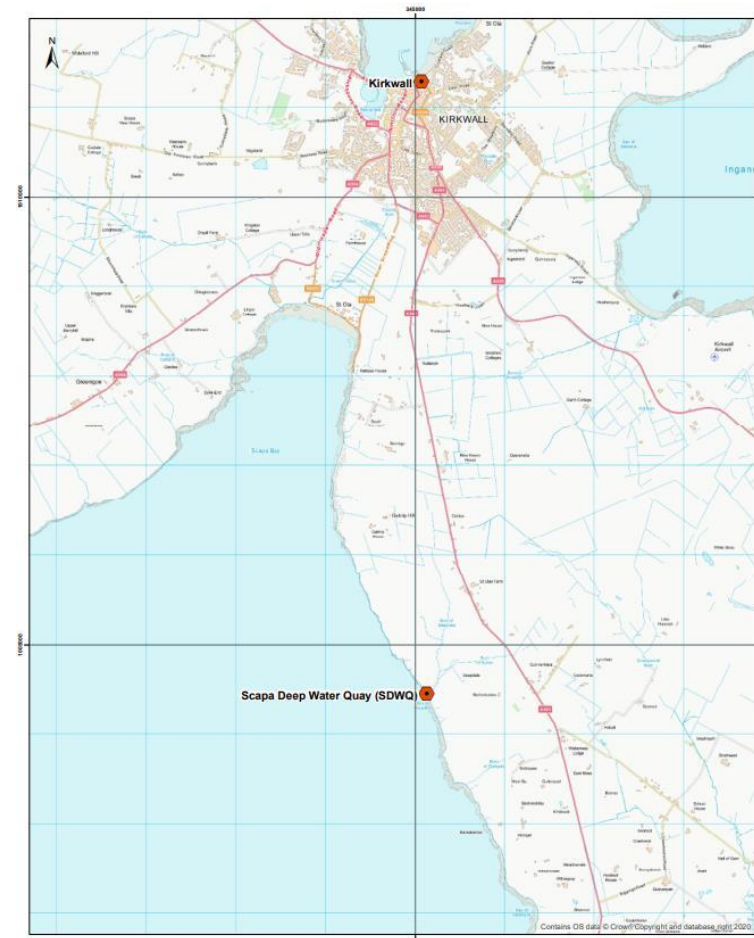


Figure 2-1: Site Location

2.3 The Need for Development

There are specific market opportunities in the offshore wind and oil and gas sectors that need access to deep water pier infrastructure, both deep water access and laydown / working areas. However, there is currently no such facility

located on the Orkney Mainland coast, and an under provision of such facilities generally in Scotland and the UK. As part of the Orkney Harbours Masterplan Phase 1 development, consideration was given to several possible locations for a deep-water quayside facility (Refer to Section 2.4 for further details) with the site at Deepdale, to the south of the existing Scapa Pier being the final preferred option following a multi-criteria appraisal (Refer to Section 2.4 Alternatives for further details)..

The main purpose of this facility would be to undertake multiple industrial activities that require both deep-water berthing and large laydown area. It is envisaged that the main activity will be the construction/assembly and maintenance of offshore wind turbines, particularly, and in the first instance associated with ScotWind developments, which support Scotland's approach to transforming the energy sector..

This is also a potential location for the development of a storage and supply hub for future marine fuels, a key project as part of the Islands Growth Deal.

2.4 Alternatives

As mentioned in Section 1.3 of this EIAR, OICHA launched the Orkney Harbours Masterplan Phase 1 in August 2020. The projects included in the Masterplan (in which SDWQ is one) were identified by their potential to meet the aims and objectives of the Masterplan. As required by the Environmental Assessment (Scotland) Act 2005 the development of the Masterplan was undertaken in parallel with a Strategic Environmental Assessment (SEA). A Habitats Regulations Assessment (HRA) was also undertaken as part of the SEA process.

At the start of the Masterplan development, optioneering was undertaken through stakeholder discussions / workshops, OICHA internal discussions with staff, market assessments in conjunction with desk-based research. Through this process an extensive list of proposals for harbour improvements was identified as listed in Table 2-1.

Table 2-1: List of Proposals Considered in the Draft Orkney Harbours Masterplan

Geographical Area	Locations of Piers/Harbours initially proposed for Enhancement	Description
Kirkwall Bay & Tingwall	Kirkwall Pier	New quayside infrastructure, reclamation and marina expansion
	Hatston	New quayside infrastructure, reclamation and areas identified for particular uses, such as boat repair, aquaculture, freight handling, etc.
	Hatston Slip	Potential enhancements including improving the surface of the slipway, provision of shore facilities, slipway extension and provision of boat repair facilities.
	Shapinsay	Potential enhancements including reconfiguration of the ferry terminal and parking areas.
	Tingwall	Consideration of options to improve wave climate and create more berthing space which could be done through building new quayside infrastructure or extending the existing pier, coupled with landside reclamation.
Scapa Flow	Scapa Pier	Extension of existing pier, with dredging and reclamation to create laydown area and marine berths.
	New Scapa Quay (10m depth)	New quayside infrastructure with depth of -10m chart datum (CD) and circa 5 hectares of laydown area.

² Orkney Harbours Masterplan Phase 1 (V1) Strategic Environmental Assessment – Environmental Report, *Intertek Report No P2214_R4666_Rev1*, dated 1 March 2019

	New Scapa Quay (20m depth)	New quayside infrastructure with depth of -20m chart datum (CD) and circa 5 hectares of laydown area.
	Lyness	Creation of hard standing area.
	Burray	Quay extension and dredging.
	Stromness	Reclamation and infilling between fenders at Copland's Dock and marina expansion in Stromness.
	Houton	Additional berthing space for small boats.
	Longhope	Additional berthing space for small boats.
	Graemsay	Additional berthing space for small boats.
	Moaness	Additional berthing space for small boats.
	Burwick	Enhancements to quayside infrastructure for ferry services.
North Isles	All harbours	Enhancements to quayside infrastructure.

The Masterplan objectives were then used to identify viable options for taking forward into the Masterplan which were subsequently assessed against the SEA Objectives. The SEA also considered the likely changes to the environment as a result of not implementing the Masterplan.

The SEA considered the effects of the Masterplan on the environment using a systematic methodology as prescribed in the Environmental Assessment (Scotland) Act 2005. The SEA process aims were to

- Integrate environmental factors into the preparation of the Masterplan;
- Highlight potential environmental impacts as a result of the Masterplan implementation and provide high level mitigation measures to be considered at the detailed stages of individual projects;
- Involve members of the public in the development of the Masterplan; and
- Enable the decision-making process to be transparent.

The outcomes of the SEA were used to inform a draft Orkney Harbours Masterplan Phase 1 with details of the process including alternatives considered, reasons for discounting or taking forward options and potential environmental impacts as reported in the Strategic Environmental Assessment – Environmental Report².

The draft Orkney Harbours Masterplan Phase 1 and accompanying SEA Environmental Report were then consulted on in summer 2019. The consultation comprised public meetings and 'drop-in' sessions with copies of the documents available to the public both online and as a hard copy. Comments from the consultation process were then fed into the Masterplan prior to finalisation and adoption August 2020. The SEA – Post Adoption Statement³ provides information on how the SEA and consultee's views have been taken into account within the finalised Masterplan.

Since the Masterplan was adopted the overall concept and business case for SDWQ has evolved and been redefined. This includes the refinement of the siting of the proposed development, which was originally positioned in an area to the north of the Burn of Deepdale. However, following initial site investigations and preliminary ecological surveys it was concluded a move of the development to its current location would be preferable. The move was a result of the engineering and environmental considerations as listed below:

- The quantity of overburden and unsuitable material (for development purposes) was determined to be greatly reduced by re-positioning the development on the land to the south of the burn;
- The current site selected avoided crossing the Burn of Deepdale; and
- Moving the development footprint to the south would avoid encroachment into the Gaitnip Hill LNCS which would have been the case if it was situated to the north of the Burn of Deepdale.

³ Orkney Harbours Masterplan Phase 1 Strategic Environmental Assessment – Post Adoption Statement, *Intertek Report No P2214_RN5054_Rev1*, dated 16 June 2020

2.5 The Proposed Development and Outline Design Principles

2.5.1 Introduction

The following sub-chapters provide a summary of the proposals. Additional engineering details are provided in the document 'SDWQ – Project Description & Potential Methods' contained in Technical Appendix 2.1 (Volume 3 of this EIAR).

The Drawings listed below present illustrative layouts of the planned development and are located in Volume 2 of this EIAR:

- Overall Site Layout (Drawing Ref 202042EIA-110);
- Site Access Road Layout (Drawing Ref 202042EIA-300);
- Phase 1 Overall Layout (Drawing Ref 202042EIA-400);
- Phase 1 Site Entrance Layout (Drawing Ref 202042EIA-401);
- Phase 2 Overall Layout (Drawing Ref 202042EIA-500); and
- Phase 3 Overall Dredging Layout (Drawing Ref 202042EIA-600).

2.5.2 Design Principles

This proposal comprises approx. 597m long main quayside berth with general -15m CD water depth, incorporating a 135m quayside pocket with -20m CD water depth. Further north tug (3No.) and pilot boat (2No.) berth approx. 180m long with depths between -6 and -9m CD. Laydown area directly behind quay face approx. 22.85 Hectares.

The development is designed to be built in three phases although the timing of Phases 2 and 3 will be dependent on the economic need for these facilities. The phasing details are:

Phase 1

- Installation of an access road from the A961 to the site;
- Excavation of current landform along with reclamation of shore to form ~12Ha of laydown area bounded by bunds on the north and eastern edges;
- Creation of 450m of berthing by formation of a quay ~320m x ~46m wide; and
- Dredging adjacent to the newly formed Phase 1 quay and proposed Phase 2 quay (i.e. one dredge campaign) to provide -15m CD water depth.

Phase 2

- Excavation of current landform along with reclamation of shore to form an additional 6Ha of laydown area to the south of Phase 1 laydown area. The bund on the eastern edge will be extended along the length of the new laydown area and partially along the southern edge; and
- Extension of the Phase 1 quay area by ~297m x ~46m to the south.

Phase 3

- Dredging on the southern side of the newly formed quay extension to provide a berthing pocket with -20m CD water depth.

It should be noted that as a design principle it has been attempted to balance any dredging or cut into the land with construction and/or reclamation requirements. This has avoided the requirement to import virgin material to create the development platform. Sea disposal of dredging material will be avoided as far as possible.

2.6 Construction Phase

It is important to note that the contract for construction of the facility may be awarded on a design and build basis. Therefore, while exemplar tender designs have been completed by Arch Henderson (Project Technical Advisors), until the preferred contractor is identified, and procurement complete the exact detail of the construction methodologies cannot be confirmed at this stage in the development process. However, based on professional advice from the Project Technical Advisors, Arch Henderson, the following construction activities summarised below and provided in detail in Technical Appendix 2.1, Volume 3 of this EIAR, are considered most suitable for assessment in the EIAR.

Access Road Construction (Phase 1)

- Installation of access road to main cut and fill site;
- Laying of all ducts and services to the site within the road verge;
- Initial bitmac surfacing at junction of access road with main road; and
- Laying of the final road surfacing on completion of the development.

Laydown Area (Phases 1 and 2)

- Installation of perimeter V ditches and silt retention prior to stripping operations commencing;
- Stripping of all non-inert material (organic soil and peat along with unsuitable clays) and creation of temporary stockpiles;
- Heavy tracked plant used to excavate and rip material;
- For harder strata on land the excavation may require pre-treatment through drilling 100mm diameter holes and controlled delayed explosives (approximately 25kg per hole);
- Recovered material would be screened and suitable inert stone and glacial till (both to be free of all organic and clay material) to be stockpiled on site for use as fill in future reclamation and quay works;
- All non-inert material recovered during initial site stripping and the main excavation operations to be used to form perimeter bunds; and
- Works estimated to take place over ~10 to 14 months for each development phases.

Initial Reclamation (Phase 1 only)

- Prior to work commencing a silt boom to minimise dispersion of fine material will be moored out from the foreshore;
- The north perimeter bund will be formed from suitably won materials extending from the access road to the rear of the proposed quay works;
- The advancing head of the perimeter core bund will be protected by the silt boom which shall advance in front of the work;
- As the northern bund progresses, geotextile will be placed on the northern slope to mitigate the migration of fines; and
- Secondary armour and primary armour stone to be placed on top of the geotextile. (Note: it is envisaged that the majority of armour stone will be brought to site by sea.)

Reclamation and Quay Works (Phases 1 and 2)

- The access road formed in the initial reclamation phase will be used for labour, plant and construction materials to access the quay works and laydown area construction sites. For Phase 2 and Phase 3 construction work access will be from Phase 1;
- To form the quay, tubular steel piles (approximately 1.6m to 2.2m diameter) clutched with sheet piles between tubes to form a combi wall will be installed as follows:
 - Drill rigs to work over water from temporary piling platforms from the reclamation bund or a jack up barge to install tubular and sheet piles;
 - Both types of piles to be installed by vibro-hammer to required depth;
 - Piles will then be filled with tremie concrete, tie rods installed and secured between the front face and rear sheet pile wall and a concrete cope formed;

- Quay infill to be vibro-treated to compact and reduce future consolidation and settlement; and
- Concrete deck immediately behind the quay face shall be placed no less than 6 months after fill takes place in order to minimise differential settlement and consolidation.
- As the quay works advance south then the reclamation fill would advance behind thereby affording additional sea fetch protection to the shore works; and
- Once the concrete deck behind the quay face is placed then the remaining reclamation and laydown area shall be capped and compacted with graded hard core with the surface falling to V ditches and French drains leading to interceptors and eventually sea outfalls.

Dredging (All Phases)

- Dredging adjacent to the newly formed Phase 1 quay and proposed Phase 2 quay (i.e. one dredge campaign) to provide -15m CD water depth; and
- Phase 3 – deepening of an area on the southern side of the newly formed quay extension to provide a berthing pocket with -20m CD water depth.

The dredge areas and estimation of sediment being recovered are provided in Table 2-2 below.

Table 2-2: Dredging Area and Sediment Quantities

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

A Site Investigation (SI) has been carried out to determine the nature and chemistry of the sediment to be dredged in Phase 1 and 2 dredge area. This information was used to inform the Best Practicable Environmental Option (BPEO) for reuse / disposal of the dredging material. The conclusions of the BPEO (refer to TA 2.2, Volume 3 of this EIAR) identifies that the majority of the sediment is suitable for use as infill material. The small component that fails to meet the engineering criteria for use as infill material could either be disposed of at a licenced marine disposal site (refer to the BPEO report) or used to form the northern / eastern bunds.

The future Phase 3 dredging campaign will require a SI to confirm the nature of the sediment between -15m CD and -20m CD within the area of the deeper berthing pocket. As this information is currently unknown at the time of writing, a separate application will be submitted to MD-LOT at a later stage for the Phase 3 dredge.

2.6.1 Reclamation Material Volumes

As noted above the primary principal in the design of SDWQ facility has been to maximise and balance all inert excavated material for re-use as infill or if unsuitable for this purpose (i.e. organic soil, vegetated peat and clays) to form perimeter bunds (minimise visual and airborne noise impacts to the surrounds). Table 2-3 provides estimated volumes of site won material which have been calculated from information from SI's.

Table 2-3: Estimated Reclamation Material Volumes

Construction Phases	Est. Total (m ³)	Est. Total – Infilling (m ³)	Est. Total Bund Formation (m ³)	Estimated Duration (Weeks)
Phase 1	925,000	800,000	125,000	26
Phase 2	765,000	705,000	60,000	22

2.6.2 Site Drainage and Water Management

During the construction phase temporary drainage and water management measures will be implemented to protect the water environment (these are discussed in Chapter 4 of this EIAR).

The permanent drainage infrastructure will also be installed during the construction phase. This permanent infrastructure is designed to incorporate Sustainable Urban Drainage Systems (SUDS) designed in accordance with the CIRA SUDS Manual (C697). The design will therefore include attenuation chambers, oil interceptors and sampling chambers before discharging to sea via outfall(s).

2.6.3 Vessel Movements

Construction vessel movements were considered as part of a Navigational Risk Assessment (NRA) carried out for the proposed development. The NRA is provided in full in Technical Appendix 2.3, Volume 3 of the EIAR. From information within the NRA construction vessel movements can be summarised as follows:

- Until tenders are issued for construction works, the type and volume of vessel traffic associated with the construction of the new facility is not accurately defined. However, it would be reasonable to assume that there will be a need for some construction vessels to be used for the marine aspects of the new quay;
- It would be expected that there will be some requirement for marine traffic related to delivery of materials, piling, quay construction and other activities such as fender installation. This is likely to include tugs, work boats, survey craft, and possibly crew transfer vessels;
- It is envisaged that the main vessels to the site during the construction of Phases 1 and 2 will comprise:
 - 2 Jack up barges with cranes;
 - Steel pile delivery vessels (4 vessels per Phase); and
 - Rock armour delivery (2 vessels per phase)
- The number of vessels and movements will be small in relation to current traffic levels in the study area, but the assessors made an allowance for such traffic being both present at the construction site and making occasional transits to and from site (from Scapa Pier, and in and out of the boundaries of the study area); and
- In summary, the NRA concludes there is a low risk, and a number of recommendations were made regarding navigation during the operational and construction phases. These recommendations will be implemented in line with Marine Services ongoing operational requirements.



Figure 2-2: Aerial View of Scapa Flow

2.6.4 Overall Construction Timescales and Working Hours

The exemplar design is now well established for SDWQ and the anticipated timetable for works is expected to be:

- Main Works – Commencing September 2024 assuming planning and marine licences can be obtained;
- Phase 1 is anticipated to completed by 2027; and
- Phase 2 is anticipated to commence September 2027 and completed in 2028.

The timing for Phase 3 is currently unknown and will be subject to a separate application for a marine licence prior to works commencing.

The normal working hours for construction are expected to be Monday – Saturday 7am to 7pm and Sunday 7am until 2pm. Dredging and drilling would be 24 hours, 7 days a week.

2.6.5 Environmental Management During Construction

Only experienced marine contractors will be invited to tender for the Works. The successful tenderer will be required to submit:

- A Construction Environmental Management Plan (CEMP);
- Risk Assessments and Method Statements (RAMS) for all major aspects of the Works; and
- A Site Waste Management Plan (SWMP).

The above documents will be submitted for approval by the Statutory Authorities prior to any Works commencing on site.

Implementation of the CEMP and other environmental control procedures will be checked by an independent environmental clerk of works, through site visits, inspections and audit of the Contractors records throughout the Works.

2.7 Operational Phase

2.7.1 Expected Site Activities

For the operational phase, expected site activities are the delivery and partial assembly of offshore windfarm turbines. It is also envisaged that the pilot and tugboats that currently operate out from Scapa Pier would be relocated to SDWQ.

2.7.2 Predicted Staff Numbers

The Outline Business Case (OBC) (Refer to Technical Appendix 2.4, Volume 3 of the EIAR) identifies the potential for job opportunities which are likely to be higher value added jobs requiring specific skills. It predicts that the total number of Full-Time Equivalent (FTE) jobs would vary from 73 to 100 between 2027 and 2034. Between 2035 and 2044 this number is estimated to be in the region of 50 FTE⁴ but could be greater depending on the future offshore wind activity relating to the site. Refer to Chapter 8 Socio-economics for further information.

⁴ Orkney Harbours Masterplan Phase 1. (2022). Outline Business Case.

2.7.3 Dredging

During the operational phase, maintenance dredging is not expected to be required. This is discussed in Chapter 4 Water Environment.

2.7.4 Vessel Movements and Navigation

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

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

The NRA documents the predicted operational traffic movements and predicted navigational risks associated with the new quay.

Operational vessel movements provided within the NRA can be summarised as follows:

- Delivery and installation vessel movements are noted as being 18 and 8 respectively for 2028;
- 2029 shows delivery vessel movements as 19 calls in total with 12 delivery vessel calls;
- Similarly for 2030 delivery and installation vessel calls are 18 and 9;
- For 2031 delivery calls decrease to 10 but installation vessel calls increase to 19; and
- After 2032 the number of vessel calls is difficult to predict.

The predicted vessel movements were used to carry out a series of risk assessments related to navigation. The assessment outcomes can be summarised as follows:

- there is little significant new navigational risk associated with either the construction or operation of the proposed Scapa Flow Deep Water Quay;
- The project site is located in an area of very low present day traffic density, and which is already subject to numerous effective risk control measures (VTS, Pilotage, Towage, etc). As a result of both of these factors, incident frequency is also low; and
- There will be an inevitable increase in navigation risk through the introduction of a new structure, generating an increased volume of traffic. However, the increase in risk is low, on top of an already low baseline.

Notwithstanding the assessment of low risk, a number of recommendations were made regarding navigation and associated risks including:

- Existing control measures should be kept in place (VTS, Pilotage, Towage) during both construction and operation phases;
- Good communications should be maintained with stakeholders throughout. There will be a need for close liaison between the OICHA and the contractors during the construction phase and between OICHA and the berth operator during the operational phase.;
- Communication should be established with local leisure users who may be currently using an inshore route at the project site and a plan to manage these vessels during construction and operation phases should be developed;
- A Navigation Management Plan for the construction phase should be designed and implemented to reduce the chance of ship-to-ship collisions between craft involved in the construction phase; and

- All of the risks should be kept under review by OICHA as the development progresses.

2.7.5 Propellor Wash

Propeller wash (or prop wash) and the potential for scour on the seabed was raised as a potential concern during consultation. This is not expected to be a significant issue given the following:

- Large deeper draught vessels approaching the quay will be moving slowly at safe navigational speed and have a vessel draught well above final dredge level which is only required for non-propulsion floating renewable components.
- Their main propeller(s) will therefore not be generating significant wash or turbulence on approach; and
- On final approach most vessels will be manoeuvring on thrusters which should not cause significant vertical turbulence.

Therefore, any effects to the seabed would be expected to be small and limited to immediately adjacent to the quay. The area adjacent to the quay would be subject to dredging during construction and effects on the seabed in this area are therefore considered in the EIAR within Chapter 5 - Biodiversity.

2.8 Decommissioning Phase

For a development of this type, decommissioning is not envisaged. Should decommissioning ever be planned in the future Statutory Regulators would be consulted and applications made at that time under whatever future regulatory regime exists at that point in the future.

3 EIA METHODOLOGY AND SCOPE

3.1 Introduction

The purpose of an EIA is to identify and evaluate the likely significant effects of a proposed development on the environment, both direct and indirect, and identify measures to mitigate or manage any significant adverse effects. The EIA process also provides an opportunity to 'design out' adverse effects wherever possible. Where adverse effects cannot be designed out, mitigation measures are proposed to avoid, compensate or reduce significant environmental effects to an acceptable level where possible. The findings of the EIA process must be documented in a clear and understandable manner within the EIAR. The EIAR is then submitted to assist the Regulators in determining any planning and / or marine licence applications required.

The EIAR submission includes a Non-Technical Summary (NTS). This is a concise, stand-alone document which provides a project description, the baseline environmental conditions along with the findings of the EIAR in an accessible and easy-to-read format. The NTS does not use technical terms, detailed data or scientific discussion.

The EIA work is undertaken by specialist environmental and technical consultants on the basis of project information supplied by the Applicant and their engineers and following consultation with statutory consultees, other bodies and members of the public.

EIA is an iterative process which allows feedback from stakeholder consultation and the results from baseline studies to be fed into the design process of the proposed development.

3.2 EIA Objectives

The objectives of the EIA are:

- To establish a robust environmental baseline upon which to base environmental assessment, incorporating field surveys, desk study and consultation;
- To provide an assessment of the potential environmental impacts of the proposed development and to determine which of these, if any, are likely to result in a significant effect on the receiving environment; and
- Where significant effects are predicted, to determine mitigation measures to reduce the residual effects to acceptable levels where possible and document residual effects.

3.3 EIAR Content

Schedule 4 of both EIA Regulations requires that the following information is provided:

- A description of the location of development, its physical characteristics and land-use requirements during construction and operation;
- A description of the main characteristics of the operational phase of the development;
- An estimate of residues and emissions produced during the construction and operation phases;
- A description of reasonable alternatives, and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects;
- A description of the relevant aspects of the current state of the environment and an outline of the likely evolution thereof without implementation of the development as far as reasonable;
- A description of environmental receptors likely to be significantly affected by the development;
- A description of the likely significant effects of the development on the environment;
- A description of the forecasting methods or evidence used to identify and assess the significant effects;

- A description of the measures envisaged to mitigate significant effects;
- A description of expected significant adverse effects deriving from the vulnerability of the development to risks of major accidents and/or disaster; and
- A non-technical summary of the aforementioned information.

3.4 EIA Key Stages

Whilst each environmental topic discussed within the EIAR establishes its own methodology based upon good practice and relevant industry guidance, there is a basic methodological framework which is applied to all EIA technical chapters.

The EIA process involves the following key stages:

- Baseline Studies – identification of existing environmental conditions through review of existing information, monitoring and field studies as required, to provide a baseline against which to assess the likely impacts of the proposed development;
- Potential Significant Impacts – identification of potential impacts and their resulting effects during the construction and operational phases, in relation to the design mitigation already implemented and where applicable, taking alternatives into account;
- Impact Assessment – evaluation of the effects, resulting from the identified potential impacts, to determine their significance, both positively and negatively, and incorporating cumulative effects;
- Mitigation and Monitoring – the identification of measures to avoid, reduce or compensate likely significant effects and any steps required to monitor these potential environmental effects; and
- Residual Effects – identification of residual effects assuming successful implementation of mitigation.

For consistency where possible, the above headings have been used within the technical chapters of this EIAR.

3.5 Risk Assessment Approach

3.5.1 Introduction

The risk assessment approach uses the source – pathway – receptor linkages to assess the significance of the impact(s). The significance of an impact is defined by the probability of the impact occurring and its likely consequences (i.e. the Magnitude of Impact / Change). When a significant impact is identified then appropriate mitigation measures are identified to avoid or reduce that impact if possible and the residual risk following implementation of the mitigation measures is then considered. The risk assessment approach includes consideration of cumulative impacts with other developments.

Further information on the risk assessment approach is provided in the sections below.

3.5.2 Sensitivity/Importance of Receptors

The sensitivity of the baseline conditions/receptors is defined according to the relative importance of existing environmental features on or in the vicinity of the site, or by the sensitivity of receptors which would potentially be affected by the proposed development.

Criteria for the determination of sensitivity (e.g. high, medium or low) or of importance (e.g. international, national, regional or authority area) were established for each topic assessment based on prescribed guidance, legislation, statutory designation and/or professional judgement relevant to that topic.

3.5.3 Magnitude of Impact/Change

The methods for predicting the nature and magnitude of potential impacts vary according to the subject area. Quantitative methods of assessment can predict values that can be compared against published thresholds and indicative criteria in Government guidance and standards. However, it is not always possible to ascribe values to environmental assessments and therefore qualitative assessments are sometimes used. Such assessments rely on previous experience and professional judgement. The methodologies used for assessing each topic area are described within the specialist chapters of this EIAR and supporting assessments.

In general terms, the magnitude of impact on environmental baseline conditions is identified through detailed consideration of the proposed development, taking due cognisance of any legislative or policy standards or guidelines, and/or the following factors:

- The degree to which the environment is affected, e.g. whether the quality is enhanced or impaired;
- The scale or degree of change from the existing situation;
- Whether the impact is temporary or permanent, indirect or direct, short-term, medium-term or long-term; and
- Any in-combination effects and potential cumulative effects.

In some cases, the likelihood of impact occurrence may also be relevant and, where this is a determining feature of the assessment, this is clearly stated.

3.5.4 Significance of Effect

Significant effects are predicted where important resources, or numerous sensitive receptors, could be subject to impacts of considerable magnitude. Effects are unlikely to be significant where low value or non-sensitive resources are subject to minor effects.

The criteria for determining the significance of an effect have been developed giving due regard to the following, where applicable;

- Sensitivity, importance or value of the resource or receptor;
- Extent and magnitude and duration of the impact; and
- Performance against environmental quality standards.

The criteria and assessment methodology used for each topic considered within this EIAR are set out within the 'Methodology' section of the respective EIAR technical chapter.

Unless otherwise stated, reported effects are considered to be adverse. It is however possible that some effects may be positive and these are stated and explained where appropriate.

The EIAR reports on the significance of the environmental effects as per the EIA Regulations. Although a significant effect does not always have to equate to an unacceptable effect, in order to ensure impartiality, the EIAR does not comment on acceptability.

3.5.5 Design Mitigation and Residual Effects

Design mitigation is integral to providing an environmentally robust development whereby suggestions for mitigation are incorporated into the project prior to 'design freeze'. This in-built mitigation represents, where applicable, environmental good practice and places a responsibility upon the Applicant to provide environmentally sustainable design solutions.

Design rationale is further discussed within the Design and Access Statement which accompanies the wider applications, along with a section within each EIAR chapter that comments on design mitigation that has been incorporated into the development before the assessment is carried out. Therefore, where design mitigation has been employed, the impact assessment is carried out with this design mitigation in place as it forms a constituent part of the proposed development. Residual effects are generally then the effects that follow the assessment of proposed development with design incorporated.

Residual effects of the proposed development are those that remain, assuming successful implementation of the identified mitigation measures. All remaining effects of the proposed development, following the application of mitigation measures, are summarised clearly and their significance stated, within the 'Residual Effects' section of each specialist chapter.

Where applicable, the EIAR also reports on opportunities for enhancement which could be incorporated into planning permission or marine licence conditions.

3.5.6 Cumulative Impact Assessment

Consideration of cumulative effects is a requirement of the EIA Regulations. By definition, these are effects that result from incremental changes caused by past, present and reasonably foreseeable actions together with the proposed development. There are different types of cumulative effects (such as in-combination and sequential effects) and typically cumulative impact assessment is assessed within each technical chapter.

3.6 Screening as Part of the EIA Process

In determining the requirement for an EIA, Schedule 1 of both EIA Regulations sets out the types of development for which EIA is a mandatory requirement, whilst Schedule 2 lists the projects where the need for EIA is judged on a case-by-case basis, depending on whether a proposal is likely to cause significant environmental effects or is located in a sensitive area as defined by the EIA Regulations.

As the proposed development contains elements which transcends the intertidal zone (i.e. the area between Mean High Water Springs (MHWS) and Mean Low Water Springs (MLWS), which constitutes the dividing line between terrestrial and marine planning, consents will be required from both OIC (for any elements not covered under OICHAs' Permitted Development Rights) and MD-LOT. A Screening Request was submitted to both OIC and MS-LOT in July 2020 to confirm if the proposed development, was deemed to fall within either Schedule 1 or 2 development as defined by the EIA Regulations and the Marine EIA Regulations.

OIC confirmed that the proposed development is considered to be EIA development. MD-LOT confirmed in their Screening Opinion, dated 22 July 2020, that the proposed works are considered to constitute Schedule 1 development as it falls under paragraph 21 "*Any change to or extension of projects listed in this schedule where such a change or extension in itself meets the thresholds, if any, or description of projects set out in this schedule.*"

By virtue of its nature, size and location, the proposed development could potentially have (if unmitigated) significant adverse effects on the environment. The remainder of this chapter discusses where and how the EIAR meets the requirements of the EIA Regulations and the Scoping exercise.

3.7 Scoping as Part of the EIA Process

3.7.1 Introduction

The sections below set out the EIA Scoping process for this development and accordingly documents how the EIAR was shaped into what is currently included and offers rationale to why other topics have been excluded, based on the likelihood of likely potential significant effects.

3.7.2 Scoping Requests and Opinions

A request for a formal Scoping Opinion was submitted to OIC and MD-LOT on 30th March 2021 under Regulation 17(1) of the EIA Regulations and Regulation 14(1) of the Marine EIA Regulations. This was accompanied by an EIA Scoping Report (Refer to Technical Appendix 3.1, Volume 3 of this EIAR) provided to assist the OIC, MD-LOT, statutory and non-statutory consultees to form an opinion upon the likelihood of potentially significant environmental effects and hence the topics to be assessed in the EIA (i.e. those topics where significant environmental effects could potentially result if unmitigated). The Scoping Report also provided an opportunity for consultees to comment upon suggested methodologies for technical assessment.

A Scoping Opinion was provided by OIC dated 13th October 2021 (Refer to Technical Appendix 3.2, Volume 3 of this EIAR). This contained formal responses from internal Council departments, Historic Environment Scotland (HES), Marine Scotland, Marine Services, Northern Lighthouse Board, Orkney Fisheries Association, Orkney Trout Fishing Association, Royal Society for the Protection of Birds (RSPB), Royal Yachting Association Scotland (RYA Scotland), Scottish Environment Protection Agency (SEPA), NatureScot and Scottish Water.

A Scoping Opinion was provided by MD-LOT dated 21st October 2021 (Refer to Technical Appendix 3.3, Volume 3 of this EIAR). This also contained formal responses from Defence Infrastructure Organisation (Ministry of Defence), HES, Maritime and Coastguard Agency (MCA), NatureScot, Northern Lighthouse Board (NLB), OIC and RSPB with specific advice sought from Marine Scotland Science (MSS), the Marine Scotland – Marine Analytical Unit (MAU), Marine Scotland Planning and Policy and Transport Scotland (TS).

3.7.3 Scoping Opinion – Defined Scope

The Scoping Responses from both OIC and MD-LOT are summarised in Table 3-1. This table provides a signpost of where these issues have been addressed, or where applicable why they have been Scoped out of the EIA.

Where the same issue has been raised by more than one consultation body, it has only been referred to once in order to avoid duplication. Further information is available within each technical chapter regarding where this information is held within that chapter.

Table 3-1: Summary of Scoping Responses

Consultee	Topic	Point for Inclusion	EIA Report Chapter	Justification
Highland and Islands Airports Ltd	Aviation	The development falls within the safeguarded area for Kirkwall Airport. The turbines could possibly affect the Instrument Flight Procedures.	Section 10.4 and Technical Appendix 10.2	
Historic Environment Scotland	Archaeology	Potential significant construction effects from dredging and operational effects from propeller scour on MBES Contact 1 and any previously unrecorded debris/stray finds/ordnance should be assessed.	Sections 6.6.1.3, 6.6.1.4 and 6.6.2.2	
		Agree that cumulative operational impacts on the settings of specified cultural heritage assets should be assessed.	Section 6.6.3	
Marine Scotland Science Maritime and Coastguard Agency NatureScot	Water Environment	<p>Physical environment / coastal processes</p> <p>Potential impacts to coastal processes including wave action, tidal currents and sediment transport, changes in infiltration rates, flood risk and drainage; contamination of the water environment from spillages, runoff or sediment transfer during construction and operation phases of the proposed works.</p> <p>Assessment of environment/coastal processes is required.</p>	<p>Addressed throughout chapter with the assessment informed by hydrodynamic modelling within Technical Appendix 4.1 and wave modelling within Technical Appendix 4.2.</p> <p>Assessment of sediment transport has been informed by the above technical appendices, along with the Site Investigation report. Further information on sediment transport is provided in Section 4.5.6.3</p> <p>Impacts upon water quality are discussed in Sections 4.7.2.2 and 4.7.3.2.</p> <p>Impacts upon sediment transport are discussed in Sections 4.7.2.6 and 4.7.4.1.</p> <p>Impacts to benthic habitats and other ecological features are considered in Chapter 5 of this EIAR.</p>	Impacts on the water environment, including coastal processes are addressed throughout Chapter 4.
	Socio-Economics	<p>The Scottish Ministers advise that socio-economic impacts are scoped in, and an SEIA considering both the construction and operation phases must be included within the EIA Report.</p> <p>Engage with any other marine users and sectors in the vicinity of the Proposed Works, including marine farm operators, who may be impacted by the Proposed Works.</p>	Chapter 8 Socio-economics	<p>Assessment of likely significant effects (including impacts) for socioeconomics have been scoped into the EIA process and reported in the EIA Report.</p> <p>Marine users have been included in the methodology (including consultation) of the assessment.</p>
	Airborne Noise	The Scottish Ministers advise that airborne noise is scoped in for both construction and operation phases and a construction noise impact assessment must be included in the EIA Report. If construction methodologies have not been confirmed then the worst case scenario must be assessed.	Chapter 9 Airborne Noise	<p>Assessment of construction and operational airborne noise have been included in the EIAR in order to address the responses from both OIC and Marine Scotland.</p> <p>Both assessments assume worst case scenarios.</p>

	Air Quality	Agree that the temporary impacts can be controlled through developing a site-specific dust management plan as part of the CEMP.	Technical Appendix 10.1 Construction Dust Risk Assessment	A low risk of dust impact during the construction phase was identified. Construction phase dust mitigation measures will therefore be included within the Construction Environmental Management Plan.
	Climate Change	Include a Greenhouse Gas (GHG) Assessment of the pre-construction, construction, operational and decommissioning phases, including consideration of the supply chain as well as benefits beyond the life cycle of the proposed works. The assessment should be based on a Life Cycle Assessment ("LCA") approach taking into account the "Assessing Greenhouse Gas Emissions and Evaluating Their Significance" guidance produced by IEMA.	Section 10.4.3	A carbon assessment has been produced as a technical note to the ES. The assessment provides an overview into the carbon assessment methodology, summary of results and carbon mitigation opportunities.
	Navigation	Include consideration of a Navigation Risk Assessment (NRA) to accompany the EIA to identify impacts and likely effects and their significance will be assessed in the EIA	Section 2.6.3, 2.7.4 and Technical Appendix 2.3.	An NRA has been carried out and included as a technical appendix with a summary provided in the EIAR.
	Water Environment	It states in Section 4.6 of the Scoping Report that it is not anticipated for the development to lead to any significant changes to coastal processes and thus a qualitative assessment is all that's required. At present, due to the scale of the development and without any detailed information regarding construction methodology, dredge spoil disposal, impacts from coastal reconfiguration from use of explosives or appropriate mitigation measures, it is recommended that potential impacts on coastal processes and subsequent impacts on benthic habitat and foraging marine birds are assessed within the EIA.	Addressed throughout chapter with the assessment informed by hydrodynamic modelling within Technical Appendix 4.1 and wave modelling within Technical Appendix 4.2. Assessment of sediment transport has been informed by the above technical appendices, along with the Site Investigation report. Further information on sediment transport is provided in Section 4.5.6.3 Impacts upon water quality are discussed in Sections 4.7.2.2 and 4.7.3.2. Impacts upon sediment transport are discussed in Sections 4.7.2.6 and 4.7.4.1. Impacts to benthic habitats and other ecological features are considered in Chapter 5 of this EIAR.	Impacts on the water environment, including coastal processes are addressed throughout Chapter 4.
NatureScot	SLVIA	Request that SLVIA be included within the scope of the EIAR.	Chapter 7 SLVIA	Chapter included.
	SLVIA	Request that potential effect on the Hoy and West Mainland NSA be considered.	Chapter 7 SLVIA	Desktop assessment of effect on the NSA included. In Section 7.8.3
	SLVIA	Request that a representative viewpoint be included from within the NSA at Bring Head.	Chapter 7 SLVIA	A representative viewpoint at Bring Head within the NSA has not been included within the SLVIA chapter of the EIAR. The rationale for its exclusion and the reliance on a desktop assessment of the NSA is set out within the chapter.
	SLVIA	Request that ZTVs be provided.	Chapter 7 SLVIA	ZTVs provided in chapter. ZTVs also provided to NatureScot during post scoping

				consultations to assist agreement of representative viewpoints (other than matters relating to the NSA the agreement of viewpoints was largely deferred by NatureScot to OIC).
	SLVIA	Request that cumulative assessment be included.	Chapter 7 SLVIA	Included.
	Climate Change	"It is noted in Section 3.3.1 of the Report that it is proposed to exclude climate change impacts on the grounds that any negative impacts would be insignificant, as the facility may be used to support decarbonisation of marine fuels and support future offshore windfarm developments. However, it states in Section 2.2.1 potential use of the facility by the oil and gas sector. Due to the scale of the development, we would expect some impacts from construction. If there are potentially significant positive or negative climate change benefits, including from the construction phase, these should be considered within the EIA"	Section 10.4.3	See response given to Marine Scotland Science above
	Biodiversity	<p><u>Designated Sites</u></p> <p>The proposed development is likely to have a significant effect on qualifying interests of the Scapa Flow pSPA, Hoy SPA, Orkney Mainland Moors SPA, Loch of Stenness Special Area of Conservation (SAC) and Sanday SAC. Therefore, effects on these sites features should be assessed for all phases of the development in the EIAR, as well as HRA.</p> <p>Waulkmill SSSI located approximately 7km west of the proposal, whose saltmarsh feature could be affected. This site may need to be considered in further detail when information is available on potential impacts to coastal processes and dredge spoil disposal.</p>	Chapter 5, Sections 5.2, 5.6.1, 5.6.2, 5.6.3, Technical Appendix 5.5	<p>These designated sites have been considered within the Biodiversity Chapter, however, only Scapa Flow SPA, Orkney Mainland Moors SPA and Sanday SAC were taken forward for Impact Assessment.</p> <p>The features of the other designated sites were either outside of the respective predicted Zone of Influence or no significant adverse impacts were considered likely.</p>
		<p><u>Otter</u></p> <p>If any impacts on otters are identified then mitigation measures should be provided in a Species Protection Plan.</p>	Chapter 5, Section 5.6.5; Technical Appendix 5.8	Otter have been scoped into the assessment. General mitigation measures have been recommended, however a detailed species protection plan will be completed upon further pre-construction surveys.
		<p><u>Cetaceans</u></p> <p>The list of species to be scoped in for assessment should also include humpback, fin, sperm, long-finned pilot and sei, curvier's beaked whale along with striped dolphin. Mitigation should be proposed relating to the findings of this modelling (under water noise) and the applicant should be made aware that they may require a licence.</p>	Chapter 5, Section 5.2, 5.6.8-5.6.11, Technical Appendix 5.2, 5.6, 5.7.	<p>Long-finned pilot whale have been included. The additional species were considered but not taken forward as they are present very infrequently and there is negligible risk of them being impacted.</p> <p>Underwater noise modelling has been conducted and recommendations in relation to licensing have been made.</p>
Northern Lighthouse Board	N/A	Northern Lighthouse Board are content with the proposed EIA study and will respond in full to the Planning Permission application.	N/A	N/A
Orkney Islands Council	Archaeology	Marine and land based cultural heritage and archaeology should be scoped into the EIA Report, for both the construction and operational phases of development. The assets/impacts to be considered are as set out in the scoping report.	Sections 6.6.1, 6.6.2, and 6.6.3	
	Seascape, Landscape and Visual Impact Assessment (SLVIA)	Request that SLVIA be included within the scope of the EIAR.	Chapter 7 SLVIA	Chapter included.
		Request that potential effect on the Hoy and West Mainland NSA be considered.	Chapter 7 SLVIA	Desktop assessment of effect on the NSA included. in Section 7.8.3
		Request that a representative viewpoint be included from within the NSA at Bring Head.	Chapter 7 SLVIA	A representative viewpoint at Bring Head within the NSA has not been included within the SLVIA chapter of the EIAR. The rationale for its exclusion and the reliance on a

				desktop assessment of the NSA is set out within the chapter.
		Request that ZTVs be provided.	Chapter 7 SLVIA	ZTVs provided in chapter. ZTVs also provided to NatureScot during post scoping consultations to assist agreement of representative viewpoints (other than matters relating to the NSA the agreement of viewpoints was largely deferred by NatureScot to OIC).
		Request than cumulative assessment be included.	Chapter 7 SLVIA	Included.
		Request that SLVIA be included within the scope of the EIAR.	Chapter 7 SLVIA	Chapter included.
		Request that potential effect on the Hoy and West Mainland NSA be considered.	Chapter 7 SLVIA	Desktop assessment of effect on the NSA included. in Section 7.8.3.
Socio-Economics		It is possible that there could be some significant beneficial socio-economic effects, during the construction and operational phases of the proposed development. The EIA should therefore include an assessment of socio-economic effects following the advice of Orkney Islands Council DaMP.	Chapter 8 Socio-economics	Assessment of likely significant effects for socioeconomic have been scoped into the EIA process and reported in the EIA Report.
Airborne Noise		With appropriate mitigation, including the provision of a Framework CEMP/ Dust Mitigation Strategy defined within the EIA, it should be possible to scope noise out during the construction phase of the proposed development for the reasons set out in the Scoping Report. Operational noise should be scoped into the EIA	Chapter 9 Airborne Noise	Assessment of construction and operational airborne noise have been included in the EIAR in order to address the responses from both OIC and Marine Scotland. Both assessments assume worst case scenarios.
Air Quality		EIA should assess construction and operational impacts on the amenity of local residents and businesses due to noise, vibration, dust or other impacts. The construction dust assessment should consider the potential impacts associated with worst case scenario, including likely HGV movements and appropriate mitigation, including a Framework CEMP/Dust Mitigation Strategy. It is noted that further works needs to be undertaken to better understand likely operational traffic movements and associated local air quality impacts.	Technical Appendix 10.1, Volume 3 Construction Dust Risk Assessment Air Quality Supporting Assessment	A low risk of dust impact during the construction phase was identified. Construction phase dust mitigation measures will therefore be included within the Construction Environmental Management Plan. Chapter 10.3 (Air Quality) confirms that the expected operational traffic movements will be negligible, resulting in no significant local air quality impacts to human or ecological receptors.
Climate Change		It is considered that the matter of Climate Change Resilience will be successfully covered in relevant technical chapters of the EIA Report and there is no requirement for a stand-alone chapter. The introductory sections of the EIA Report should include a section on climate change, including analysis of the carbon cost of the development and signposting where climate change matters are considered within the technical EIA chapters and information explaining how the development will ensure it operates as a decarbonised shipping port which would produce only negligible increases in emissions, as stated in the Scoping Report.	Section 10.4.4	The carbon assessment identifies carbon mitigation opportunities and provides guidance on how the development can decarbonise in the operational phase.

	<p>Biodiversity</p>	<p><u>Designated Sites</u> The EIA Report should give full consideration to:</p> <ul style="list-style-type: none"> • Scapa Flow SPA • Hoy SPA • Orkney Mainland Moors SPA • North Orkney SPA (dependent on vessel movements) • Loch of Stenness SAC • Sanday SAC • Waulkmill SSSI • Gaitnip Hill Local Nature Conservation Site 	<p>Chapter 5</p>	<p>These designated sites have been considered within the Biodiversity Chapter, however, only Scapa Flow SPA, Orkney Mainland Moors SPA and Sanday SAC were taken forward for Impact Assessment.</p> <p>The features of the other designated sites were either outside of the respective predicted Zone of Influence or no significant adverse impacts were considered likely.</p>
		<p><u>Marine Mammals, Habitats and Fish</u></p> <p>Benthic habitat surveys (re Scapa Flow pSPA) should be undertaken to inform the assessment of the likely effects of all stages of the development on the pSPA and its qualifying features. The purpose of surveys would be to establish the benthic habitats and species present at the development location with particular focus on identifying presence of any PMFs. Where PMFs are identified, the extent and quality (e.g. condition, density etc.) of the features should be confirmed to help inform assessment. A combination of video/photo methods and grab sampling would be appropriate, but of these two methods collection of video/photo data would be the priority. The EIAR should include an assessment of the likely effects of the proposed development on the availability of foraging habitat for these species, as well as the capacity for species to move to alternative areas within the pSPA to avoid disturbance. The conclusions of the assessment should be used to help shape the final development proposal and inform mitigation plans.</p> <p>Basking sharks are a protected fish species and PMF, and regularly sighted in Scapa Flow. Therefore, an assessment on potential impacts on this species should be undertaken as part of the EIA and any mitigation should be detailed in the EIA Report. The Applicant should note that they may require a basking shark licence.</p> <p>The assessment within the EIAR should include, as a minimum the potential impact for noise disturbance to cetacean, which could lead to panic, confusion and temporary disorientation, with potential for strandings and exclusion from feeding areas.</p> <p>The EIA Report should include baseline data on fish. There are currently several aquaculture sites registered with Marine Scotland Science (MMS) in the vicinity of the site, which should be considered.</p>	<p>Chapter 5; Technical Appendices 5.2, 5.4, 5.6, 5.7.</p>	<p>Included</p>
		<p><u>Intertidal and other habitats</u> Impacts to the intertidal habitat should also be included within the EIAR. This should include the results of an intertidal survey to identify the habitats and species that are likely to be impacted by the development.</p>	<p>Chapter 5, Section 5.2; Technical Appendix 5.4</p>	<p>An intertidal survey was conducted, however these were scoped out for further assessment as the habitats present were common and widespread habitats and significant adverse effects were not anticipated.</p>

		<p><u>Otter</u> Given the lack of certainty as to what the likely impacts are, otters should be scoped into the EIA.</p>	<p>Chapter 5, Section 5.6.5; Technical Appendix 5.8</p>	<p>Otter have been scoped into the assessment.</p>
		<p><u>Positive Effects for Biodiversity</u> As required by the Planning (Scotland) Act 2019, National Planning Framework 4 will establish outcomes for how development will contribute to securing 'positive effects for biodiversity'. As the Scapa Deep Water Quay is a Candidate National Development, it is recommended that the developer should consider potential options for delivering such positive effects for biodiversity at the earliest opportunity.</p>	<p>Chapter 5, Section 5.8.3</p>	<p>Biodiversity Enhancements have been included.</p>
		<p><u>Biosecurity</u> Biosecurity should be fully considered (including its potential impact on human health) and measures to avoid and prevent this possible significant adverse effect on the environment, along with any proposed monitoring arrangements, should be included within the scope of the Ecology chapter of the EIAR. Site-based biosecurity plans for the proposal at the construction and operational phases to assist with managing the spread and introduction of marine INNS should be produced.</p>	<p>Chapter 5, Section 5.8</p>	<p>Marine Invasive Non-native Species (mINNS) have been considered in relation to their impact on Important Ecological Features. It is outside of the remit or professional capabilities for an ecologist to make an assessment on the impact of mINNS on human health.</p> <p>Biosecurity measures and monitoring recommended. It should be noted that due to the design and build nature of the project a detailed biosecurity plan cannot be provided at this stage.</p>
Water Environment		<p>The water environment The potential effects of all stages of the development on the water environment should be assessed and addressed.</p> <p>Coastal processes Section 4.6 of the scoping report states that 'the construction activities involved within the proposed development including dredging, construction of the quay, and land reclamation all have the potential to impact the coastal processes within Scapa Flow. However, the development site is considered to have low energy without significant sediment transport, with an absence of fine sediment. In this context it is considered that a qualitative assessment of the impact of the proposed development on coastal processes, including wave action, tidal current and sediment transport is appropriate'.</p> <p>There is a hydrodynamic model of Scapa Flow that may be useful for the purposes of assessment. Further information is also required to determine the nature of the sediment proposed to be dredged and the proposed method of disposal of dredged materials and associated effects.</p>	<p>The potential impacts of the development are discussed in section 4.7.</p> <p>Coastal processes are considered within section 4.5.6 and informed by hydrodynamic modelling within Technical Appendix 4.1 and wave modelling within Technical Appendix 4.2.</p> <p>Further information on existing flood risk is provided in Section 4.5.7. Further consideration of flood risk has been scoped out from the assessment.</p> <p>Tidal water levels, and extreme tidal water levels, are described in section 4.5.5.</p> <p>Further information on sediment transport and morphology is provided in Section 4.5.6.3.</p>	<p>Impacts on the water environment, including coastal processes are addressed throughout Chapter 4.</p>

Royal Society for the Protection of Birds	Biodiversity	Given the nature of the development and the proximity to the Scapa Flow pSPA, we wish to highlight that that the OIC/Marine Scotland, as the competent authority, must consider the Habitat Regulations and will need to undertake an appropriate assessment on the basis on potential adverse impacts to the pSPA species.	Chapter 5, Section 5.6.1 and Technical Appendix 5.5	Whilst this comment is aimed at OIC/Marine Scotland. The information required for the competent authorities to complete the Appropriate Assessment have been provided within the referenced sections.
		Given the proximity and scale of the development, Gaitnip Hill LNCS and the species it supports is likely to impacted by the development through disturbance from construction and operational activity due to increased noise, lighting, and vehicle movements. We would therefore welcome inclusion of this site in the Environmental Impact Assessment Report (EIAR).	Chapter 5, Section 5.2	Gaitnip Hill was considered within scoping, however it was not taken forward for further inclusion as the features were either outside the predicted Zone of Influence or no significant adverse impacts were predicted.
		We recommend Biosecurity is fully considered and advise that the measures to avoid and prevent this possible significant adverse effect on the environment, along with any proposed monitoring arrangements, are included within the scope of the Ecology chapter within the EIAR.	Chapter 5, Section 5.8	Biosecurity measures and monitoring recommended. It should be noted that due to the design and build nature of the project a detailed biosecurity plan cannot be provided at this stage.
Royal Yachting Association	N/A	Recreational Boating can be scoped out.	N/A	N/A
Scottish Environment Protection Agency	Water Environment	Request that assessment include GWDTE and peat. This should include adequate information to demonstrate compliance with the Guidance on the Assessment of Peat Volumes, Reuse of Excavated Peat and Minimisation of Waste and Guidance on Assessing the Impacts of Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems. For example in regard to peat, a Peat Management Plan demonstrating the proposal avoids the disturbance and excavation of peat, and appropriate reuse of peat on site.	The nature of superficial cover, including the absence of peat, at the proposed development site is discussed in Section 4.5.3. Groundwater Dependent Terrestrial Ecosystems (GWDTE) are discussed in Section 4.5.4 and Chapter 5 of the EIAR.	Impacts on GWDTE are included within the assessment.
Transport Scotland	Transport - Roads	Ensure abnormal loads can navigate routes	Section 10.5 Transport	The client has advised there is no requirement for abnormal load assessment.

3.7.4 Projects for Cumulative Assessment

The cumulative schemes identified by OIC in Appendix 2 of their Scoping Opinion (Refer to Technical Appendix 3.2, Volume 3 of the EIAR) are provided in Table 3-2. MD-LOT did not specify a list of projects to be considered other than the requirement to include cumulative assessment as part of the HRA.

Table 3-2: Cumulative Schemes for Consideration in the EIAR (Council Recommendations)

Planning Ref	Address	Description of Development	Status
20/037/TPPMAJ	Quanterness (Land Near), St Ola, Orkney.	Erect 6 wind turbines (maximum height 149.9 metres, maximum wind farm capacity 50MW), erect a meteorological mast (maximum height 90 metres) and a substation, create an access and construct access tracks, and associated infrastructure.	Awaiting decision – called in by Scottish Government.
20/313/TPPMAJ	Lyness (land near), Hoy, Orkney	Erect 6 wind turbines (maximum height 149.9 metres, maximum wind farm capacity 50MW), erect a meteorological mast (maximum height 90 metres) and a substation, construct access tracks, a water crossing and underground cabling, create a borrow pit, and associated infrastructure.	Awaiting decision – called in by Scottish Government.
20/239/SCR	Scapa Pier, Scapa, Orkney.	Screening opinion request to extend a pier and reclaim land to create laydown and operational area and slipway.	Screening opinion adopted 19.03.21. This project has subsequently been dropped and is no longer proceeding. Therefore, no need to assess.
15/409/MAR	Scapa Flow, Near Tongue of Westerbister, Holm.	Create a salmon farming site, comprising 16 x 100m circumference cages, 2 x 8 in a 60m grid and include a feed barge.	Approved 10.02.16

3.8 Further Consultation

For each individual technical assessment further consultation was undertaken as required and is detailed within the corresponding chapter.

During the development of the Phase 1 Masterplan proposals which included the proposed development there were:

- A minimum of 60 face to face meetings with statutory and non-statutory stakeholders;
- Three workshops with more than 40 harbour users to consider issues constraints and opportunities, as well as possible design options including for the proposed development; and

- A public community consultation exercise which comprised presentations, drop-in events and an online questionnaire. These events were attended by more than 60 stakeholders.

A Stakeholder Engagement Plan (SEP) was subsequently prepared to set out the intentions for communing and wider engagement – the intention being to share information about the proposed projects as well as to provide feedback, and flag any concerns, which will require considered consideration as part of the project development.

Between 2020 and 2022, there has been ongoing dialogue with more than 40 statutory and non-statutory stakeholders in relation to the Masterplan which includes the proposed development.

From mid-2022 wider and more targeted community and stakeholder engagement was initiated which incorporated the statutory Pre Application Consultation procedures relating specifically to the proposed development. A summary of activities and events held are provided below:

Specific activities and engagement approaches to February 2023 have included:

- Opening of Kiln Corner Harbours Office and showcasing of the project models for public drop ins. Weekly opportunities – morning, afternoon, and evening sessions.
- Three project newsletters to share with Masterplan distribution list, and project database of Kiln Corner visitors that have left contact details to receive project updates.
- Support to Highlands and Islands Enterprise and Economic Development in establishing regular Business Breakfasts for the prospective supply chain associated with offshore energy.
- Liaison and discussions with prospective developers to inform detailed design.
- Engagement with pilot and tug staff to inform the design of facilities for pilot boats and tugs.
- Liaison and discussions with variety of other stakeholders, individuals and groups, focussing on key complimentary and possible causal impacts, e.g. feeding into and learning from the development of the Orkney Housing Strategy.
- Supporting and hosting offshore wind developers in their own community engagement activities.

As part of these engagement undertakings, the following key activities were undertaken up to February 2023:

- Three community newsletters distributed.
- Around 400 visitors to Kiln Corner.
- More than 40 attendees at the Meet the Buyer event in December 2022.
- More than 40 attendees (38 in person) at an offshore wind-focussed meeting of the Orkney Renewable Energy Forum hosted at Kiln Corner in January 2023.
- Holm Community Council meeting in January 2023 and Kirkwall and St Ola Community Council Meeting in February 2023.

Consultation has been a key part of the application strategy for the proposed development. The objective was to ensure that all those with an interest in the project were kept informed of the design progression. Where possible, the project team worked with them at all stages to share relevant information and agree suitable mitigation to remove, reduce or minimise the impacts from the project.

3.9 Final Content and Structure of the EIAR

Based on the consultation responses and initial baseline collection, it was possible to complete the EIA with a clear focus on the main topics requiring full and detailed impact assessment. These topics are listed in Table 3-3 and this Volume contains a chapter for each. The EIAR is presented within three volumes, which are also set out within Table 3-3.

Table 3-3: Structure of the EIAR

Item	Description	Author
Volume 1: Environmental Impact Assessment Report		
Chapter 1: Introduction	This chapter sets the context for the EIA and introduces the development in a broad context	EnviroCentre
Chapter 2: Proposed Development	This chapter sets out the development description upon which the environmental assessment is based, as well as examining the design, alternatives considered and biodiversity enhancement considerations.	EnviroCentre (with marine engineering input by Arch Henderson)
Chapter 3: EIA Methodology and Scoping	This chapter introduces the EIA methodology by which the proposed development was designed, along with an outline of how the EIAR has responded to comments throughout the process.	EnviroCentre
Chapter 4: Water Environment	This chapter assesses the impact of the proposed development upon the water environment,- including water quality, hydrodynamic modelling, pollution and flood risk.	EnviroCentre
Chapter 5: Biodiversity	This chapter assess the impact of the proposed development upon the terrestrial and marine environment. It considers designated sites, terrestrial habitats and mammals, benthic habitats and fauna, marine mammals and fish.	EnviroCentre (with technical support from Seastar Surveys Ltd, Physalia and Irwin Carr)
Chapter 6: Archaeology & Cultural Heritage	This chapter presents the Archaeology and Cultural Heritage receptors of relevance to the proposed development and assesses the potential impacts from the construction of the proposed development on these receptors. These effects may result from physical loss or changes in the assets' settings.	Orkney Research Centre for Archaeology (ORCA)
Chapter 7: Seascape, Landscape & Visual Impacts	This chapter assesses the effect of the proposed development on coastal character (including seascape), on landscape character, (both environmental resources), and on visual amenity (the effect on views experienced by people living, working and visiting the area).	SWECO
Chapter 8: Socio-Economics	This chapter assesses likely significant effects as a result of direct / indirect economic and demographic impacts for the local area.	SWECO
Chapter 9: Airborne Noise	This chapter assesses the impact of the proposed development upon the local ambient noise environment at sensitive receptor locations. It considers both the construction and operational phases of the development.	EnviroCentre

Item	Description	Author
Chapter 10: Supporting Assessments	This chapter covers areas of the environment which are important to note but have not been identified as having potentially significant effects throughout the EIA process (as detailed within Chapter 3: EIA Methodology and Scoping). These include: <ul style="list-style-type: none"> • Air Quality, • Accidents & Natural Disasters, • Carbon, Climate Change & Greenhouse Gas Appraisal, and • Transport, incl. Shipping & Navigation. 	EnviroCentre and SWECO
Chapter 10: Schedule of Mitigation	This chapter sets out a summary of all mitigation measures proposed within the EIAR within a schedule which can then be used to inform an overarching Construction Environmental Management Document (CEMD) and individual Construction Environmental Management Plans (CEMP's).	EnviroCentre
Chapter 11: Conclusions	This chapter summarises the key findings of the EIAR, discusses CEMD principles, and provides a Statement of Significance in relation to the proposed development.	EnviroCentre
Volume 2:	This volume provides the figures relevant to each chapter within Volume 1 which are too large to present within the EIAR itself and is provided as a standalone volume to aid comparative assessment.	All
Volume 3: Technical Appendices	This volume provides the relevant technical background papers and studies which have informed each chapter.	All

The following documents have also been prepared to accompany the planning and marine license applications, which do not form part of the EIAR but are nevertheless associated with it.

- **Design and Access Statement** – this provides a description of the design issues in the terrestrial environment relevant to the proposed development and more specifically an explanation of site selection process, the principles and concepts that have driven the design and the approach to access provisions.
- **Planning Statement** – this document assesses the level of compliance of the landward elements of the proposed development, drawing upon the evidence contained within the EIAR, in relation to the Development Plan and other material considerations.
- **Pre-Application Consultation (PAC) Report** – this provides information on the community engagement which has been undertaken prior to this submission with regards to the proposed development, and details public engagement initiatives and attitudes towards the proposed development. It covers both terrestrial and marine based PAC requirements; and
- **Marine Construction and Dredging and Disposal License Applications** –The dredging application is accompanied by a Best Practicable Environmental Option (BPEO) appraisal.

A Non-Technical Summary (NTS) has also been prepared.

3.10 Key Terms

To ensure clarity and consistency through the EIAR, the following key terms have been used:

- 'the proposed development' refers to the construction and operation of the proposed development as described in Chapter 2: Proposed Development;
- 'the site' is the land and sea bound by the red-line boundary in which the proposed development lies, and is illustrated within Drawing No 202042EIA-110, Volume 2 of this EIAR; and
- The 'Study area' is the area over which desk based or field assessments have been undertaken and are identified within each chapter. The core study area varies depending on the nature of the potential effects within each discipline, as informed by professional guidance and best practice regarding EIA. All of the core study areas cover the site and are described within the methodology section of the relevant chapters within this EIAR.

4 WATER ENVIRONMENT

4.1 Introduction

This chapter of the EIAR provides an assessment of the implications of the proposed development on the water environment and coastal processes. The water environment is considered to encompass hydrology, hydrogeology and water quality, whilst coastal processes are considered to encompass tides, waves and sediment transport processes.

The Water Framework Directive (WFD) (Council Directive 2000/60/EC) aims to protect and enhance water bodies within Europe and covers all estuarine and coastal waters out to 1 nautical mile. This requires that there is no deterioration in the quality of surface or groundwater bodies and aims to achieve good ecological status or potential. The implications of the WFD must be considered when assessing this project and the details of how compliance will be achieved provided in the EIAR.

Details of the site and the proposed development are provided in Chapter 2: Proposed Development. The assessment will identify sensitive issues within the site by establishing the current baseline and examining the proposed development within this context.

This chapter is supplemented by the following appendices within Volume 3 of this EIAR, along with the relevant figures within Volume 2.

- Technical Appendix 4.1: Scapa Deep Water Quay – Coastal Hydrodynamic Modelling Study; and
- Technical Appendix 4.2: Significant Wave Height Desktop Study – Technical Report – Scapa Deep Water Quay.
- Technical Appendix 4.3: Scapa Deep Water Quay (DWQ) Marine – Ground Investigation

4.2 Scoping and Consultation

Scoping Opinions have been received from Marine Scotland and Orkney Islands Council (OIC), comments are contained within these from other consultees, including SEPA and NatureScot. A summary of the relevant scoping responses is set out below in Table 4-1, with details of how the scoping consultation has been taken into consideration when conducting this assessment.

Table 4-1: Summary of Consultation Responses

Organisation	Consultation Response	Comments
Marine Scotland	<p>Physical environment / coastal processes</p> <p>MSS have reviewed the relevant information, which state that there are potential impacts to coastal processes including wave action, tidal currents and sediment transport, changes in infiltration rates, flood risk and drainage; contamination of the water environment from spillages, runoff or sediment transfer during construction and operation phases of the proposed works.</p> <p>Due to the extent of the proposed development, the lack of details on construction methodology, dredging, disposal, etc., MSS advise that impacts on the physical environment/coastal processes should be scoped in and assessed within the EIA.</p>	<p>Addressed throughout chapter with the assessment informed by hydrodynamic modelling within Technical Appendix 4.1 and wave modelling within Technical Appendix 4.2.</p> <p>Assessment of sediment transport has been informed by the above technical appendices, along with the Site Investigation report⁵ within Technical Appendix 4.3. Further information on sediment transport is provided in Section 4.5.6.3</p> <p>Impacts upon water quality are discussed in Sections 4.7.2.2 and 4.7.3.2.</p> <p>Impacts upon sediment transport are discussed in Sections 4.7.2.6 and 4.7.4.1.</p> <p>Impacts to benthic habitats and other ecological features are considered in Chapter 5 of this EIAR.</p>

⁵ Causeway Geotech (2022). Hatston Pier Development – Ground Investigation. Interpretative Report.

Organisation	Consultation Response	Comments
SEPA	<p>As you will be aware we provided comments on the draft, refer our letter of 22 July 2019 (our reference PCS/165962) and note the references from this within 1.2.5 Information Arising from Previous Consultation, for example the need to carry out a survey to determine if Groundwater Dependent Terrestrial Ecosystems are present so these can be avoided. We welcome the identification of local sensitives and the Table in Section 1.3 of potential effects and mitigation, including that a peat management plan will be developed and peat habitats avoided where possible.”</p> <p>While there is reference to peat in the scoping report - “Stripping of all non-inert material (organic soil and peat along with unsuitable clays)”, the only other related reference states “All non-inert material recovered during initial site stripping and the main excavation operations to be used to form perimeter bunds”.</p> <p>We therefore request that assessment in the EIAR, or one of the supporting statements, is expanded to include GWDTE and peat. This should include adequate information to demonstrate compliance with the Guidance on the Assessment of Peat Volumes, Reuse of Excavated Peat and Minimisation of Waste and Guidance on Assessing the Impacts of Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems. For example in regard to peat, a Peat Management Plan demonstrating the proposal avoids the disturbance and excavation of peat, and appropriate reuse of peat on site.</p>	<p>The nature of superficial cover, including the absence of peat, at the proposed development site is discussed in Section 4.5.3.</p> <p>Groundwater Dependent Terrestrial Ecosystems (GWDTE) are discussed in Section 4.5.4 and Chapter 5 of the EIAR.</p>

Organisation	Consultation Response	Comments
NatureScot	<p>It states in Section 4.6 of the Scoping Report that it is not anticipated for the development to lead to any significant changes to coastal processes and thus a qualitative assessment is all that’s required. At present, due to the scale of the development and without any detailed information regarding construction methodology, dredge spoil disposal, impacts from coastal reconfiguration from use of explosives or appropriate mitigation measures, it is recommended that potential impacts on coastal processes and subsequent impacts on benthic habitat and foraging marine birds are assessed within the EIA.</p>	<p>Addressed throughout chapter with the assessment informed by hydrodynamic modelling within Technical Appendix 4.1 and wave modelling within Technical Appendix 4.2.</p> <p>Assessment of sediment transport has been informed by the above technical appendices, along with the Site Investigation report⁶ within Technical Appendix 4.3. Further information on sediment transport is provided in Section 4.5.6.3</p> <p>Impacts upon water quality are discussed in Sections 4.7.2.2 and 4.7.3.2.</p> <p>Impacts upon sediment transport are discussed in Sections 4.7.2.6 and 4.7.4.1.</p> <p>Impacts to benthic habitats and other ecological features are considered in Chapter 5 of this EIAR.</p>

⁶ Causeway Geotech (2022). Scapa Deep Water Quay (DWQ) Marine – Ground Investigation. Interpretative Report.

Organisation	Consultation Response	Comments
OIC	<p>The water environment</p> <p>The potential effects of all stages of the development on the water environment should be assessed and addressed. Careful consideration should be given to any planned onsite storage of excavated soils, as stockpiles of bare soil are vulnerable to erosion, particularly during wet weather. Poorly sited stockpiles may pose a risk to the Burn of Deepdale / Button and associated drainage ditches, as well as the marine environment. These assessments should be undertaken in line with guidance which is available from the SEPA website at www.SEPA.org.uk/.</p> <p>Coastal processes</p> <p>Section 4.6 of the scoping report states that 'the construction activities involved within the proposed development including dredging, construction of the quay, and land reclamation all have the potential to impact the coastal processes within Scapa Flow. However, the development site is considered to have low energy without significant sediment transport, with an absence of fine sediment. In this context it is considered that a qualitative assessment of the impact of the proposed development on coastal processes, including wave action, tidal current and sediment transport is appropriate'.</p> <p>The assessment of effects on coastal processes should be informed by advice from NatureScot regarding sediment transport in the vicinity of the proposed development and benthic habitat surveys to determine proximity to and interactions with potentially sensitive habitat features, particularly PMFs.</p> <p>There is a hydrodynamic model of Scapa Flow that may be useful for the purposes of assessment. Further information is also required to determine the nature of the sediment proposed to be dredged and the proposed method of disposal of dredged materials and associated effects.</p>	<p>The potential impacts of the development are discussed in section 4.7.</p> <p>Coastal processes are considered within section 4.5.6 and informed by hydrodynamic modelling within Technical Appendix 4.1 and wave modelling within Technical Appendix 4.2.</p> <p>Further information on existing flood risk is provided in Section 4.5.7. Further consideration of flood risk has been scoped out from the assessment.</p> <p>Tidal water levels, and extreme tidal water levels, are described in section 4.5.5.</p> <p>Further information on sediment transport and morphology is provided in Section 4.5.6.3.</p>

4.3 Policy, Legislation and Guidance

The assessment for the water environment and coastal processes has been undertaken with reference to the following relevant planning policy, legislation and guidance.

4.3.1 Relevant Planning Policy

- National Planning Framework 4 (NPF4) (2023);
- UK Marine Policy Statement (2011); and
- Scotland's National Marine Plan (2015).

4.3.2 Relevant Legislation

- Water Framework Directive (WFD) 2000;
- Water Environment and Water Services (Scotland) Act 2003;
- Marine (Scotland) Act 2010;
- Coast Protection Act 1949;
- Flood Risk Management (Scotland) Act 2009;
- Water Environment (Controlled Activities) (Scotland) Regulations 2011, as amended (CAR);
- Water Environment (Miscellaneous) (Scotland) Regulations 2017;
- National Planning Framework 4
- Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Flora and Fauna (The Habitats Directive);
- Environmental Impact Assessment (EIA) Directive (2014/52/EU);
- The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017; and
- The Marine Works (Environmental Impact Assessment) Regulations (Scotland) 2017;.

4.3.3 Relevant Guidance

- Guidelines for Water Pollution Prevention from Civil Engineering Contracts;
- Land Use Planning System (LUPS) SEPA Guidance CC1: Climate change allowances for flood risk assessment in land use planning;
- LUPS-GU24: Flood Risk and Land Use Vulnerability Guidance;
- Pollution Prevention Guidance 1 (PPG): General guide to the prevention of pollution;
- PPG 6: Working at construction and demolition sites;
- PPG 7: Refuelling facilities;
- PPG 18: Managing for water and major spillages;
- Guidance for Pollution Prevention (GPP) 2: Above ground oil storage tanks;
- GPP 3 Use and design of oil separators in surface water drainage systems;
- GPP 5: Works and maintenance in or near water;
- GPP 8: Safe storage and disposal of used oils;
- GPP 13: Vehicle washing and cleaning;
- GPP 21: Pollution incident response planning;
- GPP 22: Dealing with spills;
- GPP 26 Safe storage - drums and intermediate bulk containers;
- WAT-SG-26: Good Practice Guide – Sediment Management; and
- WAT-SG-29: Good Practice Guide – Construction Methods.

4.4 Methodology

4.4.1 General

The assessment follows standard EIA procedures which include:

- Desk based review of the design of the proposed development in relation to the local water environment, soils and coastal processes;
- Consultation with key stakeholders to obtain relevant information and to ensure their concerns are addressed within the study;
- Establishing the existing baseline conditions:
 - Review topography, soils, geology and ground conditions at the site and environs;
 - Review of hydrology, catchment characteristics, and water quality conditions;
 - Review of coastal processes including bathymetry, tidal levels, and tidal flow currents, wave action, bed sediment type and distribution, sediment transport and deposition, geology;
 - Review of detailed hydrodynamic modelling report displayed within Technical Appendix 4.1: Scapa Deep Water Quay – Coastal Hydrodynamic Modelling Study;
 - Review of detailed wave modelling report displayed within Technical Appendix 4.2 Significant Wave Height Desktop Study – Technical Report – Scapa Deep Water Quay; and
 - Reporting of baseline conditions to provide a basis for assessment of the potential impact.
- Impact Assessment:
 - Identification of sensitive receptors and environmental constraints;
 - Identification of potential impacts;
 - Assessment of impact magnitude;
 - Identification and assessment of mitigation measures to reduce or avoid any potential impacts of the proposed development; and
 - Statement of residual effects.

Potential impacts arising from the proposed development have been predicted and evaluated. The observed baseline data was used along with professional opinion to qualitatively assess the potential impacts and the significance to receptors.

4.4.2 Assessment Criteria

The assessment criteria set out in Table 4-2 and Table 4-3 has been used to develop a matrix to assess the significance of effects from the proposed development on the local water environment (Table 4.4). The assessment of residual effects also takes into consideration the probability of the effect occurring (certain, likely, possible or unlikely) and the duration of the effect (short (less than 2 years), medium (2 – 5 years), long term (more than 5 years) or permanent).

All direct and indirect impacts causing moderate or major effects as identified in Table 4-4 are considered to be significant.

Table 4-2: Criteria for Assessing Receptor Sensitivity

Receptor Sensitivity	Description
Low	<p>Receptors with a high capacity to accommodate change, low value or poor condition and no significant uses, for example:</p> <ul style="list-style-type: none"> • Receptor is not an internationally, nationally or locally designated site. • Not classified as a surface water body for the River Basin Management Plan (RBMP). • Surface water body not significant in terms of fish spawning and no other sensitive aquatic ecological receptors e.g. freshwater pearl mussels. • Surface water body not used for abstraction. • Surface water body not used for recreation directly related to water quality e.g. angling, swimming, watersports. • Surface water body not used by commercial or recreational vessels. • Low or very low productivity aquifer with no identified abstractions.
Medium	<p>Receptors with a moderate capacity to accommodate change, medium value or condition and limited use, for example:</p> <ul style="list-style-type: none"> • Receptor is not an internationally or nationally designated site. May be a locally designated site. • Salmonid species may be present and surface water body may be locally important for spawning. No other sensitive aquatic ecological receptors e.g. freshwater pearl mussels. • Surface water body used for private water supply or medium scale industrial/ agricultural abstractions. • Surface water body used for occasional or local recreation e.g. local angling clubs. • Navigable surface water body used by commercial or recreational vessels. • Moderate productivity aquifer. • Groundwater body supports identified private water supplies or medium scale industrial/ agricultural abstractions.
High	<p>Receptors with a low capacity to accommodate change, high value or condition and significant use, for example:</p> <ul style="list-style-type: none"> • Receptor is an internationally or nationally designated site. • Surface water body supports sensitive aquatic ecological receptors e.g. freshwater pearl mussels. • Surface water body used for public water supply or large scale industrial/ agricultural abstractions. • Surface water body important for recreation directly related to water quality e.g. swimming, watersports, angling. • High or very high productivity aquifer. • Groundwater body supports public water supply or large scale industrial/ agricultural abstractions.

Table 4-3: Criteria for Assessing Impact Magnitude

Receptor Sensitivity	Description
Negligible	Very light change from baseline conditions. Change barely distinguishable, approximating to the 'no change' situation.
Low	Minor shift away from baseline conditions. Change arising from the loss/alteration will be discernible but underlying character/composition/attributes of the baseline condition will be similar to pre-development circumstances/patterns.
Medium	Loss or alteration to one or more key elements/features of the baseline conditions such that post-development character/ composition/ attributes of baseline will be partially changed.
High	Total loss or major alteration to key elements/features of the baseline (pre-development) conditions such that post-development character/composition/attributes will be fundamentally changed.

Table 4-4: Criteria for Assessing Effects

Receptor Sensitivity	Magnitude of Impact	Predicted Effect
High	High	Major
High	Medium	
Medium	High	
High	Low	Moderate
Low	High	
Medium	Medium	
Medium	Low	Minor
Low	Medium	
Low	Low	
High, Medium or Low	Negligible	Negligible

4.5 Baseline

4.5.1 Site Description

The proposed development is located on the southern shore of the Orkney mainland, approximately 8km south of Kirkwall. It is located on the coastline of Deepdale Bay within Scapa Flow, approximately 4km south of the existing Scapa Pier. Scapa Flow is designated as a Special Protection Area (SPA), further details relating to this designation are detailed in Chapter 5 of this EIAR. There are no Marine Protected Areas (MPA) or Special Areas of Conservation (SAC) within 2km of proposed development. The site is shown in relation to water environment receptors in Figure 4.1: Hydrological Overview within Volume 2 of this EIAR.

4.5.2 Topography and Bathymetry

Topographic and bathymetric survey data is available for the site and surrounds. Bathymetric levels slope from around 3 metres relative to Chart Datum (mCD) at the shoreline to around -20mCD at the outer edge of the proposed Phase 3 dredge pocket, with depth increasing westwards into the centre of Scapa Flow. Further information on wider bathymetry is presented in Technical Appendix 4.1, Volume 3 of this EIAR.

4.5.3 Geology and Hydrogeology

The online British Geological Survey (BGS) 1:50,000 map identifies that the development site is underlain by siltstone, mudstone and sandstone of the Caithness Flagstone Formation. The adjacent headlands, including Tongue of Gangsta, as formed of Sandstone from the Eday Group⁷.

The BGS 1:50,000 map shows that superficial deposits are absent from the shoreline. Till (Devension – Diamicton) underlies the site approximately 100m inland of the shore. No peat is shown within the vicinity of the site within BGS mapping and the Carbon and Peatland Map categorises soils at the site as mineral soils⁸

The site is underlain by a moderately productive aquifer of sandstone, siltstones, mudstones and conglomerates yielding small amounts of groundwater locally. Groundwater at the Site is classified under the Water Framework Directive (WFD) monitoring programme as belonging to the Orkney groundwater body (ID: 150678) and has an overall classification of 'Good'.

Site Investigation has been undertaken for locations within both the land-based and marine based components of the proposed development to characterise ground/sea-bed conditions. For the land-based areas these are summarised as an approximate stratigraphic order comprising a thin layer of topsoil overlying glacial till which overlies bedrock of mudstone, siltstone and sandstone. Site Investigation for the marine based components are summarised as an approximate stratigraphic order comprising superficial marine deposits (loose to medium dense gravelly silty sands with shell fragments and occasional cobbles) overlying glacial till which overlies sandstone, siltstone and mudstone bedrock⁹.

4.5.4 Hydrology, Water Quality, Groundwater Dependent Terrestrial Ecosystems and Water Body Status

The Burn of Deepdale and Burn of Button flow from the northeast and east, respectively before converging and flowing into Scapa Flow immediately north of the proposed development. Both watercourses have a combined catchment of approximately 1.96km² upstream of the point of discharge to Scapa Flow.

The Burn of Gangsta is located south of the proposed development and flows from northeast to southwest, and has a catchment of 0.88 km² before discharging to Scapa Flow. A number of minor surface water features and field drains discharge to Scapa Flow from within the footprint of the development.

There are numerous other small freshwater inflows discharging into the wider Scapa Flow, as well as piped drainage outfalls, however the inflow of freshwater remains insignificant relative to the much larger volume of seawater exchanged within Scapa Flow.

The coastal waters of Scapa Flow are classified under the Water Framework Directive (WFD) monitoring programme as a coastal waterbody. The waterbody is classified as being of overall 'Good' status in 2018, with a

hydromorphological status of 'High'. There are no watercourses discharging to Scapa Flow large enough to be classified under the WFD.

Hydrological features are shown in Figure 4.1, Volume 2 of this EIAR.

Habitats with the potential for groundwater dependency are identified in the National Vegetation Classification Survey¹⁰ provided in Technical Appendix 5.1. GWDTE are protected under the Water Framework Directive and as such are assessed within Chapter 5. The NVC report details the occurrence of communities with moderate and high potential for groundwater dependency, under certain hydrological conditions, located within the cliffs at the west of the site and associated with the Burn of Deepdale. The NVC report concludes that communities maintained by proximity to watercourses, and surface water runoff are not considered to be GWDTE (M23b, M27, M28). The NVC report identifies Tufa forming springs along the cliffs within the site (considered equivalent to M37 and M38 *Cratoneuron Springs*) as being clearly fed by groundwater emerging from bedrock and are described as highly calcareous as a result of surrounding bedrock composition.

4.5.5 Tidal Water Levels

The closest port referenced in Admiralty tide tables is St Mary's, Scapa Flow. Tidal water levels at St Mary's, Scapa Flow as presented within the Admiralty tide tables are shown in Table 4-5¹¹. The mean tidal range at St Mary's is 2.7m for spring tides and 1.7m for neap tides. St Mary's, Scapa Flow, has a semi-diurnal tidal curve, with two high tides and two low tides each day, as is the case around the UK.

Table 4-5: Tidal water levels at St Mary's Scapa Flow

Tide Condition	Chart Datum (mCD)	Ordnance Datum (mOD)
Highest Astronomical Tide (HAT)	3.8	2.15
Mean High Water Springs (MHWS)	3.3	1.65
Mean High Water Neap (MHWN)	2.6	0.95
Mean Sea Level (MSL)	1.9	0.25
Mean Low Water Neap (MLWN)	1.4	-0.25
Mean Low Water Springs (MLWS)	0.6	-1.05
Lowest Astronomical Tide (LAT)	-0.1	-1.75

¹⁰Chart datum correction for Ordnance Datum is -1.65 (relative to OD at Newlyn)

Extreme sea levels have been predicted around the whole UK coastline and published by the Environment Agency / Department for Environmental Food and Rural Affairs report¹² and updated in 2018¹³. These extreme levels include the effects of both tides and storm surge but not the effect of amplification within estuaries or sea lochs. In order to provide better estimates around the Scottish coastline, the coastal estimates have been updated to account for amplification within estuaries. However, it is noted that the proposed development site is situated inshore of the estuary limit of the extreme sea level predictions for Scapa Flow, and therefore predictions from the Coastal Flood Boundary programme cannot be applied directly to the site.

The SEPA derived extreme sea levels, predicted at the closest point to the development within Scapa Flow (offshore of the prediction limits), are 2.77m Above Ordnance Datum (AOD) for the 1 in 200 year return period event and 2.89 mAOD for the 1 in 1,000 year return period event. SEPA recommend a 2100 climate change uplift of 0.93m for coastal levels. Therefore the 1 in 200 year return period plus climate change event at the prediction location has a level of 3.70mAOD and the 1 in 1000 year return period plus climate change event has a level of 3.82 mAOD.

4.5.6 Coastal Processes

4.5.6.1 Tidal Currents

Tidal Currents along the nearshore within the Bay of Kirkwall near to Hatston are insignificant¹⁴. A coastal hydrodynamic modelling study has been undertaken, as detailed in Technical Appendix 4.1, Volume 3 of this EIAR. Baseline model results show that strong currents (>5m/s) are present in the Pentland Firth to the south of Scapa Flow, whilst moderately strong currents occur through the entrances to Scapa Flow, Hoy Sound in the west and Sound of Hoxa in the south. Current speeds dissipate rapidly into the sheltered waters of Scapa Flow, where weak currents (<0.03m/s) are observed, particularly in the east around Deepdale Bay and the proposed development site. The dominant tidal stream within the Pentland Firth travelling north-west to south-east through the model extent, and other focused tidal streams through the narrow channels between islands, for example at the Hoy Sound. Within Scapa Flow the direction of the flood tide circulates generally from north-west to south-east through Scapa Flow, and parallel to the shore in the vicinity of Deepdale Bay, with the ebb tide circulating in the opposite direction.

Whilst all currents are relatively weak, model results highlight the complex and irregular phasing of tidal currents at Deepdale Bay. Correlation between tidal phase and current speed varies spatially, with some locations having higher currents speeds during the flood or ebb tide. It is considered that due to the complex structure of Scapa Flow, with numerous bays and islands, that local flow patterns and eddies influence the position and speed of currents within Deepdale Bay. Model results show there is generally a marginal dominance of ebb currents within Scapa Flow and Deepdale Bay, with the exception of the nearshore areas where there is little difference observed.

Model results show that bed shear stress is strongly correlated with tidal current speed, with peak shear stress occurring with peak current speeds. The vicinity of Deepdale Bay, and Scapa Flow generally, shows low bed shear stresses, as would be anticipated with the weak tidal currents observed. Peak bed shear stress predictions are around 0.003N/m² during spring tides.

Further details of tidal currents are presented within Technical Appendix 4.1, Volume 3 of this EIAR.

4.5.6.2 Wave Climate

The entrances to Scapa Flow act to dissipate offshore wave energy, with waves generally unable to propagate from the Pentland Firth or North Atlantic into Scapa Flow. Therefore, the wave climate tends to be locally generated wind-waves, with wave heights subject to fetch length¹⁵.

A spectral wave modelling study has been undertaken, as detailed in Technical Appendix 4.2, Volume 3 of this EIAR. Potential wave conditions at the proposed development site have been predicted for a number of scenarios using the spectral wave model. The model results show that the predicted maximum significant wave height (Hs) under existing conditions is approximately 2.6 m for the 1-in-50 year wind condition from a south-westerly and westerly direction. The maximum peak wave period (Tp) is also predicted for the 1-in-50 year wind condition from the same directions. These are the directions with the longest fetch and with a strong extreme wind speed, allowing the waves to build up to the area of interest. The results presented in the modelling study represent a fully developed sea for a constant wind direction, and therefore include a degree of conservatism (as wind speed and direction will vary temporally and spatially on a local scale).

Further details of wave climate are presented within Technical Appendix 4.2, Volume 3 of this EIAR.

4.5.6.3 Morphology and Sediment Transport

Much of the coastline near to Deepdale Bay is fronted by shingle and sand beaches. The European Nature Information System (EUNIS) seabed habitat map shows the dominant seabed habitat around Deepdale Bay to be infralittoral mud and rock with biogenic reef¹⁶. Rock substrate is shown immediately west of the proposed

¹⁰ Firth Ecology (2022). Deepdale Vegetation Survey – 2021, Phase 1 and NVC report

¹¹ UK Hydrographic Office, 2023 (Admiralty Tide Tables – Volume 1B)

¹² McMillan et al. 2011. Coastal Flood Boundary Conditions for UK Mainland and Islands. Environment Agency.

¹³ Environment Agency, 2019. Coastal flood boundary conditions for the UK: 2018 update

¹⁴ Ramsay and Brampton, 2000. Coastal Cells in Scotland: Cell 10 – Orkney.

¹⁵ Ramsay and Brampton, 2000. Coastal Cells in Scotland: Cell 10 – Orkney

¹⁶ EUNIS 2017 (<https://emodnet.eu/en>).

development location, with gravelly muddy sand substrate located further into Scapa flow¹⁷. As described in section 4.5.3, sea-bed site investigation results within the development site characterise an approximate stratigraphic order comprising superficial marine deposits (loose to medium dense gravelly silty sands with shell fragments and occasional cobbles) overlying glacial till.

Sediment input to Scapa Flow is limited, with the Churchill Barriers preventing any sediment connectivity from the east. Due to the lack of sediment input, weak tidal currents and associated low bed shear stresses, there is therefore little littoral transport other than erosion of existing glacial deposits during extreme events¹⁸.

Analysis of historical coastline alignments show that there have been no major changes to the coastline since 1890 and no significant erosion observed¹⁹.

4.5.7 Flood Risk

The SEPA flood maps do not indicate any fluvial flood risk from the watercourses identified in the vicinity of the development site, as they are too small to be included by this method. Isolated areas of pluvial flood risk are identified within low-lying areas corresponding to the channels and banks of the Burn of Deepdale and the Burn of Button, corresponding to likely zones of fluvial flood risk. These watercourses flow within well-defined, steep sided valleys, which combined with their small contributing catchment areas will limit flooding extents during high flows to the immediate watercourse corridor, with no associated risk considered to the proposed development.

A review of the SEPA online flood maps identifies that the lower coastal edge of the proposed development site is at high risk of coastal flooding²⁰. This prediction does not account for the potential effects of climate change, local bathymetry or wave action. The proposed development is a water compatible land use, in line with SEPA flood risk and land use vulnerability guidance²¹, and therefore considered suitable for development in this location.

Tidal water levels, and extreme tidal water levels, are described in section 4.5.5, with an identified 1 in 200 year extreme tidal water level of 2.77mAOD at the proposed development. SEPA recommend a 2100 climate change uplift of 0.93m for coastal levels within the Orkney river basin region²². Therefore the 1 in 200 year return period plus climate change event at the prediction location has a level of 3.70mAOD and the 1 in 1000 year return period plus climate change event has a level of 3.82 mAOD. The proposed development has been designed with reference to these stated levels, taking account of future climate projections as further detailed in the following section 4.5.8 where operationally appropriate. Therefore, flood risk is not considered further within this EIAR.

Further details of local tidal conditions are summarised in the previous section 4.5.6, and further described in Technical Appendix 4.1, Volume 3 of this EIAR. Technical Appendix 4.1, Volume 3 of this EIAR, also details modelling and assessment of proposed development impact on tidal levels and currents, the results of which are summarised in sections 4.7.2.4 and 4.7.3.3.

Further details of local wave climate are summarised in the previous section 4.5.6, and further described in Technical Appendix 4.2, Volume 3 of this EIAR. Technical Appendix 4.2, Volume 3 of this EIAR, also details modelling and assessment of proposed development impact on wave climate, the results of which are summarised in sections 4.7.2.5 and 4.7.4.

4.5.8 Future Projections and Effects of Climate Change

The UK government has published a range of climate projection reports and data for use in the assessment of climate change risks to help plan how to adapt to a changing climate. The latest set of comprehensive reports produced by UK Climate Projections (UKCP18) was published in 2018 and provides future climate projections for land and marine regions for the UK.

The UKCP18 projections are presented for a range of different scenarios or Representative Concentration Pathways (RCPs). RCPs are a method for capturing assumptions required on future economic, social and physical changes to our environment that will influence climate change. The increase in in global mean surface temperature (°C) by 2081 – 2100 for the different RCP's is outlined below:

- RCP2.6 = 1.6°C (0.9 – 2.3°C)
- RCP4.5 = 2.4°C (1.7 – 3.2°C)
- RCP6.0 = 2.8°C (2.0 – 3.7°C)
- RCP8.5 = 4.3°C (3.2 – 5.4°C)

Table 4.6 presents the UKCP18 RCP predictions for carbon dioxide concentrations, along with resulting changes in global mean surface temperatures. Table 4.7 presents UKCP18 RCP predictions for time-mean sea level change based on an average of UK ports, along with the spatial pattern of sea level change around the UK coastline at year 2100. Review of these predictions highlights that the proposed development is within a zone of moderate sea level change in a UK context.

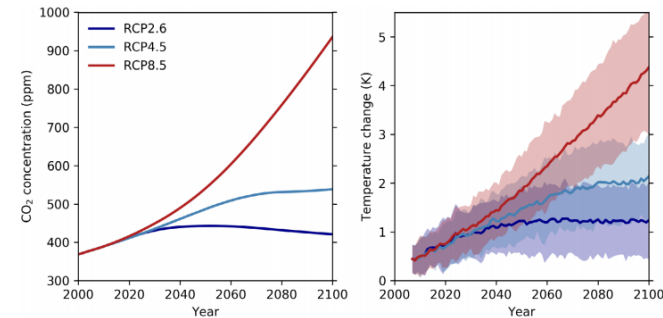


Table 4-6: UKCP18 RCP predictions over the 21st century for carbon dioxide concentrations (left) and global mean surface temperature change resulting from carbon dioxide and other climate forcings (right)

¹⁷ Marine Scotland (<https://marinescotland.atkinsgeospatial.com/nmpi/>)

¹⁸ Ramsay and Brampton, 2000. Coastal Cells in Scotland: Cell 10 – Orkney.

¹⁹ Dynamic coast online map available at: <http://www.dynamiccoast.com/webmap.html>

²⁰ SEPA, 2020 (<http://map.sepa.org.uk/floodmap/map.htm>)

²¹ Land Use Planning System

SEPA Guidance - Flood Risk and Land Use Vulnerability Guidance. SEPA, 2018

²² Climate change allowances for flood risk assessment in land use planning Version 2. SEPA, 2022.

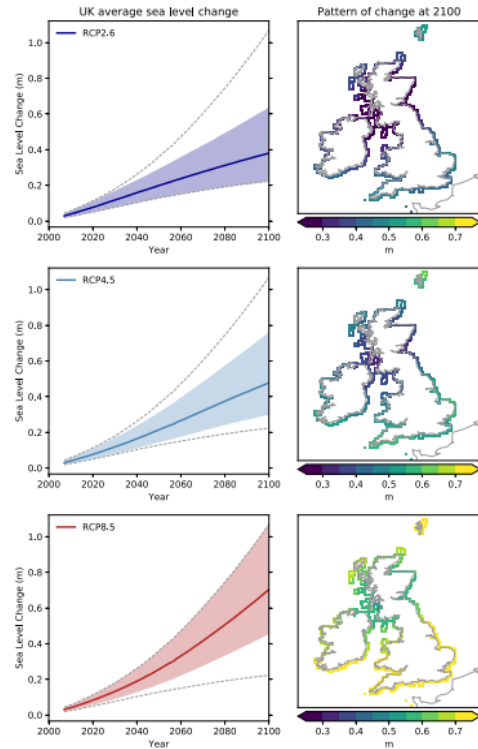


Table 4-7: UKCP18 time series of time-mean sea level change for RCPs based on average of UK ports (left) and the spatial pattern of change at 2100 (right)

It should be noted that there is a wide range of uncertainty associated with these projections, and that these values represent an average relative sea-level rise across a range of return period scenarios. Under the United Nations Climate Change Paris Agreement the UK is committed to attempt to hold the increase in global average temperature to well below 2°C above pre-industrial levels and to pursue efforts to limit warming to 1.5°C. These targets are in line with those allowed for within UKCP18 RCP 2.6, or the lower end of RCP 4.5, in terms of median global temperature increase by 2100.

The UKCP18 values for sea-level rise at the proposed development have been obtained based on the best available guidance. Cumulative rise from 2017 to 2100 for the region within which the proposed development is located (Orkney) is 0.93 m, derived from the 95th percentile estimate for RCP8.5.

4.5.9 Sensitive Receptors

On the basis of the baseline assessment the sensitive receptors to potential impacts on the water environment, soils and coastal processes have been identified as the coastal waters and sediment of the proposed development and the wider Scapa Flow, the Burn of Button, Burn of Deepdale, and the Burn of Gangsta, as well as GWDTEs.

Consideration of ecological receptors, including associated designations and commercial fishery operations, is included within Chapter 5, Biodiversity. Consideration of archaeological receptors is included within Chapter 6, Archaeology and Cultural Heritage.

4.6 Receptor Sensitivity

On the basis of the baseline assessment, Table 4-8 identifies the receptor sensitivity using the criteria outlined in Table 4-2.

Table 4-8: Receptor Sensitivity

Receptor	Sensitivity	Comment
Coastal waters and sediment of Scapa Flow	High	Within Special Protection Area (Scapa Flow); Classified waterbody under WFD; and Navigable waterbody used by commercial & recreational vessels.
Burn of Button, Burn of Deepdale, Burn of Gangsta and minor surface water features	Medium	Of local importance
GWDTE	Medium	Considered to be groundwater dependent

4.7 Impact Assessment

4.7.1 Potential Impacts

This section identifies the potential environmental impacts on the water environment, soils and coastal processes, at and around the site during the construction and operational phases of the proposed development.

The proposed works will involve the following key activities which have the potential to impact the water environment within the site and environs:

- Dredging of quay approach and berths;
- Construction activities (land reclamation, stripping of site, quay construction and onshore infrastructure);
- Site surface water drainage; and
- Site operations.

The potential impacts on the water environment, soils and coastal processes include:

- Water Environment:
 - Hydrology alterations including increased run-off and alteration of flow patterns.
 - Contamination of coastal water and sediments through spillages, leakages and/or sediment transfer (oils, fuels, welfare facilities, and suspended solids).
- Coastal Processes:
 - Changes in local wave climate.
 - Changes in local tidal regime.
 - Changes in local sediment transport regime.

The potential interactions between water environment impacts and ecology, including associated designations, are assessed within Chapter 5: Biodiversity.

The following sections consider the potential impacts and provide an assessment of likely level of significance.

4.7.2 Construction Phase

The potential impacts identified are assessed under the following headings:

- Hydrology;
- GWDTE;
- Water and sediment quality;
- Tidal regime;
- Wave climate; and
- Sediment transport.

The degree of potential environmental impact is provided as appropriate.

4.7.2.1 Hydrology

During construction there is potential for increased run-off due to the introduction of impermeable and semi-permeable surfaces arising from the compaction of soils and construction of proposed infrastructure. This will reduce the infiltration capacity and increase the rate and volume of direct surface run-off, and potentially concentrate diffuse flows. The potential environmental effect of this is to increase or alter groundwater and surface water flow rates and routes, potentially leading to increases in erosion and sediment transport.

No direct impacts are predicted on the Burn of Gangsta which is located 350m southeast of the proposed development with the topography between the development and watercourse relatively flat. The Burn of Button is located to the north of the site and is located within the site boundary within the north of the proposed development. The site access road from the A961 is located approximately 20m from the Burn of Button within the north of the proposed development and is approximately 1 – 2 m in width at this point. A vegetated buffer of between 6 – 12m is recommended within SEPA guidance for watercourses between 1 and 5m and the 20m buffer is considered sufficient to mitigate the risk of increased sediment runoff which may arise during construction of the access road.

A number of agricultural field drains are present within the site, these are not considered to be environmentally sensitive and will be removed as part of the proposed development.

Due to the small catchment, vegetated buffers and flat topography, the potential impacts of surface water flow alterations and increased run-off to coastal waters (high sensitivity) and the surface watercourses (medium sensitivity) would be of a negligible magnitude, giving rise to effects of negligible significance, prior to mitigation.

4.7.2.2 GWDTE

The tufa forming spring communities will be lost as a result of the proposed development during creation of the laydown area. As a result of the location of these communities on the cliff face, it is not possible to avoid these communities or mitigate impacts through design.

Therefore, the proposed development is assessed as having a high magnitude of impact on GWDTE (Medium sensitivity) giving rise to effects of major significance prior to mitigation.

As such it is proposed that the loss of these communities is offset by compensatory habitat creation within the cut faces of the laydown area in the northeast of the site. The same bedrock unit extends throughout the site, and it is considered that by exposing the bedrock face this will provide suitable opportunities for the creation of compensatory habitats. Further consideration of GWDTEs and associated habitat creation, is presented in Chapter 5 of this EIAR.

4.7.2.3 Water and Sediment Quality

Sediment Discharge and Dispersion from Dredging Works and the Disposal of Dredged Sediment

The proposed dredging works could potentially cause plumes of suspended solids and a reduction in water quality with a resultant impact on aquatic life.

The dredge volume is estimated to be 174,000m³, based on the bathymetry surveys and proposed berth design. As outlined in section 4.5.3, the marine deposits within the dredge area comprise an approximate stratigraphic order comprising superficial marine deposits (loose to medium dense gravelly silty sands with shell fragments and occasional cobbles) overlying glacial till. A Dredging Best Practicable Environmental Option Report (BPEO) has been produced for the proposed development (Technical Appendix 2.2 Volume 3 of the EIAR which identifies the dredge budget to consist of approximately 17% gravel, 60% sand, and 23% silt and clay. The BPEO identified fill within the reclaimed areas / construction works as the preferred option for disposal of the dredge arisings, however it is understood that a limited proportion of the dredged material may be subject to aquatic disposal at a licensed sea deposit site, where the nature of the dredged material is unsuitable for re-use.

Dredge plume dispersal modelling has been undertaken, utilising a hydrodynamic model, as described in Technical Appendix 4.1, Volume 3 of this EIAR. The model results highlight that due to the relatively coarse nature of the dredge budget, and the weak tidal currents within the vicinity of the proposed dredge pockets, plumes generated as a result of the dredging works will be very localised and short term in duration. Due to the low current speeds, any sands and gravels lost to the water column during dredging will fall out of suspension immediately, within the dredge footprint. Clay and silt lost to the water column during dredging will remain in suspension for longer, being dispersed gradually over the tidal cycle, with the residual dominance of ebb tide currents resulting in net northwards plume dispersal. Total suspended solids concentrations are predicted to be low, highest within the dredge zone and immediate surrounds of the dredger, decreasing towards the plume limits. Full details of modelled dredge plume extents and concentrations are detailed in Technical Appendix 4.1, Volume 3 of this EIAR, including consideration of potential wind forcing impacts.

Due to the small potential volume of any dredge budget disposed direct to the sea bed, it is considered that any impacts from this activity would be localised in extent, and of short duration.

Overall, it is considered that prior to mitigation the magnitude of impact of sediment discharge and dispersion from dredging works to coastal waters (high sensitivity) will be low within the dredge area and immediate vicinity, and negligible out with this area, giving rise to effects of moderate and negligible significance respectively, prior to mitigation.

Reclamation

The proposed reclamation fill (imported quarried material and dredged material) could potentially result in plumes of suspended solids and a reduction in water quality with a resultant impact on aquatic life. The fill material will be a mixture of sediment locally generated by quarries and dredging, the coarse nature of which, in combination with the locally weak tidal currents, would act to limit the duration and spread of any plume generated.

It is considered that prior to mitigation the magnitude of impact of sediment discharge and dispersion from excavation and reclamation works to coastal waters (high sensitivity) will be low within the immediate vicinity of the reclamation area, and negligible out with this area, giving rise to effects of moderate and negligible significance respectively, prior to mitigation.

Pollution Incidences

During construction there is a risk of accidental pollution incidences affecting the water environment (i.e. coastal waters and sediment) from the following sources:

- Spillage or leakage of oils and fuels stored on site;
- Spillage or leakage of oils and fuels from construction machinery or site vehicles;

- Spillage of oil or fuel from refuelling machinery on site;
- Spillage or leakage from on-site toilet facilities;
- Suspended solids from construction works; and
- The use of concrete and cement in construction works.

The main risk is considered to be posed by refuelling activities. Oil or fuel spillages to the water environment would be detrimental to water/sediment quality and could affect fauna and flora.

Concrete (specifically the cement component) is generally highly alkaline and any spillage to the water environment and/or soils could be detrimental to water/sediment quality, fauna and flora.

The effect of the potential pollution incidences during construction on water quality (high sensitivity) would be dependent on the scale and nature of the incident, therefore the magnitude of impact prior to mitigation may range from low to high, giving rise to effects of moderate to major significance prior to mitigation.

4.7.2.4 Tidal Regime

The proposed construction works could result in alterations to local tidal levels and currents. Hydrodynamic modelling results presented within Technical Appendix 4.1, Volume 3 of this EIA, highlight that the proposed development would have no impact on tidal water surface elevations. The model results show that minor changes in peak current speed are predicted at point output locations in the immediate vicinity of the proposed development (<0.02m/s change), with no change observed in the wider surrounds.

A minor increase in current speed post-development is observed in close proximity to the quay face, particularly within the -20mCD dredge pocket, during both flood and ebb tides. During the ebb tide the area of increase extends slightly further north in the direction of flow, along the quay. It is considered that the proposed development concentrates and re-directs flows resulting in the slight increase observed. No significant impact on current speeds is predicted within the wider surrounds.

Minor changes in bed shear stress are predicted in a similar pattern to the changes in current speed described above.

The model results show that in the post-development scenario low current speeds and corresponding low bed shear stresses observed remain, as under existing baseline conditions, indicative of a low energy environment.

It is considered that prior to mitigation the magnitude of impact of the proposed development on the local tidal regime (high sensitivity) will be negligible, giving rise to effects of negligible significance prior to mitigation.

4.7.2.5 Wave Climate

The proposed construction works could result in alterations to the local wave climate. Wave modelling results presented within Technical Appendix 4.2, Volume 3 of this EIA, highlight that the proposed development would result in minor changes to significant wave heights (Hs) in the immediate vicinity. For waves approaching during 1 in 50 year winds from a south-westerly and westerly direction, model results show minor increases in Hs (up to +0.8m height) along the outer (western) face of the new quay. Elsewhere, minor decreases in wave height are predicted where the proposed development provides shelter. These are the wind directions with the longest fetches, and thus largest waves, smaller scale variations are observed versus baseline conditions for other wind directions. These impacts to wave height in the immediate vicinity of the proposed development are considered to be minor, with resultant wave climate remaining of similar character to pre-development conditions.

No impact to wave climate is predicted outwith the immediate vicinity of the proposed development.

Therefore, the magnitude of impact on the wave climate (high sensitivity) is considered to be of negligible magnitude, giving rise to effects of negligible significance prior to mitigation.

4.7.2.6 Sediment Transport

The proposed construction works could result in alterations to local sediment transport processes. As outlined in section 4.5.6.3, the coarse local sediment character, lack of significant sediment inputs and prevailing weak tidal currents, will result in no significant local sediment transport processes, other than occasional storm wave driven transport of glacial materials.

In the absence of significant sediment transport processes, and given the negligible impact on tidal velocities predicted by the hydrodynamic modelling, and limited localised impact to wave climate predicted by the wave modelling, as detailed in the sections above, it is considered that there will be a negligible impact on sediment transport (high sensitivity), giving rise to effects of negligible significance, prior to mitigation.

4.7.3 Operational Phase

The potential impacts identified are assessed under the following headings:

- Hydrology;
- Water and sediment quality;
- Tidal regime;
- Wave climate; and
- Sediment transport.

The degree of potential environmental impact is provided as appropriate.

4.7.3.1 Hydrology

As during construction, there is potential for increased run-off due to the presence of impermeable and semi-permeable surfaces. The impact of surface water flow alterations and increased run-off would be of a negligible magnitude to medium sensitivity receptors, giving rise to effects of negligible significance prior to mitigation measures, due to the small contributing catchment and coastal location of the proposed development.

4.7.3.2 Water and Sediment Quality

Maintenance dredging is unlikely to be required, however should it be required the likely effects would be of a similar nature, albeit lower order, than that of the capital dredge during construction.

There is unlikely to be any groundworks during the operational phase, and therefore the risk of sedimentation will be much lower than during construction. The potential risk of pollution as a result of spillages, will however remain during the operational phase. Additionally, there is the potential risk of contamination of surface water run-off from the proposed development platform, as well as contamination of coastal waters as a result of discharges from boats. The impacts on water quality (high sensitivity) would therefore range from low to high magnitude, giving rise to effects of moderate to major significance prior to mitigation measures.

4.7.3.3 Tidal Regime

The impact of the proposed development during the operational phase on the tidal regime is considered to be the same as during the construction phase. Therefore, the magnitude of impact on the tidal regime (high sensitivity) is considered to be of negligible magnitude within the immediate vicinity of the site, negligible magnitude in the surrounds and negligible magnitude within the wider Scapa Flow, giving rise to effects of negligible significance prior to mitigation.

4.7.4 Wave Climate

The impact of the proposed development during the operational phase on the wave climate is considered to be the same as during the construction phase. Therefore the magnitude of impact on the wave climate (high sensitivity) is considered to be of negligible magnitude, giving rise to effects of negligible significance, prior to mitigation.

4.7.4.1 Sediment Transport

The impact of the proposed development during the operational phase on sediment transport is considered to be the same as during the construction phase. Therefore the magnitude of impact on sediment transport (high sensitivity) is considered to be of negligible magnitude, giving rise to effects of negligible significance, prior to mitigation.

4.8 Mitigation and Monitoring

Mitigation aims to avoid, manage, control and further minimise environmental impacts and is discussed within the following sections.

4.8.1 Construction Phase Mitigation

4.8.1.1 General Management

A Construction Environmental Management Plan (CEMP) will be developed to ensure that the mitigation measures outlined in the EIAR are followed during the proposed construction works. The CEMP includes surface water management and pollution prevention measures (e.g. Pollution Prevention Plan), and will be in place during construction and operation. The CEMP will remain a live document and will be continually updated as the work progresses. The CEMP is a practical tool to facilitate the management of environmental mitigation measures and to provide a clear roadmap of the key roles and responsibilities during construction.

A suitably qualified Environmental Clerk of Works (EnvCoW) will monitor the construction works to ensure that the CEMP and associated mitigation measures are being implemented effectively.

Best practice will be adopted throughout all phases of development, following current guidance. The programme of works, including timing, direction and method of capital dredge, will be planned, monitored and managed to minimise the potential negative environmental impacts.

A Pollution Incident Response Plan will be developed relating to the construction of the proposed development, statutory requirements and identification of areas of highest sensitivity. This will provide site spill response procedures, emergency contact details and equipment inventories and their location. All staff will be made aware of this document and its content during site induction. A copy will be available in the site office at all times.

All activities above Mean High Water Springs (MHWS) with potential to affect the water environment require to be authorised under the Water Environment (Controlled Activities) (Scotland) Regulations 2011 (CAR). The level of authorisation required is dependent on the anticipated environmental risk posed by the activity to be carried out. These activities could include construction drainage. Construction activities below MHWS with potential to affect the water environment require to be authorised under a Marine Licence.

4.8.1.2 Dredged Material

Mitigation measures relating to dredged material will be delivered by the principal contractor through detailed Construction Environment Management Plans (CEMPs) that will be produced following appointment. The contractor will be responsible for producing a site specific Pollution Prevention Plan (PPP) that will apply the principles of the agreed mitigation to show how the mitigation is implemented effectively down to the specific site.

4.8.1.3 Surface Water Management

The surface water drainage will be designed to ensure that there are no untreated surface water discharges directly to surrounding coastal waters. It is proposed to replicate natural drainage around construction areas and to use source control to deal with rainwater in proximity to where it hits the ground in line with current Sustainable Drainage Systems (SuDS) guidance. Suitable prevention measures will be in place at all times to prevent the release of pollutants to the water environment, including adjacent coastal waters. These will be regularly inspected and maintained to ensure optimal performance.

4.8.1.4 Site Compounds

Run-off from compounds will be captured and passed through construction drainage features prior to discharge. Foul drainage will either be contained in a closed system and disposed of at a suitable off-site facility with private treatment and discharge or, where possible, directed via a connection to the local foul drainage network.

4.8.1.5 Concrete

In the case that concrete batching is to be undertaken on-site the following mitigation measures would be implemented to minimise the potential impact of concrete batching on the water environment in line with PPG6:

- Concrete batching will take place on an impermeable designated area and at least 10m from any waterbody.
- Equipment and vehicles will be washed out in a designated area that has been specifically designed to contain wet concrete/ wash water.
- A closed loop system will be used for wash waters. Wash waters will be stored in a contained lined pond for settlement before being reused (e.g. for mixing and washing).
- No discharge of wash waters will occur on-site. All excess wash water that cannot be reused will be disposed of off-site.

The following mitigation is proposed for concrete handling and placement:

- Pouring of concrete will take place within well shuttered pours to prevent egress of concrete from the pour area.
- Pouring of concrete during adverse weather conditions (i.e. high rainfall etc) will be avoided.

The CEMP will include a Pollution Incident Response Plan, and drivers of vehicles carrying concrete will be informed so as to raise awareness of potential effects of concrete and of the procedures for clean-up of any accidental spills.

Concrete acidity (pH) will be as close to neutral (or site-specific pH) as practicable as a further precaution against spills or leakage. The concrete acidity for the site will be confirmed post-consent with the principal contractor involvement and detailed in the relevant CEMP.

4.8.1.6 Oil, Fuel, Site Vehicle Use and Storage

The risk of oil contamination will be minimised by good site working practice (further described below) but should a higher risk of oil contamination be identified then installation of an oil separator will be considered.

The storage of oil is considered a Controlled Activity which will be deemed to be authorised if it complies with the Regulations. The mitigation measures to minimise any risk of contaminant release are in line with SEPA PPG and GPP documents and include the following:

Storage:

- Storage for oil and fuels on site will be designed to be compliant with GPP2 and GPP8.
- The storage and use of loose drums of fuel on site will not be permitted.

- Bunded tanks will provide storage of at least 110% of the tank's maximum capacity.

Refuelling and maintenance:

- Fuelling and maintenance of vehicles and machinery, and cleaning of tools, will be carried out in a designated area where possible in line with PPG7.
- Multiple spill kits will be kept on site.
- Drip trays will be used while refuelling.
- Regular inspection and maintenance of vehicles, tanks and bunds will be undertaken.

Emergency procedure: The Pollution Incident Response Plan will include measures to deal with accidental spillages.

4.8.2 Operational Phase Mitigation

4.8.2.1 General Management

An Operational Environmental Management Document (OEMD) will be in place throughout the operational phase. Best practice will be followed throughout the operational phase, with reference to the SEPA Guidance for Pollution Prevention (GPPs), and best practice guidance.

4.8.2.2 Surface Water Management

It is proposed that drainage of surface water will adopt SuDS principles and be by means of infiltration through a permeable surface, and the underlying permeable reclamation fill, providing treatment.

Details of the operational surface water management proposals and methodology will be included within the OEMD and will be submitted to SEPA's operations team for agreement consent. Plans of the surface water management system will be located within the Site office, with foul water systems clearly marked.

Where a site use or development proposal is such that it will require a Pollution Prevention and Control (PPC) authorisation from SEPA, then specific processes, techniques and technologies will be included within the surface water management system in that location in order to meet the requirements of the PPC authorisation. Such measures would be in line with best practice guidance.

4.8.2.3 Oil, Fuel, Site Vehicle Use and Storage

The proposed development's Pollution Incident Response Plan will be updated for the operational phase of the development, taking full consideration of best practice, statutory requirements and identification of areas of highest sensitivity. It will provide site spill response procedures, emergency contact details and equipment inventories and their location. All operation staff will be made aware of this document, and its contents, and it will be available in the port office. Appropriate spill kits and absorbent materials will be stored in a suitable location which is easy to access. Staff/contractors will be trained in the use of spill kits and other pollution control equipment and the operation of pollution control devices.

4.8.3 Monitoring and Enhancement

The Applicant shall undertake a planned programme of compliance monitoring to verify the effectiveness of the project's environmental management. Monitoring plans will be established and implemented with the agreement of SEPA, NatureScot and Marine Scotland.

Specific auditing and monitoring plans will be developed by the contractor and will cover the following:

- The contractor's own Environmental Management System;
- The CEMD, schedule of mitigation register, relevant legislation and industry good practice;
- All project activity;

- Roles and responsibilities for those undertaking audits and monitoring;
- Frequency of inspection activities (i.e. daily, weekly, monthly);
- Process to deal with corrective actions/non-compliance; and
- Reporting procedures (including non-compliance).

Compensatory GWDTE habitat creation is proposed in order to mitigate for habitat loss resulting from the construction of the development platform. Further details are presented in Chapter 5 of this EIAR.

4.9 Residual Effects

The residual effects expected to arise following implementation of the mitigation measures detailed above are summarised in Table 4-9. These residual effects reflect receptor sensitivity, the post-mitigation magnitude and detail the resultant effect on each receptor.

The residual effects are considered to be negligible, with the exception of effects on GWDTEs which are considered to be minor. Accordingly, no significant effects on the water environment or coastal processes have been identified.

4.10 Statement of Significance

Overall, the effects of the proposed development on the water environment and coastal processes are not considered to be significant.

Table 4-9: Residual Effects

Effect	Receptor	Receptor Sensitivity	Source of Impact	Type of Effect	Duration	Probability of Occurrence	Magnitude of Impact Pre-mitigation	Magnitude of Impact Post-mitigation	Residual Effect (Post-mitigation)
Construction Phase									
Changes to hydrology	Coastal waters and sediment of Scapa Flow	High	Terrestrial construction works	Negative	Short	Possible	Negligible	Negligible	Negligible
	Surface watercourses	Medium	Terrestrial construction works	Negative	Short	Unlikely	Negligible	Negligible	Negligible
Water and sediment quality - excavation and reclamation	Coastal waters and sediment of Scapa Flow	High	Construction Works	Negative	Short	Possible	Low	Negligible	Negligible
	Westerbister Fish Farm	Medium	Construction Works	Negative	Short	Unlikely	Low	Negligible	Negligible
	Surface watercourses	Medium	Construction Works	Negative	Short	Unlikely	Negligible	Negligible	Negligible
GWDE	Loss of Habitat	Medium	Construction Works	Negative	Permanent	Certain	Major	Minor (compensatory habitat creation required)	Minor
Water and Sediment Quality - Sediment discharge and dispersion	Coastal waters and sediment of Scapa Flow	High	Construction including capital dredge	Negative	Short	Possible	Low – Negligible	Negligible	Negligible
	Westerbister Fish Farm	Medium	Construction including capital dredge	Negative	Short	Possible	Low – Negligible	Negligible	Negligible
	Surface watercourses	Medium	Construction including capital dredge	Negative	Short	Unlikely	Negligible	Negligible	Negligible
Pollution incidences	Coastal waters and sediment of Scapa Flow	High	Construction oils, fuels & concrete	Negative	Short	Possible	Low – High	Negligible	Negligible
	Westerbister Fish Farm	Medium	Construction oils, fuels & concrete	Negative	Short	Possible	Low – High	Negligible	Negligible
	Surface watercourses	Medium	Construction oils, fuels & concrete	Negative	Short	Unlikely	Low – High	Negligible	Negligible
Changes to tidal regime	Coastal waters and sediment of Scapa Flow	High	Construction including capital dredge	Negative	Permanent	Certain	Negligible	Negligible	Negligible
Changes to wave climate	Coastal waters and sediment of Scapa Flow	High	Construction including capital dredge	Negative	Permanent	Certain	Negligible	Negligible	Negligible
Changes to sediment transport	Coastal waters and sediment of Scapa Flow	High	Construction including capital dredge	Negative	Permanent	Certain	Negligible	Negligible	Negligible
Operational Phase									
Changes to hydrology	Coastal waters and sediment of Scapa Flow	High	Operational activities	Negative	Short – Permanent	Possible	Negligible	Negligible	Negligible
	Surface watercourses	Medium	Operational activities	Negative	Permanent	Unlikely	Negligible	Negligible	Negligible

Effect	Receptor	Receptor Sensitivity	Source of Impact	Type of Effect	Duration	Probability of Occurrence	Magnitude of Impact Pre-mitigation	Magnitude of Impact Post-mitigation	Residual Effect (Post-mitigation)
Water and sediment quality – excavation	Coastal waters and sediment of Scapa Flow	High	Operational activities	Negative	Short	Possible	Low - Negligible	Negligible	Negligible
	Westerbister Fish Farm	Medium	Operational activities	Negative	Short	Unlikely	Negligible	Negligible	Negligible
	Surface watercourses	Medium	Operational activities	Negative	Short	Unlikely	Negligible	Negligible	Negligible
Water and Sediment Quality - Sediment discharge and dispersion	Coastal waters and sediment of Scapa Flow	High	Operational activities	Negative	Short	Possible	Low	Negligible	Negligible
	Westerbister Fish Farm	Medium	Operational activities	Negative	Short	Possible	Low	Negligible	Negligible
	Surface watercourses	Medium	Operational activities	Negative	Short	Possible	Negligible	Negligible	Negligible
Pollution incidences	Coastal waters and sediment of Scapa Flow	High	Operational activities	Negative	Short	Possible	Low - High	Negligible	Negligible
	Westerbister Fish Farm	Medium	Operational activities	Negative	Short	Unlikely	Low - High	Negligible	Negligible
	Surface watercourses	Medium	Operational activities	Negative	Short	Unlikely	Low – High	Negligible	Negligible
Changes to tidal regime	Coastal waters and sediment of Scapa Flow	High	Operational activities	Negative	Permanent	Possible	Negligible	Negligible	Negligible
Changes to wave climate	Coastal waters and sediment of Scapa Flow	High	Operational activities	Negative	Permanent	Possible	Negligible	Negligible	Negligible
Changes to sediment transport	Coastal waters and sediment of Scapa Flow	High	Operational activities	Negative	Permanent	Possible	Negligible	Negligible	Negligible

5 BIODIVERSITY

5.1 Introduction

EnviroCentre Ltd was commissioned by the Applicant to undertake an Environmental Impact Assessment (EIA) of the proposed development, in order to identify and describe any likely significant effects arising from it. This chapter details the specialist ecological studies undertaken and the results of the assessment. The assessment has been carried out according to the latest guidance from the Chartered Institute of Ecology and Environmental Management (CIEEM)²³ by experienced and competent ecologists who are all Members of CIEEM and follow its Code of Professional Conduct. It is supplemented by the figures contained within Volume 2: Figures and the technical reports contained within Volume 3: Technical Appendices of this EIAR, including the following:

- Technical Appendix 5.1: Deepdale Vegetation Survey 2021;
- Technical Appendix 5.2: Marine Mammal and Fish Baseline Report;
- Technical Appendix 5.3: Scapa Deep Water Quay Ornithology Technical Report;
- Technical Appendix 5.4: Scapa Pier Habitat Mapping Survey Report;
- Technical Appendix 5.5: Habitats Regulations Appraisal (HRA);
- Technical Appendix 5.6: Underwater Noise Report;
- Technical Appendix 5.7: Marine Mammal Protection Plan; and
- Technical Appendix 5.8: Scapa Deep Water Quay Otter Survey.

Details of the site and the proposed development are provided in Chapter 2: Proposed Development.

The purpose of this chapter is to:

- Identify and describe the baseline for Important Ecological Features (IEFs) which may be impacted by the proposed development.
- Identify all potentially significant ecological impacts associated with the proposed development.
- Set out the mitigation measures required to ensure compliance with nature conservation legislation and to address adverse impacts.
- Identify how mitigation measures will be secured.
- Provide an assessment of the significance of any residual impacts.
- Set out the requirements for post-construction monitoring.

Detail actions to be taken to deliver biodiversity enhancements.

5.2 Scoping and Consultation

Potential impacts to the following features have been considered within this assessment, based on the results of baseline studies (Technical Appendices 5.1, 5.2, 5.3, 5.4, 5.8) and in response to scoping opinions (as described in Chapter 3):

- Designated sites
- Terrestrial habitats
- Terrestrial protected species

- Intertidal and sub-tidal habitats
- Marine mammals
- Fish

5.2.1 Potential Impacts and Zone of Influence

Potential impacts considered during scoping were as follows:

Construction phase:

- Terrestrial habitat loss which will lead to a loss of potential foraging, roosting, commuting and nesting opportunities for a range of faunal species;
- Accidental spills from vessels, plant and on-site storage of fuels and chemicals leading to pollution of habitats and potential harm to a range of species and habitats;
- Increased air-borne noise through construction activities (dredging, piling, plant movement, etc.) leading to disturbance and displacement of foraging, roosting or nesting faunal species;
- Increased visual stimuli through construction activities (personnel and plant movement, etc.) leading to disturbance and displacement of foraging, roosting or nesting faunal species;
- Increased, artificial lighting leading to disturbance and displacement of foraging, roosting or nesting faunal species;
- A potential change of hydrological flow which may alter the composition of the retained adjacent habitats;
- Direct loss of intertidal and subtidal habitat under the footprint of the development;
- Underwater acoustic noise and shock during piling leading to altered behaviour, this could include lethal and sub lethal impacts on marine mammals, fish and diving birds;
- Seabed excavation works during construction leading to disturbance of and potential loss of benthic communities and marine species, which in turn could lead to a reduction in or dispersal of prey items for a range of marine mammals and bird species;
- Temporary increase in suspended sediment and/or deposition from dredging and construction creating physical disturbance in the marine environment;
- Dredging activity may lead to potential disturbance of and/or loss of benthic communities and marine species, which in turn could lead to a reduction in or dispersal of prey items for a range of marine mammals and bird species;
- Increased vessel numbers causing disturbance in the marine environment and increasing collision risk with marine mammals; and
- Increased opportunities for transport of marine invasive non-native species (mINNS) due to increased vessel movements.

Operation Phase:

- Accidental spills from vessels, plant and on-site storage of fuels and chemicals leading to pollution of habitats and potential harm to a range of species and habitats;
- Increased air-borne noise through operational activities (plant movement, etc.) leading to disturbance and displacement of foraging, roosting or nesting species;
- Increased visual stimuli through operational activities (personnel and plant movement, etc.) leading to disturbance and displacement of foraging, roosting or nesting species;
- Increased, artificial lighting leading to disturbance and displacement of foraging, roosting or nesting species;

²³ CIEEM (2018). Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal, version 1.2. Chartered Institute of Ecology and Environmental Management, Winchester. Available at:

<https://cieem.net/wp-content/uploads/2018/08/EClA-Guidelines-2018-Terrestrial-Freshwater-Coastal-and-Marine-V1.2-April-22-Compressed.pdf> (Accessed 16/01/2023)

- Dredging activity may lead to potential disturbance of and/or loss of benthic communities and marine species, which in turn could lead to a reduction in or dispersal of prey items for a range of marine mammals and bird species;
- Temporary increase in suspended sediment and/or deposition from dredging and construction creating physical disturbance in the marine environment;
- Increased vessel numbers post construction causing disturbance in the marine environment and increasing collision risk for marine mammals; and
- Increased opportunities for transport of mINNS due to increased vessel movements.

The CIEEM Guidelines identify the Zone of Influence (Zol) as the area over which ecological features may be subject to significant effects as a result of the proposed development and associated activities. This is likely to extend beyond the project site, for example where there are mobile species or hydrological links beyond the site boundaries. Features found to be present or likely to be present within the predicted Zone of Influence (Zol) and which have potential to be significantly affected (positively and negatively) by the proposed development are included within the scope of this assessment. The features considered, associated Zol, scoping decision and justification are summarised in Table 5-1 below. Where impacts to features are considered to be similar, these have been grouped within the scoping and impact assessment for succinctness (eg. marine mammals within the same hearing group).

Table 5-1: Scoping Summary

Feature	Zol	Scoping Decision	Justification
Designated sites			
<p>Scapa Flow Special Protection Area (SPA):</p> <ul style="list-style-type: none"> Black-throated diver (<i>Gavia arctica</i>), non-breeding Eider (<i>Somateria mollissima</i>), non-breeding Great northern diver (<i>Gavia Immer</i>), non-breeding Long-tailed duck (<i>Clangula hyemalis</i>), non-breeding Red-breasted merganser (<i>Mergus serrator</i>), non-breeding Red-throated diver (<i>Gavia stellata</i>), breeding Slavonian grebe (<i>Podiceps auritus</i>), non-breeding 	<p>Within the development and up to 750m from the boundary (considered to be the furthest disturbance distance of bird species²)</p>	Scoped In	<p>The development is partially within the SPA and there is potential for the bird species which are features of the site to be impacted during the construction and operation.</p>
<p>Orkney Mainland Moors SPA (including Sites of Special Scientific Interest SSSIs; Orphir and Stenness Hills, West Mainland Moorlands and Keelylang Hill and Swartaback Burn):</p> <ul style="list-style-type: none"> Hen Harrier (<i>Circus cyaneus</i>) breeding and non-breeding; Red-throated diver, breeding; Short-eared Owl (<i>Asio flammeus</i>), breeding) <p>SSSI only features:</p> <ul style="list-style-type: none"> Upland habitat assemblage Blanket bog Breeding bird assemblage 	<p>For Birds: Within the development and up to 750m from the boundary (considered to be the furthest disturbance distance for species present²)</p> <p>For Terrestrial Habitats: Within the development footprint or connected hydrologically.</p>	Scoped in: Red-throated diver only	<p>The development is c.5.8km from the designated site at its nearest point and therefore birds within the site are considered to be outside of the Zol.</p> <p>However, birds breeding within the SPA may frequent the development site and adjacent habitats to forage during the breeding season. The habitat is considered sub-optimal for Hen Harrier and Short-eared Owl and so these features have been scoped out for further assessment. Red-throated diver have been scoped in as they may utilise waters within and adjacent to the proposed development.</p> <p>The SSSI upland assemblage and blanket bog habitats are outwith the Zol and thus have been scoped out.</p>
<p>Sanday SAC and East Sanday SSSI:</p> <ul style="list-style-type: none"> Harbour seal (<i>Phoca vitulina</i>) Intertidal mudflats and sandflats Reefs Subtidal sandbanks <p>SSSI only features:</p> <ul style="list-style-type: none"> Bar-tailed godwit (<i>Limosa lapponica</i>), non-breeding Purple sandpiper (<i>Calidris maritima</i>), non-breeding Ringed plover (<i>Charadrius hiaticula</i>), non-breeding Turnstone (<i>Arenaria interpres</i>), non-breeding and passage Vascular plant assemblage 	<p>For Harbour seal: Within the development and the furthest extent of noise effects on marine mammals (approximately 600m from piling activities).</p> <p>Habitats: Within the development footprint and the furthest extent of likely sediment deposition or changes to coastal processes.</p> <p>Birds: Within the development and up to 300m (considered to be the furthest disturbance distance²)</p>	Scoped in: Harbour seal only	<p>The site is c.59km north east of the development when measured round land masses. This is slightly further than the estimated distances harbour seals are likely to travel (up to 50km), however, NatureScot have requested this is scoped in for further assessment.</p> <p>It is considered that the habitat features of the SAC and SSSI and bird features of the SSSI are outside of the expected Zol and so have been scoped out.</p>
<p>Hoy SPA</p> <ul style="list-style-type: none"> Arctic skua (<i>Stercorarius parasiticus</i>), breeding Fulmar (<i>Fulmarus glacialis</i>), breeding Great black-backed gull (<i>Larus marinus</i>), breeding Great skua (<i>Stercorarius skua</i>), breeding Guillemot (<i>Uria aalge</i>), breeding Kittiwake (<i>Rissa tridactyla</i>), breeding Peregrine (<i>Falco peregrinus</i>), breeding Puffin (<i>Fratercula arctica</i>), breeding Red-throated diver, breeding Seabird assemblage, breeding 	<p>Birds: Within the development and up to 750m from the boundary (considered to be the furthest disturbance distance for species present²)</p>	Scoped in: Arctic Skua, Fulmar, Great Black-backed Gull, Great Skua, Guillemot, Kittiwake	<p>The site is located 16.5km from the development. The species scoped in may utilise the waters within the ZOI to forage so they have been scoped in for further assessment.</p> <p>Peregrine has been scoped out as their core range is 2km. Red-throated Diver can forage up to 13.5km from nest sites which is less than the distance from the development to the SPA. Puffin has been scoped out as none were recorded during the surveys.</p>

Feature	Zol	Scoping Decision	Justification
Loch of Steness SAC <ul style="list-style-type: none"> Lagoons 	Within the development footprint and the furthest extent of likely sediment deposition or changes to coastal processes.	Scoped Out	At its nearest point the site is 16km north west of the proposed development. No alterations to coastal processes are predicted at these distances and no significant sediment transportation is likely (Chapter 4; Section 4.7.2.4 and 4.7.2.5).
Waulkmill SSSI <ul style="list-style-type: none"> Golden-rod case-bearer moth (<i>Coleophora virgaureae</i>) Maritime cliff Saltmarsh 	Within the development footprint and the furthest extent of likely sediment deposition or changes to coastal processes.	Scoped out	At its nearest point the site is 6.8km west of the proposed development. No alterations to coastal processes are predicted at these distances and no significant sediment transportation is likely (Chapter 4; Section 4.7.2., 4.7.2.5 and 4.7.2.6).
Gatnip Hill Local Nature Conservation Site (LNCS)	Habitats and other species: Within the development of the footprint and furthest extent of hydrological connection.	Scoped out	The habitat is outwith the Zol. The Burn of Button lies between the site and the LNCS, separating them hydrologically. Some habitat suitable for moss carder bee adjacent to the LNCS may be lost but this is unlikely to have a significant impact due to the relatively small area lost.
Habitats: <ul style="list-style-type: none"> Upland heath Crowberry heath Lowland fens Blanket bog Burns and canalised burns Maritime cliff and slope Maritime grassland 	Ornithology: Within the footprint of the development and up to 750m (considered to be the furthest disturbance distance).	Scoped out	No Hen Harrier, Merlin or Short eared Owl were recorded breeding within 1km of the development. No works are planned within the LNCS so suitable foraging habitat remains. Similarly, suitable nesting habitat for Curlew, Redshank, Oystercatcher and Lapwing, as well as passerines. The ZOI for these species range from 10m to 300m. Works will not impinge upon these ZOIs.
Ornithology: <ul style="list-style-type: none"> Hen harrier Short-eared owl Merlin (<i>Falco columbarius</i>) Curlew (<i>Numenius arquata</i>) Lapwing (<i>Vanellus vanellus</i>) Snipe (<i>Gallinago gallinago</i>) Skylark (<i>Alauda arvensis</i>) Twite (<i>Linaria flavirostris</i>) Reed bunting (<i>Emberiza schoeniclus</i>) 			
Other species <ul style="list-style-type: none"> Moss carder bee (<i>Bombus muscorum</i>) 			
Terrestrial habitats <ul style="list-style-type: none"> Dense Scrub Unimproved acid grassland Semi-improved neutral grassland Improved grassland Marshy grassland Bracken Dry acid-heath Bryophyte dominated spring Marginal vegetation Crevice/ledge vegetation Coastal grassland 	Within development footprint and the furthest extent of hydrological connection.	Scoped in: <ul style="list-style-type: none"> Unimproved acid grassland Semi-improved neutral grassland Marshy grassland Bryophyte dominated spring Crevice/ledge vegetation Coastal grassland Coastal heath 	Habitat to be scoped in are of conservation importance and will be wholly or partially lost as a result of development. Habitats scoped out are being retained and/or are common and widespread habitats and associated impacts are considered negligible.

Feature	Zol	Scoping Decision	Justification
<ul style="list-style-type: none"> Coastal heathland Arable 		Scoped out: <ul style="list-style-type: none"> Dense Scrub Dry acid heath Improved grassland Bracken Marginal vegetation Arable 	

[Redacted]

<p>Ornithology</p> <p>Full list of species identified during baseline surveys are presented in Technical Appendix 5.3. Notable results that are not part of the Special Protection Area include:</p> <ul style="list-style-type: none"> Arctic Tern (<i>Sterna paradisaea</i>) Common Tern (<i>Sterna hirundo</i>) Curlew Redshank (<i>Trianga totanus</i>) Oystercatcher (<i>Haematopus ostralegus</i>) Ringed Plover (<i>Charadrius hiaticula</i>) Skylark 	<p>Within the development and up to 750m from the boundary (considered to be the furthest disturbance distance of bird species²⁴)</p>	<p>Scoped in: For species mentioned</p>	<p>Impacts to species associated with the Designated sites are included within the relevant SPAs.</p> <p>There is the potential for impacts to foraging tern species and breeding waders on site.</p>
<p>Inter-tidal habitats</p> <ul style="list-style-type: none"> <i>Fucus spiralis</i> on full salinity upper eulittoral rock <i>Fucus vesiculosus</i> on full salinity moderately exposed to sheltered mid eulittoral rock <i>Fucus vesiculosus</i> and barnacle mosaics on moderately exposed mid eulittoral rock <i>Fucus serratus</i> on full salinity sheltered lower eulittoral rock <i>Verrucaria maura</i> on very exposed to very sheltered upper littoral fringe rock <i>Pelvetia canaliculata</i> on sheltered littoral fringe rock <i>Fucus vesiculosus</i> on mid eulittoral mixed substrata <i>Fucus serratus</i> and red seaweeds on moderately exposed lower eulittoral rock <i>Talitrids</i> on the upper shore and strand-line <i>Ascophyllum nodosum</i> on full salinity mid eulittoral mixed substrata <i>Fucoids</i> on sheltered marine shores Barren littoral shingle 	<p>Within the footprint of the development and within dispersal distance of pollutants entering the water</p>	<p>Scoped out</p>	<p>These habitats are all within the development of the footprint and will be lost, however, they are not habitats of conservation importance, and their loss is not considered to be significant for any associated protected species.</p>

²⁴ Goodship, N.M. and Furness, R.W. (MacArthur Green) Disturbance Distances Review: An updated literature review of disturbance distances of selected bird species. NatureScot Research Report 1283. Available at: <https://www.nature.scot/doc/naturescot-research-report-1283-disturbance-distances-review-updated-literature-review-disturbance> (Accessed 19/01/2023)

Feature	Zol	Scoping Decision	Justification
<ul style="list-style-type: none"> Strandline 			
Sub-tidal habitats <ul style="list-style-type: none"> Low energy infralittoral rock Grazed, mixed <i>Laminaria hyperborea</i> and <i>Saccharina latissima</i> on sheltered infralittoral rock Grazed <i>Saccharina latissima</i> with <i>Echinus</i>, brittlestars and coralline crusts on sheltered infralittoral rock Infralittoral coarse sediment Infralittoral mixed sediment <i>Kurtiella bidentata</i> and <i>Thyasira</i> spp. in circalittoral muddy mixed sediment <i>Saccharina latissima</i> and red seaweeds on infralittoral sediments Loose-lying mats of <i>Phyllophora crispa</i> on infralittoral muddy sediment 	<p>Within the footprint of the development and within dispersal distance of pollutants entering the water</p>	<p>Scoped in:</p> <ul style="list-style-type: none"> <i>Saccharina latissima</i> and red seaweeds on infralittoral sediments Loose-lying mats of <i>Phyllophora crispa</i> on infralittoral muddy sediment Low energy infralittoral rock Grazed, mixed <i>Laminaria hyperborea</i> and <i>Saccharina latissima</i> on sheltered infralittoral rock Grazed <i>Saccharina latissima</i> with <i>Echinus</i>, brittlestars and coralline crusts on sheltered infralittoral rock Infralittoral coarse sediment <p>Scoped out:</p> <ul style="list-style-type: none"> Infralittoral mixed sediment <i>Kurtiella bidentata</i> and <i>Thyasira</i> spp. in circalittoral muddy mixed sediment 	<p>Habitats scoped in are Priority Marine Features or Annex I habitats. They are present within and adjacent to the Zol and so there is potential for impacts to occur.</p> <p>The other habitats are either outside of the Zol and/or are common and widespread habitats and therefore any impacts are unlikely to be significant.</p>
Marine Mammals			
Grey and harbour seals (<i>Halichoerus grypus</i> and <i>Phoca vitulina</i>)	Within the development and to the furthest extent of predicted noise effects on seals (approximately 1.5km from activities).	Scoped in	These species are known to be present within the waters and coastal habitats within proximity of the site and there is suitable habitat for commuting and foraging individuals within the Zol.
Harbour Porpoise (<i>Phocoena phocoena</i>)	Within the development and to the furthest extent of predicted noise effects (approximately 4km).	Scoped in	Harbour porpoise are known to be present within waters around Orkney and there is considered to be suitable habitat for commuting and foraging individual species within the Zol

Feature	Zol	Scoping Decision	Justification
Minke Whale (<i>Balaenoptera acutorostrata</i>)	Within the development and to the furthest extent of predicted noise effects (approximately 5km from activities)	Scoped in	There is suitable habitat for commuting and foraging individuals within the Zol.
Risso's Dolphin (<i>Grampus griseus</i>), White-beaked Dolphin (<i>Lagenorhynchus albirostris</i>), long-finned pilot whale (<i>Globicephala melas</i>), killer whale (<i>Orcinus orca</i>),	Within the development and to the furthest extent of predicted noise effects (approximately 400m from activities)	Scoped in	These species are known to be present within waters around Orkney and there is considered to be suitable habitat for commuting and foraging individuals within the Zol.
Atlantic white-sided dolphin (<i>Lagenorhynchus acutus</i>), sperm whale (<i>Physeter macrocephalus</i>), humpback whale (<i>Megaptera novaeangliae</i>), fin whale (<i>Balaenoptera physalus</i>), Sei whale (<i>Balaenoptera borealis</i>), striped dolphin (<i>Stenella coeruleoalba</i>), Cuvier's beaked whale (<i>Ziphius cavirostris</i>), short-beaked common dolphin (<i>Delphinus delphis</i>), bottlenose dolphin (<i>Tursiops truncatus</i>), short-finned pilot whale (<i>Globicephala macrorhynchus</i>)	Within the development and to the furthest extent of predicted noise effects (variable with species hearing group but up to approximately 5km from activities)	Scoped out	Whilst there are occasional records of these species from the waters around Orkney, they are considered to be highly infrequent visitors which are unlikely to be significantly impacted by the proposed works.
Fish			
Diadromous fish (sea trout, <i>Salmo trutta</i>)	Within the development and to the furthest extent of predicted noise effects (approximately 2.5km from activities)	Scoped out	There are no burns suitable for migratory fish such as sea trout within the Zol.
Marine fish PMFs; Anglerfish (<i>Lophius piscatorius</i>), Atlantic herring (<i>Clupea harengus</i>), flapper skate (<i>Dipturus intermedius</i>) saithe (<i>Pollachius virens</i>), sandeels (<i>Ammodytes marinus</i> & <i>Ammodytes tobianus</i>), Sand goby (<i>Pomatoschistus minutus</i>) Non-PMF; see Technical Appendix 5.2	Within the development and to the furthest extent of predicted noise effects (approximately 2.5km from activities)	Scoped in: PMFs only	Several PMF species have either been recorded as being present within the Zol or there is suitable habitat for them and it is within their expected range and so may be present. Several non-PMF species were also identified as being present within the site however they are considered to be common and widespread species and potential impacts are not likely to result in significant impacts and so have been scoped out for further assessment.
Basking shark	Within the development and to the furthest extent of predicted noise effects (approximately 2.5km from activities)	Scoped in	Basking shark are known to be present occasionally in waters around Orkney and could enter the Zol.
Aquaculture/fisheries	Within the development and to the furthest extent of predicted noise effects (approximately 3.9km from activities)	Scoped in	There is one aquaculture site within the Zol. This is predominantly for Atlantic salmon (<i>Salmo salmo</i>) and could be impacted by the works.

5.3 Policy, Legislation and Guidance

The compilation of this chapter has taken cognisance of the legislation, planning policies, conservation initiatives and general guidance presented in Table 5-2 below.

Table 5-2: Legislation, Policy and Guidance Documents

Scope	Document
International	<ul style="list-style-type: none"> International Union for the Conservation of Nature (IUCN) Red List of Threatened Species
European	<ul style="list-style-type: none"> Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Flora and Fauna (The Habitats Directive) Water Framework Directive (WFD) 2000/60/EC of the European Parliament Environmental Impact Assessment (EIA) Directive (2014/52/EU) on assessing the potential effects of projects on the environment
Scottish	<ul style="list-style-type: none"> Wildlife and Countryside Act 1981 (as amended) (WCA); The Conservation (Natural Habitats, &c.) Regulations 1994 (as amended); The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017; National Planning Framework 4²⁵; Scotland's National Marine Plan²⁶; Scottish Biodiversity List (SBL)²⁷ Priority Marine Features (PMFs) list²⁸ Scotland's Biodiversity Strategy to 2045²⁹

²⁵ Available at: <https://www.gov.scot/publications/national-planning-framework-4-revised-draft/> (Accessed 16/01/2023)

²⁶ Scottish Government (2015) Scotlands Marine Plan, A Single Framework for Managing our Sea. Available online at: <https://www.gov.scot/publications/scotlands-national-marine-plan/> (Accessed 11/01/2023).

²⁷ Available at: <https://www.nature.scot/doc/scottish-biodiversity-list> (Accessed 16/01/2023)

²⁸ Available at: <https://www.nature.scot/doc/priority-marine-features-scotlands-seas-habitats> (Accessed 16/01/2023)

²⁹ Available at: <https://www.gov.scot/publications/scottish-biodiversity-strategy-2045-tackling-nature-emergency-scotland/documents/> (Accessed 16/01/2023)

³⁰ Payne, R.D., Cook, E.J. and Macleod, A. (2014). Marine Biosecurity Planning – Guidance for producing site and operation-based plans for preventing the introduction of non-native species. Report by SRSL Ltd. in conjunction with Robin Payne to the Firth of Clyde Forum and Scottish Natural Heritage. Available online at: https://www.webarchive.org.uk/wayback/archive/20210929132843mp_/https://www.nature.scot/sites/default/files/2019-02/Marine%20Biosecurity%20Planning.pdf (Accessed 11/01/2023)

³¹ The Orkney Local Biodiversity action Plan 2018-2022 Available at:

<https://www.orkney.gov.uk/Files/Planning/Biodiversity/Orkney%20Local%20Biodiversity%20Action%20Plan%202018%20to%202022.pdf> (Accessed 11/01/2023)

Scope	Document
Local Planning Policy & Other Advice Documents	<ul style="list-style-type: none"> Marine Biosecurity Planning Guidance³⁰ BS 42020:2013: Biodiversity Code of Practice for Planning and Development 2013 Orkney Local Biodiversity Action Plan (LBAP)³¹ Orkney Local Development Plan (LDP)³² CIEEM (2018) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal, Version 1.2

5.4 Methodology

5.4.1 Desk study

A desk study was conducted in September 2020 to gather baseline data in relation to site. The following sources were checked:

- NatureScot Sitelink website for statutory designated sites up to 10km from the site;
- Orkney Local Development Plan for non-statutory designated sites up to 1km from the site;
- Online records from the Orkney Field Club;
- The Orkney LBAP; and
- The Scottish Biodiversity List (SBL).

The following sources were accessed in December 2022 to inform the marine mammal and fish baseline assessment:

- The Joint Nature Conservation Committee (JNCC)³³ & ³⁴;
- Sea Watch Foundation (SWF)³⁵ & ³⁶;
- NatureScot (NS) website³⁷;
- Whale and Dolphin Conservation (WDC)³⁸;
- The Hebridean Whale and Dolphin Trust (HWDT) Whale Track³⁹;
- Orcadian Wildlife (OW)⁴⁰;

³² Available at: <https://www.orkney.gov.uk/Service-Directory/O/Orkney-Local-Development-Plan.htm> (Accessed 11/01/2023)

³³ JNCC Statutory Nature Conservation Agency Protocol for Minimising the Risk of Injury to Marine Mammals from Piling Noise (2010) available at:

http://jncc.defra.gov.uk/pdf/JNCC_Guidelines_Piling%20protocol_August%202010.pdf last accessed 12/12/2022

³⁴ Reid, J B, Evans, P G H, and Northridge, S P. JNCC Atlas of Cetacean Distribution in north-west European waters (2003) available at: <http://jncc.defra.gov.uk/page-2713#download> last accessed 12/12/2022

³⁵ Sea Watch Foundation Cetaceans of Orkney available at: <https://seawatchfoundation.org.uk/wp-content/uploads/2012/07/Orkney2.pdf> last accessed 12/12/2022

³⁶ Sea Watch Foundation Recent Sightings Orkney available at: <https://www.seawatchfoundation.org.uk/recent-sightings/> last accessed 12/12/2022

³⁷ SNH About Scotland's Nature: Marine Mammals available at: <https://www.nature.scot/plants-animals-and-fungi/mammals/marine-mammals> last accessed 12/12/2022

³⁸ WDC species guides available at: <https://uk.whales.org/whales-dolphins/species-guide/> last accessed 12/12/2022

³⁹ HWDT sightings data available at: <https://whaletrack.hwtd.org/sightings-map/> last accessed 12/12/2022

⁴⁰ Orcadian Wildlife information available at: <http://orcadianwildlife.co.uk/wPress/cetaceans-in-orkney/> last accessed 12/12/2022

- Scottish Marine Animal Stranding Scheme (SMASS)⁴¹;
- NS⁴²;
- Orkney Marine Mammal Research Initiative (OMMRI)⁴³;
- Marine Directorate (MD) Regional baselines for marine mammal knowledge across the North Sea and Atlantic areas of Scottish waters⁴⁴ and appendices⁴⁵;
- MD Updated Seal Usage Maps: The Estimated at-sea Distribution of Grey and Harbour Seals⁴⁶;
- Scottish Government Designated Sites: Seal Haul out Sites^{47 & 48};
- IUCN Red List⁴⁹
- The Shark Trust basking shark sightings⁵⁰;
- NatureScot Basking shark satellite tagging project, Commissioned Report⁵¹;
- Orkney Trout Fishing Association (OTFA)⁵²;
- Orkney Islands Sea Angling Association (OISAA)⁵³;
- Orkney Skate Trust⁵⁴
- MD Aquaculture – Active Fin-fish Sites⁵⁵; and
- Scotland's Aquaculture⁵⁶

5.4.2 Field Studies

A Phase 1 habitat and National Vegetation Classification (NVC) survey was undertaken by Andrew Upton MCIEEM of Firth Ecology over a number of days from July to October 2021. The vegetation surveys encompassed the site boundary at the time of survey. It should be noted that the site boundary has altered slightly since the survey was conducted but all habitats within the footprint of the development have been surveyed. The vegetation surveys were undertaken in conjunction with a suite of bird surveys which were conducted between November 2020 and September 2022. They included four vantage point surveys per month over the period, in addition to onshore wintering and breeding bird surveys (three per winter and summer season).

An otter survey was conducted by Anne Bignall (self-employed) on July 21st and 23rd 2021 in dry, warm weather, after a prolonged period of dry weather. The survey encompassed the site plus 200m buffer.

A further field survey was conducted by EnviroCentre Ecologists Jennifer Paterson ACIEEM and Mhairi Mackintosh MCIEEM on the 14th of February 2023. This survey included a fish habitat assessment of the Burn of Deepdale, Burn

of Button and Burn Gangsta as well as an otter survey of the site plus 200m buffer. Two camera traps were deployed at potential otter rest features for a two week period to inform further assessment of their use.

Subtidal survey work involved the use of a drop-down camera system for the acquisition of high-definition video and high-resolution stills, and sediment sampling using a 0.1 m² Day grab for subsequent macrofaunal assessment and particle size analysis (PSA). The drop-down camera survey was undertaken on 7th December 2022, with grab sampling taking place on 8th December 2022.

For intertidal habitats, a Phase I survey was carried out to determine the range, distribution and extent of the habitats present by assigning biotopes in situ on vertical (i.e. running from high to low shore) transects, in accordance with best practice guidance. The following methods are based on the Countryside Council for Wales (CCW) 'Handbook for Marine Intertidal Biotope Mapping Survey' (Wyn et al., 2000) and the 'Marine Nature Conservation Review: Rationale and Methods' (Hiscock, 1996). The intertidal survey work was completed on 3rd and 4th December 2022. The surveys were undertaken during the period two hours before and after low water.

Full details of the above surveys can be found in the relevant Technical Appendices: 5.1, 5.2, 5.3, 5.4 and 5.8.

5.4.3 Evaluation of Important Ecological Features

The evaluations are applied to those sites, habitats and species that have been scoped into the assessment. These are termed Important Ecological Features (IEFs).

European, national and local governments and specialist organisations have together identified a large number of sites, habitats and species that provide the key focus for biodiversity conservation in the UK and Ireland, supported by policy and legislation. These provide an objective starting point for identifying the important ecological features that need to be considered. Table 5-3 shows a procedure for determining the geographical level of importance of site designations, habitats and species. Where a feature is important at more than one level in the table, its overriding importance is that of the highest level. Usually only the highest level of legal protection is listed.

⁴¹ Scottish Marine Animal Stranding Scheme (SMASS) available at: <https://strandings.org/map/> last accessed 10/04/2023

⁴² NatureScot Seals available at: <https://www.nature.scot/plants-animals-and-fungi/mammals/marine-mammals/seals> last accessed 12/12/2022

⁴³ Orkney Marine Mammal Research Initiative data request, available at: <https://ommri.org/> last accessed 18/05/2023

⁴⁴ Marine Scotland 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, available at: <https://data.marine.gov.scot/sites/default/files/Scottish%20Marine%20and%20Freshwater%20Science%20%28SMFS%29%20Vol%2011%20No%2012%20Regional%20baselines%20for%20marine%20mammal%20knowledge%20across%20the%20North%20Sea%20and%20Atlantic%20areas%20of%20Scottish%20waters.pdf>

⁴⁵ Regional baselines for marine mammal knowledge across the North Sea and Atlantic areas of Scottish waters: Appendix 3 - SCANS surveys Scottish Marine and Freshwater Science Vol 11 No 12, available at: <https://data.marine.gov.scot/sites/default/files/Scottish%20Marine%20and%20Freshwater%20Science%20%28SMFS%29%20Vol%2011%20No%2012%20Regional%20baselines%20for%20marine%20mammal%20knowledge%20across%20the%20North%20Sea%20and%20Atlantic%20areas%20of%20Scottish%20waters%20-%20Appendix%203%20SCANS%20surveys%20%281%29.pdf>

⁴⁶ Updated Seal Usage Maps: The Estimated at-sea Distribution of Grey and Harbour Seals, Scottish Marine and Freshwater Science, Vol 8 No 25, available at: <https://data.marine.gov.scot/sites/default/files/SMFS%200825.pdf>

⁴⁷ Scottish Government seal Haul-out maps available at: <http://www.gov.scot/Topics/marine/marine-environment/species/19887/20814/maps> last accessed 12/12/2022

⁴⁸ Haul Out Maps available at: https://webarchive.nrscotland.gov.uk/20180105052418mp_/http://www.gov.scot/Resource/0045/00454617.pdf last accessed 12/12/2022

⁴⁹ IUCN Red List available at: <http://www.iucnredlist.org/> last accessed 12/12/2022

⁵⁰ The Shark Trust basking shark sightings available at: <https://www.sharktrust.org/basking-shark-project> last accessed 12/12/2022

⁵¹ Witt, M.J., Doherty, P.D., Godley, B.J. Graham, R.T. Hawkes, L.A. & Henderson, S.M. 2016. Basking shark satellite tagging project: insights into basking shark (*Cetorhinus maximus*) movement, distribution and behaviour using satellite telemetry. Final Report. Scottish Natural Heritage Commissioned Report No. 908.

⁵² Contact with the Orkney Trout Fishing Association to discuss species information (09/01/2023)

⁵³ Orkney Islands Sea Angling Association list of species, available at: <https://www.orkneycommunities.co.uk/anglingorkney/index.asp?pageid=591698>, last accessed 27/03/2023

⁵⁴ Orkney Skate Trust website available at: <https://www.orkneyskatetrust.co.uk/> (accessed 27/06/2023)

⁵⁵ MarineScotland Aquaculture – active Fin-fish Sites (19.12.2022), available at: <https://marine.gov.scot/maps/1586>, last accessed 09/01/2022

⁵⁶ Scotland's Aquaculture Site Data, available at: http://aquaculture.scotland.gov.uk/data/site_details_record.aspx?site_id=FS1305, last accessed 09/01/2022

Table 5-3: Geographical Level of IEFs

Level of Importance	Sites	Habitats	Species
International	Designated, candidate or proposed Special Areas of Conservation, Special Protection Areas and Ramsar sites; UNESCO (Ecological) World Heritage Sites; UNESCO Biosphere Reserves; Biogenetic Reserves.	A viable area of habitat included in Annex I of the EC Habitats Directive; a habitat area that is critical for a part of the life cycle of an internationally important species.	A European Protected Species; an IUCN Red Data Book species that is globally Vulnerable, Endangered or Critically Endangered.
National (UK)	Sites of Special Scientific Interest; National Nature Reserve; Marine Conservation Zones (UK offshore).	An area of habitat fulfilling the criteria for designation as an SSSI or MCZ; a habitat area that is critical for a part of the life cycle of a nationally important species.	An IUCN Red Data Book species that is Vulnerable, Endangered or Critically Endangered in the UK; a species that is Rare in the UK (<15 10km grid squares); a Schedule 5 (animal) or Schedule 8 (plant) species included in the Wildlife and Countryside Act (WCA) 1981; any species protected under national (UK) legislation where there is the potential for a breach of the legislation; a species that is Vulnerable, Endangered or Critically Endangered in The Vascular Plant Red Data List for Great Britain ⁵⁷ .
National (Scotland)	National Parks; Marine Protected Areas; Marine Consultation Areas.	Scottish Biodiversity List (SBL) Priority Habitats and Priority Marine Features (PMFs) ⁵⁸ (Scotland).	Species of principal importance for biodiversity in the relevant countries ⁵⁹ , including; SBL Priority Species and PMFs (Scotland). Species protected under the Marine Scotland Act 2010.
Regional	Regional Parks (Scotland).	Regional Local Biodiversity Action Plan habitats noted as requiring protection.	A species that is Nationally Scarce in the UK (present in 16-100 10km grid squares); a species that is included in the Regional LBAP; an assemblage of regionally

⁵⁷ Cheffings, C.M. & Farrell, L. (eds), Dines, T.D., Jones, R.A., Leach, S.J., McKean, D.R., Pearman, D.A., Preston, C.D., Rumsey, F.J., Taylor, I. (2005) *The Vascular Plant Red Data List for Great Britain. Species Status No. 7*. JNCC, Peterborough. Available at: <https://hub.jncc.gov.uk/assets/cc1e96f8-b105-4dd0-bd87-4a4f60449907> (accessed 08/09/2020)

Level of Importance	Sites	Habitats	Species
			scarce species.
County / Metropolitan	Woodland Trust Sites; Royal Society for the Protection of Birds Sites; Scottish Wildlife Sites.	County LBAP habitats noted as requiring protection; semi-natural, ancient woodland >0.25ha in extent.	A species that is included in the County LBAP; an assemblage of species that are scarce at the county level.
Local		Semi-natural, ancient woodland <0.25ha in extent; semi-natural habitats that are unique or important in the local area;.	Species as defined by Local Authority lists (if available).
Site		Common and widespread habitats not covered above.	Common and widespread species not covered above.
Negative			An Invasive Non-Native Species (INNS) as defined by the GB Non-Native Species Secretariat (NNSS) and supported by the GB Invasive Non-native Species Strategy (2015).

5.4.4 Impact Assessment

The assessment of impacts describes how the baseline conditions would change as a result of the project and its associated activities and from other developments. The term ‘impact’ is used commonly throughout the EIA process and is usually defined as a change experienced by a receptor (this can be positive, neutral or negative). The term ‘effect’ is commonly used at the conclusion of the EIA process and is usually defined as the consequences for the receptor of an impact after mitigation measures have been taken into account. The EIA Regulations specifically require all likely significant effects to be considered. Therefore, impacts and effects are described separately and the effects for the IEFs are assessed as being either significant or not according to the importance and sensitivity of the IEF.

Significant cumulative effects can result from the individually insignificant but collectively significant effects of actions taking place over a period of time or concentrated in a location, for example:

- Additive / incremental;
- Associated / connected.

5.4.4.1 Assessment Criteria – Magnitude

The CIEEM guidance states that when describing changes/activities and positive or negative impacts, reference should be made to the following parameters where relevant:

⁵⁸ In July 2014, Scottish Ministers adopted a list of 81 priority marine features (PMFs) – many of which are features characteristic of the Scottish marine environment. Most are on other conservation status lists so may be valued higher than this.

⁵⁹ These are all the species that were identified as requiring action in the UKBAP and continue to be regarded as conservation priorities in the subsequent UK Post-2010 Biodiversity Framework, including any additions.

- Magnitude;
- Extent;
- Duration;
- Reversibility; and
- Timing and frequency.

Magnitude refers to the size, amount, intensity and volume of an impact, determined on a quantitative basis if possible, but typically expressed in terms of relative severity, such as major, moderate, low or negligible. Extent, duration, reversibility, timing and frequency of the impact can be assessed separately but they tie in to determine the overall magnitude.

Criteria for describing the magnitude of an impact are presented in Table 5-4 below:

Table 5-4: Criteria for Describing Magnitude of Impact

Magnitude	Description
Major	Total or major loss or alteration to the IEF, such that it will be fundamentally changed and may be lost from the site altogether; and/or loss of a very high or high proportion of the known population or range of the IEF.
Moderate	Loss or alteration to the IEF, such that it will be partially changed; and/or loss of a moderate proportion of the known population or range of the IEF.
Low	Minor shift away from the existing or predicted future baseline conditions. Change arising from the loss or alteration will be discernible but the condition of the IEF will be similar to the pre-development conditions; and/or having a minor impact on the known population or range of the IEF.
Negligible	Very slight change from the existing or predicted future baseline conditions. Change barely discernible, approximating to the 'no change' situation; and/or having a negligible impact on the known population or range of the IEF.

5.4.4.2 Assessment Criteria – Significance

Significance is a concept related to the weight that is attached to effects when decisions are made. For the purposes of EclA, a 'significant effect' is an effect that either supports or undermines biodiversity conservation objectives for IEFs. In broad terms, significant effects encompass effects on the structure and function of defined sites, habitats or ecosystems and the conservation status of habitats and species (including extent, abundance and distribution).

Significant effects are quantified with reference to an appropriate geographic scale (see Table 5.3 above). The CIEEM guidance has one 'level of importance' and a geographical 'scale of significance'. This is to deal with the fact that the geographical scale at which the effect is significant is not necessarily the same as the geographic level of importance of the IEF.

A sensitivity scale is used to assist in the determine the significance of effects, as shown in Table 5-5:

Table 5-5: Sensitivity of Important Ecological Features

Sensitivity	Definition
High	Tolerance: The IEF has a very limited tolerance of the effect.
	Adaptability: The IEF is unable to adapt to the effect.
	Recoverability: The IEF is unable to recover, resulting in permanent or long term (>10 years) change.
Medium	Tolerance: The IEF has limited tolerance of the effect.
	Adaptability: The IEF has limited ability to adapt to the effect.
	Recoverability: The IEF is able to recover to an acceptable status over the medium term (5-10 years).

⁶⁰ SERCON: System for Evaluating Rivers for Conservation, Version 2, Technical Manual. Scottish Natural Heritage (2001).

Low	Tolerance: The IEF has some tolerance of the effect.
	Adaptability: The IEF has some ability to adapt to the effect.
	Recoverability: The IEF is able to recover to an acceptable status over the short term (1-5 years).
Negligible	Tolerance: The IEF is generally tolerant of the effect.
	Adaptability: The IEF can completely adapt to the effect with no detectable changes.
	Recoverability: The IEF is able to recover to an acceptable status near instantaneously (<1 year).

Consideration of conservation status is important for assessing the significance of effects of impacts on individual habitats and species. The Habitats Directive provides a helpful definition of conservation status for habitats and species (as defined by Articles 1 (e) and 1(i)):

For habitats, conservation status is determined by the sum of the influences acting on the habitat and its typical species, that may affect its long-term distribution, structure and functions as well as the long-term survival of its typical species within a given geographical area; and

The conservation status of natural habitats will be taken as 'favourable' when:

- i. its natural range and areas it covers within that range are stable or increasing, and*
- ii. the species structure and functions which are necessary for its long term maintenance exist and are likely to continue to exist for the foreseeable future, and*
- iii. the conservation status of its typical species is favourable as defined in Article 1(i).*

For species, conservation status is determined by the sum of influences acting on the species concerned that may affect the long-term distribution and abundance of its populations within a given geographical area.

The conservation status of species will be taken as 'favourable' when:

- i. population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, and*
- ii. the natural range of the species is neither being reduced for the foreseeable future, and*
- iii. there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.*

The scientific evidence gathered during the assessment process is used along with professional judgement where appropriate to determine the significance of effects according to the guidance above. Where it is not possible to justify a conclusion of no significant effect, a significant effect is assumed based on the Precautionary Principle.

5.4.4.3 Assessment Criteria – Confidence in Predictions

CIEEM does not cover levels of confidence in predictions adequately, therefore an approach has been adopted based on river conservation evaluation⁶⁰. A simple, qualitative index based on professional judgement is assigned to each predicted effect as follows:

- A: high confidence.
- B: intermediate confidence.
- C: low confidence.

Factors influencing confidence include:

- The frequency and effort of field sampling;
- Constraints to the field survey;
- The completeness of the data (field and desk);
- The age of the data (although recent data are not necessarily always more reliable than old data);
- The state of scientific knowledge relating to the predicted effects of development activities on the IEF (the accuracy of the magnitude assessment); and
- The accuracy of the assessment of significance.

5.4.4.4 Assessment Criteria – Success of Mitigation

The word 'mitigation' has developed a wider meaning and common usage in environmental assessment than its strict meaning related to reducing the severity of something. Mitigation can sometimes be used as a generic term for a wide range of counter-acting measures, all of which, as the Directive and Regulations prescribe, are intended to *prevent, reduce and where possible offset any significant adverse effect on the environment*. Mitigation can be used to encompass measures intended to avoid, minimise or compensate for adverse effects (this is the 'mitigation hierarchy').

Mitigation and compensation measures often carry a degree of uncertainty. Uncertainty associated with a design will vary according to a number of factors, such as:

- The technical feasibility of what is proposed;
- The overall quantity of what is proposed;
- The overall quality of what is proposed;
- The level of commitment provided to achieve what is proposed;
- The provision of long-term management; and
- The timescale for predicted benefits.

The following objective scale is used for the success of mitigation:

- Certain/near certain: probability estimated at 95% chance or higher.
- Probable: probability estimated above 50% but below 95%.
- Unlikely: probability estimated above 5% but less than 50%.
- Extremely unlikely: probability estimated at less than 5%.

5.5 Baseline

5.5.1 Designated Sites

A map showing the location of designated sites in relation to the site can be found in Volume 2: Drawing no. 674795-GIS079.

5.5.1.1 Scapa Flow SPA

The Scapa Flow SPA comprises a total area of 31819 ha located within Scapa Flow, an enclosed sea area, sheltered by Mainland Orkney to the north, Hoy, South Walls and Flotta to the west and south, and Burray and South Ronaldsay to the east. The Flow is linked to the Pentland Firth in the south through the Sound of Hoxa, and to the Atlantic Ocean in the west through Hoy Sound. The site also includes nearshore waters to the east of Orkney, extending from South Ronaldsay to Deerness, and including the sheltered shallow waters of Holm Sound, between Burray and East Mainland. It encompasses a range sheltered and diverse marine communities which provide a range of food resource for breeding, moulting and roosting sea birds.

The SPA supports the following species:

- The third largest population of wintering Great Northern Diver (c.20% of the GB population or 500 individuals).
- Wintering Black-throated Diver (c. 9.5% of the GB population or 57 individuals).
- Wintering Slavonian Grebe (c.12% of GB population or 135 birds)
- The second largest population of wintering European shag in Scotland (c.3% of GB population or 2927 individuals)
- Wintering Common Eider (3% of GB population or 1997 individuals)
- Wintering Red-breasted Merganser (6% of GB population or 539 individuals)
- Wintering Long-tailed Duck (13% of GB population or 1395 individuals)
- Red-throated Diver (c.6% of GB population or 76 pairs) breeding within fresh water lochans within 10km of the SPA.

All the designated site features are assessed as favourable.

5.5.1.2 Orkney Mainland Moors SPA/West Mainland Moors SSSI

The SPA comprises three separate areas which are also designated as three different SSSIs. Based on the SSSI designations, Red-throated diver are primarily located within the West Mainland Moorlands area, located within the north of the Orkney Mainland, to the north west of Kirkwall. It consists of a large area of blanket bog, wet and dry heath with several lochans which support c.18 pairs of Red-throated diver (2% of the GB population). The feature was considered to be favourable maintained at the last condition assessment (2007).

5.5.1.3 Sanday SAC and SSSI

The site is comprises the north and east coast of Sanday from Holms of Ire in the north to Kettletoft bay in the south. The SAC also includes the surrounding waters, including the North Ronaldsay Firth, Otters Wick and Bay of Lopness. Harbour seal make use of the rocky shores for breeding and moulting. It is thought to be the biggest colony of harbour seals in Orkney. The seal feature was last assessed in 2013 as unfavourable declining. This is likely due to a wider decline in the harbour seal population within the Orkney, Shetland and east coast of Scotland which has been observed over the last c.20 years.

5.5.2 Terrestrial Habitats

This section should be read in conjunction with Technical Appendix 5.1.

The habitats within the site show a well-established zonation as the influence of the sea decreases with distance inland. Rock crevice vegetation on the cliffs above the beach grade to coastal grassland and coastal heath. In a more natural succession, the upper coastal habitats would grade into non-maritime heath or grassland. Within the site, the grassland within a few meters of the cliff top has been enclosed and improved for agriculture. The fields closest to the coast appear to be the least improved, having been used for grazing only. The fields further inland have been ploughed, re-seeded and used for silage production. Within the grazed fields closer to the coast, there are several areas of marshy grassland where sub-surface water emerges, and trickle feeds down channels onto the beach. Ground water also emerges directly from channels within the cliff face. Table 5-6 below provides a summary of habitats which have been taken forward for assessment, along with the area present and Ground Water Dependent Terrestrial Ecosystem (GWDTE) status. Although specific conditions assessments haven't been conducted the habitats are all considered to be of reasonable condition. Whilst these habitats are all of conservation importance the examples on site are relatively small and patchy and the majority are reasonably common within the Orkney Isles.

Table 5-6: Habitat Summary

Phase 1 Habitat	NVC Community (or equivalent)	Area present within the site (m ²)
Unimproved acid grassland	U5c <i>Nardus stricta</i> - <i>Galium saxatile</i> , <i>Carex panicea</i> <i>Viola riviniana</i> sub-community	1278
Semi-improved neutral grassland	MG5c <i>Centaurea nigra</i> - <i>Cynosurus cristatus</i> grassland, <i>Danthonia decumbens</i> sub-community	13660
Marshy grassland	M23b <i>Juncus effusus/acutiflorus</i> - <i>Galium palustre</i> rush pasture, <i>Juncus effusus</i> sub-community	5643
	M23Jart <i>Juncus articulatus</i> rush pasture	2653
	M27 <i>Filipendula ulmaria</i> - <i>Angelica sylvestris</i> mire	3862
	M28 <i>Iris pseudacorus</i> - <i>Filipendula ulmaria</i> mire	1447
Bryophyte dominated spring	Tufa forming spring	1230
Crevice/ledge vegetation	MC2 <i>Armeria maritima</i> - <i>Ligusticum scoticum</i> rock-crevice community	80
Coastal grassland	MC9e <i>Festuca rubra</i> - <i>Holcus lanatus</i> maritime grassland, <i>Anthoxanthum odoratum</i> sub-community	10814
Coastal heath	H7d <i>Calluna vulgaris</i> - <i>Scilla verna</i> heath <i>Empetrum nigrum</i> sub-community	2576
	H7b <i>Calluna vulgaris</i> - <i>Scilla verna</i> heath, <i>Viola riviniana</i> sub-community	1254

5.5.3 Terrestrial Mammals

5.5.3.1 Otter

This section should be read in conjunction with Technical Appendix 5.8.

Evidence of otter activity within the site was identified during both surveys, in the form of spraints of varying ages, feeding remains and paths. Three features classed as being 'low' or 'moderate' status rest sites were identified within the site boundary. Use of these features will need to be confirmed with further camera trapping under licence, however none are considered likely to be utilised as breeding sites.

The habitat within the site offers suitable foraging for otter in the locale with the sea and freshwater burns providing a source of fish and other aquatic prey items. The terrestrial habitats on site support other prey species such as amphibians, rabbits and ground nesting birds.

5.5.4 Ornithology

Full details for bird species recorded during the survey work can be found Technical Appendix 5.3: Ornithology Technical Report. These include surveys for SPA qualifying species, flight activity for selected seabird species, wintering bird surveys, breeding bird surveys and notes on raptor observations.

5.5.5 Sub-tidal Habitats

This section should be read in conjunction with Technical Appendix 5.4.

Habitats *Saccharina latissima* and red seaweeds on infralittoral sediments, and loose-lying mats of *Phyllophora crispa* on infralittoral muddy sediment are present within the footprint of the development. These habitats are included within the PMF habitat 'kelp and seaweed communities on sublittoral sediment'. This was the most frequent habitat type identified within the survey, being found in all but one of the transects. The kelp communities identified are typical of low-energy, highly sediment influenced environments and were heavily grazed. None of the associated high or moderate energy biotope components were present.

Areas of hard substrate, comprising a mix of bedrock, boulders and cobbles were observed within three transects closer to the shore, within the site boundary. These include both rocky reef, present as 'stepped' bedrock and stony reef, comprised of cobbles and boulders overlying coarse sediment. The following habitats are considered to be included within the Annex I habitat 'reefs':

- Low energy infralittoral rock
- Grazed, mixed *Laminaria hyperborea* and *Saccharina latissima* on sheltered infralittoral rock
- Grazed *Saccharina latissima* with *Echinus*, brittlestars and coralline crusts on sheltered infralittoral rock
- Infralittoral coarse sediment

Figure 5-1 below shows the known distribution of these habitat types within the wider Orkney Isles.

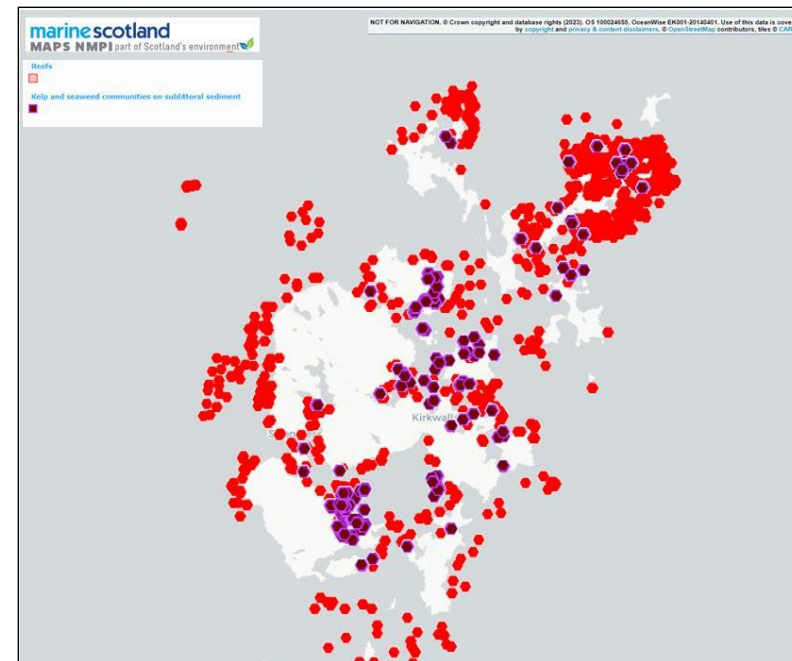


Figure 5-1: Distribution of Reef and Kelp and seaweed beds on sublittoral sediments within the Orkney Isles. Image taken from the NMPI. Data is from the Geodatabase of Marine features adjacent to Scotland (GeMS) v10 (i26).

5.5.6 Marine Mammals

This section should be read in conjunction with Technical Appendix 5.2: Marine Mammal and Fish Baseline.

5.5.6.1 Grey Seal

Orkney is a stronghold for breeding grey seals and is part of the North Coast and Orkney Seal Management Unit (SMU). It is estimated that the Orkney colonies produced nearly a third of UK pups in 2019⁶¹. The overall trend is for an increased numbers in the UK population but there was a slight reduction in the Orkney population estimate between 2016 and 2019.

The site is not within a designated site for grey seal but habitat is suitable to be used as an occasional haul out. The waters surrounding the site are home to various gadoids and flat fish which are grey seal prey species. There are many seal haul outs, two SSSIs and an SAC designated for grey seals within 100km of the site, which is considered to be their typical foraging range. It is therefore likely that grey seal will utilise waters within and surrounding the site to forage and commute between haul out sites. The estimated sea usage for grey seals within the area is slightly less than other areas of the Orkney Isles though (10 - <50 vs >100 individuals per 5km² to the north, east and south).

5.5.6.2 Harbour seal

The latest estimate of the UK harbour seal population is 43,750 with the Orkney and North Coast SMU being home to c.4.5% of that⁶². Whilst the overall trend for harbour seals within the UK is increasing, there has been a dramatic change in distribution. Counts within the Orkney and North Coast SMU have gone from c.9000 in the late 1990's to less than 2000 by 2020. Within Scotland there is a general pattern of population increases in the west and losses along the east and north coasts.

The site is not within a designated haul out for harbour seal but the habitat may be suitable for use as an occasional haul out. The waters within and surrounding the site are known to host fish and other suitable prey items for harbour seals however, and there are several designated haul outs, a SSSI and SAC within 50km of the site, which is considered to be the typical foraging range. Harbour seals may therefore use the coastal waters within and adjacent to the site for commuting between haul outs and/or foraging. Estimated at sea usage for the area around the site is c.1- <5 individuals per 5km² vs 10 - <50 to the north and south.

5.5.6.3 Harbour Porpoise

Harbour porpoise are one of the most sighted cetaceans within the UK coastal waters, however there is insufficient data to give a current estimate of population numbers and trends.

223 records of harbour porpoise sightings (dead and alive) within 10km of SDWQ have been submitted to OMMRI between 2013-2017, with five additional records returned for 2022. Scans III density estimates for the Orkney area are for 0.6 – 2.4 individuals per km². The waters surrounding the site are known to be home to fish species which are favoured prey items of harbour porpoise and it is assumed they will utilise the area for foraging.

5.5.6.4 Minke Whale

There is currently no reliable estimate of the minke whale population and trends within UK waters. They are observed regularly, primarily in the summer months, with the main concentration of sightings seen around the Hebrides and Moray Firth.

50 records of minke whale sightings (dead and alive) within 10km of SDWQ have been submitted to OMMRI between 2013-2017, with an additional seven records in 2022. Given the presence of suitable prey items it is considered likely that they will be present within the site occasionally.

5.5.6.5 Risso's Dolphin

Risso's dolphin are present in Scottish waters year-round, with concentrations generally being higher in the summer months and in more offshore waters, particularly to the west of the Outer Hebrides. There are currently no reliable estimates for UK wide population numbers or trends.

51 records of Risso's dolphin sightings within 10km of SDWQ have been submitted to OMMRI between 2013-2017, with 11 additional records returned for 2022. There is suitable prey items and habitat for this species within the site and it is considered likely that they may utilise it for foraging.

5.5.6.6 White-beaked Dolphin

White-beaked dolphin are considered to be present year-round, although they are more abundant in summer months. They can be found in both near and offshore waters, with densities highest in the northwest and east of Scotland. Data relating to population numbers and trends is not available.

Six records of white-beaked dolphin sightings within 10km of SDWQ (Billia Croo, Stromness) have been submitted to OMMRI between 2013-2022.

5.5.6.7 Long-finned pilot whale

Long-finned pilot whales are generally found in deep waters within the north Atlantic but can seasonally be found in more coastal waters in northern Scotland. There is no current population estimate for the UK.

Five records of long-finned pilot whale sightings within 10km of SDWQ (at Billia Croo and Black Craig, Stromness and Warbeth) have been submitted to OMMRI between 2013-2022. Given the suitable habitat it is assumed that long-finned pilot whale may be present within the site occasionally.

5.5.6.8 Killer whale

Killer whales are found in in Scottish waters year round. There are most likely two separate groups, one small pod present in the west, and another group associated with the Northern Isles and the wider North Atlantic. There is no reliable estimate on UK population trends.

10 records of killer whale (43 individuals) off the coast of Orkney, have been submitted to SWF in 2022, with the closest sighting being within Scapa Flow, in proximity to the development site. 25 records of killer whale sightings within 10km of SDWQ have been submitted to OMMRI between 2013-2022. There is suitable habitat and prey species for killer whale within the site.

5.5.7 Fish

This section should be read in conjunction with Technical Appendix 5.2.

⁶¹ Scientific Advice on Matters Related to the Management of Seal Populations: 2021, Natural Environment Research Council Special Committee on Seals. Available at: <http://www.smru.st-andrews.ac.uk/files/2022/08/SCOS-2021.pdf> (Accessed 08/02/2023)

⁶² Scientific Advice on Matters Related to the Management of Seal Populations: 2021, Natural Environment Research Council Special Committee on Seals. Available at: <http://www.smru.st-andrews.ac.uk/files/2022/08/SCOS-2021.pdf> (Accessed 08/02/2023)

5.5.7.1 Basking Sharks

Basking shark can be found in Scottish waters year-round, although they display winter migratory behaviour, with some moving to deeper waters off the Scottish continental shelf, and others travelling south to the Bay of Biscay or the Azores. The highest concentrations of basking shark in Scotland are found along the west coast, around the Hebrides. There is a lack of data to base a population estimate on and no indication as to current population trends.

17 records of basking shark sightings within 10km of SDWQ (Billia Croo and Black Craig, Stromness) have been submitted to OMMRI between 2013-2015, with two additional sightings in 2022 (Houton Bay, Orphir).

5.5.7.2 Marine Fish

There are several species of marine fish which are either known to be present within the site due to records from the Orkney Anglers Association or are considered likely to be present due to their being suitable habitat for them and the site is within the wider known distribution. Exact numbers of the populations at present are not known. There may be seasonal use by some of the species, or use only within specific periods of the lifecycle. For most of the PMFs, the site makes up a relatively small proportion of the known distribution within the Orkney Islands and Scotland.

Flapper skate are considered to be more sensitive and are less widely distributed than others. Records from the Orkney Skate Trust (OST) are concentrated to the north and west of the Mainland. There are no records for the proposed development site, however, OST have confirmed via pers comm that they have not carried out targeted surveys in the area and so the lack of records cannot be taken to mean they aren't present. They reported a historic record (date not provided) of a tagged adult near H.M.S Royal Oak which is c.2km to the north west of the site. The intertidal and sub-tidal habitat surveys conducted in December 2022 found that the seabed habitats within the proposed development site comprised soft, muddy sand sediments. There are some areas of hard substrate in the inshore sections of the survey area (within the consent boundary), however these were shallow (<20 m). The habitat therefore may be sub-optimal for egg laying.

Visual searches for flapper skate and egg cases (or any elasmobranch egg cases) were made via underwater video and intertidal transects but none found (Seastar, pers comm). Further investigation is planned to confirm their presence/absence from the site.

5.5.7.3 Commercial Fisheries

The Westerbister fishery is c.500m south of the proposed development. It is comprised of 16 pens and stocks Atlantic salmon. There are a further two fisheries which are outwith the predicted ZOI, these are Hunda, c.7km to the south and Toyneess c.9.5km to the west.

5.5.8 Prediction of Future Baseline

The future baseline scenario, if the proposed development does not go ahead, outlined within the Orkney Harbour Masterplan Strategic Environmental Assessment⁶³ has been used for the basis of this impact assessment. The predicted future changes to the current baseline, without out intervention are as follows:

- Increase in plankton blooms and plankton biomass.
- Deterioration of seabird populations.
- Deterioration of harbour seals populations.
- Deterioration of sharks and rays.
- Impacts resulting from ocean acidification especially those on calcareous organisms.

- Shift in warm water species northwards due to ocean warming i.e. increased numbers of basking shark and a potential decline in cold water species.
- Non-Native Species introductions are likely to continue and established species may become more widespread with a decline in native species.
- Damage caused by anchors and moorings and scallop dredging will continue to impact seabed habitats.

5.5.9 Evaluation

The evaluations have been applied only to those designated sites, habitats and species that have been scoped into the assessment and those where there is the potential for impacts that could result in significant adverse ecological effects as a result of the proposed development. The IEFs and the evaluations are presented in Table 5-7 below.

Table 5-7: Evaluation of Important Ecological Features

IEF	Present on site?	Present in wider area?	Importance	Justification
Scapa Flow SPA	Y	Y	International	European designated site
Orkney Mainland Moors SPA	N	Y	International	European designated site
Sanday SAC and East Sanday SSSI	N	Y	International	European designated site
Unimproved acid grassland	Y	Y	National (Scotland)	SBL Priority Habitat (Lowland dry acid grassland)
Semi-improved neutral grassland	Y	Y	National (Scotland)	SBL Priority Habitat (Lowland Meadow)
Marshy grassland	Y	Y	National (Scotland)	SBL Priority Habitat (Purple moor and rush pasture)
Bryophyte dominated spring	Y	Y	International	Annex I habitat (Petrifying springs with tufa formations)
Crevice/ledge vegetation	Y	Y	International	Annex I habitat (Vegetated sea-cliffs)
Coastal grassland	Y	Y	International	Annex I habitat (Vegetated sea-cliffs)

⁶³ Orkney Islands Council – Harbour Authority (2019) Draft Orkney Harbours Masterplan Phase 1 Strategic Environmental Assessment – Environmental Report.

IEF	Present on site?	Present in wider area?	Importance	Justification
Coastal heath	Y	Y	International	Annex I habitat (Dry heaths)
Otter	Y	Y	International	European protected species (EPS)
Kelp and seaweed communities on sublittoral sediment	Y	Y	National (Scotland)	PMF Habitat
Reefs	Y	Y	International	Annex I habitat
Grey and harbour seals	N	Y	National (Scotland)	Protected under the Marine Scotland Act 2010.
Harbour porpoise	N	Y	International	EPS
Minke whale	N	Y	International	EPS
Risso's dolphin, white-beaked dolphin, long-finned pilot whale, killer whale	N	Y	International	EPS
Basking shark	N	Y	International	Endangered on IUCN red list
Marine Fish	Y	Y	National (Scotland)	PMF Species
			International – Flapper Skate	Critically Endangered on IUCN red list
Commercial Fishery	N	Y	N/A	Whilst Atlantic salmon are EPS in the wild. There is no conservation protection for farmed salmon. They have however been included in the assessment for welfare purposes.

5.6 Impact Assessment

5.6.1 Scapa Flow SPA

5.6.1.1 Construction Impacts

Construction activities including dredging and piling and could result in injury or death of individual birds which are features of the SPA, reducing the overall population utilising the site. This could be due to above or below water collision with vessels, plant or machinery, or indirectly through underwater shock waves. The effects of underwater noise on birds are not as well understood as other groups such as marine mammals and they have not been included within the underwater noise assessment, however, the authors have previous knowledge of blasting causing mortality in diving birds at close range, most likely caused by barotrauma. Although blasting is not considered to be a project requirement at present, noise generated from commencement of close-range piling could have a similar impact.

Injury or death could also occur as a result of a pollution incident such as a fuel or oil spill. Release of toxic materials during dredging is not considered to be an issue as sediment sampling found no contaminants at levels likely to significantly affect water quality or pose a hazard to marine life.

Disturbance as a result of increased noise, vibrations and human presence could result in temporary displacement from feeding and loafing habitat, altering the distribution of the species within the SPA. There may also be indirect effects if prey species are killed or displaced as a result of collision, underwater noise or pollutants entering the water.

The described impacts are likely to be fairly localised to the proposed works thus affecting a small proportion of the designated site which is 31819ha. Due to the temporary nature of the impacts, it is considered that any resulting reduction in numbers of birds utilising the site, alterations in their distribution or reduction/alternation of available prey would also be temporary, with populations recovering through future recruitment.

Impacts during the construction phase will be temporary and are considered to be **low in magnitude**. The IEF is considered to have a **low sensitivity** as the SPA is large in comparison to the predicted Zol and the designated features are mobile and have the ability to move into alternative suitable habitat. The confidence level for the assessment is considered to be high.

5.6.1.2 Operational Impacts

Currently there is very little marine traffic within the site itself. The initial phases of the project will see a slight increase with less than 30 vessel movements anticipated annually from 2028 – 2031 (Chapter 2, section 2.7.4). There is less certainty on likely vessel usage beyond this period but numbers are likely to remain relatively low. The wider Scapa Flow area has significantly higher levels of marine traffic with 65 average weekly vessels movements on the approach to the nearby Scapa Pier from 2012 – 2017⁶⁴.

Impacts during construction are considered to be **low in magnitude**. The IEF is considered to have a **low sensitivity**. The confidence level for the assessment is considered to be high.

5.6.2 Orkney Mainland Moors SPA/ West Mainland Moors SSSI

5.6.2.1 Construction Impacts

There are no predicted impacts to Red-throated divers or habitat which support them within the SPA/SSSI as it is outside the predicted Zol. Red-throated divers breeding within the designated site, however, feed almost exclusively

⁶⁴ Figure based on AIS Shipping Traffic 2012-2017 average weekly density of all vessel types. Data available at: <https://marinescotland.atkinsgeospatial.com/nmpi/> (Accessed 1/04/2023)

in the marine environment, up to 13.5km from their nesting site. They have been included as a feature of the North Orkney and Scapa Flow SPAs, for this reason. It is anticipated that predicted impacts described in section 5.6.1.1 above would also be relevant for the Red-throated Diver feature of the Orkney Mainland Moors SPA.

With regards to the SPA conservation objectives, the impacts could temporarily affect the viability of the Red-throated Diver population if there is reduced breeding effort as a result of injury, mortalities or additional energy expenditure as a result of displacement from feeding grounds. Impacts would be temporary and would affect a small proportion of the population.

Impacts during the construction phase are considered to be **low in magnitude**. The IEF is considered to have a **low sensitivity** as individuals could adapt by utilise alternative habitat and any reduction in population would likely recover within a short timeframe. The confidence level for the assessment is considered to be high.

5.6.2.2 Operational Impacts

Operational impacts would be as described for Red-throated Diver within the Scapa Flow SPA (section 5.6.1.2) and impacts are considered to be of **low magnitude**, with the IEF having **low sensitivity** with regards to the predicted impacts. The confidence level for the assessment is considered to be high.

5.6.3 Sanday SAC and SSSI

5.6.3.1 Construction Impacts

The designated site is c.59km from the proposed development as the seal swims. It is not anticipated that there will be any disturbance to harbour seals or their habitats within the designated sites themselves. Harbour seal are known to travel up to 50 km, between haul outs and feeding areas and so it is less likely seal could be present within waters surrounding the development site. Details of the predicted impacts to seals as a result of construction activities is provided in section 5.6.8.1.

In relation to the conservation objectives of the designated sites, the impacts will be temporary and only affect individuals and/or prey within a relatively small area of supporting habitat outside of the sites. Harbour seal density maps (Figure 2-32 in Technical Appendix 5.2: Marine Mammal and Fish Baseline) indicate that waters to the south of the Orkney Mainland, where impacts will be experienced, are less well used than areas to the north and south (1 - <5 vs 10 – 50 individuals per 5km²). It is therefore considered that whilst the area to be impacted may support SAC/SSSI populations, it is unlikely to be critical habitat.

The impacts are considered to be of **low magnitude** and the IEF considered to be of **negligible sensitivity** as it is considered that due to their mobility seals will easily be able to adapt by utilising alternative habitats if necessary. The confidence level for the assessment is high.

5.6.3.2 Operational Impacts

It is not considered that there will be any operational impacts to seal or habitats within the SACs/SSSIs. There may be some impacts to seal utilising habitat outside of the designated sites as described in section 5.6.8.2. The impacts associated with disturbance from increased vessel movements will be permanent, but the increase is relatively small and it is considered that seals utilising waters around the site will be somewhat habituated to vessel activity associated with Scapa Pier and the oil industry related activities in the wider Scapa Flow. If there is some displacement from areas of high activity, it is considered that there is sufficient alternative habitat for foraging and commuting and so there is unlikely to be an effect on the conservation status of populations within the designated sites.

Similarly, temporary impacts arising from any pollution events or vessel strike will be localised and unlikely to cause a reduction in the overall population.

The operational impacts are of **low magnitude** and the SAC/SSSI are considered to be of **negligible sensitivity**. The confidence level for the assessment is high.

5.6.4 Terrestrial Habitats

5.6.4.1 Construction Impacts

The majority of the terrestrial habitats associated with the site will be removed to facilitate the development. Due to the nature of the proposed development (requiring considerable ground works during development and hard surfaced areas post-development for laydown etc) there is no capacity to retain the habitats within the development footprint. Table 5-8 below shows the total and percentage area of habitats to be lost within the site. A map showing the location of the habitats in relation to the development footprint can be found in Volume 2; Drawing no. 674795-GIS139. The loss of these habitats will be permanent and irreversible. By design, the tufa forming springs may be re-created within the development design as the rock face at the rear of the laydown area is the same as the existing cliff face and is likely to have the same ground water intrusions flowing through.

Where habitats are only being partially removed, the retained habitat may be subject to temporary damage as a result of plant movement, trampling by site personnel or pollution incidents.

Table 5-8 Summary of habitats lost

Phase 1 Habitat	NVC Community (or equivalent)	Area lost (m ²)	Area lost (%)
Unimproved acid grassland	U5c <i>Nardus stricta</i> - <i>Galium saxatile</i> , <i>Carex panicea</i> <i>Viola riviniana</i> sub-community	1278	100
Semi-improved neutral grassland	MG5c <i>Centaurea nigra</i> - <i>Cynosurus cristatus</i> grassland, <i>Danthonia decumbens</i> sub-community	9382	69
Marshy grassland	M23b <i>Juncus effusus/acutiflorus</i> - <i>Galium palustre</i> rush pasture, <i>Juncus effusus</i> sub-community	5643	100
	M23Jart <i>Juncus articulatus</i> rush pasture	2653	100
	M27 <i>Filipendula ulmaria</i> - <i>Angelica sylvestris</i> mire	1644	43
	M28 <i>Iris pseudacorus</i> – <i>Filipendula ulmaria</i> mire	53	4
Bryophyte dominated spring	Tufa forming spring	1032	84
Crevice/ledge vegetation	MC2 <i>Armeria maritima</i> - <i>Ligusticum scoticum</i> rock-crevice community	44	55
Coastal grassland	MC9e <i>Festuca rubra</i> - <i>Holcus lanatus</i> maritime grassland, <i>Anthoxanthum odoratum</i> sub-community	10814	100
Coastal heath	H7d <i>Calluna vulgaris</i> - <i>Scilla verna</i> heath <i>Empetrum nigrum</i> sub-community	2012	78
	H7b <i>Calluna vulgaris</i> - <i>Scilla verna</i> heath, <i>Viola riviniana</i> sub-community	1253	100

For habitats lost, the impact is considered to be of **major magnitude** with the receptor being of **high sensitivity**.

For retained habitats the impact is considered to be of **low magnitude** with the receptor being of **negligible sensitivity**.

The confidence in both these assessments is considered to be high.

5.6.4.2 Operational Impacts

There are no operation impacts for terrestrial habitats predicted as these will be outside of the site boundary or already lost to the development.

5.6.5 Otter

5.6.5.1 Construction Impacts

Construction activities including movement of rock armour, piling and dredging could result in death or injury of individuals through collision with plant, vehicles or vessels both onshore or within the water. Underwater noise generated by these activities also has potential to cause injury via Permanent Threshold Shift (PTS) or Temporary Threshold Shift (TTS) in hearing. The predicted range for TTS and PTS arising for any of the activities is less than 50m from the activity location. (Technical appendix 5.6, Table 6).

The most likely response to construction activities, however, is avoidance. It is anticipated that alterations to normal site activities would result in visual and noise disturbance, causing otter who may utilise the site for commuting and foraging to avoid it. This may reduce the overall foraging area available to otter in the locale, but it is considered that there would be sufficient alternative foraging areas and commuting routes to sustain the population. The risk of injury or death occurring is also greatly reduced if they avoid the area.

Death or injury to otter could also occur as a result of a pollution incident, either through direct contact with a contaminant or indirectly through consumption of affected prey items. Prey populations in the locale could also be temporarily reduced in the short term if they are affected by a pollution incident.

Suitable habitat within the development footprint for foraging and resting will be permanently lost, however the area is relatively small compared to the available habitat in the wider area. It is not considered that the development would represent a barrier to movement or fragmentation of otter territories.

All the construction impacts are considered to be temporary and are only expected to affect a small area of habitat which is not considered to be used for breeding. It is not expected that they will affect the favourable conservation status of the otter population in the locale. As such the impacts are considered to be of **low magnitude** and the IEF to be of **low sensitivity**. The confidence level for the assessment is high.

5.6.5.2 Operational Impacts

During operation there will be increased activity within the site in terms of vessel movements to and from the pier as well as onshore activities within the laydown area and access road. Given otter in other locations are known to utilise busy ports it is considered likely that any otter utilising the site at present may become habituated to the additional activities. No lighting assessment has been completed and so it is not known how the post-development lighting will compare to current levels. Increased artificial lighting could result in the permanent or temporary avoidance of lit areas, reducing available foraging and commuting habitat. It is unlikely that the area affected would be significant in terms of otter territory though. Additional vehicle movements may increase the risk of a road traffic accident occurring but individual losses are unlikely to affect the population viability.

Additional vessel movements at the site may increase the risk of a pollution event which could result in death or injury of individuals or their prey. Any impacts arising from such an event would be temporary and not considered likely to impact the conservation status of the otter population in the longer term.

Operational impacts are therefore considered to be of **low magnitude** and the IEF having **low sensitivity**. The confidence level for the assessment is high.

5.6.6 Ornithology

5.6.6.1 Construction Impacts

Based on the breeding bird baseline surveys, the creation of the access road and laydown area could possibly result in the loss of up to 12 pairs of Oystercatcher, one pair of Curlew, up to three pairs of Lapwing, one pair each of Redshank and Ringed Plover and up to five pairs of Skylark. However, the loss of suitable nesting habitat is considered small as suitable habitat is prevalent in the wider site environs. As such the impacts are considered to be of **low magnitude** and the IEFs to be of **low sensitivity**. The confidence level for the assessment is high.

Construction works could result in the loss of 32Ha of open water habitat which could be utilised by foraging tern species. However, this is a small area compared to the overall size of Scapa Flow (this loss represents 0.1% of the Scapa Flow SPA area). Disturbance and habitat displacement through piling and dredging activities could occur, however this is small in scale (limited to the development footprint) and short term. Impacts are therefore considered to be of **low magnitude** and the IEF having **low sensitivity**. The confidence level for the assessment is high.

5.6.6.2 Operational Impacts

During operation there will be increased activity within the site in terms of vessel movements to and from the pier as well as onshore activities within the laydown area and access road. However, it is likely that birds will become habituated to these additional activities.

Additional vessel movements at the site may increase the risk of a pollution event which could result in death or injury of individuals or their prey. Any impacts arising from such an event would be temporary and not considered likely to impact the conservation status of these bird populations in the longer term.

Operational impacts are therefore considered to be of **low magnitude** and the IEF having **low sensitivity**. The confidence level for the assessment is high.

5.6.7 Subtidal habitats

5.6.7.1 Construction Impacts

Some of the kelp and seaweed communities on sublittoral sediment and all of the reef habitats identified in the transects will be lost permanently under the development footprint. There are areas of the kelp PMF in the wider survey area which will be retained but may be temporarily damaged as result of sediment deposition from dredging works or a pollution incident. There is also a risk of introduction of mNNS through construction activities which could result in longer term damage or degradation of the retained kelp PMF with INNS outcompeting the native flora or fauna.

For habitats lost, the impact is considered to be of **major magnitude** with the receptor being of **high sensitivity**.

For retained habitats the impact is considered to be of **low magnitude** with the receptor being of **low sensitivity**.

Confidence in both the assessments is high.

5.6.7.2 Operational Impacts

Operational impacts to retained habitats may arise through a pollution incident occurring. This could result in the death of key floral and faunal species. Impacts relating to a pollution incident will be temporary and reversible. Increased vessel movements may result in introduction of mNNS which could result in longer term damage or degradation of the retained kelp PMF with INNS outcompeting the native flora or fauna.

Propellor scour from approaching vessels is considered to be unlikely (see Chapter 2, section 2.7.5).

The impact is of **low magnitude** with the receptor being of **low sensitivity**. Confidence in the assessment is high.

5.6.8 Seals

5.6.8.1 Construction Impacts

Construction activities including piling and dredging will result in underwater noise which can cause injuries and result in a PTS or TTS in hearing. Prolonged exposure to underwater noise below the PTS and TTS thresholds can reduce individual fitness as it interferes with individuals' ability to communicate with others, feed and navigate in an effect known as masking. Behavioural responses to underwater noise also include avoidance behaviours either by hauling out or moving away from the underwater noise source. These may result in reduced foraging time and/or increased energy expenditure. In extreme cases, exposure to high levels of underwater noise can result in death.

Underwater noise modelling suggests for dredging and vibro piling the PTS range is 50m or less for 1 hour exposure and it is considered likely that any individual within the area would move away from the sound source fairly quickly once commenced. The effects of this will most likely be temporary displacement of individuals from the waters surrounding the site. It is not considered that the habitat is important for breeding, mating or resting and that there are sufficient alternative foraging areas for them to utilise.

Impacts to seals may also arise through pollution events resulting in death or injury to individuals either directly or indirectly through consumption of contaminated prey. Prey populations may also be reduced in the short term.

Due to the temporary nature of the construction impacts, the relatively small area in which individuals could be exposed, and the lack of impacts to known breeding and mating sites, it is not considered that these would have a longer term affect on the population viability within the Orkney and North Coast SMU.

Impacts are considered to be of **low magnitude** with the IEF having **low sensitivity**. There is a high confidence in the assessment.

5.6.8.2 Operational Impacts

There are no ongoing maintenance activities anticipated at the development which will result in underwater noise. Maintenance dredging is not expected. The main impact to seals will likely arise from the permanent increase in vessel movements, potentially resulting in disturbance and avoidance. If there is some displacement from areas of high activity, it is considered that there is sufficient alternative habitat for foraging and commuting and would not detrimentally affect the population of either species.

Increased vessel movements will also increase the risk of pollution events and vessel strike. Although vessel strikes are generally more associated with larger and less agile marine mammals, and so the numbers affected will likely be minimal. The effects of these impacts will be highly localised and unlikely to affect the conservation status of either species.

The operational impacts are of **negligible magnitude** and IEFs are considered to be of **negligible sensitivity**. The confidence level for the assessment is high.

5.6.9 Harbour Porpoise

5.6.9.1 Construction Impacts

The main impact which will arise during construction are related to underwater noise. Estimated threshold ranges for TTS and PTS for 1 hour exposure to dredging noise are 4km and 500m respectively. The ranges for vibro piling are much less, with a PTS range of 75m. For dredging and vibro piling it is expected that individuals would move

away from the sound source quickly and injuries are unlikely to occur. The effect of noise generation associated with these activities is more likely to be displacement from a relatively small area of foraging habitat.

Impacts from pollution events may also occur, affecting individuals directly or indirectly through ingested prey items. Such an event is likely to be localised and temporary in nature.

Although there is no current population estimate for the UK it is considered that due to the relatively small area likely to be impacted and the fact that harbour porpoise are very mobile and wide ranging, there is unlikely to be an effect on the overall population viability or functioning of its supporting habitat.

The impact is considered to be of **low magnitude** with the IEF having **low sensitivity**. Confidence in the assessment is intermediate due to lack of available data on the baseline population.

5.6.9.2 Operational Impacts

Operational impacts predicted to be experienced by harbour porpoise are similar to those described for seals in section 2.4.1.2 (increased vessel movements, risk of pollution and vessel strike). As with seal, harbour porpoise are regularly found in waters with relatively high levels of marine traffic and are agile swimmers and so disturbance and vessel strike effects will be minimal.

These impacts are not considered likely to impact on the conservation status of porpoise at the UK or on a local level.

The operational impacts are of **negligible magnitude** and IEFs are considered to be of **negligible sensitivity**. The confidence level for the assessment is intermediate due to lack of available data on the baseline population.

5.6.10 Minke Whale

5.6.10.1 Construction Impacts

As with other marine mammals discussed, the main impacts to minke whale are likely to arise from underwater noise generation. Dredging and vibro piling activities have PTS ranges of 65m and 200m respectively, and will primarily result in a temporary avoidance effect.

Pollution impacts will be as described for previous marine mammals.

Although there are gaps in the data regarding minke whale populations, given the infrequent records within the area and localised nature of the impacts it is unlikely that there will be an effect on the local conservation status or wider population.

It is considered that impacts will be of **low magnitude** and the IEF is of **low sensitivity**. The confidence level for the assessment is intermediate due to lack of available data on the baseline population.

5.6.10.2 Operational Impacts

Operational impacts predicted for minke whale will be similar to those described for seals and harbour porpoise. Minke whale may experience greater negative effects as a result of increased vessel movements, in part as the low frequency noise generated may interfere with their communication. Unlike some other species, minke whale are

less able to adapt their vocalisations to adapt to increased background noise⁶⁵. They are also less able to manoeuvre away from vessels to avoid vessel strike. Existing records suggest they are not regularly present within the likely impacted area however and so effects on the conservation status are not predicted.

It is considered that impacts will be of **negligible magnitude** and the IEF is of **low sensitivity**. The confidence level for the assessment is intermediate due to lack of available data on the baseline population.

5.6.11 Dolphins

5.6.11.1 Construction Impacts

As with other marine mammals, the greatest impact to dolphins (including Risso's dolphin, white-beaked dolphin, long-finned pilot whale and killer whale) is underwater noise generation. The range over which this hearing group is expected to be impacted is much lower than other groups however with a PTS threshold range of just <50m for dredging and vibro piling.

Impacts from pollution events are also a possibility for this group.

The construction impacts are temporary in nature and due to the infrequent sightings of these species and relatively small area of habitat they utilise, minimal numbers of individuals are likely to be impacted. No effects on the favourable conservation status of the species are considered likely.

It is considered that impacts will be of **low magnitude** and the IEF is of **low sensitivity**. The confidence level for the assessment is intermediate due to lack of available data on the baseline population.

5.6.11.2 Operational Impacts

Operational impacts for dolphin species will be as described for other marine mammals.

Due to the limited number of individuals and small size of habitat likely to be affected, no effects on the conservation status of any of the species is considered likely.

It is considered that impacts will be of **negligible magnitude** and the IEF is of **low sensitivity**. The confidence level for the assessment is intermediate due to lack of available data on the baseline population.

5.6.12 Basking Shark

5.6.12.1 Construction Impacts

The effects of underwater noise on fish are less well understood as they are in marine mammals, however there is potential for permanent or temporary injury or in extreme circumstances, death in basking shark. The terminology for fish has a slightly different meaning with PTS thresholds meaning thresholds above which mortality and potential mortal injury or permanent injury. The meaning of TTS (temporary hearing shift) is the same. Underwater noise modelling predicts that the PTS range for basking shark (fish with no swim bladder) is less than 50m for dredging and 175m vibro piling. The highest TTS range is for vibropiling at 2.5km.

Construction impacts may also arise from pollution events which could cause injury or mortality to individuals.

The construction impacts will be temporary, across a small area of possible habitat and so the number of individuals which may be affected it expected to be minimal and have no effect on the wider population.

The impacts will be of **low magnitude** with the IEF being of **low sensitivity**. Due to uncertainties within the underwater noise modelling as well as poor data on basking shark confidence is intermediate.

5.6.12.2 Operational Impacts

Operational impacts are related to higher numbers of vessels. Vessel strikes are of particular concern in basking shark as they move slowly are often found near the surface of the water where they are more likely to come in to contact with propellers. It is unknown how sensitive they are to disturbance from vessel movements.

The increase in vessel numbers will be permanent, however, as basking shark appear to be infrequent visitors to the area which will be impacted, it is unlikely that there will be any effect on the wider population.

The operational impacts are considered to be of **negligible magnitude** with the IEF having a **low sensitivity**. There is intermediate confidence in the assessment due to a lack of data on basking shark populations and behavioural responses.

5.6.13 Marine Fish

5.6.13.1 Construction Impacts

The main impacts to marine fish species are likely to arise from underwater noise and/or pollution. These impacts could result in injury or mortality of individual fish. Pollution events could also have an indirect effect by reducing the quality of the habitat for spawning, nursing or feeding. Underwater noise could result in temporary avoidance as a result of disturbance. The underwater noise thresholds for PTS and TTS for the two fish hearing groups are similar though with only minor differences relating to slightly increased PTS distance in relation to vibropiling (175m for fish with no swim bladder vs <50 for fish with a swim bladder). For most activities generating underwater noise, it is considered that fish would be able to move away from the noise source before injury or death would occur.

Whilst exact population estimates for the site are not known, it is considered that for most of the species, the habitat and number of individuals present within the site is a small proportion of the total population and habitat within the wider range and that overall conservation status is unlikely to be affected.

Due to their late sexual maturation, relatively low reproduction rate and vulnerability of egg cases during a long development period, the flapper skate may be less able to recover from any loss of individuals. Given the Critically Endangered status and ongoing outside pressures on this species (from fishing by-catch primarily) further investigation of their use of the site is to be undertaken to ensure appropriate mitigation is secured.

The construction impacts are considered to be of a **low magnitude** with the IEF having a **negligible – medium sensitivity**. The confidence in the assessment is intermediate.

5.6.13.2 Operational impacts

Impacts to marine fish during the operational phase will most likely be as a result of a pollution event, with the effects as described in section 5.6.13.1 above.

The operational impacts are considered to be of a **negligible magnitude** with the IEF having a **negligible to medium sensitivity**. The confidence in the assessment is intermediate.

⁶⁵ Helble, T.A., Guazza R.A., Martin, C.R., Durbach, Alongi, G.C., Martin, S.W., Boyle, J.K. and Henderson, E.E (2020) Lombard effect: Minke whale boing call source levels vary with natural variations in ocean noise. The Journal of Acoustical Society of America Vol 147 (2).

5.6.14 Commercial Fisheries

5.6.14.1 Construction Impacts

The main impact on salmon present within the commercial fishery would be underwater noise generated by vibro piling and dredging. Unlike wild fish, caged fish can't swim away from the noise and so the threshold for 8 hour exposure to noise for dredging and 1h exposure to noise from vibro-piling have been used in the assessment as this is considered a realistic expectation in this context. For fish with swim bladders not involved in hearing, the PTS ranges are less than 50m for dredging and 175m for vibro-piling and therefore will have no effect on the commercial fishery (approx. 835m away from works). PTS for fish with swim bladders covers 'mortality and potential mortal injury' and 'recoverable injury'. The estimated TTS threshold for dredging and vibro-piling are 3.9km and 2.5km respectively. TTS for fish with swim bladders is where the hearing threshold eventually returns to normal. There is therefore potential for fish within the cages to suffer TTS as they cannot swim away, which may include temporary hearing loss or alteration due to temporarily damaged sensory hair cells and/or auditory nerves. The temporary loss of hearing is not considered to affect the overall fitness of fish, through impairing their ability to assess their environment and find food as the fish in this environment will be regularly fed and therefore do not need to actively hunt for food resources. In addition, fish have the capacity to replace hair cells over time and so exposure to noise at the TTS threshold would only have temporary effects on fish.

It is considered unlikely that any pollution or sedimentation arising from the works area would reach the fish farm in sufficient amounts to cause harm.

The impact is of **low magnitude** and the IEF is considered to have a **low sensitivity**. Due to unknown effects of repeated short term exposure to sounds within the TTS threshold, confidence in the assessment is intermediate.

5.6.14.2 Operational Impacts

No operational impacts to the commercial fishery are considered likely.

5.7 Cumulative Impact Assessment

The OICHA Harbour Masterplan also includes a proposal for extension of the existing pier at Hatston. At the time of writing, this project is being taken forward for planning submission. Many of the impacts to the marine environment are expected to be similar during the construction and operational phases. If the construction phases occur concurrently then additive cumulative effects may occur for the following receptors:

- Scapa Flow SPA
- Orkney Mainland Moors SPA
- Sanday SAC
- Seals
- Harbour porpoise
- Minke whale
- Dolphins
- Basking shark

If the construction phases are sequential then the period these receptors are exposed to impacts may be prolonged. During the operational phase both projects are expected to result in increased vessel movements and therefore cumulative effects associated with impacts resulting from vessel movements are predicted.

For all these receptors the magnitude of impacts are considered to be of low – negligible in magnitude and affecting a small area of the relative IEFs range for both projects and so even with cumulative effects, alterations to the overall conservation status of the features is not considered likely.

5.8 Mitigation and Monitoring

5.8.1 Mitigation

5.8.1.1 Construction Phase

The following good practice mitigation measures will be implemented in order to avoid and minimise the negative impacts highlighted in section 2:

- Prior to works commencing on site (including any site clearance or preparatory works) a Construction Environment Management Plan (CEMP) detailing site specific mitigation and monitoring will be agreed with planning authority and implemented to avoid and reduce negative impacts. Advise
- An Environmental Advisor/Manager will be employed to design and implement on site mitigation strategies as they are required.
- An independent Ecological/Environmental Clerk of Works (ECoW) will be employed to audit and report on adherence to the CEMP as well as any other relevant planning consents, environmental permits, legislation and mitigation.
- Terrestrial habitats out-with the footprint of the development should be retained and clearly delimited from the works area in order to reduce the risk of damage.
- Compensation for lost habitats should be provided through offsite habitat enhancement and creation. A detailed Habitat Management Plan containing a baseline survey of the proposed compensatory habitat area, clear management objectives and actions to meet those objectives, and a monitoring plan will be required.
- A silt boom to contain fine sediments will be used whilst land reclamation activities are undertaken.
- Inert stone material free from fine clays or organic materials will be utilised to form the outer bunds for land reclamation.
- The following good practice guidelines shall be adhered to and incorporated into the CEMP:
 - GGP 5: Works and maintenance in or near water;
 - PPG 6: Working at construction and demolition sites;
 - PPG 7: Safe Storage – The safe operation of refuelling facilities;
 - GPP 21: Pollution and incident response planning; and
 - GPP 22: Dealing with spills..
- All personal on the site should be made aware of the environmental sensitivities of the site (proximity to designated sites and presence of protected species including otter, marine mammals and fish) via the site induction and additional task specific toolbox talks as required.
- A pre-works check for otter should be conducted prior to works commencing on the site and regularly throughout works. If otter are observed on site at any point during construction, works within the immediate area should be halted and advice sought from the environmental advisor. If a resting site is identified either during the pre-works check or during works, a species protection plan will be required and the need for a European Protected Species (EPS) derogation licence for disturbance will be assessed.
- Where possible construction activities will be confined to daylight hours to reduce disturbance to commuting and foraging otter within the locale.
- Any artificial light required during construction will be fitted with shades and directed at the required work area only.
- A Marine Mammal Protection Plan as detailed in Technical Appendix 5.7 will be implemented to reduce the risk of underwater noise causing injury to marine mammals (and basking shark). This will involve the use of a trained Marine Mammal Observer (MMO), Passive Acoustic Monitoring (PAM) devices and soft-start techniques for vibro-piling. The MMPP also details protocols to be implemented to reduce collision risk.
- The ECoW or MMO should monitor any fish deaths as a result of activities such as vibro-piling and report these to NatureScot and Marine Scotland (number of fish and species). Consideration should be given to mitigation strategies to reduce fish mortality if it becomes an issue. This can be difficult to do however with

some strategies such as the use of netting or bubble curtains sometimes having the effect of preventing fish from moving away from noisy activities.

- Further survey to confirm flapper skate presence will be conducted and further species specific mitigation measures agreed with regulatory authorities in advance of works commencing if necessary.
- The principal contractor will produce and implement a biosecurity plan throughout the duration of works. This will include the cleaning of equipment and plant machinery prior to deployment and at regular intervals throughout to reduce risk of transmitting non-native and invasive species. The plan will be submitted to the planning authority and other relevant consultees for approval prior to works commencing and implementation would be audited by the ECoW.
- A strict speed limit for both onshore and marine traffic will be implemented to reduce risk of collision with protected species (15mph on shore and 4 knots within the water).

5.8.1.2 Operation Phase

During the operational phase of the development, the following mitigation measures will be undertaken to avoid and minimise the predicted negative impacts:

- Implementation of Ballast Water Management Plan and industry standard ballast water management practices⁶⁶.
- Implementation of a vessel management plan including agreed routes and speed limits.
- Safe vessel operation to minimise risk of collision with marine mammals and basking shark to be promoted to users. Training courses such as those provided by the WiSe scheme⁶⁷ could be offered at regular intervals.
- Onshore speed limits will be kept at 15mph to reduce otter collision risk.
- Continuation of the Harbour Authorities biosecurity monitoring programme as detailed in the existing Ballast Water Management Policy⁶⁸.
- Permanent lighting design will be kept to the minimum required for health and safety and security purposes. All lighting will be fitted with shades and directed at the required areas. The shoreline and surrounding waters will be avoided as far as possible to reduce disturbance to wildlife.

5.8.2 Licensing

Whilst mitigation will reduce the likelihood of impacts from underwater noise, and lessen the severity of the predicted effects, it won't be possible to completely avoid some level of disturbance to marine mammals and basking shark which may be present in the area. It is illegal to intentionally or recklessly disturb cetaceans in Scottish waters, which are all EPS. Basking shark are also protected from disturbance under the WCA. A derogation licence to permit disturbance of harbour porpoise, minke whale, Risso's dolphin, white-beaked dolphin, long-finned pilot whale, killer whale and basking shark, will be required for imperative reasons of overriding public interest.

A licence for destruction of otter resting sites may be required, depending on the outcome of pre-construction monitoring.

⁶⁶ Available at: <https://www.gov.uk/guidance/control-and-management-of-ballast-water> (Accessed 10/04/2023)

⁶⁷ Information available at: <https://www.wisescheme.org/> (accessed 02/03/2023)

⁶⁸ Available at: <https://www.orkneyharbours.com/documents/ballast-water-management-policy> (Accessed 10/01/2023)

⁶⁹ MacArthur, M., Naylor, L.A., Hansom, J.D. and Burrows, M.T. (2020) Ecological enhancement of coastal engineering structures: Passive enhancement techniques. Science of the Total Environment Vol 740. Available at: <https://www.sciencedirect.com/science/article/pii/S0048969720335014#f0005> (Accessed 23/02/2023)

5.8.3 Biodiversity Enhancements

In order to enhance the site for biodiversity a Biodiversity Action Plan (BAP) will be developed for the onshore and intertidal habitats within the site and adjacent Orkney Islands Council Harbour Authority (OICHA) land holdings. This will include specific, measurable objectives for habitat creation and management and cover a period of 30 years, with management to be reviewed regularly and informed by monitoring data. It is anticipated that the following actions will be included:

- Creation of habitat features within the rock armour to maximise ecological niches to support a diverse range of species. This can be achieved passively through careful selection and placement of boulders to create ledges and pools or actively through introduction of features such as ridged concrete tiles which are designed to mimic natural rock features^{69,70}.
- Nest box installation upon suitable onshore buildings and the pier structure. Tunnel type nest boxes could be mounted on/under the quay, c.2m above the water to attract Black Guillemots. Nest boxes on buildings could be used to encourage birds such as swifts, sparrows and other small passerines.
- Creation of insect habitat in the form of rock piles, deadwood piles and/or 'bug hotels' which contain a range of features for sheltering and nesting insects. These could be self-standing or attached to buildings or other infrastructure.

Off-site biodiversity enhancement in the form of native oyster (*Ostrea edulis*) restoration project within the Orkney Isles will also take place.

5.8.4 Monitoring

Monitoring is required to determine the success of mitigation and enhancement measures and provide data on which to base adaptive management when objectives are not being achieved. It is anticipated that the following monitoring will be required during and/or post-construction:

- Regular winter and breeding bird surveys will be conducted throughout the construction period and during the operation of the port to determine if there are changes to bird use, particularly with regards to species which are features of the Scapa Flow SPA. This data would be shared with stakeholders to provide evidence on the impacts of the project which would help inform future planning decisions. It could also be used to inform the need for additional mitigation such as alteration of timings of work to avoid sensitive periods or times of day or provision of screening such as bunds to reduce noise and/or visual disturbance.
- Water quality monitoring will be conducted ahead of construction to gain a baseline and will continue at regular intervals (weekly) throughout construction.
- Underwater noise monitoring will be carried out during high-risk activities such as vibro piling to confirm results of the underwater noise modelling and add confidence in mitigation strategies. Monitoring would likely only be needed for long enough to confirm modelling results and wouldn't necessarily need to be for the duration of works. The cessation of monitoring would be agreed with regulators.
- OICHA has an existing monitoring programme for marine non-native species. Scapa Flow is already included in this and monitoring at the site should continue.

⁷⁰ Vozzo, M.L., Mayer-Pinto, M., Bishop, M.J., Cumbo, V.R., Bugnot, A.B., Dafforn, K.A., Johnston, E.L., Steinberg, P. D. and Strain, E.M.A. (2021) Making seawalls multi-functional: The Positive effects of seeded bivalves and habitat structure on species diversity and filtration rates. Marine Environmental Research Vol 165. Available at: <https://www.sciencedirect.com/science/article/abs/pii/S0141113620310102> (Accessed 23/02/2023).

- Monitoring of created compensatory and enhancement habitats will form part of the BAP. It is anticipated that the onshore habitats will require annual monitoring for the first three years, as they become established and then at five year intervals for the duration of the management plan. The method will follow a site adapted version of the relevant Joint Nature Conservancy Council (JNCC) Common Standards Monitoring guidance⁷¹. The intertidal habitats should also be monitored annually for the first three years and then can be included into the existing OICHA intertidal habitats monitoring plan. Methodology should follow that of the existing monitoring programme. Nest and insect boxes should be checked annually for damage and be replaced as necessary.
- It is worth noting that a survey of the intertidal habitats to gather additional baseline information has been undertaken by OICHA at the development site earlier this year. Further work is ongoing.

5.9 Residual Effects

The significance of residual effects considered to be likely, once mitigation has been taken into consideration are summarised in table 5-9 below.

5.10 Statement of Significance

Once mitigation has been taken into consideration, the only significant effect after mitigation is taken into consideration is the loss of a small areas of Annex I, SBL and PMF habitats under the development of the footprint. This is considered to be significant at a site level only as the habitats are relatively widespread within the Orkney Islands and the loss will not affect the overall conservation status. No significant effects on other Important Ecological Features are predicted. Whilst there are some uncertainties or limitations in the assessments and/or mitigation proposed, it is anticipated that monitoring both during construction and through operation will allow for mitigation to be adapted as necessary. There is a possibility of a small number of individual birds, otter, marine mammals or basking sharks experiencing disturbance or being displaced from a small area of their habitat but this is not considered likely to affect the favourable conservation status of populations in a local, national or international context. A derogation licence will be required for disturbance to cetaceans and basking sharks. A licence may be required in relation to destruction of otter resting sites. If successfully implemented, the biodiversity enhancements should provide benefits to the local biodiversity, creating habitats suitable for a variety of floral and faunal terrestrial and intertidal species.

⁷¹ Available at: <https://jncc.gov.uk/our-work/common-standards-monitoring-guidance/> (accessed 01/03/2023)

Table 5-9: Residual effects summary

IEF	Importance of IEF	Type of impact	Nature	Source	Duration	Magnitude	Sensitivity	Significance of effect	Confidence	Success of mitigation
Scapa Flow SPA	International	Construction negative	Death, injury or disturbance to birds. Habitat displacement	Dredging, piling, pollution	Temporary	Low	Low	Not significant at any geographic level	High	Near certain
Orkney Mainland Moors SPA/West Mainland Moors SSSI	International	Construction negative	Death, injury or disturbance of birds. Habitat displacement	Dredging, piling, pollution	Temporary	Low	Low	Not significant at any geographic level	High	Near certain
Orkney Mainland Moors SPA/West Mainland Moors SSSI	International	Operational negative	Death or injury to birds which are designated site features.	Pollution	Temporary	Low	Low	Not significant at any geographic level	High	Near certain
Hoy SPA	International	Construction negative	Disturbance, habitat displacement	Dredging, piling, pollution	Temporary	Low	Low	Not significant at any geographic level	High	Near certain
Hoy SPA	International	Operation negative	Disturbance, habitat displacement	pollution, vessel movements	Permanent	Low	Low	Not significant at any geographic level	High	Near certain
Sanday SAC/SSSI	International	Construction Negative	Death, injury or disturbance to individuals. Habitat displacement	Dredging, piling, pollution.	Temporary	Low	Negligible	Not significant at any geographic level	High	Near certain
Sanday SAC/SSSI	International	Operation negative	Death, injury or disturbance to individuals. Habitat displacement.	Vessel movements, pollution.	Permanent	Low	Negligible	Not significant at any geographic level	High	Near certain
Otter	International	Construction negative	Death, injury or disturbance. Habitat Displacement.	Dredging, piling, pollution and lighting	Temporary	Low	Low	Not significant at any geographic level	High	Near certain
Otter	International	Operational negative	Death, injury or disturbance. Habitat Displacement.	Increased vessel movements, pollution and lighting	Permanent	Low	Low	Not significant at any geographic level	High	Near certain
Ornithology: Arctic Tern, Common Tern, Curlew, Redshank, Ringed Plover, Oystercatcher, Lapwing, Skylark	National	Construction negative	Habitat Loss, disturbance	Development footprint, piling, vessel movements	Permanent/ Temporary	Low	Low	Not significant at any geographic level	High	Near Certain
Ornithology: Arctic Tern, Common Tern, Curlew, Redshank, Ringed Plover, Oystercatcher, Lapwing, Skylark	National	Operation negative	disturbance	vessel movements	Permanent	Low	Low	Not significant at any geographic level	High	Near Certain
Terrestrial Habitats	International/National (Scotland)	Construction negative	Habitat loss	Development footprint	Permanent	Major	High	Significant at the site level	High	Probable
Terrestrial Habitats	International/National (Scotland)	Construction negative	Damage	Plant movement, inappropriate storage of materials, pollution	Temporary	Low	Negligible	Not significant at any geographic level	High	Near certain
Subtidal Habitats	International/National (Scotland)	Construction negative	Habitat loss	Development footprint	Permanent	Major	High	Significant at the site level	High	Near certain
Subtidal Habitats	International/National (Scotland)	Construction negative	Damage	Pollution, sediment deposition during dredging, mINNS	Temporary	Low	Low	Not significant at any geographic level	High	Near certain
Subtidal Habitats	International/National (Scotland)	Operational negative	Damage	Pollution, mINNS	Temporary	Low	Low	Not significant at any geographic level	High	Near certain

Grey and Harbour Seals	National	Construction negative	Death, injury or disturbance. Habitat Displacement.	Dredging, piling, pollution	Temporary	Low	Low	Not significant at any geographic level	High	Near certain
Grey and Harbour Seals	National	Operational negative	Death, injury or disturbance. Habitat Displacement.	Increased vessel movements and pollution	Permanent	Negligible	Low	Not significant at any geographic level	High	Near certain
Harbour porpoise	International	Construction negative	Death, injury or disturbance. Habitat Displacement.	Dredging, piling, pollution	Temporary	Low	Low	Not significant at any geographic level	High	Near certain
Harbour porpoise	International	Operational negative	Death, injury or disturbance. Habitat Displacement.	Increased vessel movements and pollution	Permanent	Negligible	Low	Not significant at any geographic level	High	Near certain
Minke whale	International	Construction negative	Death, injury or disturbance. Habitat Displacement.	Dredging, piling, pollution	Temporary	Low	Low	Not significant at any geographic level	Intermediate	Near certain
Minke whale	International	Operational negative	Death, injury or disturbance. Habitat Displacement.	Increased vessel movements and pollution	Permanent	Negligible	Low	Not significant at any geographic level	Intermediate	Near certain
Dolphins	International	Construction negative	Death, injury or disturbance. Habitat Displacement.	Dredging, piling, pollution	Temporary	Low	Low	Not significant at any geographic level	Intermediate	Near certain
Dolphins	International	Operational negative	Death, injury or disturbance. Habitat Displacement.	Increased vessel movements and pollution	Permanent	Negligible	Low	Not significant at any geographic level	Intermediate	Near certain
Basking shark	National	Construction negative	Death, injury or disturbance. Habitat Displacement.	Dredging, piling, pollution	Temporary	Low	Low	Not significant at any geographic level	Intermediate	Near certain
Basking shark	National	Operational negative	Death, injury or disturbance. Habitat Displacement.	Increased vessel movements and pollution	Permanent	Negligible	Low	Not significant at any geographic level	Intermediate	Near certain
Marine Fish	National	Construction negative	Death, injury or disturbance. Habitat Displacement.	Dredging, piling, pollution	Temporary	Low	Low – medium	Not significant at any geographic level	Intermediate	Near certain
Marine Fish	National	Operational negative	Death, injury or disturbance.	Pollution	Permanent	Negligible	Low - medium	Not significant at any geographic level	Intermediate	Near certain
Commercial fishery	N/A	Construction negative	Injury or disturbance	Dredging and piling	Temporary	Low	Low	Not significant at any geographic level	Intermediate	Probable

6 ARCHAEOLOGY AND CULTURAL HERITAGE

6.1 Introduction

This chapter of the EIA Report presents the Archaeology and Cultural Heritage receptors of relevance to the proposed development and assesses the potential impacts from the construction of the proposed development on these receptors. These effects may result from physical loss or changes in the assets' settings. Potential cumulative impacts are also considered.

The chapter details the relevant planning policy context, methodology followed, reviews the baseline conditions in the defined study area, identifies the potential effects and appropriate mitigation measures to prevent, reduce or offset effects, and the residual effects of the proposed development.

6.2 Scoping and Consultation

Relevant comments from the EIA Scoping Opinions from Historic Environment Scotland (HES) and Orkney Islands Council (OIC) are summarised in Table 6-1 below, which provides a high level view on how these comments have been addressed within the EIAR.

Table 6-1: Summary of consultation responses in the Scoping Opinion specific to the historic environment

Consultee	Comment/Issue Raised	Addressed
OIC	The HMS Royal Oak historic asset will be scoped out of the EIA on the grounds no work will be undertaken in or within 50m of the 200m exclusion.	Noted
OIC	Direct impact on onshore heritage assets and unknown medieval, post medieval and modern assets have been scoped out of the EIA.	Noted
OIC	Marine and land based cultural heritage and archaeology should be scoped into the EIA Report, for both the construction and operational phases of development. The assets/impacts to be considered are as set out in the scoping report.	Significance of potential impacts are considered in Sections 6.6.1, 6.6.2, and 6.6.3
HES	Risk of unidentified marine historic environment assets within construction area is extremely low and impacts from construction of quay on marine heritage assets should not be a risk.	Noted
HES	Potential significant construction effects from dredging and operational effects from propeller scour on MBES Contact 1 and any previously unrecorded debris/stray finds/ordnance should be assessed.	Significance of potential impacts are considered in Sections 6.6.1.3, 6.6.1.4 and 6.6.2.2
HES	Agree that cumulative operational impacts on the settings of specified cultural heritage assets should be assessed.	Significance of potential impacts are considered in Section 6.6.3
HES	Proposed development is unlikely to have significant effects on the site or setting of any terrestrial designated assets.	Noted

6.3 Policy, Legislation and Guidance

The following legislation, policy and guidance are relevant to the assessment of impacts from the Proposed Development on Archaeology and Cultural Heritage.

6.3.1 Legislation

- The European Convention on the Protection of the Archaeological Heritage (revised), known as the Valletta Convention, contains provisions for the protection of archaeological heritage, preferably in situ, but with provisions for appropriate recording and recovery if disturbance is unavoidable;
- The Protection of Military Remains Act 1986 (PoMRA) has the principal concern to protect the sanctity of vessels and aircraft that are military maritime graves. Any aircraft lost while in military service is automatically protected under this Act;
- The European Landscape Convention (ratified by the UK government in 2006), promotes the protection, management and planning of landscapes, including the historical and cultural aspects of landscapes;
- The primary piece of UK legislation concerning archaeology is the Ancient Monuments and Archaeological Areas Act 1979 (AMAAA), concerning sites or areas that warrant statutory protection due to being of national importance and are Scheduled under the provisions of the Act. It is an offence to carry out, without the prior written consent of the Scottish Ministers (Scheduled Monument Consent), any works which would have the effect of demolishing, destroying, damaging, removing, repairing, altering, adding to, flooding or covering up the monument;
- The Town and Country Planning (Scotland) Act (1997) and amendments, Planning (Listed Buildings and Conservation Areas) (Scotland) Act 1997 and amendments, and The Planning etc. (Scotland) Act 2006 and the Planning (Scotland) 2019 Act are the primary legislation which govern onshore development planning and development management in Scotland in relation to the historic environment. Planning authorities, prior to granting planning permission, consult with Historic Environment Scotland as a statutory consultee on any development proposals that may affect the site or setting of a Scheduled Monument, an A-Listed building, an Inventoried Garden or Designed Landscape, or an Inventoried Historic Battlefield. This means that the presence of such sites within the area of a proposed development and the protection of its setting are material considerations in the planning process.

6.3.2 Policy

- Policy 7 in National Planning Framework 4 has been designed to 'To protect and enhance historic environment assets and places, and to enable positive change as a catalyst for the regeneration of places' and contains a number of policies to ensure that the cultural significance of assets which might be significantly impacted is fully assessed, and that Designated Assets and Non-designated historic environment assets, places and their setting are protected and preserved in situ wherever feasible.
- The Historic Environment Policy Statement for Scotland (HEPS) 2019 includes policies that decisions affecting any part of the historic environment require understanding of its significance, its wider context and setting, and consideration of avoiding or reducing detrimental impacts; and
- The Pentland Firth and Orkney Waters Marine Spatial Plan (PFOW MSP, 2016) and the Orkney Local Development Plan (2017) policies concerning the protection of and approaches to the historic environment.

6.3.3 Guidance

- Historic Environment Scotland Designation Policy and Selection Guidance 2019 stands alongside HEPS 2019 and outlines the principles and criteria that underpin the designation of HMPAs;

- Historic Environment Scotland Managing Change in the Historic Environment Guidance Series: Setting (revised in 2020), states that “Setting can be important to the way in which historic structures or places are understood, appreciated and experienced. It can often be integral to a historic asset’s cultural significance.” The setting of historic assets or places should be taken into account when considering environmental assessments / statements, and when making decisions on applications.
- Historic Environment Scotland and Scottish Natural Heritage’s [now NatureScot] Environmental Impact Assessment Handbook: Guidance for competent authorities, consultation bodies, and others involved in the Environmental Impact Assessment process in Scotland. 2018, v5; and
- The Chartered Institute for Archaeologists (CIfA) Codes, Standards and Guidelines (<https://www.archaeologists.net/codes/cifa>).

6.4 Methodology

6.4.1 Impact Assessment Methodology

6.4.1.1 Impacts Requiring Assessment

This assessment covers all potential impacts identified through the scoping process, as well as any further potential impacts that have been highlighted as the EIA has progressed. It should be noted that impacts are not necessarily relevant to all stages of the proposed development.

Table 6-2 below indicates all the potential direct and indirect impacts assessed with regards to Archaeology and Cultural Heritage and indicates the development stages to which they relate. Cumulative impacts are discussed in Section 6.6.3.

Table 6-2: Impacts Requiring Assessment

Impact	Description
Construction	
Loss of or damage to known onshore historic environment assets;	During construction any activities that include ground-breaking works have the potential to result in the damage to/loss of known assets within the onshore site boundary. The potential for this impact is considered in Section 6.6.1.1
Loss of or damage to unknown onshore historic environment assets;	During construction any activities that include ground-breaking works have the potential to result in the damage to/loss of unknown assets within the onshore site boundary. An assessment of this impact is provided in Section 6.6.1.2
Loss of or damage to known marine historic environment asset;	Dredging of the seabed has the potential to result in the damage to/loss of known cultural material lying on the seabed. The potential for this impact is considered in Section 6.6.1.3
Loss of or damage to unknown marine and intertidal historic environment assets;	Dredging of the seabed has the potential to result in the damage to/loss of unknown cultural material lying on the seabed, such as debris/stray finds/ordnance. An assessment of this impact is provided in Section 6.6.1.4.
Operation	
Long-term changes to the setting of historic environment assets that reduces their value	There is a possibility that the development and visiting vessels could have long-term effects on the setting of historic environment assets and places, affecting the way in which the assets are understood, appreciated and experienced, and thus the significance/importance of the historic asset. An assessment of this impact is provided in Section 6.6.2.1. There may also be cumulative effects on setting with other projects. An assessment of this cumulative impact is provided in Section 6.6.3

Impact	Description
Scouring of seabed from propeller wash	There is potential for the scouring of seabed deposits to expose and damage heritage assets and submerged prehistoric deposits. An assessment of this impact is provided in Section 6.6.2.2

The assessment of direct impacts on the historic environment and on historic assets potentially indirectly affected by the proposed development affecting their setting was a desk-based exercise making use of project specific desk-based research, the results of a marine UXO and SI survey, site visits and ZTV.

6.4.1.2 Assessment Methodology

The assessment for Archaeology and Cultural Heritage is undertaken following the principles set out in Chapter 3: EIA methodology and scope. The sensitivity of the receptor is combined with the magnitude of impact to determine the consequence and impact significance. Topic-specific criteria have been developed for the value of the importance, sensitivity and vulnerability of historic environment receptors as outlined in Tables 6-3 and 6-4.

The sensitivity or value of the receptor is combined with the magnitude of impact, supported by expert judgement to arrive at a consequence for each impact under consideration. Example criteria for assessing magnitude of impact on historic environment receptors are presented in Table 6-5. The consequence and significance of effect is then determined using the matrix provided in Table 6-6.

The example criteria presented in the tables below are used to inform the assessment, but the tables and matrices are tools and not mechanical systems. Professional judgement is also required to input into the assessment, which may result in heritage values and significance of effect being moved higher or lower than the matrix result. This may also result in a significant material effect that does not reduce the integrity or heritage value of the receptor being identified as potentially acceptable by the statutory authorities. This reasoning is stated in the individual assessment wherever this is the case.

“Setting can often be integral to a historic asset’s cultural significance. ‘Setting’ is the way the surroundings of a historic asset or place contribute to how it is understood, appreciated and experienced. Monuments, buildings, gardens and settlements were almost always placed and orientated deliberately, normally with reference to the surrounding topography, resources, landscape and other structures. Over time, these relationships change, although aspects of earlier settings can be retained.”⁷² A number of assets and places were identified at the scoping stage whose settings were identified as requiring assessment.

Table 6-3: Example Importance Criteria for Historic Environment Receptors

Importance of asset	Cultural heritage value
High (H)	<ul style="list-style-type: none"> • World Heritage Sites • Scheduled Monuments and sites proposed for scheduling • Category A Listed Buildings • Inventoried Gardens and Designed Landscapes • Interconnected groups of B-Listed buildings • Outstanding Conservation Areas • Historic Battlefields • Historic Marine Protected Areas and Designated Wrecks • Aircraft lost on military service • Undesignated wrecks, archaeological sites, areas and buildings of national and international importance (identified in the HER) due to association, rarity, intrinsic value, loss of life and/or retaining archaeological, structural, architectural, decorative or other

⁷² Historic Environment Scotland, 2020, Managing Change in the Historic Environment: Setting

Importance of asset	Cultural heritage value
	physical remains to the extent that it makes a significant contribution to our understanding or appreciation of the past. <ul style="list-style-type: none"> Marine Geophysical Anomaly which appears anthropogenic (atypical in its context); or there is identifiable cultural material; or it is in the area of a known archaeological site, or another contact/anomaly identified to be of high potential.
Medium (M)	<ul style="list-style-type: none"> Category B and Category C(S) Listed Buildings Burial Grounds Protected heritage landscapes Conservation Areas Undesignated archaeological sites, areas, buildings, wrecks and cargos of equivalent regional importance (identified in the HER), or of high local significance, due to association, rarity, intrinsic value, loss of life, and/or retaining archaeological, structural, architectural, decorative or other physical remains to the extent that it makes a significant contribution to our understanding or appreciation of the past.
Low (L)	<ul style="list-style-type: none"> Cultural heritage assets the physical remains of which contribute little to our understanding or appreciation of the past. Cultural heritage assets of local value or interest for education or cultural appreciation Undesignated archaeological sites, areas, buildings, wrecks and cargos of equivalent local importance (identified in the HER) due to limited intrinsic, contextual or associative characteristics, or that are still common. Unlisted historic buildings and settlements with local characteristics. Marine Geophysical Anomaly which is likely to be a natural formation such as a sand dune, boulder or bedrock formation. It could also be a processing error of the geophysical data.
Negligible (N)	<ul style="list-style-type: none"> Sites of former archaeological features, lifted or salvaged wrecks. Unlisted buildings of little historic or architectural interest. Sites or features the physical remains of which make a negligible contribution to our understanding or appreciation of the past. Single findspots. Sites of little or no known heritage importance.

Table 6-4: Example Importance Criteria for Setting and Sensitivity to Change

Sensitivity to change	Importance of Setting
High (H)	A setting that makes a critical contribution to the understanding and/or appreciation of the siting and/or historical / archaeological / architectural context of a receptor. (Examples of this include: prominent topographic locations; surroundings that include related monuments in close association; surroundings that are believed to be unchanged, or little changed, from those when the receptor was created).
Medium (M)	A setting that makes a positive contribution to the understanding and/or appreciation of the siting and/or historical / archaeological / architectural context of a receptor. (Examples of this include: surroundings that complement the siting and appearance of a receptor, such as the presence of a feature of the rural past within a more recent farming landscape containing little or no urban or industrial development).
Low (L)	A setting that makes little positive contribution to the understanding and/or appreciation of the siting and/or historical / archaeological / architectural context of a receptor. (Examples of this include: surroundings that only partially complement the siting and appearance of a receptor, such as the presence of a feature of the rural past within a partly urbanized or industrialized landscape).

Sensitivity to change	Importance of Setting
Negligible (N)	A setting that does not contribute positively to the understanding and/or appreciation of the siting and/or historical / archaeological / architectural context of a receptor. (Examples of this include: immediate surroundings, such as commercial coniferous woodland or an industrial development, that are not relevant to the understanding of the context of the receptor).

Table 6-5: Example Criteria for the Assessment of Impacts on Historic Environment Assets

Magnitude of Effect	Direct Impacts: Onshore	Indirect Impacts: Onshore
High	Works would result in the complete loss of the site, or the loss of an area, features or evidence fundamental to the historic character and integrity of the site, which would result in the complete loss of physical integrity.	The removal of, or a fundamental and irreversible change to, the relationship between a heritage asset and its relevant setting. Major change that removes or prevents appreciation, understanding or experience of a heritage asset and its key characteristics, or permanent change to or removal of surroundings of a less sensitive asset. A noticeable change to a key relationship between a heritage asset and a highly sensitive, valued or historically relevant setting over a wide area or an intensive change to a less sensitive or valued asset or setting over a limited area.
Medium	Works would result in the loss of an important part of the site or some important features and evidence, but not areas or features fundamental to its historic character and integrity. The integrity of the site would be affected, but key physical relationships would not be lost.	Noticeable change to a non-key relationship between a heritage asset and its relevant setting. A heritage asset and setting that is tolerant of moderate levels of change. Small changes to the relationship between a heritage asset and its setting over a wide area or noticeable change over a limited area.
Low	Works would not affect the main features of the site. The historic integrity of the site would not be significantly affected.	Minor changes to the relationship between a heritage asset and its setting over a wide area or minor changes over a limited area. A heritage asset and setting that is considered tolerant of change.
Negligible	Works would be confined to a relatively small, peripheral and/or unimportant part of the site. The integrity of the site, or the quality of the surviving evidence would not be affected.	Changes to that cannot be discerned or perceived in relation to the heritage asset or environment.
Positive	An enhancement to the baseline condition of the asset.	
Magnitude of Effect	Direct Impacts: Marine	Indirect Impacts: Marine
High	Works would result in the complete loss of an asset, or the loss of an area, features or evidence fundamental to the historic character and integrity of the site, which would result in the complete loss of physical integrity.	The removal of, or a fundamental and irreversible change to, the relationship between a marine heritage asset or environment and a historically relevant seabed context. Major change that removes or prevents appreciation of characteristics key to a heritage asset, or permanent change to or removal of surroundings of a less sensitive asset or seabed context. A noticeable change to a key

Magnitude of Effect	Direct Impacts: Onshore	Indirect Impacts: Onshore
		relationship between a marine heritage asset or environment and a highly sensitive, valued or historically relevant seabed context over a wide area or an intensive change to a less sensitive or valued asset or seabed context over a limited area.
Medium	Works would result in the loss of an important part of the site or some important features and evidence, but not areas or features fundamental to its historic character and integrity. The integrity of the site would be affected, but key physical relationships would not be lost.	Noticeable change to a non-key relationship between a marine heritage asset or environment and a historically relevant seabed context. A heritage asset and setting that is tolerant of moderate levels of change. Small changes to the relationship between a heritage asset and a historically relevant seabed context over a wide area or noticeable change over a limited area.
Low	Works would not affect the main features of the site. The historic integrity of the site would not be significantly affected.	Minor changes to the relationship between a heritage asset or environment and a historically relevant seabed context over a wide area or minor changes over a limited area. A heritage asset and setting that is considered tolerant of change.
Negligible	Works would be confined to a relatively small, peripheral and/or unimportant part of the site. The integrity of the site, or the quality of the surviving evidence would not be affected.	Changes to a historically relevant seabed context that cannot be discerned or perceived in relation to the heritage asset or environment.
Unknown	Groundbreaking works over features that have not been fully interpreted would reduce the chance of interpretation in the future. In the event of significant features this would constitute impact of high magnitude; for sites of lesser significance it is less problematical. Nevertheless, it remains an issue where features have not been or could not be interpreted.	Changes to a seabed context, where it is uncertain how these contribute to our understanding of the site because the feature or asset itself could not or has not been understood or interpreted.
Positive	An enhancement to the baseline condition of the asset.	An enhancement to the seabed context of a heritage asset or environment. An enhancement to preservation conditions of a heritage asset or environment.

Table 6-6: Assessment of Impact Significance

Asset Importance or Sensitivity	Magnitude of Effect					
	High	Medium	Low	Negligible	Uncertain	Positive
High	Major	Major	Moderate	Minor	Uncertain/ Major	Positive

Medium	Major	Moderate	Minor	Minor	Uncertain/ Moderate	Positive
Low	Moderate	Minor	Minor	Negligible	Uncertain/ Minor	Positive
Negligible	Minor	Negligible	Negligible	Negligible	Uncertain/ Negligible	Positive
Uncertain	Uncertain/ Major	Uncertain/ Moderate	Uncertain/ Minor	Uncertain/ Negligible	Uncertain/ Negligible	Positive

Table 6-7: Definitions for Significance of Impact

Consequence	Significance	
Positive	Positive – to be encouraged	Positive
Major	Highly significant and requires immediate action. May be intolerable risk or significance	Significant impact under EIA Regulations
Moderate	Significant – requires additional control measures and/or management	
Minor	Not significant – however may require some management to ensure remains within acceptable levels	Insignificant impact under EIA Regulations
Negligible	Not Significant	

6.5 Baseline

6.5.1 Baseline Characterisation

This section comprises a characterisation of known historic environment assets within the site, as well as the potential for unidentified assets to be present. This characterisation is based on desk-based studies, and walkover survey data collected as part of the current study.

This section also includes a baseline summary of the assets and places and their setting that may be affected by the proposed development, based on desk-based studies and site visit.

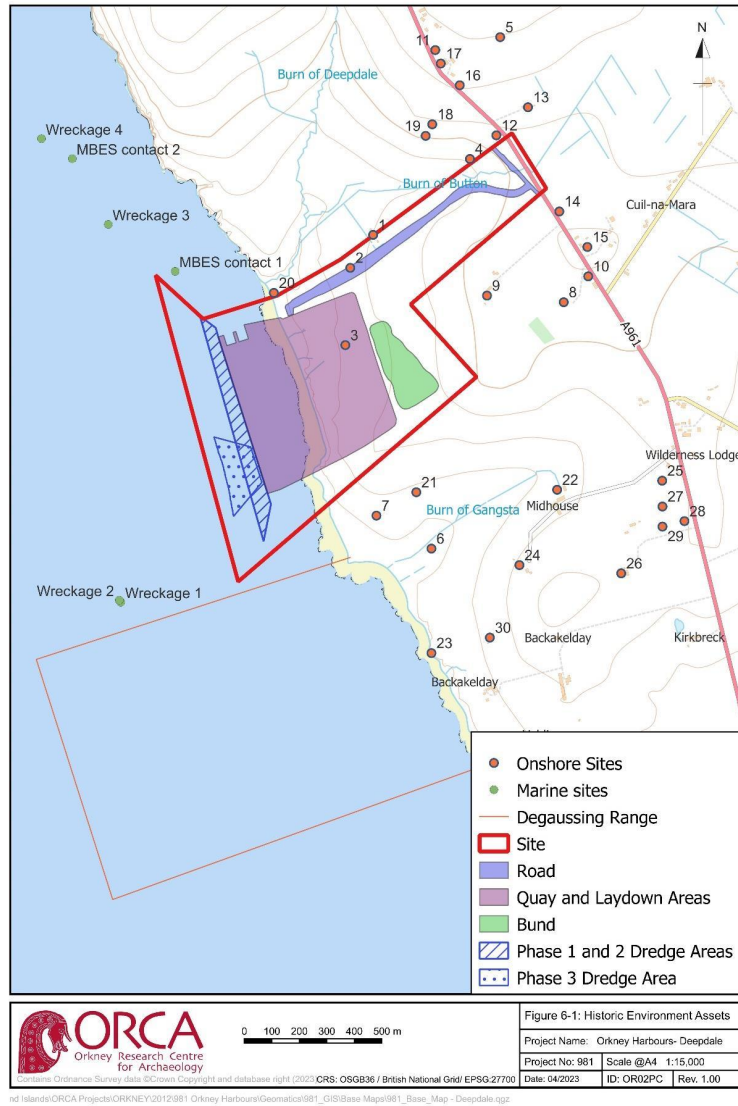


Figure 6-1: Historic Environment Assets

6.5.1.1 Study Areas

The following areas are referred to in the impact assessment:

- The site (see Figure 6-1), which comprises the proposed onshore infrastructure area, road, the new quay and areas of dredging.
- The Study Area – The area for identifying the historic environment baseline and potential impacts upon it comprised a 1km radius from the centre of the proposed development (see Figure 6.1), although some assets outwith this were considered in relation to potential effects on setting.

6.5.1.2 Sources of Information

A review was undertaken of the key literature and data relevant to this assessment relating to historic environment assets and was used to produce the overview of the existing historic environment. The main data sources used in the preparation of this chapter are listed below in Table 6-8. Any other sources used are referenced in the text.

Table 6-8 Summary of Key Datasets and Reports

Title	Source	Year	Author
British Geological Survey Bedrock and Superficial Geology map	Geology of Britain viewer – British Geological Survey (bgs.ac.uk)	Ongoing	BGS
The National Record of the Historic Environment (NRHE) of Scotland	Canmore (https://canmore.org.uk) and Pastmap database (http://pastmap.org.uk)	Ongoing	HES
Statutory lists, registers and designated areas, including Lists of Scheduled Monuments, Listed Buildings, Gardens & Designed Landscapes, Designated Wrecks and Historic Marine Protected Areas	The Historic Environment Scotland Data Portal https://portal.historicenvironment.scot/	Ongoing	HES
Orkney Historic Environment Record	Digital data – Pastmap database (http://pastmap.org.uk); physical records held at Orkney College	Ongoing	OIC
Historic Land-use Assessment	HLA (hlamap.org.uk)	Ongoing	HES
UKHO wreck register & nautical charts	https://www.admiralty.co.uk/digital-services/data-solutions/admiralty-marine-data-portal	Ongoing	UKHO
The Ship Wreck Index of Great Britain & Ireland Vol. 4 Scotland	London: Lloyd’s Register of Shipping	1998	Larn, R & Larn, B
Shipwrecks of Orkney & Shetland	Newton Abbot: David & Charles	1988	Ferguson, D
Ferguson/Heath Collection	Private collection, continuing to update Ferguson’s database	Ongoing	Ferguson, D & Heath, K
Wreck Site EU	http://www.wrecksite.eu	Ongoing	N/A
The British Newspaper Archives	https://www.britishnewspaperarchive.co.uk/	Ongoing	N/A
Lloyds Shipping Register	https://hec.lfoundation.org.uk/archive-library/lloyds-register-of-ships-online/lloyds-register-of-ships-online	Ongoing	Lloyds of London
Bi-monthly Minesweeping Reports	National Archives, Kew	N/A	N/A

Lost in Waters Deep	https://lostinwatersdeep.co.uk/index.html	Ongoing	Heath, K & Sadler, W
Aviation Research Group Orkney & Shetland	https://crashsiteorkney.com/index.html	Ongoing	A.R.G.O.S
The scope of Strategic Environmental Assessment of Continental Shelf Area SEA 4 in regard to prehistoric archaeological remains	https://assets.publishing.service.gov.uk/government	2003	Flemming, N.C
Submerged Landscapes of the European Continental Shelf	Chichester: John Wiley & Sons Ltd	2017	Flemming, N.C et al (eds)
Off Scotland: a comprehensive record of maritime and aviation losses in Scottish waters	Edinburgh – C-Anne Publishing	1998	Whittaker I.G.
Sky over Scapa 1939-1945	Kirkwall: Bellavista Publications	2007	Lamb, G.

6.5.2 Onshore Baseline Conditions

6.5.2.1 Geology and Land Use

The bedrock geology of the onshore development consists of Caithness Flagstone Group formed in the Mid Devonian epoch, overlain by Diamicton⁷³.

The onshore development lies within an area of rectilinear fields and farmsteads. These are generally indicative of agricultural improvements in the 19th century however the Ordnance Survey First edition (1882) shows much of the areas as unimproved demonstrating that much of the modern landscape has its origins in the 20th century.

6.5.2.2 Mesolithic: c. 9000BC to c. 4000BC

The Mesolithic period extends from the end of the last glaciation period, c. 9000 BC to the arrival of farming, c. 4000BC. In Scotland, the period is largely characterised by settlement traces in the form of cave and rock-shelters, shell middens and lithic scatters. The presence of Mesolithic communities in Orkney is now well-established, though the evidence is still considered inconclusive when trying to ascertain if the earliest human activity in Orkney was the result of seasonal movements of regional populations or infrequent visits based on resource exploitation.

There are no known Mesolithic sites within the site or within the Study Area.

6.5.2.3 Neolithic: c. 4000BC to c. 2000BC

The Neolithic period in Orkney spans around 2000 years, from c. 4000 BC to c. 2000 BC and the importance of the monumental sites of the Neolithic period in Orkney is well-known. A wide range of settlement forms characterise the Neolithic period in Orkney with the use of local tabular flagstone a defining feature in the construction of Orcadian Neolithic houses. The Neolithic tombs of Orkney display huge variety of setting and form. Many of the tombs survive as amorphous mounds with little detail of internal arrangement. Standing stones, occurring usually as individual stones, are found across many of the islands. The stones were usually erected in conspicuous locations, intimately tied into the local landscape, and some remain prominent markers in the landscape.

There are no known Neolithic sites within the site or within the Study Area.

6.5.2.4 Bronze Age c.2000BC to 800BC

The Orcadian Bronze Age has often been characterised as a period of impoverishment, in comparison to the rich archaeological record of the Neolithic and Iron Ages. However, the Bronze Age in Orkney was a period of great social and environmental change and archaeological work undertaken across Orkney has demonstrated that there is a significant resource for examining Bronze Age life.

Burial sites are the most common monument type for Bronze Age Orkney. The most definitive burial monument is the barrow mound, found individually and in groups, generally comprising stone-built cists (containing a burial or cremated bone), surmounted by an earthen mound. During the Late Neolithic/Early Bronze Age period, the dead were also buried in large subterranean box-cists with no apparent covering mound.

Burnt mounds are another ubiquitous Bronze Age site-type in the islands, but their purpose and role are still debated. These monuments comprise large mounds of burnt stones, usually arranged in a crescentic form around a complex of stone cells and features.

Treb-dykes are large earthen banks and are a distinctive feature of Orkney, particularly in the North Isles. The appearance of these large-scale boundaries is presumed to be a Bronze Age phenomenon, but this is yet to be proven through excavation.

There are no known Bronze age sites within the site, although it is possible that site 2, a low sub-oval mound with a central depression identified during the site visit, could date to this period.

There are three Bronze Age sites within the Study Area; a barrow cemetery (site 5, Canmore 2342, which also includes at least one burnt mound); a burnt mound (site 6, Canmore 2375) and two cist burials (site 7, Canmore 2385).

6.5.2.5 Iron Age c. 800BC to c. AD 600

Conventionally, the Iron Age of northern Scotland spans the early first millennium BC to the eighth century AD, with Early, Middle and Late Iron Age phases (the latter often referred to as the 'Pictish' period). In northern and western Scotland, the Iron Age takes the form of distinct architectural and material culture forms, notably the use of complex roundhouse architecture.

Traditionally, studies of the northern Iron Age have been dominated by the broch and these substantial drystone buildings have drawn the most attention in archaeological work. Contemporary villages around brochs, are generally enclosed by substantial curvilinear earthen banks and ditches of huge proportions. The majority of broch sites across Orkney survive as grassed-over substantial mounds in predominantly coastal or lochside locations. There is often a close correlation between the locations of brochs and later ecclesiastical structures across Orkney.

There are no known Iron Age sites within the site or within the Study Area.

6.5.2.6 The Medieval Period (c. AD 800 to c.1614)

In order to reflect the particular political circumstances of the North of Scotland, the medieval period can be usefully sub-divided into the 'Viking Period', with a focus on initial Viking contact and activity, followed by the initial Norse settlement, and the 'Late Norse Period', marked by close political ties with Scandinavia. In Orkney, the Viking and early Norse Period is archaeologically defined as c.AD 800 to c.1050 and the Late Norse Period covers c.1050 to 1468 (the date when Orkney was transferred from Norwegian to Scottish rule). The remainder of the medieval period, c.1468 – c.1614, is historically defined as the period of Scottish Rule.

Viking sites are generally found close to the shore and usually take the form of lengths of exposed middens with some structural remains. They are a rich source of information with great potential to inform on the past (particularly

⁷³ British Geological Survey 2022: BGS Geology of Britain Map Viewer Geology of Britain viewer - British Geological Survey, bgs.ac.uk

diet and economy). Norse settlements tend to take the form of a longhouse, which provided accommodation for people and a byre for animals under one roof. One of the most distinctive types of Norse site across Orkney is the 'farm mound'. In general, these mounds are thought to be largely Norse in origin, and it has been suggested that the farm-names can tell us whether farm-mounds were primary Norse settlements, or if they were extant features of the landscape early in the Norse occupation. Generally associated with areas of good soil, the mounds then became a focus for settlement and a number contain buried structural elements.

There are no known Medieval sites within the site or Study Area.

6.5.2.7 *The Post-Medieval Period (c.1614 to c.1900)*

The post-medieval period in Orkney is traditionally regarded as commencing with the execution, in 1614, of Earl Patrick Stewart and his son for inciting rebellion. The life of the islanders during the period was dominated by the slow-downs and upturns in the wider British economy. The late eighteenth and nineteenth centuries saw the development of three key industries across Orkney; kelp processing, herring fishing and linen production. All of these developed as secondary occupations for farm labourers and their family, but at times came to almost dominate the islands' economy.

The heritage resource for the period across Orkney is largely characterised by farmsteads, including small farmsteads, crofts and larger farms with associated features, such as enclosures, dykes and cultivation remains. Remains dating from this period can be significant in a local context as they may represent the transition from the final vestiges of Norse practice through later farming traditions to the agricultural improvements, begun in earnest during the mid-nineteenth century.

Along with the remains of the industries mentioned above, the remains of maritime infrastructure are also visible, important to Orkney's maritime society. Such remains include nousts, or boat shelters, built or hollowed out above the high water mark. Their style and form did not greatly change through time (Viking-Modern), however, and it is difficult to establish dates for particular examples.

There are two sites which date to this period within the site, comprising the farmstead at Deepdale (site 1) and a dyke and sheep pens (site 3). Site 1, the farmstead at Deepdale, lies on the northern boundary of the site and is marked on the Ordnance Survey First Edition map (1882)⁷⁴, demonstrating that predates this map. It appears as a multi-phase, enclosed complex of unroofed/partly roofed traditional stone buildings arranged around central farmyard with additional buildings to the south-east. Site 3 comprises the remains of a traditional drystone dyke with two small attached sub-rectangular banks at the centre of the development area which are likely to represent the remains of two sheep pens.

A further possible agricultural site (Site 2) is also located within the site, comprising, a low sub-oval mound with a central depression which may represent the remains of a sheep fold. However, it is also possible that the site is much older as its form is also consistent with a prehistoric site.

There are numerous other sites dating to this period within the Study Area, including seven further farmsteads; Rashieburn (site 13, Canmore 316861), Netherbutton (site 9, Canmore 179645, LB46383), Roadside (site 15), Mid House (site 22), West Bu (site 24, Canmore 182634), Gutterpool (Site 26, Canmore 182635) and Howa (site 30, Canmore 179642,256355, 256356, 256357, LB46381). Netherbutton and Howa are Listed Buildings (LB46383; LB46381), the other farmsteads are marked on the Ordnance Survey First Edition (1882) but are currently occupied sites so it is unknown how much of the original buildings survive. There are also agricultural infrastructure sites marked on the Ordnance Survey First Edition; three quarries (sites 14, 18 and 19); two gravel pits (sites 16 and 17); a sheepright (site 20) and a well (site 21) but it is unknown if there are any surviving remains present at these locations.

6.5.2.8 *The Modern Period (after c.1900)*

This period is dominated by the presence of the Royal Navy and the use of Orkney, in particular Scapa Flow, as its wartime base. Orkney was an active battlefield during the blockade of Germany in both the First World War and the Second World War, and wartime sites are present throughout the islands, varying in form and state of preservation. There are also a number of Victorian and Edwardian military structures built by landowners for local volunteer units.

The west coast of Holm bounds Scapa Flow, the location of the strategically important naval base in WWII. The associated defences form an important part of the local archaeological record and there is an associated site c. 20m north of the northern boundary of the site; a small military installation, possibly an observation post (Site 4).

Site 4 may be related to RAF Netherbutton (site 8, Canmore 81727) which lies within the Study Area, to the south-east of the site, and was the most northerly of a chain of radar stations developed ahead of WWII, part of the defences of Scapa Flow. It consists of a transmitter block, four base masts and at least two further concrete structures. There are three further associated sites within the Study Area; a warden's house (site 10, Canmore 314832) built for staff at Netherbutton, a military camp (site 11, Canmore 269282), and an engine house (site 12, Canmore 269283). The Royal Navy Degaussing Range Station at Backakelday and Midhouse anti-aircraft battery are also recorded within the study area.

6.5.2.9 *Previous Archaeological Investigations*

No archaeological investigations are known to have been conducted within the site or study area.

6.5.2.10 *Sites Within the Development Area*

There are no Scheduled Monuments (SMs), Listed Buildings (LBs), Garden and Designed Landscapes, Historic Battlefields or World Heritage Sites within the site, and two Listed Buildings within the Study Area.

There are three potential historic environment assets within the development area (sites 1-3) and a further 27 assets (sites 4-30) within the Study Area (Technical Appendix 6-1 in Volume 3).

6.5.2.10.1 *Sites of High Importance*

There are no sites of high importance located within the site or Study Area.

6.5.2.10.2 *Sites of Medium Importance*

There are no sites of medium importance located within the site.

There is a site of medium importance immediately to the north of the site, a military installation (site 4), possibly associated with RAF Netherbutton (site 8) which lies within the study area, together with three further associated sites: a warden's house (site 10); a military camp (site 11) and an engine house (site 12). The site of Royal Navy degaussing range station (site 23) is also of medium importance. In addition, there are also two Bronze Age sites of medium importance within the Study Area: a barrow cemetery (site 5), which also includes at least one burnt mound) and a further burnt mound (site 6). There are also two Listed Buildings within the Study Area, both Grade C and dating to the 19th century; *Netherbutton, Including Boundary Walls, Gatepiers And Outbuilding* (LB46383; site 9), and *Howa, Including Kiln* (LB46381. Site 30).

Sites of Low Importance

There is one site of low importance within the site - Deepdale Post-Medieval farmstead (site 1).

Within the Study Area, remains relating to the command and control block for Midhouse heavy anti-aircraft battery (site 25) and an associated Platform for a mobile radar unit (Site 27) are of low importance.

⁷⁴ Ordnance Survey (1882) Orkney Sheet CXIV.3 (Holm) County Series 1:2500, 1st Edition

6.5.2.10.3 Sites of Negligible Importance

There is a single site of negligible importance within the site, comprising a dyke attached to two small sheep pens (site 3).

There are a further nine sites of negligible importance within the study area; these relate to Post-Medieval/WW2 activity and comprise three quarries (sites 14, 18 and 19), two gravel pits (sites 16 and 17), a sheepright (site 20), a well (site 21), the site of a barrage balloon (site 28) and the site of searchlight emplacement. (site 29).

6.5.2.10.4 Sites of Uncertain Importance

There is a single site of uncertain importance within the site, consisting of a low mound with a central depression (site 2). If proven to be prehistoric in date, it would likely be of medium importance, but further investigation will be required to characterise it fully.

There are five Post-Medieval farmsteads (sites 13, 15, 22, 24 and 26) marked on the Ordnance Survey First Edition within the study area but the locations are currently occupied so their importance is uncertain as it is unclear how much of the original structures survive. There is also a Bronze Age cist burial (site 7) within the Study Area which is of uncertain importance because it is unclear if any remains survive on site.

6.5.2.11 Historic Environment Assets and their setting

The landscape of Orkney has a predominantly low and gentle relief, the smooth contours of which are emphasised by the scarcity of trees and woodland cover. This landscape, though windswept, supports large areas of productive pastures and some arable farming. The sea is important to the physical and cultural landscapes of Orkney. The meeting of land and sea at the coast, and the features that are formed, are key elements in the landscape. The most dramatic topography is found around Orkney's coastline where spectacular cliffs have been sculpted into arches, stacks, geos (coastal clefts) and gloops (blowholes). These renowned features are essential contributors to Orkney's identity and perception. Along the western coast in particular, the land meets the sea in a cliff rampart up to 300 metres high which has been shaped by the relentless action of Atlantic waves. In contrast, many of the lowest areas appear drowned by shallow lochs and bays. Here, the lower-lying coastal features such as tilted flags, sand dunes and sandy bays present an entirely different character.

There are two Listed Buildings within the Search Area, as well as further places/views identified in the scoping report as requiring assessment, comprising the maritime approach to Scapa Bay where Kirkwall Cathedral has acted as a dominant seamark and the visibility of the marker for HMS *Royal Oak*, especially from viewpoints such as the Royal Oak Remembrance Garden and Memorial at Scapa, the setting of which could potentially be indirectly impacted by the development (Figure 6-2). These last two are considered in this section, but it should be noted that they have an offshore as well as an onshore component to their setting.

6.5.2.11.1 Netherbutton, Including Boundary Walls, Gatepiers And Outbuilding, LB46383

This C-Listed Building is a largely complete and relatively unaltered typical later 19th century Orkney steading, which is characteristic because of its length⁷⁵. Features of special interest include the existence of the Caithness stone roof and the ball-finished outbuildings. Its name possibly derives from the Old Norse word, *botn*, meaning 'situated at the bottom of a glen'. Netherbutton remains located within a broadly agricultural context, despite the relatively recent construction of the dwelling of Scarhaven immediately to the north-east. It's setting makes a contribution to the understanding of the asset as a rural farmstead, although it derives most of its importance from its illustrative value as an example steading. Consequently it is considered to have a medium sensitivity to change.

⁷⁵ <https://portal.historicenvironment.scot/designation/LB46383>

⁷⁶ <https://www.buildingsatrisk.org.uk/details/913311>; accessed 3/2/23

⁷⁷ Hewison, W. S. 2006. This Great Harbour: Scapa Flow. Havertown: Birlinn, Limited.

⁷⁸ Scottish Natural Heritage, 2016. Coastal character assessment: Orkney and North Caithness

6.5.2.11.2 Howa, Including Kiln, LB46381

This earlier to mid 19th century C-listed group of buildings comprises a single storey, 2-bay farmhouse, adjoining a former dwelling house/byre range, with a single storey, barn and kiln range. The interest in this group lies chiefly in the kiln which is a fine, relatively rare and characteristic survivor of a traditional Orcadian farm. Howa is in poor condition⁷⁶, but remains located within a rural agricultural context (albeit in very close proximity to a wind turbine) which makes a limited contribution towards the understanding of the asset as a former rural farmstead. Consequently it is considered to have a low sensitivity to change.

6.5.2.11.3 Maritime Approach to Scapa Bay

The name Scapa Flow is derived from the Old Norse word *Skalpeiofloi* meaning the 'fjord or loch of the ship isthmus', suggesting Scapa Bay would have acted as a landing place, situated as it is on the south side of the isthmus dividing Orkney Mainland, with Kirkwall on the north shore⁷⁷. The maritime approach to Scapa Bay from the south-west includes the tower of St Magnus Cathedral within its view, which would have acted as a seamark since its construction. For vessels closer to shore, the landform either side of the bay would have provided a framed view of the cathedral. Despite the frequent passage of commercial vessels within Scapa Flow⁷⁸ this view still retains a degree of heritage interest, illustrating the history of seafaring in this area. The approach to Scapa Bay is considered to have a medium sensitivity to change.

6.5.2.11.4 Visibility of the marker for HMS Royal Oak

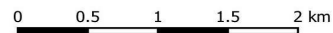
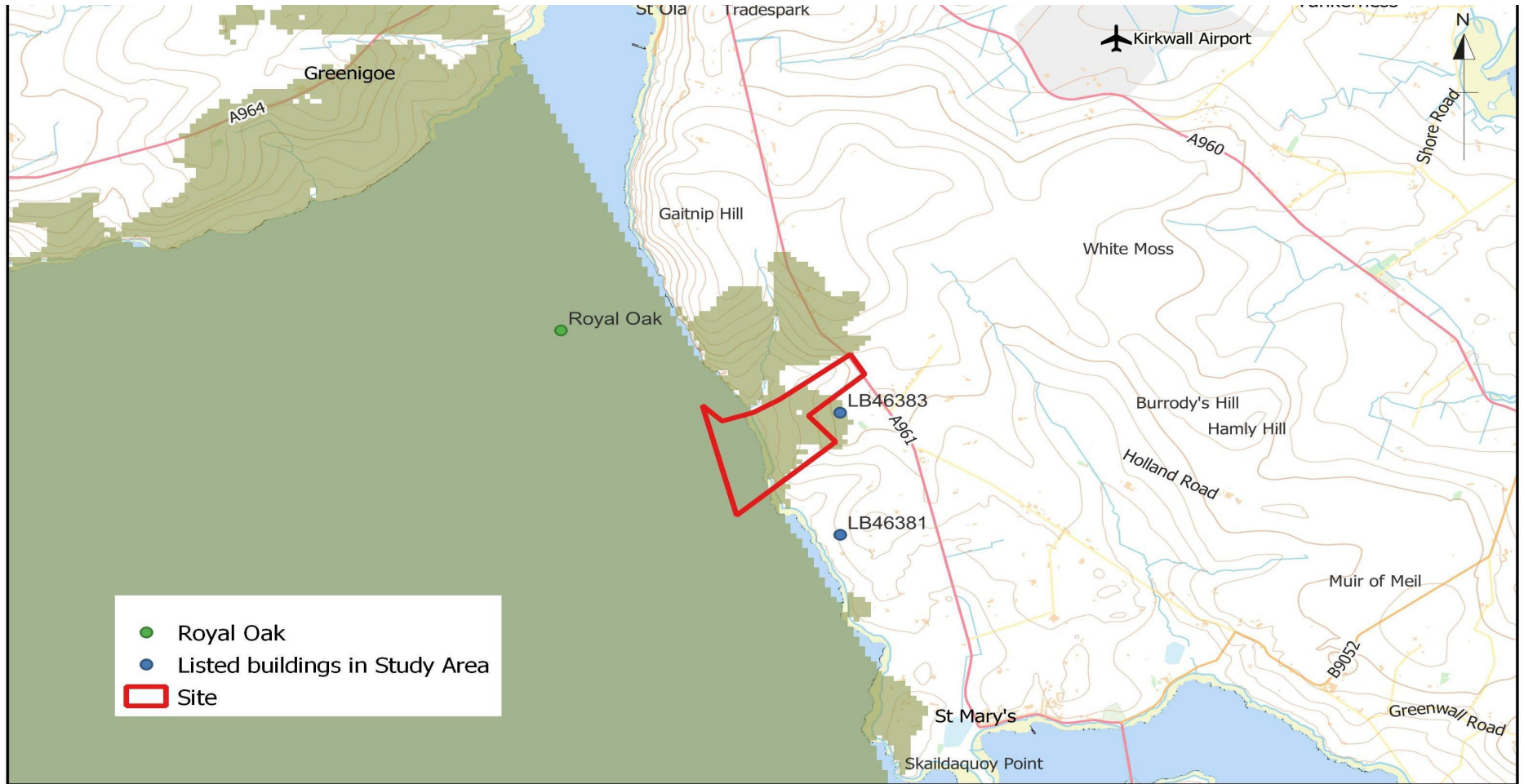
HMS Royal Oak (Canmore 102373) was sunk at anchor on the night of 13-14 October 1939 by torpedoes fired by the German submarine U-47. It sank with the loss of 835 officers and ratings. The ship has statutory protection as a war grave and its wreck buoy is included in the Imperial War Museums War Memorials Register⁷⁹. The marker has an illustrative and commemorative value of the sinking of the Royal Oak and the loss of life, and is intrinsically linked to the nearby wreck, which it memorialises. Its immediate setting within the waters of Scapa Flow makes a substantial contribution to the significance of the marker, with more distant views of the marker also having some importance, albeit to a lesser degree given the wider context of Scapa Flow with its regular passage of boat traffic, particularly oil tankers and larger commercial vessels (Scottish Natural Heritage, 2016), as well as the occasional mooring of oil rigs. The views of the marker have a high sensitivity to change in its immediate environs, and a medium sensitivity to change in its more remote views.

6.5.3 Offshore Baseline Conditions

There are no marine cultural heritage statutory designations within the study area, nor are there any assets that are in the proposal for the designation of Historic Marine Protected Area in Scapa Flow⁸⁰. There are no UKHO charted wrecks, dead wrecks or non-sub contacts within the study area. HMS Royal Oak is located c. 1.5km to the north-west of the proposed development, marked by a large green buoy. It is a designated war grave of national importance and protected from any disturbance under PoMRA.

⁷⁹ <https://www.iwm.org.uk/memorials/item/memorial/13382>

⁸⁰ <https://www.gov.scot/publications/proposal-designate-two-historic-marine-protected-areas/pages/3/> [accessed 23/02/2023]



Contains Ordnance Survey data ©Crown Copyright and database right (2023) CRS: OSGB36 / British National Grid/ EPSG:27700

Figure 6-2 ZTV	
Project Name: Orkney Harbours- Deepdale	
Project No: 981	Scale @A4 1:50,000
Date: 04/2023	Rev. No: 1.0

Figure 6-2: ZTV

Hominids and humans have occupied the UK continental shelf (UKCS) at various times for more than 700,000 years but finds showing this are incredibly rare. Submerged landscapes are where human beings and early hominids previously lived or hunted on terrain which was at that time dry land, or where they exploited fish and shellfish on the coast which is now submerged.

Some 12,000 years ago, at the end of the last Ice Age, relative sea levels around Orkney may have been 30-40m lower than present only reaching current levels approximately 2,000 BC^{81,82}. Although there are known submerged paleoenvironmental remains in the shallow margins of Scapa Flow, such as the peats and tree trunks at Widewall Bay, South Ronaldsay⁸³, assessment of stratigraphic records of core samples (refer to Technical Appendix 4.3, Volume 3 of the EIAR) collected during preliminary geotechnical survey work has confirmed there are no sediments of interest for any palaeoecological study (Timpany pers comm). The sediments encountered comprised a series of largely minerogenic deposits comprising sands, clays, and gravels. These deposits hold little or no palaeoenvironmental potential for reconstructing former landscapes through proxies such as pollen analysis.

Canmore has a number of ship losses listed as generic 'In Scapa Flow' and there is a low possibility that some vessels could be in the development area. A number of wartime aircraft went missing in Scapa Flow and there is a low possibility of finding one within the area, which although not likely, cannot be discounted. Any aircraft would automatically fall under PoMRA. There are still missing torpedoes from U47 and the Luftwaffe attacked ships anchored in Scapa Flow, but there are none recorded in the area of the proposed development.

A Multi-Beam Echo Sounder (MBES) survey was conducted in the area in 2010, from which two anomalies were identified that could be anthropogenic and potentially of high archaeological interest, and were therefore entered into the Canmore database (MBES Contacts 1 and 2). Subsequently, a sidescan sonar (SSS) survey of the area in 2020 identified potentially anthropogenic anomalies, which were dived on⁸⁴. Four items of vessel debris were identified (Wreckage sites 1-4). A further UXO survey (SSS and Magnetometer) undertaken in 2021⁸⁵ identified an abandoned line of fishing pots in the northern part of the site, but no potential UXO risk was identified.

The marine historic environment assets with known locations are listed in Table 6-9 and shown on Figure 6.1.

Table 6-9: Overview of Identified Marine Historic Environment Assets

Name	Canmore ID	Description	Date lost	Source	Importance
Wreckage 1		Heat exchanger, outer casing badly degraded. Piped very degraded. 4m from Wreckage 2.	Unknown	1	Low-Negligible
Wreckage 2		Heat exchanger, outer casing badly degraded. 4m from Wreckage 1.	Unknown	1	Low-Negligible
Wreckage 3		Debris that appears to be keel section of a steel vessel, filled with concrete ballast. Likely to relate to Wreckage 4	Unknown	1	Low-Negligible

⁸¹ C. R. Wickham-Jones, S. Dawson & R. Bates (2009) The Submerged Landscape of Orkney, Archaeological Journal, 166:sup1, 26-31, DOI: 10.1080/00665983.2009.11771028

⁸² Dawson, S., Bates, R., Wickham-Jones, C. & Dawson, A. (2017). 'Northern North Sea and Atlantic Northwest Approaches. In Flemming, N.C., Harff, J., Moura, D., Burgess, A. & Bailey, G.N. (eds.) *Submerged Landscapes of the European Continental Shelf: Quaternary Paleoenvironments*. Chichester: John Wiley & Sons Ltd. 187-209

Wreckage 4		Debris that appears to be lower bow section of a steel vessel, filled with concrete ballast. Likely to relate to Wreckage 3.	Unknown	1	Low-Negligible
MBES Contact 1	330777	MBES anomaly presenting as oval mound 14.5m by 9.7m by 1.5m high, in 18m water depth. Considered of high archaeological potential.	N/A	2	Unknown
MBES Contact 2	330776	MBES anomaly presenting as oval mound 14.5m by 14m by 1.7m high in 25m water depth. Considered of high archaeological potential.	N/A	2	Unknown
Degaussing range	269584	World War Two degaussing range area.	N/A	2	Moderate

Source (see Table 6-8): 1 SULA Diving 2020; 2 Canmore

The pieces of wreckage that were identified by diving on the SSS survey contacts have been assessed as being of low-negligible historic value. This is because of their poor condition and cannot be identified as from any particular vessels, even though they are of 20th-century date, and may be the result of historic naval activity in Scapa Flow (SULA Diving, 2020).

The two MBES contacts may not have high potential for being archaeology, because they did not show in the 2020 SSS survey and are not the correct proportions to be vessels. However, they cannot be entirely discounted.

In World War Two, a deep-water degaussing range was laid near the Tongue of Gangsta, some 1 to 1.5km south of the proposed development (Figure 6.1; National Archives Kew, ADM 116-5790 Fleet Base Scapa Flow 1937-1946). The range was designed to de magnetize ships so they would not set off German magnetic mines. The area would have had a grid of copper cables laid over the seabed which the ship would pass over to be degaussed. This operation was run from the Backakelday degaussing shore station (Canmore 269584). The area of the range is indicated by the Prohibited Anchorage shown on Admiralty chart *Scapa Flow and Approaches (North Sheet) 1944*. It is possible that the copper grid survives below modern sediments, and would represent the remains of what was a significant operation during World War Two, contributing to the collection of historic environment resources in Scapa Flow.

⁸³ Timpany, S., Crone, A., Hamilton, D., & Sharpe, M., (2017) 'Revealed by Waves: A Stratigraphic, Palaeoecological, and Dendrochronological Investigation of a Prehistoric Oak Timber and Intertidal Peats, Bay of Ireland, West Mainland, Orkney' in The Journal of Island and Coastal Archaeology, 12:4, 515-539, DOI: 10.1080/15564894.2017.1284960

⁸⁴ SULA Diving. (2020). Investigation of seabed wreckage off the Bay of Deepdale, Scapa Flow, Orkney. Report for Department of Marine Services, Orkney Islands Council.

⁸⁵ Eodex 2021, Orkney UXO Survey Clearance Certification

6.6 Impact Assessment

6.6.1 Impacts during construction

6.6.1.1 Loss of or damage to known onshore historic environment assets

During construction any activities that include ground-breaking works have the potential to result in the damage to or loss of the three known heritage assets within the site boundary.

Within the onshore area, below ground impact from the proposed development is anticipated from the construction of the new road and the terracing for the quayside infrastructure and laydown area.

Two known historic environment assets, the dyke and sheep pens (Site 3) and the mound with central depression (Site 2) will be impacted by the development. It is likely that this will result in the entire removal of the remains of the dyke and sheep pens, whilst the mound will be at least partially impacted by the cutting for the road.

The dyke and sheep pens are of negligible importance, and the impact from the development is considered to be of high magnitude, as it would result in the complete loss of the site. This would result in a minor consequence of impact, which is not a significant impact under EIA Regulations.

The mound with central depression (Site 2) is of uncertain importance. If proven to be prehistoric in date, it would likely be of medium importance, but further investigation will be required to characterise it fully. The impact from development is considered to be of medium impact, as the mound will be at least partially removed by the development. This would result in an uncertain/moderate consequence of impact, which could be a Significant impact under EIA Regulations. Mitigation (Section 6.7) comprising further archaeological investigation will allow the characterisation of the nature, importance and extent of the asset. The results of this work will then be used to formulate an appropriate mitigation strategy in consultation with OIC if required. The implementation of these additional mitigations would result in a low residual magnitude of impact with a minor consequence of residual effect, resulting in a minor significance of residual effect, which is not significant.

6.6.1.2 Loss of or damage to unknown onshore historic environment assets

During construction any activities that include ground-breaking works have the potential to result in the damage to/loss of unknown assets within the onshore site boundary. However, the risk of unknown historic environment assets being present in the site has been reduced because of the desk-based and walkover surveys conducted. Consequently, the site is considered unlikely to contain any unknown archaeological assets of higher than Low importance.

There remains the potential for previously unknown archaeological assets, of low importance, to be subject of an impact of high magnitude of effect, which would result in a moderate consequence of impact, which is a significant impact under EIA Regulations. Mitigation (Section 6.7), focussed in the area of Site 2, comprising further archaeological investigation will allow the characterisation of the nature, importance and extent of any such assets present. The results of this work will then be used to formulate an appropriate mitigation strategy in consultation with OIC if required. The implementation of these additional mitigations would result in a low residual magnitude of impact with a minor consequence of residual effect, resulting in a minor significance of residual effect, which is not significant.

6.6.1.3 Loss of or damage to known marine historic environment asset

Dredging of the seabed has the potential to result in damage to/loss of known cultural material lying on the seabed. A single marine historic environment asset - MBES Contact 1, an MBES anomaly presenting as oval mound 14.5m by 9.7m by 1.5m high, in 18m water depth (although it did not show up in the 2020 SSS survey does not appear to be of the right proportions to be a vessel) - was identified in the scoping report as being at risk of being impacted by dredging. However changes to the design of the development since the scoping report have resulted in the

movement of the 20m dredging area much further south; as a result the closest area to be dredged (to a depth of 15m) will be 185m south of MBES contact 1. MBES Contact 1 is of unknown importance and, following the redesign, the impact of development will be negligible/nil, resulting in an impact of negligible significance, which is not a significant impact under EIA regulations.

6.6.1.4 Loss of or damage to unknown marine and intertidal historic environment assets

Dredging of the seabed has the potential to result in the damage to/loss of unknown cultural material lying on the seabed, such as debris/stray finds/ordnance.

The risk of unknown marine historic environment assets being in the area that will subject to dredging has been reduced because of the previous marine geophysical surveys conducted and reviewed. It is never possible to eliminate the risk entirely, because smaller artefacts/wreckage of stone, non-ferrous materials such as aluminium and wood might not be picked up by such surveys.

The sensitivity of such items could vary anywhere from negligible to high, however due to the surveys conducted to reduce the risk and the localised construction/installation activities, the likelihood of impact is considered low. The mitigation (Section 6.7) of the specialist review of the of the data collected for the UXO survey, and the preparation and implementation of a PAD to avoid or mitigate accidental impacts and manage any accidental discoveries of archaeological interest means that the magnitude of direct impact is negligible.

Therefore, the consequence of effect is minor and the resulting significance of effect minor and therefore not significant.

6.6.2 Impacts during operation

6.6.2.1 Long-term changes to the setting of historic environment assets that reduces their value

There is a possibility that the development and vessels visiting it could have long-term effects on the setting of historic environment assets and places, affecting the way in which the assets and places are understood, appreciated and experienced, and thus the significance/importance of the asset.

The following assets and places were identified in the Scoping Report, the setting of which could potentially be indirectly impacted by the development.

6.6.2.1.1 Netherbutton, Including Boundary Walls, Gatepiers And Outbuilding, LB46383

This C-Listed Building has a medium sensitivity to change and is located within the ZTV of the development. Although the development will result in change to its wider setting, introducing an industrial element to its views to the south-west, Netherbutton will also retain its immediate setting of agricultural land, which will still allow it to be understood and experienced as an example Orcadian steading. Consequently, Netherbutton would be subjected to a low magnitude of effect by the construction of the proposed development, which would result in a minor consequence of impact, which is not a significant impact under EIA Regulations.

6.6.2.1.2 Howa, Including Kiln, LB46381

This C-listed group of buildings has a low sensitivity to change and is located within the ZTV. The development will result in change to its wider setting, but it will retain its immediate setting of agricultural land, allowing the kiln in particular to be understood as a fine example, surviving in its immediate farm context. Howa would be subjected to a low magnitude of effect by the construction of the proposed development, which would result in a minor consequence of impact, which is not a significant impact under EIA Regulations.

6.6.2.1.3 Maritime Approach to Scapa Bay

The wider views on the maritime approach to Scapa Bay from the south-west will be changed by the development, introducing a further industrial element on the eastern side of Scapa Bay. However, given that the development is located c. 4km from Scapa Beach and 6km from St Magnus Cathedral, it would not be visible in the same framed

view as the seamark of St Magnus Cathedral during the final approaches to Scapa beach – but only experienced if a viewer physically turns away from the seamark to face the development. The maritime approach consequently will be subjected to a low magnitude of effect by the construction of the proposed development, which would result in a minor consequence of impact, which is not a significant impact under EIA Regulations.

6.6.2.1.4 Visibility of the marker for HMS Royal Oak

The distance between the marker and the development (c. 1.5 km) means that it will retain its immediate marine surroundings and it will continue to be understood in its marine context as a marker illustrating the location of the wreck and commemorating the loss of the Royal Oak. The headland of Gaitnip Hill intervenes between the Royal Oak Remembrance Garden and Memorial at Scapa and the development, and there is no intervisibility between the two.

There will be some views of the marker in which the new development will act as a backdrop, which will reduce its visibility at least partially – with the largest impact during the hours of darkness, if the proposed development's lighting is in use. However, this reduction of visibility will not be universal and the marker will retain its immediate maritime setting. The visibility of the marker will be subjected to a minor consequence of impact by the construction of the proposed development, which is not a significant impact under EIA Regulations.

6.6.2.2 Scouring of seabed from propeller wash

There is potential for the scouring of seabed deposits to expose and damage heritage assets and submerged prehistoric deposits.

The risk of unknown marine historic environment assets being in the area that will be scoured has been reduced because of the previous marine geophysical surveys conducted and reviewed. It is never possible to eliminate the risk entirely, because smaller artefacts/wreckage of stone, non-ferrous materials such as aluminium and wood might not be picked up by such surveys. The sensitivity of such items could vary anywhere from negligible to high.

Submerged prehistoric and palaeoenvironmental deposits are generally considered to have moderate or high sensitivity. However, no submerged palaeoenvironmental deposits have been identified within the site following specialist review of the initial geotechnical investigations, and none is known from other studies.

Propeller wash and the potential for scour on the seabed is not expected to have a large impact given the following:

- Large deeper draught vessels approaching the quay will be moving slowly e.g., 1 knots for safety purposes;
- Their main propeller(s) will therefore not be generating significant wash or turbulence on approach; and
- On final approach most vessels will be manoeuvring on thrusters which should not cause significant vertical turbulence (more horizontal thrust system).

Consequently the negligible impact from scouring would result in an uncertain/minor consequence of impact, which would not be a Significant impact under EIA Regulations.

6.6.3 Cumulative Impacts

The potential for cumulative effects and cumulative impact has been assessed for the proposed development and three further cumulative schemes (Table 3-2).

The nature of archaeological remains is such that there is no potential for any direct cumulative impacts between the schemes, as there is no pathway for them to impact upon any historic environment assets in common.

There is a possibility that the proposed development could have cumulative long-term effects on the setting of historic environment assets/places, affecting the way in which the asset or place is understood, appreciated and experienced, and thus the importance of the historic asset; an assessment of any such potential cumulative impacts

has been made on the assets and places identified in the Scoping Report. Given the distance to the Quanterness and Lyness wind farms (c. 10km and 15km respectively) it is considered that these schemes will not have a cumulative impact upon the setting of any assets or places and they are not considered further.

6.6.3.1.1 Netherbutton, Including Boundary Walls, Gatepiers And Outbuilding, LB46383

This C-Listed Building has a medium sensitivity to change. The Tongue of Westerbister fish farm, formed of 16 cages and a feed barge, will have a low profile within the sea and will not impact upon the predominantly terrestrial setting of Netherbutton; there is a negligible magnitude of effect from cumulative impact, which would result in a minor consequence of impact, which is not a significant impact under EIA Regulations.

6.6.3.1.2 Howa, Including Kiln, LB46381

This C-listed group of buildings has a low sensitivity to change. The Tongue of Westerbister fish farm, formed of 16 cages and a feed barge, will have a low profile within the sea and will not impact upon the predominantly terrestrial setting of Howa; there is a negligible magnitude of effect from cumulative impact, which would result in a negligible consequence of impact, which is not a significant impact under EIA Regulations.

6.6.3.1.3 Maritime Approach to Scapa Bay

There is the potential that the proposed development and The Tongue of Westerbister fish farm would both be visible in some wider, long distance, views on the maritime approach to Scapa Bay from the south-west. Given the distance involved and the relatively modest changes made by the developments to the wider seascape and landscape there would be negligible cumulative impact from these schemes. Therefore, there is a low magnitude of effect from cumulative impact, which would result in a minor consequence of impact, which is not a significant impact under EIA Regulations.

6.6.3.1.4 Visibility of the marker for HMS Royal Oak

The marker will retain its immediate setting of open water and it will continue to be understood in its marine context as a marker illustrating and commemorating the loss of the Royal Oak. There is the potential that the proposed development and The Tongue of Westerbister fish farm will both be visible in some views of the marker; these may reduce its visibility at least partially but this reduction will not be universal and the marker will retain its immediate maritime setting which provides it with the marine context of HMS Royal Oak. The visibility of the marker will be subjected to a low magnitude of effect from cumulative impact, which would result in a minor consequence of impact, which is not a significant impact under EIA Regulations.

6.7 Mitigation and Monitoring

Further archaeological investigation, potentially comprising geophysical survey and/or archaeological trial trenching, will be agreed with OIC in advance of the construction phase of the projects. This may lead to further requirements for mitigation, either before or during the construction.

Specialist marine archaeological interpretation of the geophysical surveys which took place in 2021 will be undertaken and submitted to OIC and MD-LOT prior to the construction phase of the project.

A Written Scheme of Investigation (WSI) and Protocol for Archaeological Discoveries (PAD) to avoid or mitigate accidental impacts and manage any accidental discoveries of archaeological interest will be compiled and submitted for approval to OIC and MD-LOT and fully implemented during the construction phase of the project.

6.8 Residual Effects

Table 6-10 summarises the effects for all impacts assessed. In summary, no significant residual effects on historic environment assets have been identified.

Table 6-10 Summary of Residual Effects for Archaeology and Cultural Heritage Receptors

Predicted Impact	Receptor	Assessment Consequences	Significance	Mitigation Identified	Significance of Residual Effect
Construction					
Loss of or damage to known onshore historic environment assets;	Dyke and sheep pens (Site 3)	Minor	Not significant	None	Not significant
	Mound with central depression (Site 2)	Uncertain/Moderate	Significant	Further investigations (geophysical survey/trenching) and excavation if necessary	Not significant
Loss of or damage to unknown onshore historic environment assets;	Unlocated archaeology surviving within the onshore part of proposed development	Moderate	Significant	Further investigations (geophysical survey/trenching) and excavation if necessary	Not significant
Loss of or damage to known marine and intertidal historic environment assets;	MBES Contact 1	Minor	Not significant	WSI/PAD	Not significant
Loss of or damage to unknown marine and intertidal historic environment assets;	Unlocated shipwrecks, aircraft and other unknown assets	Minor	Not significant	Specialist Review of data collected for UXO survey; WSI/PAD	Not significant
Operation					
Long-term changes to the setting of historic environment assets that	Netherbutton	Minor	Not significant	Due to the lack of significant effects, no mitigation	Not significant
	Howa	Minor	Not significant		Not significant
	Maritime Approach to Scapa Bay	Minor	Not significant		Not significant

reduces their value	Visibility of the marker for HMS Royal Oak	Minor	Not significant	measures are proposed	Not significant
Scouring of seabed from propeller wash	MBES Contact 1, previously unrecorded debris/stray finds/ordnance	Minor/Uncertain	Not significant	None	Not significant
Cumulative Impacts					
Long-term changes to the setting of historic environment assets that reduces their value	Netherbutton	Minor	Not significant	Due to the lack of significant effects, no mitigation measures are proposed	Not significant
	Howa	Negligible	Not significant		Not significant
	Maritime Approach to Scapa Bay	Minor	Not significant		Not significant
	Visibility of the marker for HMS Royal Oak	Minor	Not significant		Not significant

6.9 Statement of Significance

This chapter has considered the likely effects of the proposed development on archaeological assets (both onshore and marine), historic buildings, and other aspects of the historic environment.

Baseline conditions were established through a desk-based assessment of existing archaeological and documentary evidence, a site walk-over survey, and assessment of stratigraphic records of core samples collected during geotechnical survey work.

These studies have established that there are no designated heritage assets within the site or in close proximity to the site and that the proposed development will not have a significant impact on the significance or setting of any designated heritage assets in the surrounding area. No marine heritage assets or sediments of interest for palaeoecological study have been identified within the site.

The baseline studies identified two heritage assets within the site which could be impacted by the proposed development; a dyke and sheep pens (site 3) and a possible prehistoric mound (site 2). The dyke and sheep pens are of negligible importance, and the impact from the development is considered to be of high magnitude, as it would result in the complete loss of the site. This would result in a minor consequence of impact, which is not a significant impact under EIA Regulations. The mound with central depression (Site 2) is of uncertain importance. If proven to be prehistoric in date, it would likely be of medium importance, but further investigation would be required to characterise it fully. The impact from development is considered to be of medium impact, as the mound will be at least partially removed by the development. This would result in an uncertain/moderate consequence of impact, which could be a Significant impact under EIA Regulations. Mitigation comprising further archaeological investigation will allow the characterisation of the nature, importance and extent of the asset. The results of this work will then be used to formulate an appropriate mitigation strategy in consultation with OIC if required. The implementation of these additional mitigations would result in a low residual magnitude of impact with a minor consequence of residual effect, resulting in a minor significance of residual effect, which is not significant.

7 SEASCAPE, LANDSCAPE AND VISUAL IMPACT ASSESSMENT

7.1 Introduction

7.1.1 Purpose and scope of the SLVIA

This chapter of the EIAR presents the findings of the seascape, landscape and visual impact assessment (SLVIA) of the proposed development. This includes consideration of effects on both terrestrial and coastal character. Likely significant residual effects are identified for both the construction and operational phases.

The location of the proposed development requires that the SLVIA pay due regard to effects on coastal character and seascape. For the purposes of this assessment, 'coastal character' (as defined in guidance published by NatureScot – Guidance on Coastal Character, August 2017) is considered to adequately cover the 'seascape' aspect of the SLVIA required by scoping stage statutory consultation responses (including that from NatureScot). This approach and the application of this guidance was agreed with NatureScot during post scoping consultations. As a consequence, this SLVIA does not consider 'seascape' as a separate and additional topic but as the coastal counterpart to 'landscape' informed by the published coastal character assessment of Orkney and Caithness (NatureScot, August 2016). Herein, references to seascape assessment can be considered as referring to the assessment of effect on coastal character and vice versa.

Full details of the site and of the proposed development are located within Chapter 1 of the EIAR (Introduction) and Chapter 2 (Proposed Development). The following introductory sections within this chapter provide a brief summary of the site and proposed development with specific regard to the assessment of seascape, coastal, landscape and visual effects.

7.1.2 The site

The site is located approximately 6km to the south of Kirkwall on the southern coast of Mainland in Orkney (see Figure 1, Volume 2 of the EIAR). The site comprises undeveloped coastline and opens out to the south west into the waters of Scapa Flow. Inland from the coastline the site comprises a geometric pattern of sloping agricultural fields with higher, uncultivated ground at Gaitnip Hill immediately to the north beyond the Burns of Deepdale and Button. Further inland the site is passed to its east by the route of the A961 (running approximately 1km back from the coastline) with a scattering of residential properties found mainly to the east and south east.

7.1.3 The proposed development

The permanent infrastructure associated with the proposed development comprises:

- A new quayside extending out into Scapa Flow, approximately 597m in length roughly parallel to the existing natural coastline, with a laydown area behind the quayside at between approximately 6m to 12m Above Ordnance Datum (mAOD). Approximately half of this operational laydown area would extend out to the south west into the waters of Scapa Flow and approximately half would be cut back into the existing hillside. The overall extent of the laydown area is in the region of 18 hectares. Security boundary fencing would restrict access to this area.
- The approximate 20m change in level to the north east of the laydown area (to the rear of the new quay) caused by the required cut into the hillside would likely comprise a minimum 1:1 gradient embankment. This would likely comprise bare rock with the likely incorporation of terracing to help control possible rock falls. This assessment has assumed that this cut would remain permanently unvegetated.
- Lighting of the quayside and laydown areas is likely to comprise approximately eight 40m high lamps.

- An access road of approximately 1km in length would link the north eastern boundary of the main coastal quayside site at the shoreline to the A961 at an elevation of approximately 60 mAOD to the north east. The sloping access road would run close to grade with short sections of shallow cutting and shallow fill in response to local topographical form. No lighting or security fencing is proposed along the access road which would be open to public and cycle use.

For the avoidance of doubt, the assessments in this chapter do not anticipate the following to be included within the permanent infrastructure:

- New buildings on the new quay or within the laydown area.
- Incorporation of permanent cranes on the quayside (any cranes would either be fixed to visiting vessels or temporarily brought to site).
- Lighting along the access road.

In addition to the permanent infrastructure, the assessment considers the temporary activities and uses that the proposed development is likely to attract and accommodate. These uses and activities are not currently confirmed but, nevertheless, it is anticipated that the proposed development might likely service the off-shore wind energy industry and act as an assembly hub for large-scale components. The SLVIA additionally considers the following in more general terms:

- The presence of visiting vessels (including their passage to and from the quay).
- Temporary activities and component storage at the quayside and within the laydown areas. It is acknowledged that these components could be very large in scale and may, either when stored or whilst being handled, exceed the height of the proposed 40m high lighting columns which would form part of the permanent fixed infrastructure.

With regard to the temporary presence of elements that might be attracted by the presence of the quay and the uses that evolve, this assessment does not factor in the possibility of additional rigs being anchored out to sea. It is noted that the baseline situation already features such rigs and they appear in many of the viewpoint photographs included within this chapter.

7.2 Scoping and Consultation

7.2.1 Scoping report

A scoping report for the proposed development was submitted by Envirocentre on behalf of Orkney Islands Council Harbour Authority (OICHA) to both Orkney Island Council (OIC) and Marine Scotland in March 2021. Section 7 of the scoping report considered potential landscape and visual effects. It was based on a preliminary appraisal including a site visit. It sought to consider:

- The landscape/seascape character of the site and surrounding area.
- The coverage of any landscape designations across the site and surrounding area.
- Important views and viewpoints towards the site from the surrounding landscape.
- Any potentially significant landscape and visual effects during construction and post-completion.
- Recommendations for mitigating any potentially significant adverse effects.

The scoping report proposed to scope in the seascape, landscape and visual topic into the EIAR. Neither a Zone of Theoretical Visibility (ZTV) for the proposed development nor a schedule of proposed representative viewpoints was provided at scoping stage.

7.2.2 Scoping opinions

Formal scoping opinions were received from:

- Orkney Islands Council (May 2021).
- Marine Scotland (October 2021).

Both scoping opinions draw on many of the same consultation responses from consultees and the key seascape, coastal, landscape and visual matters raised in the scoping opinion of OIC were supported in full by Marine Scotland with no materially additional matters raised. The scope of this assessment therefore principally responds to the scoping opinion of OIC.

Orkney Islands Council Scoping Opinion

OIC's formal scoping opinion included a general requirement for a SLVIA within the EIAR and Section 6.6 of their scoping opinion included the following specific requests:

- The possibility of an effect upon the Hoy and West Mainland National Scenic Area (NSA) was raised as a consideration.
- The opinion suggested that historic environment assets may require consideration as visual receptors.
- It asked that viewpoints and visual receptors be agreed with the council.
- It included a request to consider cumulative effects (paragraph 6.6.2).

Individual consultee responses are provided in Appendix 1 of the OIC scoping opinion. The following contain relevant information.

Development Management (OIC Policy Officer) scoping comments

This states that *"the effects on landscape, seascape and coastal character are likely to be significant as a result of the scale of the proposed development and a full SLVIA should be required as part of the EIAR. This should include an assessment of cumulative effects. In the absence of an identified zone of theoretical visibility it is not possible to comment at this stage on the identification of seascape, landscape and visual receptors. Due to the proposed nature and scale of the development it is likely that landscape and visual impacts will be experienced across the local area. It is therefore considered premature to conclude in the scoping report at para. 7.4.3 that 'it is very unlikely that any significant effects would be experienced', as this will depend on the outcome of the SLVIA and potential mitigation. It is recommended that the developer should identify the zone of theoretical visibility and consult the planning authority to identify viewpoints and key receptors. This is likely to include historic environment assets."*

NatureScot scoping comments

NatureScot raised the Hoy and West Mainland NSA as a potential issue and suggested that a representative viewpoint might be included from there. They suggest that as part of the assessment a ZTV should be prepared and used to identify viewpoints and key receptors, in consultation with the planning authority.

Cumulative assessment

Paragraph 6.13.3 of the OIC scoping opinion reports NatureScot's request for cumulative matters to be considered. It quotes NatureScot as suggesting that *"the cumulative assessment needs to take into consideration ... sectors including aquaculture, renewable energy developments, cable installations etc... further information on cumulative assessment was provided to the Applicant as part of the consultation on the Orkney Harbour Masterplan. We consider that the Orkney Islands Council are best placed to advise the Applicants on which proposals to include in the cumulative assessment"*.

A list of developments for possible inclusion within the scope of any cumulative assessment was included as Appendix 2 to the OIC scoping opinion.

7.2.3 Further consultations during the early stages of the assessment

Following receipt of the scoping opinions, further consultations were undertaken during the early stages of the assessment with both OIC and NatureScot. The scope of the SLVIA is also informed by the outcome of two Pre-Application Consultation (PAC) events held in December 2022 and February 2023 (further details of these PAC events are provided within Chapter 2 of this EIAR).

Post scoping consultations with OIC comprised:

- A ZTV and proposed representative viewpoints were issued to OIC on 15 October 2022 prior to undertaking a first site visit (no response was received).
- Captured representative viewpoint locations were shared with OIC on 20 October 2022 following a first site visit (no response was received).
- A telephone conversation took place on 28 November 2022 between Phillip Black of Sweco (the lead author of this assessment) and Jamie Macvie of OIC during which possible representative viewpoint locations, receptors, the NSA and the topic of seascape were discussed. A number of possible representative viewpoint locations were mentioned including heritage sites where visitors might also be present. Jamie Macvie agreed to further discuss the issues with colleagues on 30 November 2022 but no further response was received.
- A final method statement was subsequently issued to OIC on 2 December 22. No further written comments were received.

Post scoping consultations with NatureScot comprised:

- A ZTV and proposed representative viewpoints were issued to NatureScot on 15 October 2022 prior to undertaking a first site visit (no response was received).
- Captured viewpoint locations were shared with NatureScot on 20 October 2022 following a first site visit (no response was received).
- An email was issued to NatureScot on 28 November 2022 seeking a response to the proposed treatment of the Hoy and West Mainland NSA and seeking confirmation of the required approach to seascape assessment. Responses were received from both Jonathan Swale and Sian Haddon on 29 November 22 stating that they would respond in due course.
- A further holding email was issued by Sian Haddon on 29 November 22, but also seeking additional information regarding heights/sections.
- A final email was received from Sian Haddon at NatureScot on 1 December 2022. An offer to discuss the likelihood of a significant effect on the NSA was not taken up. The response confirmed that the desire to have a representative viewpoint at Hoy was sustained (but in all other respects viewpoint selection was deferred to OIC). Seascape assessment was confirmed as requiring reference to the relevant SNH (Scottish Natural Heritage – now renamed NatureScot) guidance document and to the Orkney and North Caithness Coastal Character Assessment (August 2016).
- A final method statement was subsequently issued to OIC on 2 December 22. No further written comments were received.

The post-scoping consultations with OIC and NatureScot focused on the following key topics reaching the following key agreements:

Extent of the 15km radius study area

No proposed study area was suggested within the original scoping report. An initial study area of 15km radius around the extent of the site was adopted to run preliminary ZTVs. ZTVs showing a 15km radius study area were issued to both OIC and NatureScot. Neither body commented on the proposed study area.

Methodology and assessment criteria

A comprehensive method statement was issued to both OIC and NatureScot on 2 December 2022. This confirmed that photomontage visualisations were not proposed. Neither party responded.

Agreement of the principal representative viewpoints for the visual assessment

No proposed representative viewpoints were included in the original scoping report. Following production of a preliminary ZTV, consultations took place in September and October 2022 to agree the representative viewpoints for the visual assessment with both OIC and NatureScot. NatureScot generally deferred to OIC on this matter and, in the absence of detailed written responses, the representative viewpoints are considered to be agreed with both parties. The one exception was NatureScot's suggestion that a viewpoint should be included from Hoy (within the NSA), however this was rejected and the reasoning for this is set out later within this chapter.

Consideration of effects on the Hoy and West Mainland NSA

NatureScot requested that a representative viewpoint be included from the Hoy and West Mainland NSA in the vicinity of Bring Head (approximately 14km to the west of the site on the other side of Scapa Flow and approximately 16km to the closest areas from where views of the proposed development might occur). The assessment within this chapter sets out why this was judged not to be necessary.

Definition of the topic of seascape

It was suggested in the proposed method statement issued to both OIC and NatureScot on 2 December 2022 that seascape and coastal character are effectively the same thing and that appropriate reference to the Orkney Coastal Character Assessment adequately covered the matter. NatureScot confirmed this to be the relevant guidance. OIC deferred to NatureScot on the matter.

7.3 Policy, Legislation and Guidance

7.3.1 National planning policy

National Planning Framework 4

National Planning Framework 4 (NPF4) was published in February 2023 and sets out the national spatial strategy for Scotland. The following parts of NPF4 relate to the potential landscape and visual effects of the proposed development.

The regional spatial priorities for the north and west coast and islands recognises that *'the area has an exceptional environment with coastal and island landscapes that are an important part of [Scotland's] national identity'*.

Policy 14

Policy 14 of NPF4 states that *'development proposals will be designed to improve the quality of an area whether in urban or rural locations and regardless of scale'* and *'development proposals will be supported where they are consistent with the six qualities of successful places'*. These six qualities of successful places are identified to include *'Pleasant: Supporting attractive natural and built spaces'* and *'Distinctive: Supporting attention to detail of local architectural styles and natural landscapes to be interpreted, literally or creatively, into designs to reinforce identity.'*

Annex D of NPF4 expands on these qualities of successful places. Relevant excerpts include:

'2. Pleasant: Supporting attractive natural and built spaces. Designing for: connecting with nature including natural landscape, existing landforms and features, biodiversity and eco-systems, integrating blue and green infrastructure and visual connection ... enjoyment, enabling people to feel at ease, spend more time outdoors and take inspiration from their surroundings.'

'4. Distinctive: Supporting attention to detail of local architectural styles and natural landscapes to be interpreted into designs to reinforce identity. Designing for: sense of place including design influences, architectural styles, choice of materials and finishes, detailing, landscape design, active frontages and cultural context.'

7.3.2 Regional planning policy

Pilot Pentland Firth and Orkney Waters Marine Spatial Plan (2016)

Statutory Regional Marine Plans are due to be prepared for all Scottish waters. The pilot Pentland Firth and Orkney Waters (PFOW) Marine Spatial Plan is the outcome of a pilot process for setting up planning policy framework for future statutory Regional Marine Plans. Paragraph 12.1 of the Orkney Local Development Plan, 2017, states that the PFOW *"supports an integrated approach to terrestrial and marine planning and the Pentland Firth and Orkney Waters Pilot Marine Spatial Plan, and any subsequent Regional Marine Plan, which will form part of the statutory marine planning regime under the Marine (Scotland) Act 2010, will be adopted as Planning Policy Advice."*

7.3.3 Local planning policy

Orkney Islands Council (OIC) is the local planning authority for Orkney. The Development and Marine Planning Team at OIC cover a range of responsibilities associated with strategic and local policy development for the use, development and protection of land and sea in Orkney. This includes preparation of the Orkney Regional Marine Plan (see above) and the Orkney Local Development Plan (OLDP).

Orkney Local Development Plan 2017 - 2022

The OLDLP, adopted in April 2017, contains the land use planning policies which OIC use for determining applications and OIC development proposals for town, villages and rural settlements within the local authority area. The main document is supported by appendices, Supplementary Guidance, Planning Policy Advice and Development Management Guidance. The local plan contains the following policies relevant to the seascape, landscape and visual assessment of the proposed development:

Policy 1 – Criteria for all development

Policy 1 sets out the general requirements for all development including to ensure that it responds to the landscape and seascape character context:

"Development will be supported where:

- i. It is sited and designed taking into consideration the location and the wider townscape, landscape and coastal character;*
- iv. The amenity of the surrounding area is preserved and there are no unacceptable adverse impacts on the amenity of adjacent and nearby properties/users;*
- ix. It protects and where possible enhances and promotes access to natural heritage, including green infrastructure, landscape and the wider environment; and*
- x. It protects and where possible enhances Orkney's cultural heritage resources."*

Policy 2 – Design

Policy 2 seeks to deliver good design.

"Where relevant, proposals must demonstrate, through consideration of scale, massing, form, proportions, plot size/density, materials, layout and landscaping, that it complies with the following fundamental principles:

- i. it reinforces the distinctive identity of Orkney's built environment and is sympathetic to the character of its local area;*
- ii. it has a positive or neutral effect on the appearance and amenity of the area;*

vi. all external lighting is designed to minimise light pollution.”

Policy 9 – Natural heritage and landscape

Policy 9 covers ecology, trees and landscape. The explanatory text states that:

“During the lifetime of the Plan, the Council will investigate and identify Local Landscape Areas. Development within a Local Landscape Area should pay due regard to any supporting information on the areas that is produced by the Council as planning policy advice.”

Specifically in relation to landscape, Policy 9 states that:

- “i. All development proposals must be sited and designed to minimise negative impacts on the landscape, townscape and seascape characteristics and landscape sensitivities that are identified in the Orkney Landscape Character Assessment, and should be sympathetic to locally important natural and/or historic features within the landscape.*
- ii. Consideration should be given to the siting, scale and design of the proposal, as well as the potential for cumulative effects with other developments.*
- iii. Development that affects the NSA will only be permitted where it is demonstrated that: a) the proposal will not have a significant effect on the overall integrity of the area or the qualities for which it has been designated; or b) any such adverse effects are clearly outweighed by social, environmental or economic benefits of national importance.*
- iv. Development proposals affecting the area of wild land on Hoy will only be permitted where it has been demonstrated that any significant effects on the character and qualities of this area can be substantially overcome by siting, design or other mitigation.”*

Policy 10 – Green infrastructure

Policy 10 deals with green infrastructure including core paths, access and open spaces in settlements.

“Where a proposal will affect access rights, a core path, a right of way or other public paths it will be necessary to ... maintain or enhance the amenity value of the current route”.

Policy 12 – Coastal development

The role of this policy is to manage coastal development. The policy is split into several parts listed from A to E. Parts A and E contain relevant policy context information and extracts from the key parts are included below.

“A - Criteria for all Coastal Development - Development in the coastal zone (above Mean Low Water Mark of Ordinary Spring Tides) will be supported where it can be demonstrated that: i. the scale, location, siting and design of the development will not have a significant adverse effect, either individually or cumulatively, on the landscape/coastal character, seascape or townscape, taking account of all relevant national studies and guidance; ... and v. public access to and along the coast will be maintained and enhanced wherever possible. Development that would result in significant adverse effects under criteria i to v, that cannot be appropriately mitigated, will only be permitted when it can be demonstrated that any such effects are clearly outweighed by significant socioeconomic benefits.

C - Locational Considerations – focuses on steering development towards existing settlement boundaries.

E - Ports & Harbours - i. Development which requires a pier and/or harbour location, including for fishing, renewables, aquaculture or marine leisure and recreational purposes, will be supported within areas identified for harbour and pier uses where; a) the proposal requires a harbour-side location or is ancillary to activities taking place within the harbour area; b) the proposal would not adversely affect the commercial viability or efficient working of the harbour or pier for commercial marine related uses; c) the design, scale and siting of new development would not have a significant adverse effect on the local coastal character and visual amenity; ... ii. The enhancement and upgrading of piers, landing facilities and other facilities associated with the industries which require a pier and/or harbour location will be supported.”

Orkney Local Development Plan Supplementary Guidance

Six Supplementary Guidance documents have statutory status, meaning they form part of the Plan and have the same weight when deciding planning applications.

Supplementary Guidance **Natural Environment** (March 2017) focuses on ecology and is not relevant to this assessment.

Supplementary Guidance **Settlement Statements** (April 2017). Settlement statements have been produced for all the settlements on Mainland. These set out the key information for each settlement to complement the policies of the Orkney Local Development Plan. The site of the proposed development is located some distance from any identified settlement.

Supplementary Guidance **Historic Environment and Cultural Heritage** (March 2017) sets out the required approach to assessing the effects of development on cultural heritage. This matter is considered elsewhere within this ES.

7.3.4 Key issues emerging from the policy context

The key seascape, coastal, landscape and visual issues associated with the proposed development have been identified as follows:

- The site is located in a rural coastal location some distance from any existing settlement limits and is not allocated for development.
- The site is, however, located a considerable distance from any nationally or locally designated landscapes (such as the NSA), conservation areas or core paths. The principal consideration therefore is the relationship of the nature of the proposed development to the value and characteristics of its specific seascape, coastal and landscape character context.
- The scale, location, siting and design of development should seek not have a significant adverse effect on the landscape and coastal character.
- The visual amenity of local residents should be protected.

Elements of the policy context are shown in Figure 2, Volume 2 of the EIAR.

7.4 Methodology

This section of the chapter sets out the methodology used for the assessment of the seascape, landscape and visual effects of the proposed development. The bespoke methodology was developed in response to OIC’s scoping opinion including paragraphs 6.6.1 to 6.6.4 which provided specific guidance on what should be considered. The substantive content of this method statement was shared by email with both OIC and NatureScot on 2 December 2022. No written comments on the method statement were received from either statutory consultee. It is therefore considered to have been agreed by both parties.

7.4.1 Scope of the assessments

The assessment considers the likely seascape, landscape and visual effects of the proposed development. The assessment considers effects on landscape and coastal character (the effect on the landscape and seascape resource) and on visual amenity (the effect on people’s visual amenity in specific locations). The potential for cumulative effects is considered.

The location of the proposed development requires that the landscape assessment pay due regard to coastal and seascape character. For the purposes of this assessment ‘coastal character’ (as defined and considered within published documents) is considered to capture seascape matters. Seascape is treated as a subset of coastal

character. The assessment draws on published documentation relating to terrestrial landscape and coastal character but does not then consider 'seascape' as a separate and additional topic.

The assessment considers both the construction and operational phase effects of the proposed development. It considers the operational phase effects in year 1 immediately after completion of construction. Separate consideration of effects over the longer term (typically residual effects in year 15 after any mitigation planting has begun to mature) has not been undertaken for this proposed development because, due to the location and specific landscape and coastal character context, mitigation of potential seascape, landscape and visual effects does not include areas of proposed new tree planting to screen the proposed development.

7.4.2 Guidance

The overall method of assessment is based on the principles established in best practice guidance Guidelines for Landscape and Visual Impact Assessment, Third Edition (2013) (GLVIA3) (Landscape Institute and the Institute of Environmental Management and Assessment). GLVIA3 states that any assessment of effects and the assessment criteria used should be tailored to the specific nature and likely potential effects of the development proposed.

Consideration of coastal character has been informed by Nature Scot's "Guidance Note Coastal Character Assessment" (version 1a, July 2018) Paragraph 1.7 of this guidance explains that 'Coastal character is made up of the often-narrow margin of the coastal edge, its immediate hinterland and areas of sea. These three key components of coastal character include what is commonly known as 'seascape.'

Within the context of SLVIA, this assessment considers 'seascape' as the coastal counterpart to 'landscape'. As such, the method of assessment of effects applied to coastal character area receptors has been the same as the approach applied to the assessment of effects on terrestrial landscape character areas.

7.4.3 Study areas

The proposed development principally comprises the creation of a new quay, laydown areas and access road. The permanent infrastructure would generally be low lying at approximately 6-12 mAOD (albeit with up to 40m tall lighting columns). The temporary activities and uses of the quay (including visiting vessels) could, however, be taller and potentially more widely visible. The following study areas have been adopted for the assessment of seascape, landscape and visual effects:

- A general study area of 15km radius around the proposed development for consideration of seascape, coastal and landscape character effects; the production of ZTVs; and the selection of principal representative viewpoints for the visual assessment.
- A more focused study area of 2km radius around the proposed development for more detailed consideration of individual visual receptors within the immediate locality including residential locations near to the site.

7.4.4 Zones of theoretical visibility (ZTVs)

The adoption of a 15km radius general study area was informed by the production at the early stages of the assessment of preliminary ZTVs to a 20km radius. This demonstrated that the principal areas of potential visibility lay within 15km and that any occasional longer distance visibility and resulting effects would unlikely be significant (see also section below on NSA).

Banded ZTVs were produced to help explain the varying levels of potential visibility based on different parts of the permanent infrastructure and the temporary associated activities. These comprised ZTVs for the following:

- The low-level nature of the proposed new quay (the permanent fixed infrastructure) (to approximately 5.3 mAOD).
- Low structures and quayside traffic movements and activities (likely to generally extend to a maximum of approximately 15 mAOD).
- Lighting columns (likely to extend to a height of approximately 40m above quayside levels).
- Taller temporary features such as visiting shipping, cranes and cargo movements (likely to extend to a height of up to approximate 50 mAOD).
- A ZTV from a nominal height of 100 mAOD was also run to provide an absolute worst case for anything that might visit or be assembled at the assembly hub.

7.4.5 Determining baseline seascape, landscape and visual conditions

Baseline seascape, landscape and visual assessments have been undertaken in parallel and have been informed by a combination of desk and field-based techniques.

Desktop Assessment

Preliminary identification, description and evaluation of the existing seascape, landscape and visual context of the study area has involved a desk-based review and interrogation of the following principal information sources:

- Scottish Natural Heritage (SNH – now renamed NatureScot) national landscape character assessments – identification of landscape character types in the vicinity of the site and across the development ZTV (the site is located within the Inclined Coastal Pasture Landscape Character Type (LCT 302).
- The regional and local coastal character areas identified in the Orkney and North Caithness Coastal Character Assessment (August 2016) (the site is located on the boundary of the Hemp Stack to Bay of Deepdale and the Bay of Deepdale to Howequoy Head local coastal character areas (LCCA 22c and 22d) within the regional coastal character area of Scapa Bay (RCCA 22)).
- Ordnance Survey mapping and aerial photography relating to existing landform, vegetation, settlement patterns, promoted viewpoints and drainage regimes; and

Field Assessment

Field surveys have been undertaken during periods of clement weather from public highways and publicly accessible areas. Site work has involved:

- A corroboration of the findings of the desktop review;
- Collection of additional information on landscape elements, landscape and coastal character, views and localised screening; and
- Baseline viewpoint photography from agreed representative viewpoints across the general 15km radius study area and from selected additional residential locations within 2km of the site.

Visual receptors

Visual receptors have been identified that lie within the ZTV of the proposed development within a 15 km radius of the site. These comprise people in different locations. Key categories include residential locations, users of footpaths (in particular, core paths) and users of local roads. This understanding over the 15km radius study area has then be used to inform the selection of the principal representative viewpoints. Detailed consideration of visual receptors is limited to the 2km radius study area with a focus on residential locations. Consideration of footpath users acknowledges general rights of access for recreational purposes in Orkney but focuses on the core path network.

Paragraph 6.6.2 of OIC's scoping opinion identifies historic environment assets as potential visual receptors. This is in recognition that heritage assets on Orkney can attract high numbers of visitors. Where appropriate, it was therefore agreed that the visual assessment would therefore consider the effect on the visual amenity of people

visiting these sites but not the effect on the setting of the asset (which is covered in the archaeology and cultural heritage chapter of this EIAR). In practice no such frequently visited heritage sites were identified as falling within the ZTV of the proposed development or potentially subject to significant visual effects.

7.4.6 Representative viewpoints, photography and visualisations

The visual assessment principally draws on detailed consideration of selected representative viewpoints across the 15km radius general study area. The location of representative viewpoints has been informed by the identification of potential visual receptors and by the production of ZTVs. Seven representative viewpoint locations have been identified and agreed with OIC and with NatureScot. All of these locations are terrestrial and on Mainland. Views from the sea have not been included in the representative viewpoint assessment due to the absence of ferry routes in the immediate vicinity.

A panoramic photographed baseline image has been presented for each representative viewpoint and the anticipated effects upon it described and assessed. Given the open nature of the Orkney landscape it is considered appropriate that baseline photographs are taken in either winter or summer (the majority were taken in winter). Due to the absence of tree cover seasonal differences in the levels of visibility and the visual effect of the proposed development would be very limited.

Verified photomontage visualisations of the proposed development are not included for any of the agreed representative viewpoints. This is because the permanent infrastructure of the proposed quay would be very low lying. The taller elements are likely to be associated mobile and temporary features such as visiting vessels, and any photomontage image would be highly conjectural.

7.4.7 Consideration of landscape designations

The Hoy and West Mainland NSA lies approximately 14km to the west of the site at its closest point. Preliminary ZTVs (including to a potential height of 100 mAOD) demonstrated that there was some potential for visibility of the proposed development from areas within the designation in the vicinity of Bring Head on the north east coast of Hoy. However, the extent of this potential visibility over distances in excess of approximately 17km is relatively limited and it is considered that the potential for a significant effect on the character, value and integrity of the designation is negligible. A desktop assessment of the effect of the proposed development on the NSA is included in the SLVIA but no representative viewpoints have been included from Hoy. Further rationale for this approach is set out within the relevant part of the assessment. There are no known local landscape designations that could potentially be affected by the proposed development.

7.4.8 Assessment terminology and criteria

In accordance with GLVIA3, the assessments use experienced professional judgement to assess the sensitivity of the baseline seascape, landscape and visual environment and to consider the magnitude of potential change that the proposed development would cause. These are then combined to consider the level of effect and its significance. Major and moderate levels of effect are generally regarded to be significant.

Landscape and Coastal Character Areas

The sensitivity of landscape or coastal character area have been assessed by combining the susceptibility of their key characteristics to the type of changes likely to be associated with the proposed development with the value or importance understood to be attached to the area. Key characteristics can include matters such as scale; enclosure; openness, landform; landcover; landscape pattern; and manmade influences. The sensitivity of the landscape or coastal character area are assessed as High, Medium, or Low using professional judgement.

Assessment of the magnitude of change may take account of all the following factors and professional judgement is used to determine the relevance and appropriate weighting to be attributed to each:

- The degree of change that takes place;
- The geographical extent of the landscape or coastal character area that will be changed;
- The likely duration of the change to the character area; and
- Whether the change to the character area would be reversible if the development were decommissioned.

The degree of likely change is assessed as High, Medium, Low or Negligible. A judgement of a High change is typically defined as the development forming a prominent element or will result in a substantial alteration to key characteristics. A judgement of a Negligible magnitude of change is typically defined as the development will be a barely perceptible or will not change the key characteristics.

A final judgement on the overall level of effect on the landscape or seascape character area has then been made by combining the sensitivity of the receiving environment with the magnitude of change to it. The level of effect has been described using a four-point scale of Major, Moderate, Minor or Negligible and the nature of effect has been judged as Adverse or Beneficial. Reasoned professional judgement has been used to combine considerations and assess the overall level of effect.

Visual

The sensitivity of visual receptors and representative viewpoints has been assessed by combining consideration of their visual susceptibility with the value, or importance, that they are likely to attribute to their available views. The sensitivity of the receptors has been assessed as High, Medium, or Low using professional judgement. Typically, high sensitivity receptors are people with a particular interest in their available view or with prolonged viewing opportunities such as residential locations; tourist destinations providing a specific important and highly valued view; recreational hilltops; ornamental parks/designed landscapes; and core paths. Typically, low sensitivity receptors are people with a passing interest in their surroundings such as places of employment; major highways (excluding those likely to attract high levels of tourist traffic).

Assessment of the magnitude of visual change may take account of all the following elements and professional judgement has been used to determine the relevance and appropriate weighting to be attributed to each:

- The degree of visual change that takes place;
- The geographical extent of the area from which the change will be visible;
- The likely duration of the visual change; and
- Whether the visual change is likely to be reversible if the infrastructure were decommissioned.

The degree of likely visual change has been assessed as High, Medium, Low or Negligible. A judgement of a High magnitude of change is typically defined as the visual changes associated with the development will form a prominent element within the view, resulting in a prominent change to the quality and character of the view. A judgement of a Negligible magnitude of change is typically defined as the visual changes associated with the development will result in a barely perceptible change in the view or will cause no change to the existing view.

A final judgement has been made on the overall level of effect on the visual receptors by combining their sensitivity with the magnitude of visual change that they would likely experience. Overall effects are described using a four-point scale of Major, Moderate, Minor or Negligible and the nature of effect judged as Adverse or Beneficial. Reasoned professional judgement has been used to combine considerations and assess the overall level of visual effect.

7.5 Baseline

7.5.1 Site description

The site is located on the eastern shore of Scapa Flow, Mainland Orkney, at the Bay of Deepdale approximately 6km south of Kirkwall (see Figure 7.1, Volume 2 of the EIAR). The Bay of Deepdale is a shallow linear bay extending to 700m and defined by two short headlands to the north and south. The headland to the north extends 50m beyond the bay and lessens in height towards the bay where it defines the northern banks of the Burn of Deepdale as it enters the sea. In the northern corner of the bay, a small fluvial plain 60m wide through which the Burn of Deepdale flows forms the lowest part of the coastline across the bay. Beyond this to the south, the coastline for the next 650m sits between approximately 10-15m above sea level and consists of steep rocky outcrops between 3-10m in height topped with domed grassy slopes. These grassy slopes interact with the steep rocky outcrops and can often extend down to within a few metres of sea level. The shore along the length of the bay comprises large, rounded cobbles with eroded bedrock protruding in many places close to shore and lessening towards the waterline. The tidal range across the bay extends to approximately 20-30m during spring tides (although this is estimated from observations of the high tide line and angle of the cobbled shore). Towards the southern end of the bay the coastline becomes higher as the ground level beyond rises towards a small ridgeline which forms a headland at the southern end of the bay. For the final 150m of the bay the grassy slopes are more dominant, extending almost to the shoreline, with little exposed rock. These slopes rise to between 15-20m before the coastline turns and the 70m southern headland projects seaward. Steeper rocky outcrops return and become incised as this headland projects beyond the bay. The headland loses elevation towards the sea, becoming rugged exposed bedrock for its final few metres down to sea level.

The proposed development site extends landward from the bay where the grassy slopes crest to form a broadly level elevated coastline and before the topography rises at a consistent gradient to the east. Gaitnip Hill forms a shallow, but large domed mass approximately 85m above sea level to the north. This elevation falls to the east where the Burn of Deepdale has created a modest incised valley as it flows in a south, south-westerly direction towards the bay. Higher ground beyond the burn wraps around to the east from Gaitnip Hill. This higher ground continues to wrap around the site but loses elevation to the east and south due to the presence of a second watercourse named Burn of Button. This second watercourse joins the Burn of Deepdale 300m or so before its confluence with the sea and forms a large bowl shaped landform. To the south, the high ground from the east wraps around to create a shallow domed ridge on which the property at Netherbutton sits and extends towards the sea where it creates the southern headland at the south of the Bay of Deepdale. The site is located on the broad convex slopes of this southern headland as it falls towards the bay.

The northern corner of the site is located on the A961 main road that links Kirkwall with the southern settlements of St. Mary's and St. Margaret's Hope. The north-western boundary of the site descends through the shallow bowl landform of the watercourses adjacent to the existing track leading to the disused sheiling at Deepdale and continues to meet the shoreline approximately 50m south of the Burn of Deepdale in the vicinity of Scapa Flow. To the north-east, the site follows the A961 for approximately 250m before descending towards the shoreline in a south-westerly direction roughly parallel to the northwest boundary. The boundary then turns 90 degrees to the southeast and continues for approximately 400m crossing the track which passes the properties at Netherbutton. The boundary changes direction once again to extend in a south-westerly direction, meeting the shoreline at the southern headland at the southern end of the Bay of Deepdale. The site boundary then extends approximately 250m offshore to encompass a large section of seabed. At the northwest corner, the site boundary has a wedge-shaped extension extending approximately 200m beyond the point at which the land boundary meets the shoreline, before returning to meet with the intersection of this line some 200m offshore.

The site land-use is almost entirely semi-improved grassland pasture set out into a regular field pattern bounded by post and wire stock fencing which is of moderate condition showing signs of weathering and age for the most part.

An old and disused vehicle lies within the centre of the field used as a scarecrow deterrent for geese. Near the northern boundary and in the centre of the site between the A961 and shoreline lies the ruined sheiling of Deepdale. This consists of a dilapidated barn, the collapsing walls of another barn and outhouse and sheep pens. All of this is in a serious state of structural decay. The ground underfoot is bare soil in poor condition where foot and machinery traffic have churned a deep mud. The track from the main road channelling water and acting as a minor watercourse which concentrates water in and around the remnant buildings causing or at least exacerbating the poor conditions underfoot. At the north and east of the site lies the A961 with a cluster of residential properties loosely dispersed along the road corridor. On the shoreline, there is an area of discarded fish farm infrastructure in the form of pen-stock walkway and barrier, presumably temporarily stored here due to maintenance issues.

In summary, the site is situated on the coastline of the Bay of Deepdale, approximately 6km to the south of Kirkwall at its closest point. It is accessed via a rough farm track that leads in a south-westerly direction over several fields of open pasture from the nearby A961. The site occupies an undeveloped section of exposed coastline that comprises mostly gravel beach and exposed rock that overall, exhibits a strong semi-natural coastal character. The Burn of Deepdale drains into the bay immediately to the north of the site and a nearby small rocky promontory forms a degree of localised containment to the south. The surrounding landscape to the north, east and south has a prevailing open rural character with a pattern of scattered farmsteads and dwellings. To the west, the isles of Flotta and Hoy provide a relatively distant backdrop to the expanse of Scapa Flow. The site is located on the coastline in a location with a relatively broad inter-tidal zone. There is some 'indentedness'.

The main site of the proposed quay is approximately square in shape with a width along the coastline of approximately 597m and a similar depth from south west to north east. Approximately half of the site extends into the sea with the other half cut into the hillside. The main site would be linked to the closest section of the A961 by an approximately 1km long access road which would cross Burn of Button and enter the site close to the shoreline on its north western edge.

7.5.2 National landscape character context

NatureScot's national terrestrial landscape character assessment identifies, describes and maps variation in landscape character in a systematic way. Coastal character assessment complements this by carrying out a similar process for coasts. Scotland has a digital map-based national LCA (published in 2019). This shows Landscape Character Types (LCTs) – i.e. areas of consistent and recognisable landscape character.

7.5.3 Local terrestrial landscape character context

The terrestrial landscape character context identified by NatureScot is identified on Figure 3, Volume 2 of the EIAR. This shows that the site of the proposed development is entirely located (including the proposed access road linking to the A961) within an area of Inclined Coastal Pasture (LCT 302) with an area of Plateau Heath and Pasture (LCT 312) immediately to the north (this area is associated with Gaitnip Hill and its southern boundary arguably extends further south in the vicinity of the site to more closely follow the alignment of the Burn of Button close to the northern boundary of the site). An area of Coastal Basin (LCT 301) lies inland of the site but, due to the steeply sloping coastal topography, is much less likely to be subject to landscape effects arising from the proposed new quay.

The site of the proposed development is located within the **Inclined Coastal Pasture** LCT (the 'host' character type). This LCT consists of gently sloping agricultural land falling to the coast, and includes bay coastlines which lack the topographic enclosure of the Enclosed Bays LCT. They occur as long coastal strips on Orkney Mainland, Hoy, South Ronaldsay, Rousay, and Eday, and in smaller tracts on Burray and Stronsay. Its key characteristics are:

- Gentle slopes falling to the coast which include unenclosed bay coastlines;
- A mix of improved and rough pastures with a variety of semi-natural habitats including small amounts of tree and shrub cover;

- Rectilinear field patterns often with strong orientation to coastline;
- Mixture of small-scale clusters of resettled crofts and less developed geometric landscape of estate farms;
- Occasional large houses and farms with tree frameworks;
- Roads running parallel to coast, usually inland, giving access to the coastal fringe and higher pastures;
- Rich coastal archaeology, particularly evident at the coast;
- Restricted views inland dominated by an open, sometimes hilly skyline; and
- Extensive views out to sea over fields which appear to merge with the sea.

The **Plateau Heaths and Pasture** Landscape Character Type located to the north of the site at Gaitnip Hill, is mainly on inland high ground on Stronsay, Shapinsay, East Orkney Mainland and South Ronaldsay, and also near the coast of northern Hoy. It is most extensive on East Orkney Mainland and South Ronaldsay. The distinct plateau character is sometimes a continuation of Ridgeline Islands. It encloses Coastal Basins and merges with low and inclined pastures. Its key characteristics are:

- Locally high ground, 50m to 110m above sea level, often forming a fairly flat or gently rolling, fairly extensive plateau.
- Mixture of pastures and heathland in geometric patchwork.
- A few areas of natural landforms, habitat and trees add diversity.
- Large-scale field pattern with occasional unenclosed areas.
- Widely scattered farmsteads and few other built structures.
- Field and road patterns create an overall random pattern.
- Elevated topography denies views to the coast except from the plateau margins.
- Generally open and exposed character despite relatively low altitude.
- Buildings and structures stand out on the skyline.

The **Coastal Basin** Landscape Character Type located further inland has a smooth relief falling gently from adjoining higher ground to the concave curve of the coastline, and contains many of the archipelago's lowland burns and wetlands. The basins occur on six islands: Eday, Rousay, Burray, South Ronaldsay, with the largest basins found on West and East Orkney Mainland. Its key characteristics are:

- Wide, basin-shaped landform open to the sea, with smooth relief falling from surrounding hills and cliffs to a concave, curved coastline.
- Wetland and small lochs on lower ground and along watercourses and 'ouse' waterbodies behind the coastline, with associated semi-natural vegetation.
- Productive agriculture with improved grazing, cultivated grass and arable crops in rectilinear, stone-walled fields.
- Woodlands and tree groups are very small scale, scarce but prominent features, associated with buildings.
- Many estate farms, resettled crofts and a few small settlements.
- Kirkwall is Orkney's main settlement, its townscape around the harbour and historic St Magnus' Cathedral forming a dominant feature in Eastern Mainland and in views from nearby bays.
- Mature trees within the urban area of Kirkwall.
- Minor and major roads which follow mid-level ground and provide good access to lower ground and beaches.
- Rich in archaeology and built heritage including mills, estate farms and World War II defence sites.
- Views subtly focused by the landform onto the coastline, and skylines form the visual containment when viewed from low level.

7.5.4 Coastal character context

Due to the coastal location of the site, coastal, or seascape, character is also an important factor to consider in this SLVIA. As defined by NatureScot (formerly SNH), coastal character is made up of physical characteristics of the hinterland, coastline and sea, as well as visual aspects and perceptions.

The Orkney and North Caithness Coastal Character Assessment (SNH, August 2016) identifies both Regional Coastal Character Areas (RCCA) and Local Coastal Character Areas (LCCA). The extent of these regional and local coastal character areas in the vicinity of the proposed development are shown on Figure 7.3, Volume 2 of the EIAR. The Orkney and North Caithness Coastal Character Assessment identifies that the SDWQ site is located within the Regional Coastal Character Area of Scapa Bay (RCCA 22). This extends from Hobbister in the west through Scapa Bay to St Mary's/Howequoy Head to the south. The key characteristics of the Scapa Bay coastal character area (RCCA 22) are identified as follows:

- "Generally south facing onto Scapa Flow;
- Strong maritime connections with historic remnants and regular boat traffic, particularly oil tankers;
- Relatively sheltered bay flanked by open and exposed moderate to high cliffs with a narrow to limited foreshore;
- Coastal hinterland of rough grassland and dark heathland at higher elevation and agricultural land at lower elevation;
- Settlement is dispersed along the elevated main roads, with clusters of buildings around Scapa Bay; and
- Open views from the main roads, and framed views from Scapa Beach."

Of particular note is the detailed description that follows of the maritime influences on the overall RCCA – "*This coastline generally faces south onto Scapa Flow. This elevated coast is open and exposed to wind and waves though the waters of Scapa Flow are relatively sheltered, though seldom entirely calm. There are strong maritime connections with a pier within the bay. Out in Scapa Flow, the War Grave of HMS Royal Oak is visibly marked by a buoy and the passage of boat traffic, particularly oil tankers and larger commercial vessels, is regularly visible*". This baseline description of the waters off Bay of Deepdale therefore makes clear the presence already of frequent boat movements.

RCCA 22 Scapa Bay is then broken down into four LCCA, namely:

- LCCA 22a: Waulkmill Bay to Hellia
- LCCA 22b: Hellia to Hemp Stack
- LCCA 22c: Hemp Stack to Bay of Deepdale
- LCCA 22d: Bay of Deepdale to Howequoy Head

The site of the proposed development at SDWQ is located on the boundary of two of these LCCA. LCCA 22c Hemp Stack to Bay of Deepdale lies immediately to the north of the site but the site of the proposed quay is located within LCCA 22d Bay of Deepdale to Howequoy Head. These two coastal character areas broadly associate with the extent of the two terrestrial character areas described above. The course of the Burn of Button essentially separates Gaitnip Hill to the north (associated with the Plateau Heaths and Pasture LCT and LCCA 22c) from the Deepdale Pastures to the south (associated with the Inclined Coastal Pasture LCT and LCCA 22d).

The boundary between the two LCCA is shown on Figure 7.3, Volume 2 of the EIAR (as a short solid black line perpendicular to the alignment of the coastline). The boundary between LCCA 22c (to the north) and LCCA 22d (to the south) coincides both with where the Burn of Deepdale and Burn of Button meet the sea at the Craig of Gaitnip and also with the northern boundary of the site (shown on Figure 7.3, Volume 2 of the EIAR as a red line). This is where the coastline transitions from the more elevated and uncultivated land and cliffs around Gaitnip Hill (up to approximately 100 mAOD within approximately 500m of the coastline) to the north, to the lower lying, gentler and more settled coastline to the south (generally remaining below 50 mAOD in areas within 1km of the coastline).

The site of the proposed development lies at the northern tip of the Bay of Deepdale to Howequoy Head local coastal character area (LCCA 22d). This is described in more detail as follows:

Location and extent: This coastline extends the Bay of Deepdale in the north-west to Howequoy Head in the south-east and includes the Bay of Sandoyne.

Maritime influence: The significant extent of open tidal water, seaweed, a fairly deep intertidal zone, boat traffic, especially oil tankers, and views out to 'open sea' via the Sound of Hoxa creates a relatively strong maritime influence over the land. Exposed flow of water animated by wind action, seldom very calm.

Character of coastal edge: This area is characterised by a large, semi enclosed, body of water contained by distant landmasses, including West and East Mainland, Hoy, Flotta, and South Ronaldsay, and low lying agricultural hinterland. The indented, generally low lying coastal edge is comprised of low cliffs, rock platforms and stretches of shingle, defined by dark seaweed tide line and breaking waves.

Character of immediate hinterland: Pasture and arable land inclines over gently undulating ground and convex slopes from the shoreline restricting views from eastern locations and along the A961. Stonewalls and fence lines add structure to irregular field patterns and enhance or break up topographical features.

Extent of human influence: Settlement is irregularly scattered throughout the hinterland, residing at low level within inclined pastures and coastal basins. Telegraph poles add vertical elements and a degree of complexity to the irregular arrangement of farmsteads, clustered dwellings and isolated dwellings. Access to the coast is limited over agricultural land, private track or by boat.

Views: Views are generally semi-contained within the hinterland, obstructed and dominated by the convex topography. Views from the coastline are open and exposed at low level to onshore winds and the influence of the sea with relatively long-range views back across the hinterland.

The **Hemp Stack to Bay of Deepdale** local coastal character area (LCCA 22c) is associated with the more elevated and uncultivated ground at Gaitnip Hill. It lies immediately to the north of the site and is described in detail as follows:

Location and extent: This coast extends from Hemp Stack in the north-west to the Bay of Deepdale in the south-east;

Maritime influence: The influence of Scapa Flow and its maritime character including changeable light conditions, tidal movements, and boat traffic especially oil tankers is strongest from along the cliff edge. The War Grave of HMS Royal Oak is visible marked by buoy. The simple, narrow, coastal edge comprises cliff face, some rock and shingle, and breaking waves. A characteristic 'crimped' effect is clearly visible along the cliff line with localised indentations, points, ravines, stacks, and waterfalls.

Character of coastal edge: This exposed stretch of isolated coastline is characterised by relatively high, rugged cliffs overlooking an animated expanse of flow which is seldom calm. The high cliff edge itself experiences a sense of exposure and close proximity to the dynamic sea, enhanced by onshore winds, with open views along the coastline to the north and south and across Scapa Flow to distant, silhouetted landmasses including Hoy, Fara, Cava, Flotta, Burray and South Ronaldsay. Views through the Sound of Hoxa to 'open sea' are also obtained.

Character of immediate hinterland: Elevated, hinterland falls to the west over steep, convex slopes interrupting views of the coastline and creating a sense of shelter and distance from the sea, i.e. a limited opportunity to easily experience the smells and sounds of the sea. Pasture and arable land, rough grassland, and dark heath flank the cliff tops and extend east over plateau towards the A961. The simple, open landscape character of hinterland results in vertical elements such as telegraph poles and fence lines appearing prominent. Access to the coast is limited to boat or remote cliff top footpaths.

Extent of human influence: Settlement is sparse and largely out with the immediate exposed hinterland, along the A961 to the east with isolated farmsteads on exposed plateau.

Views: Views from the A961 are substantially interrupted by convex slopes and the nature of the ridgeline landscape.

7.5.5 Landscape and coastal character area receptors for assessment

Figure 7.3, Volume 2 of the EIAR shows the spatial relationship between the terrestrial and coastal character areas identified by NatureScot within the vicinity of the site. On the ground, the boundary between the two local coastal character areas (22c and 22d) is arguably located a little further to the south than shown to more closely reflect the southern edge of Gaitnip Hill and the presence of the lower ground at Burn of Button. The assessment undertaken here therefore principally focuses on two combined areas (the boundary of these two pairs of terrestrial and coastal character areas roughly coincides with the alignment of the Burn of Button which flows into Scapa Flow immediately to the north of the site):

- The Inclined Coastal Pasture (host terrestrial landscape character area) and Bay of Deepdale to Howequoy Head (local coastal character area) – the host landscape and coastal character area for the site which is principally defined by its lower elevation, gentler coastline and pastoral land use.
- The Plateau Heaths and Pastures (immediately adjacent landscape character area to the north) and Hemp Stack to Bay of Deepdale (local coastal character area) – the landscape and coastline immediately to the north of the site associated with the more elevated and uncultivated land at Gaitnip Hill and resulting cliffs.

7.5.6 Landscape designations

At its closest point The Hoy and West Mainland NSA is located approximately 14km west of the site (see Figure 7.2, Volume 2 of the EIAR). Areas where potential visibility might occur are limited to parts of north Hoy in excess of approximately 16.5km. Further information regarding the nature of the NSA and potential effects upon it is contained in section 8.3 below (residual effects) and is not repeated here.

7.5.7 Visual context

Topographical context

Figure 4, Volume 2 of the EIAR provides an analysis of the topography in the vicinity of the site. The graphic focuses on areas within approximately 7km of the site to assist legibility of the key issues. This topographical analysis illustrates the following key aspects of the visual context of the site:

- The site is associated with an area of lower ground at the Bay of Deepdale just to the south of where Burn of Deepdale and Burn of Button flow south west into the sea at Scapa Flow.
- Substantially higher ground is located to the north at Gaitnip Hill (to 101 mAOD) providing visual separation with areas to the north and north east including the town of Kirkwall.
- There is a distinct contrast between the topographical nature of the sections of coastline to the north and to the south of the site. To the north of the site the coastline slopes steeply or comprises sections of cliff. To the south (including the Bay of Deepdale and the site extent) the coastal slopes are more gradual with a wider inter-tidal zone. This topographical and elevational change is reflected in contrasting landcover with uncultivated ground to the north but enclosed agricultural fields along the coastline at and to the south of the site.
- Higher ground also wraps round to the south east of the site providing a degree of visual separation from the more settled areas of Southern Mainland to the south west towards St Mary's.

- A spine of higher ground along central areas of Mainland to the north east (Heathery Howes and Burrody's Hill) rises to approximately 70 mAOD and provides visual separation from areas of Mainland to the north east and along the north eastern coast.
- Open views exist over the waters of Scapa Flow to the north west, west, south west and south.

Landcover context

Areas surrounding the site are visually open. Landcover is limited with very few trees. Occasional houses provide a limited degree of visual containment in a few locations. Topographical undulations therefore remain the principal determinant of visibility between the site and surrounding areas.

7.5.8 Zone of Theoretical Visibility (ZTV)

A ZTV was not produced at scoping stage. Consultees commented that it was difficult to advise on the scope of the required assessment in the absence of this information.

A preliminary ZTV was produced in October 2022 to assist with early consultations on viewpoint selection (see Figure 5, Volume 2 of the EIAR). The preliminary ZTV is based on a nominal point in the vicinity of the proposed quay and run at nominal elevations of 10 mAOD (as proxy for ground level activity at the proposed extended quay), 50 mAOD (as proxy for larger ships, cargo and operations likely to be occurring in the vicinity of the quay, laydown area and landside areas) and 100 mAOD (to capture a likely upper limit for the height of any largest structures that might in due course be associated with the operation of the quay – inclusion of this upper height gave confidence that the maximum worst case area of potential visibility of port operations had been determined). The preliminary ZTV demonstrates that:

- Potential visibility would principally be limited to coastal areas around Scapa Flow within approximately 15km of the site.
- Areas of potential visibility over shorter distances were primarily associated with areas of Mainland within approximately 2km of the coast.
- Elevated ground to the west of Kirkwall around Wideford Hill also gives potential visibility over longer distances.
- There is potential visibility from the Hoy and West Mainland NSA to the west.
- Longer potential views could occur across Scapa Flow from northern coastal areas of the islands of Burray and South Ronaldsay to the south.

This preliminary ZTV was shared with consultees and used to help select representative viewpoints for the visual assessment.

Figure 7, Volume 2 of the EIAR additionally provides a more detailed ZTV within approximately 2km of the site and covering all of the 2km radius residential study area used in this assessment to consider localised visual effects on nearby residential locations. This more detailed ZTV was generated using the following source points:

- The front of the proposed new quayside at approximately 6 mAOD – this part of the ZTV shows the surrounding local areas from which the front of the new quay would likely be visible extending out into the open waters of Scapa Flow.
- The top of the likely eight no. 40m high lighting columns and lamps that would extend across the quayside and laydown areas – this part of the ZTV shows additional locations within the surrounding local area from which the top of the proposed lighting would likely be visible. The lower level quayside level activity would not be visible from these additional locations due to topographical screening.

The more detailed ZTV shown by Figure 7.7, Volume 2 of the EIAR is subject to the following limitations:

- The extent of the potential visibility of quayside levels from areas inland from the site may be slightly understated by the ZTV (but not the assessment) because the ZTV is based on the existing topographical form and does not take into account additional visibility that may be opened up by cutting part of the hillside away to form the laydown area. Similarly, a slight reduction in the extent of potential visibility as a consequence of the unsuitable material to be deposited to the north east of the site has not been modelled into the ZTV. These limitations to the more detailed ZTV are not considered to be material to the assessment. The assessment uses the ZTV only as a starting point and the assessment of visual effects of surrounding receptors has taken account of these modifying factors.
- The tops of the 40m high proposed lighting columns were adopted as the source point for this ZTV because they would form part of the permanent fixed infrastructure. It is nevertheless noted that future uses of the quay and laydown areas would likely include the presence of temporary features of potentially greater height (e.g. the temporary presence of vessels at the quayside and the likely handling of off shore wind farm components that are expected to exceed 40m in height while being handled and assembled). Due to the temporary nature of these movements they were not included in the ZTV.

The more detailed ZTV shown by Figure 7, Volume 2 of the EIAR illustrates that:

- The extent of the ZTV associated with the quayside itself is principally limited to an area within approximately 2km of the site and of the coastline
- The ZTV extends along the coastline to the north and to the south but less so inland to areas to the east
- There are notable areas to the east and south east of the site where the quayside areas would not be visible (screened by the convex form of the intervening topography) but the tops of proposed lighting columns (and other taller temporary features associated with use of the site) would be visible.

7.5.9 Visual receptors within the study area and ZTV

Important views from the site are focused across Scapa Flow to distant, silhouetted landmasses including Hoy, Fara, Cava, Flotta, Burray and South Ronaldsay. Potential nearby visual receptors are largely restricted to agricultural workers, residents of several nearby scattered dwellings, occasional recreational users (coastal and inland) and road users along the A961. From the sea, boat users would also experience views of the site. The following identifies the principal likely visual receptors within the ZTV of the proposed development including those located closest to the site within the detailed 2km radius residential study area.

Residential locations

Residential locations within approximately 2km of the site were reviewed to identify whether they are likely to fall within the ZTV of the proposed development and be visually affected. The following table records preliminary consideration of the approximately 60 properties located within 2km in approximate order of proximity. Residences are grouped where appropriate. This process was used to identify the eleven residential locations within 2km considered further later in the assessment (see Figure 7.7, Volume 2 of the EIAR).

Table 7-1: Preliminary Baseline Consideration of Residential Locations within 2km

Residential location	Proximity (approx')	Within ZTV (see Figure 7.7)	Likelihood of an effect
Deepdale (associated property) (1 no.)	0.5km to quayside (adjacent proposed access road which is planned to also provide access to this property)	Yes (to lower levels)	Yes. Design of earthworks at northern corner of site will affect outcome.
Rashieburn (1 no.)	Approx' 1km	Yes	Elevated property

Residential location	Proximity (approx')	Within ZTV (see Figure 7.7)	Likelihood of an effect
Netherbutton (approx' 5 no. properties directly inland from the site to the west of the A961)	0.5 to 1km.	On fringes of ZTV for lower heights.	Visibility likely to be limited to taller structures with much of the quay and laydown area screened by the convex slope and proposed bunds. Some vegetation around some of the houses
Cuil-na-Mara (west) (approx' 4 no. properties directly inland from the site to the east of the A961)	Approx' 1km to 1.5km	On fringes of ZTV for greater heights only.	Visibility likely to be limited to taller structures.
Cuil-na-Mara (east) (approx' 8 no. properties including Northfield directly inland from the site to the east of the A961 alongside road (all to its north))	Approx' 2km	On fringes of ZTV for greater heights only.	Visibility likely to be limited to taller structures.
Lynnfield, Cockmurra and Hilltoft (approx' 3 no. dispersed farm properties)	2km	Only for taller elements.	Would only be affected by the tallest of structures
Quoylobs, East Moss and the junction (inc. Donnersbrae and Wilderness Lodge) (approx' 10 no. properties clustered around the junction)	1.5km	On fringes for taller elements.	Probably too far back for views to be opened up by the earthworks.
Southern group around Midhouse Cottage to the south (approx' 10 no. dispersed properties around Green Knowe as far as Hardbreck)	Ranging between approximately 1km and 2km	Variable. Fringes of ZTV for taller elements.	Views may open up
Northern group around Gaitnip Hill (approx' 20 no. dispersed properties including Fernbank, St Clair Farm and Gaitnip)	Ranging between approximately 1km and 2km	Variable.	Views may open up

Public Rights of Way/Core Paths

There is a general right of access in Orkney and there are therefore no defined Public Rights of Way (PROWs). Figure 7.2, Volume 2 of the EIAR shows the location of those available routes which are defined as core paths. There are none in the immediate vicinity of the site (within 2km) nor along the coastline at Bay of Deepdale. The closest core paths are located at Scapa Bay (approximately 4km to the north) and around Howequoy Head (approximately 3km to the south). There are no core paths between these two areas, along the coastline between them, nor at Gaitnip Hill a short distance to the north of the site.

Roads

The A961 passes to within approximately 1km of the site inland. It runs roughly parallel with the coastline and is set back approximately 1km from the coastal edge. There are areas of potential visibility from the road, principally:

- For southbound vehicle movements coming down off the high ground of Gaitnip Hill to the north, the ZTV suggests potential visibility to low levels here
- The section of the road immediately inland around Netherbutton and Cuil-na-Mara (earthworks may open up views to the coastline that do not currently exist)
- Areas directly to the east around East Moss

Ferry routes and passing cruise ships

There are no ferry routes in the immediate vicinity. Passenger carrying boat movements within the study area are likely to be very rare.

Heritage sites (within 2km)

The Five Hillocks Tumuli heritage site is located close to the site. This location falls within the ZTV but is unlikely to attract many visitors. It is therefore not considered appropriate to treat as a visual receptor location.

7.5.10 Selected representative viewpoints

The preceding review of potential visual receptors combined with analysis of ZTVs helped to identify representative viewpoints for detailed assessment. For this assessment, these viewpoints fall into two categories:

- A main schedule of seven principal representative viewpoints across the wider study area which were agreed with consultees (OIC and NatureScot) and which have been subject to detailed consideration (see Figure 5, Volume 2 of the EIAR) – the purpose of these viewpoints is to gain an overall understanding of visual effects over the full 15km radius study area
- A secondary schedule of eleven residential locations within a localised 2km radius study area which have been considered in a more simplified tabulated form (see Figure 7, Volume 2 of the EIAR) – the purpose of these selected residential locations is to supplement the main representative viewpoint assessment with a better understanding of visual effects at the local level and to explore subtle variations in effects on different localised residential locations due to local topography, landcover and slope profile (see Figure Showing Section Lines 1 2 & 3 – Rev, Volume 2 of the EIAR for selected long sections between the site and three of these locations)

The following comprise the seven selected and agreed principal representative viewpoints which have been identified for detailed assessment. The location of the selected viewpoints is shown in Figure 5, Volume 2 of the EIAR. Baseline descriptions of each viewpoint are included in Section 7.8.4.

- **VP01 – Scorra Dale** - Elevated view facing the site from a location close to the NSA.
- **VP02 – Wester Greenigoe** - A relatively elevated view on the main road on Mainland to the west.
- **VP03 – Wideford Hill** - A panoramic elevated viewpoint at an elevation of approximately 225 mAOD. The viewpoint provides a panoramic view in all directions including across Scapa Flow to the south. Gaitnip Hill is clearly visible.
- **VP04 – A961 at Lynburn** - The closest section of the main road as it passes residential properties close to the site (Figure 5, Volume 2 of the EIAR). This principal representative viewpoint is relatively close to the site and falls within the focused 2km radius study area.
- **VP05 – West Bu** – A residential location to the south east of the site. This principal representative viewpoint is relatively close to the site and falls within the focused 2km radius study area.
- **VP06 – Burray (Swannies Point)** - Longer distance view across Scapa Flow from the south.
- **VP07 – South Ronaldsay (St Margaret's Hope)** - Elevated view from South Ronaldsay overlooking the settlement of St Margaret's Hope.

7.5.11 Residential locations

The seven selected and agreed principal representative viewpoints provide an overall understanding of the visual context of the proposed development from the wider study area. As a consequence of public feedback at the PAC events, it was deemed necessary to also consider views from locations within the local area immediately around the site in more detail, particularly residential locations (further details of the outcome of the PAC events is provided in Chapter 2 of this EIAR). Therefore, in addition to the seven principal representative viewpoints, the potential visual effects of the proposed development in the vicinity of the following eleven residential locations within 2km are also given consideration. These residential locations also capture views from the route of the A961 which provides the main visual access to the local area for non-residents given the absence of other visual receptor locations nearby such as core paths, community or tourism facilities:

- **RL1 – Fernbank**
- **RL2 – Rashieburn**
- **RL3 – Netherbutton**
- **RL4 – Darmont**
- **RL5 – Northfield**
- **RL6 – Lynnfield**
- **RL7 – Quoylobs**
- **RL8 – Midhouse**
- **RL9 – Backakelday**
- **RL10 – Westerbister**
- **RL11 - Hestwall**

Long sections through the 2km radius residential study area

Figure Showing Section Lines 1 2 & 3 – Rev, Volume 2 of the EIAR provides three diagrammatic long sections through the proposed development and through local areas within the detailed 2km radius residential study area. These sections help to interpret the detailed ZTV and to understand variations in landform to the north, north east and south east of the site and how they affect potential visibility. The principal observation based on these sections is that:

- The high ground at Gaitnip Hill to the north of the site provides an elevated vantage point from which views down into the quayside areas would occur. This visibility down into the site from the north (including from southbound traffic coming down off Gaitnip Hill) would be further enhanced and opened up by the cutting away of the landform to form the quayside areas.
- Potential visibility to quayside level in views from the south east would be more limited due to the shielding effect of an area of high ground immediately to the south east of the site; the valley form associated with the Burn of Gangsta and the generally slightly lower elevations found further inland in this direction.

7.6 Impact Assessment

This section of the chapter identifies the sources of the potentially significant landscape, coastal and visual effects of the proposed development.

7.6.1 The sources of potential landscape and coastal character effects

The potentially significant landscape and coastal character effects of the proposed development would be associated with impacts arising from the following aspects of the scheme. They include aspects both of the permanent infrastructure and of the temporary activities likely to be associated with future uses that are likely to be attracted to use the new deep water quay.

The permanent fixed infrastructure would include:

- Extensive and deep cut into the sloping existing hillside.
- Introduction of a large new quay and laydown area close to sea level.
- Introduction of tall lighting columns within a currently undeveloped and dark section of coastline.
- Introduction of a sloping access road across fields linking to the A961.
- Depositing of spoil/excess material/unsuitable material arising from the excavations into the hillside (material that cannot be used as fill for the quay areas extending out to sea).

Temporary features would likely include:

- Vessels coming and going from the quay and berthed at the quayside.
- Items stored within the laydown area (likely to include large-scale components associated with an assembly hub for the offshore wind energy sector, or similar).

Cut

The creation of the quay and laydown area would require a very extensive area of sloping pastoral land to be excavated to a depth of up to 20m. This would constitute a very large physical impact on the natural topographical form of the coastline and landscape. This impact would be exacerbated by the need, for operational reasons, for the footprint of the development to be essentially square and not respond in its shape to the existing natural contours.

Presence of the new quayside and laydown area

Despite its considerable size, the horizontal nature and low elevation of the permanent infrastructure of the new quayside and laydown area would not be the source of the most substantial visual effects. It would be difficult to discern the platform in long distance views across the sea from the west. It would, however, be a prominent new element in local views from the landside to the north east. This would especially be the case where the quay would be seen to extend out into the sea some distance from the current coastline, and, in particular, in views south for southbound traffic coming down off the high ground of Gaitnip Hill to the north. An important observation is that the Bay of Deepdale comprises only a very shallow form (the coastline here is essentially straight) and the new quay extending some 200m out into the waters of Scapa Flow would be discordant and not anchored to, or contained within, any existing bay or landform (for example, the quayside would extend further out into the sea than the slight headland formed by the Tongue of Gangsta to its south).

Access road

The proposed access road would introduce road access to the coastline in an area where such access does not currently exist.

Unsuitable material

A volume of excess or unsuitable material that cannot be used to form the quayside extending out to sea would be deposited above the cut to the east of the site. The volume of unsuitable material likely to arise is of the order of 185,000m³. Consideration has been given to whether this material could be used in any way to mitigate the visual effects of the proposed development, perhaps in the form of a bund or false cutting along the top of the cut slope or in the vicinity of the access road. It was concluded that any such bund would be ineffective and counterproductive in mitigating the adverse effects of the proposed development. It is therefore proposed that this material (a proportion of which would be topsoil) would be deposited thinly across adjacent fields and graded out to integrate with the existing landform. This material is not therefore anticipated likely to be the source of permanent adverse effects.

7.6.2 The potential visual effects of the proposed development

The potentially significant visual effects of the proposed development would be associated with impacts arising from all of the aspects of the scheme considered above, but with particular emphasis on the following:

Cut slope

Visibility of the extensive and deep cut into the sloping natural hillside has the potential to give rise to significant visual effects. The scale and height of the cut (which would comprise bare, unvegetated rock) has the potential to be visible across the waters of Scapa Flow over a considerable distance. The difference in colour between the uncultivated landcover at Gaitnip Hill, the pastures on the slopes of Bay of Deepdale and the rock cutting has the potential to be noticeable over long distances.

Lighting

Visibility of illuminated lighting columns has the potential to give rise to significant visual effects. The position of the likely 8 no. approximately 40m high lighting columns within the low quayside and laydown areas mean that their potential to have significant visual effects during daytime are limited. This is because for closer visual receptors on the land side to the north east their height would largely be absorbed by the cut slope with only the tops visible over the intervening landform. These would then appear not to be significantly greater in height than existing features such as the telegraph poles that connect the scattered residential properties in the area. In the very long distance views across the waters of Scapa Flow from the west and south west the lighting columns are likely to be too slender to be easily discerned during hours of daylight. During hours of darkness however (potentially including long periods of the working day during winter months or at dusk) the large illuminated multi-headed lamps would be very prominent locally and likely to be easily seen (and eye catching given the limited light sources currently present) over longer distances across the sea from the west and south west. The presence of these lights is likely to be one of the most substantial changes to impressions of this section of coastline and cause some of the largest impacts associated with the proposed development, both at a localised and wider scale.

Visiting vessels

Visiting vessels (both their movements to and from the quay and whilst berthed at the quay) would not likely generally cause substantial change and significant visual effects. Large-scale vessels are an existing characteristic of Scapa Bay and, along with anchored rigs, a reasonably frequent and familiar presence. The visiting vessels, however, would be static and present over a longer duration. This has the potential to draw attention to and increase the adverse effects of other aspects of the proposed development and would be an unfamiliar element for visual receptors close by such as residential locations within 2km radius of the site. Visiting vessels are also likely to be illuminated, either on board, or as a consequence of the adjacent quayside lighting, making them particularly visible at night from land side areas to the north east.

Elements stored in the laydown area

There is a level of uncertainty about this aspect of the proposed development and therefore its likely effects. This uncertainty relates both to the likely scale and height of what might be present and also the duration and seasonality of it being there. Impacts might also be different depending on whether transient elements (such as those associated with a possible off shore wind farm assembly hub) are being handled/moved or simply stored/static. In large part, it is likely that elements stored within the laydown areas would often not exceed the approximately 20m height of the proposed cut slope to the rear of the quay meaning that they would in large part be screened in views from land side receptors (especially were taller elements to be positioned closer to the cut at the rear of the laydown area away from the quayside which extends out to sea and has the potential to be more visible locally). It remains the case, however, that stored components could be very large in scale and could rise above the cut slope in views from the land side and be large enough to be discernible over very long distances in views across the sea from the west. These features have the potential to appear more discordant within this largely undisturbed and undeveloped coastal setting than visiting vessels.

7.7 Mitigation and Monitoring

7.7.1 Mitigation

No landscape or visual mitigation has been incorporated into the proposed development. The nature of the proposed development means that its design must principally respond to operational and functional requirements.

Deposition of unsuitable material

Unsuitable material would be placed on land to the north east of the cut slope. The depth of this material would be minimised and graded out into surrounding field levels. The land would be returned to pastoral use. This would prevent this material from giving rise to adverse landscape or visual effects. Visual screening in the form of higher bunds or false cuttings would not be effective due to the scale of the proposed development and the topographical context. Higher and steeper sided bunding over a smaller area would also not be appropriate to the landscape character context.

7.7.2 Enhancement opportunities

The following aspect of the proposed development may be considered further at detailed design with a view to as far as possible integrating the development into its landscape context. Planting is not however identified within this assessment as required mitigation and the assessment of residual landscape and visual effects does not rest on it being included.

New planting

Tree cover is not a characteristic of this area or coastline and new tree planting would be very difficult to establish in this location. Furthermore, visual screening of the proposed development with tree cover is not feasible. Some tree planting could however be incorporated to help integrate the permanent site footprint with its landscape setting. Some tree or shrubby planting associated with the proposed access road and the slightly lower and more sheltered ground at Burn of Button would be considered.

7.8 Residual Effects

This section of the assessment summarises the level of seascape, coastal, landscape and visual effects that the proposed development would cause. The assessment principally focuses on the long term residual effects of the

development. It does not provide a separate assessment of year 1 and year 15 effects due to the absence of proposed new planting which would be neither effective nor desirable within this very exposed and open landscape character context.

7.8.1 Construction phase effects

The scale of the proposed development means that there would be large-scale construction activity for the duration of the construction works.

Landscape and visual effects during construction would be significant due to the rural, largely undeveloped and visually open nature of the site and its surroundings.

The construction activity would nevertheless be temporary.

7.8.2 Operation phase landscape and coastal character effect

The proposed development is:

1. Located within an area of Inclined Coastal Pasture landscape which extends south from the site to Bay of Sandoyne. This area is associated with Coastal Character Area 22d - Bay of Deepdale to Howequoy Head.
2. Located immediately to the south of an area of elevated and wilder Plateau Heath and Pasture associated with Gaitnip Hill and with Coastal Character Area 22c - Hemp Stack to Bay of Deepdale.

These coastal and landscape areas are shown on Figure 3, Volume 2 of the EIAR. For ease of reference within the following assessment they are henceforth referred to as:

1. Deepdale Coastal Pasture (the location of the site)
2. Gaitnip Hill (immediately to the north of the site)

Effect on the Deepdale Coastal Pasture

Description: The site lies within the landscape type, 'Inclined Coastal Pasture' and exhibits many of the common characteristics of this landscape. The landform generally slopes down towards the sea with a gently rolling concave – convex shape of slope, leaving the coastline hidden and the middle distance back clothed by the sea beyond. Pasture grazing fields cover the extents of this landscape and are laid out in strong geometric shapes generally elongated down the slope towards the sea. Roads and a small number of watercourses being the only features to break with this pattern.

There is a lack of verticality to the area, with only the properties and associated man-made elements providing any height. This creates a very open and exposed landscape.

The man-made elements are scattered in a random pattern that tends to tie in well with the geometric field pattern with clusters of properties in some locations.

Coastal Character: Domed grassy slopes between 10-20m above sea level steepen and fall towards the sea with exposed rocky outcrops where the gradient become too steep for soils to be retained. This coastline is much less incised presenting a more linear coastline although there is some interplay between rocky outcrops and steep grassy slopes. The shoreline consists of a shingle beach comprised of generally large cobbles at a shallow angle. This exposes an extended foreshore at lower tide levels.

The site of the proposed development lies at the northern tip of the **Bay of Deepdale to Howequoy Head** local coastal character area (LCCA 22d).

Key aspects of how this coastal character area is described include:

"Maritime influence: The significant extent of open tidal water, seaweed, a fairly deep intertidal zone, boat traffic, especially oil tankers, and views out to 'open sea' via the Sound of Hoxa creates a relatively strong maritime influence over the land.

Character of coastal edge: This area is characterised by a large, semi enclosed, body of water contained by distant landmasses, including West and East Mainland, Hoy, Flotta, and South Ronaldsay, and low lying agricultural hinterland. The indented, generally low lying coastal edge is comprised of low cliffs, rock platforms and stretches of shingle, defined by dark seaweed tide line and breaking waves.

Character of immediate hinterland: Pasture and arable land inclines over gently undulating ground and convex slopes from the shoreline restricting views from eastern locations and along the A961. Stonewalls and fence lines add structure to irregular field patterns and enhance or break up topographical features.

Extent of human influence: Settlement is irregularly scattered throughout the hinterland, residing at low level within inclined pastures and coastal basins. Telegraph poles add vertical elements and a degree of complexity to the irregular arrangement of farmsteads, clustered dwellings and isolated dwellings. Access to the coast is limited over agricultural land, private track or by boat.

Views: Views are generally semi-contained within the hinterland, obstructed and dominated by the convex topography. Views from the coastline are open and exposed at low level to onshore winds and the influence of the sea with relatively long-range views back across the hinterland."

Value: Generally the site lies within relatively a low value landscape. The ground cover is short grazing pasture with post and wire stock fence affording some non-grazed grass margins. Watercourses provide some opportunity for natural flora, but again this is limited due to grazing and extremes of climate. The sense of openness and relationship with the sea being the highest value aspects of the site. The site is not subject to designation. Overall, however, given its coastal location and the attractive nature of the coastline itself (albeit a section of coastline for which there is limited access) the overall value of the landscape is considered to be medium.

Susceptibility: The susceptibility of the characteristics of this landscape to the potential changes due to the proposed development is high.

Seascape and presence of boat movements. The assessment has included consideration of whether the additional shipping movements associated with the new quay would give rise to adverse seascape or coastal character effects. The assessment has concluded that baseline conditions already include frequent boat movement and the additional boat movements would be relatively few. Whether as a consequence of vessels moving to or from the quay or as a consequence of vessels berthed at the quay, boat movements are not considered likely to materially contribute to the adverse effects of the development.

Sensitivity: The site would be sensitive to change given the complete openness of the site and relationship to the sea. The low relief landform and lack of vertical elements means any development would be visible and in contrast to the characteristics of this landscape.

Indicators of higher sensitivity include:

- A section of coastline generally undisturbed by large-scale man-made infrastructural influences
- No sources of lighting on the coast
- Visually open
- Absence of large-scale infrastructure on the coastline

- Absence of built development on the coastline (settlement is generally set back from the coastline and accessed from the A961 which is generally aligned approximately 1km back from the coastline)
- Limited access to the coastline (there are relatively few tracks down to the coastline and no roads or tracks along the immediate coastline)
- The site of the proposed development comprises a relatively straight section of coastline rather than occupying a deeply indented bay (the bay of Deepdale comprises only a shallow indentation along the coastline and the proposed quayside would extend proud of the Tongue of Gangsta to the south)

Indicators of lower sensitivity include:

- An ordinary settled landscape
- Dispersed vertical features including telegraph poles and turbines
- Little access to the coast
- Convex slopes with little visibility of the intertidal zone
- Broad intertidal zone but generally not visible from inland

Overall the **sensitivity** of this area to the effects of the proposed development is considered to be medium.

Magnitude of change: The magnitude of landscape change within this area would be high.

Level of effect: The level of effect on the Bay of Deepdale coastal pastures landscape area and its associated coastline would be major adverse (significant).

Effect on Gaitnip Hill

Description: Gaitnip Hill is an area of rough grass and moorland which occupies the high ground to the north of the site and contrasts with most of the surrounding pasture farmland areas. The moorland appearance of this area occurs through land management approaches and has the appearance of a more 'natural' condition than the surrounding pasture farmland.

The evidence of former land management is apparent through the numerous linear features that cover the domed slopes of Gaitnip. These features are remnant walls and fence lines that allude to former farming use. The ground cover is a mosaic of heather and unimproved grass which gives way to semi-improved grassland pasture to the east near the A961 and the various farm buildings and properties scattered along its route. A prominent stone wall defines the southern boundary of the Gaitnip Hill moorland, with semi-improved grassland pasture to the south. Only where this wall crosses the Burn of Deepdale, and between this point and the sea, does the moorland ground cover extend beyond the wall. In this location the landform surrounding the watercourse acts as the division between moorland to the north and pasture farmland lying to the south.

The topography of this area is broadly in keeping with the landscape character type, with gently rolling convex slopes lying between 50 & 110m within a section of coastal edge. This edge is dominated by high rocky cliffs with a domed grassy crown and several geos (long, narrow, steep-sided clefts formed by erosion in coastal cliffs).

Coastal Character: Steep rough grass slopes gradually steepening until soils can no longer be supported and are easily eroded and weathered leaving exposed rocky outcrops. These outcrops steepen to cliffs of varying height between 20-40m. The rock strata is prominent along these cliffs and varies in orientation which when coupled with the incised geos, has a very random and chaotic appearance. The rocky cliffs continue at the shoreline with little difference in character at differing tide levels.

Visual relationship of site with Gaitnip Hill landscape area: Views are elevated over the proposed development with the focus of the view on the distant islands and hills beyond Scapa Flow. Views are also panoramic and have a horizontal emphasis with a large sky. The foreground landscape appears bowl shaped when looking down the line of Burn of Deepdale, which focusses the near – middle distance views to the location of the proposed development

site. Residential properties and farm buildings in various states of repair litter the near landscape. The A961 and traffic provides foreground activity. Stone walls and stock fences to field boundaries. Rough grassland pasture and heather moor. Scapa Flow is a prominent feature with the oil rig and fish farm infrastructure. Site clearly visible and will become the dominant feature of the views. Earthworks and access road visible. Building, lighting columns and cranes all visible. Temporary structures, boats etc all going to be clearly visible. Lighting at night and on dark days / winter time is going to be very visually intrusive. There are no mitigation opportunities that would notably reduce the visual effects of the proposed development. Roadside planting on A961 could make a difference, but will not be in keeping with the overall landscape character of the area. Distant views to Hoy not visible during site visit due to weather conditions.

Value: The area generally comprises low to medium value landscape or rough grassland and moor over elevated ground. The openness and exposed nature of the landscape has a slightly wilder characteristic than neighbouring landscape types. The elevated nature of the coastline at Gaitnip Hill limits the coastal relationship of this character area, however the sea has a notable presence within this landscape type. The landform of Gaitnip hill contributes significantly in long distance views across Scapa Flow. Overall, the value of this landscape area is considered to be medium.

Susceptibility: The susceptibility of the characteristics of this landscape to the potential effects of the proposed development is high due to its elevation, visual openness and uncultivated landcover.

Sensitivity: The openness and exposed nature of this landscape means any development would be readily apparent and could not be accommodated within any of its landscape features. The sensitivity of this area to the effects of the proposed development is high.

Magnitude of change: The magnitude of landscape change within this area would be medium.

Level of effect: The level of effect on the Gaitnip Hill landscape area and associated coastline would be moderate adverse (significant).

7.8.3 Operation phase effect on the NSA

The extent of the Hoy and West Mainland NSA designation is shown on Figure 2, Volume 2 of the EIAR (the NSA). At its closest point the NSA is located approximately 14km west of the site. Areas where potential visibility might occur are limited to parts of north Hoy in excess of approximately 16.5km.

NatureScot publish a map, description and a statement of the special qualities of the NSA. The description of the NSA (dating from Scotland's Scenic Heritage, 1978) reads:

"The great ice-rounded eminences of the hills of North Hoy dominate the Orkney scene with a power that is scarcely in tune with their modest height (479 metres). Their bold shape, fine grouping, soaring cliffs and headlands, including the famous stack of the Old Man of Hoy, are almost as important to the Caithness scene as they are in that of Orkney.

North Hoy has a particularly strong visual inter-relationship with the south-west mainland of Orkney, the pastoral character of which around the shores of the Loch of Stenness makes a good foil for the bold hills of Hoy. The basin of this loch is enclosed by low rolling hills of lush grassland, some arable land, scattered farm steadings and stone dykes with a noticeable lack of trees, giving a very open landscape, the character of which is enlivened by the abundant remains of ancient occupation.

This landscape culminates in the west in cliffed headlands like a rampart against the sea, which breaks through at Hoy Sound in a tidal race of impressive swiftness. The stone-built settlement of Stromness rising steeply out of its harbour further enhances the character of the area."

It is noted that this relatively brief description from 1978 makes no reference to views east from north Hoy to south eastern parts of Mainland.

The 'Special Qualities of the National Scenic Areas' (SNH commissioned Report No.374, 2010) provides a more detailed analysis of the special qualities for which the NSA is designated. It identifies a list of eleven special qualities:

- *A palimpsest of geology, topography, archaeology and land use*
- *An archaeological landscape of World Heritage Status*
- *The spectacular coastal scenery*
- *Sandstone and flagstone as an essence of Orkney*
- *A long-settled and productive land and sea*
- *The contrast between the fertile farmland and the unimproved moorland*
- *A landscape of contrasting curves and lines*
- *Land and water in constantly changing combinations under the open sky*
- *The high hills of Hoy*
- *The townscape of Stromness, its setting and its link with the sea*
- *The traditional buildings and crofting patterns of Rackwick*

Further information is provided for each. Relevant excerpts include:

The spectacular coastal scenery

"In comparison, the sheltered waters and gentle topography of the western approaches to Scapa Flow contrast with the Atlantic-battered western seaboard."

Land and water in constantly changing combinations under the open sky

"Under the wide horizons, endless combinations of water, land, sea and sky can be experienced, varying both with location and the weather. Movement is brought to the landscape by the almost ceaseless wind, whether the scudding of clouds, the shafts of sunlight moving across the fields and moors, the patterns on the water, or long grass blowing in the wind."

Overall, within the document there are few specific references to views and only passing mention of views east across Scapa Flow. There is no mention of distant views to south east Mainland (the location of the proposed development). It is apparent that the special qualities of the NSA do not heavily rest on the views east across Scapa Flow to the low lying landform of south east Mainland. These views are incidental to much more important views to the dramatic landforms of north Hoy and the low lying areas in west Mainland.

At its closest point The Hoy and West Mainland NSA is located approximately 14km to the west of the site. A preliminary ZTV, run to a distance of 25km radius around the site and including potential development heights of up to 100 mAOD, showed areas of potential visibility of the proposed development (and its potential uses) from within the NSA. The areas of potential visibility from within the NSA are limited to coastal and more elevated areas of north Hoy in the vicinity of Bring Head and Burra (no areas of potential visibility from within the NSA on Mainland were identified). The closest areas of potential visibility of the proposed development from within the NSA are located at Bring Head (more specifically Lyrawa Hill and Chalmers' Hope/Scad Hill).

A viewpoint is annotated at Lyrawa Hill on OS mapping. Deep Head, Lyrawa Hill and Scad Head all lie approximately 16.5km west of the site of the proposed development across the open sea of Scapa Flow. Other areas of potential visibility from within the NSA identified by the preliminary ZTV comprised the low lying coastal settlement at

Quoyness (approximately 20km west of the site); and the hilltops of Ward Hill and Cuilags (approximately 22km and 24km west of the site respectively).

The areas of potential visibility from Hoy within the NSA based on a worst case assumption of development reaching an elevation of up to 100 mAOD comprise a very small proportion of the overall extent of the NSA designation (see Figure 5, Volume 2 of the EIAR).

Although it lies just outside of the NSA boundary (and closer to the site than areas of potential visibility from the NSA), representative viewpoint VP01 at Scorra Dale provides an impression of the kind of views towards the site that would occur from parts of the SLA (albeit that views from more distance parts of the SLA would have a greater proportion of the open water of Scapa Flow in the foreground).

Views would exist from the NSA towards the site of the proposed development over Scapa Flow and over a distance of in excess of approximately 16.5km. In these views:

- The landform around Bay of Deepdale is seen as a low and relatively flat backdrop to the waters of Scapa Flow to the east (the backdrop landform is limited in elevation to approximately 60 mAOD).
- The outline of Wideford Hill near Kirkwall (rising to 225 mAOD) can be seen to the north east/left.
- However, higher hills which draw the eye are located around Wideford Hill in Orphir also to the north east.
- From the perspective of Hoy the proposed development lies in broadly the same direction of view as the most settled parts of Mainland around Kirkwall and Scapa Bay.
- The oil terminal at Flotta is likely to be visible from Lyrawa Hill to the south east.
- West of Bring Head and towards the coastal settlement of Quoyness much more eye catching and scenic views exist to the north west towards the dramatic landforms of Ward Hill and Cuilags.
- Any long distance glimpses of the proposed development across Scapa Flow to the east would not sit within the backdrop to more important and valuable views from and of the NSA featuring the dramatic hills of north Hoy or the pastoral landscape of west Mainland.

Views east towards the site do not form a focus from here. The viewpoint at Lyrawa Hill annotated on OS mapping is shown as being focused on the north easterly direction of view across Bring Deeps towards Ward Hill at Orphir.

It is arguable the NSA designation around Bring Head seeks to protect views towards Ward Hill and Cuilags in north Hoy rather than views away to the east towards the eastern part of Mainland.


Overall, therefore, it is considered that the scenic value of the Hoy and West Mainland NSA in the vicinity of Bring Head derives from views north east, north and west and that views east towards the site of the proposed development are neither highly contributory to that scenic quality nor prominent or focal in how the landscape is appreciated. Despite the high value and sensitivity of the NSA, given the distance of the proposed development, the magnitude of change to the NSA would be negligible and the level of effect upon it would be negligible.

Furthermore, the proposed access road and quay would be indiscernible. It is likely that proposed lighting would similarly be difficult to discern over such a distance. Visibility of the proposed development would largely be the product of visibility of temporary features such as visiting vessels. These are already a common feature of the intervening waters of Scapa Flow which include a ferry route between Houton/Midland on Mainland and southern Hoy and Fara. The activities associated with the likely uses of the proposed development are already a relatively common and familiar feature of those parts of Scapa Flow that are visible in views east from the NSA.


Overall, despite some potential for low levels of visibility over a limited area, it is considered that the subsequent effect of the proposed development on the character, scenic value and integrity of the NSA designation would be negligible.


7.8.4 Operational phase visual effects at selected representative viewpoints

This section of the chapter identifies in detail the residual visual effects of the proposed development from the seven selected and agreed principal representative viewpoints. Viewpoint locations are identified on Figure 5, Volume 2 of the EIAR.


	
Location	HY 32580 05333, approximately 81 mAOD
Distance	Approximately 13km to approximate centre of the proposed laydown area.
Direction of view	East
Receptors	Road users. Occasional residential properties. Elevated scenic route likely to attract some tourism use. Provides elevated views over Scapa Flow.
Sensitivity	MEDIUM Elevated viewpoint commanding views over Scapa Flow but located outside of any designated area.
Baseline view	<p>This viewpoint is located on elevated ground close to the boundary of the NSA within west Mainland. It provides views east over the waters of Scapa Flow towards the site on south Mainland.</p> <p>Views from Scorra Dale are easterly from an elevated position over open pasture fields. Views are large-scale and panoramic with a dominant sky. Scapa Flow is the principal feature of these views with the southern peninsula of Mainland Orkney defining the distant coastline. The low, rolling topography of the southern peninsula is a strong linear element within the view and it reinforces the horizontal characteristics of the overall view. Rigs are visible within the waters of Scapa Flow.</p> <p>Features of the foreground include field boundaries, scattered buildings and a mosaic of pastoral field colours interspersed with rough grass and moorland patches. Scrub patches stand out. The foreground includes a number of residential properties and farmsteads giving a settled and farmed character.</p> <p>The low, horizontal form of the very distant south peninsula provides a distant backdrop comprising low cliffs which front the high ground of Gaitnip Hill and farmland further south. The undeveloped nature of this section of coastline in the vicinity of the site is less apparent in this very distant view and the form of Gaitnip Hill a less prominent and eye-catching feature. To the right of these cliffs the pasture fields appear to extend down to the coastline and this identifies the location of the proposed development site. The difference in landcover at Gaitnip Hill and across the coastal pastures to its south is apparent but less prominent</p>

	than in other closer views. The existing pier and associated buildings at Scapa Bay are not visible from this viewpoint.
Construction phase magnitude of change	LOW The distance involved means that the magnitude of visual change associated with the temporary construction activities would be low.
Construction phase level of effect and significance	MINOR ADVERSE (NOT SIGNIFICANT) The construction operations would be distant and temporary.
Operational phase magnitude of change	<p>LOW</p> <p>The proposed development would be visible within this view albeit at some considerable distance. Parts of the cut slope would be discernible during daylight hours. The quay itself is unlikely to be discernible at this distance and head on angle. Lighting columns would not be visible by day but could be eye-catching at night in clear weather conditions. The access road would be too distant to discern.</p> <p>Temporary elements, which could include vessels, turbine components etc., could be more visible (and would attract attention to the site) as they are much larger elements and will frequently move position within the view. Existing seaborne infrastructure in the form of oil rigs and large boats already feature within the view which would lessen the potential impacts of these additional temporary elements.</p> <p>Night time lighting, especially during the darker winter months will have significant visual effects as the coastline in this area has no current development or lit elements. This is likely to be the source of the most substantial visual effects.</p>
Operational phase level of effect and significance	MINOR ADVERSE (NOT SIGNIFICANT) The distance involved and the nature of the settled foreground mean that the currently undeveloped nature of the coastline between Scapa Pier and Howequooy Head is less apparent in this view. The cut slope and the presence of tall lighting would alter impressions of this section of coastline in this view but the change would be less apparent than from closer positions.
Mitigation opportunities	None identified.
Long term residual effect	MINOR ADVERSE (NOT SIGNIFICANT) The conclusion of a minor and not significant visual effect (on people's visual amenity) at this specific representative viewpoint does not imply a consequently minor adverse landscape effect on the environmental resource NSA landscape designation further to the west (see section 8.3).


VP02 – Wester Greenigoe	
	
Location	HY 40468 07334, approximately 83 mAOD
Distance	Approximately 6km to approximate centre of the proposed laydown area.
Direction of view	South east
Receptors	Road users on the A964. Sustrans cycle route. Residential settlement which takes advantage of views to the south. Major highway link between Kirkwall and west Mainland. Open panoramic views over Scapa Flow to the south.
Sensitivity	MEDIUM
Baseline view	View across the waters of Scapa Flow to the cliffs associated with the coastline at Gaitnip Hill, with lower pastoral areas beyond. Rounded form of Gaitnip Hill catches the eye. Prominent rigs anchored in Scapa Flow but otherwise the coastlines around south Mainland appear largely undeveloped and free of detracting features. No settlement on the coastline. The proximity of this viewpoint and the open and undeveloped land in the foreground emphasise and make apparent the largely undeveloped character of the coastline between Scapa Pier and Howequooy Head. Visible development in the form of residential properties and farmsteads tends to appear on the spine of higher ground and not along the coastline.
Construction phase magnitude of change	LOW The distance involved means that the magnitude of visual change associated with the temporary construction activities would be low.
Construction phase level of effect and significance	MINOR ADVERSE (NOT SIGNIFICANT) The construction operations would be relatively distant and temporary.
Operational phase magnitude of change	HIGH The proposed development would be sited prominently on the opposite undeveloped coastline. The currently undeveloped nature of the coastline around Gaitnip Hill and Bay of Deepdale is legible from this distance and in the absence of foreground activity would result in substantial visual change. The quayside structure and cut slope would be prominent. Lighting columns would likely not be visible other than when illuminated at night. The access road would not be visible. Visiting vessels and possible turbine components would be noticeable.
Operational phase level of effect and significance	MODERATE ADVERSE (SIGNIFICANT)
Mitigation opportunities	None identified.
Long term residual effect	MODERATE ADVERSE (SIGNIFICANT)

VP03 – Wideford Hill	
	
Location	HY 41291 11352, approximately 167 mAOD
Distance	Approximately 8km to approximate centre of the proposed laydown area.
Direction of view	South east
Receptors	Recreational.
Sensitivity	HIGH High point offering panoramic views over a wide area of Orkney.
Baseline view	Hilltop location offering extensive panoramic views across almost all of Orkney depending on chosen vantage point. On the south side of the hill views are afforded over Scapa Flow. Views in this location extend from Kirkwall in the east round to Hoy in the West. The view is dominated by Scapa Flow and interest is provided by the interplay of islands and sea across the extended bay. Views are of large-scale with open expansive sky. The land masses close to the horizon line give a strong horizontal emphasis to the view. The foreground land mass is predominantly pasture grazing with the occasional patches of rough grassland in geometric patterns creating a patchwork mosaic across the landscape. These boundaries are often emphasised by residential properties and farm buildings in clusters and groups with the occasional individual property. Trees and scrub often accompany these properties and are the only vertical elements within the foreground landscape. The land mass of the southern peninsula of Mainland island is prominent, creating the left hand (eastern) edge of Scapa Flow. The high ground of Gaitnip Hill is obvious and screens much of the farmlands down towards St. Mary's. The high cliffs along the shore line are a notable feature and appear remote and isolated. The existing pier and associated facilities at Scapa Bay are visible in this view.
Construction phase magnitude of change	LOW The distance involved means that the magnitude of visual change associated with the temporary construction activities would be low.
Construction phase level of effect and significance	MINOR ADVERSE (NOT SIGNIFICANT) The construction operations would be relatively distant and temporary. Some visual screening would be afforded by the land mass of Gaitnip Hill.
Operational phase magnitude of change	HIGH The location of the inland part of the proposed development and cut slope would be hidden from view from this perspective although the development itself would protrude significantly beyond the extent of the high cliffs below Gaitnip Hill significantly altering the perceived scenic qualities and undeveloped nature of the coastline. The currently undeveloped nature of the coastline around Gaitnip Hill and Bay of Deepdale is legible from this distance and from this elevated vantage point looking along the coastline the introduction of the quay protruding out to sea would result in substantial visual change. It's position beyond the high ground of


	Gaitnip Hill would appear separated from the existing pier and development within Scapa Bay. The quay would not be clearly tied to the shore and would appear without any anchoring landscape context. The permanent structure of the quay itself will not have significant adverse visual effects as it will be read with a similar interplay between sea and land as can be seen around the rest of Scapa Flow. Tall lighting would introduce a new and visually prominent element, though more prominent when illuminated. The temporary works including ships and possible turbine component would contrast with the existing nature of the view. Night time lighting will have significant adverse effects, however, receptors in this location are likely to be limited during hours of darkness / low light.
Operational phase level of effect and significance	MAJOR ADVERSE (SIGNIFICANT) The view and character of the coastline is defined from this perspective by the rounded form of Gaitnip Hill contrasting with the lower pastures to its south. This undeveloped character would be altered significantly by the introduction of a lit quay extending out from the coastline.
Mitigation opportunities	There are no mitigation measures possible for this location given the development site protrudes out into the sea and the viewpoint is an elevated hilltop. There are no intervening landscape elements or topography that can be modified or enhanced to mitigate the effects upon this receptor location.
Long term residual effect	MAJOR ADVERSE (SIGNIFICANT)

VP04 – A961 at Lynburn	
	
Location	HY 45630 05514, approximately 79 mAOD.
Distance	Approximately 1.5km to approximate centre of the proposed laydown area.
Direction of view	South.
Receptors	Users of A961 (especially southbound coming down off Gaitnip Hill). Nearby residential properties around St Clair Farm and Lynburn.
Sensitivity	HIGH Open view from an elevated position looking south west over Scapa Flow towards the islands of Flotta, South Ronaldsay and Burray. Views from Lynburn are in a south-westerly direction over Scapa Flow to the western islands of Orkney. Views are panoramic and large-scale with the principal focus on the distant islands on the opposite side of Scapa Flow. Foreground landscape is foreshortened due to the angle of slope across the fields towards the shore being close to the viewing angle and which has the effect of appearing to bring the sea much closer. The foreground comprises semi-improved grassland grazing pasture with adjacent rough grassland and moorland on Gaitnip Hill.
Baseline view	This position provides an open view south from an elevated position across Scapa Flow towards the southern islands of Orkney. Settlement is sparse and landcover limited to grassland and moor providing an open panorama. The contrasting character of the uncultivated Gaitnip Hill to the north and the field pattern to the


	south is apparent. The coastline itself and the associated inter-tidal zone is not visible due to the convex intervening topography. The 'notch' associated with where Burn of Deepdale and Burn of Button flow into the sea is visible at the centre of the view. A rig forms a prominent feature a short distance out to sea. The view has an undeveloped character with no easy access to the coastline.
Construction phase magnitude of visual change	HIGH Construction activity would be visually prominent.
Construction phase level of effect and significance	MODERATE ADVERSE (SIGNIFICANT) Construction activity would be visually prominent and disruptive within this undeveloped context. Its temporary duration leads to a conclusion of a moderate rather than major level of visual effect.
Operational phase magnitude of visual change	HIGH Permanent infrastructure: The front of the quayside would be visible extending out into the sea. Lighting columns would be visible. This would be down to ground level for those closer to quay front. The cut rock face to the rear of the site would not be visible from this viewpoint. The fill material placed at the top of the cut to the north east of the site would be visible but would be graded out into the adjacent landform. Any security fencing around the cut would be visible against a backdrop of sea or the new quay/laydown area. The alignment of the access road would mean that there would be limited visibility from this perspective, though traffic movement along it would be visible. Temporary uses: Visiting vessels and large-scale temporary features at the quayside and laydown area would be visually prominent. The proposed development will be prominent in the view and will draw the eye from the current distant focus, to the foreground and the industrial activity on the shoreline. Whilst the foreshortened foreground landscape will assist in screening a large part of the development at sea level, the extent to which it projects into Scapa Flow will mean that a significant proportion is clearly visible. The access road and associated earthworks will open up partial views of a greater part of the quayside which would otherwise be screened by landform. Whilst not extending up to the horizon, the tall lighting columns will extend up and into the views of the sea. These will serve to draw further attention to the development and away from the existing distant coastal focus of views. During night-time working and low light level days during winter, the lighting will constitute a significant adverse visual effect in an otherwise dark nightscape. These visual effects will be compounded by the temporary activities and infrastructure associated with the proposed development and will serve to further contrast with the existing remote character.
Operational phase level of effect and significance	MAJOR ADVERSE (SIGNIFICANT) The proposed development would be visually prominent within an open setting in a location not currently affected by large-scale infrastructure on the coastline.
Mitigation opportunities	None identified.
Long term residual effect	MAJOR ADVERSE (SIGNIFICANT)

VP05 – West Bu	
	
Location	HY 46084 03484, approximately 32 mAOD
Distance	Approximately 1km to approximate centre of the proposed laydown area.
Direction of view	North west.
Receptors	Residential location close to the coastline.
Sensitivity	HIGH
Baseline view	Panoramic views west over Scapa Flow. Large-scale with a distant focus on the hills of Hoy and western Mainland. The rolling hillscape on the horizon contrasts with the typical Orcadian seascape views where lower island topography creates a much more linear horizon. Focus is added to the hillscape distance by the foreground topography, which is a shallow rolling ridge from the east, with slopes drawing the eye west and towards the sea. The relatively uniform appearance of the semi-improved pastoral grassland contrasts with the darker undulating skyline. Foreground farm buildings and neighbouring property are the only structures to feature in the view. The field boundaries and oil rig which is temporarily berthed in Scapa Flow are the only other man made elements. These are minor elements and do not detract from the impressive view.
Construction phase magnitude of change	HIGH Prominent construction activity over a short distance from an elevated position.
Construction phase level of effect and significance	MODERATE ADVERSE (SIGNIFICANT) Level of effects judged moderate not major due to temporary nature of construction activities.
Operational phase magnitude of change	LOW, MEDIUM, HIGH The cut slope, much of the laydown area and access road would not be visible from this position due to the shielding effect of the intervening low headland landform. Views would be focused on areas towards the front of the quay along with visiting vessels. The proposed quayside structure is likely to just protrude beyond the headland indicating the presence of some man-made elements into an otherwise natural view. Furthermore, the lighting columns will extend above the skyline from this receptor location. These will break the rolling form of the skyline and have adverse effects upon this viewpoint. During periods of darkness and low light levels during the winter months the presence of these lights would have a substantial adverse visual effects for receptors at West Bu.
Operational phase level of effect and significance	MODERATE ADVERSE (SIGNIFICANT) The current view has strong scenic qualities and, despite the presence of anchored rigs out to sea, a largely undeveloped quality. The proposed development would introduce a new feature on a section of undeveloped coastline. The visibility of the permanent infrastructure would be partially contained by the headland landform to the south east of the site. This would focus views to the quayside and any vessels present would appear to sit alongside the coastline rather than significant protrude out into the open waters. A conclusion of

	moderate rather than major adverse has therefore been reached. It is noted, however, that effects could be major adverse at times as a consequence of lighting and/or if very large components are stored in the laydown area and rise significantly above the screening intervening headland landform.
Mitigation opportunities	None identified.
Long term residual effect	MODERATE ADVERSE (SIGNIFICANT)

VP06 – Burray (Swannies Point)	
	
Location	ND 45861 97116, approximately 26 mAOD.
Distance	Approximately 7km to approximate centre of the proposed laydown area.
Direction of view	North.
Receptors	Minor roads and sparse settlement.
Sensitivity	MEDIUM
Baseline view	Views are panoramic and expansive with a large sky and strong horizontal emphasis. Scapa Flow occupies the middle distance across the width of the view with a minimal foreground and distant band of gently undulating land occupying the distance along the horizon. The high ground of Gaitnip Hill, Wideford Hill and Ward Hill are easily discernible within this panorama. Viewpoint location feels exposed and remote with a limited number of dispersed individual properties scattered amongst the geometric field pattern of pasture grassland.
Construction phase magnitude of change	MEDIUM
Construction phase level of effect and significance	MINOR ADVERSE (NOT SIGNIFICANT) Temporary and relatively distant.
Operational phase magnitude of change	HIGH The proposed development will be clearly visible albeit at some distance across Scapa Flow. The site will however be seen against a backcloth of Gaitnip Hill. This somewhat reduces the potential adverse visual effects of the development. The lighting issue described in many of the other viewpoints during hours of low light / darkness will be significant from this location. The lighting will be prominent along this otherwise dark coastline, but seen in the context of lighting at Kirkwall seen adjacent / behind the development. Climatic conditions will lessen / exacerbate this effect throughout the year.

Operational phase level of effect and significance	MODERATE ADVERSE (SIGNIFICANT)
Mitigation opportunities	None identified.
Long term residual effect	MODERATE ADVERSE (SIGNIFICANT)

VP07 – South Ronaldsay (St. Margaret’s Hope)	
	
Location	ND 44621 92446, approximately 53 mAOD.
Distance	Approximately 12km to approximate centre of the proposed laydown area.
Direction of view	North.
Receptors	Road.
Sensitivity	MEDIUM Road near settlement. Relatively scenic panoramic quality suggest medium rather than low sensitivity.
Baseline view	Elevated position above the settlement of St Margaret’s Hope. Views are medium in scale, with greater emphasis on foreground and middle-distance elements reducing the overall scale of the view when compared to many of the other viewpoints. The focus of the view is on the village edge and the immediate bay area. The presence of the ferry for several hours each day provides a colourful and large feature within the bay which draws the eye of the viewer. The topography further serves to frame the foreground elements of the view to some extent. There is significantly more scrub and small tree species evident in this view and the cluster of properties, which comprise St. Margret’s Hope, contrast with the open and remote characteristics of many of the other viewpoints. The section of coastline between Scapa Pier and Howequoy Head where the site of the proposed development is located forms a less prominent backdrop to the view. In the context of the busier foreground the undeveloped nature of the coastline is less apparent.
Construction phase magnitude of change	Low
Construction phase level of effect and significance	MINOR ADVERSE (NOT SIGNIFICANT)

	Distant and seen in the backdrop to a relatively busy view containing settlement and ferry movements.
Operational phase magnitude of change	LOW The development site will be discernible on the distant shore of Scapa Flow. It will be at such a distance as to not provide a substantial change to the view during daylight hours. The landscape elements within the foreground provide the principal focus of the view and the small scale of the proposed development at such distance will not detract from these elements or focus. From this perspective the undeveloped nature of the coastline at the site is less apparent due to foreground activity. The principal visual effects of the proposed development upon this viewpoint receptor will be the night time / low light hours, where the development site will be apparent on an otherwise dark stretch of coastline. Again from this location, the light will be seen within the context of light sources at Kirkwall although this will vary with climatic conditions, being worse when moisture levels are high.
Operational phase level of effect and significance	MINOR ADVERSE (NOT SIGNIFICANT) Distant within a relatively busy settled and active view. The undeveloped nature of the coastline in the vicinity of the site is less apparent from this viewpoint in the context of the settlement of St Margaret’s Hope. There would be a degree of similarity between the foreground and more distant view and the development would appear less incongruous than would be the case from other perspectives where the current undeveloped nature of the coastline is more apparent.
Mitigation opportunities	None identified.
Long term residual effect	MINOR ADVERSE (NOT SIGNIFICANT)

7.8.5 Operational phase visual effects on residential locations

The assessment of the visual effects of the proposed development at the seven agreed principal representative viewpoints is supplemented by additional consideration of the likely visual effects on residential locations within the site’s immediate vicinity, i.e. approximately 2km. The location of these eleven residential locations is shown on Figure 7, Volume 2 of the EIA. Figure 7 also shows the ZTV of the proposed development, differentiating between areas where the proposed new quay and laydown areas might be visible and the additional areas where the proposed 40m high lighting columns are likely to be visible.

The selected residential locations are not comprehensive in the respect that they do not capture every residential property within 2km. However, the selection of the eleven residential locations was informed by a combination of analysis of the ZTV and responses at public consultation events. The exercise seeks to explore the full range of potential localised visual relationships with both permanent infrastructure and temporary activities and, therefore, some of the selected residential locations lie outside of the ZTV. Figure Showing Section Lines 1 2 & 3 – Rev, Volume 2 of the EIA provides long sections through the site from some of these key parts of the study area to help understand the landform and how this affects potential visibility within a very open setting.

The following table provides the assessment of the eleven residential locations within approximately 2km of the site. In undertaking the assessment all eleven locations are considered to be high sensitivity due to their being residential locations in a rural coastline setting. The table separates out the potential visibility of different parts of the proposed development and considers both the principal elements of the proposed permanent infrastructure and the temporary activities and uses that are likely to occur.

Table 7-2: Assessment of Visual Effects on Selected Representative Residential Locations within Approximately 2km

Residential location	Baseline view	Potential visibility of permanent infrastructure				Potential visibility of temporary activities		Mitigation opportunities	Magnitude of visual change	Level of visual effect
		Quayside and laydown area	Cut slope	40m high lighting columns	Access road	Visiting vessels at the quayside	Temporary uses/storage in laydown area			
RL1 Fernbank	See Figure Showing Section Lines 1 2 & 3 – Rev, Section 1 for typical long section illustrating visual relationship to cut landform and quayside extending out to sea. View south from an elevated position on the southern slopes of Gaitnip Hill. View over open fields. Coastline is not visible. Rigs visible out to sea. Property at Deepdale visible in the foreground.	Quayside and front areas of the laydown area would be visible.	The cut slope would alter the appearance of the landform against the backdrop of the sea. The cut would open up additional visibility to the laydown areas.	Lighting columns would rise above the quayside level and landform and be prominent against the backdrop of the sea. Lighting columns toward the front of the quayside would be visible to ground level.	Traffic movements on the road would be visible but the road itself would not be visually prominent when views from the side and from a similar elevation.	Highly visible	Highly visible – subject to height	None identified	Large	Major adverse (significant)
RL2 Rashieburn	See Figure Showing Section Lines 1 2 & 3 – Rev, Section 1 for typical long section illustrating visual relationship to cut landform and quayside extending out to sea. Position on the A961 looking south west towards the site, located close to where the access road would connect. Perspective coincides with lower ground associated with the Burn of Button. Coastline not visible. Property at Deepdale visible against sea. Rigs prominently visible out to sea.	Quayside and front areas of the laydown area would be visible.	Cut slope would not be visible from this elevation. May result in slight indent in landform with small amount of opening up of views to the quayside.	Lighting columns would rise above the quayside level and landform and be prominent against the backdrop of the sea. Lighting columns toward the front of the quayside may be visible to ground level.	Perspective means that the alignment of the access road and its associated traffic movements would be visible in the vicinity of the property at Deepdale.	Highly visible but against backdrop which often contains rigs.	Taller stored structures likely to rise above the shielding effect of the cut slope and be prominent - subject to height	None identified	Large	Major adverse (significant)
RL3 Netherbutton	See Figure Showing Section Lines 1 2 & 3 – Rev, Section 2 for typical long section illustrating visual relationship to cut landform and quayside extending out to sea. Elevated view towards the coastline from the closest residential location to the proposed development. Sloping fields in the foreground but no existing visibility of the coastline. Contrasting landcover at Gaitnip Hill to the north apparent. Landform associated with Burn of Button marks where it meets the waters of Scapa Flow. Rigs prominent out to sea.	Although less elevated than other residential locations the cut slope would mean that the front of the quayside would be visible extending out into the sea. Majority of the laydown area would be screened by intervening landform.	No visibility of the cut slope but its excavation would change the landform profile of the coast and open up a degree of additional visibility to the quayside.	Lighting columns would rise above the quayside level and landform and be prominent against the backdrop of the sea. Lighting columns toward the front of the quayside would be visible to ground level.	Visible but mainly from the side and largely as a consequence of traffic movements	Highly visible but against backdrop which often contains rigs.	Taller stored structures likely to rise above the shielding effect of the cut slope and be prominent - subject to height	None identified	Large	Major adverse (significant)
RL4 Darmont	See Figure Showing Section Lines 1 2 & 3 – Rev, Section 2 for typical long section illustrating visual relationship to cut landform and quayside extending out to sea. Residential location on the A961 with views out to sea to the south west. 'Table' of flatter ground in the foreground with intervening properties at Netherbutton prominent in the view mean that the coastline itself is not visible. Rigs out to sea less prominent due to intervening landform. View interrupted by telegraph poles and some small amounts of vegetative landcover.	The quayside and laydown area would not be visible.	The cut slope would not be visible and would not alter the landform profile of the coastline as viewed from this perspective.	The top of the proposed lighting columns would rise above the landform profile of the coastline. These would be in a similar direction to properties and telegraph poles at Netherbutton. They would not extend above the roofline of these properties.	Minimal visibility from this distance and elevation due to side view. Largely screened by intervening domed landform.	Largely screened by landform but glimpses of tops of vessels in similar direction to Netherbutton properties depending on specific height. Likely to be large absorbed in the view and against the backdrop of frequent presence of rigs anchored out to sea.	Some temporarily large-scale stored items could be prominent given that, on occasion, they might exceed 40m in height. But not generally likely to be visible.	None identified	Small to medium (the proposed development would be more prominent when the lights are on)	Minor adverse (not significant)
RL5 Northfield	See Figure Showing Section Lines 1 2 & 3 – Rev, Section 2 for typical long section illustrating visual relationship	The ZTV (Figure 7) shows that the front of the quayside would	Not visible.	The ZTV (Figure 7) shows that the tops of the lighting	Not visible	Largely screened by landform but glimpses of tops of vessels likely	Some temporarily large-scale stored items could be visible above the intervening landform given that,	None identified	Small (the proposed development	Minor adverse (not significant)

Residential location	Baseline view	Potential visibility of permanent infrastructure				Potential visibility of temporary activities		Mitigation opportunities	Magnitude of visual change	Level of visual effect
		Quayside and laydown area	Cut slope	40m high lighting columns	Access road	Visiting vessels at the quayside	Temporary uses/storage in laydown area			
	to cut landform and quayside extending out to sea. This vantage point demonstrates the nature of the views from residential locations further inland. The sea is visible but not the coastline itself. Intervening properties within an open landscape interrupt the available views. There is nevertheless a slight 'bowl' in the landform profile of the coastline in the direction of the site and the top of rigs anchored out to sea can be seen.	not be visible from this location due to intervening landform.		columns could just be visible but, amongst intervening properties and low in the view they would not be prominent greater prominence at night if the lamps are just visible above the landform		subject to specific height. Would be seen in the context of frequently anchored rigs.	on occasion, they might exceed 40m in height. But not generally likely to be visible.		may be more prominent when the lights are on if the tops of the lighting columns rise a little above the coastal landform)	
RL6 Lynnfield	See Figure Showing Section Lines 1 2 & 3 – Rev, Section 2 for typical long section illustrating visual relationship to cut landform and quayside extending out to sea. Elevated view from inland position less closely associated with the coastline. Ferry movement and top of rig anchored out to sea nevertheless visible.	The ZTV (Figure 7) shows that the front of the quayside would not be visible from this location due to intervening landform.	Not visible	The ZTV (Figure 7) shows that the tops of the lighting columns would not be visible from this location due to intervening landform.	Not visible	Berthed vessels likely to be screened by landform but top of taller vessels may be glimpsed similar to rigs anchored out to sea.	Some temporarily large-scale stored items could be visible above the intervening landform given that, on occasion, they might exceed 40m in height. But not generally likely to be visible. Likely to be very infrequently the case that any stored items would be visible from this locality.	None identified	Negligible	Negligible (not significant)
RL7 Quoylobs	See Figure Showing Section Lines 1 2 & 3 – Rev, Section 3 for typical long section illustrating visual relationship to cut landform and quayside extending out to sea. Residential location close to the A961 and its junction with a local road heading inland. Elevated position looking west down into the Bay of Deepdale, though the coastline itself is not visible. Landform associated with the Burn of Button visible including close to where it meets the sea. Anchored rigs prominent out to sea.	Quayside and front areas of the laydown area would be visible.	The cut slope would alter the appearance of the landform against the backdrop of the sea. The cut would open up additional visibility to the laydown areas.	Lighting columns would rise above the quayside level and landform and be prominent against the backdrop of the sea. Lighting columns toward the front of the quayside may be visible to ground level.	Likely to be largely screened by intervening landform.	Highly visible	Highly visible – subject to height	None identified	Large	Major adverse (significant)
RL8 Midhouse	See Figure Showing Section Lines 1 2 & 3 – Rev, Section 3 for typical long section illustrating visual relationship to cut landform and quayside extending out to sea. Less elevated position than Quoylobs with more frequent built forms intervening to reduce the openness of the view. Rising intervening headland landform to the south east of the site provides some visual shielding.	The ZTV (Figure 7) shows that the quayside and front areas of the laydown area likely be visible over the intervening landform.	Cut slope largely screened by intervening landform.	Lighting columns would rise above the quayside level and landform and be prominent against the backdrop of the sea. Lighting columns toward the front of the quayside may be visible to ground level.	Likely to be largely screened by intervening landform.	Highly visible	Highly visible – subject to height	None identified	Medium	Moderate adverse (significant)
RL9 Backakelday	See Figure Showing Section Lines 1 2 & 3 – Rev, Section 3 for typical long section illustrating visual relationship to cut landform and quayside extending out to sea. Residential location close to the coastline. The low cliffs of the coastline in the vicinity of the headland at Tongue of Gangsta become visible at this proximity and elevation. The elevated headland to the south of the site does provide	The ZTV (Figure 7) shows that the quayside and front areas of the laydown area likely be visible over the intervening landform.	Cut slope largely screened by intervening landform.	Lighting columns would rise above the quayside level and landform and be prominent against the backdrop of the sea. Lighting columns toward the front of the quayside may be visible to ground level.	Not visible. Screened by intervening landform.	Highly visible	Highly visible – subject to height	None identified	Large	Major adverse (significant)

Residential location	Baseline view	Potential visibility of permanent infrastructure				Potential visibility of temporary activities		Mitigation opportunities	Magnitude of visual change	Level of visual effect
		Quayside and laydown area	Cut slope	40m high lighting columns	Access road	Visiting vessels at the quayside	Temporary uses/storage in laydown area			
	some visual screening. Gaitnip Hill a prominent landform to the north.									
RL10 Westerbister	Residential location further to the south.	The ZTV (Figure 7) shows that this location lies on the fringes of where the quayside is likely be visible.	Not visible.	Lighting columns would rise above the quayside level and landform and be prominent against the backdrop of the sea.	Not visible. Screened by intervening landform.	May be visible from parts of general vicinity.	May be visible from parts of general vicinity.	None identified	Small	Minor adverse (not significant)
RL11 Hestwall	Location further to the south and inland. Included due to feedback at public consultation event.	The ZTV (Figure 7) shows that this location lies outside of the area where the quayside and front areas of the laydown area are likely be visible.	Not visible	The ZTV (Figure 7) shows not visible.	Not visible.	Unlikely to be visible at quayside depending on height. Movements to and from quayside would be visible.	Visibility very unlikely but some temporarily large-scale stored items could be visible above the intervening landform given that, on occasion, they might exceed 40m in height. Likely to be very infrequently the case that any stored items would be visible from this locality.	None identified	Negligible	Negligible (not significant)

7.8.6 Operational phase cumulative effects

A list of developments for possible inclusion in an assessment of cumulative effects was provided as Appendix 2 to OIC's scoping opinion. This listed:

- Two wind farms: one at Quanterness to the north west of Kirkwall and one at Lyness on Hoy
- A proposal to extend the pier at Scapa Bay
- A proposal for a fish farm off the coast at Tongue of Westerbister

The two wind farm proposals are both considered too distant from the proposed development to give rise to significant additional cumulative seascape, coastal, landscape or visual effects. The proposed development at Quanterness would be located on the opposite side of Mainland separated by high ground. Although potentially both visible in different directions from locations such as Wideford Hill, the two schemes would exert influences on different parts of the island to the site and on different landscapes and coastlines. The proposed development at Lyness on Hoy would be located on a different island on the opposite side of Scapa Flow. There is no potential for interaction between these distant schemes in a way that would notably add to or exacerbate the seascape, coastal, landscape or visual effects of either or both.

Fish farms are already a feature of the waters off Deepdale Bay and therefore the addition of further fish farm activity would not alter the identified effects of the proposed development.

The proposed extension of the pier and laydown areas at Scapa Bay would be located approximately 4km to the north of the proposed development. The two developments would be sited within different local coastal character areas and would be visually separated by the intervening mass of Gaitnip Hill. Changes at Scapa Pier would not likely exacerbate the effects of the proposed development to any material degree.

In general, the purpose of considering the potential for cumulative effects is to identify how a development might add to a cumulative scenario that might, as a consequence, give rise to a significant effect where in isolation one would not occur. For this assessment, it is important to note that significant landscape and visual effects have been identified as a consequence of the proposed development on its own and in the absence of cumulative interaction. In the context of these already identified significant effects, it is considered that additional cumulative considerations do not materially alter the overall assessment.

7.9 Statement of Significance

Seascape, coastal, landscape and visual effects would be significant and adverse during both the construction and operational phases of the proposed development. Significant effects during construction would be localised and largely associated with visual effects on nearby residential properties. Significant operational effects would be more widespread. The proposed lighting would be a particular source of adverse landscape and visual effects both at a local, i.e. within 2km from the site, and wider scale.

The significant effects on seascape, coastal and landscape character would be associated principally with landscape and coastal areas on the eastern side of Scapa Flow in the southern part of Mainland. Significant seascape, coastal and landscape effects would not extend to areas to the north, south or west of Scapa Flow.

The significant coastal and landscape effects would principally be associated with areas within approximately 2km of the site at the Bay of Deepdale coastal pastures (the host landscape area and coastline) but also extend to adjacent areas on the southern slopes of Gaitnip Hill, immediately to the north, as a consequence of views down across the site. The significant effects relate to the relatively undeveloped nature of this area with an absence of large-scale

infrastructure. Although anchored rigs are often positioned out to sea, the coastline itself is relatively undisturbed and inaccessible.

The effect on the Hoy and West Mainland NSA would not be significant.

Major adverse and significant visual effects would similarly principally be associated with residential locations within approximately 2km of the site, however, would extend more widely where sensitive views exist. Five of the seven principal representative viewpoints assessed would be subject to long term residual significant visual effects (moderate and major). The exception to this would be the more distant views from Scorra Dale and South Ronaldsay from where the currently undeveloped character of the coastline between Scapa Pier and Howequoy Head is less apparent. The undeveloped nature of this section of coastline is, however, more apparent in views from distances of up to 5km to 7km, such as at Wester Greenigoe and Burray, especially where the foreground comprises open sea or undeveloped coastline. Residential locations within 2km of the site subject to major adverse and significant visual effects would include those at RL1 Fernbank, RL2 Rashieburn, RL3 Netherbutton, RL7 Quoylobs and RL9 Backakelday.

Opportunities to mitigate adverse landscape and visual effects are very limited due to the scale of the proposed development and the visually open character of Orkney. Screening the proposed development using either banded material or planting is not feasible due to the exposed coastal location and topographical context.

8 SOCIO-ECONOMICS

8.1 Introduction

This chapter of the Environmental Impact Assessment Report (EIAR) will identify the likely potential socio-economic effects during the short term (construction) and long term (operation) of the proposed development.

The assessment considers the potential direct and indirect economic and demographic impacts from the proposed development on identified key sensitive receptors within the local area.

A baseline has been established through relevant social and economic indicators with national comparisons for context where possible. The magnitude of potential impacts from the proposed development are considered in terms of scale and length of time as a reasonable worst-case. The assessment will seek to mitigate adverse effects and enhance the design, construction and operation of the proposed development to improve the outcomes of the residual effects.

8.2 Scoping and Consultation

An EIA Scoping Report was submitted in March 2021 and is detailed in Volume 3 Technical Appendix 3.1.

The Scoping Report was submitted to both Orkney Islands Council and Marine Scotland as statutory consultees in the EIA process. The proposed development contains elements which are both above and below Mean High Water Springs (MHWS), which constitutes the dividing line between terrestrial and marine planning, therefore both Orkney Islands Council and Marine Scotland were required to be consulted.

An EIA Scoping Opinion was received from Orkney Islands Council in May 2021 and from Marine Scotland- Licensing Operations Team in October 2021. The Scoping Opinions are included within Volume 3 Technical Appendix's 3.2 and 3.3 respectively.

Both Scoping Opinions agreed that Population and Human Health should be scoped out of the EIA process, but that social and economic impacts could potentially arise from the Proposed Works and that these should be fully assessed in the EIA Report.

In response, a methodology for a Socio-economic EIAR chapter was submitted to the statutory consultees on 5th January 2023 for their review and consideration. At time of writing (February 2023), no response has been received from the statutory consultees.

The following statutory consultees were sent the SDWQ Proposal of Application Notice (PAN) for comment between November 2022 and February 2023:

- OIC including:
 - Development and Marine Planning Department
 - Engineering Services Department
 - Environmental Health Department
 - Road Services Department
 - Kirkwall Fisheries Office
 - Marine Services Department

- Orkney Archaeologist Department
- Orkney Harbour Authority

- Marine Scotland
- Historic Environment Scotland
- SEPA
- NatureScot

Comments and responses to the PAN have been recorded for consideration in the design process.

Stakeholder Engagement

Stakeholder engagement has been ongoing throughout the design process including Statutory Public Exhibitions, 1-2-1 meetings with stakeholders, informal drop-in events, workshops, presentations to a variety of participants (including Community Councils), and the issue of newsletters and media releases. This allows for local residents and businesses to access information regarding the proposed development and provide input, feedback and raise any concerns. These inputs have been used to shape the detailed design for the project. A Stakeholder Engagement Plan was produced in September 2022 and is routinely updated once new information becomes available. Stakeholder engagement activities are collated through a central database and relevant actions / suggestions logged with the project team.

Key topics of discussion and concern in relation to socio-economics collated include:

- Project benefits
- Timing of the projects
- Potential impacts on traffic
- Finance and how projects will be funded
- Concerns around housing constraints (for construction and operational staff)
- Opportunities for added value, e.g. community benefits, biodiversity enhancements, distribution of benefits across the community
- Desire for projects to proceed to secure maritime activity and jobs for Orkney into the future, and in the context of the downturn in activity around the oil and gas activities.

The responses within the Stakeholder Engagement Plan informed the assessment and potential impacts anticipated.

8.3 Policy, Legislation and Guidance

National Policy

***National Planning Framework 4 (2023)*⁸⁶**

The NPF4 sets out how future development must support a just transition, highlighting that opportunities for development and regeneration that are designed to tackle social, economic and health inequalities and specifically mentions Orkney and the surrounding waters.

Scapa Flow Future Fuels Hub in Annex B is referred to as a development contributing to “*energy innovation development on the islands*”. NPF4 supports development which are for “*renewable energy generation, renewable hydrogen production, infrastructure and shipping, and associated opportunities in the supply chain for fabrication, research and development. Any strategy for deployment of these technologies must enable decarbonisation at pace*”.

⁸⁶ Scottish Government (2023) National Planning Framework 4. Available at: <https://www.gov.scot/publications/national-planning-framework-4/>

and cannot be used to justify unsustainable levels of fossil fuel extraction or impede Scotland's just transition to net zero."

The NPF4 specifically mentions "Supporting Scapa Flow Future Fuels Hub and Orkney Harbours" and references Scapa Flow directly in Annex B National Developments Statement of Needs:

- **1. Energy Innovation Development on the Islands:** "The classes below apply to development that is for the delivery of the Future Fuels Hub, new quay in Scapa Flow, and the Orkney Logistics Base at Hatston, which support services for the renewable and marine energy and shipping sectors:

Including: "Quay to service renewable energy, energy transportation, energy decommissioning, fabrication or freight handling, including new or enhanced associated laydown or operational area at, Scapa Flow, and Hatston (Kirkwall);"

The policy recognises that "the use of low and zero emission fuels will play a crucial role in decarbonising island and mainland energy use, shipping, strengthening energy security overall and creating a low carbon energy economy for the islands and islanders. The developments will add value where they link into national and international energy expertise, learning and research and development networks."

The NPF4 also states that: "It is essential, and a statutory requirement, that people with protected characteristics, including disability, race, age, sex and sexual orientation, and including people from a range of socio-economic backgrounds, are given particular support to express their views on plans and decisions, with consultations designed to meet the communication needs of people."

When applying the spatial principles in practice, the NPF4 outlines how Scottish Government wants future places to work for everyone and achieve sustainable development.

Scotland's National Marine Plan (2015)⁸⁷

Scotland's National Marine Plan (NMP) sets out guidance specifically for regional planners and includes basic legislative requirements. Within these requirements is:

- Keeping under review the physical, environmental, social, cultural and economic characteristics of the region; the purposes for which it is used; its communication, energy and transport systems; and the living resources which it supports; and
- Setting economic, social, marine ecosystem and climate change objectives.

The NMP states that it "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."

The NMP also sets out that "The Marine (Scotland) Act 2010 requires marine plans to set economic, social and marine ecosystem objectives and objectives relating to the mitigation of, and adaptation to, climate change. Plans must also state policies for, and in connection with, the sustainable development of the area to which this Plan applies."

⁸⁷ Marine Scotland. (2015). Scotland's National Marine Plan. Available at: <https://www.gov.scot/binaries/content/documents/govscot/publications/strategy-plan/2015/03/scotlands-national-marine-plan/documents/00475466-pdf/00475466-pdf/govscot%3Adocument/00475466.pdf>

⁸⁸ The Scottish Government (2022) Scotland's National Strategy for Economic Transformation: Delivering Economic Prosperity [online] Available at:

The NMP includes the following general policies related to socio-economics:

- **GEN 2 Economic benefit:** Sustainable development and use which provides economic benefit to Scottish communities is encouraged when consistent with the objectives and policies of this Plan. "The economic benefit of proposed development and use should be considered carefully and taken into account, appropriately and proportionately, in marine decision making. Particular consideration should be given to opportunities that aim to provide benefit to communities, including local job creation and local training either directly or through supply chain projects."
- **GEN 3 Social benefit:** Sustainable development and use which provides social benefits is encouraged when consistent with the objectives and policies of this Plan. "The social benefit of proposed developments and increasing use should be considered carefully and taken into account, appropriately and proportionately, in marine decision making. Consideration should be given where industries and developers assist in supporting the development of onshore infrastructure, helping to achieve community cohesion and reducing social disparity. The impact of proposed development on existing activities, including those which promote health and wellbeing, should also be taken into account in decision making."
- **GEN 4 Co-existence:** Proposals which enable coexistence with other development sectors and activities within the Scottish marine areas are encouraged in planning and decision making processes, when consistent with policies and objectives of this Plan.

"As development and use of the marine environment continues to increase, there is likely to be increased competition for space. One approach to managing this is to encourage development proposals which bring together activities which are compatible or synergistic in one location, to make good use of space, i.e. those which involve or allow co-existence, taking account of temporal and spatial issues."

This applies to a wide range of scenarios, including using existing infrastructure as a basis for a new activity, or taking advantage of opportunities now and in the future as technology advances, or for inshore activities to locate further offshore in tandem with other industries.

Opportunities for coexistence and synergies may be identified through existing examples, by sectors as new practices and technologies emerge or by data collection at a national or regional level. Where possible, marine planners and decision makers should encourage development or use which does not result in areas being unsuitable for future use by others"

Scotland's National Strategy for Economic Transformation: Delivering Economic Prosperity (2022)⁸⁸

Scotland's National Strategy for Economic Transformation (SNSET) sets out the priorities for Scotland's economy as well as actions needed to maximise opportunities over the next decade to achieve a wellbeing economy. The SNSET sets out five policy programmes of action:

- "establish Scotland as a world-class entrepreneurial nation founded on a culture that encourages, promotes and celebrates entrepreneurial activity in every sector of our economy
- strengthen Scotland's position in new markets and industries, generating new, well-paid jobs from a just transition to net zero
- make Scotland's businesses, industries, regions, communities and public services more productive and innovative

<https://www.gov.scot/binaries/content/documents/govscot/publications/strategy-plan/2022/03/scotlands-national-strategy-economic-transformation/documents/delivering-economic-prosperity/delivering-economic-prosperity/govscot%3Adocument/delivering-economic-prosperity.pdf>

- ensure that people have the skills they need at every stage of life to have rewarding careers and meet the demands of an ever-changing economy and society, and that employers invest in the skilled employees they need to grow their businesses
- reorient our economy towards wellbeing and fair work, to deliver higher rates of employment and wage growth, to significantly reduce structural poverty, particularly child poverty, and improve health, cultural and social outcomes for disadvantaged families and communities”

These five policy programmes outline how Scotland will tackle long-term structural challenges, build on economic strengths, and position Scotland to maximise economic opportunities of the next ten years.

Regional and Local Policy

The Pilot Pentland Firth and Orkney Waters Marine Spatial Plan⁸⁹

The Pilot Pentland Firth and Orkney Waters Marine Spatial Plan (OWMSP) seeks to: “support the cultural and social wellbeing of local communities including the maintenance and enhancement of quality of life, and visual amenity in coastal areas”

General Policy 1B of the OWMSP refers to “Supporting sustainable social and economic benefits” which outlines how the renewable energy sector has the potential to have a transformational effect on the local economy. Existing marine industries already make a vital social and economic contribution towards both productivity and employment; the OWMSP aims to support the growth of the renewable energy sector to “bring forward social, economic and environmental benefits in a way that co-exists with existing economic activities”.

General Policy 1B sets out that developments that are supported by the OWMSP must demonstrate:

- sustainable employment benefits
- that opportunities to support local supply chains and create skilled employment in local communities have been maximised
- that any adverse social, economic and operational effects on existing activities have been avoided, or where avoidance is not possible, adverse effects have been appropriately mitigated
- that opportunities to support synergistic benefits between development and activities have been maximised

It is also emphasised in General Policy 1B that early engagement should be undertaken with the local authority or other relevant bodies if there are likely to be significant impacts on local infrastructure or services.

Orkney Local Development Plan 2017- 2022⁹⁰

The Local Development Plan (LDP) for Orkney outlines planning policies that seek to strengthen and support Orkney’s communities by enabling developments which have a positive and sustainable socio-economic impact on the community. With this, it seeks to utilise locally available resources, whilst striving to preserve and enhance the natural and cultural heritage assets upon which Orkney’s economy and society depends.

The LDP seeks to “support the growth of Orkney’s communities in a sustainable manner, ensuring that development is directed in the first instance to places with sufficient infrastructure and facilities to support sustainable social and economic development; the towns, villages and rural settlements of the Plan [LDP].”

⁸⁹ The Scottish Government (2016) Pilot Pentland Firth and Orkney Waters Marine Spatial Plan. Available at: <https://www.gov.scot/binaries/content/documents/govscot/publications/factsheet/2016/03/pilot-pentland-firth-orkney-waters-marine-spatial-plan/documents/00497299-pdf/00497299-pdf/govscot%3Adocument/00497299.pdf>

The following policies relate to socio-economics:

- **Policy 12: Coastal Development:** Ports & Harbours: ‘Development which requires a pier and/or harbour location, including for fishing, renewables, aquaculture or marine leisure and recreational purposes, will be supported within areas identified for harbour and pier uses where;
a) the proposal requires a harbour-side location or is ancillary to activities taking place within the harbour area;
b) the proposal would not adversely affect the commercial viability or efficient working of the harbour or pier for commercial marine related uses;
c) the design, scale and siting of new development would not have a significant adverse effect on the local coastal character and visual amenity; and
d) the proposal complies with the requirements of the HSE where the pier or harbour is covered by an HSE Consultation Zone.
ii. The enhancement and upgrading of piers, landing facilities and other facilities associated with the industries which require a pier and/or harbour location will be supported.’

In support of this policy a Masterplan setting out the vision for the physical transformation of harbours across five locations, including Scapa, on the mainland and has been adopted by Orkney Islands Council as supplementary planning guidance.

Orkney Child Poverty Strategy 2022-2026⁹¹

The Orkney Child Poverty Strategy (OCPS) describes “the impact of poverty on children and shows how the experience of Orkney’s children and families compares with Scotland”. It sets out five themes to drive the strategy (pockets, prospects, places, prevention and priorities) and includes an action plan which will be taken to meet immediate need and to address long-term prevention of child poverty in Orkney. The outline action plan includes short, medium and long-term target outcomes; those outcomes specific to this socio-economic chapter include:

- Places (Every family has a sustainable home):
 - Extend more employment opportunities to the isles
 - Explore options to apply the benefits from wind power development to reduce home energy costs
- Prevention (Future generations can escape poverty):
 - Promote good employment practice, flexibility and fair pay, and their benefits to employers

Guidance & Industry Standards

There is no published specific methodological guidance and technical significance criteria to assess socio-economic effects within EIA. Professional judgement based on experience, relevant industry guidance and reports, has informed this assessment. Relevant industry guidance and reports included:

- Institute of Environmental Management and Assessment (IEMA)
- His Majesty’s (HM) Treasury’s Green Book (2022)
- The Blue Economy in the Highlands and Islands Report (2023)
- Orkney Economic Review (2020)
- Outline Business Case (OBC) for Orkney Harbours Masterplan Phase 1 Projects (2022)

⁹⁰ <https://www.orkney.gov.uk/Service-Directory/O/Orkney-Local-Development-Plan.htm>

⁹¹ Orkney Islands Council (2022) Orkney Child Poverty Strategy 2022 to 2026 [online]. Available at: <https://www.orkney.gov.uk/Files/OHAC/Orkney%20Child%20Poverty%20Strategy%202022-2026.pdf>

8.4 Methodology

Assumptions & Limitations

The following assumptions and limitations have influenced the data collection and assessment of this chapter:

- The aim of this EIAR chapter is to consider the potential significant effects of the proposed development based on the information available at this time. It is acknowledged that more information will become available as the project develops. The assessment has taken a reasonable conservative approach to the assessment and findings i.e. that benefits are reduced in magnitude where there is uncertainty, and magnitude of an adverse impact is raised when there are potential unknowns likely to lead to significant effects. This approach is based on professional experience and the type, scale and location of the proposed development. It is considered likely that as the project develops the benefits will be greater and adverse impacts diminished than reported here, but it is considered a robust and proportionate assessment approach to inform the design, statutory environmental bodies, local planning authority and other key decision makers.
- There are no technical significance criteria relating to the assessment of socio-economic effects. The assessment approach is to take a 'benchmark' of relevant socio-economic baseline conditions for the identified study area. The baseline of the Site and surrounding area has been qualitatively considered where relevant in the context of the proposed development not being delivered. The degree of change is assessed against the sensitivity of the receptor to determine the significance of effect. The degree of uncertainty influences the conclusions on the significance of effects and reflects a conservative outcome i.e. beneficial outcomes are reduced in significance and negative outcomes increased, which is likely to change as more detailed information is made available.
- As with any dataset, baseline data will change over time. While the most recent published data sources have been used in this assessment; however, it should be noted that in some instances this data may not be up-to-date.
- Based on the information available, the context of the location and the scale and type of the project, it has been assumed that all identified receptors in the assessment are of a high sensitivity.
- The assessment has been undertaken using information from the OBC for the proposed development such as construction and operational employment numbers, Gross Value Added (GVA) and Net Present Value (NPV) impacts.
- The construction timeline and operational dates of the proposed development is 3 years, starting 2024 but this is assumed to be indicative. For the purposes of this assessment it has been assumed that the duration of the construction timeline will be less than 5 years.
- The development will be procured on a design and build contract so therefore, it is not possible to determine the exact location from which the construction workforce will be employed (local, regional or at a national level). However assumptions can be made that this will consist of a mix of local, regional and national workers, due to the scale of the project and that there will be certain requirements placed upon the contractor to utilise local workers and engage the local supply chain.
- The specific nature of operational jobs is not known at this stage in the design. It has been assumed for the purposes of this assessment that the development will present the opportunity for an increase in higher paid, more secure permanent employment.
- The operational uses of the proposed development will include facilities for a major assembly hub for fixed and floating wind substructures and turbine integration, as well as small scale manufacturing and wet storage.
- No existing shipping lanes located within the Site.
- Operational activities of shipping traffic within Scapa Flow will continue to use existing routes and this will be supported by the Navigation Risk Assessment.
- The specific impacts on businesses is based on the responses within the Stakeholder Engagement Plan (2022), the Public Consultation Q&A and the OBC.

Study Area

The study area for the assessment differs based on the best information available and receptors identified to inform the design. This includes:

- Site Level - the site (where data is available at this spatial level)
- Local Area – Orkney Islands Council
- National - Scotland / UK (where data is available at this spatial level)

Baseline conditions

Data has been gathered and summarised in quantitative and/or qualitative terms depending on the availability, relevance and completeness of data at the time of undertaking the assessment. For the purpose of this assessment, the socio-economic baseline comprises the following indicators:

- Population size
- Scottish Indices of Multiple Deprivation
- Employment and economic activity
- Unemployment
- Job Seeker's Allowance
- Workforce qualifications
- Occupation category of residents
- Key business sectors
- Household income
- Tourism volume and value

Cumulative

There are related projects based in and around Orkney that have the potential to have socio-economic impacts within the local area.

Local future projects included in the assessment are based on the findings within OBC, which include Hatston, Scapa and Lyness. It is assumed that the construction phases of all projects are in parallel. A brief overview of the other projects is provided:

Hatston

Hatston Pier and Terminal is located on the Orkney Mainland coast to the immediate northwest of Kirkwall. It is Orkney's primary commercial terminal and gateway to Aberdeen and north to Shetland. The longest existing berth is 385m in length, offering 10.5m draft. The original pier was built in 2002, and a 160m extension was completed in 2013. The proposed expansion comprises:

- 300m outer quay extension.
- Water depth of 10m below Chart Datum.
- 125m inner berth with linkspan and adjacent boat lift
- 7.5 hectares of additional land close to the quay through reclamation.

- Ex-pipe fuel supply and storage, with ability to offer low or zero carbon fuels in the future⁹².

Lyness

Lyness is an existing facility located on the island of Hoy, which had particular prominence as a former wartime Royal Navy base. Investment is required to create a hard standing laydown area behind the quay. There is one site in close proximity to the quayside comprising 3.76 hectares which will be developed to provide a suitable laydown area for these activities⁹³.

Other Developments

In addition to the above schemes, the OIC planning portal was searched for development type relevant to the proposed development that could give rise to cumulative effects:

- 4a Business and industry – Major
- 4a Business and industry – Local (with EIA)
- 5c Waste Management – Local (with EIA)
- 7c Freshwater Fish Farming – Local EIA
- 8c Marine Finfish Farming – Local (with EIA)
- 10a Other developments – Major
- 10c Other Developments – Local (with EIA)
- Pre-App Query

No project was identified within the last 2 years on the planning portal. It is reasonable to assume that projects with the potential to have significant environmental effects, including socio-economic impacts, would be required to have an EIA Scoping Report and that would be available on the planning portal. In the absence of other projects with overlapping construction period and / or any EIA Scoping Reports, no further cumulative effects are considered. For future projects that trigger an EIA, these will need to consider the proposed development as part of their assessment where there is overlap in programme and potential significant effects to meet the EIA regulations.

Key receptors

As set out in the methodology shared with the statutory consultees prior to preparing this EIAR chapter, the following key receptors have been identified based on the likely relevant impacts of the proposed development and the established study area:

- The existing local communities
- Local businesses
- Marine users
- Other local community assets

Magnitude criteria

Impacts will be categorised according to the following magnitudes:

Major

Total or major change to key receptors of the baseline conditions resulting in fundamental differences. Examples would include major, long term (5+ years) changes to the Site profile, such as operational employment impacts and changes to local Gross Domestic Product (GDP).

Moderate

Loss or change of one or more key receptors of the baseline conditions resulting in material changes. Examples would include short term (<5 years) changes to the Site profile, such as construction employment effects.

Minor

Minor change to key receptor conditions, with limited differences to the baseline. Examples would include minor, short-term changes to the Site profile such as increased traffic congestion during construction.

Negligible

A very minor loss or detrimental alteration to socio-economic resource, one or more characteristics, features, or elements; or a very minor benefit or positive addition to socio-economic resource, one or more characteristics, features or elements.

Mitigation and enhancement

Identifying ways of mitigating potential negative impacts and maximising positive opportunities have been included as part of the assessment. This approach is inherent to a successful EIA process that will inform and improve the design and residual outcomes for the community.

Significant effects

The assessment of likely significant effects is based on the EIA significance criteria terminology, as set out in table 8.1. An effect of Moderate or above is considered significant.

Table 8-1: Significance matrix – significant effects highlighted in bold

Receptor Sensitivity / Value	Impact Magnitude			
	Negligible	Minor	Moderate	Major
Low	Negligible	Negligible	Negligible	Slight
Medium	Negligible	Negligible	Slight	Moderate
High	Negligible	Slight	Moderate	Substantial
Very High	Slight	Moderate	Substantial	Substantial

Assessment Methodology

A qualitative analysis has been undertaken using established methodologies, including the Additionality Guide by English Partnerships (2014). The Additionality Guide sets out an approach to measuring the extent to which a

⁹² Orkney Harbours Masterplan Phase 1. (2022). Outline business case.

⁹³ Orkney Harbours Masterplan Phase 1. (2022). Outline business case.

proposed development (and associated outputs, outcomes and impacts) is larger in scale, at a higher quality, takes place quicker, takes place at a different location, or takes place at all as a result of intervention. Additionality measures the net result, taking account of deadweight, leakage, displacement, substitution and economic multipliers.

The OBC for the proposed development provides the key outputs and forecast on employment and economic impacts.

To establish the likely potential operational impacts of the proposed development on key receptors, the assessment considers the following for both the construction and operational phases:

- **Impact on employment;** assessed using predicted construction employment
- **Impact on local businesses;** including access and operational activities of existing local businesses, including marine users and tourism
- **Impact on local community;** including capacity of local community services

The results of the socio-economic assessment will benchmark the overall project aims against a variety of additional socio-economic components, and how these meets established social and economic policy objectives at the national level.

8.5 Baseline

Population

The site of the proposed development is located within the ward of East Mainland, South Ronaldsay and Burray. Table 8.2 presents the demographic profile for Orkney Islands and Scotland.

Table 8.2 indicates that in 2021, the life expectancy and fertility rate of the Orkney Islands population was higher than in Scotland. Good or very good general health was also higher and bad or very bad general health lower in Orkney Islands than in the rest of Scotland.

Table 8-2: Population and demographics for Orkney Islands

Indicator	Orkney Islands ⁹⁴	Scotland ⁹⁵
Population (2021)	22,540	5,479,900
Female population (2021)	11,336	2,807,338
Male population (2021)	11,204	2,672,338
Life expectancy (males) (2019-2021)	80.4	76.6 ⁹⁶
Life expectancy (females) (2019-2021)	83.8	80.8 ⁹⁶

⁹⁴ National Records of Scotland (2021) Orkney Islands Council Area Profile. Available at: https://www.nrscotland.gov.uk/files/statistics/council-area-data-sheets/orkney-islands-council-profile.html#table_pop_est

⁹⁵ National Records of Scotland (2022) Mid-2021 Population Estimates Scotland. Available at: [https://www.nrscotland.gov.uk/statistics-and-data/statistics/statistics-by-theme/population/population-estimates/mid-year-population-estimates/mid-2021#:~:text=Key%20Findings%3A,around%2023%2C100%20people%20\(0.43%25\)](https://www.nrscotland.gov.uk/statistics-and-data/statistics/statistics-by-theme/population/population-estimates/mid-year-population-estimates/mid-2021#:~:text=Key%20Findings%3A,around%2023%2C100%20people%20(0.43%25)).

⁹⁶ National Records of Scotland (2022) Life Expectancy in Scotland 2019-2021. Available at: <https://www.nrscotland.gov.uk/files/statistics/life-expectancy-in-scotland/19-21/life-expectancy-19-21-report.pdf>

Indicator	Orkney Islands ⁹⁴	Scotland ⁹⁵
Approximated total fertility rate (2021)	1.42	1.31 (2021) ⁹⁷
General Health⁹⁸		
General health (bad or very bad %)	2.4%	8.1%
General health (good or very good %)	80.4%	73%

* data in table 8.2 is not available at the 'Site level' study area

* General health is presented as a percentage of the population

* the data source for table 8.2 is included as a footnote reference in the indicator heading. Where a different data source has been used due to data availability, the footnote reference has been included next to the value.

Figure 8.1 shows that in 2021, the 45 to 64 age group was the largest and the 16 to 24 age group was the smallest. Orkney has a higher older population than the Scotland average. The Fraser of Allander Institute identified that the 'natural change' in the population of Orkney population will be negative. With this, the population projections show that Orkney's working age is forecast to decline by 8% between 2018 and 2043 and 'pensioners' are forecast to grow by 28%. Figure 8.2 shows the projected population profile for Orkney between 2018 and 2028.

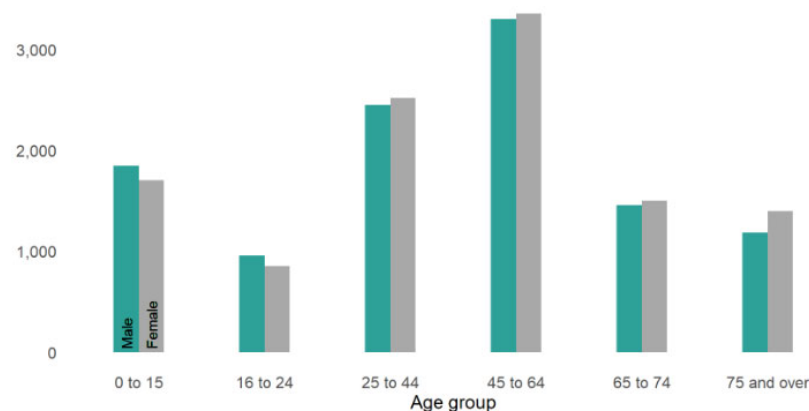


Figure 8-1: Population of Orkney Islands by age and gender (2021)⁹⁹

⁹⁷ National Records of Scotland (2022) Birth date the second lowest since records began. Available at: <https://www.nrscotland.gov.uk/news/2022/birth-rate-the-second-lowest-since-records-began>

⁹⁸ Scottish Government (n.d) General Health – Scottish Survey Core Questions. Available at: <https://statistics.gov.scot/resource?uri=http%3A%2F%2Fstatistics.gov.scot%2Fdata%2Fgeneral-health-sscq>

⁹⁹ National Records of Scotland (n.d) Orkney Islands Council Area Profile. Available at: https://www.nrscotland.gov.uk/files/statistics/council-area-data-sheets/orkney-islands-council-profile.html#population_projections



Figure 8-2: Projected population profile for 2018 and 2028 – Orkney Islands¹⁰⁰.

Scottish Indices of Multiple Deprivation

The Scottish Index of Multiple Deprivation (SIMD) is a relative measure of deprivation across 6,976 small areas (data zones) within Scotland. There is an overall index of multiple deprivation rank for each area, which is made up of seven 'domains', which consist of the topics shown in Figure 8.3.

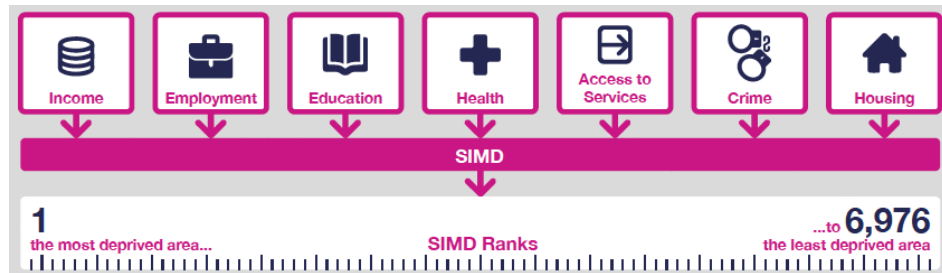


Figure 8-3: Scottish Index of Multiple Deprivation Ranks

The site of the proposed development lies within the East Mainland data zone (S01011813). The indices of deprivation rank all data zones from 1 to 6,976 (total data zones in Scotland) with 1 representing the most deprived area in Scotland.

¹⁰⁰ National Records of Scotland (n.d) Orkney Islands Council Area Profile. Available at: https://www.nrscotland.gov.uk/files/statistics/council-area-data-sheets/orkney-islands-council-profile.html#population_projections

Table 8.3 presents the SIMD scores for East Mainland S01011813. East Mainland S01011813 is within the 40% least deprived areas in Scotland. Table 8.3 also presents the data for each of the individual domains. East Mainland S01011813 is within at least 40% of the least deprived neighbourhoods for most domains, except for 'geographic access' in which it is within the 10% most deprived.

Table 8-3: Scottish Index of Multiple Deprivation Scores

Indices	Data Zone: S01011813 – East Mainland ¹⁰¹ (2020)
Overall rank in Scottish Index of Multiple Deprivation	4373 Within 40% least deprived
Income domain rank	4697 Within 40% least deprived
Employment domain rank	4751 Within 40% least deprived
Education / skills domain rank	5129 Within 30% least deprived
Health domain rank	4754 Within 40% least deprived
Crime rank	6642 Within 10% least deprived
Housing domain rank	5068 Within 30% least deprived
Geographic access domain rank	406 Within 10% most deprived

¹⁰¹ Scottish Government (2020) Scottish Index of Multiple Deprivation 2020. Available at: <https://simd.scot/#/simd2020/BTTTTT/9/-4.0000/58.9000/>

The Orkney Child Poverty Strategy 2022-2026¹⁰² describes the impact of poverty on children and shows how the experience of Orkney's children and families compares against Scotland statistics. The strategy outlined the following findings:

The percentage of children in working families in Orkney fell sharply from 80% in 2019 to 58% in 2020, dipping below Scotland at 63%

- 8% of Orkney adults have no savings
- 12% of Orkney households with children contained an adult with a long term health problem
- 66% of Orkney households are managing well financially (34% are not)
- 3% of Orkney households are single parent families and 5% have 3+ children
- Of all family households in Orkney, 17% are single parent families and 26% have 3+ children
- 14.7% of first-time mothers in Orkney are under 25
- The End Child Poverty Coalition estimate for child poverty in Orkney after housing costs are deducted from household income is 23%, reflecting the relatively high cost of housing in Orkney

Employment, Unemployment and Economic Activity

Table 8.4 presents employment, unemployment and economic activity statistics for Orkney Islands and Scotland. The data indicates that more people are in employment as a percentage of the total population in Orkney Islands than in Scotland overall. The majority of people are employees in Orkney Islands as opposed to self-employed, and both being employed and self-employment are higher in Orkney Islands than in Scotland as a percentage of the population. Less people are unemployed in Orkney Islands than in Scotland as a percentage of the population.

Table 8-4: Employment and unemployment levels

Economic status¹⁰³	Orkney Islands (Oct 2021-Sep 2022)	Scotland (Oct 2021-Sep 2022)
In employment	81.7%	74.5%
Employees	72.7%	66.4%
Self employed	10.5% (2020) ¹⁰⁴	7.7%
Unemployed	2.7%	3.5%

* Economic status is presented as a percentage of the population

* the data source for table 8.4 is included as a footnote reference in the indicator heading. Where a different data source has been used due to data availability, the footnote reference has been included next to the value.

* data in table 8.4 is not available at the 'Site level' study area

Job Seekers Allowance

¹⁰² The Orkney Partnership (2022) Orkney Child Poverty Strategy 2022-2026. Available at: <https://www.orkney.gov.uk/Files/OHAC/Orkney%20Child%20Poverty%20Strategy%202022-2026.pdf>

¹⁰³ NOMIS (2021) Labour Market Profile – Orkney Islands. Available at: <https://www.nomisweb.co.uk/reports/lmp/la/1946157427/printable.aspx>

¹⁰⁴ Orkney Islands Council (2020) Orkney Economic Review. Available at: https://www.orkney.gov.uk/Files/Business-and-Trade/Economic_Review/Orkney%20Economic%20Review%202020.pdf

Table 8.5 presents the Job Seekers Allowance and Universal Credit claimants in Orkney Islands compared with Scotland. The data indicates that the majority of claimants in Orkney Islands are between the ages of 16 and 24, which is also the case for Scotland. The least number of claimants for Orkney Islands are aged 50 or over, which again is also the case for Scotland.

Table 8-5: Job Seeker Allowance and Universal Credit claimants for Orkney Islands and Scotland

Job Seeker Allowance and Universal Credit claimants (2022)¹⁰⁵	Orkney Islands	Scotland
All claimants (aged 16+)	1.6%	3.2%
Aged 16-24	4.5%	4.7%
Aged 25-49	1.5%	3.7%
Aged 50 and over	1.1%	2.3%

*% is number of claimants as a proportion of resident population of the same age

* data in table 8.5 is not available at the 'Site level' study area

Occupation category of residents

Table 8.6. presents the employment in Orkney Islands compared with Scotland by employment sector. It indicates that 22.4% of the Orkney Islands population are employed within 'skilled trade occupations' which is significantly higher than the national average of 12.5%. The most recent census data available for Orkney is 2011.

Table 8-6: Employment by employment sector (2011)

Employment Sector¹⁰⁶	Orkney Islands (%)	Scotland (%)
1 Managers, Directors And Senior Officials	8.1	8.4
2 Professional Occupations	12.7	16.8
3 Associate Professional Occupations	9.4	12.6
4 Administrative & Secretarial Occupations	8.7	11.4
5 Skilled Trades Occupations	22.4	12.5
6 Caring, Leisure And Other Service Occupations	10.8	9.7
7 Sales And Customer Service Occs	6.8	9.3

¹⁰⁵ NOMIS (2022) Labour Market profile- Orkney Islands. Available at: <https://www.nomisweb.co.uk/reports/lmp/la/1946157427/printable.aspx>

¹⁰⁶ Orkney Islands Council (2019) Orkney Economic Review 2019. Available at: https://www.orkney.gov.uk/Files/Business-and-Trade/Economic_Review/Orkney%20Economic%20Review%202019.pdf

8 Process Plant & Machine Operatives	7.9	7.7
9 Elementary Occupations	13.2	11.6

* data in table 8.5 is not available at the 'Site level' study area

* % is as a proportion of all persons in employment (16+)

Table 8.7 presents the employment by industry in Orkney Islands compared with Scotland. Table 8.7 indicates that largest employment sectors within Orkney are: agriculture, forestry and fishing, wholesale and retail trade and human health and social work activities (10.4%, 14.6% and 16.7% respectively). These industries have higher employment in Orkney than Scotland, with agriculture, forestry and fishing, in particular, being significantly higher.

Table 8-7: Employment by industry (2021)¹⁰⁷

Industry	Orkney Islands (%)	Scotland (%)
A : Agriculture, forestry and fishing	10.4	1.8
B : Mining and quarrying	0.6	1.0
C : Manufacturing	3.8	7.0
D : Electricity, gas, steam and air conditioning supply	0.6	0.7
E : Water supply; sewerage, waste management and remediation activities	0.4	0.8
F : Construction	6.7	6.0
G : Wholesale and retail trade; repair of motor vehicles and motorcycles	14.6	14.2
H : Transportation and storage	7.5	4.1
I : Accommodation and food service activities	8.8	7.5
J : Information and communication	1.7	3.1
K : Financial and insurance activities	0.4	3.1
L : Real estate activities	0.8	1.5
M : Professional, scientific and technical activities	4.2	6.4
N : Administrative and support service activities	2.5	7.9
O : Public administration and defence; compulsory social security	8.3	6.5
P : Education	7.5	8.6
Q : Human health and social work activities	16.7	18.7
R : Arts, entertainment and recreation	3.3	2.4

¹⁰⁷ NOMIS (n.d) Business Register and Employment Survey. Available at: <https://www.nomisweb.co.uk/query/construct/submit.asp?forward=yes&menuopt=201&subcomp=>

Industry	Orkney Islands (%)	Scotland (%)
S : Other service activities	1.5	1.7
T : Activities of households as employers;undifferentiated goods-and services-producing activities of households for own use	0.0	0.0
U : Activities of extraterritorial organisations and bodies	0.0	0.0

Workforce Qualifications

Table 8.8 presents the level of qualification held by the population of Orkney Islands and Scotland. The data indicates that the majority of the population in Orkney Islands hold an NVQ1 and above qualification, which is cognisant with the data for Scotland overall. NVQ 4 and above is the least held qualification by both those in Orkney Islands and in Scotland overall.

Table 8-8: Qualifications for Orkney Islands and Scotland

Number of people with the following qualifications (all persons aged 16 and over) (2021) ¹⁰⁸ :		
	Orkney Islands	Scotland
No qualifications	No available data	7.8%
NVQ1* and above	89.5%	86.4%
NVQ2* and above	78.8%	79.6%
NVQ3* and above	58.8%	64.8%
NVQ4* and above	40.6%	50%

NVQ1 - SVQ/NVQ level 1, Level 1 vocational awards, IVQ certificate, Level 1 International Introductory Awards (Academic: GCSE grades D - G, 3/Foundations S Grade, Foundation GNVQ).

NVQ2 - SVQ/NVQ level 2, Level 2 vocational awards, IVQ Technician certificate, IVQ Diploma, Level 2 International awards(Academic: GCSE grades A* - C).

NVQ3 - SVQ/NVQ level 3, Level 3 vocational awards, IVQ Technician Diploma, IVQ Advanced Diploma, Level 3 International Awards (Academic: A- Level)

*NVQ4 - Licentiatehip (LCGI), Higher Professional Diploma, SVQ/NVQ level 4, Level 4 vocational awards (Academic: Undergraduate)

* % is as a proportion of resident population of area aged 16-64

¹⁰⁸ NOMIS (n.d) Labour Market Profile – Orkney Islands. Available at: <https://www.nomisweb.co.uk/reports/lmp/la/1946157427/report.aspx?town=orkney>

The Fraser of Allander Institute reported that in 2018, a higher proportion of those aged 16-64 had level 4 qualifications and above in Scotland (44.2%) than in Orkney (42.5%), although a higher proportion of those aged 16-64 in Scotland had no qualifications (9.7%) than in Orkney (2.7%)¹⁰⁹.

Key business sectors

The structure of the Orkney economy (2018), by sector, is shown in Table 8.9. The Orkney Islands Economic Review (Fraser of Allander Institute, 2020) highlighted that tourism is an important source of income for Orkney. The tourism industry “cuts across a number of different sectors, including accommodation and food services, manufacturing and transport, depending on the goods and services that tourists consume when they visit.” This report also found that it is estimated that the visitor economy in Orkney is worth over £67m per annum – with average spend per visit at £350.

Table 8-9: GVA share by sector 2018110

Sector	Orkney	Scotland
Agriculture, fishing, mining, electricity, gas, water and waste	14%	7%
Manufacturing	4%	10%
Construction	7%	6%
Wholesale and retail trade; repair of motor vehicles	7%	10%
Transportation and storage	5%	4%
Accommodation and food service activities	2%	3%
Information and communication	1%	4%
Financial and insurance activities	2%	7%
Real estate activities	10%	11%
Professional, scientific and technical activities	6%	7%
Administrative and support service activities	1%	4%
Public administration and defence	12%	7%
Education	5%	6%
Human health and social work activities	24%	10%
Arts, entertainment and recreation	1%	2%

¹⁰⁹ Fraser of Allander Institute (2020) Orkney Islands Economic Review [online] Available at: https://strathprints.strath.ac.uk/75705/1/FAI_2020_Orkney_Islands_Economic_Review.pdf

¹¹⁰ Fraser of Allander Institute (2020) Orkney Islands Economic Review [online] Available at: https://strathprints.strath.ac.uk/75705/1/FAI_2020_Orkney_Islands_Economic_Review.pdf

¹¹¹ Scotland's Aquaculture (2023) Site Details. Available at:

http://aquaculture.scotland.gov.uk/data/site_details_record.aspx?site_id=FS1305

¹¹² Scottish Sea Farms Ltd (2023) Key Facts. Available at: <https://scottishseafarms.com/about-us/key-facts/>

Sector	Orkney	Scotland
Other service activities	0%	2%

An active seawater finfish farm is located approximately 1 mile (1.68 km) from the proposed site for SDWQ (Fish farm National Grid Reference: HY 4527 0250). The farm site, Westerbiter, is operated by Scottish Sea Farms Ltd and is licensed by SEPA under CAR/L/1143253/V1¹¹¹. Species farmed on site include Salmon, Lump sucker, and Wrasse with a maximum biomass allowed on site of 1791.2 tonnes.

Scottish Sea Farms Ltd have 57 marine farms across Scotland and have 679 employees (including 55 modern apprenticeships) the majority in remote and rural communities. The company spent over £100M annually with over 700 Scottish suppliers and have awarded 691 grants to 456 local causes, totalling over £1.7M in support to date¹¹².

Gross Disposable Household Income

Table 8.10 shows that residents in Orkney Islands have slightly less Gross Domestic Household Income (GDHI) than those in Scotland, which can be explained by a lower rate of income than the national average. The median hourly pay in Orkney Islands is lower than the national average.

Table 8-10: GDHI for Orkney Islands and Scotland

Gross Disposable Household Income (2020) ¹¹³		
	Orkney Islands	Scotland
GDHI per head	£19,159	£19,706
Median Hourly Pay (excluding overtime) for all employees (2021) ¹¹⁴		
	Orkney Islands	Scotland
Median Hourly Pay	£13.66	£14.29

Tourism volume and value

Table 8.11 presents the tourism profile for Orkney Islands in 2019 and 2020. In 2019 the Transport sector had the largest share of tourism-related income in Orkney, and accommodation benefitted second-highest. Recreation benefitted least from tourism-related income. These trends are similar in 2020, however the tourism-related income is significantly lower: this is attributed to the Covid-19 pandemic in that year.

¹¹³ Office for National Statistics (2022). Regional gross disposable household income, UK: 1997 to 2020. Available at:

<https://www.ons.gov.uk/economy/regionalaccounts/grossdisposablehouseholdincome/bulletins/regionalgrossdisposablehouseholdincomegdhi/1997to2020>

¹¹⁴ The Scottish Parliament (2021) Earnings in Scotland. Available at:

<https://digitalpublications.parliament.scot/ResearchBriefings/Report/2022/3/9/ce765259-d82e-4db7-8ecf-802683f7e56b#43d4dae3-ac86-444b-8354-9a6dea331e3d.dita>

Table 8-11: Tourism sector statistics for Orkney Islands

Tourism sector ¹¹⁵	Orkney Islands (2019)	Orkney Islands (2020)**
All staying visitors (000s)*	219.56	77.05
Estimated economic impact from tourism**		
Total (£) (in millions)	98.40	38.48
Distribution of economic impact by sector		
Sector	£ (in millions)	£ (in millions)****
Transport	22.38 (23.5%)	8.049 (22.7%)
Accommodation	20.68 (21.7%)	8.095 (22.8%)
Shopping	18.47 (19.4%)	6.461 (18.2%)
Indirect	17.2 (18.0%)	6.352 (17.9%)
Food and drink	10.89 (11.4%)	4.434 (12.5%)
Recreation	8.768 (6.0%)	2.092 (8.9%)
Total	98.4	38.48
Visitor attractions		
St Magnus Cathedral (free admission)	198,521	8,334
Skara Brae (paid admission)	115,136	6,642
Italian Chapel (free admission)	Unknown	Unknown
Skaill House (paid admission)	80,731	1,712
Pier Arts Centre (paid admission)	48,937	Unknown
Orkney Museum (free admission)	44,337	3,387
Visiting Cruise Vessels		
Number of port calls	158	1
Total passengers	132,388	681

*Staying visitors are defined as 'Visitors who are staying overnight for one or more nights away from home for holidays'

**Note: Values may be impacted by the Covid-19 global pandemic.

***Estimated economic impact refers to the economic value / income of the tourism sector in Orkney Islands.

¹¹⁵ Orkney Islands Council (2020) Orkney Economic Review. Available at: https://www.orkney.gov.uk/Files/Business-and-Trade/Economic_Review/Orkney%20Economic%20Review%202020.pdf

**** % is of total distribution

Future Baseline

The OBC identifies that without the Masterplan proposals, there would be little change to the proposed site for the SDWQ.

Design Interventions and Controls

Design interventions and / or controls have not been proposed prior to this stage in the design as a result of the EIA socio-economic assessment.

8.6 Impact Assessment

It is anticipated that the following potential impacts would arise during the construction and operation phase of the proposed development:

Construction phase

A summary of construction phase impacts is provided in Table 8.14.

Employment opportunities

Construction of the proposed development will require the temporary employment of construction workers throughout each of the construction phases. Construction is anticipated to take place in 3 phases from June 2024 and December 2027 over less than five years. The OBC estimates that phase 1 would be completed in 2026 and full completion would be expected for December 2027.

Based on the indicative estimates within the OBC, across the five year construction period there are 542 job-years of employment in the Orkney economy from the three projects (including Scapa). This estimate is a potentially significant increase in employment opportunities locally but the detail at this stage of the development is limited. As a result, the assessment adopts a low probability as a reasonable worst case scenario. The certainty is likely to increase as the proposed development progresses and the positive impacts potentially increase in magnitude.

Construction of the proposed development is considered likely to provide beneficial increased employment impacts for the local study area (see Tables 5-12 and 5-13). At this stage, there is not a lot of detail on the value of the jobs, the amount of employment, the opportunities and training for locals, and the temporary nature of construction jobs, this is considered of minor magnitude.

Due to the scale of the proposed development (estimated overall project cost of £218.5M¹¹⁶) the design team anticipate it is likely that a construction contractor will be sourced outside of the local study area. It is likely that the construction workforce will comprise a mix of local, mainland Scotland and international workers. Therefore there is likely to be leakage in terms of additionality, whereas the temporary recruitment of construction workers outside of Orkney will likely have a direct minor benefit to the wider economy of mainland Scotland and to a lesser extent the UK and EU (likely negligible).

¹¹⁶ Arch Henderson. (2022). Scapa Deep Water Port Development Exemplar Design Check, Update on High Level Cost Estimates. All costs are based on applicable submitted contractor rates over the last 7 years within Northern Isles with suitable quantity contingency, inflation and fuel surcharge added to Q2 2024. Figure excludes Optimism Bias (Suggest 40% until EIA submitted), HRO,EIA, Land Purchase, Legal, VAT cost etc

Table 8-12: Construction impacts: employment impacts by year (full time job years)

Project	2022	2023	2024	2025	2026	2027	2028	2029	2030	Total
Direct	0	0	198	397	397	0	0	0	0	992
Indirect & Induced	1	2	54	108	108	0	0	0	0	273
Total	1	2	252	505	505	0	0	0	0	1,265

Table 8-13: Construction impacts: employment impacts by year (full time job years) – total employment

Project	2024	2025	2026	2027	2028	2029	2030	Total
Orkney Logistics Base	56	0	0	226	261	0	0	543
Scapa Deep Water Quay	253	505	505	0	0	0	0	1,265
Lyness	0	0	0	0	0	15	26	41
Total	309	505	505	226	261	15	26	1,846

Local spend

Construction impacts associated with SDWQ will generate £227.6m GVA over a 30-year period.

It is likely that the construction workforce will comprise a mix of local, mainland Scotland and international workers. Therefore, there is likely to be leakage in terms of additionality, whereas the temporary recruitment of construction workers outside of Orkney will likely have a direct minor benefit on the wider economy of mainland Scotland and to a lesser extent the UK and EU (likely negligible).

As the impact would be temporary and there is a degree of uncertainty around the level of detail known at this stage, the impact is considered an indirect minor benefit to local businesses.

Access / operation of local businesses

The proposed development would introduce a new access for marine users. It is anticipated that the contractor appointed will not impact access to existing business activities outside of the Site. The magnitude of disruption is considered to be negligible.

Capacity / availability of local businesses

As part of the consultation engagement, local residents raised concerns regarding an increase in construction personnel in the local study area and the impact on capacity of local hotels and other available accommodation.

Magnitude and nature of the impact is dependent on the timing and scale of the workforce required from outside Orkney:

- a moderate adverse impact is likely should a large workforce require accommodation during peak tourist season (summer) and / or during key local events (e.g. Orkney International Island Games 2025) and thereby reducing availability for visitors / attendees / event organisers;

- a minor beneficial impact is likely should the workforce require accommodation during the off-peak tourist season, with no major overlap with key local events and thereby increasing income for local businesses in traditionally quieter periods;
- a negligible impact is likely should the required workforce sourced from outside the local study area be minimal and over a short period.

Table 8-14: Summary of the identified likely construction impacts

Identified Construction Impacts	Magnitude
Likely temporary increase in employment / jobs for local workers	Minor beneficial
Likely temporary increase in employment / jobs for national / international workers	Negligible
Likely economic impacts to the local businesses as a result of construction workers temporarily residing in Orkney and associated spend	Minor beneficial
Potential impact on access and operational activities of local businesses and marine users currently within the local area	Negligible
Potential impact on capacity of local accommodation during peak season and / or during key events and reducing availability of visitors / attendees / organisers outwith Orkney Island Council area.	Moderate adverse
Potential impact on the tourist offseason in relation to additional income.	Minor beneficial

Operation phase

A summary of operational phase impacts is provided in Table 8.15

Employment opportunities

There are several areas of business identified in the OBC, attracted as a result of the proposed development, including:

- Offshore wind assembly hub;
- Maintenance of offshore structures and platforms;
- Large vessel maintenance, chandlery, layover;
- Storage and distribution hub for future fuels;
- Future uses not yet identified (i.e. next generation of renewables and fuels etc).

There will likely new job opportunities for the operational phase of the proposed development, with requirements for a mix in sector and skills. These opportunities are likely to be higher value added jobs requiring specific skills.

During operation of the proposed development, the OBC predicts that the total number of Full-Time Equivalent (FTE) jobs would vary from 73 to 100 between 2027 and 2034. Between 2035 and 2044 this number is estimated to be in

the region of 50 FTE.¹¹⁷ The OBC states that this number could be greater depending on the future offshore wind activity relating to the site. This is considered to be the base case and includes: direct, indirect and induced employment.

The area of employment is identified in the OBC as likely to be offshore wind marshalling and assembly facility for workers within the local supply chain. Other opportunities identified include the possibility for local companies to develop their skills base and expertise to harness any construction and assembly work but acknowledges that it might be that an external company oversees particular work streams and takes responsibility for employing local staff.

An increase of full time employment is likely to have a positive impact for the local economy. The detail at this stage of the development is limited. As a result, the assessment adopts a low probability as a reasonable worst case scenario. The certainty is likely to increase as the proposed development progresses and the positive impacts potentially increase in magnitude. On this basis, the impact is considered to be limited to minor in magnitude.

Local Economy

Increased capacity at the harbour as a result of the proposed development would likely facilitate provision for new industry at the harbour.

The OBC states that the proposed development will generate a GVA over a 30 year period of £227.6M, with an annual average of £8.6M (and in some years GVA increases to between £12M and £17M), above the baseline to the Orkney economy. This includes indirect and induced GVA and attributed largely to offshore wind and operations and maintenance. The scale of the benefit is dependent on the capacity available in the local economy and the procurement practices of various externally based contractors.

This is likely to have a beneficial impact to the local economy but it is unknown if the capacity in the local economy would facilitate a material change for key receptors. It is therefore considered at a minimum a minor impact.

Access / operation of local businesses

The operational phase of the proposed development is likely to increase access and capability for local businesses using the infrastructure. As the level of detail at this stage on the extent and degree of benefits is limited, the magnitude of the impact is limited to a minor beneficial. This is likely to improve as the design and engagement develops.

The responses within the stakeholder engagement plan did not include any concerns / issues raised in terms of access.

Local Community Capacity

During the stakeholder engagement activities, concerns were raised regarding housing availability due to a potential influx of workers.

The economic assessment as part of the OBC identifies the cumulative number of FTE jobs for Hatston, Scapa and Lyness overall as 'significant but not unachievable or of such a magnitude that it will have substantial negative impacts on Council services'. In addition, the report acknowledges that there is a need to consider 'a number of areas such as housing, education and health. These forecasts are already being considered within the housing needs assessment currently being undertaken with the Council.' Given that the OBC does not identify a substantial adverse impact to the council services and capacity of facilities of the local community and that forecasts are being

undertaken already outwith the EIA process, this assessment concludes that there would likely be no greater than a minor adverse impact for the proposed development.

The OBC outlined that there are numerous smaller piers and harbours throughout the North and South Isles of Orkney, as well as around the Orkney Mainland: many of which accommodate lifeline island ferry services, aquaculture, fishing and marine leisure activities. These piers are critical in ensuring the viability of small island communities. The proposed development has the potential to facilitate benefits that can be disseminated across the inner ferry-connected islands in Orkney by creating accessible job opportunities that are available for people living on the inner ferry-linked isles. The proposed development is located on the main X1 bus service, which connects on a regular frequency to a number of existing communities between St Margaret's Hope through Kirkwall to Stromness.

There is potential for the proposed development to add additional infrastructure capacity and increased opportunities for the community but the level of detail and certainty is not available at this stage in the design and therefore not considered as part of the conclusions of this assessment as a reasonable worst case scenario approach.

Table 8-15: Summary of the identified likely operation impacts

Identified Operational Impacts	Magnitude
New, permanent jobs for local workers and wider opportunities	Minor beneficial
Increase in GVA for the Orkney economy	Minor beneficial
Local community capacity and council services	Minor adverse
Continued access and operations for existing local businesses	Minor beneficial

8.7 Mitigation and Enhancement

Construction

During the construction phase, the following mitigation and enhancement measures would reduce adverse impacts and enhance opportunities:

- Requirements upon the contractor to provide local job creation and local training either directly or through supply chain for the construction of the development to provide greater and longer lasting benefit to communities;
- Continue to consult with local businesses, including local tourists' groups such as Orkney Tourism Group, throughout the proposed development design and construction programme to manage significant inflow of workers during peak tourist season and large scale events, projects and activities;
- Engage with local businesses, including marine users, to understand their access and operational requirements. The contractor and design team should ensure that current operations can reasonably continue during construction of the proposed development and effectively communicate when there are any changes to access (including short term changes);
- Engage with local authority and other agencies to ensure there is sufficient capacity in local services and infrastructure to accommodate additional workers; and
- Community benefits and social value should be maximised during the construction period, such as the provision of apprenticeships, training and work experience opportunities. The baseline indicates that the age group 16 – 24 has the highest proportion on the island of being unemployed; targeting this group would

¹¹⁷ Orkney Harbours Masterplan Phase 1. (2022). Outline Business Case.

maximise benefits and this would represent a significant opportunity to provide long term employment and development of key green skills locally.

Operation

During the operational phase, the following mitigation and enhancement measures would reduce adverse impacts and enhance opportunities:

- New permanent employment opportunities should be made available to local residents in the first instance, in combination with appropriate training, support, development and access to higher skill / paid jobs; and
- Continued consultation and liaison with Orkney Islands Council and other agencies; and ongoing monitoring of employment forecasts to inform housing need assessments and implications for education, training and health.

8.8 Residual Effects

Construction phase

A summary of construction phase effects is provided in Table 8.16.

Employment opportunities

The magnitude of the impact identified in Section 8.6, will be dependent on the degree that job creation and local training (either directly or through supply chain) is locally based.

Where jobs and opportunities are sourced locally, as per the mitigation set out in Section 8.7, the result is likely to be a moderate impact on employment for the local community (a high value receptor), which is assessed as a **Moderate** beneficial residual effect.

This is considered a significant beneficial temporary effect of the development.

Local spend

The local spend is likely to have a minor positive impact on the economy of the local community (a high value receptor) and have a greater impact when the construction period is out with the peak tourist season and does not clash with key local events.

Based on the short-term nature of the impact and that the extent of local spend is unclear at this stage in the design, this is considered a **Slight** beneficial residual effect and therefore not assessed as significant.

Access / operation of local businesses

Access and operational activities of local businesses, including marine users, is assumed to continue to a reasonable degree. Engagement between the contractor and businesses will increase the opportunities to alleviate potential issues.

The residual effect is considered limited to **Slight** adverse and therefore not assessed as significant.

Capacity / availability of local businesses

Depending on the timing and scale of the required labour force from outside of the local area, there is the potential for significant **Moderate** adverse effects on the local community and businesses alike as this may limit potential visitor access and experience during peak season / key events.

Should the contractor engage with local businesses and tourist groups (such as Orkney Tourism Group and VisitScotland) to avoid significant inflow of workers during peak tourist season and large-scale events on the island, this effect is likely to be limited to a **Slight** adverse residual effect and therefore not assessed as significant.

Table 8-16: Summary of the identified likely construction effects

Identified Construction Impacts	Identified Effects	Residual Effects
Likely temporary increase in employment / jobs for local, regional and national workers	Slight beneficial	Moderate beneficial
Likely economic impacts to the local businesses as a result of construction workers temporarily residing in Orkney and associated spend	Slight beneficial	Slight beneficial
Potential impact on access and operational activities of local businesses and marine users currently using facilities near the development.	Slight adverse	Slight adverse
Potential impact on capacity of local accommodation during peak season and / or during key events and reducing availability of visitors / attendees / organisers outwith Orkney Island Council area.	Moderate adverse	Slight adverse
Potential impact on the tourist offseason in relation to additional income.	Slight beneficial	Slight beneficial

Operation phase

A summary of operational phase effects is provided in Table 8.17.

Employment opportunities

An increase of full-time employment, as per the OBC, is likely to have a positive impact for the economy of the local community (a high value receptor). The extent to which this will directly and / or indirectly effect the local area is dependent on a number of factors and capabilities locally, which makes it difficult to determine at this stage in the design.

Based on the information available, the residual effect is considered Slight beneficial and therefore not assessed as significant. This assessment would likely improve as more information is available regarding the FTE opportunities and the opportunities for locals as a result of the proposed development. Where jobs and opportunities are sourced locally, as per the enhancement set out in section 8.7, the result is more likely to be a **Moderate** beneficial residual effect.

Local Economy

The scale of the benefit is dependent on the capacity available in the economy of the local community and the procurement practices of various externally based contractors.

At a minimum, it is considered a Slight beneficial residual effect and therefore not assessed as significant. This assessment would likely improve as more information is available regarding the capacity within the local economy

to support the supply chain for the proposed development. Where jobs and opportunities are sourced locally, as per the enhancement set out in section 8.7, the result is more likely to be a **Moderate** beneficial residual effect.

Access / Operation of Local Businesses

It is anticipated that the operation of the proposed development would incorporate inclusive design to facilitate the current access requirements for local businesses, including marine users, and potentially improve access and capabilities.

The residual effect is considered limited to Slight beneficial and therefore not assessed as significant.

Local Community Capacity

The OBC identifies that the cumulative impact of three local schemes (Hatston, Scapa and Lyness) will not have substantial negative impacts on council services. There is also potential for positive impacts to the wider community.

With ongoing consultation and monitoring as outlined in the mitigation section of this report, it is considered that the residual effect would be limited to Slight adverse and therefore not assessed as significant.

Table 8-17: Summary of the identified likely operation effects

Identified Operation Impacts	Identified Effects	Residual Effects
New, permanent jobs for local workers and wider opportunities	Slight beneficial	Moderate beneficial
Increase in GVA for the Orkney economy	Slight beneficial	Moderate beneficial
Continued access and operations for existing local businesses	Negligible	Slight beneficial
Local community capacity and council services	Slight adverse	Slight adverse

8.9 Statement of Significance

This chapter has identified the likely potential socio-economic effects during the short term (construction) and long term (operation) of the proposed development. Key sensitive receptors include:

- The existing local communities;
- Local businesses;
- Marine users; and
- Other local community assets.

Potential impacts during both construction and operational phases included:

- Employment opportunities;
- Local spend opportunities;
- Access and operational impacts for existing local businesses; and
- Capacity of the local community and businesses

Many of the benefits from the proposed development are dependent on how achievable the FTE goals identified in the OBC are, and the capacity and skill set of the local supply chain and workforce, and local employment opportunities both directly and indirectly attributed to the proposed development. This is difficult to assess at this stage in the design. The design team and Contractor will need to support local jobs and opportunities to maximise

benefits to the local area. The assessment concluded residual significant beneficial effects for the employment and the economy of the local community should mitigation and enhancement measures be adopted.

Access and operational activities of existing businesses are not anticipated to be impacted and this is expected to be supported by the Navigation Risk Assessment; no significant effect identified.

The scale of employment opportunities is assessed within the OBC and concludes that it would be of a magnitude that would not have substantial negative impacts on Council services. The report also highlights that consideration in advance will need to be given across a number of areas such as housing, education and health. These forecasts are already being considered as part of the Council’s housing needs assessment and continued monitoring / updates is recommended.

There is a potential significant adverse effect during the construction phase should a large workforce from outside of the local area be required and as a result limits potential visitor access and experience during peak season / local key events. The design team and contractor will need to continue to consult with local businesses, including local tourist groups throughout the proposed development design and construction programme to reduce this impact and potentially have a positive effect on businesses during low season.

9 AIRBORNE NOISE

9.1 Introduction

This chapter summarises the findings of the noise impact assessment (NIA) which was carried out for the proposed development. The noise assessment considers the airborne construction and operational noise impacts at existing sensitive receptors surrounding the site. The full NIA is presented in Technical Appendix 9.1.

The effects of construction noise on marine life is considered as part of the Underwater Noise Assessment presented in Chapter 5 – Biodiversity and Technical Appendix 5.6, Volume 3 of the EIAR.

9.2 Scoping and Consultation

A summary of the relevant responses to the Scoping Report submitted by EnviroCentre, and further email consultation with Orkney Island Council's (OIC) Environmental Health Department, is shown in Table 9-1.

Table 9-1: Summary of Consultation Responses

Organisation	Consultation Response	How and where addressed
Orkney Island Council (OIC)	With appropriate mitigation, including the provision of a Framework CEMP/ Dust Mitigation Strategy defined within the EIA, it should be possible to scope noise out during the construction phase of the proposed development for the reasons set out in the Scoping Report.	Assessment of construction and operational airborne noise have been included in the EIAR in order to address the responses from both OIC and Marine Scotland.
	Operational noise should be scoped into the EIA	
Marine Scotland	The Scottish Ministers advise that airborne noise is scoped in for both construction and operation phases and a construction noise impact assessment must be included in the EIA Report. If construction methodologies have not been confirmed then the worst case scenario must be assessed.	Both assessments assume worst case scenarios.

9.3 Policy, Legislation and Guidance

Policy, legislation and guidance relevant to the assessment of noise impact from the proposed development is listed below and presented in full in Section 2 of the NIA report.

- National Planning Framework 4;
- PAN 1/2011 Planning and Noise;
- Assessment of Noise: Technical Advice Note;
- World Health Organization Guidelines for Community Noise;

- BS5228-1:2009+A1:2014; Code of Practice for Noise and Vibration Control on Construction and Open Sites; and
- BS 4142:2014+A1:2019, Methods for rating and assessing industrial and commercial sound.

9.4 Methodology

9.4.1 Noise Assessment Methodology

The noise assessment was undertaken to establish the impact of construction and operational activities on noise sensitive receptors surrounding the Site. The assessment involved the following stages;

- Consultation with OIC Environmental Health Department to agree assessment methodology and noise criteria;
- Measurement of existing baseline noise environment at a sample of 2 areas representative of the most exposed noise sensitive receptors surrounding the proposed development; the monitoring locations are shown in Drawing No. 674795-GIS143 Appendix A;
- Review of construction activities, locations and noise data;
- Calculation and assessment of construction noise at the most exposed sensitive receptors, following guidance provided in BS5228-1:2009+A1:2-014; Code of Practice for Noise and Vibration on Construction and Open Sites. 3D computer noise modelling using CadnaA software has been used in the calculation of construction noise at sensitive receptors.
- Review of existing and proposed operational activities, locations and noise data;
- Prediction of operational noise using CadnaA software at location of most exposed sensitive receptors; and
- PAN 1/2011 assessment of operational noise, using principles defined in BS4142:2014.

9.4.2 Construction Noise Assessment Target Criteria

The assessment of construction noise was carried out in accordance with guidance provided in BS 5228-1:2009+A1:2014 'Code of Practice for Noise and Vibration Control on Construction and Open Sites – Part 1 Noise'. The standard describes methods for evaluating the potential significant effects of construction noise, one of which is the 'ABC' method which is based on exceedance of fixed noise limits. The ABC method, as detailed within Annex E.3.2 has been used within this noise assessment, as it considers the pre-existing industrial noise climate at the receptors. Full details of the method are provided in Section 3.3 of the NIA report.

The construction noise significance criteria used in the assessment is provided in Table 9-2.

Table 9-2: Significance Criteria for the Assessment of Construction Noise

Significance	Level Above Threshold Value dB(A)	Definition
Neutral	< 0	No effect, not significant, noise need not be considered as a determining factor in the decision making process.
Slight adverse	≤ 0 to < 3	These effects may be raised but are unlikely to be of importance in the decision making process.
Moderate adverse	≤ 3 to < 5	These effects, if adverse, while important, are not likely to be key decision making issues.
Large adverse	≤ 5.0 to < 10	The effects are likely to be important considerations but where mitigation may be effectively employed such that resultant adverse effects are likely to have a moderate or slight significance.

Significance	Level Above Threshold Value dB(A)	Definition
Very large adverse	≥ 10	These effects represent key factors in the decision making process. They are generally, but not exclusively, associated with impacts where mitigation is not practical or would be ineffective.

9.4.3 Operational Noise Assessment Target Criteria

Proposed activities from the operations within the site are assessed following guidance provided in PAN 1/2011 (as the associated document TAN 1/2011 'Technical Assessment of Noise'), using principles defined in BS4142:2014. Full details of the method are provided in Section 3.4 of the NIA report.

The Significance of Impact from operational noise is provided in Table 9-3.

Table 9-3: Significance of Effects; Operational Industrial Noise

Magnitude of Impact (After – Before) L _{Aeq,T} dB	Sensitivity of Receptor based on likelihood of complaint X = (Rating (L _{A,r,T,r}) – Background (L _{A90,T})) dB		
	Low (x < 5)	Medium (5 ≤ x < 10)	High (x ≥ 10)
Major (≥ 5)	Slight / Moderate	Moderate / Large	Large / Very Large
Moderate (3 to 4.9)	Slight	Moderate	Moderate / Large
Minor (1 to 2.9)	Neutral / Slight	Slight	Slight / Moderate
Negligible (0.1 to 0.9)	Neutral / Slight	Neutral / Slight	Slight
No Change (0)	Neutral	Neutral	Neutral

9.5 Baseline

9.5.1 Introduction

A background noise survey was carried out in the area surrounding the proposed development site during day and night-time periods between 28th and 30th November 2022. The purpose of the survey was to establish day and night-time background noise levels at areas representative of the most exposed properties surrounding the development site as described in Table 9-4 and shown in Figure 9.1. The noise monitoring locations and methodology were agreed with OIC Environmental Health Department through consultation.

Full details of the noise monitoring including details of the equipment, meteorological conditions, observations etc are provided in Section 4 of the NIA report.

Table 9-4: Noise Monitoring Locations

NML ID	Grid Reference	Location
01	345915 1004426	At the end of the farm track connected to the A961 which leads to Netherbutton Cottages with unobstructed views of Scapa Flow and the Bay of Deepdale.
02	345782 1005233	On the grass at Fernbank, adjacent to the A961. Chosen to be representative of the closest properties to the development located along the A961.

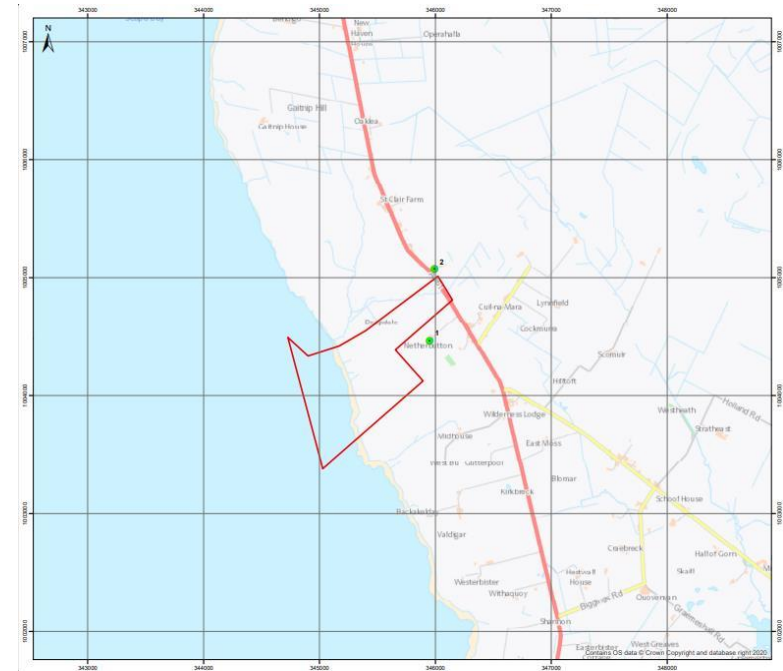


Figure 9-1: Airborne Noise Monitoring Locations

9.5.2 Measured Noise Levels

A summary of the day and night-time results are provided in Tables 9-5 and 9-6.

Table 9-5: Daytime Background Sound Measured Results

NML ID	Date	Start time	Duration, T (hrs:mins)	L _{Aeq,T} (dB)	L _{A90,T} (dB)
1	28/11/2022	16:37	01:00	36.0	30.6
	29/11/2022	14:21	01:00	35.7	30.6
2	28/11/2022	17:58	01:00	59.8	35.1
	29/11/2022	17:01	01:00	62.6	36.1

Table 9-6: Night-time Background Sound Measured Results

NML ID	Date	Start time	Duration, T (hrs:mins)	L _{Aeq,T} (dB)	L _{A90,T} (dB)
1	29/11/2022	01:25	00:30	33.9	31.5
	29/11/2022	23:45	00:30	31.8	28.5
2	29/11/2022	00:41	00:30	48.3	28.9
	29/11/2022	23:02	00:30	49.9	31.9

9.6 Impact Assessment

9.6.1 Introduction

Noise models were built using Cadna-A software and interrogated in order to assess the worst-case impact of both construction and operational airborne noise levels at sensitive receptors during the day and night-time periods. Full details of the noise modelling exercise including source noise data, modelling assumptions etc are provided in Section 5 & 6 of the NIA report.

9.6.2 Noise Sensitive Receptors

The sensitive receptors are described in Table 9-7 and shown in Figure 9.2.

Table 9-7: Noise Sensitive Receptor Locations; Construction and Operational Noise

NSR ID	Location	Grid Reference
NSR 1	Gaitnip House and farm	344681 1006281
NSR 2	Midway, A961	345690 1005423
NSR 3	Netherbutton Cottages	345924 1004408
NSR 4	West Bu	346078 1003418

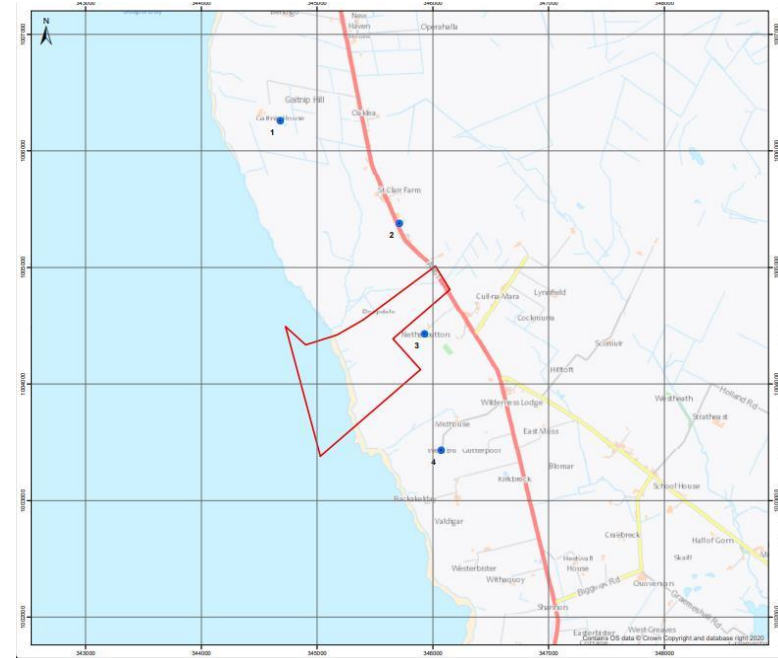


Figure 9-2: Noise Sensitive Receptors

9.6.3 Construction Noise Assessment

Construction Noise Modelling Scenarios

The scenarios have been set up to model the worst-case combination of construction activities for the construction phases as shown in Table 9-8. Phases 1 & 2 entail similar construction activities and there is anticipated to be overlap between these. In order to account for the worst case cumulative impact of concurrent activities, individual noise modelling scenarios have been set up for each of these phases assuming all proposed activities occurring simultaneously. It should be noted that while the modelling has predicted all operations within a Phase/scenario to be concurrent, this is a conservative assumption, and some activities will in fact be contiguous.

Table 9-8: Modelled Scenarios; Construction Noise

Modelled Scenario	Modelled Combination of Construction Stages (Worst Case)	Relevant Assessment Periods
Access Road Construction	Excavation and drilling	Day, Evening, Night, Weekend
	HGV movement of material and tipping	
	Rolling/compaction	
Phase 1	Excavation and drilling, HGV movement of material and tipping	Day, Evening, Night, Weekend
	Rock armour revetment	
	Drainage, infill and compaction	

Modelled Scenario	Modelled Combination of Construction Stages (Worst Case)	Relevant Assessment Periods
	Pile sea bed pre-treatment	
	Install sheet pile wall	
	Tie rod / anchor walls	
	Surfacing	
	Dredging	
Phase 2	Excavation and drilling, HGV movement of material and tipping	Day, Evening, Night, Weekend
	Rock armour revetment	
	Drainage, infill and compaction	
	Pile sea bed pre-treatment	
	Install sheet pile wall	
	Tie rod / anchor walls	
	Surfacing	
Dredging		
Phase 3	Dredging	Day, Evening, Night, Weekend

With reference to the assessment periods included in Table 9-8 only in the case of land drilling of the existing landform and dredging offshore are works scheduled to be carried out over a 24-hour period. All other activities are expected to have finished by 19:00 hours on a daily basis Monday to Saturday and by 14:00 hours on Sundays.

The proposed construction schedule includes working during daytime hours during the week days and the weekends. The implication of this is that works associated with higher noise levels are likely to be continued during weekend hours (Saturday 07:00 – 19:00 and Sunday 08:00 – 14:00), which are subject to more stringent noise limits than during the weekdays.

Construction Noise Assessment

The outcome of the BS5228 assessment is that Neutral impacts are predicted at the surrounding residential receptors as a result of all construction phases during the day and night-time periods. There are no adverse effects predicted in EIA terms.

9.6.4 Operational Noise Assessment

Operational Noise Scenarios

During the operational stage, there is the potential for noise from ships berthing, loading / unloading activities, assembly of turbines and transfer of materials to / from the laydown area to impact upon existing residents. In summary, the potentially significant noise generating operational activities as a result of the proposed quay and laydown area are anticipated to comprise of;

- Deep-water ship berthing (including on-board generators) and mooring;
- Movement, laydown, and storage of renewables components such as those for off shore wind farms. This is typically carried out using Self Propelled Modular Transporters (SMPTs);
- Movement of OIC tug and pilot boat vessels;
- Construction / assembly and maintenance of offshore wind turbines;
- Plant and HGV movements within quay and laydown area; and
- Loading / unloading of HGVs.

BS4142:2014 Acoustic Feature Correction

To calculate the rated sound level, the assessment considers the character of the sound being assessed at the receptor location. If present, corrections for impulsivity, intermittency and/or tonality are added to the specific sound level to calculate the rated sound level.

A sound source may exhibit acoustic characteristics at source, however, the prominence of these features may be masked at the location of the noise sensitive receptors by the residual (background) sound at these locations. The amount by which the residual sound masks these features varies as the residual sound changes in level and possible character. Similarly, the sources acoustic character may also vary with time.

In the case of ships loading / unloading, the movement of cargo and wind turbine components has the potential to create sound which is impulsive in nature. The modelled specific sound from these activities is predicted to be below, or close to the measured background noise at the most exposed sensitive receptors, which is an indication that the sound is predicted to be mostly inaudible. Despite this, due to the high transient peak levels that the movement of cargo and wind turbine components may create it is considered likely that some sound from these activities may be perceptible at the most exposed sensitive receptors. For this reason, a correction of 3dB(A), for impulsivity that is just perceptible, has been applied to the specific noise levels at NSR 1 (Gaitnip House and farm) and NSR 2 (Midway, A961) which are located over 1km from the laydown area. A correction of 6dB(A), for impulsivity that is clearly perceptible, has been applied to the specific noise levels at NSR 3 (Netherbutton Cottages) and NSR 4 (West Bu) as these receptors are located at distances of circa 500m and 700m from the laydown area with direct line of sight to the development.

Operational Noise Assessment

The results show that the daytime noise from proposed operations is predicted to result in an increase in noise levels at sensitive receptors of between 0.8dB(A) at NSR 4 to 1.4dB(A) at NSR 3. The significance of the increases in noise levels is Neutral / Slight at NSR 4 and Slight at NSR 3. No increase in noise levels is predicted at NSR 1 or NSR 2.

At night the noise from proposed operations is predicted to result in an increase in noise levels at sensitive receptors NSR 2, 3 and 4 between 1.2dB(A) and 2.5dB(A). The significance of the increases in noise levels are Neutral / Slight. The noise levels are predicted to be unchanged at NSR 1.

In terms of human perception of sound, an increase of 3dB(A) is considered to be barely perceptible, therefore the maximum predicted increase of 2.5 dB(A) at night is considered likely to be mostly imperceptible.

9.7 Mitigation and Monitoring

No additional mitigation is proposed to reduce airborne noise generated by construction and operational activities during the day and night-time periods.

9.8 Residual Effects

Noise generated by construction activities is temporary in nature, therefore there are no predicted long-term residual effects.

Worst case residual effects as a result of operational industrial noise are predicted to be of Neutral significance during the daytime and Neutral / Slight significance during the night-time.

9.9 Statement of Significance

The residual effects are compliant with PAN 1/2011 and result in no significant effects in EIA terms. It is therefore recommended that the site is acceptable in terms of airborne noise.

10 SUPPORTING ASSESSMENTS

10.1 Accidents and Natural Disasters

10.1.1 Introduction

Major accidents and/or disasters is a topic introduced by the 2014/52/EU EIA Directive and subsequent national legislation. Major accidents and/or disasters should be considered where the development has the potential to cause loss of life, permanent injury and or temporary or permanent destruction of an environmental receptor. This section considered the potential for such eventualities in the context of the new deep water quay and laydown area at the Bay of Deepdale, Scapa Flow as describe in Chapter 2.

10.1.2 Assessment Scope and Methodology

The Scoping document supplied to OIC and MD-LOT suggested that Accidents and Disasters could be scoped out of the EIAR. However, within the Scoping Responses (MD-LOT) the following was requested:

'The EIA Report must include a description and assessment of the likely significant effects deriving from the vulnerability of the Proposed Works to major accidents and disasters. The Applicant should make use of appropriate guidance, including the recent Institute of Environmental Management and Assessment ("IEMA") 'Major Accidents and Disasters in EIA: A Primer', to better understand the likelihood of an occurrence and the Proposed Works susceptibility to potential major accidents and hazards.'

The Institute of Environmental Management and Assessment ("IEMA") 'Major Accidents and Disasters in EIA: A Primer (September 2020), hereafter referred to as 'The Primer' was reviewed and informed the assessment below where the following was carried out (as suggested by The Primer):

- The development itself was considered in regard to being a source of major accidents or vulnerability to disasters;
- Interactions with external hazards or associated activity were also considered; and
- If a major accident or disaster occurred would the existence of the development increase risk of significant effects to environmental receptors.

10.1.3 Baseline Conditions

As described in Chapter 2 SDWQ is currently an undeveloped part of the coastline on the eastern side of Scapa Flow. The proposed development site is not located within an area of significant seismic activity, nor are climatic factors prone to creating natural disasters such as tsunamis, hurricanes or catastrophic fluvial flooding. Coastal flooding and sea level rise is considered within Chapter 4 – Water Environment and is not considered further here.

10.1.4 Potential Impacts

There are three tests suggested by The Primer. These are described and assessed below:

1. Is the development a source of hazard that could result in a major accident and/or disaster?

In our view, no. The quay itself and associated laydown area do not present a source of such hazard.

2. Does the development interact with any external sources of hazard?

Yes. The creation of the facility will result in additional vessel movements. Vessel operations are a source of hazard. This is assessed further below.

3. If an external man-made or natural hazard occurred would the presence of the development increase the risk of significant environmental effect to an environmental receptor occurring?

In our view no. The development will not increase the risk of significant effects due to other hazards occurring.

With regard to Test 2 above, Navigation Risk Assessment (NRA) was undertaken to take into account the proposed SDWQ development to explore the risks associated with increased vessel movements within the vicinity of the development site. This is contained in full in Technical Appendix 2.3 (Volume 3 of this EIAR). The NRA key findings can be summarised as follows:

- The NRA was undertaken following the collation of detailed input data including information about the project methodology, current vessel traffic densities, historic incident rates in the project area and, importantly, comprehensive stakeholder input;
- It was established that existing traffic density in the development area is at the lowest level for any part of Scapa Flow. The development will result in a significant increase of vessel numbers in the area but overall the number of movements will remain low;
- Historic incident rates are low with the majority spread across the whole study area with very few in the vicinity of the development site;
- Nevertheless, 61 potential hazards were identified during the project construction phase, and 48 during operation. All of these were assessed in accordance with the International Maritime Organisation Formal Safety Assessment methodology for risk assessments;
- No hazards were assessed to be in the High Risk or Significant Risk band for either the construction or operation phase of the project.
- The assessment identified that there are a number of over-arching merchant shipping regulations that apply in all ports / harbours in the UK. In addition there are additional Risk Control Measures currently in place within Scapa Flow;
- The NRA identified the highest risk is directly related to construction activity and recommends that in addition to ongoing traffic monitoring and direction provided by OIC VTS, that a navigation management plan is developed and implemented to manage all vessels involved in the construction project; and
- There will be an inevitable increase in navigation risk through the introduction of a new structure, generating an increased volume of traffic. However, the increase in risk is low, on top of an already low baseline.

On the basis of the NRA carried out for the SDWQ development the risk of major accident and/or disaster from shipping associated with the development is not considered significant.

In terms of general safety protocols and procedures it should also be noted that:

- Orkney Islands Council Harbour Authority have an existing Safety Management System, which aims to enhance safety within the Harbour Authority area by ensuring that all marine navigation hazards are identified, control measures are in place, and levels of risks are acceptable
- The Harbour Authority are compliant with the Department for Transport Port Marine Safety Code; and
- The OIC Marine Services division of OICHA 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 surrounding environment.

10.1.5 Mitigation Measures

On the basis of the assessment carried out and the supporting NRA, the only mitigation considered necessary is the ongoing updating and review of existing protocols described above, either in response to legislation changes, if port operations are modified in the future, or as part of normal OICHA periodic review.

10.2 Air Quality

10.2.1 Introduction

A detailed review of the Proposed Development was undertaken by Envirocentre to support the EIA Scoping Report and the potential change in air quality as a result of it. This considered the baseline air quality, the construction phase emissions and the operational phase emissions. Based upon the predicted change in vehicle movements associated with both phases air quality was scoped out; Marine Scotland agreed that air quality could be scoped out, however OIC stated;

“Further work needs to be undertaken to better understand likely operational traffic movements and until this works is undertaken air quality impacts from the operational road traffic should be scoped into the EIA.”

Since submission of the Scoping Report there has been further transport work carried out, which includes forecasting of operational traffic movements. This information has been considered within this assessment in line with OIC comments.

10.2.2 Assessment Scope and Methodology

This assessment considers the air quality impacts associated with both the construction and operation of the Proposed Development. Likely changes to local air quality, owing to the Proposed Development, have been also considered. The assessment also recommends mitigation measures necessary to reduce any potentially significant impacts associated with the development.

During construction, emissions of dust and other pollutants emissions from onsite activities and construction vehicle movements will have a potential impact on local air quality. It was agreed from feedback from the scoping report that in order to inform the construction and environmental management plan (CEMP) a construction dust risk assessment should be completed to allow for the appropriate level of mitigation measures to be identified. The full construction site risk assessment can be found in Technical Appendix 10.1, Volume 3 of the EIAR.

With regards to operational impacts, emissions from vehicle and vessel movements associated with the Proposed Development will have a potential impact on local air quality. Emissions generated from any proposed combustion plant equipment (generators, energy centre equipment, etc.) may also give rise to local air quality impact.

10.2.3 Baseline Conditions

The island has a predominantly rural nature with no large-scale industrial processes therefore, the main source of existing air pollution is road traffic emissions. The key pollutants of concern that are associated with road transport emissions are nitrogen dioxide (NO₂) and particulates (PM₁₀ and PM_{2.5}).

¹¹⁸ Department for Transport (DfT) (2023) Manual count points Site number: 1182 <https://roadtraffic.dft.gov.uk/manualcountpoints/1182>

The main traffic routes in Orkney are a series of ‘A’ roads that link the west mainland to the east, through Kirkwall and southwards across the barriers to South Ronaldsay. The nearest ‘A’ Road to the Proposed Development site is the A961, an arterial road linking St Mary’s to Kirkwall. This road is located 800m east of the site boundary and recent estimates from a Department of Transport (DfT) count point (ID: 1182)¹¹⁸ on this road show the annual average daily trips in 2021 (AADT) to be 2,029. There have also been recent traffic surveys on the A961, notably for the Design Realignment Study. The traffic surveys for this study recorded AADT flows in 2019 to be 2,927. Traffic levels increase in Kirkwall centre, with the AADT reaching approximately 11,000 on Junction Road, the high street road which intersects the middle of the town. Traffic flows at this volume are unlikely to lead to significant air quality issues, especially where traffic is free flowing and without major congestion.

The islands are linked to mainland Scotland via its airport situated 2 miles outside Kirkwall, and via ferry services across three routes. Other smaller air and ferry links serve the outer isles and link to ‘The Mainland’.

Defra provide estimated background concentrations of key pollutants across the UK at a 1 km resolution. The current year (2023) forecasted annual mean background concentrations of key pollutants within the 1km grid-square encompassing the site (345500, 1004500) are presented in Table 10-1. The estimated background concentrations are well below relevant air quality objectives indicating good local air quality and a lack of nearby major sources of emissions.

Table 10-1 Background pollutant concentrations at the Proposed Development site

Year	Pollutant		
	NO ₂	PM ₁₀	PM _{2.5}
2023	1.9	4.7	2.8

Overall, air quality in Orkney is good and there are no areas on the island where there is a risk of exceeding the air quality objectives of any key pollutants.

10.2.4 Potential Impacts

10.2.4.1 Construction Phase

During the construction phase of the development there is risk of impact arising from;

- Vehicle movements associated with the construction site, both from staff commuting to the site and the movement and delivery of construction materials;
- Dust emissions generated from construction activities, including earthworks, trackout and demolition;
- Emissions from plant equipment and non-road mobile machinery (NRMM).

These emissions may give rise to air quality impacts at human or ecological receptors and lead to increased particulate matter concentrations and dust nuisance and soiling.

The IAQM (2017) *Land-use Planning & Development Control: Planning for Air Quality*¹¹⁹ guidance document sets out thresholds that, if exceeded, indicate the need for detailed assessment. This guidance advises that where the change is less than 100 HDV and/or 500 LDVs AADT, detailed assessment, i.e. dispersion modelling, is not required as air quality impact is likely to be insignificant.

¹¹⁹ Institute of Air Quality Management (IAQM) (2017) *Land-use Planning & Development Control: Planning for Air Quality v1.2 London*. Accessed 05/05/23 - <https://www.iaqm.co.uk/text/guidance/air-quality-planning-guidance.pdf>

The Road Transport Assessment, Section 10.5, assumes that 10 HDVs will need to access the site each day across the construction phase, as well as 60 LDVs associated with construction staff commuting to the site. This is well below the relevant thresholds and therefore emissions from construction phase vehicle movements will not lead to a material local air quality impact. Therefore, within the context of baseline conditions, there is no further assessment of air quality impacts from construction vehicle movements is required. Similarly, given the good existing air quality within the local area and the temporary and intermittent nature of construction phase works, emissions from non-road mobile machinery will have no material impact on local air quality.

In accordance with the Scoping Opinions, a full construction dust risk assessment has been carried out and is provided in Technical Appendix 10.1, Volume 3 of the EIAR which follows *IAQM (2014) Guidance on the assessment of dust from demolition and construction*¹²⁰.

The construction phase dust risk assessment study area, defined with reference to the above IAQM guidance, has conservatively assumed that construction activities could occur anywhere within and up to the red line boundary for the Proposed Development site.

The study area includes eight (8) human receptors within 350 m of the Proposed Development site boundary with the potential to be impacted by dust generated from earthworks and construction activities. The nearest receptors are Nether Button Cottage (residential dwelling) located approximately 100 m to the east of the site boundary and a residential dwelling located 100 m to the north of the site boundary where it encompasses the site access junction with the A691. With respect to trackout activities, there are six (6) residential dwellings within 20 m of the access route (A691) likely to be used by construction vehicles, up to 500 m from the site entrance.

Whilst Scapa Flow SPA adjacent to the Proposed Development, the appointed ecology consultant for the project has confirmed that the Scapa Flow SPA being a waterbody designated for non-breeding birds is not considered particularly sensitive to dust deposition. Given the construction dust control measures proposed, the SPA is unlikely to be significantly impacted upon by the Proposed Development with regards to construction dust emissions.

The dust risk assessment concluded that there is a **low risk** of dust impacts from earthworks, construction activities and trackout. The recommended mitigation measures specific to the Proposed Development are detailed in Section 10.2.5.

10.2.4.2 Operational Phase Emissions

During operation, there is risk of air quality impacts arising from;

- Vehicle and vessel movements associated with the Proposed Development;
- Use of emission generating plant equipment, i.e., diesel generators.

Large ships generally burn high sulphur content oils in their main engines (bunker oils). For large ports, this may give rise to elevated short-term SO₂ concentrations, which can lead to exceedances of the 15-minute or 1-hour mean objectives. NO_x and PM emissions may also lead to elevated concentrations at sensitive receptors around ports.

The *Local Air Quality Management (LAQM) Technical Guidance (22)*¹²¹ includes an assessment criteria for shipping movements, which states shipping emissions should be considered where:

- There are there more than 5,000 large ship movements per year for receptors within 250m, or;
- There are there more than 15,000 large ship movements per year with relevant exposure within 1km.

A large ship is defined as cross-channel ferries, roll on-roll off ships, bulk cargo, container ships, cruise liners, etc – one ship generating two movements (arrival and departure).

Considering the above criteria, no further assessment is required as the number of movements associated with SDWQ will be less than 100 per annum. Furthermore, the nearest residential properties (Nether Button Cottages) are located approximately 500 m from the coastline, providing a significant separation distance from where vessels would be berthed. Given the low number of ship movements per annum, the Proposed Development have no significant adverse impact on human receptors or the Scapa Flow SPA.

With respect to operational traffic, there will be limited HGV's (i.e. 3-4 per week) accessing the port during operation as all heavy goods will come via sea. The access road will be used by staff in private vehicles and four (4) parking spaces will be available close to the shoreline to allow leisure trips from local residents. Given the low number of vehicle movements associated with the operational phase, and within the context of existing good baseline air quality, the change in traffic will be negligible, resulting in no significant local air quality impacts to human or ecological receptors.

To further reduce any potential emissions to air, shore side power for vessels will be provided via a suitable high voltage grid connection power supply (estimated to be 9 MegaVolt Amperes (MVA)). This will include the pilot vessels and tugs operated by the Harbour Authority which will relocate to SDWQ.

10.2.5 Mitigation Measures

The following mitigation measures are recommended in line with the **Low Risk** of impact defined within the construction phase dust risk assessment:

Communications

- Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager.
- Display the head or regional office contact information.
- Develop and implement a Dust Management Plan (DMP), which may include measures to control other emissions, approved by the Local Authority. The DMP should include, as a minimum, the measures outlined in this section.

Site Management

- Record any exceptional incidents that cause dust and/or air emissions, either on- or offsite, and the action taken to resolve the situation in the log book.
- Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken.
- Make the complaints log available to the local authority when asked.

Monitoring

- Carry out regular site inspections to monitor compliance with the DMP, record inspection results, and make an inspection log available to the local authority when asked.
- Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.

¹²⁰ Institute of Air Quality Management (IAQM) (2014) AQM Guidance on the assessment of dust from demolition and construction, Institute of Air Quality Management, London. Accessed 05/05/23 - www.iaqm.co.uk/text/guidance/construction-dust-2014.pdf.

¹²¹ Defra (2022) Local Air Quality Management. Technical Guidance (TG22)

Site Maintenance

- Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible.
- Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site.
- Avoid site runoff of water or mud.

Operations and Waste Management

- Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems.
- Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate.
- Use enclosed chutes and conveyors and covered skips.
- Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.

Vehicle and Plant Operation

- Ensure all vehicles switch off engines when stationary – no idling vehicles.
- Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable.

These measures will be included within the Construction Environmental Management Plan (CEMP) or similar, which will be produced by the contractor prior to construction and will require to be approved by OIC. The implementation of the above measures will ensure the residual effect of construction phase dust emissions on local air quality will be negligible and **not significant**.

No mitigation is required during the operational phase of the Proposed Development with respect to local air quality. However, to further reduce any potential emissions to air, it is recommended that renewable energy sources are considered for when ships are at berth.

10.3 Carbon, Climate Change and Greenhouse Gas Emissions Assessment

10.3.1 Introduction

This report details the carbon assessment conducted for the new Scapa Deep Water Port Development, hereafter referred to as “the development”. The development includes the proposal of:

- Construction of an access road to the site;
- Initial phase of reclamation – creation of land, extending the shore northeast;

Construction of 597m of new quayside 597m long main quayside berth with general -15m CD water depth, incorporating a 135m quayside pocket with -20m CD water depth. Further north tug (3No.) and pilot boat (2No.) berth approx. 180m long with depths between -6 and -9m CD; Dredging of areas adjacent to the new length of quay; and

- Further reclamation phases – creation of land adjacent south of the initial newly formed laydown area.

The purpose of this assessment is to establish the capital carbon emissions associated with the construction and maintenance of the development, as detailed above. This involved identifying emissions associated with use of the materials across the lifecycle modules within PAS 2080 – Carbon Management in Infrastructure (A1- 5, B2 and B3).

PAS 2080

PAS 2080 - Carbon Management in Infrastructure is a specification for whole life carbon management within the infrastructure sector (transport, energy, water, waste and communications) and sets out the general principles of a carbon management process, to promote carbon and cost reduction in infrastructure delivery on a whole life carbon basis. The framework looks at the whole value chain, aiming to reduce carbon and reduce cost through more intelligent design, construction, and use.

Effective carbon management in infrastructure will make an important contribution to tackling climate change and leave a positive legacy for future generations.

Regulatory Guidance

International

The Paris Agreement is a legally binding international treaty on climate change. The treaty was adopted by 196 parties at COP21 (Conference of the Parties) in Paris, in 2015. The Paris Agreement and subsequent scientific reports, including Intergovernmental Panel on Climate Change (IPCC) reports, all point to clear conclusions:

- Global warming is likely to reach 1.5°C between 2030 and 2035 at current trends.
- Global ‘rebalancing’ must be pursued at pace and requires interim emission cuts of around 50% by 2030, for any prospect of staying close to 1.5°C of warming.

To achieve this long-term climate change mitigation goal, countries aim to reach global peaking of GHG emissions as soon as possible to achieve a climate neutral world by 2050. Each signatory to the Paris Agreement has a duty to produce a Nationally Determined Contribution (NDC), indicating how state-level transformations will contribute to climate action.

National

The Climate Change Act (2008) is central to the UK Government’s plan to reduce carbon emissions. The Act is a legally binding target to reduce the UK’s GHG emissions by a reduction of 80% against 1990 levels by 2050. In May 2019, the UK Government declared a climate emergency, leading to updating the commitments in the 2008 Act to target net zero carbon emissions by 2050 under the Climate Change Act (2050 Target Amendment) Order 2019.

Following the UK publication of The Climate Change Act, the Scottish Government produced the Climate Change (Scotland) Act 2009 which sets the statutory framework for GHG emission reductions in Scotland. However, this was amended by the Climate Change (Emissions Reduction Targets) (Scotland) Act 2019, which increased the ambition of Scotland’s emissions reduction targets to net zero by 2045 and revised interim and annual emissions reduction targets to the following;

- 2030 is at least 75% lower than the 1990/1995 baseline; and
- 2040 is at least 90% lower than the 1990/1995 baseline.

The Climate Change Plan 2018-2032: Securing a Green Recovery on a Path to Net Zero and Climate Ready Scotland: Second Scottish Climate Change Adaptation Programme 2019-2024 set out key steps for achieving a reduction in greenhouse gas emissions across Scotland.

Within the Draft Energy and Just Transition Plan it states that the “*Scottish Government is clear that unlimited extraction of fossil fuels is not consistent with our climate obligations*”.

Regional

The Orkney Local Development Plan (LDP) 2017 sets out a vision and spatial strategy for the development of land in Orkney over the next 10-20 years. If a proposal is contrary to any single policy within the LDP, then it does not accord with the Plan.

One key and relevant policy is *POLICY 1 - Criteria for All Development*, where it was stated that development will be supported where “*it is resource efficient and utilises sustainable construction technologies, techniques and materials and, where practicable, low and zero carbon generating technologies are installed*”.

10.3.2 Assessment Scope and Methodology

PAS 2080

The assessment methodology aligns with the modular framework set out in PAS 2080 Carbon Management in Infrastructure).

From previous project experience and industry guidance, such as RICS Professional Statement for Whole Life Carbon Assessment for the Built Environment (2017), it is known that the majority of embodied carbon falls within the A1-A5 (before use). Therefore, the assessment boundary and therefore emission sources considered within the assessment include the pre-construction and construction emissions (A1 – A5), with the additional reporting of Use (specifically B2 and B3 – maintenance and repair). Pre-construction and construction phases comprise the physical assets associated with the development and are hereafter referred to as the “**capital carbon**” of the development. This includes emissions associated with sourcing of materials and construction activities and are defined in terms of lifecycle stages, detailed in PAS 2080 and RICS (2017), as follows:

- Products and materials (A1-3) - use of materials for temporary and permanent construction activities.
- Transport to the Project site (A4) – the transportation of materials to the Project site, e.g., by heavy good vehicles (HGV); and
- Construction and installation processes (A5) - construction plant use.

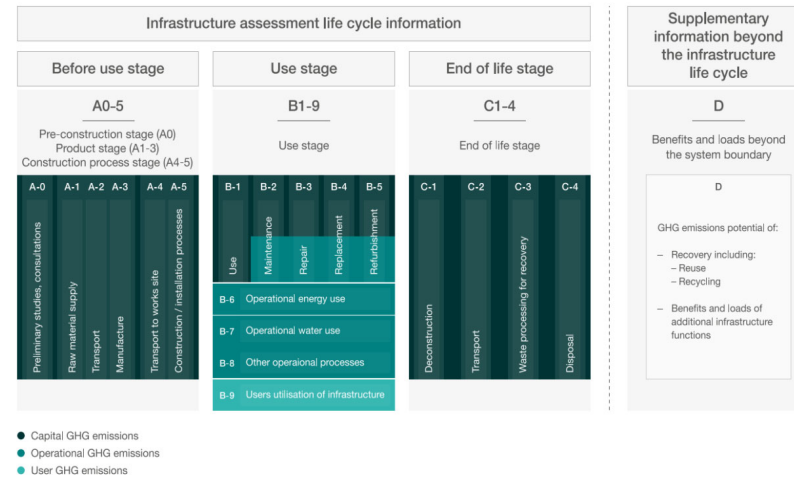


Figure 10-1 – PAS 2080 Life Cycle Modules

For the assessment of the development’s emissions, a calculation method is used following data collection. The calculation of GHG emission that is used in this assessment follows that provided within the GHG Protocol and is defined as:

Activity Data x Emission Factor = GHG Emission (kgCO₂e)

The material quantities were sourced from the ‘Exemplar Design Check – Updated High Level Cost Estimate’ document produced by Arch Henderson (dated 27/09/2022). Various industry standards and databases were used to source the carbon emission factors to calculate the construction and plant emissions. Table 10-2 details the emission factor sources according to the life cycle stage of the Project.

Table 10-2: Capital Carbon Emissions Considered in the Assessment

Life Cycle Stage	Guidance	Industry Standard / Source of Carbon Factors
A1 – A3	Product	CESSM4
A4	Transport of materials to project site	RICS 2017
A5	Construction and installation processes	CESSM4

Sweco’s carbon estimating tool was used to calculate emissions associated with the development. Emission factors derived from industry leading guidance, such as those from CESSM4 and the Inventory of Carbon and Energy (ICE) databases, are embedded within the tool. The tool also uses RICS (2017) guidance and associated emission factors to inform A4 emissions. The emission factor (kgCO₂e/kg) associated with each distance category (Local, National or European) is used depending on the distance from the source location of materials to the construction site. Where it is assumed materials will be site won no transport emissions have been associated with these.

For some specific items (service road, dredging and rock armour), additional sources of information were identified and the emission factors within these reports were used. These were:

- Road: Engineering and Physical Sciences Research Council and Decarbon8, 'Measuring Road Infrastructure Carbon: A 'critical' in transport's journey to net-zero,' 2022.
- Dredging: The Crown Estate, 'Marine Estate Research Report: Carbon Footprint of Marine Aggregate Extraction', 2010.
- Rock Armour: HR Wallingford, 'Quantifying the carbon footprint of coastal construction - a new tool HRCAT,' 2011

Assumptions

The following assumptions have been made in this carbon assessment:

- The project lifetime, also known as the Reference Study Period (RSP) has been assumed to be 60 years. This is in line with industry standards; RICS (2017) guidance.
- Although maintenance and repair have been accounted for, replacement (B4) or refurbishment (B5) of materials have not been considered as it has been assumed the lifetime of assets would be as the RSP.
- For the assessment of A4 emissions, it is assumed that materials are locally sourced (50km radius) materials unless informed otherwise.
- Although a 60-year RSP has been used in this assessment, the end-of-life emissions are not estimated as the development will be built in perpetuity.

Climate Change Projections

The latest UK Climate Projections (UKCP18, published November 2018) are used to assess the future climate scenario in the location of the proposed development. UKCP18 uses Representative Concentration Pathways (RCPs) which are named according to the concentration of GHG modelled to occur in the atmosphere in 2100. There are 4 RCPs available in the UKCP18 climate projections: 2.6, 4.5, 6.0 and 8.5. RCP8.5 is the most conservative, highest-impact (worst case) scenario.

10.3.3 Baseline Conditions

Total Carbon

The total carbon emission for the project is **153,341 tCO₂e**. Table 10-3 highlights the carbon associated with lifecycle stages A (construction) and B (maintenance and repair).

Table 10-3: Total Emissions of Proposed Development (tCO₂e)

Life cycle stage	Activity	Emissions (tCO ₂ e)
A	Before use stage	152,277
B	Use stage	1,064
Total Embodied Emissions (tCO₂e)		153,341

Capital Carbon

Emissions from the construction phase, which covers the capital carbon of the development, are summarised in Table 10-4.

Table 10-4: Emissions arising from the construction phase (A1-5)

Life Cycle Stage	Activity	Emissions (tCO ₂ e)
A1 – A3	Materials used in construction	77,889
A4	Transportation of materials to site	21,438
A5	Construction site emissions	52,950
Total Pre-Use Capital Carbon Emissions (tCO₂e)		152,277

Capital carbon emissions from construction materials are the main contributor to climate change during this period, with additional emissions arising from the direct use of plant and transport of materials to site. The total capital carbon of the project was **152,277 tCO₂e**. Use stage emissions from maintenance and repair were significantly smaller as most infrastructure assets were assumed to have a lifetime equal to the study period.

Emissions associated with core fill and quay work are the most carbon intensive elements of the proposed development, as Figure 10-2 shows.

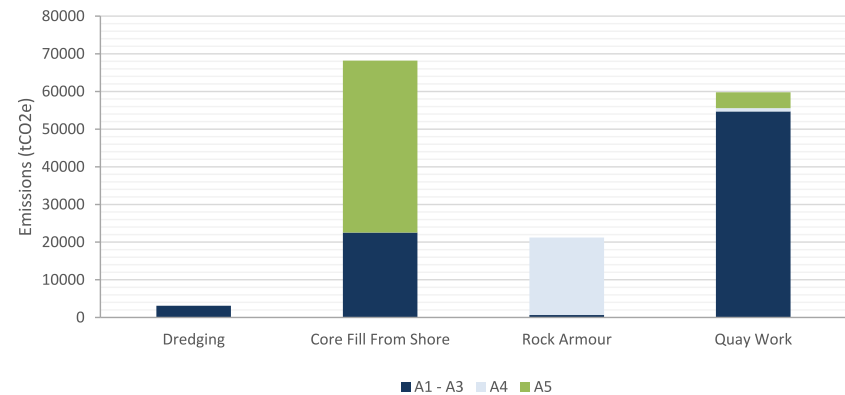


Figure 10-2: Emissions associated with lifecycle Stage A across all activities

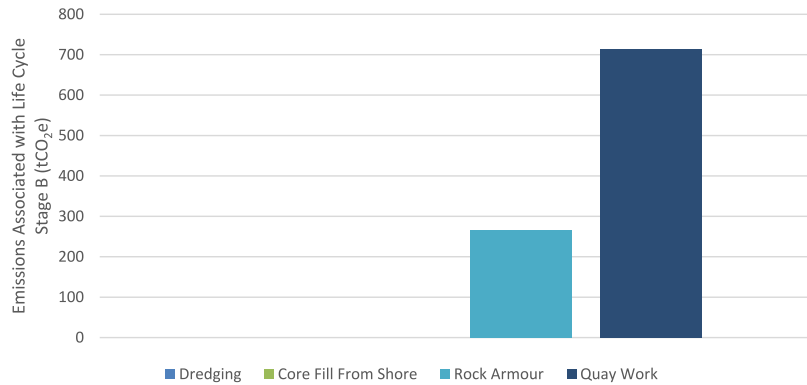


Figure 10-3: Emissions associated with lifecycle Stage B across all activities

Use Stage Carbon

Total carbon emissions associated with the use stage (B2 and B3 emissions) are estimated to be **1,064 tCO₂e**. Assumptions made for maintenance and repair are based on assumptions from RICS Professional Statement (2017). Dredging and core fill have no emissions associated with lifecycle stage B as these are one-time activities that occur in construction phase.

Climate Change Projections

The UK Climate Projections provide regional climate projection information for the North Scotland Administrative Region (where the proposed development is located).

The general trend for the region is warmer, drier summers and milder, wetter winters. These changes are predicted to occur under all emissions scenarios (low, medium and high levels of carbon emissions), which are incorporated into the climate change models used by the IPCC.

Under the highest emissions scenario (RCP8.5) for the 2080s (2080-2099), estimated changes in climatic conditions are outlined in Table 10-5.

Table 10-5: Future Climate Projections for North of Scotland (2080s; RCP8.5)

Climate Variables	Climate Observations
Temperature	The average annual temperature modelled to occur within 2080s, under the RCP8.5 scenario at the 50 th percentile, is an increase of approximately 2°C. Summer temperature is projected to increase by 3-4°C under the central estimate, which represents 'as likely as not' probability of change (50 th percentile). Average winter temperature is estimated to increase by 2-3°C (50 th percentile).
Rainfall	The average annual rainfall rate predicted to occur between 2080 and 2099, under the RCP8.5 scenario at the 50 th percentile, is an increase in precipitation anomaly between 0% and 10%. The average summer rainfall rate is projected to decrease by 10%-20%, whereas the average winter rainfall rate is estimated to increase by 10%-20% (in the 50 th percentile or central estimate for both).

Wind	Climate projections for wind are more uncertain than those for temperature and precipitation, due to inherent difficulty in modelling future wind conditions. However, an increase in extreme weather including wind is projected (Committee on Climate Change, 2017).
-------------	--

10.3.4 Mitigation Measures

Carbon Reduction Opportunities

PAS 2080 promotes the carbon reduction hierarchy (Figure 10-4: PAS 2080 Carbon Reduction Hierarchy and Figure 10-5: Diagram Showing Ability to Influence Carbon Reduction) which helps value chain members to identify potential opportunities to reduce carbon.

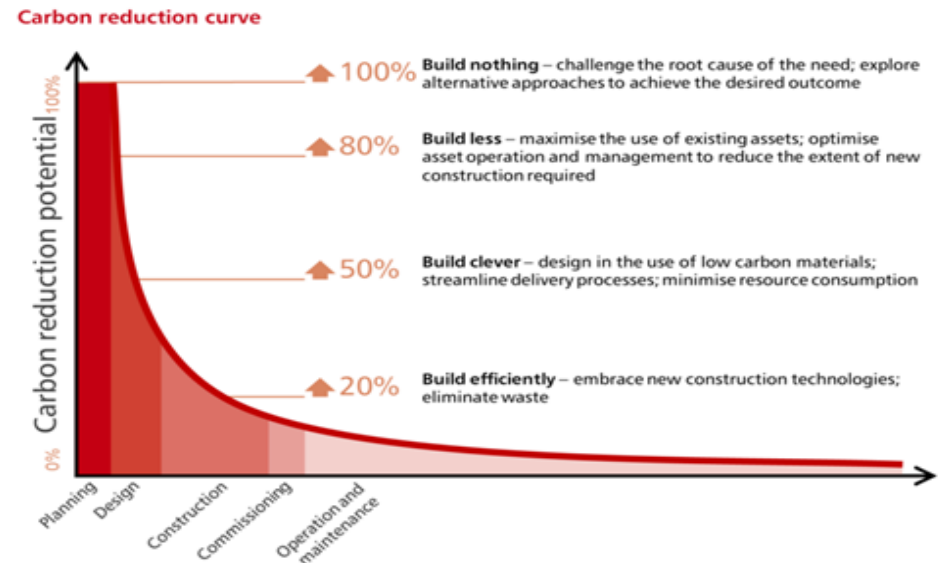


Figure 10-4: PAS 2080 Carbon Reduction Hierarchy

The carbon reduction hierarchy highlights the importance of implementing measures of carbon reduction at the early stages, where the potential of carbon reduction is greatest. This is also reiterated in Figure 10-5 Diagram Showing Ability to Influence Carbon Reduction; the scope for reducing whole life cycle carbon emissions is greater during the initial working stages than in the later working stages.

The 'build nothing, build less, build clever, build efficiently' strategy shows that measures to optimise the design should always be prioritised before methods such as use of alternative materials. Consider the developments implications on a system level, with methods of decarbonisation through design and operation optimisation working in synergy with other interconnected assets to promote system-wide opportunities, whilst identifying and managing system-wide risks. Solutions that best support decarbonisation at the across the whole system should be prioritised to prevent locked-in high carbon behaviours.

The earlier in a project carbon mitigation is considered, the more opportunities there are to make emissions reductions and energy efficiencies.

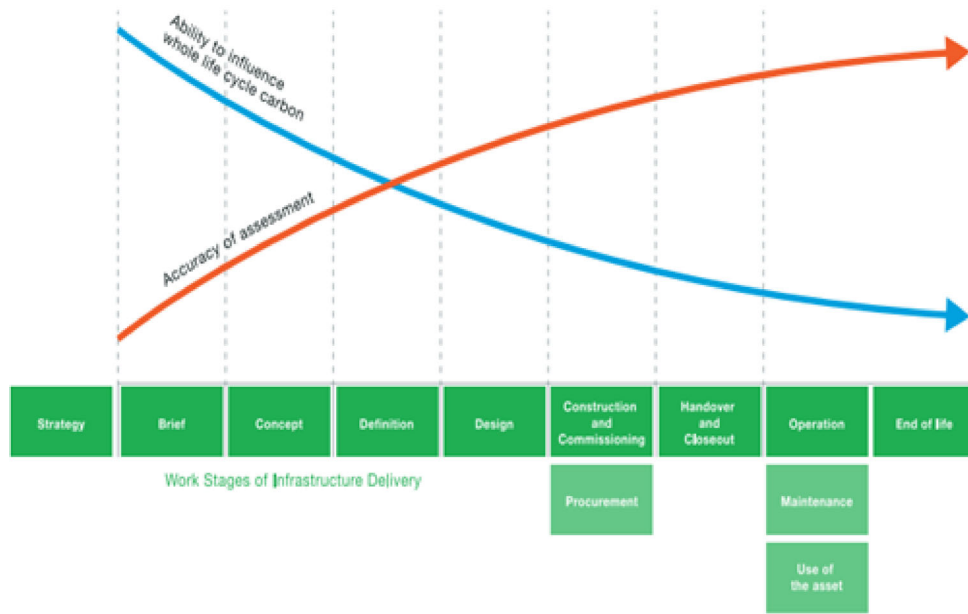


Figure 10-5: Diagram Showing Ability to Influence Carbon Reduction

Opportunities for areas of carbon reduction in the construction phase include:

1. **Materials:** The use of materials with a lower embodied carbon impact (for example, low carbon concrete or recycled steel) would significantly reduce the emissions.

Examples of low carbon materials include low carbon concrete (75% cement replacement is achievable using GGBS or fly ash substitution), use of recycled steel, or electric arc furnace (EAF) steel with high recycled content, fibre reinforcement for concrete and concrete mix optimisation.

The development at Scapa will aim to use site won and locally sourced materials, only importing materials from further afield where necessary. Doing so will minimise emissions associated with A4 lifecycle stage and therefore capital carbon.

2. **Material efficiency:** A design optimisation process is needed to ensure only the necessary quantity and type of materials are used. Assessing options to build efficiently and optimising the use of materials needs to occur through design, procurement, and construction phases.
3. **Construction site management:** Sourcing energy efficient plant, regular vehicle maintenance and putting in good practice site procedures (for example, reducing vehicle/plant idling) to make operations more efficient.

4. **Site Waste Management Plan:** Promoting the reduction and effective management of waste during construction, following the waste mitigation hierarchy and relevant national waste reduction policies.

This will fall within the Construction Environmental Management Plan that will be produced.

Once the proposed development becomes operational, consideration to measures of emission reduction during the operational phase can follow the Energy Hierarchy. The 'Energy Hierarchy' is a widely adopted method to identify opportunities to reduce energy demand and therefore decrease the related carbon emissions. This hierarchy suggests the use of a four-tiered approach to reducing operational energy consumption, **Be Lean, Be Clean, Be Green and Be Seen** stages.

A brief explanation of each stage of the energy hierarchy is given below:

- **Be Lean:** This stage focuses on being energy efficient. This involves reassessing any architectural layouts of the development based on internal parameters (i.e., daylighting requirement, function of the space, thermal characteristics of the space) and external factors such as surrounding buildings, site morphology, and local weather data.
- **Be Clean:** The second step on the optimisation process entails an analysis of the site's available energy sources and the evaluation of alternative technologies to deliver the required energy in the most sustainable way.
 - Clean fuels for shipping will be a critical requirement to achieving the UK and Scottish Governments' net zero targets by 2050 and 2045 respectively. In the short term cleaner fuels are needed to enable shipping to meet emissions regulations set by the International Maritime Organisation (IMO). The Future Fuels Hub project, as part of the Islands Deal, could provide storage, supply and bunkering of low and zero carbon fuels at SDWQ.
- **Be Green:** The strategy will seek to maximise the provision of low and zero carbon energy capture and generation to meet the remaining demands of the development.
 - Shore side power for vessels will be provided via a suitable high voltage grid connection power supply (estimated to be 9 MegaVolt Amperes (MVA)). This would provide sufficient energy to accommodate future electricity requirements as plant transitions from diesel to electricity as well as further reduce any potential emissions to air for vessels.
 - Existing **shore power** connections for the pilot vessels and tugs operated by the Harbour Authority will also be maintained at SDWQ.
 - As the site is developed other means to reduce the carbon footprint of the development will be considered (i.e. solar power, battery storage etc).
- **Be Seen:** The final stage of the process would aim to optimise the performance of the development and verify performance against the design intent through monitoring of consumption. This stage would seek to close any performance gaps and reporting on actual energy performance and lessons learned.

Climate Change Resilience

Climate change projections suggest a general trend of warmer, drier summers and milder, wetter winters. With the development in close proximity to the coastline, it is likely that sea level rise and storm surges, as an indirect impact to the projected changes in climate, will become more of a threat to the development in Orkney.

However, the proposed development at Scapa has been designed at a height that sustains current high tide and projected sea level rise height. More specifically, the architects informed that the "quay cope height has been chosen as +5.0m OD (+6.4m CD) which is at a level above highest recorded tide for Kirkwall (taken at Stromness) and the addition of 0.51m for worldwide local sea level projections at mid-range sea-level projection (50th percentile)."

It is therefore assumed that the development will be resilient to projected climate change and associated impacts over the assessed 60-year period.

10.4 Transport - Aviation

10.4.1 Introduction

The Scoping Opinion from OIC note that the development site lies within the safeguarded area for Kirkwall Airport and therefore,

“the turbines that are proposed to be constructed, assembled and maintained within the development area, could affect the instrument flight procedures for the airport. In the interests of aviation safety, HIAL could not accept degradation of this service and would work with the development towards resolution.”*

*Highland and Islands Airport Ltd (HIAL)

As a result of the scoping response, OICHA commissioned an Assessment of Instrument Flight Procedures (IFPs) which is provided as Technical Appendix 10.2, Volume 3 of this EIA. A summary of the assessment is provided below.

10.4.2 Assessment Scope and Methodology

The IFP's assessed were as follows:

AIRAC 02/2023 effective 23 FEB 2023

- AD 2.EGPA-8-1 ILS DME VOR RWY09 (12 Aug 2021);
- AD 2.EGPA-8-2 LOC DME VOR RWY09 (12 Aug 2021);
- AD 2.EGPA-8-3 VOR DME RWY09 (12 Aug 2021);
- AD 2.EGPA-8-4 RNP RWY09 (02 Dec 2021);
- AD 2.EGPA-8-5 NDB(L) DME RWY09 (04 Nov 2021);
- AD 2.EGPA-8-6 DIRECT ARRIVALS RWY09 (12 Aug 2021);
- AD 2.EGPA-8-7 ILS DME VOR RWY27 (12 Aug 2021);
- AD 2.EGPA-8-8 LOC DME VOR RWY27 (12 Aug 2021);
- AD 2.EGPA-8-9 VOR DME RWY27 (12 Aug 2021);
- AD 2.EGPA-8-10 VOR RWY27 (12 Aug 2021);
- AD 2.EGPA-8-11 RNP RWY27 (02 Dec 2021);
- AD 2.EGPA-8-12 NDB(L) DME RWY27 (12 Aug 2021);
- AD 2.EGPA-8-13 NDB(L) RWY27 (12 Aug 2021);
- AD 2.EGPA-8-14 DIRECT ARRIVALS RWY27 (12 Aug 2021)

Additionally, the assessment considered the following:

- Visual Circling
- Holding
- Visual Segment Surface
- Minimum Sector Altitudes (MSA's)

10.4.3 Baseline Conditions

The airport is located to the east of Kirkwall circa 4.5 km to the North Northeast of the development site. The highest elevation at the development site was taken to be 31m with the elevation of the constructed turbines (including the addition of the blades) was taken as being 300m.

10.4.4 Potential Impacts

There is potential for the future turbine construction activities to affect the instrument flight procedures for the airport as a result of the height of the turbines and the sites proximity to the airport and it's associated flight path. The State Aeronautical Information Publication (AIP) website¹²² is a library of aeronautical information for flight planning purposes. It provides specific details such as flight approach and elevations for each airport in the world and provides instructions for various scenarios for pilots. This website was accessed to obtain the site specific Kirkwall Airports flight procedures for aircraft arriving and departing from the airport.

The elevations of aircraft in various scenarios provided by the website were compared to the elevations of the built turbines. The assessment concluded that for the majority of scenarios, the proposed development would have no impact on the various Kirkwall IFPs apart from:

- RNP RWY 27 which relates to missed approach procedures considering the worst case scenario;
- Visual Circling; and
- The South East Quadrant minima of the published MSA's.

As such mitigation measures are required (Refer to Section 10.4.5).

OICHA have, since the report being issued, established regular meetings with the HIAL Safeguarding and Operational team in order to keep them informed of progress and any new information that comes to light such as turbine construction processes.

10.4.5 Mitigation Measures

Mitigation would take the form of

- Continuing the discussions with the Kirkwall airport operators (HIAL) to identify suitable mitigation measures such as altering the airports IFP's; and
- Liaising with Loganair (operator of internal and external scheduled air services) in respect to their operational procedures which are beyond the aerodrome 'rules' that may need modification in light of the development.

10.5 Transport - Roads

The scoping response from the Roads Department at OIC for the Scapa site includes the following statement:

“Roads Services consultation response notes that very little information has been provided in the scoping request in relation to the effects of the proposed development on the existing public road infrastructure. Given that the proposals involves construction of a new access road and the realignment of the A961 this indicated that the development is highly likely to have significant impacts on the existing public road infrastructure. The consultee

¹²² NATS UK | AIP (ead-it.com)

therefore requires that the effects of both construction and operational traffic on the public road network must be identified in the EIA.”

The response from the Council states that there was too little information provided in the original scoping note.

10.5.1 Assessment Scope and Methodology

This section will provide further transport detail, justifying the level of transport planning input required to support the development at Scapa.

Based on information supplied on the operation of the proposed development, it is considered that the construction phase will generate a higher level of traffic than the operational phase. On this basis, the construction phase has been considered within this section.

10.5.2 Baseline Conditions

Several data sources were reviewed to obtain baseline data. The following data was reviewed:

Design Realignment A961

The A961 realignment study recoded Automatic Traffic Count (ATC) data along the A961, from which access to the Scapa site will be taken. A counter very close to the proposed site access was used to obtain base data. The base data was collected in 2019 over 17 days in September.

Finstown Traffic Management Study

Finstown Traffic Management study was undertaken by Systra and reported on in 2022. As part of this study, ATC data counters were used at 5 locations surrounding Finstown (west of Hatston). With data at Site 4 and Site 5 used to calculate flows along the A965.

Department For Transport (DFT) counters

Existing traffic levels were taken from ATC data counters installed by the Department for Transport (DFT). Although no data has been collected in recent year, only historic data. The DFT traffic counters provide bi-directional average daily flows for each link.

Kirkwall Housing TA

Additional information was gathered from a Transport Assessment for a residential development (19/04/PPMAJ) near to the proposed development site in Kirkwall. Traffic data was collected in 2018 for peak hour periods. No 24-hour data was available however it provides an indication of traffic levels.

Data from the realignment of the A961 study was used to provide base data, with the other counters used for comparison to ensure reliable data. The location of the counters is shown in Figure 10-6.



Figure 10-6: Location of Traffic Counters

The base traffic flows for Scapa are shown in Figure 10-7. The average % HGV on the routes considered is 5%.

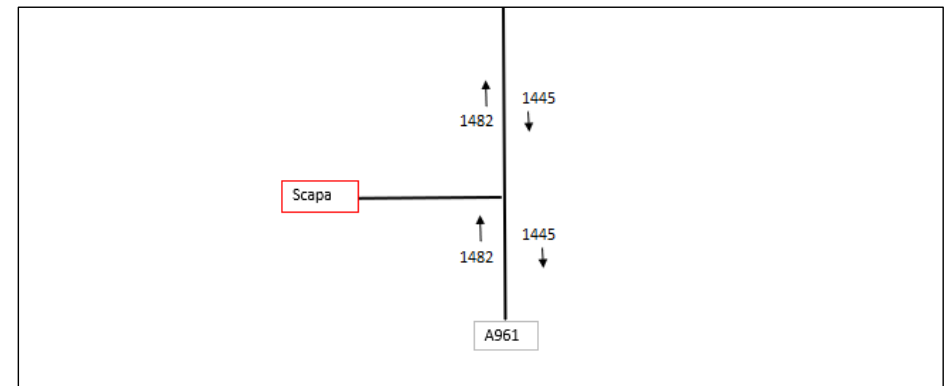


Figure 10-7: AADT Base Traffic Flows for Scapa

10.5.3 Potential Impacts

Construction traffic

For the new quay at Scapa, onsite cut and fill will be utilised, removing the need for material to be transported onto site.

For the preliminary assessment outlined within this section, 10 HGVS per day have been allowed for accessing the site. There will be a short period of mobilisation to site when most of the HGVs will arrive and then remain on site and not create trips on the network. 10-HGVs have been assumed as a worst-case scenario but in reality it is anticipated there will be lower number of movements on the average day.

It is estimated that there will be approximately 75 staff working on the site during the construction stage. To estimate the number of vehicles generated by staff attending the site, the Scottish Household Survey (SHS) data was used to obtain the travel to work mode share for Orkney Council area. The data shows that 60% of employees commute by car. This data however may be skewed due to workers with shorter commutes living within Kirkwall and more likely to walk / cycle etc. In order to accurately reflect the scenario in the more rural environment of the site, it has been assumed that 80% of commuters will drive. Based on this, it is assumed that 60 cars will access the site per day associated with staff. On review of the residential demographics of the surrounding areas, 22% of commuters are predicted to travel from the south and 78% from the north via the A961.

The traffic flows have been based on staff commuting in private vehicles, however, the contractor, depending upon the mix of resident and visiting staff, and the location and distribution of associated accommodation, may choose to organise transport to the site for workers, which would reduce the impact associated with the project on the road network.

The predicted construction traffic flows for Scapa are shown in Figure 10.8. These are construction vehicles and staff related trips.

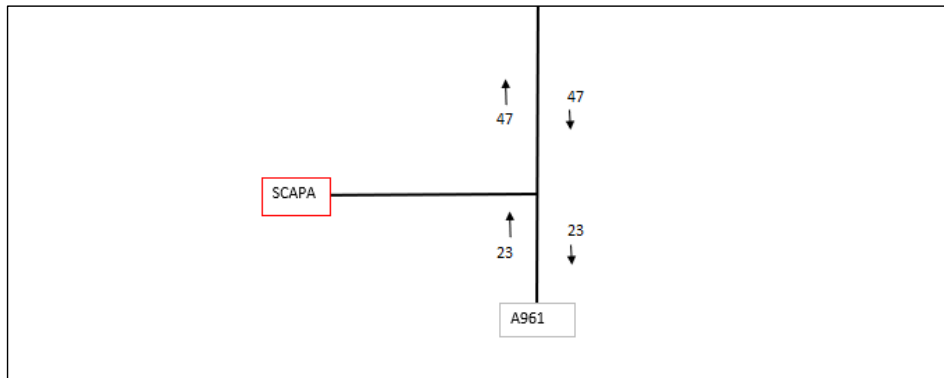


Figure 10-8: Scapa Construction Related Traffic Flows

For evaluation purposes, the significance of the environmental effects associated with the development generated traffic are categorised as outlined within Table 10-6: Traffic Assessment Significance Criteria, extracted from the Institution of Environmental Management and Assessment's (IEMA) 'Guidelines for the Environmental Assessment of Road Traffic'.

Table 10-6: Traffic Assessment Significance Criteria

Significance Rating	Description of Significance
Major	Where the impact leads to serious and lasting disruption (e.g., a 90% increase in baseline traffic) and permanent mitigation measures are required.
Moderate	Where the impact is of a temporary nature, leading to disruption (e.g., a 60% increase in baseline traffic) and short-term mitigation measures are required.
Slight	Where the impact exceeds industry standard design thresholds, or a traffic increase of above 30%, but does not lead to disruption. No mitigation measures are required.

Insignificant	No perceivable impact. No mitigation measures are required.
Positive	Where the proposals result in an improvement to current conditions.

Early indications suggest that the traffic impact of the proposed development is insignificant with the threshold showing a lower than 30% percentage increase. The threshold results for Scapa are shown in Figure 10-9: Scapa Threshold Assessment

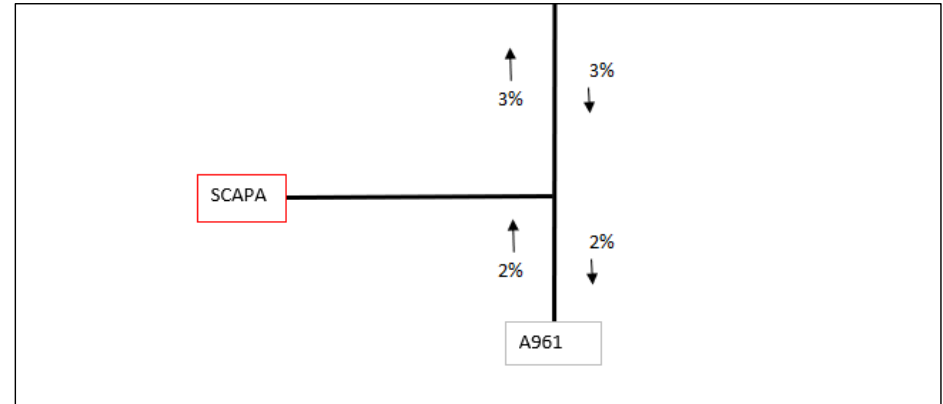


Figure 10-9: Scapa Threshold Assessment

The threshold assessments show there is a 3% increase in vehicles exiting and accessing the site from the north and 2% from and to the south. Therefore, it is predicted there will be a negligible impact on the surrounding road network.

Operational traffic

There will be limited HGVs (3 to 4 per week) accessing the port during operation as all heavy goods will come via sea. The access road will be used by staff in private vehicles and 4 parking spaces will be available close to the shoreline to allow leisure trips from local residents. Operational traffic at Scapa will therefore be lower than the construction phases.

10.5.4 Mitigation Measures

The creation of an access road which locals can use by car or active travel modes will provide added community benefit, making this section of the coastline accessible.

11 SCHEDULE OF MITIGATION

11.1 Introduction

This Chapter presents a summary of the mitigation and enhancement measures identified by the specialist environmental studies throughout the EIA process. It indicates how these mitigation measures have or would be implemented. In addition to summarising mitigation, enhancement measures identified in the topic specific Chapters of this EIAR are also highlighted.

The mitigation and enhancement measures included in this EIAR would be implemented during one or more of the following three broad phases of the proposed development:

- Measures incorporated during the design process;
- Measures required through the construction phase; and
- Measures likely to be required during post-construction.

Table 11-1 below provides a summary of the mitigation measures proposed for each issue identified by the EIA process. The measures are divided into the categories outlined above. It should be noted that the table presents a summary only; further details on the mitigation and enhancement measures are included within each Chapter of this EIAR.

The Schedule is designed to provide a comprehensive summary of all construction or physical mitigation measures that would require to be carried through into the construction and operation of the proposed development, to ensure that the environmental assessment outcomes discussed throughout this EIAR are reached, e.g. to ensure that significant adverse effects are avoided where applicable and possible.

11.2 Mitigation Measures

Mitigation detailed in each technical chapter has been summarised below.

Table 11-1: Schedule of Mitigation

Feature / Topic	Mitigation	Timing
General		
Construction Environmental Management Plan	<p>A Construction Environmental Management Plan (CEMP) will be developed to ensure that the mitigation measures outlined in the EIA are followed during the proposed construction works. The CEMP will include surface water management and pollution prevention measures (e.g. Pollution Prevention Plan), and will be in place during construction and operation. The CEMP will remain a live document and will be continually updated as the work progresses. The CEMP will be developed as a practical tool to facilitate the management of environmental mitigation measures and to provide a clear roadmap of the key roles and responsibilities during construction. All mitigation measures will be incorporated into the CEMP, which will include detailed Construction Method Statements (CMS).</p> <p>An Environmental Clerk of Works (EnvCoW) will monitor the construction works to ensure that the CEMP and associated mitigation measures are being implemented effectively.</p>	Construction
Best Practice	Best practice will be adopted throughout all phases of development, following current guidance as listed in Chapter 5 of this EIAR. The programme of works, including timings and methods, will be planned, monitored and managed to minimise the potential negative environmental impacts.	Construction
Pollution Incident Response Plan	A Pollution Incident Response Plan will be set out in the CEMP relating to the construction of the proposed development, statutory requirements and identification of areas of highest sensitivity. This will provide site spill response procedures, emergency contact details and equipment inventories and their location. All staff will be made aware of this document and its content during site induction. A copy will be available in the site office at all times.	Construction
Vessel Movements and Navigational	All of the risks should be kept under review by OICHA as the development progresses	Construction and Operation
Chapter 4: Water Environment		
Construction Environmental Management Plan	A Construction Environmental Management Plan (CEMP) will be developed to ensure that the mitigation measures outlined in the EIAR are followed during the proposed construction works. The CEMP includes surface water management and pollution prevention measures (e.g. Pollution Prevention Plan), and will be in place during construction and operation. The CEMP will remain a live document and will be continually updated as the work progresses. The CEMP is a practical tool to facilitate the management of environmental mitigation measures and to provide a clear roadmap of the key roles and responsibilities during construction.	Construction
	A suitably qualified Environmental Clerk of Works (EnvCoW) will monitor the construction works to ensure that the CEMP and associated mitigation measures are being implemented effectively.	Construction
	Best practice will be adopted throughout all phases of development, following current guidance. The programme of works, including timing, direction and method of capital dredge, will be planned, monitored and managed to minimise the potential negative environmental impacts.	Construction
	A Pollution Incident Response Plan will be developed relating to the construction of the proposed development, statutory requirements and identification of areas of highest sensitivity. This will provide site spill response procedures, emergency contact details and equipment inventories and their location. All staff will be made aware of this document and its content during site induction. A copy will be available in the site office at all times.	Construction
	All activities above Mean High Water Springs (MHWS) with potential to affect the water environment require to be authorised under the Water Environment (Controlled Activities) (Scotland) Regulations 2011 (CAR). The level of authorisation required is dependent on the anticipated environmental risk posed by the activity to be carried out. These activities could include construction drainage. Construction activities below MHWS with potential to affect the water environment require to be authorised under a Marine Licence.	Construction
Dredged Material	Mitigation measures will be delivered by the principal contractor through detailed Construction Environment Management Plans (CEMPs) that will be produced following appointment. The contractor will be responsible for producing a site specific Pollution Prevention Plan (PPP) that will apply the principles of the agreed mitigation to show how the mitigation is implemented effectively down to the specific site.	Construction
Surface Water Management	The surface water drainage will be designed to ensure that there are no untreated surface water discharges directly to surrounding coastal waters. It is proposed to replicate natural drainage around construction areas and to use source control to deal with rainwater in proximity to where it hits the ground in line with current Sustainable Drainage Systems (SuDS) guidance. Suitable prevention measures will be in place at all times to prevent the release of pollutants to the water environment, including adjacent coastal waters. These will be regularly inspected and maintained to ensure optimal performance.	Construction
Site Compounds	Run-off from compounds will be captured and passed through construction drainage features prior to discharge. Foul drainage will either be contained in a closed system and disposed of at a suitable off-site facility with private treatment and discharge or, where possible, directed via a connection to the local drainage network.	Construction
Concrete	<p>In the case that concrete batching was to be undertaken on-site the following mitigation measures would be implemented to minimise the potential impact of concrete batching on the water environment in line with PPG6:</p> <ul style="list-style-type: none"> Concrete batching will take place on an impermeable designated area and at least 10m from any waterbody. Equipment and vehicles will be washed out in a designated area that has been specifically designed to contain wet concrete/ wash water. A closed loop system will be used for wash waters. Wash waters will be stored in a contained lined pond for settlement before being reused (e.g. for mixing and washing). No discharge of wash waters will occur on-site. All excess wash water that cannot be reused will be disposed of off-site. 	Construction

Feature / Topic	Mitigation	Timing
	<p>The following mitigation is proposed for concrete handling and placement:</p> <ul style="list-style-type: none"> - Pouring of concrete will take place within well shuttered pours to prevent egress of concrete from the pour area. - Pouring of concrete during adverse weather conditions will be avoided. - The CEMP will include a Pollution Incident Response Plan, and drivers of vehicles carrying concrete will be informed so as to raise awareness of potential effects of concrete and of the procedures for clean-up of any accidental spills. - Concrete acidity (pH) will be as close to neutral (or site-specific pH) as practicable as a further precaution against spills or leakage. 	
Oil, Fuel, Site Vehicle Use and Storage	<p>The risk of oil contamination will be minimised by good site working practice (further described below) but should a higher risk of oil contamination be identified then installation of an oil separator will be considered. The storage of oil is considered a Controlled Activity which will be deemed to be authorised if it complies with the Regulations. The mitigation measures to minimise any risk of contaminant release are in line with SEPA GPP and PPG documents and include the following:</p> <ul style="list-style-type: none"> • Storage: <ul style="list-style-type: none"> ○ Storage for oil and fuels on site will be designed to be compliant with GPP2 and GPP8. ○ The storage and use of loose drums of fuel on site will not be permitted. ○ Bunded tanks will provide storage of at least 110% of the tank's maximum capacity. • Refuelling and maintenance: <ul style="list-style-type: none"> ○ Fuelling and maintenance of vehicles and machinery, and cleaning of tools, will be carried out in a designated area where possible in line with PPG7. ○ Multiple spill kits will be kept on site. ○ Drip trays will be used while refuelling. ○ Regular inspection and maintenance of vehicles, tanks and bunds will be undertaken. <p>Emergency procedure: The Pollution Incident Response Plan will include measures to deal with accidental spillages.</p>	Construction
Operational Environmental Management Document (OEMD)	<p>An Operational Environmental Management Document (OEMD) will be in place throughout the operational phase. Best practice will be followed throughout the operational phase, with reference to the SEPA Guidance for Pollution Prevention (GPPs), and best practice guidance.</p>	Operational
Surface Water Management	<p>It is proposed that drainage of surface water will adopt SuDS principles and be by means of infiltration through a permeable surface, and the underlying permeable reclamation fill, providing treatment.</p> <p>Details of the operational surface water management proposals and methodology will be included within the OEMD and will be submitted to SEPA's operations team for agreement consent. Plans of the surface water management system will be located within the Site office, with foul water systems clearly marked.</p> <p>Where a site use or development proposal is such that it will require a Pollution Prevention and Control (PPC) authorisation from SEPA, then specific processes, techniques and technologies will be included within the surface water management system in that location in order to meet the requirements of the PPC authorisation. Such measures would be in line with best practice guidance.</p>	Operational
Oil, Fuel, Site Vehicle Use and Storage	<p>The proposed development's Pollution Incident Response Plan will be updated for the operational phase of the development, taking full consideration of best practice, statutory requirements and identification of areas of highest sensitivity. It will provide site spill response procedures, emergency contact details and equipment inventories and their location. All operation staff will be made aware of this document, and its contents, and it will be available in the port office. Appropriate spill kits and absorbent materials will be stored in a suitable location which is easy to access. Staff/contractors will be trained in the use of spill kits and other pollution control equipment and the operation of pollution control devices.</p>	Operational
Monitoring and Enhancement	<p>The Developer shall undertake a planned programme of compliance monitoring to verify the effectiveness of the project's environmental management. Monitoring plans will be established and implemented with the agreement of SEPA, SNH and Marine Scotland.</p> <p>Specific auditing and monitoring plans will be developed by the contractor and will cover the following:</p> <ul style="list-style-type: none"> • The contractor's own Environmental Management System; • The CEMD, schedule of mitigation register, relevant legislation and industry good practice; • All project activity; • Roles and responsibilities for those undertaking audits and monitoring; • Frequency of inspection activities (i.e. daily, weekly, monthly); 	Construction/Operational

Feature / Topic	Mitigation	Timing
	<ul style="list-style-type: none"> Process to deal with corrective actions/non-compliance; and Reporting procedures (including non-compliance). 	
Chapter 5: Biodiversity		
Terrestrial Habitats	<p>Terrestrial habitats outwith the footprint of the development should be retained and clearly delimited from the works area in order to reduce the risk of damage.</p> <p>Compensation for lost habitats should be provided through offsite habitat enhancement and creation. A detailed Habitat Management Plan containing a baseline survey of the proposed compensatory habitat area, clear management objectives and actions to meet those objectives, and a monitoring plan will be required.</p>	Construction
Sub-tidal habitats	<p>A silt boom to contain fine sediments will be used whilst land reclamation activities are undertaken.</p> <p>Inert stone material free from fine clays or organic materials will be utilised to form the outer bunds for land reclamation.</p> <p>The principal contractor will produce and implement a biosecurity plan throughout the duration of works. This will include the cleaning of equipment and plant machinery prior to deployment and at regular intervals throughout to reduce risk of transmitting non-native and invasive species. The plan will be submitted to the planning authority and other relevant consultees for approval prior to works commencing and implementation would be audited by the ECoW.</p> <p>Implementation of Ballast Water Management Plan and industry standard ballast water management practices</p> <p>Continuation of the Harbour Authorities biosecurity monitoring programme as detailed in the existing Ballast Water Management Policy</p>	Construction and operation
Otter	<p>All personal on the site should be made aware of the presence of protected species including otter via the site induction and additional task specific toolbox talks as required.</p> <p>A pre-works check for otter should be conducted prior to works commencing on the site and regularly throughout works. If otter are observed on site at any point during construction, works should be halted and advice sought from the environmental advisor. If a resting site is identified either during the pre-works check or during works, a species protection plan will be required and the need for a disturbance licence will be assessed.</p> <p>Where possible construction activities will be confined to daylight hours to reduce disturbance to commuting and foraging otter within the locale.</p> <p>Any artificial light required during construction will be fitted with shades and directed at the required work area only.</p> <p>A strict speed limit for both onshore and marine traffic will be implemented to reduce risk of collision with protected species (15mph on shore and 4 knots within the water).</p> <p>Permanent lighting design will be kept to the minimum required for health and safety and security purposes. All lighting will be fitted with shades and directed and the required areas. The shoreline and surrounding waters will be avoided as far as possible to reduce disturbance to wildlife.</p>	Prior to and during construction and operation
Marine Mammals	<p>All personal on the site should be made aware of the presence of protected species including marine mammals via the site induction and additional task specific toolbox talks as required.</p> <p>A Marine Mammal Protection Plan will be implemented to reduce the risk of underwater noise causing injury to marine mammals. This will involve the use of a trained Marine Mammal Observer (MMO), Passive Acoustic Monitoring (PAM) devices and soft-start techniques for noise generating activities. The MMPP also details protocols to be implemented to reduce collision risk.</p> <p>Implementation of a vessel management plan including agreed routes and speed limits.</p> <p>Safe vessel operation to minimise risk of collision with marine mammals and basking shark to be promoted to users. Training courses such as those provided by the WiSe scheme could be offered at regular intervals.</p>	Construction and operation
Fish	<p>All personal on the site should be made aware of the presence of protected species including fish via the site induction and additional task specific toolbox talks as required.</p> <p>Any artificial light required during construction will be fitted with shades and directed at the required work area only.</p> <p>A Basking Shark Protection Plan will be implemented to reduce the risk of underwater noise causing injury. This will involve the use of a trained Marine Mammal Observer (MMO), Passive Acoustic Monitoring (PAM) devices and soft-start techniques for noise generating activities. The MMPP also details protocols to be implemented to reduce collision risk.</p>	Construction and operation

Feature / Topic	Mitigation	Timing
	<p>The ECoW or MMO should monitor any fish deaths as a result activities such as vibro piling and report these to NatureScot and Marine Scotland (number of fish and species). Consideration should be given to mitigation strategies to reduce fish mortality if it becomes an issue. This can be difficult to do however with some strategies such as the use of netting or bubble curtains sometimes having the effect of preventing fish from moving away from noisy activities.</p> <p>Implementation of a vessel management plan including agreed routes and speed limits.</p> <p>Safe vessel operation to minimise risk of collision with marine mammals and basking shark to be promoted to users. Training courses such as those provided by the WiSe scheme could be offered at regular intervals.</p> <p>Permanent lighting design will be kept to the minimum required for health and safety and security purposes. All lighting will be fitted with shades and directed and the required areas. The shoreline and surrounding waters will be avoided as far as possible to reduce disturbance to wildlife.</p>	
Chapter 6: Archaeology and Cultural Heritage		
Archaeological Investigations	Further archaeological investigation in the vicinity of Site 2 , potentially comprising geophysical survey and/or archaeological trial trenching, will be agreed with OIC in advance of the construction phase of the project. This may lead to further requirements for mitigation, either before or during the construction.	Prior to Construction/Construction
Marine Geophysics	Specialist marine archaeological interpretation of the geophysical surveys which took place in 2021 will be undertaken and submitted to OIC and MD-LOT prior to the construction phase of the project.	Prior to Construction
WSI/PAD	A Written Scheme of Investigation (WSI) and Protocol for Archaeological Discoveries (PAD) to avoid or mitigate accidental impacts and manage any accidental discoveries of archaeological interest will be compiled and submitted for approval to OIC and fully implemented during the construction phase of the project	Construction
Chapter 7: Seascape, Landscape and Visual Impact		
General	No mitigation is proposed	Construction and Operation
Excess unsuitable material	Excess unsuitable material (including topsoil) that cannot be used to form the quayside extending out into the sea will be deposited on land immediately above and to the north east of the proposed cut slope. This material will be deposited to a relatively thin depth and graded out into/integrated with surrounding pastoral farmland. The material would not be deposited in the form of visually obtrusive bunds or mounds. It would visually assimilate with surrounding sloping grazed farmland.	Construction
Chapter 8: Socio-Economics		
Employment opportunities	Requirements upon the contractor to provide local job creation and local training either directly or through supply chain for the construction and operational phases of the development to provide greater and longer lasting benefit to communities.	Construction
Local Businesses	Continue to consult with local businesses, including local tourist groups throughout the proposed development design and construction programme to manage significant inflow of workers during peak tourist season and large scale events on the island.	Construction
Local Businesses	Engage with local businesses, including marine users, to understand their access and operational requirements. Contractor and design team should ensure that current operations at the harbour can reasonably continue during construction of the proposed development and effectively communicate when there are any changes to access (including short term changes).	Construction
Local Community Capacity	Engage with local authority to ensure there is sufficient capacity in council services and infrastructure to accommodate influx in workers.	Construction
Community Benefits	Community benefits and social value should be maximised during the construction period, such as the provision of apprenticeships, training and work experience opportunities. The baseline indicates that the age group 18 – 24 has the highest proportion on the island of being unemployed; targeting this group would maximise benefits and this would represent a significant opportunity to provide long term employment and development of key green skills locally.	Construction
Employment opportunities	New permanent employment opportunities should be made available to local residents in the first instance in combination with appropriate training, support and access to higher skill / paid jobs.	Operation
Local Community Capacity	Continued consultation with Orkney Islands Council and ongoing monitoring of employment forecasts to inform housing need assessments and implications for education and health.	Operation
Local Businesses	Engage with local businesses, including marine users, to understand their access and operational requirements. Design team should at a minimum ensure that current operations at the harbour can reasonably continue during operation of the proposed development and ideally improve access / capabilities of the pier.	Operation
Chapter 9: Airborne Noise		

Feature / Topic	Mitigation	Timing
Construction General	Develop a construction noise management plan to ensure surrounding residents are not impacted by site development activities.	Construction
Operational General	Develop an operational noise management plan to ensure surrounding residents are not impacted by site industrial activities.	Operation
Chapter 10.1: Accidents and Natural Disasters		
Marine Safety	Orkney Islands Council Harbour Authority existing Safety Management System should be updated periodically as harbour operations change or new legislation arises	Construction and Operation
Chapter 10.2: Air Quality		
Construction Dust Risk	<p><u>Communications</u></p> <ul style="list-style-type: none"> • Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager. • Display the head or regional office contact information. • Develop and implement a Dust Management Plan (DMP), which may include measures to control other emissions, approved by the Local Authority. The DMP should include, as a minimum, the measures outlined in this section. <p><u>Site Management</u></p> <ul style="list-style-type: none"> • Record any exceptional incidents that cause dust and/or air emissions, either on- or offsite, and the action taken to resolve the situation in the log book. • Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken. • Make the complaints log available to the local authority when asked. <p><u>Monitoring</u></p> <ul style="list-style-type: none"> • Carry out regular site inspections to monitor compliance with the DMP, record inspection results, and make an inspection log available to the local authority when asked. • Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions. <p><u>Site Maintenance</u></p> <ul style="list-style-type: none"> • Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible. • Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site. • Avoid site runoff of water or mud. <p><u>Operations and Waste Management</u></p> <ul style="list-style-type: none"> • Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems. • Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate. • Use enclosed chutes and conveyors and covered skips. • Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate. <p><u>Vehicle and Plant Operation</u></p> <ul style="list-style-type: none"> • Ensure all vehicles switch off engines when stationary – no idling vehicles. • Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable. <p>These measures will be included within the CEMP or similar which will be produced by the contractor prior to construction and signed off by Orkney Islands Council.</p>	Construction
Chapter 10.3: Carbon, Climate Change and Greenhouse Gas Emissions		

Feature / Topic	Mitigation	Timing
Construction	Opportunities of carbon reduction in the construction phase can be achieved through consideration of alternative/recycled materials, design optimisation, construction site management (e.g. sourcing energy efficient plant) and construction waste management. These examples are discussed in more detail in <i>Section 9.4.4</i> of the Carbon, Climate Change, and Greenhouse Gas Emissions Assessment.	Construction
Operation	Consideration to measures of emission reduction during the operational phase can follow the Energy Hierarchy. This hierarchy suggests the use of a four-tiered approach to reducing operational consumption via <i>Be Lean, Be Green, and Be Seen</i> . Examples of mitigation measures at each stage of the hierarchy are discussed in detail within <i>Section 9.4.4</i> of the Carbon, Climate Change, and Greenhouse Gas Emissions Assessment.	Operation
Chapter 10.4 – Transport Aviation		
Operation	Continuing the discussions with the Kirkwall airport operators (HIAL) to identify suitable mitigation measures such as altering the airports IFP's.	Operation
Operation	Liaison with Loganair regarding flight procedures.	Operation
Chapter 10.5: Transport Roads		
Access road	The creation of an access road which locals can use by car or active travel modes will provide added community benefit, making this section of the coastline accessible.	

11.3 Construction Environmental Management Document

The Schedule of Mitigation would form the basis of the subsequent Construction Environmental Management Document (CEMD).

The CEMD would be a working document which would be updated throughout the construction phase of the project. It would also provide a clear roadmap of the key roles and responsibilities during construction works. An Environmental Manager would be identified who would be responsible for the implementation of the CEMD ensuring that all measures identified within the Schedule of Mitigation are applied and adhered to.

12 SUMMARY OF EFFECTS

12.1 Introduction

The predicted environmental effects related to the construction and operation of the proposed Scapa Deep Water Quay (SDWQ) have been considered throughout the design and subsequent assessment of the development layout. The views of statutory consultees have been taken into account as presented in Chapter 3: EIA Methodology and Consultation.

The final design of the proposed development has been subject to a detailed EIA and design iteration process which has sought to minimise the effects resulting from the proposed development whilst ensuring the maximum benefits to the environment, nearby communities, and future generations. Where appropriate, additional mitigation measures have been proposed as well as opportunities for enhancement. Both mitigation and enhancement measures are detailed within their respective specific chapters and summarised within Chapter 11: Schedule of Mitigation of this EIAR.

The conclusions of each chapter are provided below.

12.2 Water Environment

Assessment of the impacts of the proposed development on the Water Environment in the study area was undertaken and detailed within Chapter 4 of the EIAR. The assessment considered the potential for significant impacts on hydrology, hydrogeology, water quality and coastal processes comprising tides, waves and sediment transport. The assessment concluded that the magnitude of effects of the proposed development were deemed to be negligible (and therefore not significant) prior to mitigation apart from:-

- Groundwater Dependent Terrestrial Ecosystems (GWDTE) during the construction phase, is assessed as having a high magnitude of impact giving rise to effects of major significance;
- The magnitude of impact of sediment discharge and dispersion from dredging works will be low within the dredge area and immediate vicinity;
- Sediment discharge and dispersion from excavation and reclamation works will be low within the immediate vicinity of the reclamation area;
- Pollution incidences during the construction phase were assessed as having a low to high magnitude of impact depending on the scale and nature of the incident; and
- Water Quality during the operational phase were assessed as having a low to high magnitude of impact depending on the scale and nature of the incident.

With suitable mitigation measures identified and in place, the residual effects are subsequently reduced to negligible in their magnitude and therefore not significant for both the construction and operational phases apart from GWDTE's which are considered to be minor. A monitoring programme to verify the effectiveness of the mitigation measures proposed is provided in the Chapter.

Overall, the effects of the proposed development on the Water Environment are considered **not significant**.

12.3 Biodiversity

Chapter 5 Biodiversity considered the impacts of the development on the ecology of both the terrestrial and marine environments. A number of specialist ecological studies were undertaken, which includes a Habitats Regulations Appraisal (HRA), to inform the impact assessment. A number of Important Ecological Feature's (IEF's) considered

in the Chapter were assessed as having a negligible magnitude prior to mitigation measures being implemented apart from:-

- Scapa Flow SPA was deemed to have a low magnitude of impact during the construction and operational phases. For both phases the IEF's were considered to have a low sensitivity;
- Orkney Mainland Moors SPA/ West Mainland Moors SSSI deemed to have a low magnitude of impact during the construction and operational phases. For both phases the IEF's were considered to have a low sensitivity;
- Sanday SAC and SSSI was assessed as having a low magnitude of impact with the SAC/SSSI considered to be of negligible sensitivity during the construction and operational phase;
- Loss of terrestrial and subtidal habitats has a major magnitude of impact for the construction phase only. The receptor is identified as being of high sensitivity;
- Retained terrestrial and subtidal habitats is assessed as being of low magnitude during the construction phase only. The receptor sensitivity is considered to be negligible;
- The impact on otters is assessed as having a low magnitude and the IEF's to be of low sensitivity for the construction and operational phases;
- The impacts on ornithology during both phases of development are identified as having a low magnitude and the IEFs to be of a low sensitivity;
- Seals, harbour porpoise, Minke Whale, Dolphins and Basking Sharks were all deemed to have a low magnitude of impact with the IEF's considered to be of low sensitivity during the construction phase only;
- Marine fish during the construction phase only is assessed as having a low magnitude of impact with the IEF considered to have a negligible - medium sensitivity.
- The commercial fishery during the construction phase only is assessed as being of low magnitude of impact with the IEF considered to have a low sensitivity.

Cumulative impacts on Biodiversity were identified during the construction phase of this development and the extension to Hatston Ferry Terminal to create the Orkney Logistics Base (Hatston) should these phases occur concurrently or sequentially. Both developments are predicted to have cumulative impacts during the operational phases. The magnitude of impacts are considered to be of low – negligible in magnitude and affect a small area of the relative IEFs range for both projects. However alterations to the overall conservation status of the features is not considered likely.

With suitable mitigation measures identified and in place, the residual effects for the IEF's are subsequently reduced to negligible in their magnitude and therefore not significant for both the construction and operational phases apart from the low of small area of Annex I, SBL and Priority Marine Feature (PMF) habitats under the development footprint. This is considered to be significant at site level only. A derogation licence will be required for disturbance to cetaceans and basking sharks during the construction phase. A licence may also be required in relation to destruction of otter resting sites.

Biodiversity enhancements are also identified which should provide benefits to the local biodiversity, creating habitats suitable for a variety of floral and faunal terrestrial and intertidal species. A monitoring programme to verify the effectiveness of the mitigation measures proposed is provided in the Chapter.

Overall, the effects of the proposed development on Biodiversity are considered **not significant**.

12.4 Archaeology and Cultural Heritage

Archaeology and Cultural Heritage of the study area is presented in Chapter 6 of the EIAR.

The construction assessment identified two known historic environment assets, (the dyke and sheep pens) within the development footprint. Although these are considered to be of negligible importance, there would be a high

magnitude of impact as a result of ground-breaking works. However it was concluded this would result in a minor consequence of impact.

A mound with a central depression will be at least partially removed by the development. This would result in a medium impact with an uncertain/moderate consequence of impact. However through implementation of mitigation measures would result in a minor significance of residual effect.

A single marine historic environment asset was identified in the scoping report as being at risk of being impacted by dredging. However, changes to the development design has resulted in the impact of the development will be negligible / nil resulting in a negligible significance of impact.

A review of marine surveys has identified no features of interest, therefore the likelihood of loss of or damage to unknown marine and intertidal historic environment assets is considered low. No submerged paleoenvironmental deposits have been identified within the study area.

The Archaeology and Cultural Assessment of the operational phase of the development identified no significant impacts under the EIA Regulations.

Mitigation and monitoring proposed in the Chapter takes the form of further archaeological investigations, such as specialist marine archaeological interpretation of the geophysical surveys, geophysical survey and or archaeological trial trenching, in advance of construction works which would be agreed with OIC and MD-LOT. A Written Scheme of Investigation (WSI) and a Protocol for Archaeological Discoveries (PAD) to avoid or mitigate accidental impacts and manage any accidental discoveries of archaeological interest will be compiled and submitted for approval to OIC and MD-LOT.

Overall, the effects of the proposed development on Archaeology and Cultural Heritage are considered **not significant**.

12.5 Seascape, Landscape and Visual

The findings of the Seascape, Landscape and Visual Impact Assessment (SLVIA) are presented in Chapter 7 of the EIAR. The Zone of Theoretical Visibility (ZTV) was used to identify viewpoints and key receptors to be considered in the SLVIA including historic environment assets.

Seascape, coastal, landscape and visual effects would be significant and adverse during both the construction and operational phases of the proposed development. Significant effects during construction would be localised and largely associated with visual effects on nearby residential properties. Significant operational effects would be more widespread. The proposed lighting would be a particular source of adverse landscape and visual effects both at a local, i.e. within 2km from the site, and wider scale.

The significant effects on seascape, coastal and landscape character would be associated principally with landscape and coastal areas on the eastern side of Scapa Flow in the southern part of Mainland. Significant seascape, coastal and landscape effects would not extend to areas to the north, south or west of Scapa Flow.

The significant coastal and landscape effects would principally be associated with areas within approximately 2km of the site at the Bay of Deepdale coastal pastures (the host landscape area and coastline) but also extend to adjacent areas on the southern slopes of Gaitnip Hill, immediately to the north, as a consequence of views down across the site. The significant effects relate to the relatively undeveloped nature of this area with an absence of large-scale infrastructure. Although anchored rigs are often positioned out to sea, the coastline itself is relatively undisturbed and inaccessible.

The effect on the Hoy and West Mainland NSA would not be significant.

Major adverse and significant visual effects would similarly principally be associated with residential locations within approximately 2km of the site, however, would extend more widely where sensitive views exist.

Opportunities to mitigate adverse landscape and visual effects are very limited due to the scale of the proposed development and the visually open character of Orkney. Screening the proposed development using either banded material or planting is not feasible due to the exposed coastal location and topographical context.

Overall, the effects of the proposed development on the Seascape, Landscape and Visually are considered **significant**.

12.6 Socio-Economics

The potential for socio-economic effects during the short-term (construction) and long-term (operation) of the development were considered in Chapter 8 of the EIAR. The assessment took account of the cumulative impacts associated with related projects based in and around Orkney that also have the potential to have socio-economic impacts within the local area during the construction phase.

The construction assessments considered the impacts associated with:-

- Temporary increase in employment / jobs for local workers;
- Temporary increase in employment / jobs for national / international workers;
- Economic impacts to local businesses as a result of construction works temporarily residing in Orkney and associated spend;
- On access and operational activities of local businesses and marine users currently using the existing pier;
- On the capacity of local accommodation during peak season and / or during key events and reducing availability of visitors / attendees / organisers out with OIC area; and
- Potential impact during the tourist off-season in relation to additional income.

The magnitude of the impact identified ranged between Moderate adverse in relation to availability of local accommodation during peak season and or during key events to Minor beneficial in relation to increase in local employment, for local businesses and during the tourist off-season.

During the operational phase, the socio-economic impact assessment identified minor beneficial magnitude of impacts associated with new permanent jobs for local workers and an increase in GVA for the Orkney economy. A minor adverse magnitude of impacts was assigned to the capacity of the local community and council services and access and operations for existing local businesses.

The outcomes of the assessment are based on the level of detail known at the time of writing and as such are reflective of the worst-case scenario. However, as the level of certainty increases as the proposed development progresses the positive impacts will potentially increase in magnitude.

Mitigation and enhancement measures were proposed for both the construction and operational phases of the development to reduce adverse impacts and enhance opportunities. With the implementation of these measures the overall effects of the proposed development on socio-economical aspects of Orkney Islands are considered **not significant**.

12.7 Terrestrial Noise

Chapter 9 assessed the potential impact on the local noise environment as a result of the airborne construction and operational activities associated with the development. The assessment concluded that in relation to the

construction noise assessment Neutral impacts are predicted at surrounding residential receptors and therefore no adverse effects are predicted in EIA terms prior to mitigation.

For operational noise, although there will be a slight increase in noise levels at sensitive receptors during the day and night time periods, the significance of the increases are identified as being Neutral / Slight at some receptors and no change for the other receptors considered. No additional mitigation measures are identified above the industry standard measures.

Over all, the effects of the proposed development on Airborne Noise are considered **not significant**.

12.8 Other Issues

Chapter 10: Topics not Requiring Full EIA, covers topics including Accidents and Natural Disasters, Air Quality, Carbon, Climate Change and Greenhouse Gas Emissions, Transport Aviation and Transport Roads. None of these aspects are considered significant in terms of the EIA Regulations.

GLOSSARY

AADT	Annual Average Daily Traffic
AMAAA	Ancient Monuments and Archaeological Areas Act 1979
AOD	Above Ordnance Datum
AQ	Air Quality
BGS	British Geological Survey
BPEO	Best Practicable Environmental Option
CD	Chart Datum
CEMD	Construction Environmental Management Document
CEMP	Construction Environmental Management Plan
CFB	Coastal Flood Boundary
CifA	Chartered Institute for Archaeologists
CIEEM	Chartered Institute of Ecology and Environmental Management
COP	Conference of the Parties
CRTN	Calculation of Road Traffic Noise
dB	Decibel
DTW	Down The Hole
ECOW	Ecological Clerk of Works
EHD	Environmental Health Department
EHO	Environmental Health Officer
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
EIA Regulations	Town & Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017
EnvCoW	Environmental Clerk of Works
GGBS	Ground Granulated Blast-furnace Slag
GHG	Greenhouse Gas
Ha	Hectares
HES	Historic Environment Scotland
HEPS	Historic Environment Policy Statement for Scotland
HGV	Heavy Goods Vehicles
HAL	Highland and Islands Airports
HLA	Historic Land-use Assessment
HRA	Habitats Regulations Assessment
ICE	Inventory of Carbon and Energy
IEF	Important Ecological Features
IEMA	Institute of Environmental Management and Assessment
IES	Institute of Environmental Science
IFPs	Instrument Flight Procedures
IMO	International Maritime Organisation
IPCC	Intergovernmental Panel on Climate Change
JNCC	Joint Nature Conservation Committee
kgCO ₂ e	Kilograms of Carbon Dioxide Equivalent
LBAP	Orkney Local Biodiversity Action Plan
LCT	Landscape Character Types
LCA	Life Cycle Assessment
LPG	Liquified Petroleum Gas
mAOD	Metres Above Ordnance Datum
MD-LOT	Marine Directorate Licensing Operations Team

Marine EIA Regulations
MMPP
MMO
mNNIS
MSA
MVA
MWHS
NIA
NPF
NRA
NRHE
NS
NSA
NTS
O&M
OIC
OICHA
OLBH
OLDP
OW
PAC
PAD
PMF
PoMRA
PPG
pSPA
RAMS
RBMP
RICS
RCP
RSP
SAC
SBL
SDWQ
SEA
SEIA
SEPA
SLVIA
SPA
SPMT
SPP
SSSI
STS
SUDS
SWF
SWMP
UKCP
WCA
WDC
WFD
WSI
ZOI
ZTV

Marine Works (Environmental Impact Assessment) (Scotland) Regulations 2017
Marine Mammal Protection Plan
Marine Mammal Observer
Marine Non Native Invasive Species
Minimum Sector Altitude
MegaVolt Amperes
Mean Water High Springs
Noise Impact Assessment
National Planning Framework
Navigation Risk Assessment
National Record of the Historic Environment
NatureScot
National Scenic Area
Non-Technical Summary
Operations & Maintenance
Orkney Islands Council
Orkney Islands Council Harbour Authority
Orkney Logistics Base Hatston
Orkney Local Development Plan
Orcadian Wildlife
pre-Application Consultation Report
Protocol for Archaeological Discoveries
Priority Marine Features
Protection of Military Remains Act 1986
Pollution Prevention Guidance
Proposed Special Area of Protection
Risk Assessments and Method Statements
River Basin Management Plan
Royal Institution of Chartered Surveyors
Representative Concentration Pathways
Reference Study Period
Special Area of Conservation
Scottish Biodiversity List
Scapa Deep Water Quay
Strategic Environmental Assessment
Socio-Economic Impact Assessment
Scottish Environmental Protection Agency
Seascape, Landscape & Visual Impact Assessment
Special Area of Protection
Self-Propelled Modular Transporter
Scottish Planning Policy
Sites of Special Scientific Interest
Ship-to-ship
Sustainable Urban Draining System
Seawatch Foundation
Site Waste Management Plan
UK Climate Projections
Wildlife and Countryside Act 1981
Wale and Dolphin Conservation
Water Framework Directive
Written Scheme of Investigation
Zone of Influence
Zone of Theoretical Visibility