ENVIRONMENTAL IMPACT ASSESSMENT REPORT

Iona Breakwater Project
Volume II – Main Report

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Prepared by:

RPS

Dr Laura McAnallen CSci C.WEM MCIWEM
Associate - Water Environment & Flood Risk Management

Elmwood House
74 Boucher Road, Belfast
Co. Antrim BT12 6RZ

T +44 2890 667 914
E laura.mcanallen@rpsgroup.com

Prepared for:

Argyll & Bute Council

Elsa Simoes
Infrastructure Design Manager

Argyll and Bute Council
Kilmory, Lochgilphead
PA31 8RT

T 01546 604531
E Elsa.Simoes@argyll-bute.gov.uk

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GLOSSARY

Term	Definition
ABRC	Argyll Biological Records Centre
ACOP	Approved Code of Practice
ADCP	Acoustic Doppler Current Profile
ADDs	Acoustic Deterrent Devices
AIS	Automatic Identification System
AL	Action Level
ALARP	As Low as Reasonably Practicable
ALRS	Admiralty List of Radio Signals
AONB	Area of Outstanding Natural Beauty
APQ	Area of Panoramic Quality
AtN	Aids to Navigation
BAP	Biodiversity Action Plan
BH	Borehole
BPEO	Best Practical Environmental Option
BS	British Standard
BSH	Broad Scale Habitats
BSI	British Standard Institute
BT	British Telecom
BTO	British Trust for Ornithology
CalMac	Caledonian MacBrayne
CCA	Coastal Character Area
CCT	Coastal Character Type
CD	Chart Datum
CEFAS	Centre for Environment, Fisheries and Aquaculture Science
CEMP	Construction Environmental Management Plan
CFP	Computational Fluid Dynamic
CIA	Cumulative Impact Assessment
CIEEM	Chartered Institute of Ecology and Environmental Management
CIRIA	Construction Industry Research and Information Association
CLVIA	Cumulative Landscape and Visual Impact Assessment
COLREGS	Convention on the International Regulations for Preventing Collisions at Sea
DAERA	Department of Agriculture, Environment and Rural Affairs
Db	Decibel
DDC	Drop Down Camera
DECC	Department of Energy and Climate Change
DEM	Digital Elevation Model
DfT	Department for Transport
DHI	Danish Hydraulic Institute
DMRB	Design Manual for Road and Bridges
DRS	Deposit Return Scheme
EA	Environment Agency
EAR	Environmental Appraisal Report
EC	European Commission
ECMWF	European Centre for Medium-range Weather Forecasting
ECoW	Ecological Clerk of Works
EIA	Environmental Impact Assessment

EIAR	Environmental Impact Assessment Report
EMODnet	European Marine Observation and Data Network
EMP	Environmental Management Plan
EUNIS	European Nature Information System
EPR	Extended Producer Responsibility
EPS	European Protected Species
ES	Environmental Statement
GDL	Gardens and Designed Landscape
GDPR	General Data Protection Regulations
GES	Good Ecological Status
GHG	Greenhouse Gas
GIS	Geographical Information System
GLVIA	Guidelines for Landscape and Visual Impact Assessment
GPP	Guidance for Pollution Prevention
GWP	Global Warming Potential
FSA	Formal Safety Assessment
HAS	Highest Astronomical Tide
HD	Hydrodynamic
HER	Historic Environment Record
HES	Historic Environment Scotland
HF	High Frequency
HIA	Health Impact Assessment
HNS	Hazardous Noxious Substances
HRA	Habitats Regulation Appraisal
HSE	Health and Safety Executive
HWDT	Hebridean Whale and Dolphin Trust
IAIA	International Association for Impact Assessment
IAMMWG	Inter-Agency Marine Mammal Working Group
ICC	Iona Community Council
IDA	Industrial Denatured Alcohol
IEFs	Important Ecological Features
IEMA	Institute of Environmental Management and Assessment
IMO	International Maritime Organization
INNS	Invasive non-native species
IOF	Important Ecological Features
IPCC	Intergovernmental Panel on Climate Change
IPH	Institute of Public Health
ISSF	Irish Storm Surge Forecasting
IUCN	International Union for Convention of Nature
JNCC	Joint Nature Conservation Committee
LATN	Local Aids to Navigation
LBAP	Local Biodiversity Action Plan
LCA	Life Cycle Assessment
LCT	Landscape Character Type
LDP	Local Development Plan
LF	Low Frequency
LLA	Local Landscape Area
LNCA	Local Nature Conservation Site
LNR	Local Nature Reserve
LSE	Likely Significant Effect
LULUCF	Land Use, Land Use Change And Forestry

LVIA	Landscape and Visual Impact Assessment
MAIB	Marine Accident Investigation Branch
MARESA	Marine Evidence-based Assessment
MarLIN	Marine Life Information Network
MAU	Marine Analytical Unit
MCA	Maritime and Coastguard Agency
MCL	Morphological Condition Limit
MCS	Marine conservation Society
MHWS	Mean High Water Springs
MLWN	Mean Low Water Neaps
MLWS	Mean Low Water Springs
MNCR	Marine Nature Conservation Review
MoD	Ministry of Defence
MPA	Marine Protected Area
MPS	Marine Policy Statement
MS	Method Statement
MSFD	Marine Strategy Framework Directive
MSL	Mean Sea Level
MSLOT	Marine Scotland Licencing Operations Team
MSS	Marine Scotland Science
MV	Motor Vessel
NBN	National Biodiversity Network
NHS	National Health Service
NIEA	Northern Ireland Environment Agency
NLB	Northern Lighthouse Board
NMBAQC	National Marine Biological Analytical Quality Control
NML	Noise Monitoring Location
NMPI	National Marine Plan Interactive
NPF	National Planning Framework
NRW	Natural Resources Wales
NTS	Non-Technical Summary
NS	NatureScot
NSA	National Scenic Area
NTS	National Trust for Scotland
OD	Ordnance Datum
OEMP	Operational Environmental Management Plan
OPW	Office of Public Works
OREI	Offshore Renewable Energy Installations
OS	Ordnance Survey
PAN	Planning Advice Note
PEA	Preliminary Ecological Appraisal
PEL	Probable Effect Levels
PIN	Planning Inspectorate
PMF	Priority Marine Feature
PMSC	Port Marine Safety Code
PPC	Pollution Prevention Control
PPG	Pollution Prevention Guidance
PPV	Peak Particle Velocity
PSA	Particle Size Analysis
PSD	Particle Size Distribution
PTS	Permanent Threshold Shift

QAF	Quality Assurance Framework
RBD	River Basin District
RBMP	River Basin Management Plan
RNLI	Royal Nautical Lifeboat Institute
RSPB	Royal Society for the Protection of Birds
rWFD	Revised Waste Framework Directive
SAC	Special Area of Conservation
SCOS	Special Committee on Seals
SEIA	Socio Economic Impact Assessment
SEL	Sound Exposure Levels
SEPA	Scottish Environment Protection Agency
SFFS	Scottish Flood Forecasting Service
SHA	Statutory Harbour Authority
SHIIAN	Scottish Health and Inequality Impact Assessment Network
SIMD	Scottish Index of Multiple Deprivation
SINCs	Sites of Importance for Nature Conservation
SMR	Scottish Marine Region
SNH	Scottish Natural Heritage
SoIHC	Sound of Iona Harbours Committee
SOP	Standard Operating Procedure
SPA	Special Protection Area
SPM	Suspended Particulate Matter
SPP	Scottish Planning Policy
SSCs	Suspended Sediment Concentrations
SSSI	Sites of Special Scientific Interest
SW	Scottish Water
SWMP	Site Waste Management Plan
TAN	Technical Advice Note
TEL	Threshold Effect Levels
TNMP	Traffic and Navigation Management Plan
TraC-MImAS	Transitional and Coastal waters Morphological Impact Assessment System
TTS	Temporary Threshold Shift
TTTC	Through the Tide Count
UAV	Unmanned Aerial Vehicle
UKCP	UK Climate Projections
VHF	Very High Frequency
WDC	Whale and Dolphin Conservation
WeBS	Wetland Bird Survey
WFD	Water Framework Directive
WML	Waste Management Licence
WoE	Weight of Evidence
WoRMS	World Register of Marine Species
WoSAS	West of Scotland Archaeology Service
WSI	Written Scheme of Investigation
WWT	Wildfowl and Wetlands Trust
ZoI	Zone of Impact or Zone of Influence
ZTV	Zone of Theoretical Visibility

1 INTRODUCTION

1.1 Context

This Environmental Impact Assessment Report (EIAR) has been prepared by RPS on behalf of Argyll & Bute Council for the proposed Iona Breakwater Project, hereafter referred to as the 'Proposed Development', for which development consent is sought.

The Proposed Development falls under paragraph 10(m) of Schedule 2 of The Marine Works (Environmental Impact Assessment) (Scotland) Regulations 2017 (as amended) ("the 2017 MW Regulations"), and as such an Environmental Impact Assessment must be carried out in support of the Marine Licence Application.

1.2 Purpose of the EIAR

Environmental Impact Assessment (EIA) is a procedure under the terms of European Directives[1] for the assessment of the likely significant effects of a project on the environment. An Environmental Impact Assessment Report (EIAR) is a statement prepared by the applicant, providing information on the likely significant effects on the environment based on current knowledge and methods of assessment. It is carried out by competent experts, with appropriate expertise, to provide informed assessment within their discipline.

The primary objective of the EIAR is to identify the baseline environmental context of the Proposed Development, predict potential beneficial and/or adverse effects of the Proposed Development and propose appropriate mitigation measures where necessary. In preparing the EIAR, the following legal provisions and guidelines were considered:

- European Commission Environmental Impact Assessment of Projects Guidance on the preparation of the Environmental Impact Assessment Report (Directive 2011/92/EU as amended by 2014/52/EU) (European Commission, 2017);
- Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (Environmental Protection Agency, Draft August 2017);
- The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017);
- The Marine Works (Environmental Impact Assessment) (Scotland) Regulations 2017;
- Marine (Scotland) Act 2010.

[1] *EU Directive 85/337/EEC as amended by Directives 2011/92/EU and DIRECTIVE 2014/52/EU*

1.3 Function of the EIAR

This EIAR is a report of the effects, if any, which the Proposed Development, if carried out, would have on the environment, and includes the information specified in Annex IV of the Environmental Impact Assessment Directive and in Schedule 4 of the Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations and the Marine Works (Environmental Impact Assessment) (Scotland) Regulations. The EIAR is the document prepared on behalf of the applicant that presents the output of the assessment conducted on behalf of the applicant, and contains information regarding:

- the Proposed Development;
- reasonable proposed alternatives;
- the baseline scenario;
- the likely significant effects of the project;
- the features and measures to avoid, prevent, reduce or offset significant adverse effects;
- any additional information specified in Annex IV of the EIA Directive and Schedule 4 the Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations and the Marine Works (Environmental Impact Assessment) (Scotland) Regulations; as well as
- the Non-Technical Summary.

The EIAR must include the necessary information for the competent authority to reach a reasoned conclusion and should be of a sufficient quality to enable this judgement. Many of the the requirements and provisions of the Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations and the Marine Works (Environmental Impact Assessment) (Scotland) Regulations aim to ensure that the EIAR is of a sufficient quality to effectively serve this purpose.

The EIAR has been prepared following an examination, analysis and evaluation of the direct and indirect significant effects of the Proposed Development in relation to the receiving environment.

1.4 The Proposed Development

The Proposed Development is described in detail in Chapter 3, and comprises the following elements:

- Construction of a rock armour breakwater located approximately 70m south of the existing slipway in Iona; and
- Minor overburden dredging covering an area of 2,017 m^2 with a dredge removal volume of 1,225m^3

The total duration of the works is expected to be 52 weeks and it is not anticipated that the works will interfere with any infrastructure in the area. Materials will be transported to the site by barge, meaning that disruption to road transport will be minimal.

1.5 Methodology & Structure of the EIAR

The main aim of this EIAR is to provide information on the Proposed Development to the public concerned, prescribed bodies and the competent authority. To this end, Article 3(1) of the EIA Directive requires that significant effects are identified, assessed, and described in an 'appropriate manner'.

Article 5(1) of the EIA Directive sets out the information that should be presented in an EIAR to enable stakeholders and authorities to form opinions, and to make decisions regarding the project. While there are no formal requirements concerning the format and the presentation of the report, this EIAR clearly sets out the methodological considerations and the reasoning behind the identification and assessment of likely significant effects.

1.5.1 EIAR Content

Article 5(1) of the EIA Directive sets out what must be included *as a minimum* in the EIAR. Schedule 3 of the Marine Works (Environmental Impact Assessment) Regulations 2017 specify information to be included in an EIAR:

1. A description of the project and of the regulated activity, including details of the following matters—
    a. the location, size and nature of the project and the regulated activity;
    b. the quantity and nature and source of the materials to be used in the course of the project and the regulated activity;
    c. the quantity, nature and source of any items or materials to be deposited in the sea in the course of the project and the regulated activity; and
    d. the working methods to be used in the course of the project and the regulated activity.
2. A description of the aspects of the environment likely to be significantly affected by the project and the regulated activity, including—
    a. human beings, fauna and flora;
    b. soil, water, air, climate and the landscape;
    c. material assets and the cultural heritage; and
    d. the interaction between any two or more of the things mentioned in the preceding sub-paragraphs.
3. (1) A description, complying with sub-paragraph (2), of the likely significant effects of the project and the regulated activity on the environment resulting from—
    a. the nature of the activities to be carried out and the manner in which they are to be carried out;
    b. the use of natural resources;

c. the emission of pollutants;

d. the creation of nuisances; and

e. the elimination of waste.

(2) The description should cover each of the following categories of effect—

a. direct and indirect effects;

b. secondary effects;

c. cumulative effects;

d. short-term, medium-term and long-term effects;

e. permanent and temporary effects; and

f. positive and negative effects.

4. The forecasting methods used by the applicant to assess the main effects that the project and the regulated activity are likely to have on the environment.

5. A description of the measures envisaged to prevent, reduce and offset any significant adverse effects of the project and the regulated activity on the environment.

6. An outline of the main alternatives studied by the applicant and an indication of the main reasons for the applicant's choice, taking into account the environmental effects of those alternatives and the project as proposed.

7. A non-technical summary of the information provided under paragraphs 1 to 6.

8. Any difficulties, such as technical deficiencies or lack of knowledge, encountered in compiling any information of a kind specified in paragraphs 1 to 6.

1.5.2 Assessment of Environmental Effects

1.5.2.1 Assessment Methodology

The assessment of whether the Proposed Development is likely to have a significant effect on the environment has been undertaken through a variety of methods:

- Professional judgment and experience based on published guidance criteria;
- Assessment of both temporary and permanent effects (direct, indirect, secondary and residual);
- Assessment of interaction and cumulative effects;
- Assessment of duration and reversibility of these effects;
- Assessment against local, regional and national planning policy; and
- Consultation with statutory and non-statutory consultees.

Generally, the significance of effects is determined referring to the Institute of Environmental Management and Assessment (IEMA) guidance as illustrated in Figure 1-1 unless otherwise outlined in specific chapters of this report.

More Significant  **Less Significant**	**Effects which are substantial.** They represent key factors in the decision-making process with regard to development consent. These effects are generally, but not exclusively, associated with sites or features of international, national or regional importance that are likely to suffer the most damaging impact and loss of resource integrity.
	Effects which are major. These beneficial or adverse effects are considered to be very important considerations and are likely to be material in the decision-making process.
	Effects which are moderate. These beneficial or adverse effects may be important but are not likely to be key decision-making factors. The cumulative effects of such factors may influence decision making if they lead to an increase in the overall adverse effect on a particular resource or receptor.
	Effects which are minor. These beneficial or adverse effects may be raised as local factors. They are unlikely to be critical in the decision-making process but are important in enhancing the subsequent design of the project.
	Effects which are negligible. No effects or those that are beneath levels of perception, within normal bounds of variation or within the margin of forecasting error.

Figure 1-1 General categorisation of the scale of significance

The cumulative effects of the Proposed Development, in conjunction with other proposed projects, are considered within each topic chapter. Relevant developments considered within the cumulative assessments include those which are:

- Under construction;
- Permitted, but not yet implemented;
- Submitted, but not yet determined; and
- Identified in the Local Development Plan (and emerging Local Development Plans), recognising that much information on any relevant proposals is limited.

It is noted that projects that are built and operational at the time of submission are considered to be part of the existing baseline conditions.

Each chapter further considers whether there are significant cumulative effects which are likely to arise as a result of interactions within topic chapters and/or as a result of the Proposed Development.

1.5.2.2 Mitigation and/or Compensation Measures

Where required, mitigation measures are identified and described within individual topic chapters. These are measures which could avoid, prevent, reduce and, where possible, offset likely significant adverse effects upon the environment.

The description of mitigation measures includes details regarding the specific adverse effects for which measures are proposed, an assessment of the expected effectiveness, reliability and certainty of the measures, and any commitments regarding their implementation and future monitoring.

1.5.2.3 Monitoring

Further to mitigation measures, appropriate and proportionate monitoring measures are also identified and summarised within individual topic chapters.

Such monitoring measures may arise owing to legislative requirements and/or directly in response to the anticipated effects of the Proposed Development upon environmental factors. Nevertheless, duplication of efforts will be strictly avoided.

1.5.2.4 Conclusion on Likely Significant Effects

A conclusion by the authors of the EIAR on the likely significant effects of the Proposed Development on the environment, taking into account the results of the examination of the information presented in the EIAR is provided. In addition, a summary of the key impacts and mitigation and monitoring measures associated with the Proposed Development is provided, along with a discussion of cumulative impacts, interactions and inter-relationships between environmental topics. This conclusion will inform the reasoned conclusion to be made by the competent authority in conducting the Environmental Impact Assessment.

1.5.3 Structure of the EIAR

The EIAR has been structured in accordance with the European Commission's Guidance "Environmental Impact Assessment of Projects Guidance on the preparation of the Environmental Impact Assessment Report (Directive 2011/92/EU as amended by 2014/52/EU)" (2017). Accordingly, the EIAR:

- Is presented with a clear structure with a logical sequence that describes, inter alia, existing baseline conditions, predicted impacts (nature, extent and magnitude), scope for mitigation, proposed mitigation measures, significance of unavoidable/residual impacts for each environmental factor;
- Contains a table of contents at the beginning of the document;
- Comprises a description of the consent procedure and how Environmental Impact Assessment fits within it;
- Reads as a single document with appropriate cross-referencing and is concise, comprehensive and objective;
- Is written in an impartial manner without bias;
- Includes a full description and comparison of the alternatives studied;

- Makes effective use of diagrams, illustrations, photographs and other graphics to support the text;
- Uses consistent terminology with a glossary;
- References all information sources used;
- Has a clear explanation of complex issues;
- Contains a good description of the methods used for the studies of each environmental factor;
- Covers each environmental factor in a way which is proportionate to its importance;
- Provides evidence of effective consultations;
- Provides a basis for effective consultations to come;
- Makes a commitment to mitigation (with a programme) and to monitoring;
- Contains a Non-Technical Summary which does not contain technical jargon;
- Contains, where relevant, a reference list detailing the sources used for the description and assessments included in the EIAR.

The EIAR is broken down into the Chapters shown in Table 1-1 below.

Table 1-1 EIAR Chapter Structure Breakdown

Chapter Number	Chapter Title	Additional Information
N/A	Glossary	Glossary of terms
1	Introduction	Introduction to the project, purpose and function of the EIAR and methodology and structure of the EIAR.
2	Need for the Project	Description of the current baseline conditions at Iona pier and slipway, the objectives of the Proposed Development and spatial planning policy relevant to the project.
3	Project Description	Description of the Proposed Development being assessed through this EIAR. Includes a description of the site location.
4	Assessment of Alternatives	Summary of alternative options explored as part of the project. Includes strategic level and project level options.
5	Project Scoping & Consultation	Summary of EIA Scoping and consultation undertaken to date.
6	Navigation & Safety	These Chapters address specific environmental factors and provide a description of the existing environment, the likelihood of effects, the significance of effects, remedial and mitigation measures, residual impacts and monitoring measures. The specific environmental factors considered, following Environmental Impact Assessment Scoping as described in Chapter 5 of this report.
7	Terrestrial Biodiversity	
8	Marine Biodiversity	
9	Ornithology	
10	Terrestrial Noise & Vibration	
11	Water Quality	
12	Flood Risk	
13	Coastal Processes	
14	Population & Human Health	
15	Landscape & Visual	
16	Cultural Heritage	

Chapter Number	Chapter Title	Additional Information
17	Waste	
18	Greenhouse Gas Assessment	
19	Risk of Major Accidents & Disasters	
20	Summary of Mitigation Measures	Summary of Mitigation Measures proposed within the EIAR
21	Cumulative Effects & Environmental Interactions	Summary of the assessment of cumulative effects which may arise from adjacent or nearby developments together with those predicted for the Proposed Development as well as the environmental interactions which have been examined within the individual technical assessment chapters.
22	Summary & Conclusions	Summary & Conclusions of EIAR.
23	References & Bibliography	List of references included within the EIAR.

The advantages of using this type of format are that it is easy to examine each environmental topic and it facilitates easy cross-reference to specialist studies undertaken as part of the assessment.

Each topic of environmental assessment is considered as a separate chapter and is drafted by relevant specialists (Table 1-2).

The EIAR is presented in three volumes of the application documentation, as follows:

- Volume I EIAR Non-Technical Summary
- Volume II EIAR Main Report
- Volume III EIAR Technical Appendices

The following companies were involved in the preparation of the EIAR:

- RPS – Lead Environmental consultants
- ABPmer (Global Marine Consultancy Services) – Risk of Major Accidents (Navigation)

The production of the EIAR has been co-ordinated by RPS. The EIAR structure, responsibility and qualified input for each chapter are detailed in Table 1-2.

Table 1-2 List of Contributors to EIAR Chapters

Chapter of EIAR	Lead Author(s)	Company	Subject	Qualifications
Chapter 1	Laura McAnallen	RPS	Introduction	BSc, MSc, PhD, C.Sci, C.WEM MCIWEM
Chapter 2	Laura McAnallen	RPS	Need for Project	BSc, MSc, PhD, C.Sci, C.WEM MCIWEM
Chapter 3	Laura McAnallen	RPS	Project Description	BSc, MSc, PhD, C.Sci, C.WEM MCIWEM
Chapter 4	Laura McAnallen	RPS	Assessment of Alternatives	BSc, MSc, PhD, C.Sci, C.WEM MCIWEM
Chapter 5	Laura McAnallen	RPS	Project Scoping & Consultation	BSc, MSc, PhD, C.Sci, C.WEM MCIWEM
Chapter 6	Monty Smedley	ABPmer	Risk of Major Accidents (Navigation)	BSc
Chapter 7	Julia Ferguson	RPS	Terrestrial Biodiversity	BSc, MSC MCIEEM
Chapter 8	Tessa McGarry	RPS	Marine Biodiversity	PhD, MRes, BSc, MCIEEM
Chapter 9	Simon Zisman	RPS	Ornithology	BSc, MSc, PhD
Chapter 10	Catriona Cooper	RPS	Terrestrial Noise & Vibration	BSc, PG Dip, MCIEH, MIoA, MIAQM
Chapter 11	Mark Magee	RPS	Water Quality	BSc MSc CSci C.WEM MCIWEM
Chapter 12	Diane McGinnis	RPS	Flood Risk Assessment	BEng, CEng, MSc, MIEI, MICE
Chapter 13	Adrian Bell	RPS	Coastal Processes	BSc CEng FIAE FIEI MICE MIStructE
Chapter 14	Senuri Mahamithawa	RPS	Population & Human Health	BSc, MSc, AIEMA
Chapter 15	Raymond Holbeach	RPS	Landscape & Visual	MSc CMIL
Chapter 16	Richard Connolly	RPS	Cultural Heritage	MA, MCIfA FSA Scot
Chapter 17	Ciara Devine	RPS	Waste	BSc, MSc, MCIWM
Chapter 18	Stephen McAfee	RPS	Greenhouse Gas Assessment	BSc,MSc, C.Sci, AIEMA, IAQM
Chapter 19	James Hamilton	RPS	Risk of Major Accidents & Disasters	BSc, MSc
Chapter 20	Laura McAnallen	RPS	Summary of Mitigation Measures	BSc, MSc, PhD, C.Sci, C.WEM MCIWEM
Chapter 21	Laura McAnallen	RPS	Cumulative Effects & Environmental Interactions	BSc, MSc, PhD, C.Sci, C.WEM MCIWEM
Chapter 22	Laura McAnallen	RPS	Summary & Conclusions	BSc, MSc, PhD, C.Sci, C.WEM MCIWEM
Chapter 23	Laura McAnallen	RPS	References & Bibliography	BSc, MSc, PhD, C.Sci, C.WEM MCIWEM

2 NEED FOR THE PROJECT

2.1 Introduction

This chapter of the EIAR details the need for the Proposed Development and examines this in the context of relevant spatial planning policy having regard to international, national, regional, and local policy objectives.

This chapter should be read in conjunction with Chapter 3 'Project Description' which describes the Proposed Development and provides information on the project site, design, size, and other relevant features.

2.2 Project Rationale

2.2.1 Introduction

Iona is a small island located to the west of the Isle of Mull. The Sound of Iona, which is orientated north-by-northeast to south-by-southwest and is open to the Atlantic Ocean particularly from the southwest, separates the Isle of Iona and the Isle of Mull. At Iona, an existing ferry terminal, comprising a pier and a steep slipway, is located within the small village of Baile Mòr. A small-scale passenger ferry operates from this location between the Iona ferry terminal and the Fionnphort ferry terminal, on the Isle of Mull.

As part of the Argyll & Bute Council Local Development Plan (LDP)[2], a new strategy for Oban, Lorn and the Isles was developed in order to address known infrastructure constraints and improve ferry services. More information on the Argyll & Bute LDP can be found in Section 4.2.1 of this report.

2.2.2 Proposed Development Objectives

The overall objective is to provide improved access facilities at Iona for the ferry which operates between the two villages of Iona and Fionnphort, across the Iona Sound.

The current facilities consist of a pier for ferry operations, fishing and some commercial vessels. Berthing is also available for visiting craft. The following parties operate from the pier:

- The Iona ferry route is operated by Caledonian MacBrayne (CalMac) Ferries Ltd with the Motor Vessel (MV) Loch Buie as the assigned vessel. The MV Loch Buie is 30.2m length overall, with a beam of 10m and a draught of 1.6m. The crossing time is typically 10 minutes with the lifeline ferry service providing for passengers and occasional vehicles transported between the islands of Mull and Iona;

[2] Argyll & Bute Local Development Plan - https://www.argyll-bute.gov.uk/ldp

- Crab/fishing vessel operators;
- Leisure boat operators; and
- Private boat owners.

The Iona ferry, operated by CalMac, operates daily all year round with the total number of passengers transported to and from Iona recorded in 2009 as amounting to 232,215[3]. This figure at that time represented a 4.48% increase on the previous year's passenger numbers. Of that figure over 70% were visitors to Iona.

Consultation was undertaken with CalMac to ascertain the number of scheduled and cancelled ferry operations on the return journey from Fionnphort and Iona in recent years. Data was assessed from 2017 – 2022 and is provided in Table 2-1.

Table 2-1 CalMac scheduled and cancelled ferry operations

	Year					2017-2022
	2017/ 2018	2018/ 2019	2019/ 2020	2020/ 2021	2021/ 2022	
Total scheduled return sailings between Iona and Fionnphort	8,400	8,402	5,219	7,653	8,420	**38,094**
Cancelled sailings total	296	346	434	260	520	**1,856**
Cancelled sailings due to weather	268	336	432	249	486	**1,771**
Percentage of cancelled sailings which are attributed to weather						**95.4%**

Over the last five years almost 1,900 scheduled return ferry journeys between Fionnphort and Iona were cancelled. Of these cancellations 95.4% were directly attributed to poor weather conditions, and could therefore have been mitigated, if the current berthing practice was improved.

The current berthing practice at Iona is that after traversing the Sound, the ferry holds its position at Iona using the weight of the ramp and the friction between the ramp and the slipway deck, however the slipway at Iona is currently very vulnerable to waves, particularly from the south, resulting in the ramp of the ferry rising and falling from the deck of the slipway. The instability of the ferry, as a result of swells, presents a risk to both ferry operators, passengers embarking and disembarking, vehicles and other slipway users.

During storm events or periods of intense wave action, the health and safety risk associated with the current berthing practice means that the ferry is not able to operate and results in cancelled sailings. This means that ferry users are not able to access Iona, or in fact, may become trapped at Iona until

[3] Sound of Iona Piers Development Framework and Master Plan (2013)

the ferry is able to operate again. This presents issues such as lack of accommodation (visitor accommodation on Iona is limited to two hotels, a number of B&Bs, self-catering units, and a campsite), with tourists having to sleep in their vehicles[4] and subsequent reputational issues, with tourists unlikely to revisit after having a poor experience. In addition, there is no shelter or indoor waiting area for ferry passengers in times of unfavourable weather conditions. This often presents difficulties when the weather is either wet or windy.

The current berthing practice also has a negative impact on service provision to residents of Iona. These problems have had a direct impact on the lives of the people who live there. A day without a ferry operating results in essential services to the island being affected – medical, educational, refuse collection, business delivery etc.

In addition to improved ferry operation (including health and safety mitigations), the Island and the Sound bring people visiting on holiday including discernible increases in the total numbers of leisure yachts, which sail around Mull and Iona in the summer season berthing within the Sound as a safe overnight mooring. This is an opportunity for these visitors to eat locally as well as stock up on supplies.

The Proposed Development aims to address these issues by making the connection between the Isle of Mull and Iona safer, more efficient, and more attractive to both ferry customers and leisure sailors. The Proposed Development is intended to make the ferry crossings more reliable and safer. It is not intended to increase the frequency of the ferry crossings and thereby no change in vessel traffic is expected as a result of the works.

2.3 Spatial Planning Policy

2.3.1 Introduction

This section of the EIAR considers national, regional and local land use and development policy guiding and regulating the development of the Proposed Development. Figure 2-1 illustrates an overview of the Scottish Planning System and the importance of policy in the assessment of planning applications. The relevant planning policies are set out for each level within the hierarchy in the sections that follow.

[4] BBC News Article 2021 - https://www.bbc.co.uk/news/articles/ce9n25zeyx1o

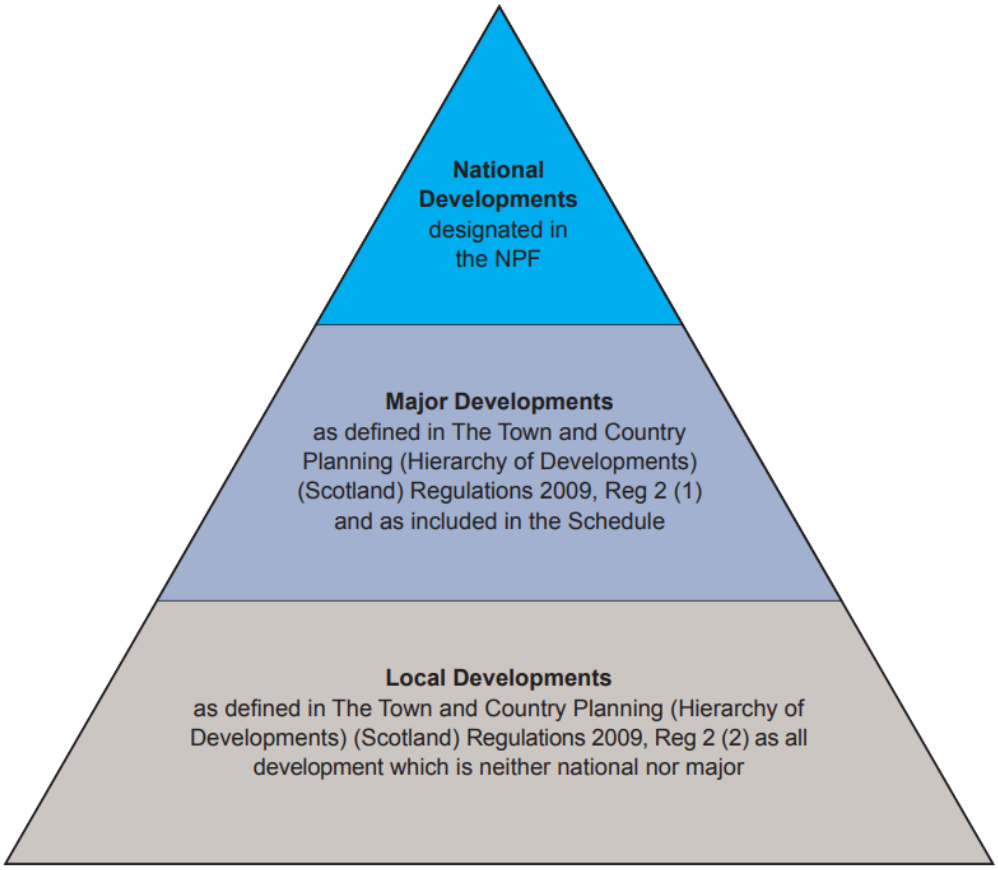

Figure 2-1: Planning Policy Hierarchy (Source: https://www.gov.scot/publications/guide-planning-system-scotland/documents/)

2.3.2 Relevant National Planning and Development Policy

2.3.2.1 Scottish Planning Policy

Scottish Planning Policy (SPP) aims to set out national policies which reflect Scottish Ministers' priorities for the operation of the planning system and for the development and use of land. The SPP promotes consistency in application of policy across Scotland whilst allowing flexibility to account for local variations. It relates to:

- Preparation of development plans;
- Design of development, from concept to delivery; and
- Determination of planning applications and appeals.

2.3.2.2 National Planning Framework

The National Planning Framework (NPF) is a long-term strategy for Scotland which is the spatial expression of the Government Economic Strategy. NPF identifies national developments and other strategically important development opportunities in Scotland. Statutory developments must have

regard to the NPF along with the National and Regional Marine Plans where necessary. Together with SPP, NPF aims to help the planning system to deliver Scottish Government visions for Scotland.

2.3.2.3 Scotland's National Marine Plan

Scotland's National Marine Plan sets out strategic policies for the sustainable development of Scotland's marine resources out to 200 nautical miles. It is required to be compatible with the UK Marine Policy Statement (MPS) and existing plans across the UK. This allows for a review at a national scale of the effectiveness of policies implemented against the plan and the progress made towards securing the objectives set out within the plan. See Section 2.3.3.2 for Regional Marine Plans which fall under Scotland's National Marine Plan.

2.3.3 Relevant Regional & Local Planning and Development Policy

2.3.3.1 Argyll & Bute Local Development Plan

The Argyll & Bute Local Development Plan (LDP) is a planning document, adopted in 2015, focusing both on land and aquaculture. It sets out a strategy for how Argyll & Bute Council wants to see the region develop to 2024 and beyond. Overall, the Argyll & Bute LDP provides an important foundation which port and harbour development projects should build upon. The Proposed Development is important in helping Argyll & Bute Council achieve its development goals by 2024.

It is important to note that an updated LDP (Argyll & Bute LPD2) is currently being prepared by Argyll & Bute Council which will replace the existing LDP that was adopted in 2015.

The LDP takes account of projected population changes, economic changes, transport and infrastructure needs, housing needs, the impacts of climate change, the need to protect and enhance the outstanding natural, built and cultural heritage of the area and the need to improve quality of life for workers, residents and visitors.

The current LDP provides a number of themes including:

- The Settlement and Spatial Strategy – Aims to deliver sustainable growth by steering significant development to existing settlements where essential services, employment opportunities, community facilities and infrastructure assets are found. Furthermore, a network of Key Rural Settlements has been identified to help establish rural growth points.
- Key Policy Themes:
  - Protecting, Conserving and Enhancing Our Outstanding Environment Together – Aims to protect, conserve, and enhance the existing environment through policy and implementation of actions in identified key areas.
  - Creating a Sustainable and Growing Economy Together – Aims to adopt a flexible approach to ensure that economic opportunities can be realised while preserving assets that already underpin the economy.

- Strengthening Our Communities Together – Aims to meet housing needs through a proactive and flexible approach, stimulating the economy by creating employment opportunities, investing in urban areas and green spaces, improving community infrastructure, improving designs of urban areas, improving access to services and community facilities, improving public transport, supporting community plans and local regeneration activities, and creating better recreational and leisure opportunities.
- Maximising Our Resources and Reducing Consumption Together – Aims to establish a land use framework that enables the further development of sustainable growth, especially in the renewables sector.
- Improving Our Connectivity and Infrastructure Together – Aims to ensure integrated land use with regional transport strategies as well as focussing funding on key transport infrastructure and ensuring new developments do not hinder existing infrastructure. There is also a focus on improving designs of new infrastructure to maximise the benefit and reduce impacts where possible.

2.3.3.2 Regional Marine Planning

Regional Marine Plans are implemented at a local level within Scottish Marine Regions, extending out to 12 nautical miles. This allows plans to be developed by Marine Planning Partnerships in order to account for local variations and smaller ecosystem units. These regional plans fall under Scotland's National Marine Plan (see Section 2.3.2.3).

2.3.3.3 Sound of Iona Piers Development Framework and Master Plan

The Sound of Iona Piers Development Framework was developed in 2013 by the Sound of Iona Harbours Committee (SoIHC) in conjunction with Sinclair Knight Metz (SKM). The Master Plan lays out a number of objectives to contribute to the wider regeneration and revitalisation of the settlements on either side of the Sound of Iona. The objectives are as follows:

- Creating safer landing facilities for tourists, fishermen and CalMac staff;
- Developing the marine heritage of the Sound of Iona to support higher forms of tourism activities;
- Improving the local economy by providing a wider range of facilities which build on the existing maritime activities;
- Increasing the attractiveness of the pier areas for visitors and local users; and
- Contributing towards the long-term growth in population within the settlements.

Within the Sound of Iona Piers Development Framework and Master Plan, the Fionnphort and Iona piers are recognised as being essential for the provision of a transport link between Iona and Mull. As such, preparation of this Master Plan involved the examination of a series of development options in and around Iona drawn from existing baseline information, the views of the communities and other key

stakeholders and the analysis of socio-economic target data and notes related to the Ross of Mull. The Sound of Iona Piers Development Framework and Master Plan is provided in Volume III, Appendix 2.1.

3 PROJECT DESCRIPTION

3.1 Location of Project and Site Characteristics

3.1.1 Site Location

Iona is a small island located west of the Isle of Mull, on the west coast of Scotland (Figure 3-1). The Iona Ferry Terminal consists of a slipway and pier jutting out into the Sound of Iona. There is a passenger queueing area along the slipway, but there is no shelter in wet weather. There is no car parking. The National Grid Reference for the site is NM275245. Photographs of the Iona slipway are included in Figure 3-2 and Figure 3-3.

There are multiple sand bars in the Sound of Iona (Figure 3-4), however there is limited migration of the sandwaves, with most of the sandwave crests not moving significantly within six years. The prevailing wind and wave conditions are from the southwest.

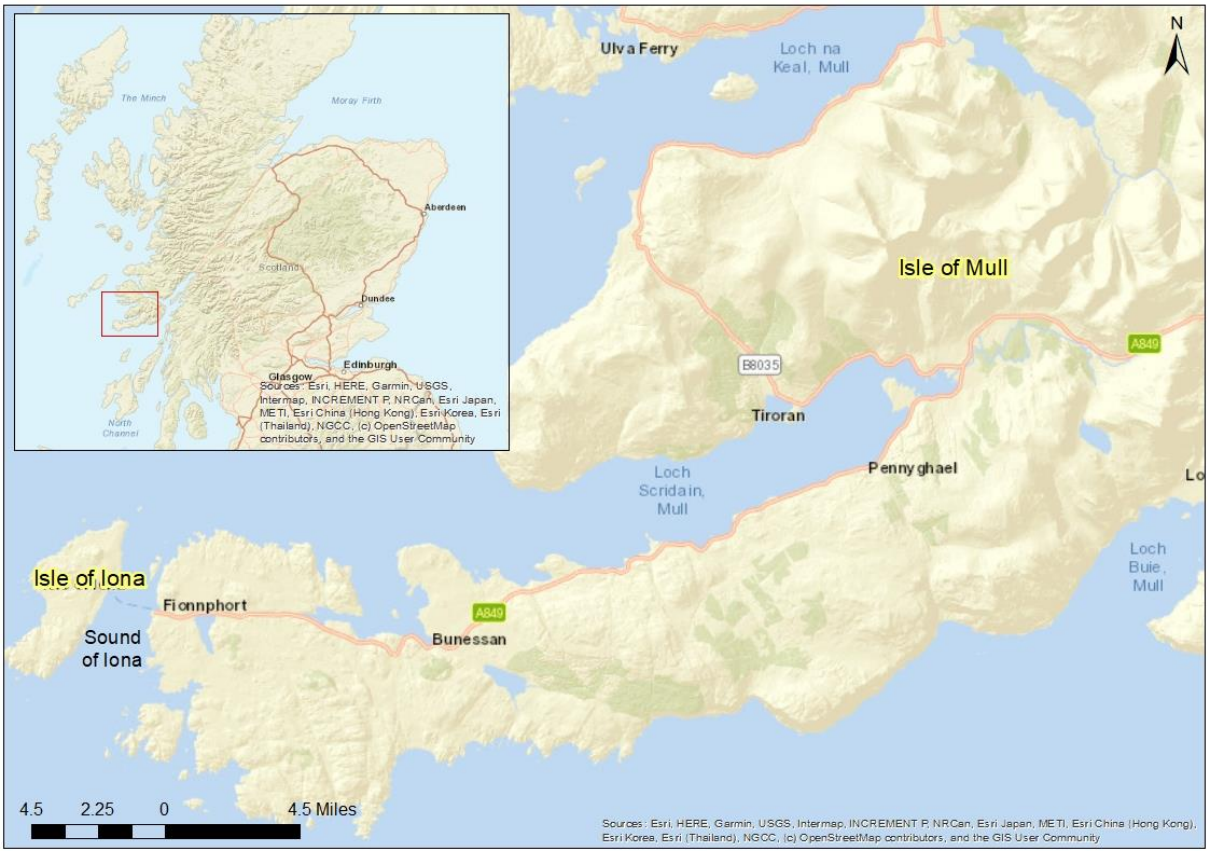

Figure 3-1 Proposed Development (Site Location)

Figure 3-2 Iona slipway (*Image Source: Google.com (dated July 2018)*)

Figure 3-3 CalMac Ferry at Iona (*Image Source: Google.com (dated August 2015))*

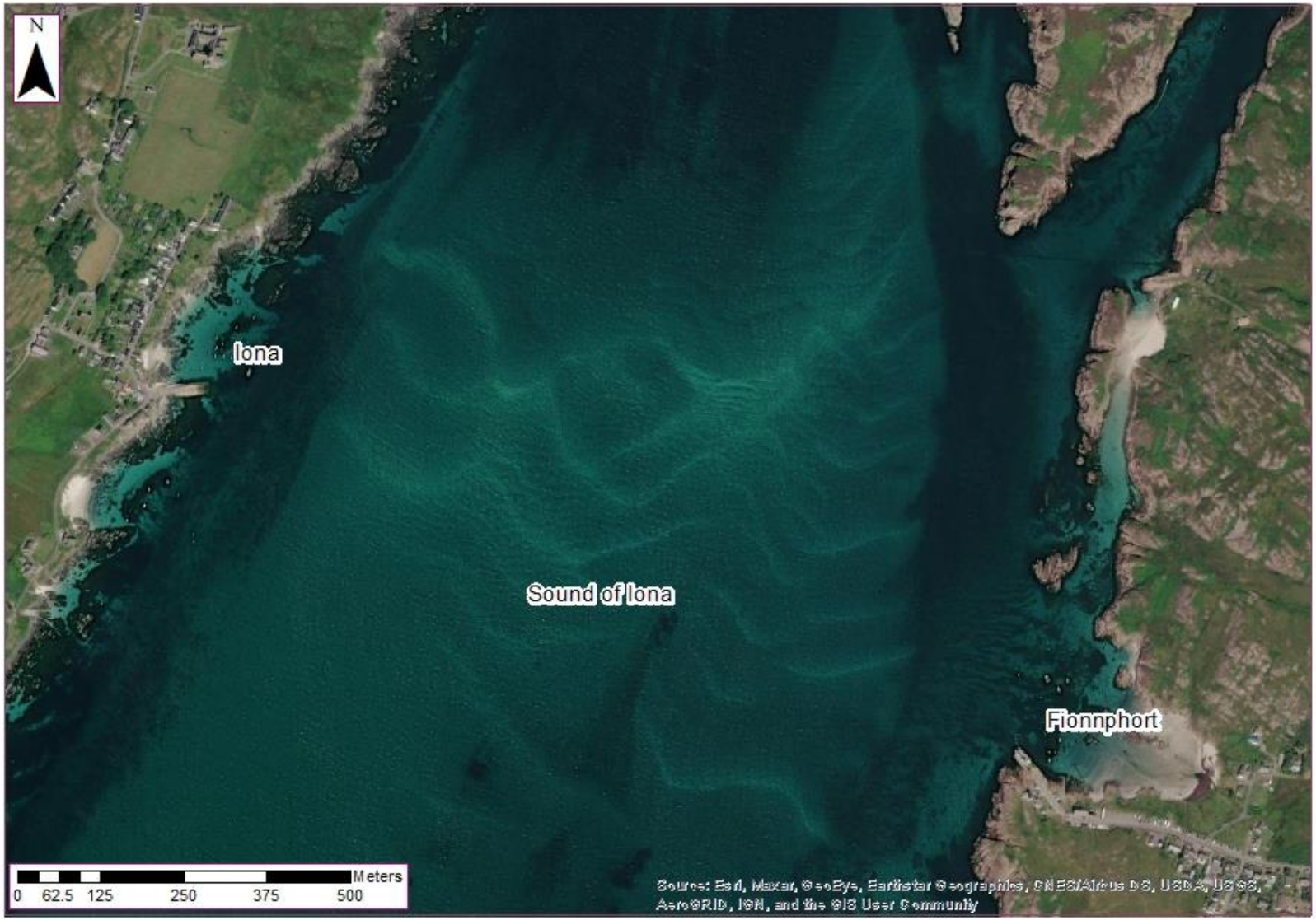

Figure 3-4 Sound of Iona

3.2 Proposed Development

In 2019, a Feasibility Study was undertaken by Byrne Looby (Byrne Looby, 2019) on behalf of Argyll & Bute Council whereby five different options for a rubble mound breakwater, as well as construction methodologies were explored.

The Proposed Development builds on Option 1B of the Feasibility Study (Byrne Looby, 2019). The Proposed Development consists of a new rock armour breakwater and dredging (Figure 3-5). The following detailed drawings are available for reference in Volume III, Appendix 3.1:

- Iona location plan, ownership boundary and site boundary;
- Iona existing general arrangement and elevation;
- Iona proposed general arrangement and elevation;
- Iona proposed sections and typical details; and
- Proposed dredge deposit location.

The Proposed Development consists of the construction of a new rock armour breakwater (185m crest length) to the south of the existing slipway. Minor overburden dredging (2,017m^2 area, 1,225m^3 dredge volume) will be required in order to accommodate the new navigation channel requirements. Descriptions of these proposed activities are provided in the sub-sections below.

Earlier iterations of the breakwater design include for berthing piles, which were subject to some of the early baseline environmental assessments included in Volume III Appendix, which have fed into the final assessments. All piling has been removed from the final design of the Iona breakwater. The early baseline environmental assessments therefore considered a development with a greater potential environmental impact than is actually proposed. The analysis of environmental impact for the proposed development is therefore rigorous and robust for the final design at Iona. All final assessments included in Sections 6- 19 of the EIAR have considered the environmental impact of the most up to date breakwater design at Iona.

3.2.1 Rock Armour Breakwater

The function of the structure is primarily to provide defence from waves propagating from the prevailing southerly direction and provide protection for slipway users and ferry vessels. The breakwater will result in an overall reduction of wave heights at the slipway. This will significantly reduce the risks to ferry operators and passengers and vehicles boarding and disembarking the ferry. The reduction in wave height provides a greater grip between the ferry ramp and the slipway deck.

The design details of the rock armour breakwater are listed below:

- The breakwater will be located approximately 70m south of the existing slipway in Iona.
- Crest length of circa 185m.
- 2:1 slope on outer face (non-slipway side) and 1:1.5 on the inner face (slipway side).
- The proposed maximum crest level will be 7.71m CD.
- Due to high flows through the crest during storm conditions, the crest width will be 4m.
- The base of the breakwater will be lined with a tear resistant geotextile membrane with the bedding placed on top of this layer comprising a 500mm deep layer of 300-1000kg graded rock.
- The core will be constructed of 1000 – 3000kg graded rock.
- The outer layer will be constructed of 3000-6000kg graded rock.
- A 3m wide and 2.5m high toe will be constructed on each face of 3000-6000kg graded rock. The toe will not be visible as it will be under a layer of sediment. Therefore, an area of sediment will need to be excavated, however this material will be replaced after construction is complete.
- At the end of the breakwater, a 5:1 batter will be constructed of 1000-3000kg of graded rock.
- The overall footprint of the breakwater is approximately 2.18ha.
- The rock armour breakwater will be constructed of clean quarried rock.
- The estimated volume of rock armour required for the proposed breakwater is 149,812 tonnes.
- It is likely that local sources of rock armour will not be suitable, however Glensanda Quarry (Aggregate Industries) in Oban has been identified as a quarry which will be capable of producing rock armour material to a grading sufficient for the application at Iona. The quarry is equipped with marine loading facilities.

Figure 3-6 and Figure 3-7 illustrate the design of the proposed breakwater in more detail.

3.2.2 Dredging

In order to accommodate the new navigation channel requirements, some dredging works will be required, however these will be minor in nature and comprise overburden dredging only (Figure 3-5). The approximate dredge area is 2,017m^2. The approximate dredge volume to be removed is 1,225m^3. It is proposed that this is carried out by a backhoe dredger, with the material deposited at the location shown in Figure 3-8.

In November 2020, Argyll & Bute Council commissioned Structural Soil Limited to undertake a ground investigation at the Proposed Development site. This included three seabed sediment cores within the dredge area and six grab samples in the vicinity of the breakwater. The sediments were analysed for a suite of chemical parameters and screened against Marine Scotland Revised Action Levels (AL) 1 and 2, in order to identify any contamination which may be present. All samples within the dredge area were below the revised AL1 and AL2 Action Levels. See Table 5-1 for further information.

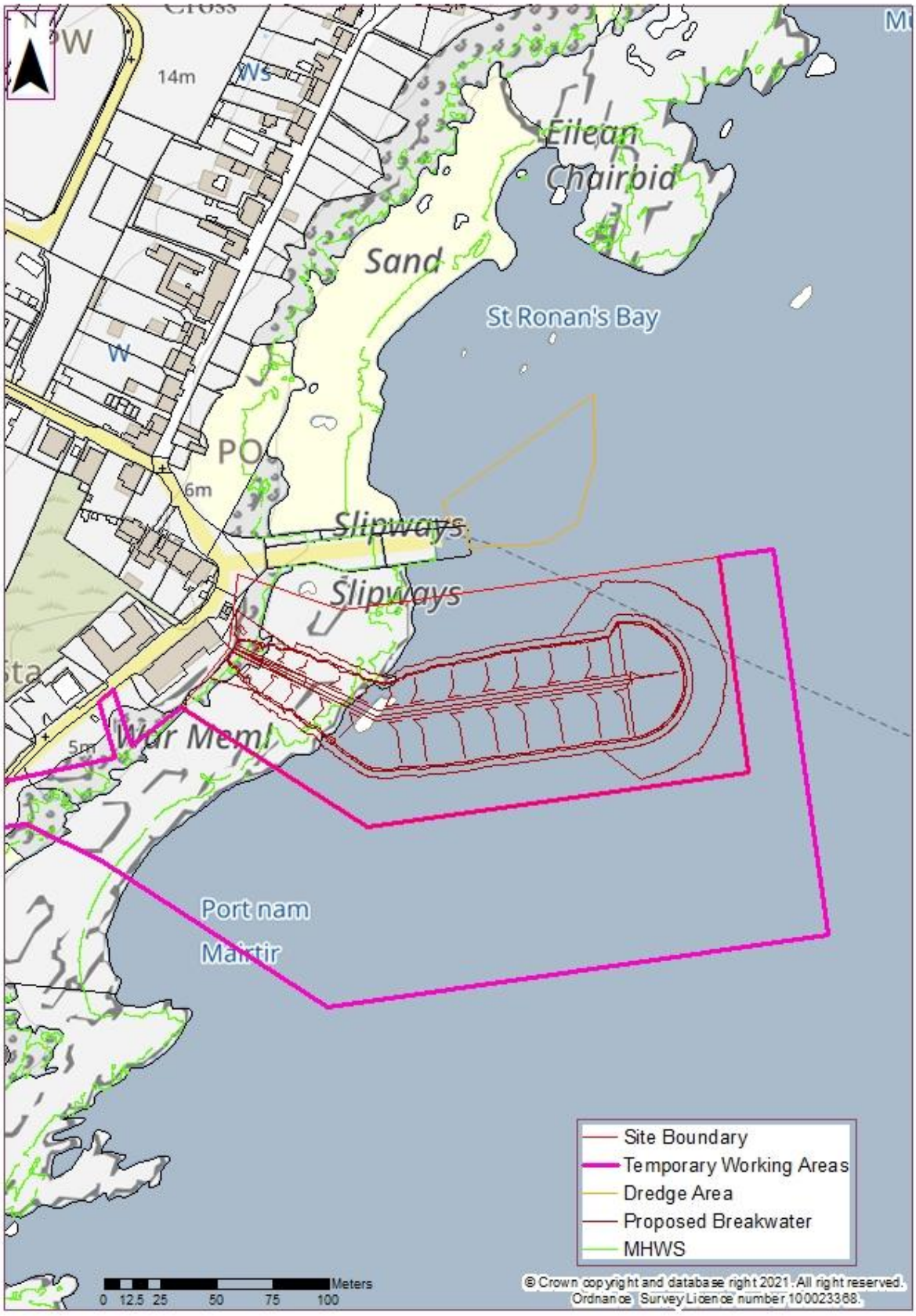

Figure 3-5 Proposed Development Overview, Site Boundary and Working Areas

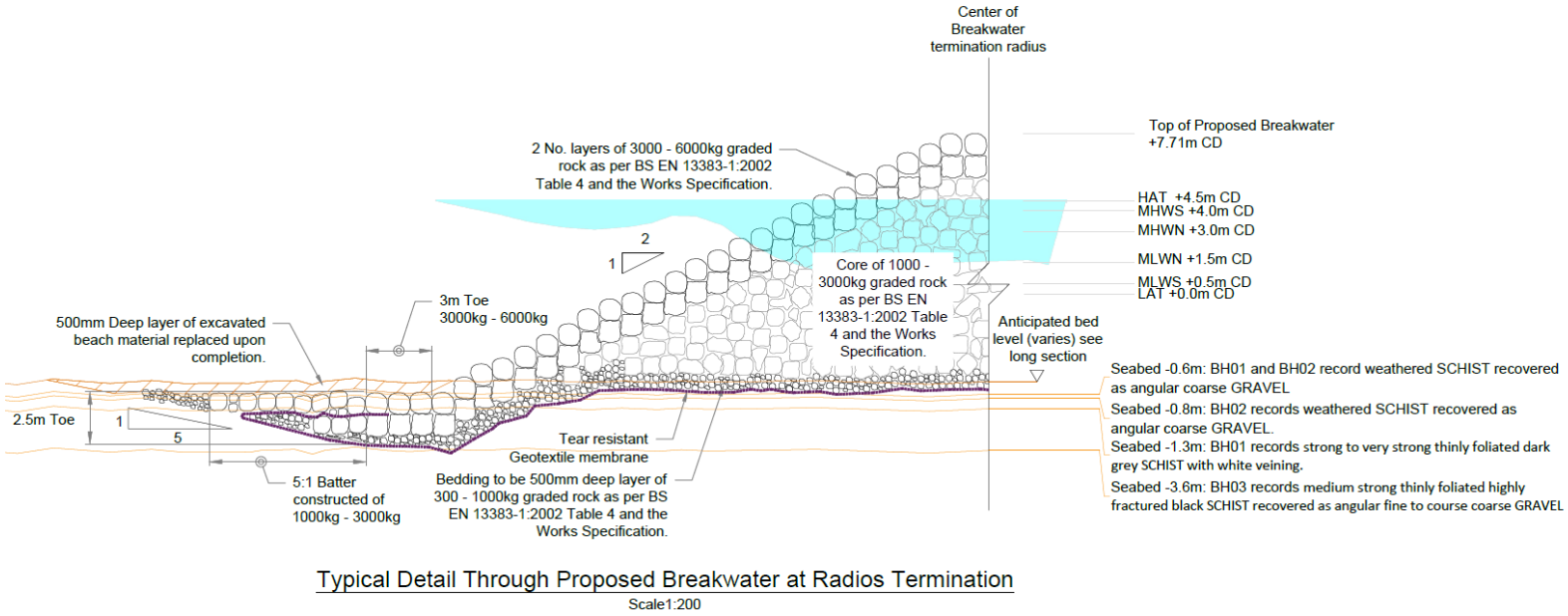

Figure 3-6: Proposed Breakwater Design (End of Breakwater)

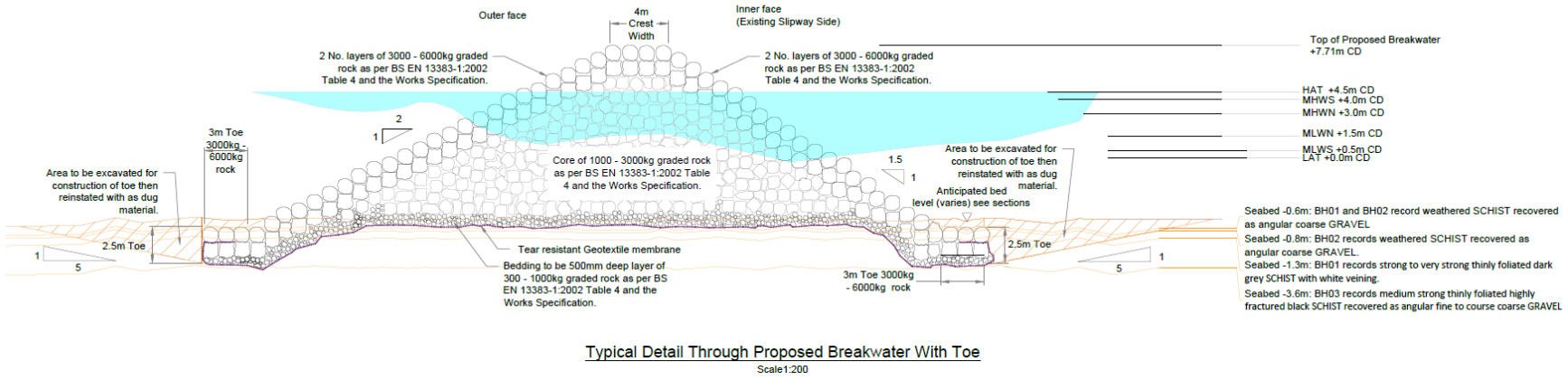

Figure 3-7: Proposed Breakwater Design (Cross Section)

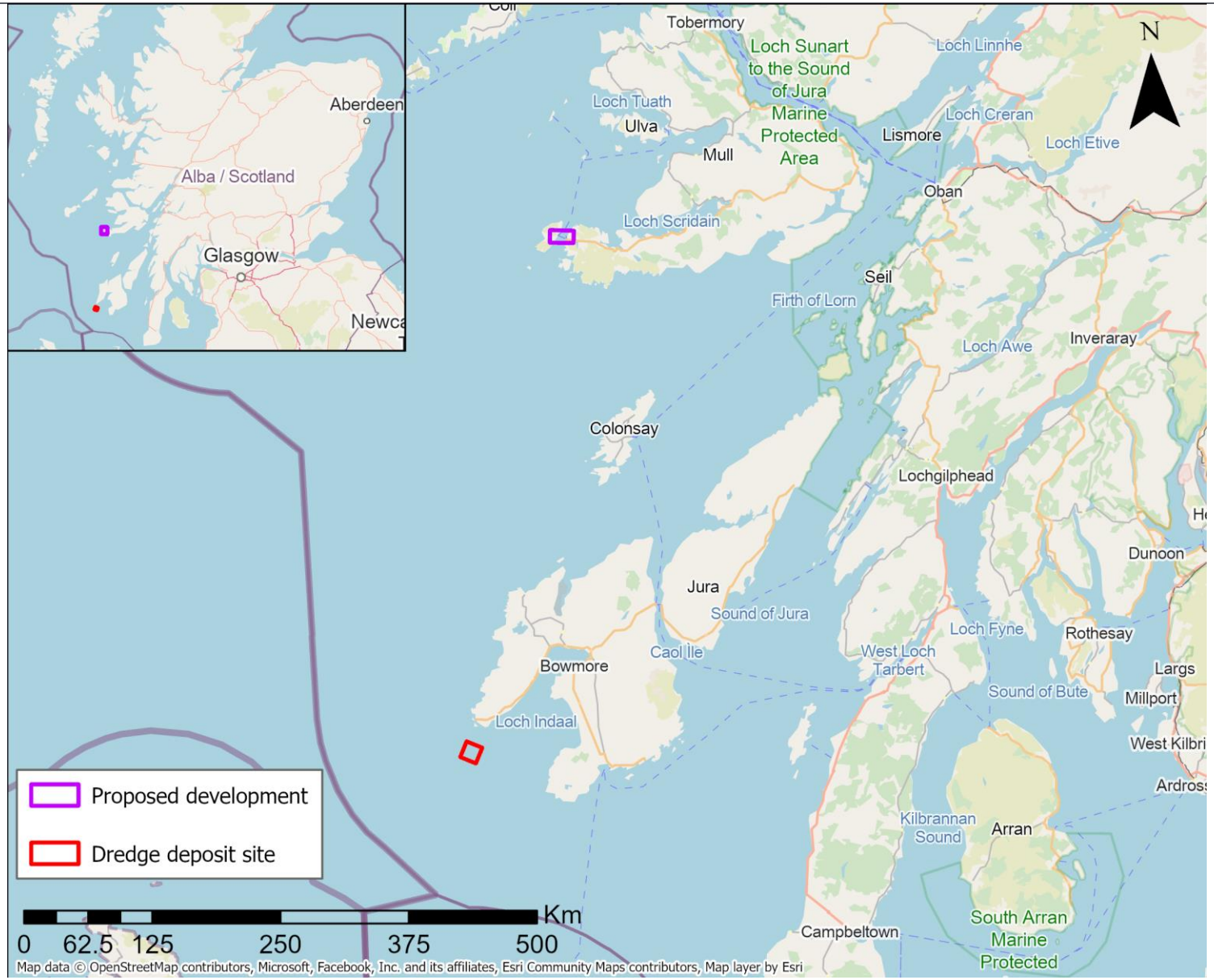

Figure 3-8: Potential dredge deposit location (shown in red)

3.2.3 Other Technical Information relating to Proposed Development

- Design Life: The design life of the structure is 120 years in accordance with the UK National Annex to BS EN 1990:2002, Category 5.
- Transport of Material to site: Materials are expected to be transported to site by barge and installed from a barge. Transport by road will be minimal – there is no estimated impact on the road transport network.
- Duration of Works: The duration of the works at Iona is estimated to be 52 weeks.
- Dredging: It is expected that dredging work will last for a maximum of 1 week. The dredge pocket will be undertaken prior to breakwater construction.
- Maintenance: Maintenance dredging will be required after construction is complete. The frequency of maintenance dredging will be established as part of the construction contract following the construction of the breakwater. Maintenance of the breakwater will be required as rock armour will move/adjust for a period of time. The defect period is expected to be 104 weeks during which the breakwater will be monitored, and any movement recorded and reported. After this, the breakwater will be inspected as part of the ongoing seabed bathymetric surveys regime. Systematic surveying of the UK's coastal waters is administered by the Maritime and Coastguard Agency (MCA) under the Civil Hydrology Programme[5].
- Services: Mains electric is known to be present well to the north of the site and the proposed works will have no interference with these services.
- Current ferry services: Given that the breakwater is proposed to be located c.70m south of the existing slipway, it is expected that current ferry operations are not likely to be disturbed during the construction phase. Dredging activities are expected to be undertaken overnight to minimise any disturbance during this time.

3.3 Outline Method Statement

The outline method of construction is likely to be:

1. Undertaking of site dilapidation survey and level surveys as required to show the condition of the surrounding area and roads prior to the start of the works.
2. Site welfare facilities, site compound and storage areas established within the area. The site boundaries on land around the site compound and storage areas shall be defined with Heras fencing. Working area over water shall be marked with indicative safety buoys deployed at approx. 10m centres to delineate.

[5] The Civil Hydrography Programme - https://www.gov.uk/guidance/the-civil-hydrography-programme

3. Dredging Works:

    a) Mobilisation of dredging plant to site.

    b) Pre-dredge bathymetric survey.

    c) Removal/relocation of existing private moorings and buoys from within the site boundary, working areas and dredging area and subsequent installation of the moorings at temporary locations nearby.

    d) Dredge pocket to the northeast of the existing Iona slipway as shown in Figure 3-5. As part of the dredging is along the ferry route, the dredging operations shall be overnight or as arranged with the ferry operator CalMac Ferries Ltd.

    e) Post-dredge bathymetric survey.

4. Construction of Breakwater:

    a) Mobilisation of plant and operations team to site.

    b) Rock armour and materials for breakwater delivered to site by barge. Rock armour can be stored below MHWS on the south side of the proposed breakwater.

    c) Removal of existing toilet block septic tank outfall pipe with concrete surround.

    d) Formation of breakwater footprint.

    e) Installation of Geotextile membrane.

    f) Installation of secondary rock and primary rock to existing seabed level.

    g) Partial reinstatement with new pipe and concrete surround (the section from the septic through the breakwater to where it breaks through the south face only).

    h) Installation of inner core & primary rock armour.

    i) Installation of beacon access steps.

    j) Installation of navigation beacon to crest of breakwater.

    k) Reinstatement of breakwater toe to existing seabed level with site won seabed material.

    l) Disposal of surplus seabed material in accordance with Marine Dredging Licence.

    m) Installation of final length of pipe and concrete protection for the toilet block septic tank outfall to reinstate its original length.

    n) Installation of rock armour along shore between existing slipway and south end of existing restaurant.

    o) Reinstatement of private moorings and buoys to final, permanent locations.

    p) Removal of safety buoys marking out the site.

    q) Installation of security gate.

r) As-built surveys.

s) Demobilisation.

t) Submission of Health and Safety File.

It should be noted that a Construction Environmental Management Plan (CEMP) which will include a Traffic & Navigation Management Plan (TNMP) and a Method Statement (MS) will be prepared by the successful contractor. The Planning Schedule of Conditions should include a requirement for a CEMP, TNMP & MS prior to construction commencing in the usual manner.

4 ASSESSMENT OF ALTERNATIVES

4.1 Introduction

Assessment of reasonable alternatives is mandatory under the EIA Directive. The process allows for adjustment to minimise environmental impact thus minimising significant effects on the environment.

Alternatives are different ways of carrying out a Project in order to meet its agreed objective(s). There are a range of alternative types that can be considered in relation to a Project. These relate to the following:

- Design;
- Technology;
- Location;
- Size; and
- Scale.

The assessment of alternatives for the Proposed Development has been undertaken in accordance with the following guidance documents:

- The EU Commission's Environmental Impact Assessment of Projects Guidance on the Preparation of the Environmental Impact Assessment Report (Directive 2011/92/EU as amended by 2014 /52/EU)
- NatureScot's Advice Environmental Impact Assessment Handbook: Guidance for competent authorities, consultation bodies, and others involved in the Environmental Impact Assessment Process in Scotland (2018)
- SEPA's notes on Marine Development and Marine Aquaculture Planning Guidance (2014).

4.2 Examination of Strategic Level Alternatives

4.2.1 Argyll & Bute Local Development Plan

In the Argyll & Bute Local Development Plan (LDP), the council lays out its '*Settlement and Spatial Strategy'*, in which one of the key objectives for Oban, Lorn and the Isles is:

> *"A better connected and accessible place with improved ferry services, road, rail, air and active travel links together with improved telecommunications networks and broadband coverage."*

Further to this under '*Key Policy Theme: Improving our Connectivity and Infrastructure Together'* Argyll & Bute Council list the enhancement of key ports and harbours as a key issue for the LDP in terms of connectivity. It is also highlighted that the continual improvement of strategic links (including lifeline ferry services) is a key aim of the LDP up to 2024.

Overall, the Argyll & Bute LDP provides an important foundation which port and harbour development projects should build upon. Therefore, the Proposed Development is important in helping Argyll & Bute Council achieve its development goals by 2024.

4.2.2 Sound of Iona Piers Development Framework and Master Plan

In July 2013, the Sound of Iona Harbours Committee (SoIHC) awarded Sinclair Knight Merz (SKM) a commission to undertake a Master Plan of the piers at both Iona and Fionnphort. Preparation of this Master Plan involved the examination of a series of development options in and around Iona drawn from existing baseline information, the views of the communities and other key stakeholders and the analysis of socio-economic target data and notes related to the Ross of Mull.

Following commissioning, an Interim Report was produced on 3 October 2013 which identified and reported on lessons learned and the opportunities for future development. This report also described studies on related areas at Lindisfarne in Northumberland, northeast England, and St David's in Pembrokeshire, southwest Wales. The Interim Report identified the baseline conditions which formed the Inventory of Findings on which the recommendations on Master Plan options in and around the piers at Fionnphort and Iona. The key development factors included:

- A broad range of costs;
- Feasibility and timescales;
- Advantages and disadvantages;
- Delivery; and
- Source of funding.

These summaries are, by their nature, outlines, and intended to inform thinking and priorities at a strategic level rather than offering detailed analysis on individual development options. The main findings identified that, as a major project activity, the Proposed Development will require a significant investment in its design, consenting, and construction. The precise location of the breakwater would be dependent on detailed technical studies including hydrographical, bathymetric and marine geotechnical surveys in the first instance, together with detailed modelling and analysis to understand issues such as wave propagation and energy absorption, residual wave conditions within the protected waters, the impact on currents and the risks of any resultant erosion/accretion of mobile sands and sediments. The approach would also need careful assessment to ensure the safe navigation of vessels.

It was identified that the form of the breakwater would require careful consideration. The requirement considered a rock boulder breakwater, in order to permit tidal flows through the body of the breakwater whilst absorbing the energy of waves impacting the breakwater; or a reef breakwater permitting waves and high water to pass over the top. However, feasibility of this would be determined by detailed survey and design. Any design concepts should also be considered alongside ferry passenger management to ensure limited disruption to current services.

4.3 Examination of Project Level Alternative Options

Upon completion of strategic level studies to identify the options available, project level studies were undertaken. This section of the EIAR describes the project level evolution of the design of the proposed works required to achieve the objective of the Proposed Development. The key objective is to create a safer, more efficient and more attractive ferry service that links the Isle of Mull and the Isle of Iona, as outlined in the Argyll & Bute Council LDP.

4.3.1 Do Nothing Option

The overall objective is to provide improved access facilities at both Fionnphort and Iona for the ferry which operates between the two villages across the Sound of Iona. The Iona ferry route is operated by Caledonian MacBrayne (CalMac) Ferries Ltd with the Motor Vessel (MV) Loch Buie as the assigned vessel. The MV Loch Buie is 30.2m length overall, with a beam of 10m and a draught of 1.6m. The crossing time is typically 10 minutes with the lifeline ferry service providing for passengers and occasional vehicles transported between the islands of Mull and Iona.

The ferry holds its position at Iona using the weight of the ramp and the friction between the ramp and the slipway deck, however the slipway at Iona is currently very vulnerable to waves, particularly from the south, resulting in the ramp of the ferry rising and falling from the deck of the slipway. The instability of the ferry as a result of wave action presents a risk to both ferry operators, passengers, vehicles and other slipway users.

During storm events or periods of intense wave action, the risk associated with the current berthing practice means that the ferry is not able to operate. This means that ferry users are not able to access Iona, or in fact, may become trapped at Iona until the ferry is able to operate again. This presents issues such as lack of accommodation, with tourists having to sleep in their vehicles[6] and subsequent reputational issues, with tourists unlikely to revisit after having a poor experience.

The current berthing practice also has a negative impact on service provision to residents of Iona. These problems have had a direct impact on the lives of the people who live there. A day without a ferry operating results in essential services to the island being affected – medical, educational, refuse collection, business delivery etc.

In the 'Do Nothing' scenario, i.e., in the absence of the Proposed Development, ferry service provision will continue to be impacted by poor weather, presenting a continued health and safety risk to ferry operators, passengers, vehicles and other slipway users.

Tourists visiting the Isle of Iona will continue to be impacted by disturbances to the ferry operations which could potentially have negative consequences for future tourist numbers and consequently, the tourist economy of the island.

[6] BBC News Article 2021 - https://www.bbc.co.uk/news/articles/ce9n25zeyx1o

Residents of Iona will continue to be impacted by disturbances to the ferry operations, which will continue to impact on the delivery of essential services.

4.3.2 A New Pier Attached to the South Side of the Existing Slipway

A new pier could be built along the southern side of the slipway so as to cut off waves coming from the dominant south to south westerly wave direction. This structure, shown indicatively in red in Figure 4-1, would extend beyond the end of the existing slipway so as to shelter the ferry when it is loading and unloading at the slipway.

Figure 4-1 Indicative layout of pier at slipway

While this new pier would only have a small additional footprint on the seabed, and is in an area of the coast which is already impacted by the existing concrete slipway, the level of the crest of the new pier would have to be very high to prevent any wave overtopping during storms up to a 1 in 1 year return period event. Pedestrians waiting to board the ferry would be very vulnerable to any wave overtopping as they would be unable to see the waves coming and would thus be more susceptible to injury from overtopping waves. The net result of this is that the crest level of the pier would need to be excessive thus making the new structure very visually intrusive. Furthermore, during periods when waves approach the slipway from the north, the wave reflections from the northern side of the new pier would make conditions at the slipway considerably worse than they are at present.

As the tides in the Sound of Iona are relatively strong, any pier jutting out from the coastline will result in an accelerated flow around the end of the pier. If the pier is close to the slipway, then this would result in a significant navigational hazard as the ferry approaches or leaves the slipway. This results from the impact of the accelerated tidal flow around the end of the pier on the ferry as it enters or leaves the shelter of the pier; when half of the ferry will be in the accelerated tidal flow while the other half of the ferry will be sheltered. This will result in the ferry being slewed around by the accelerated tidal flow, which could lead to a serious accident.

Given the tidal and wave conditions at Iona, the construction of a pier attached to the existing slipway would present a very significant navigational hazard and thus is not a safe option for this site.

4.3.3 A Traditional Pier Located 50m to the South of the Existing Slipway

A traditional pier could be constructed some 50 metres to the south of the slipway as indicated in red in Figure 4-2 and the northern face of the pier would provide berthing for local boats and visiting yachts.

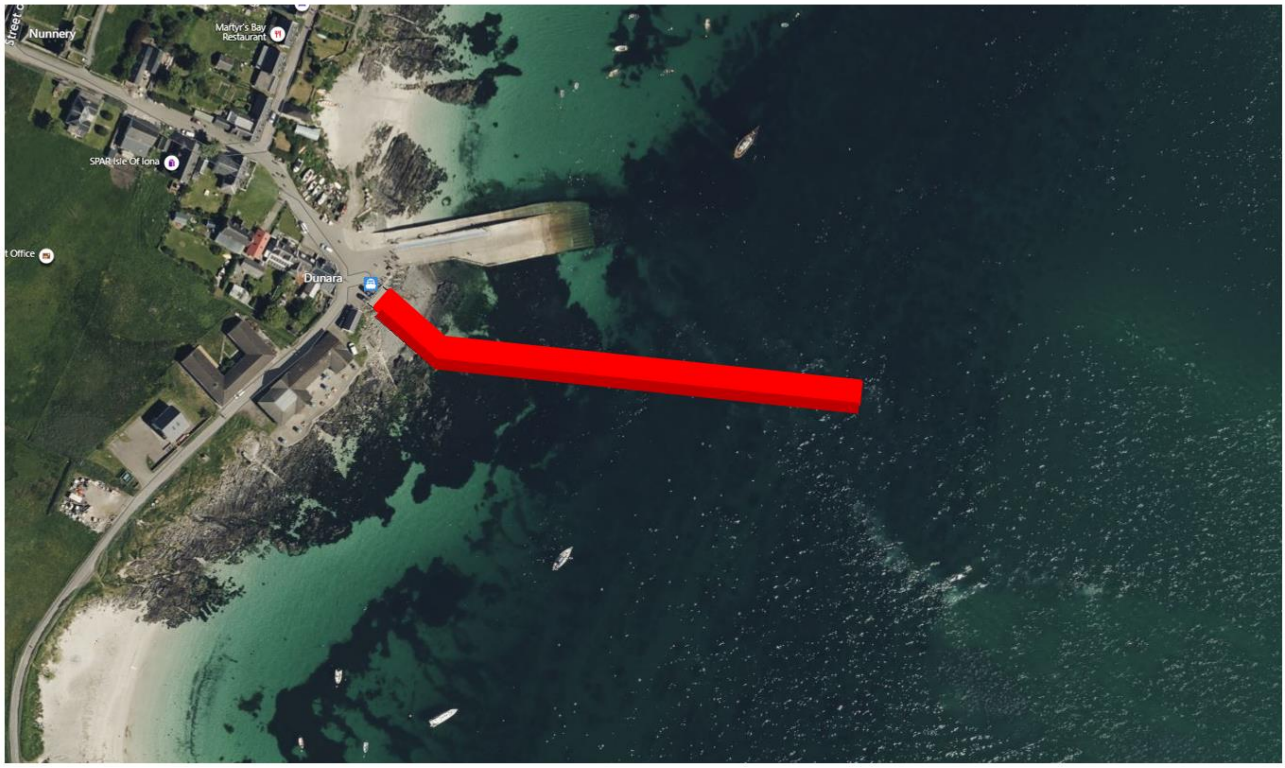

Figure 4-2 Traditional pier located 50m to the south of the slipway

The outer end of this pier would be at a sufficient distance from the slipway for the acceleration of the tidal currents around the end of the pier not to impose a navigational constraint when the ferry is approaching the slipway and this traditional, vertical faced, pier would have a relatively small footprint on the seabed. However, wave reflections from this structure would have an influence on the wave climate approaching Martyrs Bay during southerly storms and, in particular, on the slipway during times when waves approach from the northerly sector. Local scour from wave reflection along the face of the pier will also substantially increase the impact of the pier on the seabed and, unlike rubble mound breakwaters, the pier structure would not provide any additional habitat for marine life.

While this pier could provide extra berthing space for visiting boats during good weather, the crest wall on the southern side of the pier would need to have a very high crest level to prevent excess overtopping, being a danger to those using the pier in bad weather. This would make the pier very visibly intrusive.

The impact of wave reflection from this pier makes a vertical faced structure unsuitable for this site.

4.3.4 Rubble Mound Breakwater

The assessment of vertical faced piers/breakwaters indicated that these types of structure were unlikely to provide a feasible solution for this project and that the use of a rubble mound (rock armour) breakwater with its wave absorbing characteristics and increased habitat for marine life would be more suited to the environment at this site.

As previously mentioned, in a 2019 Feasibility Study by Byrne Looby (Byrne Looby, 2019), five different options for a rubble mound breakwater, as well as construction methodologies, were explored with regard to the Proposed Development. The five options are presented in this section as well as resources, materials and constructability information.

4.3.4.1 Byrne Looby – Option 1A

Option 1A comprises a breakwater development approximately 70m south of the existing slipway in Iona. The overall length of the breakwater crest is 140m. The breakwater comprises a rock armour structure with a proposed slope of 1 in 1.5. The function of the structure is primarily to provide defence from waves propagating from a southerly direction. This option was discounted as Option 1B provided greater wave reduction. Figure 4-3 shows an outline map of Option 1A.

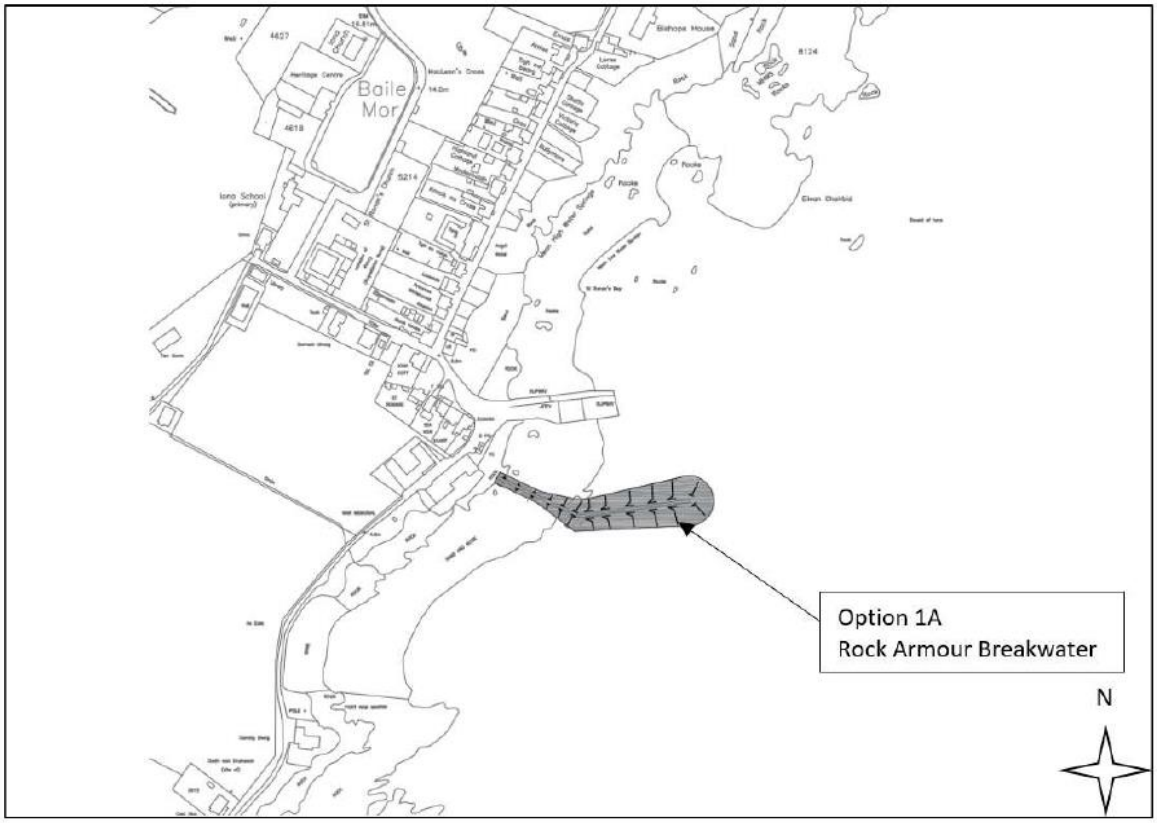

Figure 4-3 Option 1A

4.3.4.2 Byrne Looby – Option 1B

Option 1B comprises an extension of Option 1A and has an overall crest length of 177m. It is located approximately 70m south of the existing slipway in Iona. The breakwater comprises a rock armour structure with a proposed slope of 1 in 1.5. The function of the structure is primarily to provide defence from waves propagating from a southerly direction but is anticipated to provide greater protection than Option 1A and it also provides protection for future longer ferry vessels.

The structure is likely to have a negative impact on the typical track of the ferry; however, it is understood that the vessel operator will alter their course in a more northerly trajectory when approaching the slipway. It should be noted that this was selected as the preferred option. Figure 4-4 shows an outline map of option 1B.

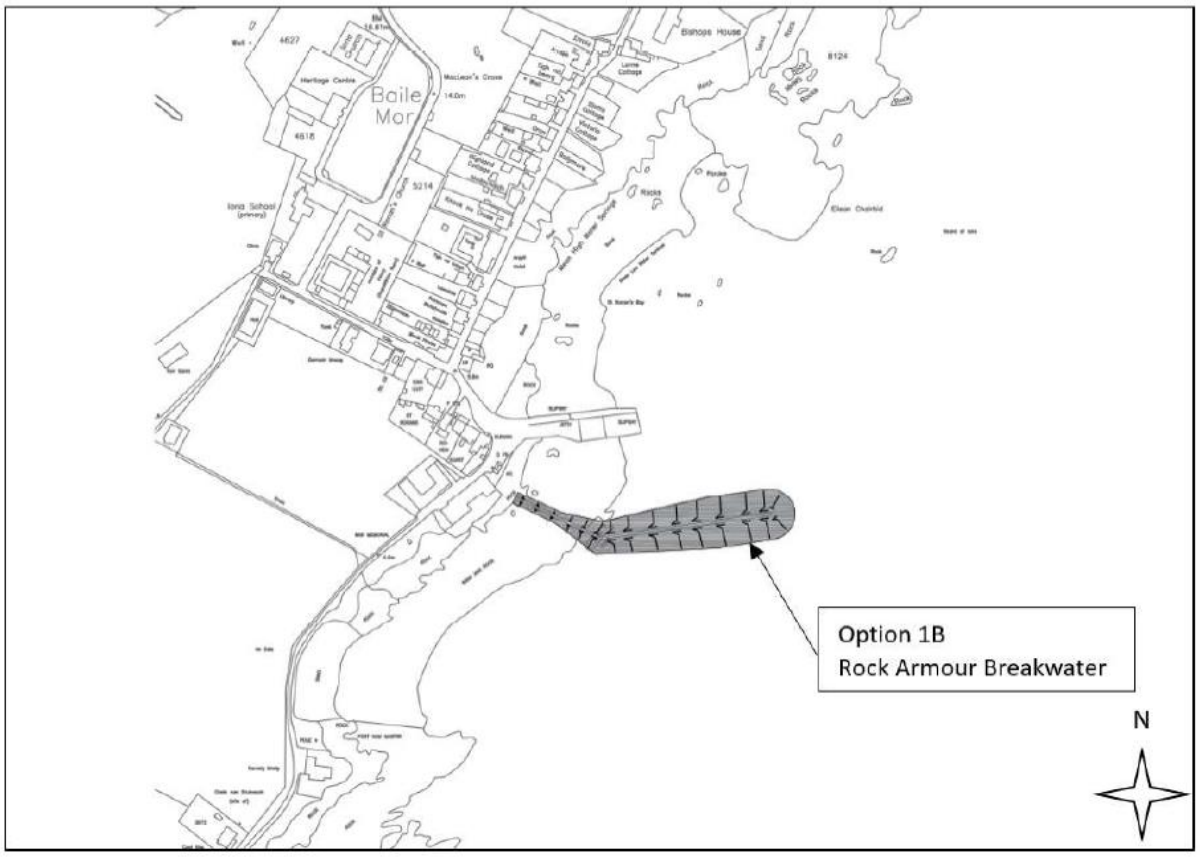

Figure 4-4 Option 1B

4.3.4.3 Byrne Looby – Option 2A

Option 2A comprises a breakwater with an approximate crest length of 140m located approximately 210m south of the slipway at Iona. The breakwater comprises a rock armour structure with a proposed slope of 1 in 1.5. The function of the structure is primarily to provide defence from waves propagating from a southerly direction. It extends from an existing natural rock outcrop which provides some natural protection to the slipway and comprises two legs; leg 1 extends approximately west to east, and leg 2 extends in an east-north-east direction. This option was discounted as Option 1B provided greater wave reduction. Figure 4-5 shows an outline map of Option 2A.

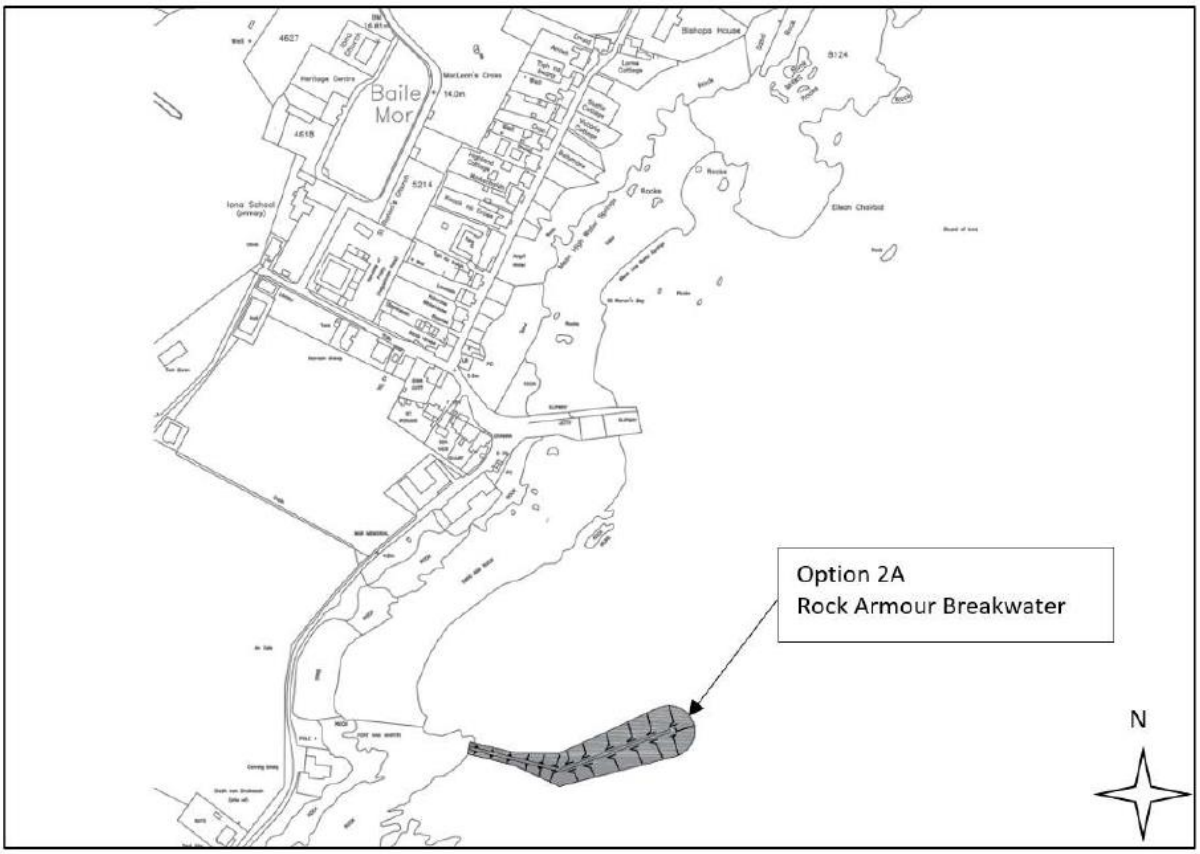

Figure 4-5 Option 2A

4.3.4.4 Byrne Looby – Option 2B

Option 2B comprises an extension of Option 2A and has an overall crest length of 235m. It comprises the first two legs of Option 2A, with a third leg extending in a north-easterly direction. The breakwater comprises a rock armour structure with a proposed slope of 1 in 1.5. The function of the structure is primarily to provide defence from waves propagating from a southerly direction but is anticipated to provide greater protection than Option 2A. This option was discounted due to high capital development costs. The option would also provide only marginal wave reduction. Figure 4-6 shows an outline map of Option 2B.

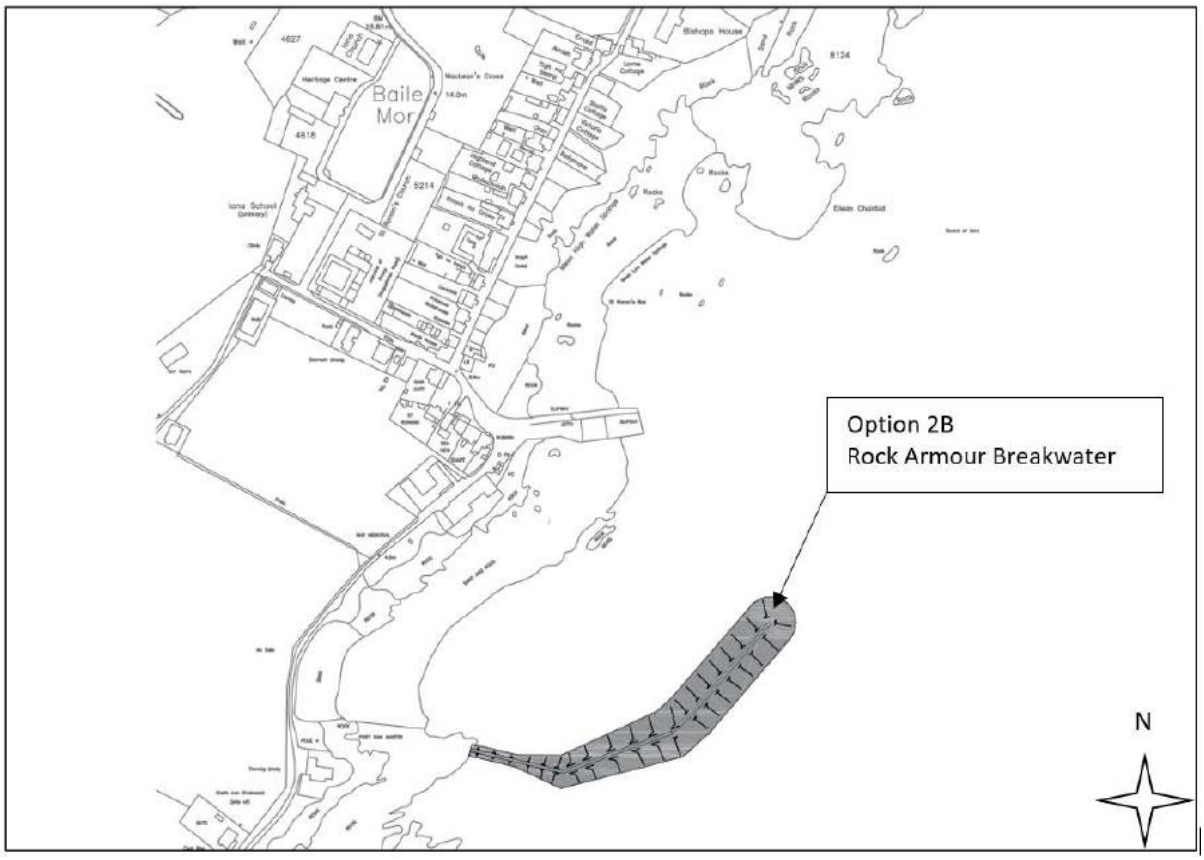

Figure 4-6 Option 2B

4.3.4.5 Byrne Looby – Option 3

Option 3 comprises Option 2B to the south with an additional breakwater to the north. The purpose of the northern breakwater is to provide additional protection from waves incident from the north. The northern breakwater comprises a rock armour structure with a crest length of 118m. The southern end of the north breakwater is approximately 170m from the slipway. This option was discounted due to high capital development costs. There was also strong local opposition due to the proximity of the option to Iona Abbey. Figure 4-7 shows an outline map of option 3.

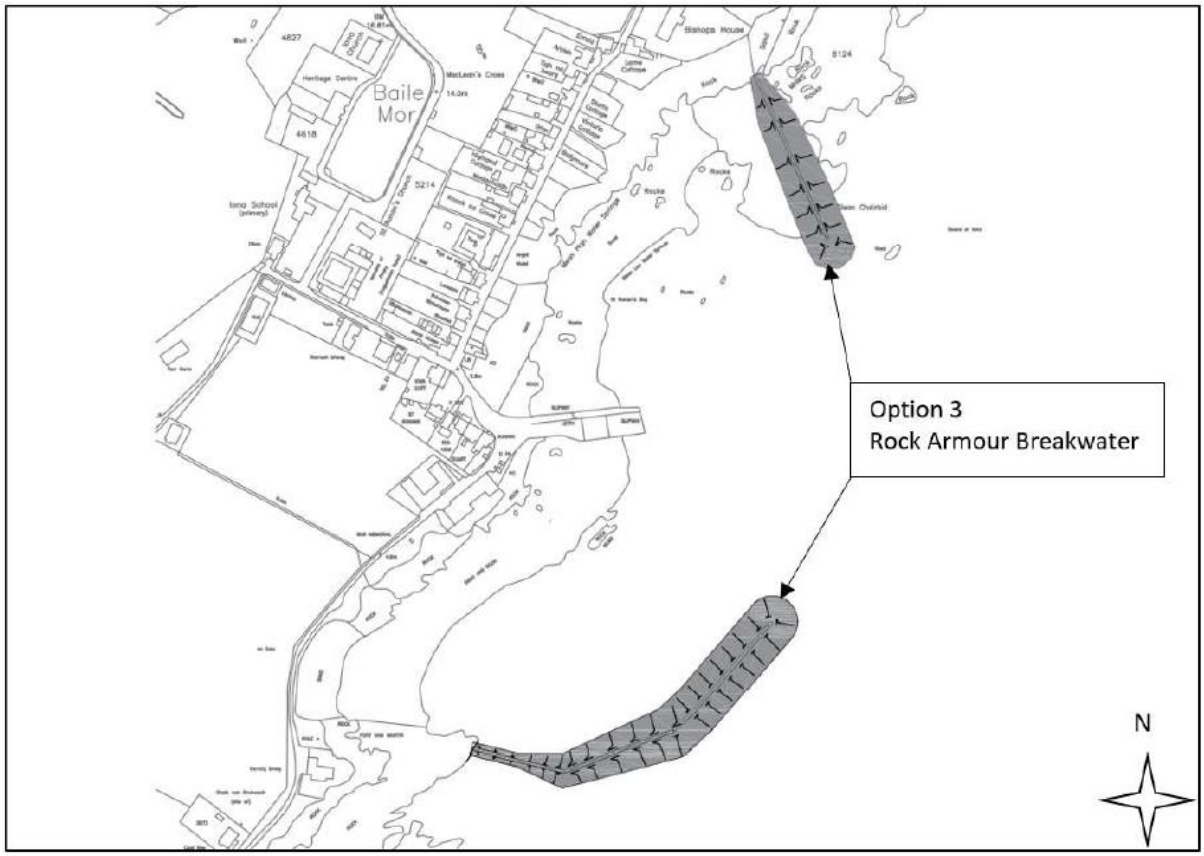

Figure 4-7 Option 3

The 2019 Byrne Looby Feasibility Report identified that the existing marine infrastructure between Fionnphort and Iona is in urgent need of investment. The primary investment required is the installation of coastal protection structures in order to reduce wave heights and reduce safety risks to passengers and operators. Option 1B was selected by Byrne Looby as the preferred option at Iona. This layout was generally accepted by the stakeholders, provides a good degree of protection to the slipway and is a medium cost solution. It is noted however that this structure will not provide protection from waves incident from the north or east. The estimated cost of this development at the time of writing was £9.9m.

4.4 Summary of Consideration of Alternative Options

At a strategic level, the Argyll & Bute LDP provides a number of key connectivity and infrastructure improvement goals that the council aims to achieve by 2024. The LDP is a key document, and all development of harbour and port infrastructure should be carried out in such a way that these goals can be realised.

Building on the themes laid out in the LDP, the Sound of Iona Piers Development Framework and the Master Plan identified that development of a breakwater, pier extension or pier repair was vital to the improvement of transport links between Mull and Iona.

While the Sound of Iona Piers Development Framework and Master Plan did not outline a preferred option moving forward, it did bring a number of different avenues to the attention of the SoIHC and provided a more detailed outline of ways to improve the infrastructure in the Sound of Iona, building upon the goals of the LDP.

The Proposed Development is therefore concluded to be an essential step in building upon the foundations laid down in the LDP and developing some of the options presented in the Sound of Iona Piers Development Framework and Master Plan in more detail.

At design level, there were a number of different options considered for a return period of 1 year, which led to the adoption of a rubble mound breakwater as the optimum type of structure for the site at Iona. The 2019 Byrne Looby Feasibility Study examined the location for a suitable rubble mound structure and, after analysis of costs, constructability, hydrodynamic modelling, surveys and consultation responses, Option 1B was selected as the preferred option. The preferred option identified by Byrne Looby was then taken forward and adapted by Argyll & Bute Council. As such, in 2020, Argyll & Bute Council commissioned JBA Consulting to undertake a morphodynamic modelling assessment to investigate the impact of the proposed new berthing facilities on sedimentation at Iona and to assess how the new berthing facilities would impact the morphodynamics in the Sound of Iona and determine areas where significant sedimentation or erosion would occur.

In 2021, Argyll & Bute Council appointed RPS to undertake an expert review of all works carried out to date. This included the requirement for more detailed information relating to crest levels and overtopping, toe design and the interaction with tidal, flow or sediment transport regimes within the Sound. As such, Argyll & Bute Council, aided by RPS, have refined the preferred option on the basis of findings from coastal process hydrodynamic modelling, as presented in Chapter 3. In particular, detailed Computation Fluid Dynamic (CFD) breakwater overtopping modelling was undertaken to refine the breakwater cross section and crest levels to reduce the height of the breakwater, to reduce the visual impact of the proposed structure while ensuring that it remains effective.

5 PROJECT SCOPING & CONSULTATION

5.1 Introduction

The Proposed Development has been brought forward for development based on the objectives of the Argyll & Bute LDP, the Sound of Iona Piers Development Framework and Master Plan, and the preferred option has built upon the Byrne Looby Feasibility Study. The process of early consultation has enabled Argyll & Bute Council to solicit opinions on general development options for the Iona Breakwater and facilitated differing perspectives to be taken into account in the initial stages of the project.

The Environmental Impact Assessment (EIA) Directive provides for a mandatory scoping process. Scoping for the Proposed Development was undertaken in accordance with the European Commission's 2017 "Environmental Impact Assessment of Projects Guidance on Scoping", which states:

> "*It is good practice to carry out Scoping even if it is not required by legislation: Developers should endeavour to include a Scoping stage in their work programme for EIA, so that all of the concerns can be identified and addressed during the Scoping stage*."

The purpose of the EIAR scoping process is to identify the issues which are likely to be important during the environmental impact assessment and to eliminate those that are not relevant. The scoping process identifies the sources or causes of potential environmental effects, the pathways by which the effects can happen, and the sensitive receptors, which are likely to be affected. It defines the appropriate level of detail for the information to be provided in the EIAR. The primary focus of scoping is to define the most appropriate assessment of significant effects related to the Proposed Development.

In relation to consultation, the EIA Directive, implementing legislation and guidance documentation make clear that there are specific requirements regarding the use of the EIAR, both as a tool to inform concerned stakeholders and the public, as well as to make decisions regarding development consent for projects. Accordingly, this EIAR provides evidence of effective consultations which have already taken place and provides the basis for effective consultations to come.

Consultation with statutory and non-statutory bodies has been undertaken from the project inception by Argyll & Bute Council in order to ensure the considerations of local stakeholders and community groups are taken on board throughout the design process.

Argyll & Bute Council undertook all public consultations to ensure the considerations of local stakeholders and community groups are taken on board throughout the design process.

5.2 Scoping

5.2.1 Scoping Approach

An EIA Screening Opinion on the Iona Breakwater Project was issued from Marine Scotland Licensing Operations Team (MSLOT) in February 2021. The Opinion determined that the Proposed Development falls under paragraph 10(m) of Schedule 2 of The Marine Works (Environmental Impact Assessment) (Scotland) Regulations 2017 (as amended) ("the 2017 MW Regulations"), and as such an Environmental Impact Assessment must be carried out in support of the Marine Licence Application.

An EIA Scoping Report, developed by RPS, was submitted to MSLOT in August 2021, accompanying a request for a Scoping Opinion. A subsequent EIA Scoping Opinion was received from MSLOT in May 2022. The Scoping Opinion was adopted by the Scottish Ministers, under regulation 14 of the EIA Regulations and forms the basis of the EIAR.

5.2.2 Scoping Responses

Upon completion of the EIA Scoping Report, it was sent to MSLOT who then distributed it to a variety of statutory consultees for a Scoping Opinion. The bodies that the report was sent to were:

- Marine Scotland Science (MSS);
- Historic Environment Scotland (HES);
- Iona Community Council (ICC);
- Maritime & Coastguard Agency (MCA);
- Ministry of Defence (MoD);
- Northern Lighthouse Board (NLB);
- Scottish Environmental Protection Agency (SEPA);
- Scottish Water (SW);
- Transport Scotland;
- NatureScot (NS);
- National Trust for Scotland (NTS); and
- Whale and Dolphin Conservation (WDC).

Each of the listed bodies provided a scoping response to MSLOT, outlined whether they agreed or disagreed with the scoping in or out of the various chapters, and provided any feedback to help improve each of the chapters. Responses from each of the listed consultees were provided to Marine Scotland and aided in the formation of their Scoping Opinion.

The scoping process/report identified the issues that are likely to be important to consider in the environmental impact assessment of the Proposed Development. The scoping process identified the sources or causes of potential environmental effects, the pathways by which the effects can happen, and the sensitive receptors, which are likely to be affected, and defined the appropriate level of detail for the information to be provided in the EIAR. Certain environmental topics were scoped out as part of this formal scoping process. The topics proposed to be scoped out at the scoping stage and the reasoning for this are set out in Table 5-1.

Table 5-1 Topics scoped out during the scoping process

Topic	Reasons for scoping topic out
LAND, SOILS, GEOLOGY & HYDROGEOLOGY	
Land	The Proposed Development will not result in land take during construction. Site welfare facilities and site compound are expected to be established on a barge, as the works will all be undertaken from a barge, however there will likely be a small compound on shore which could be established at the car park adjacent to the pier (occupying maximum 2 spaces). The potential impact on land during construction is considered to be negligible. The Proposed Development will not result in land take during operation. The overall footprint of the breakwater is approximately 7,000m^2. The future land uses within the footprint of the Proposed Development will not significantly change. The potential impact on land during operation is considered to be minimal.
Soils	As shown in the results of the sediment analysis, the sediment chemistry results show very low levels of contamination. The sediments in the vicinity of the Iona dredge area were below the Marine Scotland Revised Action Levels (AL1 and AL2). The potential impact from the mobilisation of any contaminated suspended sediment during dredging operations is considered to be negligible but will be considered fully within the Coastal Processes chapter and Water quality chapter. The Proposed Development consists of the construction of a breakwater and/or changes in the configuration of the seabed bathymetry through localised capital dredging works. These elements have the potential to impact on the mobility of the sand waves within the Sound of Iona during the operational phase of the project. The potential impacts of the Proposed Development will be assessed in the Coastal Processes section of the EIAR.
Geology	The Proposed Development is not located within any sites of geological significance, and there are no faults or outcrops mapped in the vicinity of the site, therefore it is unlikely that the Proposed Development will have any significant effects on geology. The potential impact on Geology during construction is considered to be negligible.
Hydrogeology	Given that no significant sources of contamination were identified during previous ground investigations, the potential impact on Hydrogeology during construction is considered to be negligible. Impacts to hydrogeology will be assessed within the Water Quality chapter.

Topic	Reasons for scoping topic out
AIR QUALITY AND CLIMATE CHANGE	
Air Quality and Climate Change	All dredged material will inherently have high moisture content and hence a lower risk of dust impact. The dredging operations are considered very low risk for dust impacts given that this material will have very high moisture content (circa 50% by weight). This is also the case for the transport of this material. As such, these operations are considered to have negligible dust impacts. With regards to potential impacts from emissions to the atmosphere from construction plant and marine vessels during dredging and material handling, all dredging and construction material handling will be undertaken within the marine environment with limited requirement for road traffic. All construction material will be brought to site via barge and as such, there will be no perceptible traffic impact on the national road network and hence the potential for impacts from emissions on air quality from road transport are considered negligible. The Scottish Ministers are mindful that Greenhouse Gas (GHG) emissions from all projects contribute to climate change. As such, the Scottish Ministers have requested that climate change must be considered within a GHG Assessment which should be based on a Life Cycle Assessment (LCA) approach, at the pre-construction, construction, operation and decommissioning phases. This assessment is included within Chapter 18 of this EIAR.
MATERIAL ASSETS	
Material Assets	Material Assets are considered under two categories: built assets and natural assets. Built assets include transport, energy, services infrastructure, settlement and commercial land, port / harbour infrastructure, community resources and the historic environment. Natural assets include forestry, open space, minerals, water resources and watercourses. Given the nature of the Proposed Development, in this case, Material Assets considered are those below the MHWS. Existing utilities infrastructure are anticipated to be unaffected by the Proposed Development. Good consultation with the utilities companies is recommended to identify exact locations of services in order that these can be considered as necessary at the detailed design stage. The Proposed Development will be an improvement of the existing Iona facilities which will facilitate ongoing use of the port by ferry, fishing, commercial and leisure craft. Whilst the Proposed Development will not result in a direct increase in port usage (through for example the introduction of new services i.e., a new ferry route), the continuation of the existing services with greater reliability and safety, will result in a positive impact in terms of connectivity, port related services, tourism offer and ongoing provision of services to the local population.
TRAFFIC AND TRANSPORTATION	
Traffic and Transportation	Potential effects on Traffic and Transportation associated with the Proposed Development are predicted to be limited. Construction related traffic can often be the cause of significant impacts due to an increase in the volume and the type of traffic (e.g., HGVs, heavy plant and machinery). However, materials will be transported to site and installed via a barge, with project related traffic volumes, using the local network, anticipated to be minimal.

Topic	Reasons for scoping topic out
WASTE	
Waste	Construction of the new rock armour breakwater will use clean quarried stone and dredge material will be disposed of at a licenced offshore sea disposal site. The Scottish Ministers disagreed with the Scoping Report decision to scope out Waste from the EIAR. The Scottish Ministers advised that Waste must be scoped in for further assessment and a qualitative assessment of waste must be completed. This assessment is included within Chapter 17 of this EIAR.

The Scoping Opinion also provided comments regarding the contents and detail to be included in the EIAR. From these, RPS set out the actions required to ensure that the Scoping Opinion would be fully considered in the EIAR, as shown in Table 5-2.

Table 5-2 Summary of comments and actions required from Marine Scotland Scoping Opinion

Chapter Title	Comment	Action Required
General Comments	A Best Practical Environmental Option (BPEO) statement must be prepared in relation to the deposit of dredge material and a separate marine licence to deposit this material will be required	Feedback passed on to chapter author(s)/ the Applicant
	The impacts of dredging activities on other users (apart from ferry operator) need to be considered (e.g., local residents, tour boat operators etc.)	
	More detail is required relating to rock armour installation (i.e., use of a diving team).	
	Detailed charts of distances of breakwater from key infrastructure is required	
	EIAR should include consideration of the impacts of vessel movements on relevant receptors during construction of the breakwater	
	If details of the Proposed Works cannot be defined precisely, then a Design Envelope approach should be adopted	
	EIAR must include an up to date consideration of the reasonable alternatives studied	
	The likely efficacy of mitigation proposed should be explained with reference to residual effects. The EIAR must identify and describe any proposed monitoring of significant effects and how the results of such monitoring would be utilised to inform any necessary remedial actions. The EIAR should demonstrate the use of the mitigation hierarchy. The EIAR must include a table of mitigation which corresponds with the mitigation identified and discussed within the various EIA chapters.	
	Navigation & Safety and Risk of Major Accidents and/or Disasters must be addressed as two separate chapters in the EIAR	
	Greenhouse gas emissions from all projects contribute to climate change, therefore Scottish Ministers highlight the need for climate change to be assessed in the EIAR. IEMA guidance should be used to develop this GHG assessment	
Navigation & Safety	The Scottish Ministers agree with scoping and advise that the Applicant must assess the impacts to recreational vessels and sea kayakers with full consideration of points raised by the Argyll & Bute Council. For the avoidance of doubt this includes, but is not limited to, an assessment of the impact of the Proposed Development on sea kayaking in the area and the safety implications of this, the impact of the height of the structure on water level crafts, and the impact on navigation and/or anchorage of recreational vessels.	Feedback passed on to chapter author(s)/ the Applicant
Terrestrial Biodiversity	The Scottish Ministers note that ornithology has been included within Section 3.2 of the Scoping Report, however, advise that its inclusion within the section titled ‘Marine Biodiversity’ would be more appropriate.	Specialist authors have decided that it would be more pragmatic to have a

Chapter Title	Comment	Action Required
		standalone Ornithology chapter
	The Scottish Ministers highlight acknowledgement from NS confirming that the Applicant has been in contact regarding methodologies and species / habitat locations and further advise the Applicant to engage with NS to ensure appropriate surveys are undertaken.	Feedback passed on to chapter author(s)/ the Applicant
	Applicant must make use of the National Biodiversity Network Atlas NBN Atlas in establishing otter baselines. Additionally, the Scottish Ministers direct the Applicant to representation from ICC and advise that the Applicant must consult with the Ross of Mull Ranger to inform the EIA Report.	
	The Scottish Ministers agree with the representation from ABC and advise that species management plans, ecological surveys and a construction environmental management plan must form part of the wider assessment.	
	The Scottish Ministers agree with the Applicant and consultees and advise that terrestrial biodiversity is scoped in for further assessment in the EIA Report for the construction and operational phases.	
Marine Biodiversity	Benthic ecology – no issues, agree with scoping	N/A
	Marine fish ecology – generally agree with scoping however, Scottish Ministers advise that information should be provided on fish spawning and nursery periods to be considered alongside construction programme timeline. Also, must assess the effects of increased suspended sediment concentrations and sediment deposition on marine fish and shellfish (including eggs and larvae). Applicant also must consider marine fish species within the underwater noise propagation modelling with consideration of timing of noisy construction activities relative to fish spawning periods.	Feedback passed on to chapter author(s)/ the Applicant
	Diadromous fish – Scottish Ministers consider that there is a lack of detail and consideration given in Scoping Report. Recommend engaging with Argyll Fisheries Trust	
	Marine mammals – Scottish Ministers advise that disturbance from the physical presence of vessels must be scoped in. Also advise that the impact through changes in prey distribution and abundance during construction and operation be scoped in. Impacts to marine mammals may be through other pathways, not just noise and these should be assessed for the construction phase. Need to include assessments on effects on harbour porpoise, minke whale and basking sharks. Recommend that applicant engages with MSS for further advice on suitable underwater noise propagation modelling.	
	Marine ornithology – needs to be moved into the Marine Biodiversity chapter. Vessel activity (other than noise) should also be considered. Scottish Ministers do not consider the list of species likely to be impacted as exhaustive and therefore more species must be considered. Foraging ranges for seabird species exceed 30km, therefore designated sites further away must be considered. Scoping Report does not make it clear if Through the Tide Counts are restricted to the traditional	Ornithology now included as a standalone chapter

Chapter Title	Comment	Action Required
	species included in Wetland Bird Surveys or will include all marine bird species present during observations. A small number of breeding bird surveys must be conducted to assess the impact of construction works during the breeding period and used to identify if any mitigation is required. Scottish ministers direct the applicant to advice from MSS and encourage engagement to ensure mitigation measures are appropriate. Marine ornithology should be scoped in for further assessment for both the construction and operational phases.	
Land Soils, Geology & Hydrogeology	Agree with scoping conclusion and no major issues.	N/A
Water Quality	The Scottish Ministers acknowledge the Applicant's commitment to consider the WFD and direct the Applicant to representation from SEPA which provides further information and guidance on how to meet the requirements of the WFD and what should be considered in the assessment. The Scottish Ministers advise that the Applicant must address this advice from SEPA, including advice that relates to the site layout.	Feedback passed on to chapter author(s)/ the Applicant
	The Scottish Ministers advise the Applicant to refer to SEPA's Pollution Prevention guidelines and other guidance produced by the Construction Industry Research and Information Association ("CIRIA"). The draft Schedule of Mitigation must be included in the oCEMP.	
	Scottish Ministers direct the Applicant to representation from SW regarding surface water and advise the Applicant to consider this advice and contact SW directly if necessary.	
Flood Risk	Agree with scoping. No major issues. Scottish ministers direct the applicant to SEPA guidance.	N/A
Air Quality & Climate Change	Need to consider climate change (this was scoped out)	GHG Assessment now included as a standalone chapter
	Air quality can be scoped out on the basis that material is not brought in via the road network.	
	Dust and emissions management plan should be included in the oCEMP	
Terrestrial Noise & Vibration	Agree with scoping, no major issues	N/A
Coastal Processes	Representation from ABC states that assessment of whether the design of the structure could influence wave refraction, tidal velocity or current direction in the sound must be undertaken, and MSS advise that hydrodynamic and sediment transport conditions, including waves and tidal currents in the Sound and suspended sediment transport, must be considered to support calibration validation. Additionally, aspects of tidal scouring and changes in tidal stream velocities (and turbulence) must be explored in more detail in the EIA Report	Feedback passed on to chapter author(s)/ the Applicant

Chapter Title	Comment	Action Required
	The Scottish Ministers highlight advice from MSS supporting these simulations and advise that a 1:100 year storm event must be included as a worst case scenario. Further, the Scottish Ministers advise that cumulative effects with the works at Fionnphort also need to be considered, so a combined modelling study must be undertaken. The Scottish Ministers highlight representation from ICC regarding the lack of detail surrounding mitigation measures for coastal processes provided in the Scoping Report and encourage the Applicant to engage with ICC whilst determining appropriate mitigation measures.	
	The coastal processes section must also include an assessment of the Proposed Works on the mobility of sand waves within the Sound of Iona	
Material Assets	Agree to scope out, however topics considered under other chapters (Navigation and Safety, Landscape and Visual, Population and Human Health).	N/A
Traffic and Transport	Agree to scope out as material will be transported via barge.	N/A
Cultural Heritage	Overall agree the need to scope in chapter	Feedback passed on to chapter author(s)/ the Applicant
	The Scottish Ministers highlight representation from ICC regarding the lack of clarity on the methodology of the Proposed Works or any proposed mitigation relating to cultural heritage aspects	
	The Scottish Ministers agree with the views of ICC and advise that the Applicant must consult with the local community with regards to both the methodology and mitigation measures to ensure the value and importance of cultural heritage is considered appropriately.	
Landscape & Visual	Concerns raised regarding the potential impacts on the surrounding area due to the high importance of Iona's cultural and natural heritage	Feedback passed on to chapter author(s)/ the Applicant
	Lack of clarity in the Scoping Report on what is being assessed under Landscape and Visual Assessment	
	Must consider the whole island in the Landscape Character Assessment	
	Must include mitigation that enhances the design and ensures the Proposed Works are an attractive feature	
	Evaluation of any potential cumulative visual impacts and navigational lighting and markings, including night time impacts must be included in the Landscape Character Assessment and Visual Impact Assessment	
	Issues with viewpoints selected as they are not considered to be representative of the area, are out of date and incorrectly labelled. Further viewpoints should be considered in the assessments (2 additional viewpoints recommended by NTS)	
	Advise applicant to engage with ICC regarding the inclusion of further appropriate visualisations.	

Chapter Title	Comment	Action Required
	Applicant must engage with ICC and HES to discuss mitigation of impacts.	
Population & Human Health	The scoping contains limited consideration for the socio-economic impact of the Proposed Works. This should be considered in its own chapter of the EIAR.	Feedback passed on to chapter author(s)/ the Applicant
	Consideration of potential benefits of the Proposed Works should also be included.	
	Particular attention should be directed towards consideration of other sea users who may be pushed into more dangerous waters due to the Proposed Works (Sail boats and kayaks)	
	Consider the impact of noise on other users	
Waste	The Scottish Ministers disagree with the Applicants proposal that waste can be scoped out of the EIA Report. The Scottish Ministers advise that waste must be scoped in for further assessment within the EIA Report and a qualitative assessment on the effects of waste must be completed.	Waste chapter now scoped in
	This assessment should be comprehensive enough to allow an understanding of the potential impacts of waste during the construction and operational phases of the Proposed Works.	
Cumulative Effects	The Scottish Ministers advise that cumulative effects do not necessarily require a standalone chapter in the EIA Report, but cumulative impacts must be considered in relation to each of the chapters scoped in above. The Scottish Ministers also advise the Applicant to consider representation from Argyll & Bute Council, ICC, MCC, SoIHC, SEPA, and advice from MSS when assessing cumulative effects	Feedback passed on to chapter author(s)/ the Applicant
Socio-Economic	The review of Population and Human Health contains limited consideration of the socio-economic impact of the Proposed Development.	Feedback passed on to chapter author(s)/ the Applicant. Information on the socio-economics of the Proposed Development has been previously undertaken and the information is included within Appendix 2.1.
	Consider a broader range of socio-economic impacts through a Socio-Economic Impact Assessment (SEIA)	
	Consideration must be given to whether the Proposed Works may displace fishing activity or restrict access to the harbour. Engagement with the local fishing community is important in this regard.	
	There is a lack of context concerning communities in the Scoping Report. The EIAR must include context about the communities as well as baseline information about the current level of disruption as per MAU advice. The MAU recommend further assessment of economic opportunities as a result of the Proposed Works.	
	Must include details on how the Proposed Works might cause disruption to the lifeline ferry during the construction phase and details of how this will be mitigated	

Following the receipt of this feedback, RPS shared the MSLOT Scoping Opinion with each of the chapter lead authors to ensure all feedback was incorporated into the EIAR. The Scoping Opinion was also shared with the Applicant (Argyll & Bute Council) to ensure that all feedback was considered within the design of the Proposed Development.

The main changes to the structure of the EIAR were:

- The scoping in of a Greenhouse Gas Assessment chapter and Waste chapter;
- The development of a standalone Ornithology chapter; and
- The inclusion of a separate Risk of Major Accidents & Disasters chapter (in addition to Navigation & Safety).

6 NAVIGATION & SAFETY

6.1 Introduction

This chapter of the EIAR describes the likely significant impacts to Navigation from both the construction and the operation of the Proposed Development, plus the wider effects of vessel traffic transiting to locations outside of the immediate area of study.

The result of this assessment is based on the assumption that the Proposed Development will not lead to any substantial increase in vessel traffic. The breakwater will be located outside an established Statutory Harbour Authority (SHA) and therefore the competent authority with respect to marine safety is the Maritime and Coastguard Agency (MCA).

6.2 Assessment Methodology

6.2.1 Relevant Guidance

When assessing the effects of the Proposed Development on navigation and marine safety, the following guidance documents have been used in the preparation of the EIAR chapter and Navigational Risk Assessment (NRA) (see Volume III, Appendix 6.1):

- The Department for Transport's (DfT) 'Port Marine Safety Code', (DfT, 2016); and
- The DfT, 'A Guide to Good Practice on Port Marine Operations', (DfT, 2018).

The following documents provide additional considerations and supplementary information that, when applicable, have been used within the NRA process:

- International Maritime Organization (IMO) Revised Guidelines for Formal Safety Assessment (FSA) for use in the IMO rule making process (IMO, 2018);
- Marine Guidance Note (MGN 654) Offshore Renewable Energy Installations (OREI) safety response. Incorporating: Annex 1 Methodology for assessing marine navigational safety and emergency response risks of OREIs. Maritime and Coastguard Agency (MCA, 2021a);
- Marine safety guidance and advice from the MCA as the competent authority for marine safety, Argyll and Bute Council as the marine facility owner and CalMac Ferries Limited as the ferry route operator; and
- Argyll and Bute Council's Marine Safety Management System (A&BC, 2020).

6.2.2 Study Area

The study area for the navigation assessment comprises the marine works within the Sound of Iona, plus the route that the dredger and disposal craft will take between the dredge site at Iona and the proposed disposal site, see Figure 6-1.

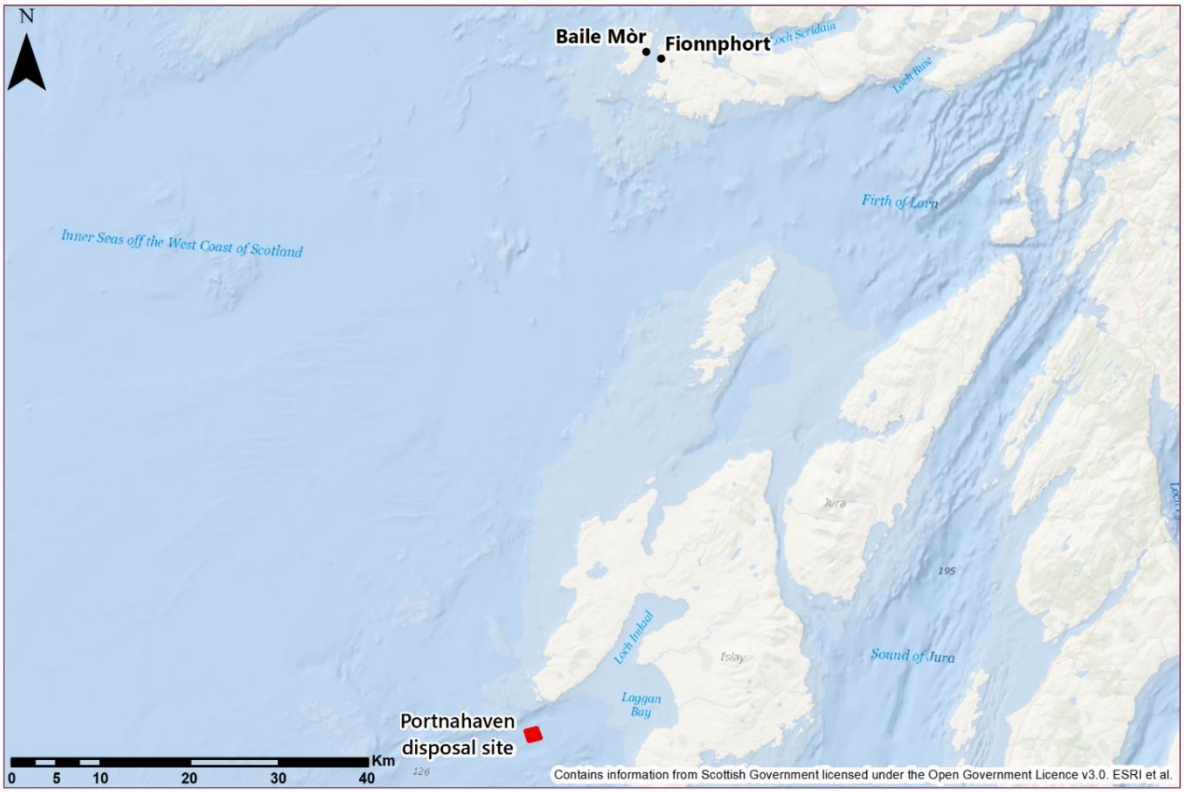

Figure 6-1 Study Area

6.2.3 Baseline Scenario

In order to assess the impact of the Proposed Development on navigation and shipping within the study area (and the routes work vessels take), a full NRA has been conducted (see Volume II, Appendix 6.1). Listed below are the analysis methods and data that this assessment is based on:

- An evaluation of legislation and guidance concerning the area.
- An analysis of the navigational environment: Aids to Navigation, tidal flows, wind, waves and emergency response capabilities.
- Marine traffic analysis using Automatic Identification System (AIS) from 01 November 2021 to 31 October 2022. This data includes both AIS-A and AIS-B and is sourced from a commercial provider by ABPmer to create a geodatabase of vessel transits.
- A review of marine incidents using data recorded by the Marine Accident Investigation Branch (MAIB) and the Royal Nautical Lifeboat Institute (RNLI).
- A Hazard Identification Workshop with key stakeholders providing stakeholder consultation to inform the risk assessments produced as part of the NRA.

6.2.4 Consultation

Consultation with marine stakeholders took place in the form of a Hazard Identification Workshop on 9th September 2021. Table 6-1 lists the organisations and stakeholders that attended this workshop.

Additional invitees that were unable to attend the workshop included individual local fishermen, the Scottish Canoe Association, the Royal Yachting Association (RYA) and the RNLI.

Table 6-1 Attendees at the Hazard Identification Workshop

Attendee	Organisation
Scott Reid	Argyll & Bute Council
Elsa Simoes	Argyll & Bute Council
Jamie Salmon	Argyll & Bute Council
James Hamilton	RPS
Helen Croxson	Maritime & Coastguard Agecy (MCA)
Sam Chudley	MCA
Peter Douglas	Northern Lighthouse Board (NLB)
David McHardie	Caledonian Maritime Assets Ltd
Alastair Mackie	Fionnphort Fishing Vessel Owner
Mark Jardine	Iona Tour Boat

6.2.5 Assessment Criteria and Assessment of Significance

When a receptor is exposed to an impact, the overall sensitivity of the receptor to that impact needs to be considered. This process incorporates a degree of subjectivity. The sensitivity assessments for shipping and navigation receptors have applied expert opinion and have had regard to the following:

- Outputs of the NRA (Volume III, Appendix 6.1);
- Number of transits of specific vessels and/or vessel type; and
- Level of risk established through assessment of the accident-incident rate.

For the purposes of assessing the impact on shipping and navigation receptors, the level of sensitivity covers a range from neutral to very high. The greater the safety impact and/or the lower the ability for the receptor to adapt to the impact, the greater the level of sensitivity. A safety impact is classified as any impact that may influence the navigational safety of the shipping and navigation receptor.

Table 6-2 presents the definitions of sensitivity that have been applied in the assessment.

Table 6-2 Definition of Receptor Sensitivity

Sensitivity	Example Descriptor
Very High	Very high level of safety impact for vessels and navigation receptors. Very limited ability to adapt to impact.
High	High level of safety impact for shipping and navigation receptors. Limited ability to adapt.
Medium	Medium level of safety impact for shipping and navigation receptors. Some ability to adapt.
Low	Low level of safety impact for shipping and navigation receptors. Ability to adapt to majority of impact.
Negligible	Negligible level of safety impact for shipping and navigation receptors. Ability to adapt to all of impact.
Neutral	No impact for shipping and navigation receptors.

Once the sensitivity of the receptor has been defined, an assessment is undertaken of the magnitude of the impact as defined by its geographical extent, frequency of occurrence and duration. Determining the overall magnitude of shipping and navigation impacts also incorporates a degree of subjectivity as decisions are based on expert opinion in combination with baseline data and information from the Study Area.

Table 6-3 presents the definitions of impact magnitude that have been applied in this assessment.

Table 6-3 Definitions of Impact Magnitude

Magnitude	Example Descriptor
High	Impact geographical area beyond the extent of the study area. Impact present on a permanent basis throughout the operation of the Marine works/Operational area. Incidents very likely, monthly accidents.
Medium	Impact localised to geographical extent of the study area. Impact present on a permanent basis throughout the operation of the Marine works/ Operational area. Incidents are likely, may occur annually.
Low	Impact localised to geographical extent of Marine Works/Operational area. Impact present on a temporary basis. Impacts relatively infrequently.
Neutral	No impact on vessels or navigational receptors.
Positive	Navigation receptors benefit as a result of the impact.

6.2.6 Significance of Effects

The outcomes of the assessment of the sensitivity of the receptor and the magnitude of the potential impact are applied to a matrix to define the significance of the resulting effect. Any impact that is deemed to be moderate or greater is considered significant.

Table 6-4 presents the matrix that has been used to define the significance of effects in this assessment.

Table 6-4 Significance of effect matrix

Sensitivity	Magnitude of Impact				
	Positive	**Neutral**	**Low**	**Medium**	**High**
Neutral	No effect	No effect	No effect	No effect	No effect
Negligible	Negligible	No effect	Negligible to minor adverse	Negligible to minor adverse	Minor adverse
Low	Minor beneficial	No effect	Negligible to minor adverse	Negligible to minor adverse	Minor adverse
Medium	Moderate beneficial	No effect	Negligible to minor adverse	Minor adverse	Moderate adverse
High	Major to minor beneficial	No effect	Minor adverse	Minor to moderate adverse	Moderate to major adverse
Very high	Major to minor beneficial	No effect	Minor to moderate adverse	Moderate to major adverse	Major to substantial adverse

6.3 Baseline Scenario

The Sound of Iona separates the islands of Mull and Iona. It is approximately 0.7 nm wide at the ferry crossing point. The Sound is approximately four nautical miles (nm) long, with the island of Erraid at the southern end, as well as a number of smaller islands and skerries including Eilean nam Bàn, Eilean Dubh na Ciste and Eilean Ghòmhain. The Sound of Iona provides sheltered waters but can be exposed to south-westerly winds and swell from the south.

Baile Mòr on the Isle of Iona is the location of the Iona slipway and pier used by the Iona Ferry. Fionnphort is the Mull terminal for the Iona Ferry. Both ports have a slipway providing passenger and vehicle access to the ferry, plus a pier which is used by local fishing vessels, recreational and privately-owned craft. The marine access facilities at Baile Mòr slipway are owned by Argyll & Bute Council. However, the area does not form part of a Statutory Harbour Authority. This means the MCA, which is an executive agency of the DfT has the responsibility to ensure that the area is competently managed. The Iona to Fionnphort ferry is operated by CalMac Ferries Ltd who provide the safety and management processes for all aspects of the shipboard operations including berthing.

The maximum tidal flow occurs during a spring tide ebb flow and is over 2.0 knots (1.04 m/s) just north of the midpoint between Iona and Fionnphort. The area is particularly exposed to winds from the south, south-west and west of the site, the strongest of these are greater than 16 m/s. These winds would correspond to a maximum wave height of 3.0 m on the transect line between Baile Mòr and Fionnphort, and 5.0 m at the southern end of the Sound.

Vessel traffic within the Sound of Iona can be characterised into two groups. The first is the ferry traffic which navigates between Fionnphort and Baile Mòr on the Isle of Iona (approximate east to west route, linking the Isles of Mull and Iona). The second is traffic transiting through the Sound (approximate north-east, south-west direction) which is comprised of fishing vessels, recreational vessels and the Staffa Tour boats which operate from Fionnphort and Iona Baile Mòr (see Figure 6-1 for locations).

Analysis of vessel traffic using the 365 days of traffic data (from 01 November 2021 to 31 October 2022) identifies a high density of traffic transiting between Fionnphort and Baile Mòr, and a clear route along the Fionnphort shore towards Bull Hole Channel where the ferries currently berth overnight. This location is also used as an anchorage during bad weather by local boat owners. The average weekly vessel density is shown in Figure 6-2.

From the AIS data, nearly all the vessels transiting across the Sound of Iona between Baile Mòr and Fionnphort were passenger vessels (including the ferry and tour boat operators). Vessels transiting through the Sound of Iona were mainly fishing vessels. However, recreational, and small fishing vessels are not required to carry AIS so may not be captured within this data. Anecdotal information sources from stakeholder consultation have been used to characterise the area in the absence of AIS data.

There were two RNLI and three MAIB recorded incidents within 2010 – 2019 (inclusive). These comprised two groundings, two equipment failures (vessel) and one person in distress. Notably, both groundings were near Erraid in an area with numerous rocky outcrops which covers and uncovers with the tide.

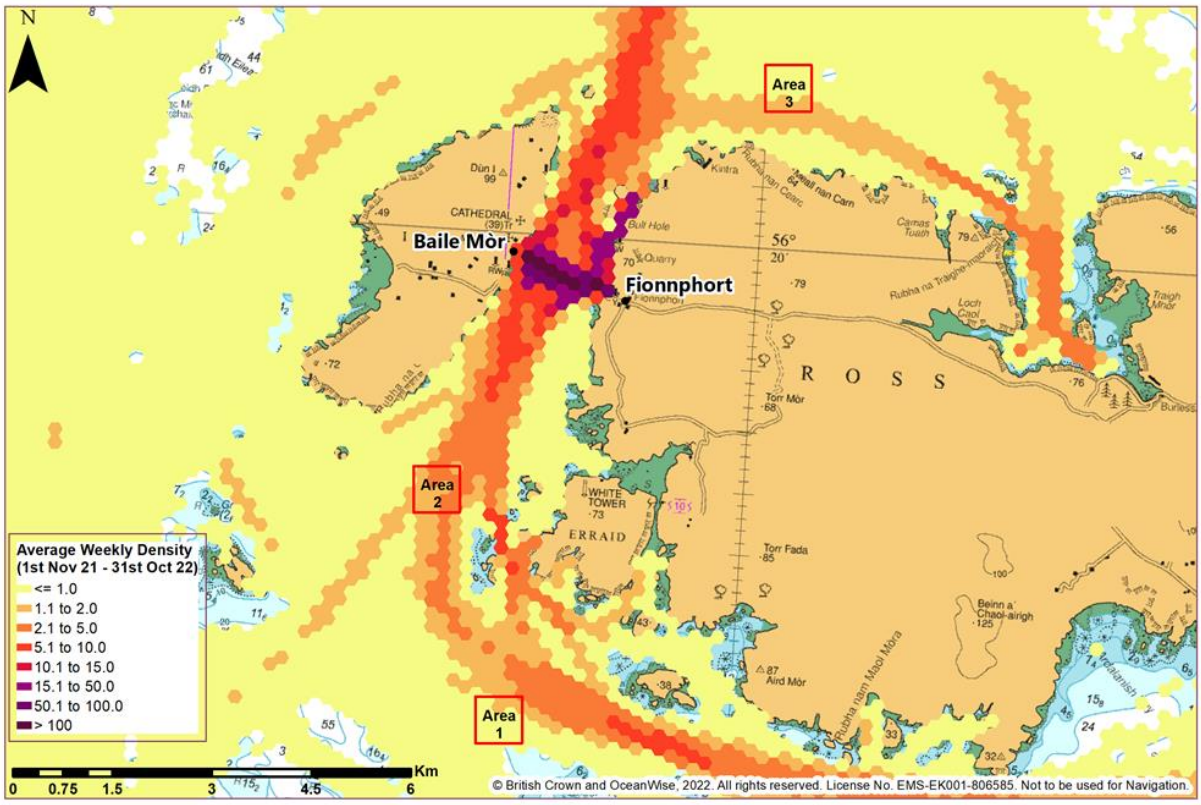

Figure 6-2 Average Weekly Vessel Density (using AIS from 01 Nov 2021 to 31 Oct 2022)

6.4 Description of Likely Significant Effects

This section identifies preliminary potential likely effects on the commercial and recreational navigation receptors as a result of the construction and subsequent operation of the Proposed Development.

6.4.1 Assessment of Construction Effects

Based on the existing understanding of the scale of the Proposed Development, together with the navigational baseline and stakeholder comments from the Scoping Opinion, the potential effects during the construction phase that are considered to be potentially relevant and require further assessment are as follows:

- Ferry or tour boat allision (heavy contact) with the Proposed Development: ferry or tour boats manoeuvring in close proximity to the breakwater have the potential for heavy contact with the breakwater during construction.
- Dredger flooding whilst engaged in operations: an ingress of water affects the vessel stability and has the potential to lead to the dredger sinking.
- Dredge/construction plant impact with the Proposed Development during the construction phase: manoeuvring of construction/dredge craft in close proximity to the breakwater has the potential for heavy contact with the breakwater during construction.
- Recreational or fishing vessel allision with the Proposed Development: vessel (fishing or recreational) manoeuvring in close proximity to the breakwater has the potential for contact with the breakwater during construction.
- Dredge/construction plant collision with recreational/fishing vessel: vessel collision (recreational or fishing) with the construction or dredging craft whilst transiting to/from the site or during activities within the disposal site.
- Tug and tow collision with recreational/fishing vessel: vessel collision (recreational or fishing) with the tug and tow whilst transiting to/from the site.
- Tug and tow collision with ferry/tour boat: vessel collision (ferry or tour boat) with the construction or dredging craft whilst transiting to/from the site or during activities within the disposal site.
- Accidental spill during marine works: an accidental spill during the construction phase has the possibility to lead to pollution in and around the Sound of Iona.
- Heavy lift failure, or failure of lifting gear: failure of lifting gear has the potential to result in injuries and damage to the vessel.
- Small non-powered craft displaced by the Proposed Development: the Proposed Development may cause the displacement of small craft into deeper water and potentially lead to a collision with other vessels transiting across the Sound of Iona.

These are examined in further detail in Sections 6.4.1.1 to 6.4.1.10 below.

6.4.1.1 Ferry or tour boat allision with the Proposed Development

Ferry and tour boats transiting in proximity to the Proposed Development have the potential to make heavy contact (allision) with the works. Allision risk will be increased during times of adverse weather when wind activity and wave action have the potential to adversely affect vessel manoeuvring, and in periods of reduced visibility where it will be difficult to see the breakwater. The risk will also be increased in periods of high vessel movements as this will decrease the available space for manoeuvring. Any contact has the potential to result in some damage which may lead to a pollution event (for example, a fuel or oil spill) and, due to passengers being often onboard the vessel, there is a risk of multiple injuries and associated negative publicity.

This potential effect would have a medium level of sensitivity as vessels have some ability to adapt to the situation through the application of their engines to manoeuvre or use of anchors to avoid/reduce the impact of an allision. These vessels will also have Standard Operating Procedures (SOPs) in place which would provide a process to follow for crew and passengers if a marine incident occurs. This could potentially reduce the severity of an incident. The potential effect from an allision will be localised to the immediate extent of the marine construction area. The impact has the potential to occur throughout the construction phase and therefore has a medium negative magnitude. Therefore, the overall outcome is **moderate to minor adverse**.

The following mitigation measures would need to be introduced by Argyll & Bute Council to reduce the risk to a level that could be considered to be ‘as low as reasonably practicable’ (ALARP):

- Notices to mariners – issued on the Council website containing details about construction activities.
- Aids to navigation, provision and maintenance of – illumination of marine works at night.
- Marine liaison officer – central point of contact to coordinate activities.
- Availability of pollution response equipment – contractor to have Tier 1 pollution equipment.
- Promulgation of information – information on activities shared with local communities.

Following the implementation of these measures, specifically the appointment of a marine liaison officer, notices to mariners and the illumination of the Proposed Development at night, the magnitude (Table 6-3) is reduced to small negative as likelihood of an allision is reduced. Therefore, the scenario is assessed as **minor adverse**.

6.4.1.2 Dredger flooding whilst engaged in operations

During the construction phase dredge and marine works, there is an increased risk of dredge vessels having an ingress of water during dredge operations through a weld failure, sea value defect or dredge cargo loading error with the vessel close inshore, in complex tidal conditions. The outcome would have a low negative magnitude as the potential impact will be localised to the extent of the marine construction area and will be present for the construction phase only. The hazard scenario has the potential to occur throughout the construction phase and would have a high impact on safety with limited ability to adapt to the situation, hence the sensitivity is high. Therefore, the dredger flooding has an overall assessment of **minor adverse**.

The following mitigation measure would need to be introduced by Argyll & Bute Council to reduce the risk to a level that could be considered ALARP:

- Marine liaison officer – to coordinate emergency response with shore side resources.

Following the implementation of this measure neither the sensitivity nor the magnitude of this assessment will change and therefore it will still be considered **minor adverse**.

6.4.1.3 Dredge/construction plant impact with the Proposed Development during construction phase

Dredge/construction plant used during the construction phase of the Proposed Development has the potential to make heavy contact with the works. These vessels include jack-up platforms, barges, tugs and tows, dredging plant and workboat support craft. It should be noted that construction activities carried out from platforms held in place by spud support legs are not subject to allision when the platform is elevated. However, when being manoeuvred into position there is a risk of contact between the vessel and structures within the marine construction area. Allision risk increases during times of adverse weather when wind activity and wave action have the potential to adversely affect vessel manoeuvring. Any contact has the potential to result in some damage which may lead to a pollution event (for example, a fuel or oil spill).

This potential effect would have a high level of sensitivity as the vessels have some ability to adapt to the situation through the application of their engines, anchors or adjusting moorings. In addition, it is likely that dredge and construction vessels would be moving at a slow speed whilst working making any allision a controlled outcome if avoidance action is taken. The potential effect from an allision will be localised to the immediate extent of the marine construction area. The impact has the potential to occur throughout the construction phase whilst vessels are manoeuvring leading to a magnitude of medium thus this scenario has an overall outcome of **major to moderate adverse**.

The following mitigation measures would need to be introduced by Argyll & Bute Council to reduce the risk to a level that could be considered ALARP:

- AIS coverage – all construction craft to carry AIS to reduce the severity of the hazard if it were to occur.
- Aids to navigation, provision and maintenance of – illumination of marine works at night.
- Marine liaison officer – central point of contact to coordinate activities.
- Weather forecasting – monitored by construction personnel with weather limits for activities identified.
- Operational weather limits – Maximum wind/wave limits for construction activities.

Following the implementation of these measures, specifically the appointment of a marine liaison officer, operational weather limits and the illumination of marine works at night, the sensitivity is reduced to low. Therefore, the scenario is assessed as **minor adverse**.

6.4.1.4 Recreational or fishing vessel allision with the Proposed Development

Recreational and fishing vessels transiting proximate to the Proposed Development have the potential to make heavy contact with the works during construction. Allision risk will be increased during times of adverse weather when wind activity and wave action have the potential to adversely affect vessel manoeuvring, and in periods of reduced visibility where it will be difficult to see the breakwater. The risk will also be increased in periods of high vessel movements as this will decrease the available space for manoeuvring. Any contact has the potential to result in some damage which may lead to a pollution event (for example, a fuel or oil spill).

This potential effect would have a high level of sensitivity as the vessels have some ability to adapt to the situation through the application of their engines to manoeuvre or use of anchors to avoid/reduce the impact of an allision. The potential effect from an allision will be localised to the immediate extent of the marine construction area. The impact has the potential to occur throughout the construction phase, with accidents occurring often, leading to a medium negative magnitude. Therefore, the overall outcome is major to moderate adverse.

The following mitigation measures would need to be introduced by Argyll & Bute Council to reduce the risk to a level that could be considered ALARP:

- Notices to mariners – issued on the Council website containing details about construction activities.
- Aids to navigation, provision and maintenance of – illumination of marine works at night.
- Marine liaison officer – central point of contact to coordinate activities.
- Availability of pollution response equipment – contractor to have Tier 1 pollution equipment.
- Promulgation of information – information on activities shared with local communities.
- Communications –stakeholders should be informed of the need to move buoyed areas prior to construction and advised of other suitable locations.

Following the implementation of these measures, specifically the appointment of a marine liaison officer, notices to mariners and the illumination of marine works at night, the magnitude is reduced to low negative. Therefore, the scenario is assessed as **minor adverse**.

6.4.1.5 Dredge/construction plant collision with recreational/fishing vessel

Dredge/construction plant used during the construction phase of the Proposed Development have the potential to collide with recreational and fishing vessels transiting past the works or accessing moorings at Iona. The dredge and construction vessels include jack-up platforms, barges, dredging plant and workboat support craft. Tugs and tows are considered under a separate assessment (see Section 6.4.1.6). Collision risk will be increased during times of adverse weather when wind activity and wave action have the potential to adversely affect vessel manoeuvring, or when there is high vessel activity in the area. Any collision has the potential to result in damage which may lead to a pollution event (for example, a fuel or oil spill).

This potential effect would have a high level of sensitivity as there is a high level of safety impact for shipping and navigation receptors, despite vessels having some ability to adapt to the situation through the application of their engines, anchors or adjusting moorings. It is likely that dredge and construction vessels would be moving at a slow speed whilst working making any potential collision more avoidable and having a smaller impact. The potential effect from a collision will be localised to the immediate extent of the marine construction area. The impact has the potential to occur throughout the construction phase whilst vessels are manoeuvring leading to an assessed magnitude of medium. Therefore, the assessment of significance is **moderate to minor adverse**.

The following mitigation measures would need to be introduced by Argyll & Bute Council to reduce the risk to a level that could be considered ALARP:

- AIS coverage – all dredge/construction vessels, including barges to carry AIS (A or B (see Volume III, Appendix 6.1, Section 2.1 for definitions of AIS signals)).
- Notices to mariners – issued on the Council website containing details about construction activities.
- Promulgation of information – information on activities shared with local communities.
- Safety boat – available and manned during construction activities.
- Marine liaison officer – to provide safety information to vessels navigating in the area and to local authorities.
- Communications – stakeholders should be informed of the need to move buoyed areas prior to construction and advised of other suitable locations.

Following the implementation of these measures, specifically the appointment of a marine liaison officer, the publicising of the notices to mariners and AIS coverage, the magnitude is reduced to low. Therefore, the scenario is assessed as **minor adverse**.

6.4.1.6 Tug and tow collision with recreational/fishing vessel

A tug and tow moving material to the construction site or departing for sea may come into contact and collide with a recreational or fishing vessel. Collision risk is increased during periods of high vessel traffic, and when adverse weather may adversely affect the ability of either vessel type to manoeuvre. Collision has the potential to result in damage which may lead to a pollution event (for example, a fuel spill).

The potential effect would have a high level of sensitivity as there is a high level of safety impact and the vessels will also have some ability to adapt to the situation through application of their engines, anchors or adjustment of moorings. It is likely the tug and tow vessels will be moving at slow speed to transport material short distances between the barge and the marine works. The potential effect from the collision will be localised to the immediate extent of the marine construction area. The magnitude of effect is considered to be medium due to the frequency of tug and tow movements during the works. Hence the overall significance is **moderate adverse**.

The following mitigation measures would need to be introduced by Argyll & Bute Council to reduce the risk to a level that could be considered ALARP:

- AIS coverage – all dredge/construction vessels, including barges to carry AIS (A or B (see Volume III, Appendix 6.1, Section 2.1 for definitions of AIS signals)).
- Communications –stakeholders should be informed of the need to move buoyed areas prior to construction and advised of other suitable locations.

Following the implementation of this measure the risk would be reduced but remains within the classification of **moderate adverse**. This is reflective of the fact that once a tug and tow has left the immediate vicinity of the works, vessels will navigate in the usual way, following international rules such as the Convention on the International Regulations for Preventing Collisions at Sea, 1972 (COLREGS). The ability of the project scheme to implement additional controls is limited past the requirement to use AIS for identification.

6.4.1.7 Tug and tow collision with ferry/tour boat

A tug and tow collision with a ferry/tour boat carries a risk when the ferry/tour boat is travelling to and from the current slipway or pier. Collision risk is increased during periods of high vessel traffic, and when adverse weather may negatively affect vessel manoeuvrability. The collision has the potential to result in damage which may lead to a pollution event (for example, a fuel spill).

This assessment has a medium level of sensitivity as vessels have some ability to adapt to the situation through application of their engines, anchors or adjustment of moorings. In addition, it is likely the tug and tows will be moving at slow speed to transport material short distances between the barge and the marine works. The potential effect from a collision will be localised to the immediate extent of the marine construction area. The impact has potential to occur throughout the construction phase when these vessels are manoeuvring thus it has a magnitude of high negative. Therefore, the collision risk has an overall assessment of **moderate adverse**.

The following mitigation measures would need to be introduced by Argyll & Bute Council to reduce the risk to a level that could be considered ALARP:

- AIS coverage – all dredge/construction vessels, including barges to carry AIS (A or B (see Volume III, Appendix 6.1, Section 2.1 for definitions of AIS signals)).
- Notices to mariners – issued on the Council website containing details about construction activities.
- Marine liaison officer – to provide safety information to vessels navigating in the area and to local authorities.

Following the implementation of these measures, specifically the issuing of notices to mariners and AIS coverage, the impact reduces to medium as incidents and accidents are less likely. Therefore, the scenario is assessed as **moderate to minor adverse**.

6.4.1.8 Accidental spill during marine works

During the marine works there is an increased risk of accidental spillage of oil, fuel and chemical pollutants from the dredge plant, construction vessel activity and marine construction works. This may result in a reduction in water quality. The prevailing weather conditions during any marine pollution event will dictate the path and extent of surface water sheens.

The impact has the potential to occur infrequently throughout the period; and the volume of a spill is likely to be small scale due to the volume which could be spilled at any one time through construction activity. It should be noted that Argyll & Bute Council have oil spill contingency plans in place, which include a Tier 2 response contractor. These factors lead to an assessment of the magnitude of a spill as low and a sensitivity as high. Therefore, the overall assessment is **minor adverse**.

The following mitigation measures would need to be introduced by Argyll & Bute Council to reduce the risk to a level that can be considered ALARP:

- Availability of pollution response equipment – contractor to have Tier 1 pollution equipment.
- Marine liaison officer – coordinating activities for the construction.

Following the implementation of these measures, specifically the availability of pollution response equipment, the future risk is assessed to remain as **minor adverse**.

6.4.1.9 Heavy lift failure, or failure of lifting gear

During the marine works there is a risk of lifting gear failure whilst a load is slung or a heavy load is transferred between vessels, a vessel and the marine works, or rock is placed along the breakwater. The nature of the loads during the construction phase of the marine works means that should a failure occur, and the load be dropped onto a vessel, it would lead to major damage for the vessel and possible fatalities. The prevailing weather conditions will be the main factor leading to this impact occurring; especially high wind conditions affecting cranes, and large swell causing movement of vessels.

The potential effect would have a high level of impact for vessels and crew, with limited ability to adapt to a quickly developing incident. The sensitivity is therefore assessed as high. The potential effect would be localised to the extent of the incident within the study area and will be present for the construction phase only. The impact has the potential to occur infrequently throughout the period of the construction, which leads to low negative magnitude and an overall outcome of **minor adverse**.

The following mitigation measures would need to be introduced by Argyll & Bute Council to reduce the risk to a level that can be considered ALARP:

- Weather forecasting – monitoring of weather conditions.
- Operational weather limits – maximum wind/wave limits for construction activities.
- Marine liaison officer – coordinating activities for the construction.

Following the implementation of these measures, specifically the implementation of operational weather limits, the future risk is assessed to remain as **minor adverse**.

6.4.1.10 Small non-powered craft displaced by the Proposed Development

Small non-powered craft may be displaced by the Proposed Development into deeper water in the Sound of Iona. There is an increased risk of collision of these vessels transiting across the Sound of Iona, particularly as the small non-powered craft may not be visible to the transiting vessels. The collision has the potential to result in multiple fatalities.

The potential effect would have high level of sensitivity as there is a high level of safety impact and the powered vessels will also have some ability to adapt to the situation through application of their engines, anchors or adjustment of moorings. The potential effect from the collision will be localised to the immediate extent of the marine construction area. The magnitude of effect is considered to be low negative due to the frequency of non-powered craft using the area. Hence the overall significance is **minor adverse**.

The following mitigation measures would need to be introduced by Argyll & Bute Council to reduce the risk to a level that could be considered ALARP:

- Notices to mariners: published on the Council website containing details about construction activities, particularly times when high vessel density is expected.
- Aids to navigation, provision and maintenance of: marine works are illuminated at night.
- Marine liaison officer: coordinating activities for construction.
- Promulgation of information: information promulgated to local communities and known groups that will be affected.

Following the implementation of this measure the risk would be reduced but remains within the classification of **minor adverse**. This is reflective of the fact that the above controls will reduce the likelihood of the event happening, however the effect of the event is unlikely to change drastically.

6.4.2 Assessment of Operational Effects

Based on the existing understanding of the scale (height, length and width) of the Proposed Development, together with the navigational baseline and stakeholder comments from the Scoping Opinion, the potential effects during the operational phase that are considered to be potentially relevant and require further assessment are listed below:

- Ferry or tour boat allision with the breakwater: ferry or tour boats manoeuvring in close proximity to the breakwater have the potential for heavy contact with the breakwater.
- Small non-powered craft displaced by the breakwater: the breakwater causes the displacement of small craft into deeper water and potentially leads to a collision with other vessels transiting across the Sound of Iona.

These are examined in further detail in Sections 6.4.2.1 to 6.4.2.2 below.

6.4.2.1 Ferry or tour boat allision with the breakwater

Any allision has the potential to cause damage to a vessel which may lead to a pollution event and cause injuries to personnel. This risk will diminish with time as crew become familiar with the new breakwater location and the effects of wind and tidal flow at this location. The passage of the ferry would be altered by the Proposed Development as the presence of the breakwater would require the ferry and tour boats to transit around the new structure, thereby altering the approach/departure route compared to that used presently.

This potential effect would have a medium level of sensitivity due to safety impacts for the vessel from an allision. It is likely that any allision would be at low speed given that vessels are arriving or departing the port on the approach to the berth; meaning that there is time to react to an allision situation by use of the vessel's engines, rudder and bow thruster (if fitted). In addition, the potential impact is localised to the area of the marine facilities but can occur throughout the operational phase leading to a magnitude of medium and an overall ranking of **moderate to minor adverse**.

The following mitigation measures would need to be introduced by Argyll & Bute Council to reduce the risk to a level that can be considered ALARP:

- Passage planning – update to CalMac Ferries Ltd. passage plan.
- Update Admiralty List of Radio Signals (ALRS) and Sailing Directions – updates to include new structures.
- Review of available powers – Argyll & Bute Council should review their powers in relation to operating the port facility at Iona to determine whether further powers are required to ensure navigational safety.
- Shore side facility maintenance programme – schedule of maintenance including Aids to Navigation (AtoN).

Following the implementation of these measures, specifically the review of available powers and the updates to the marine safety management system, the overall ranking will be reduced to **minor adverse**.

6.4.2.2 Small non-powered craft displaced by the breakwater

Small non-powered craft may be displaced by the breakwater into deeper water in the Sound of Iona. There is an increased risk of collision with vessels transiting across the Sound of Iona, particularly as the small non-powered craft may not be visible to the transiting vessels. The collision has the potential to result in multiple fatalities.

The potential effect would have a high level of sensitivity as there is a high level of safety impact and the powered vessels will also have some ability to adapt to the situation through application of their engines, anchors or adjustment of moorings. The potential effect from the collision will be localised to the immediate extent of the marine construction area. The magnitude of effect is considered to be low

negative due to the frequency of non-powered craft using the area. Hence the overall significance is **minor adverse**.

The following mitigation measures would need to be introduced by Argyll & Bute Council to reduce the risk to a level that could be considered ALARP:

- Notices to mariners: published on the Council website containing details about construction start and completion dates.
- Aids to navigation, provision and maintenance of: breakwater is illuminated at night.
- Promulgation of information: information promulgated to local communities and known groups that will be affected.

Following the implementation of these measures the risk would be reduced but remains within the classification of **minor adverse**. This is reflective of the fact that the above controls will reduce the likelihood of the event happening, however the effect of the event is unlikely to change drastically.

6.5 Mitigation Measures

The following mitigation measures were identified to ensure marine safety at Iona.

- Marine liaison officer – the marine liaison officer provides a point of contact for the marine works, will provide safety information to vessels navigating in the area and coordinate with local authorities during emergency situations. This provides a central point of contact.
- AIS coverage – all dredge/construction vessels, including barges to carry AIS (A or B (see Volume III, Appendix 6.1, Section 2.1 for definitions of AIS signals)).
- Notices to mariners – issued by Argyll & Bute Council containing details about the construction works. These should be issued prior to any works (or any related activities such as diving or towage movements).
- Availability of pollution response equipment – pollution response equipment should be available and carried by the contractors for use at Iona. The equipment should be appropriate for the type and scale of pollution that may occur.
- Weather forecasting – a weather forecasting service should be regularly monitored to indicate any periods of upcoming adverse weather conditions. Appropriate actions should then be taken to mitigate any potential situations that may arise. These actions should be documented in the safety management system, detailing the specific weather conditions that will necessitate action(s).
- Operational weather limits – including maximum wave and wind limits for construction activities should be detailed in the contractors 'Risk Assessment Method Statement'.
- Promulgation of information – information on the Proposed Development and upcoming operations with associated vessel movements should be provided to local stakeholders. A website page

(potentially on the Council's website) for the project, providing information and a method to contact the project would allow any vessels in the area to obtain information.

- Provision and maintenance of aids to navigation – aids to navigation should be provided after consultation and approval of the NLB. Marine works to be illuminated at night. The aids to navigation must be maintained so that they are available, as required, to the NLB with any out of service periods reported via the Local Aids to Navigation (LATON) system.
- Safety boat – the safety boat should be appropriate for the wind and wave conditions in the area. It should be available on site and manned during construction operations in order to provide quick assistance if any incident was to occur.
- Passage planning – CalMac should update their passage plan, both during the works and on completion of the works to recognise the altered route.
- Operational planning – capital dredging should be scheduled, as far as possible, to avoid disruption to ferry operations.
- Review of available powers – Argyll & Bute Council should review their powers in relation to operating the port facility at Iona to determine whether further powers are required to ensure navigational safety
- Update ALRS volume 6 and Sailing Directions – updates to include new structures after completion of the marine works.
- Shore side facility maintenance programme – to schedule the maintenance of the site, including the AtoN.
- Communications – stakeholders should be informed of the need to move buoyed areas prior to construction and advised of other suitable locations.
- Safety - Lighting - it is important that any marine works at night or at times of reduced visibility are sufficiently illuminated in accordance with the Health and Safety Executive (HSE) Approved Code of Practice (ACOP) 'Safety in Docks' (HSE, 2014). The guidance on illumination levels is drawn from the 'Safety and Health in Ports' code of practice published by the International Labour Organization; this states that: "On access routes for people, plant and vehicles and in lorry parks and similar areas, the minimum level of illumination should not be less than 10 lux. In operational areas where people and vehicles or plant work together, the minimum level of illumination should not be less than 50 lux". (ILA, 2016). This level of illumination must be balanced alongside the requirements provided in the British Standard Institute (BSI) publication 'Design of Road Lighting' BS5489.

A further three additional mitigation measures were listed in risk assessments that were not brought forward as having a 'Significant' or higher current risk. These are listed below and detailed in Volume III, Appendix 6.1, Section 10.

- Hydrographic surveying program

- Loading/unloading plan
- Operation planning

6.6 Potential Cumulative Effects

There is no potential for cumulative impacts on navigational safety during the operational phase due to the implementation of adequate risk controls that are needed to ensure marine safety. There will be no significant cumulative impacts during the construction phase.

6.7 Residual Effects

Following the implementation of mitigation measures and incorporation of the controls into operating procedures, the residual effects are likely to be reduced to minor adverse which is concluded to be ALARP as applied within the context of the Port Marine Safety Code (PMSC).

6.8 Conclusions and Summary of Effects

A summary of the effects expected on shipping and navigation, following the application of mitigation measures during the construction and operational phases is shown in Table 6-5 and Table 6-6, respectively. There are no residual effects that are considered significant.

Table 6-5 Summary of likely effects on shipping and navigation during the construction phase following the application of mitigation measures

Receptor	Sensitivity of Receptor	Duration	Magnitude	Significance	Significant/Not significant
Ferry or tour boat allision with marine works	Medium	Construction phase	Low negative	Minor adverse	Not significant
Dredger flooding whilst engaged in operations	High	Construction phase	Low negative	Minor adverse	Not significant
Dredge/construction plant impact with marine works	Low	Construction phase	Medium negative	Minor adverse	Not significant
Recreational/fishing vessel allision with marine works	High	Construction phase	Low negative	Minor adverse	Not significant
Dredge/construction plant collision with recreational/fishing vessel	High	Construction phase	Low negative	Minor Adverse	Not significant
Tug and tow collision with recreational/fishing vessel	High	Construction phase	Medium negative	Moderate adverse	Not significant
Tug and tow collision with ferry/tour boat	Medium	Construction phase	Medium negative	Moderate to minor adverse	Not significant
Accidental spill during marine works	High	Construction phase	Low negative	Minor adverse	Not significant
Heavy lift failure, or failure of lifting gear	High	Construction phase	Low negative	Minor adverse	Not significant

Receptor	Sensitivity of Receptor	Duration	Magnitude	Significance	Significant/Not significant
Small non-powered craft displaced by marine works	High	Construction phase	Low negative	Minor adverse	Not significant

Table 6-6 Summary of likely effects on shipping and navigation during the operational phase following the application of mitigation measures

Receptor	Sensitivity of Receptor	Duration	Magnitude	Significance	Significant/Not significant
Ferry or tour boat allision with breakwater	Medium	Long term	Medium negative	Minor adverse	Not significant
Small non-powered craft displaced by breakwater	High	Long term	Low negative	Minor adverse	Not significant

7 TERRESTRIAL BIODIVERSITY

7.1 Introduction

This chapter considers the likely significant effects on terrestrial ecological receptors associated with the construction, operation and decommissioning of the Proposed Development. The effects associated with the construction phase of the Proposed Development on terrestrial ecological receptors can be considered representative of reasonable worst-case decommissioning effects, therefore a separate assessment of the decommissioning phase has not been undertaken as part of this assessment.

The specific objectives of the chapter are to:

- Describe the terrestrial ecological baseline;
- Describe the assessment methodology and significance criteria used in completing the impact assessment;
- Describe the potential effects, including direct, indirect and cumulative effects;
- Describe the mitigation measures proposed to address likely significant effects; and
- Assess the residual effects remaining following the implementation of mitigation.

The assessment has been carried out by RPS Ecologists with relevant accreditations (MCIEEM). The assessment of terrestrial ecological effects follows the guidance produced by CIEEM (2018). This sets out the process for assessment as a series of stages;

- Describing the terrestrial biodiversity baseline in the Zone of Influence (ZoI) through survey and desk study;
- Identifying Important Ecological Features (IEFs): these are the species of highest ecological importance present in the ZoI;
- Determining the nature conservation importance of the IEFs present within the ZoI;
- Identifying and characterising the potential impacts on these IEFs, based on the nature of the construction, operation and decommissioning activities associated with the Proposed Development;
- Determining the magnitude of the impacts including consideration of the sensitivity of the terrestrial ecological feature and the duration and reversibility of the effect;
- Determining the significance of the impacts based on the interaction between the effect magnitude/duration, the likelihood of the effect occurring, and the nature conservation value of the IEF;
- Identifying embedded mitigation that will counteract or avoid adverse impacts;

- Determining the residual impact significance after the effects of mitigation have been considered, including a description of any legal and policy consequences;
- Determining potential cumulative effects; and
- Identification of any monitoring requirements.

This chapter is supported by the following technical appendices (see Volume III: EIAR Appendices):

- Appendix 7.1: Terrestrial Biodiversity Survey Results; and
- Appendix 7.2: Otter Protection Plan.

7.2 Assessment Methodology

7.2.1 Scope of Assessment

This chapter details the results of the terrestrial biodiversity surveys undertaken to inform the assessment of the Proposed Development, which is described in Chapter 3: Project Description.

The surveys were designed to assess the presence and use by protected and notable species of the intertidal and near shore coastal habitats within the Iona Breakwater development zone. The surveys focussed particularly on the qualifying species of coastal/ marine designated sites of nature conservation interest associated with the Sound of Iona and wider area within the Seas of the Hebrides (shown in Figure 7-1 and Figure 7-2).

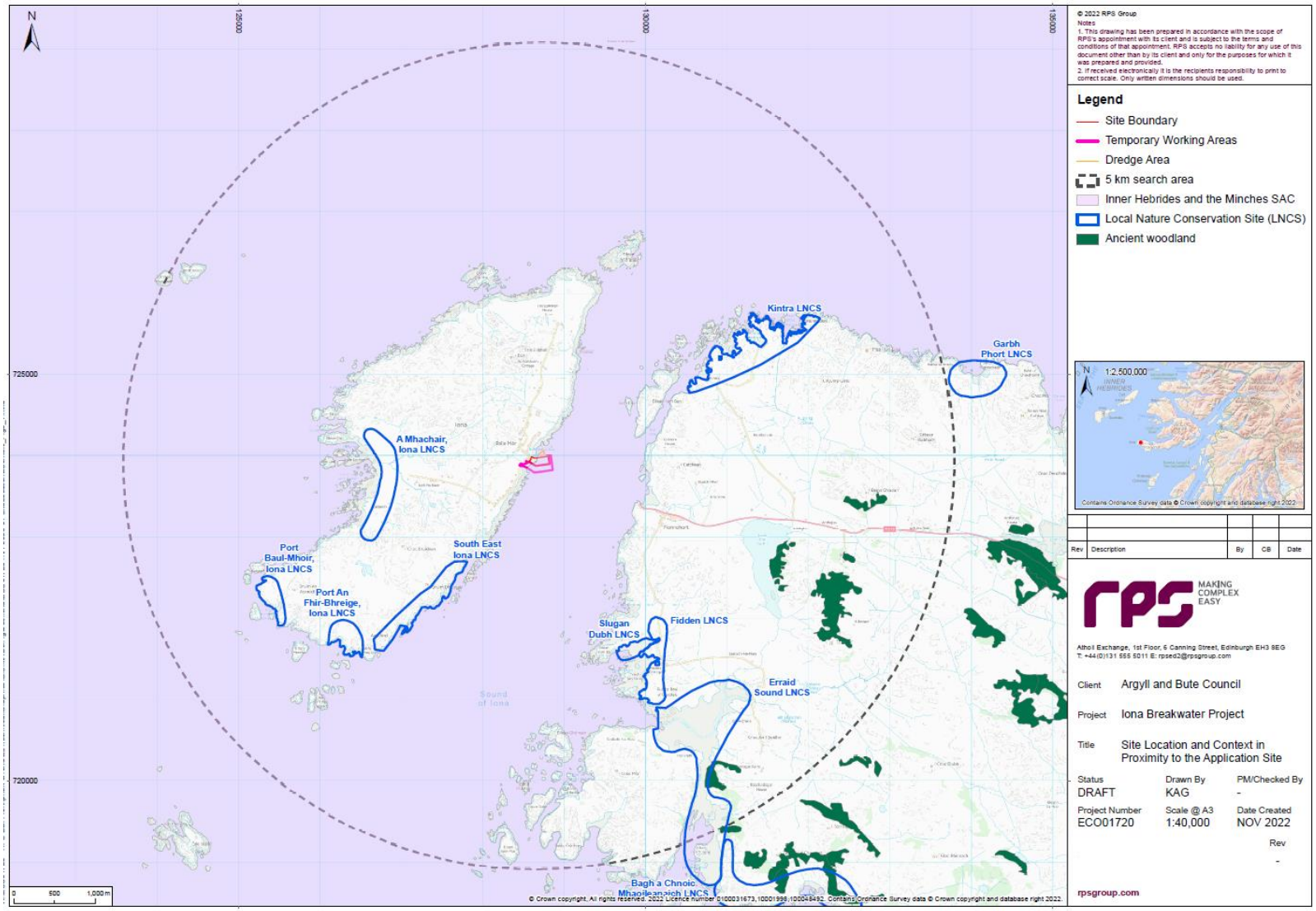

Figure 7-1 Location of sites of nature conservation interest in proximity to the Proposed Development

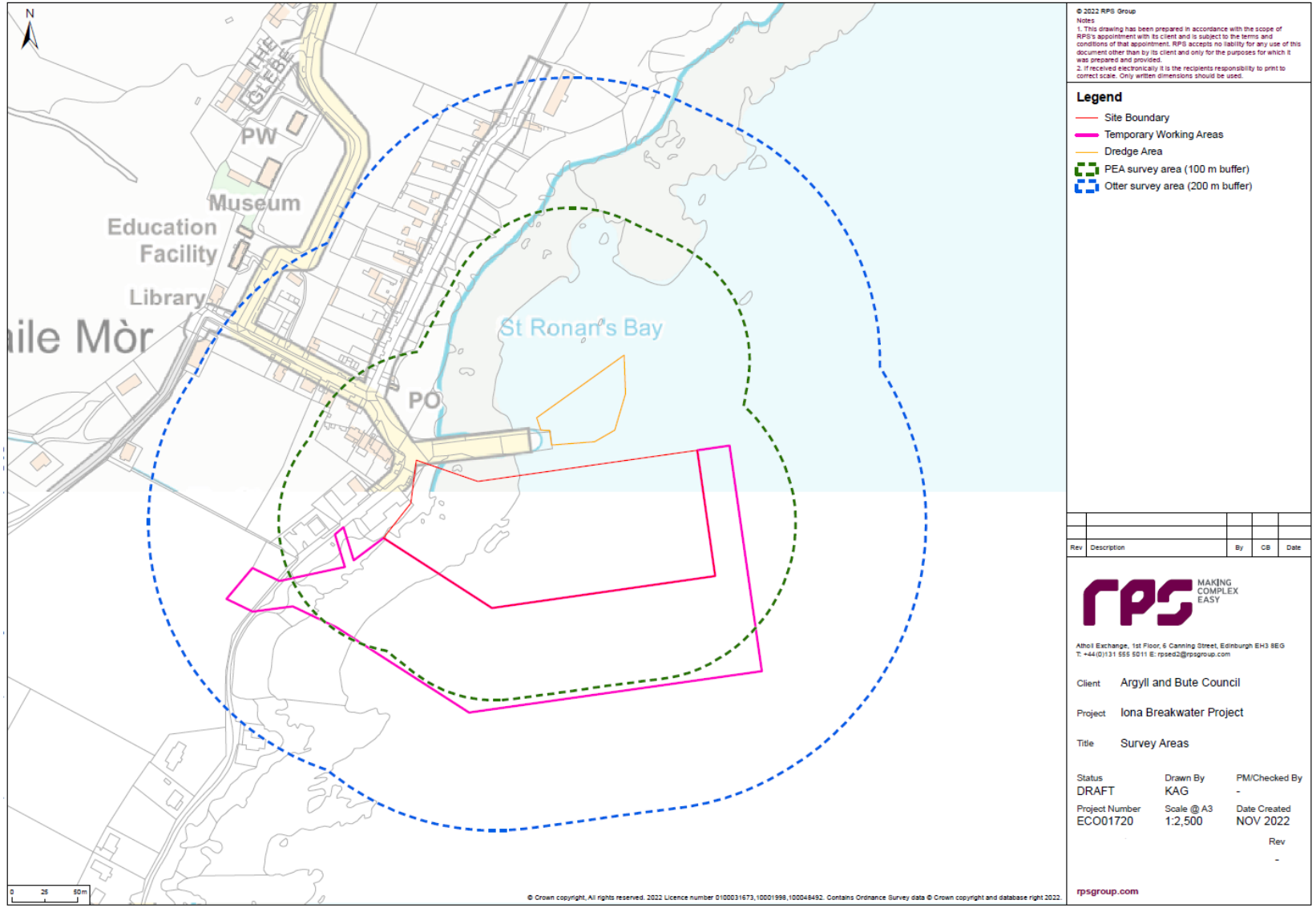

Figure 7-2 Survey Areas

The scope of the assessment has been informed by the guidelines/policies outlined in below and the consultation responses summarised in Table 7-1:

- Environmental Impact Assessment Directive 2014/52/EU (the EIA Directive);
- Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora (the Habitats Directive);
- The Conservation (Natural Habitats &c.) Amendment (Scotland) Regulations 2012, relating to reserved matters in Scotland;
- Wildlife and Countryside Act 1981 (as amended);
- The Nature Conservation Act (Scotland) Act 2004;
- The Wildlife and Natural Environment (Scotland) Act (2011);
- The Protection of Badgers Act 1992;
- Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017, which transpose the EIA Directive into the Scottish planning system;
- Planning Circular 1/2017 – Environmental Impact Assessment Regulations (Scottish Government 2017);
- PAN 51: Planning Environmental Protection and Regulation (revised 2006);
- PAN 60: Planning for Natural Heritage (Scottish Government 2000);
- Nature Conservation: Implementation in Scotland of the Habitats and Birds Directives: Scottish Executive Circular 6/1995 as amended (June 2000);
- Scottish Planning Policy (SPP);
- Guidelines for Ecological Impact Assessment in the UK and Ireland (CIEEM 2018);

7.2.1.1 Consultation

Table 7-1 summarises the relevant consultation responses to the EIA Screening / Scoping report and provides information on where and/or how they have been addressed in this assessment. Only NatureScot made comment on terrestrial biodiversity.

Information on the Scoping and Consultation can be found in Chapter 5.

Table 7-1 Consultation Responses of relevance to Terrestrial Biodiversity

Consultee and Date	Consultation	Issue Raised	Response / Action Taken	Where issue is addressed in EIA Report
NatureScot and Marine Scotland ***May 2021***	EIA screening opinion	Otter surveys required	Otter surveys were undertaken within 200m of the Proposed Development	Survey methodologies and results detailed in Appendix 7.1
NatureScot	Terrestrial ecology survey scope	No response		

The findings of these surveys have been used to inform the Environmental Impact Assessment (EIA) for the Proposed Development.

This chapter considers the potential for likely significant effects on the qualifying species of the terrestrial SACs and additional species assessed to be sensitive Important Ecological Features (IEFs) of international, national or regional importance.

7.2.1.2 Potential Effects Scoped Out

The scope of this assessment takes account of the committed mitigation measures both incorporated into the design and those standard construction and decommissioning mitigation measures incorporated into the Proposed Development, as described in Chapter 3: Project Description. No other issues have been scoped out of the assessment.

7.2.2 Assessment Methodology and Significance Criteria

7.2.2.1 Method of Baseline Characterisation

Extent of the Study Area

The study area for the purpose of the assessment comprises a set of buffers from the Proposed Development site that are of varying distance, depending on the nature of the potential receptor. These include:

- Sites designated for terrestrial biological features within 5km (e.g., Sites of Special Scientific Interest (SSSI), Special Areas of Conservation (SAC), Local Nature Reserves (LNR) and Local Nature Conservation Sites (LNCS);
- Given the coastal location of the Proposed Development and the wide-ranging foraging behaviour of otters which may be present in the area, consideration was given to SACs designated for otters within 20km;
- Records of Notable (i.e., species with conservation designations, but no legal protection) and Protected Species within 2km;
- Preliminary Ecological Appraisal (PEA) within 100m;

- Phase 1 Habitat survey within 100m; and
- Species survey of Otter within 200m

These study areas are presented in Figure 7-2.

Desk Study

A request was made to the Argyll & Bute Local Records Centre for all records of Notable and Protected Species within 2km of the site within the last 10 years. A buffer of 2km was used as it is considered unlikely the proposal would affect specific interests over and above this distance.

The desk study also sought to collate relevant information on all sites with designated terrestrial ecological features (SPAs/ SACs/ Ramsar Sites/ SSSIs/ LNRs/ LNCS) where there may exist ecological connectivity between the Site and protected or notable species.

A search for all designated sites within the defined study areas outlined above was made utilising online sources, allowing the identification of all designated sites with qualifying ecological interests. The online sources used to obtain this information were;

- NatureScot Sitelink[7];
- JNCC website[8];
- Scotland's environment web[9];
- Argyll and Bute Council open data website[10]; and
- Aerial imagery which was studied prior to the survey to inform any areas of high sensitivity which might require additional survey effort during the site visit.

Field Survey

Aerial imagery was studied in the process of the desk-based assessment to ascertain the likely habitats within and surrounding the Proposed Development, and the species these may be likely to support. As such the following surveys were carried out to complete the baseline assessment of ecological features present within the Proposed Development site and surrounding area. Full details of the field surveys undertaken are outlined in Volume III, Appendix 9.1 and are summarised below.

A Preliminary Ecological Appraisal (incorporating a Phase 1 Habitat survey) was undertaken to establish the broad habitat types present and the potential for the site to support protected species in

[7] https://sitelink.nature.scot/home

[8] https://jncc.gov.uk/our-work/list-of-spas/

[9] https://map.environment.gov.scot/sewebmap/

[10] https://data-argyll-bute.opendata.arcgis.com/datasets/open-data-local-nature-conservation-site

line with CIEEM guidelines (CIEEM 2017). The Phase 1 Habitat surveys followed the Joint Nature Conservation Committee (JNCC) Phase 1 Habitat survey methodology detailed in JNCC (2016).

A species-specific survey for otters was undertaken looking for otter field signs as described in Bang & Dahlstrøm (2001), within a 200m buffer of the Proposed Development site.

7.2.2.2 Assessment Criteria and Assignment of Significance

The method of assessment for this Chapter follows that of CIEEM (2018) guidance. The term Important Ecological Features (IEFs) is used for those species and habitats identified in the assessment. For each impact with the potential to affect the relevant IEFs, the assessment considers the following parameters:

- Whether the impact is positive or negative in its influence;
- The extent of the impact;
- The magnitude, duration and timing of the impact; and
- The impact's frequency and ease of reversibility.

The assessment similarly includes consideration of any proposed mitigation to avoid or minimise the effect of any potential impact to the relevant IEFs and identifies any potential cumulative impacts from surrounding developments prior to determining the residual significance of any effect, be this negligible, minor, moderate or major. Effects can be either adverse or beneficial.

Criteria for Assessing the Sensitivity of Receptors

The identification of IEFs and assessment of their level of importance is guided by a range of criteria, as defined in Table 7-2. These criteria are a guide and not definitive; ecologists should apply judgment based on knowledge of the region and populations involved.

Table 7-2 Approach to Valuing Ecological Receptors

Level of importance	Example of IEF
International	Species listed as qualifying feature of an internationally designated site (SAC/SPA/Ramsar Site, including candidate sites). European Protected Species (EPS) (e.g., otters, bat species).
National*	A species listed as a qualifying feature of a nationally designated site (e.g., SSSI). Species and habitats given special protection under UK legislation.
Regional*	Species that are subject to conservation action plans e.g., Scottish Biodiversity List (SBL)/UKBAP/LBAP.
District*	Species and habitats of some conservation concern listed on Local Biodiversity Action Plan (LBAP).
Local*	A species or habitat that is of nature conservation value in a local context only, with insufficient value to merit a formal designation (e.g., Red and Amber-listed BoCC bird species).
Negligible	Common and widespread species or habitat of little or no conservation value/importance.

*"National" refers to the whole of the UK; "Regional" refers to Scotland, "District" refers to Argyll and Bute and "Local" refers to the Project site and immediate environs

For the purposes of this assessment, the important populations described in Table 7-2 are graded as High, Medium and Low sensitivity as follows:

- High: Site population is of International / National importance;
- Medium: Site population is of Regional / District importance;
- Low: local: Site population is of Local / Negligible importance.

Whilst it is important to assess the importance or value of the species found during baseline surveys, the most critical consideration with regards to the EIA is the importance of the Proposed Development for these species at a population level. This is because the EIA process requires an assessment of impacts on the populations using the site of the Proposed Development.

Therefore, in the following assessment, each IEF present at the Proposed Development site is assigned a level of importance from International to Negligible. The Site level of importance is a function of the species value in combination with the size of the population that occupy or are reliant on, the Site. For example, if an internationally important species has been recorded at a site only once, or only over-flying the survey area, then the Site level of importance would be considered negligible.

Criteria for Assessing the Magnitude of Change

The magnitude of change is described in the EIAR as a quantitative value as far as is practicable. For example, magnitude of change can be quantified as a percentage decline of a population or as area of habitat from which otters will be displaced.

The magnitude of change resulting from a given development will differ between species and populations, and therefore assessing the magnitude requires consideration of a species' behavioural sensitivity, population size and condition (among other considerations, notably (relevant to this site), the degree or habituation to pre-existing background levels of human activity – walkers, dog walkers, cyclists, adjacent road traffic and off-road motorbikes). Examples include different species' responses to disturbance, and the greater vulnerability of small, declining and isolated populations to the impacts of additional pressures.

In addition, the magnitude of an impact is influenced by the duration of the impact, irreversibility and cumulative effects of other impacts. With regard to the duration of an impact, it can be defined as permanent (beyond 25 years duration), long-term (15-25 years), medium-term (5-15 years) or short-term (up to 5 years). Again, knowledge of the populations' ability to recover from impacts is required to assess the duration of the effect. For example, mortality events for species with relatively small population sizes and low reproductive output (such as otters) will take considerably longer for a population to recover from than abundant and widespread species that have high output and will fill vacant territories and replace numbers rapidly (e.g. water voles).

Consideration of the above factors allows quantification as to the magnitude of effect. Table 7-3 presents magnitude at four levels, from Major to Negligible, and this is the scale by which effect or change is quantified in this chapter. Note that the magnitude of effect is sometimes referred to as

magnitude of change, as the level of effect can be quantified in terms of change in population, range etc. Note that some of the lower magnitudes of effect can be applied to beneficial (positive) impacts.

Table 7-3 Defining the Magnitude of Effect on Important Ecological Features

Magnitude	Typical Descriptors of Effect
Major	Would cause the loss of a major proportion or whole feature/population or cause sufficient damage to a feature so as to immediately compromise long-term viability. Irreversible. For example, more than 20% decline in population that an area is able to support in the long-term.
Moderate	Effects that are detectable in short and longer-term but which should not alter the long-term viability of the feature/population, for example 10-20% decline in population that an area is able to support.
Minor	Minor effects, either sufficiently small-scale or short-duration, which cause no long-term decline in feature/population, for example less than 10% decline in population that an area is able to support.
Negligible	A potential impact that is not expected to affect the feature/population in any meaningful way, with no detectable decline in population/distribution. Any change from baseline conditions predicted at <1%.

Criteria for Assessing Cumulative Effects

Cumulative Impact Assessment (CIA) requires the availability of EIA Report chapters and appraisals for adjacent developments which have concluded potential effects on the same IEF populations that this chapter has identified to be subject to potential effects from the Proposed Development. This includes a consideration of other developments that are operational, consented, or for which a valid application has been submitted.

Varying degrees of access to these appraisals, and their differing degrees of detail or completeness, complicates the ability to undertake a thorough review of all impacts for cumulative impact assessment. Even where the appraisals are available, survey periods and methods may differ following changes to guidance and legislation over time. Furthermore, some schemes may have been in operation for many years, and therefore contemporary data is not available.

Criteria for Assessing Significance

Having followed the process of assessing the importance of IEF populations and quantifying the magnitude of impact (through consideration of the sensitivity of the population and duration of effect), the final stage of the EIA process is to establish the significance of the effect.

CIEEM (2018) guidance requires a determination of whether an effect is significant or not significant. Significance of an effect is determined by a combination of the magnitude of the impact and the importance of the population/ feature.

This chapter uses the definition of a significant effect, as defined by the EIA Regulations, as *an effect that threatens the integrity of a designated ecological feature of international importance*, such as the viability of SAC populations of breeding otters.

CIEEM discourages the use of matrices for determination of significant effects, advising professional judgement is to be used. However, a matrix for determining significant effects is often requested, and it is often useful in illustrating the process behind determination of significance.

Table 7-4shows the matrix used here for determination of significance. This is a generic matrix (for all EIA considerations) and notes have been added to illustrate the considerations for ecological features.

Table 7-4 Matrix for Determination of Significant Effects

		Magnitude of change			
		Major	**Moderate**	**Minor**	**Negligible**
Sensitivity	**High**	Major	Major/ Moderate	Moderate	Moderate/Minor
	Medium	Major/ Moderate	Moderate	Moderate/ Minor	Minor
	Low	Moderate	Moderate/ Minor	Minor	Minor/ Negligible

Sensitivity: Conservation importance of IEF
High: Site population is of **International / national importance**
Medium: Site population is **Regional / District importance**
Low: local: Site population is **Local / Negligible importance**
Magnitude of change: Size of effect on population/feature. Assessed with consideration of sensitivity of species/feature to impact, duration of effect and ability of species/feature to recover (among other factors)
***Potentially* significant effects are in dark shading**

Limitations and Assumptions

The desk study data is third party controlled data, purchased for the purpose of this report only. RPS cannot vouch for its accuracy and cannot be held liable for any error(s) in these data.

The assessment of likely significant effects is based, as much as is possible, on published scientific research and the most current known population data. When empirical data is lacking or insufficient, the judgement of experienced ecologists with detailed knowledge of animal behaviour and ecology is required. Any assumptions made during this assessment are clearly stated. With regard to uncertainty about the magnitude of adverse effects, the precautionary principle is applied, i.e., lack of full scientific certainty should not be used as a reason for postponing or failing to take measures to mitigate these adverse effects.

Following completion of the field surveys, the proposed site boundary was altered, and a Temporary Works Area was added to the Project design. As such, a small area of the Proposed Development site fell outwith the survey buffer for the Phase 1 Habitat Survey (see Figure 7-3). For completeness, this area was mapped using aerial photography and knowledge of the adjacent habitats.

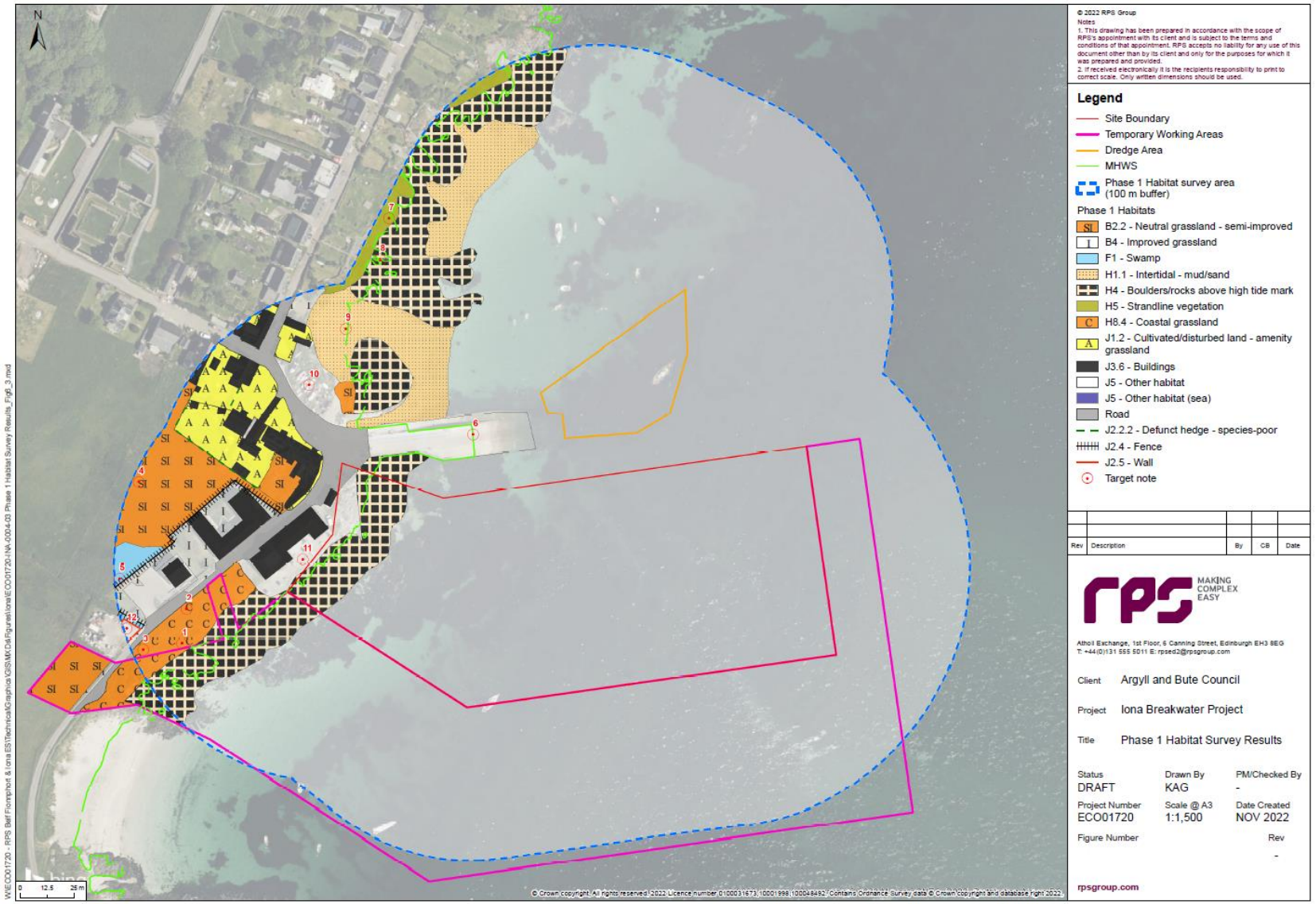

Figure 7-3 Phase I Habitat Survey Results

7.3 Baseline Scenario

7.3.1 Current Baseline

7.3.1.1 Desk Study

Designated Sites

The desk study identified the presence of the following (Table 7-5) designated sites within 5km of the site. No SACs designated for otters were identified within 20km:

Table 7-5 Statutory and Non-Statutory Designated Sites Relating to Terrestrial Ecology (Excluding Avian Interests).

Site	Designation	Distance from site	Features of interest
South East Iona	LNCS	1.4	No Information available
A Mhachair, Iona	LNCS	1.5	No Information available
Port Baul-Mhoir, Iona	LNCS	3.3	No Information available
Port an Fhir-Bheige, Iona	LNCS	2.8	No Information available
Kintra	LNCS	1.9	No Information available
Slugan Dubh	LNCS	2.3	No Information available
Fidden	LNCS	2.2	No Information available
Erraid Sound	LNCS	3.2	No Information available

No information was available on the NatureScot SiteLink website[11] or from the local authority on the nature of the designations listed in the table above. Only the first four of these were located on Iona, with the remaining sites located on Mull. Given the distance and lack of connectivity from the Proposed Development to the LNCSs it is considered that there will be no impacts on these due to the works and, as such, they are not considered further in this chapter.

No areas of ancient woodland were identified on Iona. As such, impacts relating to ancient woodland are not considered further in this chapter.

Biological Records

Argyll Biological Records Centre (ABReC) responded on 31 August 2021 stating that they could not produce full data reports at this time and granted permission for their data to be downloaded from NBN Atlas[12] in relation to the Proposed Development. The key species that have been recorded within 2km of the Proposed Development site are noted below. Of the species reported in Table 7-6, none were identified within the Proposed Development site boundary.

[11] https://sitelink.nature.scot/home

[12] https://scotland.nbnatlas.org/

Table 7-6 ABReC Records from the Last 10 Years, of Protected and Notable Species (Excluding Birds) Within 2km of the Proposed Development site

Common Name	Taxon Name	European Protected Species (Following EU Exit)	Wildlife and Countryside Act 1981 (as amended)	Argyll and Bute Local Biodiversity Action Plan
Mammal				
Eurasian otter	*Lutra lutra*	EPS (Habitats Directive)		Yes
West European hedgehog	*Erinaceus europaeus*			
Reptile				
Common lizard	*Zootoca vivipara*		Schedule 5 (Section 9(5))	

7.3.1.2 Field Surveys

Habitats

The Phase 1 Habitat Survey types identified during the survey are mapped in Figure 7-3. Table 7-7 lists the broad Phase 1 Habitat types present within the Proposed Development site. All habitats below the Mean High Water Springs (MHWS) line have been excluded from the calculations as these are considered in Chapter 8 (Marine Biodiversity). The habitats found within the Proposed Development site are discussed in detail in Volume III, Appendix 7.1.

Table 7-7 Phase 1 Habitat Types

Phase 1 Habitat Type	Survey Area (ha)*	Area in Site Boundary and Temporary Work Area (ha)
Neutral grassland - semi-improved - B2.2	0.29	0.06
Improved grassland - B4	0.12	0.01
Swamp - F1	0.03	-
Intertidal – mud/sand – H1.1	0.06	-
Boulders/rocks above high tide mark – H4	0.16	0.06
Strandline vegetation – H5	0.05	-
Coastal grassland – H8.4	0.14	0.06
Cultivated/disturbed land – amenity grassland – J1.2	0.18	-
Buildings J3.6	0.22	-
Defunct hedge – species poor - J2.2.2	N/A	-
Fence – J2.4	N/A	-
Wall – J2.5	N/A	-
Other habitat - J5 (pier, hardstanding)	0.25	0.03
Road/track	0.20	0.02
Total	1.70	0.24

* Survey Area includes those habitats mapped during the Phase 1 survey as well as a small section of the temporary working area which was mapped from aerial photography.

The Proposed Development is located offshore and, as such, the terrestrial habitats recorded were limited to an area of boulders/ rocks above high tide. The coastal habitats in the western site buffer are a mixture of coastal rock/ sand habitats and grassland habitats (coastal/ semi-improved/ amenity). A number of buildings associated with the ferry terminal and the local village were also located in the survey area. The majority of the survey area was occupied by open sea. The habitats associated with the marine environment are discussed in Chapter 8.

Otters

The coastal habitats present offer good commuting potential for otters. Inland, there is limited connectivity within the survey area from the coastal habitats to inland freshwater foraging habitats. Due to the high levels of disturbance associated with the presence of a ferry terminal and the local village it is unlikely that the habitats in the survey area are used as refugia by otters.

During the otter survey undertaken on 16 June 2021, no field signs of otter were recorded (see Volume III, Appendix 7.2).

Bats

The Proposed Development site offers little to no foraging or commuting habitat for bats due to its marine situation. The terrestrial habitats in the survey buffer to the west offer low foraging and commuting habitat potential for bat species, due to the exposed nature and lack of woodland and watercourses. The semi-improved neutral grassland, coastal grassland, swamp habitat and gardens offer foraging potential, however the foraging potential in the wider area is also relatively limited with generally poor connectivity.

During the Preliminary Ecological Appraisal (PEA) survey undertaken on 16 of June 2021, two trees were found within the survey area, neither of which had potential bat roost features. The buildings in Baile Mòr village within the survey buffer could offer moderate potential for roosting bat species utilising the area.

Therefore, the site has been assessed as having negligible potential for foraging, commuting and roosting bat species, with the terrestrial habitats to the west offering moderate potential for roosting bats and low potential for foraging and commuting.

Reptiles

The Proposed Development site offers no suitable habitat for reptiles. The survey buffer to the west has been assessed as having the potential to support common lizard (*Zootoca vivipara*) and slow worms (*Anguis fragilis*). This is due to the presence of semi-improved neutral grassland and an area of coastal grassland. The desk study only identified the presence of common lizards in Iona.

7.3.1.3 Identification of Important Ecological Features

The majority of the terrestrial ecological receptors from the Proposed Development are only likely to be impacted (ecologically) at site or regional level. This is because impacts on the potential receptors will only occur within the Proposed Development site itself.

Potential terrestrial ecological receptors identified during the desk studies and field surveys include bat species, otters, and reptiles. Those designated sites identified by the desk study relating to non-avian ecological receptors comprise eight LNCS.

Of the potential ecological receptors which could be impacted, a number were discounted:

- Designated sites – The seven LNCSs are all located over 1.5km from the site and will not directly be impacted by the development. Due to the distance from site, there are not anticipated to be any indirect impacts relating to noise disturbance. It is therefore considered that construction activities at the Proposed Development will not impact the LNCSs located within the search area;
- Bat species – the Proposed Development offers negligible foraging or commuting habitat due to its marine location. The terrestrial habitats in the survey buffer to the west offer low foraging and commuting habitat for bat species, due to the exposed nature and lack of woodland and watercourses. The buildings in Baile Mòr village within the survey buffer could offer moderate potential for roosting bat species utilising the area. As the works will all predominantly be undertaken by barge at sea, with no construction activities occurring on land, in an area where bats will already be habituated to disturbance relating to ferry traffic (both terrestrial and marine), it is anticipated that there will be no impacts on bat species utilising roosts within the survey buffer. As such, bat species have been scoped out of the assessment; and
- Reptiles – the Proposed Development has no suitable habitat for reptiles. As per the bat species, there will be no impact on suitable terrestrial habitats used by reptiles relating to damage or disturbance to reptiles and, as such, they have been scoped out of the assessment.

The following non-avian IEFs have therefore been identified for the Proposed Development site and are considered further in the assessment: habitats and otters.

7.3.2 Future Baseline

The Overview Report for Climate Change Projections and factsheets (MOHC, 2018) indicates that, in general, warmer, wetter winters and hotter, drier summers are predicted, though of course still with natural variations in that pattern from year to year. No clear trend in wind speeds or storms is predicted, though the data currently published cannot make projections for local conditions and wind gusts. Sea levels are predicted to rise overall with increases in extreme coastal water levels.

In the short term, between the time of survey and the start of construction, there are no predicted changes to the baseline scenario. In the longer term, in the absence of development it is likely that the same intertidal habitats will be present in the survey area but in different proportions due to increased fluctuations in sea level and a gradual increase in coastal water levels.

7.3.3 Summary of Sensitive Receptors

Table 7-8 summarises the IEF's to be included in the assessment and their sensitivity.

Table 7-8 Summary of Receptor Sensitivity

Receptor	Sensitivity	Justification
Habitats	Low	Only a small section of terrestrial habitat will fall within the Proposed Development site. The habitats are not UKBAP priority habitats, SBL habitats or included as priority habitats in the local Biodiversity Action Plan (Argyll and Bute Planning Service 2017).
Otters	Medium (No signs of otter recorded during the surveys)	Otter is designated as an EPS and is listed as an SBL, LBAP and UKBAP priority species. However, no field signs or resting sites were identified during the surveys and the relatively high level of baseline disturbance from the harbour may deter otters from regularly using the immediate surrounding area.

7.4 Description of Likely Significant Effects

During construction, all works will be undertaken offshore using barges to ship in materials and undertake the construction works. Welfare facilities will be located on the barge, however there will likely be a small compound established within the Temporary Work Area (Figure 7-2). Full details of the construction methods to be employed are outlined in Chapter 3, Section 3.2.

7.4.1 Potential Effects

The following potentially significant impacts have been identified for the works associated with the construction phase of the Proposed Development:

- Temporary disturbance/ loss of habitat arising from activities within the terrestrial area of the Temporary Work Area (namely the establishment of a work compound and storage of rock);
- Temporary disturbance/ loss of habitat due to airborne noise and visual disturbance from construction activities;
- Permanent loss of habitat arising from reclamation of seabed during the construction of a new rock armour breakwater to the south of the existing slipway; and
- Temporary effects on prey species due to underwater noise arising from construction activities (notably dredging and vessel noise), increased suspended sediment concentrations and sediment deposition.

The following potential impacts have been identified during the operational phase of the Proposed Development:

- Long term increase in disturbance to habitat arising from increased levels of marine activity due to improved ferry services;

- Long term increase in disturbance of habitat due to airborne noise and visual disturbance associated with the increase in terrestrial activity; and
- Long term effects on prey species due to noise arising from vessels and potential for pollution events linked with increased levels of marine activity.

7.4.2 Assessment of Construction Effects

Habitats

When considering habitats, only terrestrial habitats have been assessed, therefore all areas mapped below the MHWS line are shown as 'sea' and have been excluded from the habitat loss calculations below (Table 7-9). Habitats below the MHWS line are considered in Chapter 8 (Marine Biodiversity). When considering habitat loss, only the areas mapped as terrestrial habitat that overlap with the proposed breakwater and rock armour have been considered. All terrestrial habitats within the Temporary Work Area have been included in the habitat change calculations as these areas will be used for the site compound and rock storage, which is likely to also involve machinery movement and temporary damage to the underlying habitats.

Table 7-9 Terrestrial Habitat Loss and Change

Phase 1 Habitat Type	Total Area of Terrestrial Habitat in Site Boundary and Temporary Work Area (Ha)	Total Permanent Loss (Rock Armour and Breakwater) (Ha)	Total Area of Habitat Change (Temporary Work Area) (Ha)	Total Area Affected (Ha)	% Of Each Habitat in Proposed Development Affected
Neutral grassland - semi-improved - B2.2	0.06	-	0.06	0.06	100%
Improved grassland - B4	0.01	-	0.01	0.01	100%
Boulders/rocks above high tide mark – H4	0.06	0.01	0.04	0.05	83%
Coastal grassland – H8.4	0.06	-	0.06	0.06	100%
Other habitat - J5 (pier, hardstanding)	0.03	0.01		0.01	33%
Road/track	0.02	-	0.01	0.01	50%
Total	**0.24**	**0.01**	**0.18**	**0.19**	**79%**

* Survey Area includes those habitats mapped during the Phase 1 survey as well as a small section of the temporary working area which was mapped from aerial photography.

The construction phase will result in the loss of approximately 0.02ha of terrestrial habitat, with 0.1ha in the form of boulders/ rocks above high tide mark. This habitat is locally common in the coastal areas around Iona and is not a protected habitat. As such the habitats to be lost are considered to be of local conservation value.

Impacts relating to habitat change and damage within the Temporary Work Area are considered short term in duration and reversible, with the habitats to be affected generally locally common and of local or negligible conservation value.

Given the above, the magnitude of the impact has been assessed as minor. When considering the local conservation value as low sensitivity, the overall assessment of effect is deemed to be Minor Adverse. In terms of the EIA Regulations this is deemed a non-significant effect.

Otters

No field signs relating to otters were identified during the survey. The desk study identified otters as being present within the wider landscape. The coastal habitat is considered to provide suitable foraging and commuting habitat for otters; however, the baseline disturbance due to the presence of an active ferry terminal and dog walkers may deter otters from establishing resting sites within the survey area. Therefore, given the lack of evidence of the current use of the area by otters, it is anticipated that there will be no physical damage or disturbance to resting sites during the construction phase and the magnitude of change in relation to injuries or fatalities is negligible.

Noise and visual disturbance may result in a temporary reduction in foraging habitat (through both prey disturbance and disturbance to otters) within the immediate vicinity of the construction works. Given the widely available food sources in the immediate environs it is considered the magnitude of change in relation to reduction of foraging habitat and prey availability due to construction works is minor.

Pollution events could result in a reduction of prey availability and injury/fatality to otters. The magnitude of change in relation to injuries or fatalities is minor.

Given the above, the overall magnitude of the impact has been assessed as moderate. When considering the international conservation value and medium sensitivity at the site level, the overall assessment is deemed to be Minor Adverse. In terms of the EIA Regulations this is deemed a non-significant effect.

7.4.3 Assessment of Operational Effects

Habitats

During the operational phase there are no predicted effects on habitats.

Otters

During the operational phase there is the potential for disturbance to otters from the increase in marine activity due to the improved ferry services. Any otters using habitat around the existing ferry terminal will be tolerant to disturbance and so the additional ferry services are unlikely to have a significant impact on their foraging and commuting behaviour. This is also considered the case for prey species. Due to the low likelihood of this work disturbing protected species, these potential impacts are assessed as being of low magnitude and their effects as of Negligible significance. In terms of the EIA Regulations this is deemed a non-significant effect.

7.5 Mitigation Measures

7.5.1 Mitigation During Construction

The only impact predicted to have a minor (though not significant) effect relates to injury to otters during construction. The following mitigation describes methods that will reduce the risk for otters:

- Production of an Otter Species Protection Plan (see Volume III, Appendix 7.2) and adherence to all recommendations made within;
- Production of a Construction and Environmental Management Plan (oCEMP); and
- An Ecological Clerk of Works (ECoW) will be appointed to monitor the works in respect to otter activity.

7.5.2 Mitigation During Operation

No additional mitigation measures are required for the operational phase of the Proposed Development. The Environmental Management Plan (EMP) will manage the risks of all operational activities, facilities and cargo handled by the port and will include best practice measures to control pollution following standard guidelines such as the Environment Agency Pollution Prevention Guidelines. This is considered sufficient to limit any potential impacts relating to pollution events.

7.6 Potential Cumulative Effects

The above sections have considered the implications of the Proposed Development on IEFs in isolation from the potential effects of other plans and projects. The CIEEM guidelines also require that the Proposed Development be assessed cumulatively, so that any potential cumulative effects can be identified.

Chapter 21 summarises the criteria for selecting the list of projects to be considered. Two projects have been identified in the vicinity of the Proposed Development. These are listed below:

- The Fionnphort Breakwater and Overnight Berthing Project c.1.3km to the east. No assessment has been made in respect to this development as yet, but it is anticipated that the impacts would be of a similar nature to the Proposed Development. Due to the distance and separation of the two developments by the Sound of Iona, it is unlikely that any in-combination effects on IEFs would occur; and
- Cable installation – Iona to Fionnphort c.900m to the south. The project involves the installation of fibre optic cable and is proposed in the first half of 2023. No information on the potential impacts of this work on otters or habitats was available through the Marine Scotland website[13]. There is the potential for cumulative impacts relating to disturbance for otters using the Iona coastline. Given

[13] https://marine.gov.scot/marine-projects

the distance between the sites and the presence of alternative foraging and commuting habitats for otter to use along the coastline and inland, it is considered that that any in-combination effects would be negligible.

7.7 Residual Effects

7.7.1 Residual Construction Effects

Habitats

Following implementation of the oCEMP, as highlighted in Section 7.5, it is considered that impacts relating to habitats would be of minor magnitude and their effects of negligible significance. In terms of the EIA Regulations this is deemed a non-significant effect.

Otters

Following implementation of the mitigation outlined in Section 7.5 and Technical Appendix 6.2, the magnitude of the impact has been assessed as minor. When considering the international conservation value and medium sensitivity at the site level, the overall assessment of effects is deemed to be negligible. In terms of the EIA Regulations this is deemed a non-significant effect.

7.7.2 Residual Cumulative Effects

7.7.2.1 Ecology

Otters

Following implementation of the mitigation outlined in Section 7.5 and Appendix 7.2, it is considered that in-combination effects relating to otters would be of negligible magnitude and their effects as of minor significance. In terms of the EIA Regulations this is deemed a non-significant effect.

7.8 Conclusions and Summary of Effects

In summary, the terrestrial impacts relating to the Proposed Development will be non-significant, with the most notable impacts relating to the potential for impacts on otters (minor adverse during construction). Despite the absence of otter activity within the study area, a precautionary approach has been adopted and an Otter Protection Plan (Technical Appendix 7.2) has been included to ensure that there will be no significant effects to terrestrial IEF's.

In addition to the above, a Habitats Regulation Appraisal (HRA) has been undertaken to determine the potential for the Proposed Development to have a Likely Significant Effects (LSE) on designated sites in the UK national network of sites ('European sites'). The initial screening process (Stage 1: Screening) did not identify any sites designated for terrestrial biodiversity to be taken forward for determination of LSE via a Stage 2 Appropriate Assessment.

8 MARINE BIODIVERSITY

8.1 Introduction

This chapter of the EIAR presents the assessment of the likely significant effects on marine biodiversity receptors from the Proposed Development. Specifically, this chapter considers the likely significant effects of the Proposed Development seaward of Mean High Water Springs (MHWS) during the construction, operation and maintenance phases.

A detailed baseline that underpins the impact assessment is included in Section 8.3 of this chapter. This provides a characterisation of the marine biodiversity receptors within the Marine Biodiversity Study Area and a 100 km search area around the Marine Biodiversity Study Area.

8.1.1 Purpose of this Chapter

This EIAR chapter:

- Presents the existing environmental baseline established from desk studies, site-specific surveys and consultation;
- Presents the likely significant effects on marine ecological receptors, based on the information gathered and the analysis and assessments undertaken;
- Identifies any assumptions and limitations encountered in compiling the environmental information; and
- Highlights any necessary monitoring and/or mitigation and/or compensation measures which could prevent, minimise, reduce or offset the likely significant effects identified in the impact assessment section of this chapter.

8.1.2 Planning Policy & Legislation

This section outlines the international and national policy and legislation relevant to the assessment of likely significant effects on marine biodiversity receptors.

8.1.2.1 International

The following international policies were consulted to guide the production of this chapter of the EIAR:

- **EU Habitats Directive (Directive 92/43/EEC)** - All species of cetacean are listed in Annex IV of the EU Habitats Directive as European Protected Species (EPS) where the killing, disturbance or destruction of these species or their habitat is banned (Article 12). Two cetacean species, the bottlenose dolphin *Tursiops truncatus* and the harbour porpoise *Phocoena phocoena*, as well as the two pinniped species, harbour seal *Phoca vitulina* and grey seal *Halichoerus grypus* are also listed in Annex II as species whose conservation requires the designation of Special Areas of Conservation (SAC). Harbour seal and grey seal are also listed in Annex V.

- **Conservation of European wildlife and Natural Habitats Convention (Bern Convention)** - aims to ensure conservation and protection of wild animal species and their natural habitats, increase cooperation between contracting parties and to regulate the exploitation of those species.
- **The Convention for the Protection of the Marine Environment of the North East Atlantic (OSPAR Convention) and the Convention on the Conservation of Migratory Species of Wild Animals** - Selected species are also protected by these policies. All toothed whales, or odontocetes, (except for the sperm whale) are protected under the Agreement on the Conservation of Small Cetaceans of the Baltic, North East Atlantic, Irish and North Seas (ASCOBANS) Agreement, which is a legally binding Agreement, ratified under the Bonn Convention.
- **Marine Strategy Framework Directive -** The Marine Strategy Framework Directive (MSFD) requires Member States to prepare national strategies to manage their seas to achieve Good Environmental Status (GES) by 2020. It was transposed into UK law by the Marine Strategy Regulations in 2010.

8.1.2.2 National

The following national policies and legislation were consulted to guide the production of this chapter of the EIAR:

- **UK Marine Policy Statement** - The UK Marine Policy Statement (MPS) framework has been adopted to help achieve the vision of *'sustainable development in the United Kingdom marine area'.*
- **National Marine Plan (Scotland)** - provides a comprehensive overarching framework for all marine activity in Scottish waters. Aims to drive sustainable development and use of Scotland's marine area in a way which will protect and enhance the marine environment whilst promoting both existing and emerging industries.
- **Wildlife and Countryside Act 1981** - Species listed in Schedule 5 are protected against deliberate killing, injuring or disturbance. The Nature Conservation (Scotland) Act 2004 makes amendments to the Wildlife and Countryside Act 1981 in Scottish waters
- **UK Biodiversity Action Plan** - UK Biodiversity Action Plan (BAP) Priority species and habitats are those identified as being the most threatened and requiring conservation action. This is an important reference source and has been used to drive the statutory list of priority species in Scotland. Species of cetacean occurring regularly in UK waters are designated as UK BAP species
- **Scottish Biodiversity List** - The Scottish Biodiversity List is a list of animals, plants and habitats that are of principal importance for biodiversity conservation in Scotland. 21 species of cetacean, one pinniped species and 54 species of fish and shellfish are included on the Scottish Biodiversity List.
- **Priority Marine Features** - Scottish Ministers adopted a list of 81 priority marine features (PMF), many of which are features characteristic of the Scottish marine environment. The list helps to deliver Marine Scotland's vision for marine nature conservation.

8.1.2.3 Regional

The following regional policy was consulted to guide the production of this chapter of the EIAR:

- **Regional Marine Plans** - The Proposed Development lies within the Argyll Scottish Marine Region (SMR). At the time of writing (October 2022), there is no RMP in place for the region. See Section 2.3.3.2 for further details on Regional Marine Plans.

8.1.2.4 Local

The following local policies were consulted to guide the production of this chapter of the EIAR:

- **The Argyll & Bute Local Development Plan** - The Argyll & Bute Local Development Plan (LDP) provides the local planning framework for the Council area. See Section 2.3.3.1 for further details on the Argyll & Bute LDP.
- **Western Isles Local Biodiversity Action Plan** - The Argyll & Bute Local Biodiversity Action Plan (A&B LBAP) 2010-2015 sets out over 70 priority conservation projects being implemented by various groups. These priority projects will help assess, maintain and enhance a wide range of habitats and species across the Council area. The Plan focused on the most important priorities for conservation over 2010-2015, building on the work achieved to date and aiming to reach the longer-term vision set out for 2030 by the Scottish Biodiversity Strategy therefore, its assumptions are an important reference source in terms of biodiversity conservation.

8.1.3 Structure of this Chapter

The structure of this chapter is as follows:

- **Section 8.2 – Baseline Methodology**: This section provides details on the methodology used to undertake the desktop study, designated sites and site-specific surveys;
- **Section 8.3 – Baseline Scenario:** This section provides a characterisation of the marine biodiversity receptors;
- **Section 8.4 – Future Baseline Conditions:** This section considers the evolution of the Baseline Scenario over time in response to natural changes e.g., climate change;
- **Section 8.5 – Assessment Methodology:** This section describes the methodology used to assess the Proposed Development on the Baseline Scenario;
- **Section 8.6 – Embedded Mitigation:** This section describes the embedded mitigation measures taken as part of the Proposed Development;
- **Section 8.7 – Description of Likely Significant Effects:** This section provides details on the assessment undertaken for the Proposed Development;

- **Section 8.8 – Potential Cumulative Effects:** This section describes the potential cumulative effects on the Baseline Scenario of the Proposed Development in combination with other projects screened in for assessment;
- **Section 8.9 – Inter-Related Effects:** This section describes the likely inter-related effects arising from the Proposed Development;
- **Section 8.10 – Mitigation Measures:** This section describes the embedded mitigation measures and other mitigation to be undertaken in response to likely significant effects on the Baseline Scenario; and
- **Section 8.11 – Conclusion and Summary of Effects:** This section summarises the Baseline Scenario, description of likely significant effects, mitigation measures, potential cumulative effects and residual effects.

8.2 Baseline Methodology

8.2.1 Desktop Study

An evidence-based approach has been used to inform the Baseline Scenario. This involved utilising existing data and information from sufficiently similar studies. This evidence-based approach means that it is not always necessary for new data to be collected, or new modelling studies to be undertaken, to characterise likely significant effects with sufficient confidence for an Environmental Impact Assessment (EIA).

Data has been acquired through relevant historical data, previous studies and surveys, to characterise the Baseline Scenario. Key sources used to inform the baseline characterisation of the Marine Biodiversity Study Area are summarised in Table 8-1.

Table 8-1 Summary of key desktop reports

Title	Source	Year	Author
Annex I and II of the EU Habitats Directive	Habitats Directive (Council Directive 92/43/EEC)	1992	European Union Commission
Assessing the sensitivity of seagrass bed biotopes to pressures associated with marine activities.	JNCC	2014	D'Avack *et al*.
BAP Species List	UK Post-2010 Biodiversity Framework	2012	UK Government
BERN Convention Appendix II and II	Convention on the Conservation of European Wildlife and Natural Habitats	1979	Council of Europe
Biotope Mapping and Survey of the Treshnish Isles Candidate Special Area of Conservation	ERT	2004	ERT (Scotland) Ltd.
CITES Appendix I and II	Convention on International Trade in Endangered Species	1975	IUCN, International Treaty
EMODnet	EMODnet	2022	European Commission, EMODnet

Title	Source	Year	Author
Estimates of cetacean abundance in European Atlantic waters in summer 2016 from the SCANS-III aerial and shipboard surveys.	SCANS-III	2017	Hammond *et al*.
EUNIS Seabed and Biotope classification system	EUNIS	2019	Parry *et al.*
Fisheries sensitivity Maps in British Waters	UKOOA	1998	Coull *et al*.
Hebridean Marine Mammal Atlas. Part 1: Silurian, 15 years of marine mammal monitoring in the Hebrides	HWDT	2018	Hebridean Whale and Dolphin Trust
Isle of Mull Rivers Project: Summary of 2010 fish populations, Habitat Surveys and Potential Habitat Management Initiatives.	Argyll Fisheries Trust	2011	Argyll Fisheries Trust
IUCN Red List	International Union for the Conservation of Nature	2022	IUCN
MPA Network for Scottish Designated Sites	Scottish Government	2021	Scottish Government
Mapping the spawning and nursery grounds of selected fish for spatial planning	DEFRA	2012	Ellis *et al*.
NMFS Reports	NMFS	Various	National Marine Fisheries Service
NBN Atlas	National Biodiversity Network Scotland	2021	NBN Atlas Scotland
NMPI	National Marine Plan Interactive	2022	Marine Scotland
OSPAR	The Convention for the Protection of the Marine Environment of the North-East Atlantic	1992	European Commission
Regional baselines for marine mammal knowledge across the North Sea and Atlantic areas of Scottish waters	Marine Scotland Science	2020	Hague *et al.*
SAC characteristic reports	NatureScot	2021	NatureScot reports
Special Committee on Seals Reports	SCOS	Various	Sea Mammal Research Unit
Zostera marina beds on lower shore or infralittoral clean or muddy sand	MARLIN	2019	D'Avack *et al*.

8.2.1.1 Relevant Guidance

Guidance relevant to EIA for the Marine Biodiversity chapter is as follows:

- Chartered Institute of Ecology and Environmental Management (CIEEM) guidelines for ecological impact assessment (CIEEM, 2018);
- Environmental Impact Assessment Handbook: Guidance for competent authorities, consultation bodies, and others involved in the EIA process in Scotland (Scottish Natural Heritage (SNH), 2018);
- European Commission (EC) Guidelines on the Implementation of the Birds and Habitats Directive in Relation to Port Developments (EC, 2011);
- SNH Priority Marine Features Guidance (SNH, 2017a);

- The protection of Marine European Protected Species from injury and disturbance – Guidance for Scottish Inshore Waters (Marine Scotland, 2020);
- Marine Life Information Network (MarLIN) species and ecosystem sensitivities guidelines (Tyler-Walters e*t al*., 2001); and
- Marine Life Information Network (MarLIN) Marine Evidence-based Assessment (MARESA) – A guide (Tyler-Walters *et al*., 2018).

8.2.2 Assumptions and Limitations

8.2.2.1 Fish and Shellfish

Spawning and nursery areas vary spatially and temporally (Ellis *et al.,* 2010) and as such data only provides an indicative location, representing a 'snapshot' of available species. For this Proposed Development, it has been assumed that if the Marine Biodiversity Study Area overlaps with either spawning or nursery areas then species have been included within the assessment, unless evidence suggests otherwise (i.e., incompatible ecological parameters e.g., freshwater species in marine environments or fish known to only occur at depths not found within the Marine Biodiversity Study Area).

8.2.2.2 Marine Mammals

Mobile species, such as cetaceans and pinnipeds exhibit varying spatial and temporal patterns. All historic surveys across the Marine Biodiversity Study Area represent snapshots of the species considered at the time of sampling. The abundance and distribution of species are likely to vary both seasonally and annually.

8.2.3 Designated Sites

All designated sites within the Marine Biodiversity Study Area (Figure 8-1) with marine mammals, fish and shellfish or benthic habitats as qualifying interest features that could be potentially impacted by the Proposed Development were identified using the following approach (note terrestrial biodiversity and ornithology are assessed under Chapters 7 and 9, respectively):

- Step 1: All designated sites of international, national and local importance were identified using a number of sources (Table 8-1), encompassing Marine Protected Areas (MPAs), SACs, Special Protection Areas (SPAs), and Sites of Special Scientific Interest (SSSIs) identified by examining the Joint Nature Conservation Committee's (JNCC) website, the European Nature Information System (EUNIS) database and the Marine Scotland National Marine Plan Interactive (NMPI) website;
- Step 2: Information was compiled on the relevant qualifying feature(s) for each of these sites by examining each data source. The known occurrence of each qualifying feature within the Marine Biodiversity Study Area was based on relevant desktop information (Table 8-1);

- Step 3: Using the above information and expert judgement, sites were included in the assessment if:
  - *A designated site directly overlaps with the* Proposed Development*;*
  - *Sites and associated features were located within the potential Zone of Impact (ZoI) for impacts associated with the* Proposed Development*, based on expert judgement;*
  - *Qualifying features of a designated site were either recorded as present during historic surveys within the* Proposed Development *area or identified during the desktop study as having the potential to occur within the* Proposed Development *area; and*
  - *Where a national site falls outside of an international site but is located within identified study areas, the national site has been taken forward for further assessment of a particular feature.*

8.2.4 Site Specific Surveys

To characterise seabed sediments, and intertidal and subtidal benthic communities within the Marine Biodiversity Study Area, with a focus on the area most relevant to the Proposed Development, a number of site-specific surveys were commissioned.

8.2.4.1 Seabed Sediment Analysis

A ground investigation was undertaken between 4 November 2022 and 5 November 2022 by Structural Soils Limited. The purpose of the investigation was to characterise the sediment found within the Proposed Development dredging area. A total of three sediment cores were taken from the area via vibrocoring, with subsequent geotechnical and geoenvironmental testing and analysis performed (BHI1 – BHI3; Figure 8-1).

Samples for geotechnical testing were returned to MATtest Limited UKAS accredited laboratory, and those for geoenvironmental testing were sent to SOCOTEC Limited, a MCERTS and UKAS accredited testing laboratory.

A summary of the test results can be found in Volume III, Appendix 8.1.

8.2.4.2 Benthic Intertidal Survey

Benthic intertidal surveys, undertaken between 22nd August 2021 and 24th August 2021, involved a Phase I and Phase II intertidal walkover survey at low tide following guidance in the Marine Monitoring Handbook (Davies *et al.,* 2001), Countryside Council for Wales Handbook for Marine Intertidal Phase I Survey and Mapping (Wyn *et al.* 2006) and the latest guidance for characterising intertidal rocky shore and sediment habitats (Natural Resources Wales (NRW) 2019, Wales 2019).

The intertidal surveys covered the area extending from Mean Low Water Springs (MLWS) to Mean High Water Springs (MHWS) at each location. The survey identified representative biotopes and the extent of each to produce a spatially referenced biotope map according to the EUNIS classification system (Figure 8-4; Parry, 2019) (and correlated to the Marine Nature Conservation Review (MNCR) biotopes).

An Unmanned Aerial Vehicle (UAV) survey was undertaken to collect high-resolution imagery across the intertidal survey areas at low water, to accurately map the extent of each biotope and facilitate the production of the intertidal maps. Unmanned Aerial Vehicle mapping was undertaken in consideration of JNCC guidance for use of UAVs in marine benthic monitoring (Crabb *et al.* 2019). Additionally, a total of 86 quadrat locations were selected across the intertidal survey areas to ground truth the UAV imagery and inform the subsequent habitat/biotope mapping.

The distribution of any features of conservation interest were recorded using photographs and GPS fixes where encountered. The presence of any invasive non-native species (INNS) (e.g., *Crepidula fornicata*) were also noted and their location was recorded. All images collected during the UAV mapping flights underwent Terrain (2D) processing in the Drone Deploy software and were 'stitched' together to generate orthomosaic and Digital Elevation Model (DEM) outputs for both intertidal survey areas. Other information noted included general site conditions, sediment surface features (e.g., *Polydora sp*. Mats), sediment type and characteristics, topography and anthropogenic pressures.

The full intertidal survey report can be found in Volume III, Appendix 8.2.

8.2.4.3 Benthic Subtidal Survey

Subtidal benthic surveys, undertaken between 20th August 2022 and 23rd August 2022, involved the completion of 21 Drop-Down Camera (DDC) stations, 28 DDC transects and the collection of 20 grab samples. DDC sampling resulted in the collection of 1,033 still images. Grab sampling stations were micro-sited to avoid the notable seagrass beds that were identified during the in-field interpretation of the seabed imagery collected across both areas.

Following the survey, DDC data were analysed using the Bio-Image Indexing and Graphical Labelling Environment (BIIGLE) annotation platform (Langenkämper *et al., 2017*) and in consideration of the JNCC epibiota remote monitoring interpretation guidelines (Turner *et al., 2016*) and the most recent National Marine Biological Analytical Quality Control (NMBAQC)/JNCC Epibiota Quality Assurance Framework (QAF) guidance and identification protocols. Analysis of still images was undertaken in two stages. The first stage, "Tier 1", consisted of labels that referred to the whole image being assigned, providing appropriate metadata for the image. The second stage, "Tier 2", was used to assign percentage cover of reef types by drawing polygons. A full seagrass assessment was carried out on all images during the "Tier 1" stage whereby the percentage cover of seagrass in images was estimated based on the following percentage cover categories: 0, <5, 5-25, 26-50, 51-75 and 76-100% cover. To qualify as a PMF seagrass bed, the area covered by seagrass must have at least 5% coverage (Tyler-Walters *et al.,* 2016). The "Tier 1" analysis also included a full reef habitat assessment on all images to determine whether habitats met the definitions of Annex I reef habitats (as set out in Table 1 and Table 2 of Appendix 8.3). The annotation label tree used during analysis had major headings for each reef type. Under each reef type, labels were assigned for each of the categories required to determine whether reef habitat was present.

To classify the sediments of the grab sample Particle Size Distribution (PSD) analysis was undertaken. The process involved sample preparation, dry sieving and laser diffraction. PSD statistics for each

sample were calculated from the raw data using Gradistat V8.0 (Blott, 2010) and converted into Broad Scale Habitats (BSH) (EUNIS Level 3) using the adapted Folk trigon (Long, 2006).

Furthermore, macrobenthic analysis of grab samples was undertaken to classify the faunal species. For each macrobenthic sample, the excess formalin was drained off into a labelled container over a 1 mm mesh sieve in a well-ventilated area. The samples were then re-sieved over a 1 mm mesh sieve to remove all remaining fine sediment and fixative. The low-density fauna was then separated by elutriation with fresh water, poured over a 1 mm mesh sieve, transferred into a Nalgene bottle and preserved in 70 % Industrial Denatured Alcohol (IDA). The remaining sediment from each sample was subsequently separated into 1 mm, 2 mm and 4 mm fractions and sorted under a stereomicroscope to extract any remaining fauna. Following faunal identification, the macrobenthic species list was checked using the R package 'worms' (Holstein, 2018) to check against the World Register of Marine Species (WoRMS) taxon lists and standardise species nomenclature. All data were collated in excel spreadsheets and made suitable for statistical analysis. All data processing and statistical analysis were undertaken using R v 1.2 1335 (Team & R Core Team, 2020) and PRIMER v7 (Clarke & Gorley, 2015) software packages. Multivariate analysis was then undertaken on the biotic macrobenthic dataset.

Habitats and/or biotopes were identified and classified in accordance with the EUNIS habitat classification system, in consideration of JNCC guidance on assigning benthic biotopes (Figure 8-5; Parry, 2019). Classifications were assigned based on the combined analysis of seabed imagery and BSH data derived from both PSD and macrobenthic analyses, alongside existing habitat maps (European Marine Observation and Data Network (EMODnet) and NMPI). Seabed features were assigned as high-level classification as possible.

The full subtidal survey report can be found in Volume III, Appendix 8.3.

8.3 Baseline Environment

The Sound of Iona is a sound between the Inner Hebridean islands of Mull and Iona in western Scotland which forms part of the Atlantic Ocean. It is less than one mile across and very little is known about its ecology. However, the wider area of the western isles, the Sea of the Hebrides and the Minch is home to a multitude of benthic communities, fish and shellfish species (of both commercial and conservation value) and marine mammals. Designated sites (SACs and MPAs) within the Marine Biodiversity Study Area and wider 100 km search area are defined with minke whale *Balaenoptera acutorostrata,* harbour seal *Phoca vitulina*, grey seal *Haligochoerus grypus*, harbour porpoise *Phocoena phocoena* and basking shark *Cetorhinus maximus* as primary reasons for designation. The Inner Hebrides and the Minches SAC (designated for harbour porpoise) and the Sea of the Hebrides MPA (designated for minke whale and basking sharks) overlap with the Proposed Development. Species within the wider area are mercurial, transitory and can be found to migrate through the area.

8.3.1 Marine Biodiversity Study Area

The Marine Biodiversity Study Area includes the Proposed Development boundary. The area has been defined to encompass the maximum spatial extents of likely significant effects on identified receptors,

based on professional judgement. The Marine Biodiversity Study Area along with the Proposed Development is shown in Figure 8-1.

The Marine Biodiversity Study Area lies within the region of the western isles, the Sea of Hebrides and the Minch. To consider all receptors that may have connectivity with the Proposed Development and its local surroundings, ecological information was sought from the wider region and included an area of approximately 100 km radius from the Proposed Development (Figure 8-3).

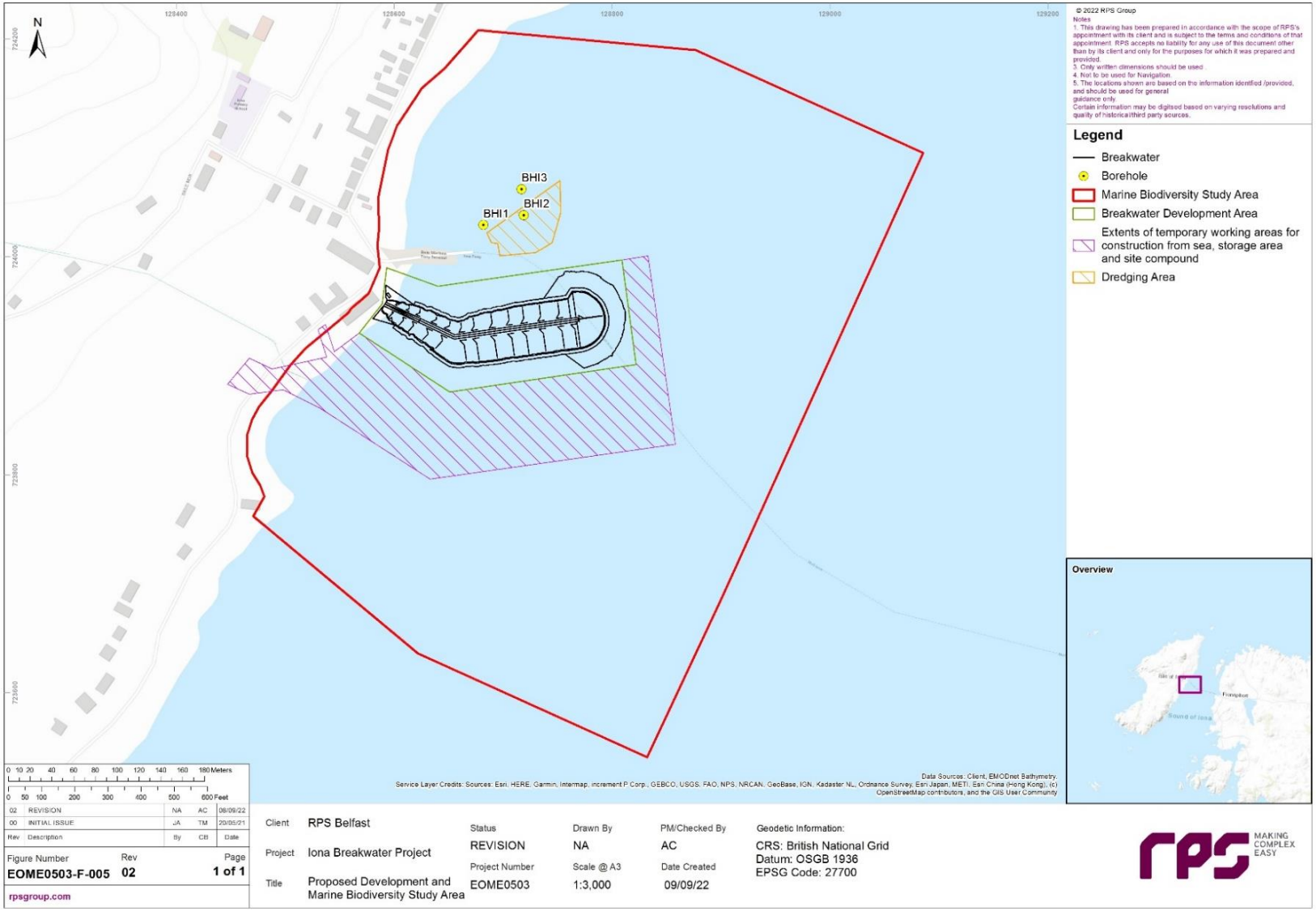

Figure 8-1 Marine Biodiversity Study Area

8.3.2 Geology

The predominant geology in the area was found to be marine beach deposits of sand and raised marine deposits of gravel, sands and silt. This is underlain by the Iona group of metasandstone and metamudstone, with some dyke intrusions (part of the Iona – Ross of Mull dyke swarm comprising Camptonite and Monchiquite igneous rocks).

Particle size analysis was undertaken as part of the geoenvironmental analysis (see Section 8.3.4). This showed the predominant sediment type was sand (91.1%), gravel (7.2%) and silt (1.7%; Figure 8-2).

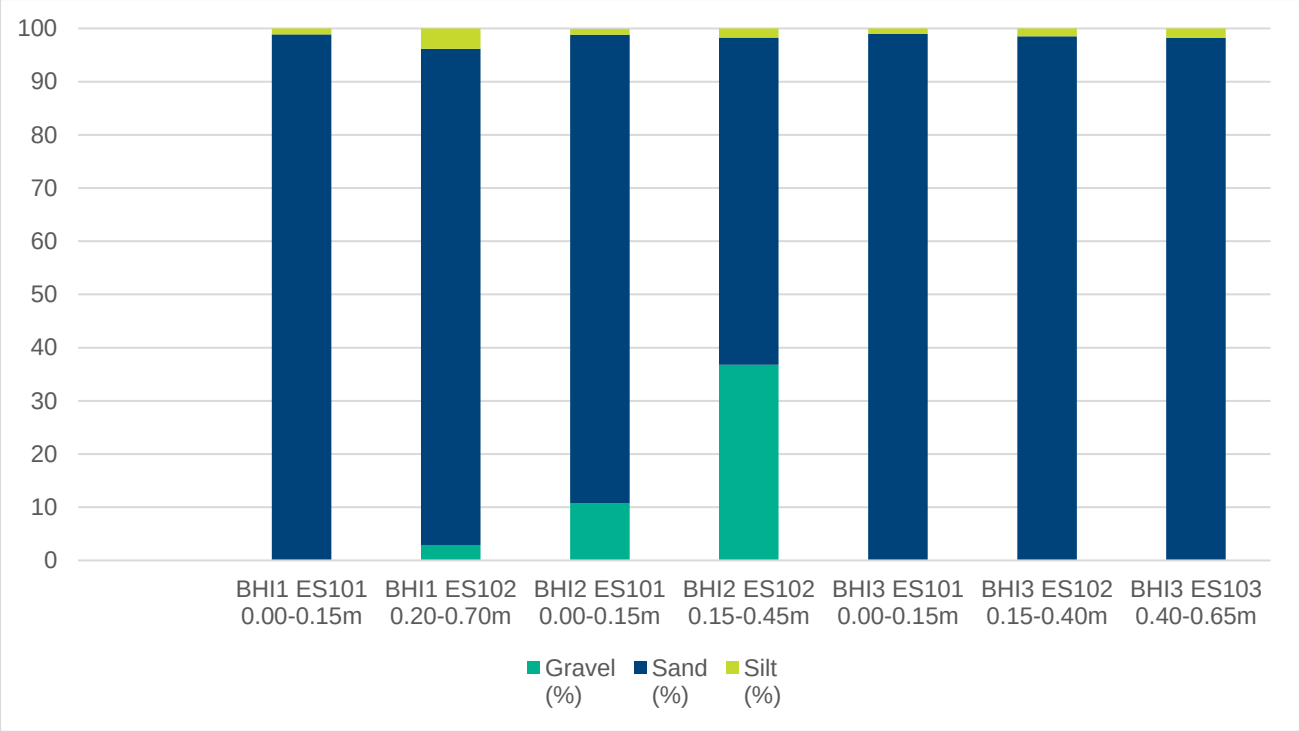

Figure 8-2 Particle size analysis. Core locations have been denoted within Figure 8-1.

8.3.3 Designated Sites

MPAs afford protection to habitats and species within the marine environment. There are three categories of MPA, namely Nature Conservation MPAs, Demonstration and Research MPAs and Historic MPAs.

The Scottish MPA network includes sites for nature conservation, protection of biodiversity, demonstrating sustainable management, and protecting Scottish heritage. As of July 2021, the MPA network covered approximately 37% of the Scottish seas and comprised (Scottish Government, 2022):

- 231 sites for nature conservation protecting a broad range of habitats and species, ranging from rocky shores and sea caves at the coastline to deep-sea habitats;
- Five other area-based measures which protect species such as sandeel and blue ling, as well as vulnerable marine ecosystems;

- One Demonstration and Research MPA around Fair Isle to investigate the factors affecting seabird populations to demonstrate the socio-economic benefits of the marine environment; and
- Eight Historic MPAs to preserve sites of historical importance around the Scottish coast.

Designated sites identified for the marine biodiversity assessment are described in Table 8-2 and shown in Figure 8-3. In addition, a summary of the conservation interest of each site with respect to relevant qualifying features is provided below.

Table 8-2 Designated sites identified for marine biodiversity receptors considered in this assessment

Designated sites	Closest distance to development (km)	Relevant qualifying feature
Sea of the Hebrides MPA	0	Basking shark *Cetorhinus maximus*
		Minke whale *Balaenoptera acutorostrata*
Inner Hebrides and the Minches SAC	0	Harbour porpoise *Phocoena phocoena*
Treshnish Isles SAC	15.5	Grey seal *Halichoerus grypus*
Loch Sunart to the Sound of Jura MPA	33	Common skate *Dipturus intermedia*
Eileanan agus Sgeiran Lios mor SAC	51.5	Harbour seal *Phoca vitulina*
South-East Islay Skerries SAC	75.6	Harbour seal *Phoca vitulina*
Sound of Barra SAC	91.2	Harbour seal *Phoca vitulina*

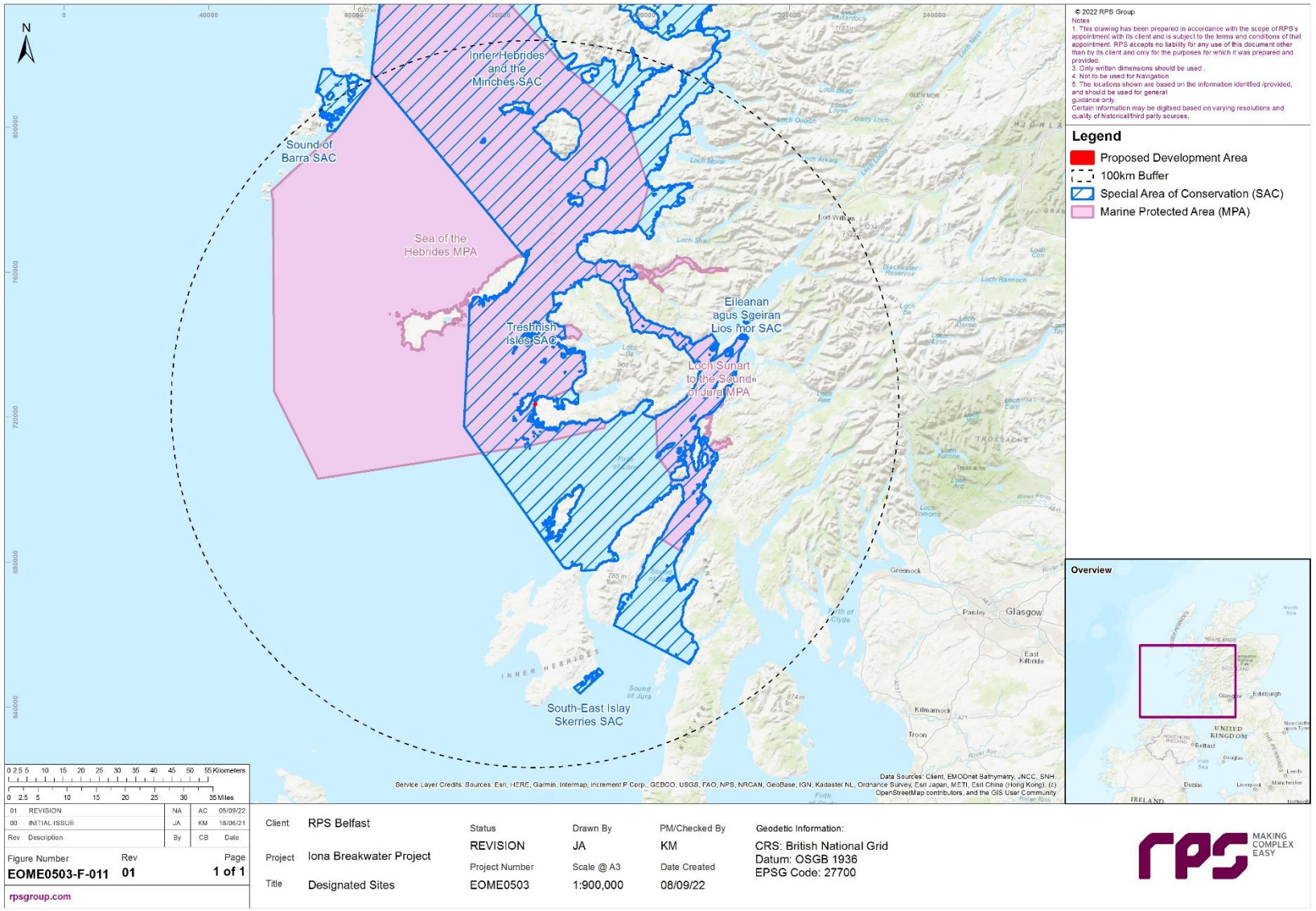

Figure 8-3 Designated sites identified for marine biodiversity receptors considered in this assessment

8.3.3.1 Species Management Plans

Conservation and environmental sensitivities along with management plans relevant to those marine biodiversity receptors considered in this chapter are summarised in Table 8-3.

8.3.3.2 Sea of the Hebrides MPA

The Sea of Hebrides MPA overlaps with the Proposed Development and encompasses the following biodiversity features: *basking shark*, *minke whale* and *fronts*. The large-scale front feature, which appears during the spring and summer southwest of Tiree, provides an important functional link to both basking shark and minke whale by facilitating favourable feeding conditions. The protected features also include *marine geomorphology of the Scottish shelf seabed (Inner Hebrides Carbonate Production Area)*, which is an internationally important example of a non-tropical shelf carbonate system characterised by very carbonate-rich sediments (NatureScot, 2021b).

Minke whales are observed seasonally, most frequently during summer in the northwest region, throughout the MPA. Sighting data highlights an area in the south and east of the MPA region, particularly around Coll and Tiree. Basking sharks remain within the MPA between June and October (NatureScot, 2021b).

In summary, the conservation objectives for this designation are:

- Protecting high densities of basking sharks and minke whales, compared to other parts of Scottish territorial waters, particularly from April to October;
- Protection of important areas where basking sharks, an OSPAR-threatened and declining species, feed and show social, group and courtship-like behaviours;
- Recognition of fronts as an important feature that provides benefits to both basking shark and minke whale by enhancing primary productivity and prey availability; and
- Conservation of the Inner Hebrides Carbonate Production Area (the geodiversity feature) ensures that important biogenic habitats such as maerl beds and seagrass are protected and that vital processes, such as the production and supply of shell-rich sands to beaches are maintained.

8.3.3.3 Inner Hebrides and the Minches SAC

The Inner Hebrides and the Minches SAC overlaps with the Proposed Development boundary. The site is designated for harbour porpoise *Phocoena phocoena*. It covers an area of 13,814km^2 of important summer habitat where the density of animals has been shown to be consistently above average. It is estimated that the site supports (based on the SCANS-II survey which took place in July 2005 only; SCANS II, 2005) approximately 5438 individuals (95% Confidence Interval (CI): 2426-12191) for at least part of the year, as seasonal differences are likely to occur, and represents approximately 32% of the population within the UK (in water depths of 200m or less) (NatureScot, 2021c). Although there are more data from the summer months, harbour porpoise are present throughout the year and thus the designation applies year-round (NatureScot, 2021a). The latest assessed condition (31st December

2016) demonstrates that the favourable conservation status is 'maintained' (NatureScot, 2021c). Studies have shown that higher densities of harbour porpoise were consistently associated with depths of between 50m and 150m (NatureScot, 2021c).

In summary, the conservation objectives for this designation are:

- To ensure that the Inner Hebrides and the Minches SAC continues to make an appropriate contribution to harbour porpoise remaining at favourable conservation status.
- To ensure for harbour porpoise within the context of environmental changes, that the integrity of the Inner Hebrides and the Minches SAC is maintained through 2a, 2b and 2c:
  - 2a. Harbour porpoise within the Inner Hebrides and the Minches are not at significant risk from injury or killing;
  - 2b. The distribution of harbour porpoise throughout the site is maintained by avoiding significant disturbance; and
  - 2c. The condition of supporting habitats and the availability of prey for harbour porpoise are maintained.

8.3.3.4 Loch Sunart to the Sound of Jura MPA

The Loch Sunart to the Sound of Jura MPA overlaps with two existing SACs, which are designated for subtidal reef habitats. The MPA itself was designated to protect critically endangered common skates *Dipturus spp.* and geodiversity features, namely Quaternary of Scotland, characterised by a number of the deep glaciated channels which provide suitable habitats to reproductively mature common skates. Around the UK, common skates are found almost exclusively in Scottish waters. The MPA contains a significant coastal population of mature common skate, which is believed to breed in the area. The tag-recapture data suggest that up to 400 individuals are residents within the MPA region, with juveniles present within the population (NatureScot, 2021a).

The conservation objective for the Quaternary of Scotland and common skate is to 'conserve' (NatureScot, 2021a).

8.3.3.5 Treshnish Isles SAC

The Treshnish Isles are a remote chain of uninhabited islands and skerries situated in southwest Scotland, located approximately 15.5 km from the Proposed Development. The islands, numerous skerries, islets and reefs support a breeding colony of designated feature species, grey seal *Halichoerus grypus*, contributing just under 3% of annual UK pup production. The SAC covers an area of approximately 20 km^2 (NatureScot, 2021d).

In summary, the conservation objectives for this designation are:

- To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained, and the site makes an

appropriate contribution to achieving favourable conservation status for each of the qualifying features;

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

8.3.3.6 Eileanan agus Sgeiran Lios mor SAC

The Eileanan agus Sgeiran Lios mor SAC comprises the islands of Lismore on the west coast of Scotland which provides the most sheltered and enclosed site for the designated feature, harbour seal *Phoca vitulina*. Lismore is a composite site comprising five groups of small offshore islands and skerries which are extensively used as haul-out sites by the colony. Seal numbers (501-1000 individuals) represent just over 1% of the UK population (NatureScot, 2021e). The site is located approximately 51.5 km from the Proposed Development and covers an area of around 11km^2.

In summary, the conservation objectives for this designation are:

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

8.3.3.7 South East Islay Skerries SAC

The South-East Islay Skerries SAC comprises the skerries, islands and rugged coastline of the Inner Hebridean island of Islay which hold a nationally important population of the designated feature, harbour seal *Phoca vitulina* (between 501 and 1000 individuals). The south-east coastline areas (approximately 15 km^2) are extensively used as pupping, moulting and haul-out sites by harbour seals, which represent between 1.5% and 2% of the UK population (NatureScot, 2021f). The site is located approximately 75 km from the Proposed Development and covers an area of 15 km^2.

In summary, the conservation objectives for this designation are:

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

8.3.3.8 Sound of Barra SAC

The Sound of Barra SAC has consistently supported a significant breeding population of harbour seal since the 1970s and is the only site designated for harbour seal in Outer Hebrides. This Annex II species is a qualifying feature, but not a primary reason for site selection. The SAC is located approximately 92 km from the Proposed Development. It covers an area of 125 km^2 and supports 116 individuals (NatureScot, 2021g).

In summary, the conservation objectives for this designation are:

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

Table 8-3 Species potentially present in the wider area of the western isles, Sea of Hebrides and the Minch with specific conservation/environmental sensitivities and/or management plans

juv. = juvenile, v = vulnerable, nt = near threatened, ce = critically endangered.

Species	Legislation/environmental sensitivity or management plan															
	Annex I of the EU Habitats Directive	Annex II of the EU Habitats Directive	EPS	BAP Species	Priority Marine Feature	OSPAR	CMS Appendix I	CMS Appendix II	ASCOBANS	IUCN Red List	Bern Convention Appendix I	Bern Convention Appendix II	Bern Convention Appendix III	CITES Appendix I	CITES Appendix II	EU Management Plans
Benthic Ecology																
Eelgrass *Zostera marina*	x			x	x	x					x					
Dwarf eelgrass *Zostera noltii*	x			x	x	x										
Maerl beds *Phymatolithon calcareum*	x			x	x	x										
Burrowing sea anemone *Arachnanthus sarsi*				x	x											
Fan mussel *Atrina fragilis*				x	x											
Ocean quahog *Arctica islandica*					x	x										
Tall sea pen *Funiculina quadrangularis*				x						x (v)						
Fireworks anemone *Pachycerianthus multiplicatus*				x												
Fish and Shellfish																
Angler fish *Lophius piscatorius*				x	x (juv.)											
Atlantic salmon *Salmo salar*		x		x	x	x										
Basking shark *Cetorhinus maximus*				x	x	x	x	x		x (v)		x			x	
Cod *Gadus morhua*				x		x				x (v)						x
Common skate *Dipturus* spp.				x	x	x				x (ce)						

Species	Legislation/environmental sensitivity or management plan															
	Annex I of the EU Habitats Directive	Annex II of the EU Habitats Directive	EPS	BAP Species	Priority Marine Feature	OSPAR	CMS Appendix I	CMS Appendix II	ASCOBANS	IUCN Red List	Bern Convention Appendix I	Bern Convention Appendix II	Bern Convention Appendix III	CITES Appendix I	CITES Appendix II	EU Management Plans
Crawfish *Palinurus elephas*				x	x					x (v)						
European eel *Anguilla anguilla*				x	x	x		x		x (ce)						x
Haddock *Melanogrammus aeglefinus*										x (v)						
Hake *Merluccius merluccius*				x												x
Herring *Clupea harengus*				x												x
Horse mackerel *Trachurus trachurus*				x	x					x (v)						
Mackerel *Scomber scombrus*				x	x											
Native oyster *Osterea edulis*				x		x										
Norway pout *Trisopterus esmarkii*					x											
Plaice *Pleuronectes platessa*				x												x
Saithe *Pollachius virens*					x (juv.)											
Sandeel *Ammodytes marinus*				x	x											
Sand goby *Pomatoschistus minutus*					x								x			
Sea trout *Salmo trutta*				x	x											
Spurdog *Squalus acanthias*				x	x			x		x (v)						
Thornback ray *Raja clavata*						x				x (nt)						
Whiting *Merlangius merlangus*				x	x											
Marine Mammals																
Bottlenose dolphin *Tursiops truncatus*		x	x	x	x			x	x			x			x	

Species	Legislation/environmental sensitivity or management plan															
	Annex I of the EU Habitats Directive	Annex II of the EU Habitats Directive	EPS	BAP Species	Priority Marine Feature	OSPAR	CMS Appendix I	CMS Appendix II	ASCOBANS	IUCN Red List	Bern Convention Appendix I	Bern Convention Appendix II	Bern Convention Appendix III	CITES Appendix I	CITES Appendix II	EU Management Plans
Harbour porpoise *Phocoena phocoena*		x	x	x	x	x		x	x			x			x	
Killer whale *Orcinus orca*			x		x			x	x			x			x	
Minke whale *Baleanoptera acutorostrata*			x		x				x			x		x		
Common dolphin *Delphinus delphis*				x	x			x	x			x				
White-beaked dolphin *Lagenorhynchus albirostris*			x		x			x	x			x			x	
Grey seal *Halichoerus grypus*		x			x			x					x			
Harbour seal *Phoca vitulina*		x			x			x					x			

8.3.4 Benthic Ecology

8.3.4.1 Intertidal

Along the west coasts of Great Britain, from the Isle of Wight around to the Orkney Islands, common fauna species include limpets *Tectura testudinalis,* bivalves *Callista chione*, sea urchins *Paracentrotius lividus, Strongylocentrotus droebachiensis* and molluscs *Volutopsis norwegicus*, *Hemithiris psittacea*, *Trichotropis borealis* (Forbes (1858) from Hiscock *et al.,* 2001).

In addition, studies of harbour and dock sediments have demonstrated very low densities of only a few macrobenthic species (Derweduwen *et al.,* 2014) and those that have been recorded have generally been short lived species (Hawkins *et al*., 2002).

Phase 1 Intertidal Results

The UAV and intertidal walkover were undertaken at Iona during low tide periods between 22 August 2021 and 24 August 2021. A total of 86 quadrat samples/target notes and 385 UAV images were collected.

A total of 18 unique biotopes from 13 EUNIS broadscale habitats were observed across the Iona intertidal survey area (Figure 8-4). High to moderate energy littoral rock habitats (A1.1 and A1.2) and sand and muddy sand (A2.2) made up the majority of the survey area at Iona.

Part of the survey area closer to the land was fringed by supralittoral and littoral fringe rock covered in lichens or small green algae (B3.11). The middle shore was interspersed with rocky habitats of different exposures (e.g., A1.2 and A1.3), littoral sand and mixed sediments (A2.4), and the lower and extreme lower shores were dominated by sand and included patches of rocks and sediments covered with kelp and seaweed communities (A3.21 and A5.52). There were also patches of barren littoral shingle (A2.111) localised in the upper shore to the north of the survey area and just south of the existing slipway.

To the north of the existing slipway, there was clear zonation observed. Lichens or green algae occurred on supralittoral and littoral fringe rock (B3.11) with exposed bedrock and large boulders representative of biotopes A1.1131 and A1.1133 with fucoids present in the fissures and crevices of the bedrock (A1.1132) in the upper to middle shore. The middle to lower shore comprised of sand (A2.2) with a mosaic of rocky habitats covered in fucoids, including *F. serratus* (A1.2141 and A1.2142), *Pelvetia caniculata* (A1.211) and *Himanthalia elongata* (A1.123). The low and extremely low shore was dominated by sand with patches covered in kelp (*L. digitata*) and seaweeds (A5.52) in the central part, while kelp on rock (A3.21) was present to the north. Similar zonation was observed south of the existing slipway; however this part of the survey area was mostly dominated by rocks.

EUNIS classifications B3.1 and B3.11 are included under ‘Supralittoral Rock: Cliff and Slopes’ on the list of Section 2(4) Habitat of Principal Importance under the Nature Conservation (Scotland) Act 2004. Similarly, EUNIS classifications A1.1133 and A1.2142 are listed as ‘Littoral Rock: Intertidal Underboulder Communities’.

No PMFs were recorded during the intertidal survey at Iona. There were no observations of seagrass or seagrass beds, INNS, or maerl (dead or alive) made within the intertidal area. Kelp was observed/noted at two locations in the northern portion of the Iona survey area; however, these observations alone did not provide enough evidence to confidently define boundaries and extent of features potentially representative of kelp bed habitats. As described above, there were large areas of rocky habitat observed across the survey area. The areas of rocky habitat in the mid to lower shore did fall within the boundary of the Inner Hebrides and the Minches Marine SAC and could therefore qualify as Annex I bedrock reef habitat, however, these areas are not afforded protection under the Habitats Directive as the SAC is not designated to protect benthic features. Similarly, some areas of sandy habitat were found within the boundary of the Inner Hebrides and the Minches Marine SAC and could be representative of Annex I mudflats and sandflats not covered by seawater at low tide, however again, these areas are not afforded protection under the Habitats Directive as this is not a qualifying feature of the SAC.

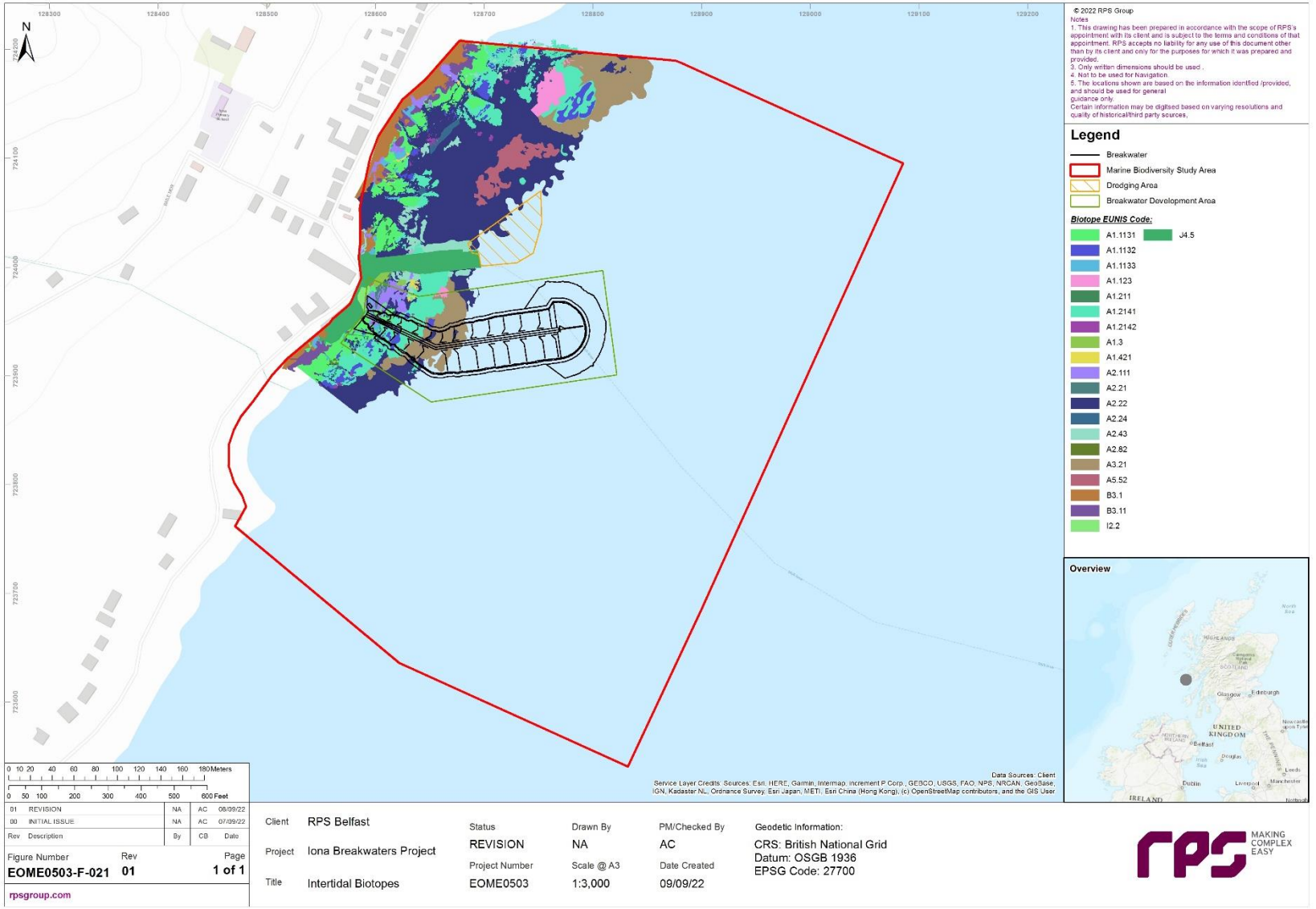

Figure 8-4 Intertidal biotopes classified within the Marine Biodiversity Study Area

8.3.4.2 Subtidal

The EMODnet indicated that the bathymetry of the Sound of Iona has a depth range of between 0 m to approximately 10 m Chart Datum (CD) (EMODnet, 2021). A review of the EMODnet broad-scale predictive habitat maps, full-detail habitat classification (EUNIS), indicates that the majority of the Sound of Iona is 'high energy infralittoral seabed'. The subtidal fringe along the east coast of Iona, within the Marine Biodiversity Study Area, has been recorded as 'low energy infralittoral seabed'. Seabed sediment in the Sound of Iona is described as "rock and hard substrate" by Marine Scotland's NMPI portal (NMPI, 2021). Other habitats recorded to the west, south and north of the Isle of Iona include Atlantic and Mediterranean high-energy infralittoral rock (A3.1), high-energy circalittoral seabed and Atlantic and Mediterranean high-energy circalittoral rock (A4.1) (EMODnet, 2021).

A review of available data has concluded that seagrass beds (a PMF) are likely to be present in the vicinity of Iona and the wider area of the western isles, Sea of the Hebrides and the Minch (Seagrass Spotter, 2021). The Sound of Iona has been identified by NatureScot as an area of management consideration for seagrass due to its coastal and shallow characteristics. *Zostera marina/angustifolia* beds on infralittoral clean or muddy sand (SS.SMp.SSgr.Zmar) were recorded in 2016, located 1km east of Iona, north of Fionnphort. This was described as many large patches located in subtidal sandy habitat at 4-6 m depth. Additionally, seagrass (*Zostera marina*) has also been recorded further north (approximately 18km) during the 'Biotope Mapping and Survey of the Treshnish Isles Candidate Special Area of Conservation (cSAC)', undertaken by ERT (Scotland) Ltd in 2004 (ERT, 2004). Seagrass species, *Zostera marina*, *Ruppia maritima*, and *Zostera noltii*, have been recorded in the wider area on Colonsay, Skye, the Outer Hebrides, and the west coast of mainland Scotland.

Other benthic PMFs associated with the wider area of the western isles, Sea of the Hebrides and the Minch include:

- Maerl or coarse shell gravel with burrowing sea cucumbers (SS.SCS.CCS.Nmix) – recorded at the nearest point of approximately 6.5 km and 10 km to the south of Iona;
- Northern sea fan and sponge communities (CR.MCR.EcCr.CarSwi) - recorded at the nearest point of approximately 15 km to the south-east and 10 km to the north-east of Iona;
- Maerl beds (SS.SMp.Mrl) - recorded at the nearest point of approximately 18 km to the north (around the Treshnish Isles) and approximately 16 km to the north-east (around Ulva) of Iona; and
- Seagrass beds (SS.SMp.SSgr.Zmar) - recorded formally at the nearest point of approximately 18 km to the north of Iona (around the Treshnish Isles). However, local consultation has determined that the Proposed Development overlaps with seagrass beds.

Subtidal Benthic Survey Results

The survey took place at Iona between 20th August 2021 to 23rd August 2021 and involved the completion of 21 DDC stations, 28 DDC transects and the collection of 20 grab samples. DDC sampling resulted in the collection of 1,033 still images supporting the classification of biotopes (Figure 8-5).

The prevailing sediment type within the Iona survey area was found to be sand, with 80% of stations dominated by Slightly Gravelly Sand ((g)S) representing EUNIS BSH A5.2 (Sand and Muddy Sand) and 20% as Gravelly Sand (gS) representing EUNIS BSH A5.1 (coarse sediment). Sand (0.63 mm to 2 mm) was the main sediment fraction present at all stations with content varying between 75.8% to 99.6%. Mud content was low with a maximum of 1.6%.

A broad trend in the distribution of habitats was apparent at the survey site with habitats further offshore characterised as infralittoral sand biotopes (A5.233) with a clear transition into areas dominated by kelp (A5.52) extending all the way to the intertidal zone. Kelp and red seaweeds (moderate energy infralittoral rock, A3.21) habitat were present in the near-shore areas (3.21%).

The dominant EUNIS BSH habitat accounting for 74.6% of the surveyed area was A5.5 – Subtidal Macrophyte Dominated Sediment. That included the following habitats:

- A5.233 - *Nephtys cirrosa* and *Bathyporeia* spp. in infralittoral sand (38.1%);
- A5.52 - Kelp and seaweed communities on sublittoral sediment (31.4%); and
- A5.5331 - *Zostera marina/angustifolia* beds on lower shore or infralittoral clean or muddy sand (5.1%).

Other than seagrass beds (A5.5331), other PMFs such as ‘Kelp and seaweed communities on sublittoral sediment’ (A5.52) and ‘Kelp beds’ (A3.125) were also recorded, encompassing 31.4% and 0.001% of the surveyed area, respectively. No live maerl was identified, however dead maerl was observed across 14% and 21% of all DDC stations and transects, respectively.

Evidence of bedrock reef was identified across one transect only, however, no evidence of stony or biogenic reef which would qualify as Annex I reef was observed during subtidal benthic surveys.

The bivalve *Goodallia triangularis* was the most abundant taxa recorded, however, the most abundant major taxonomic group was Crustacea. The major macrobenthic group was characterised by the presence of Nematoda, *Bathyporeia guilliamsoniana,* Nemerteans *and Nephtys cirrosa.* The presence of *B. guilliamsoniana* and *N. cirrosa* as well as the identification of sand-dominated sediments led to the classification of sediments under the EUNIS biotope ‘A5.233 *Nephtys cirrosa* and *Bathyporeia* spp. in infralittoral sand’, which is characteristic for sediments subject to physical disturbance.

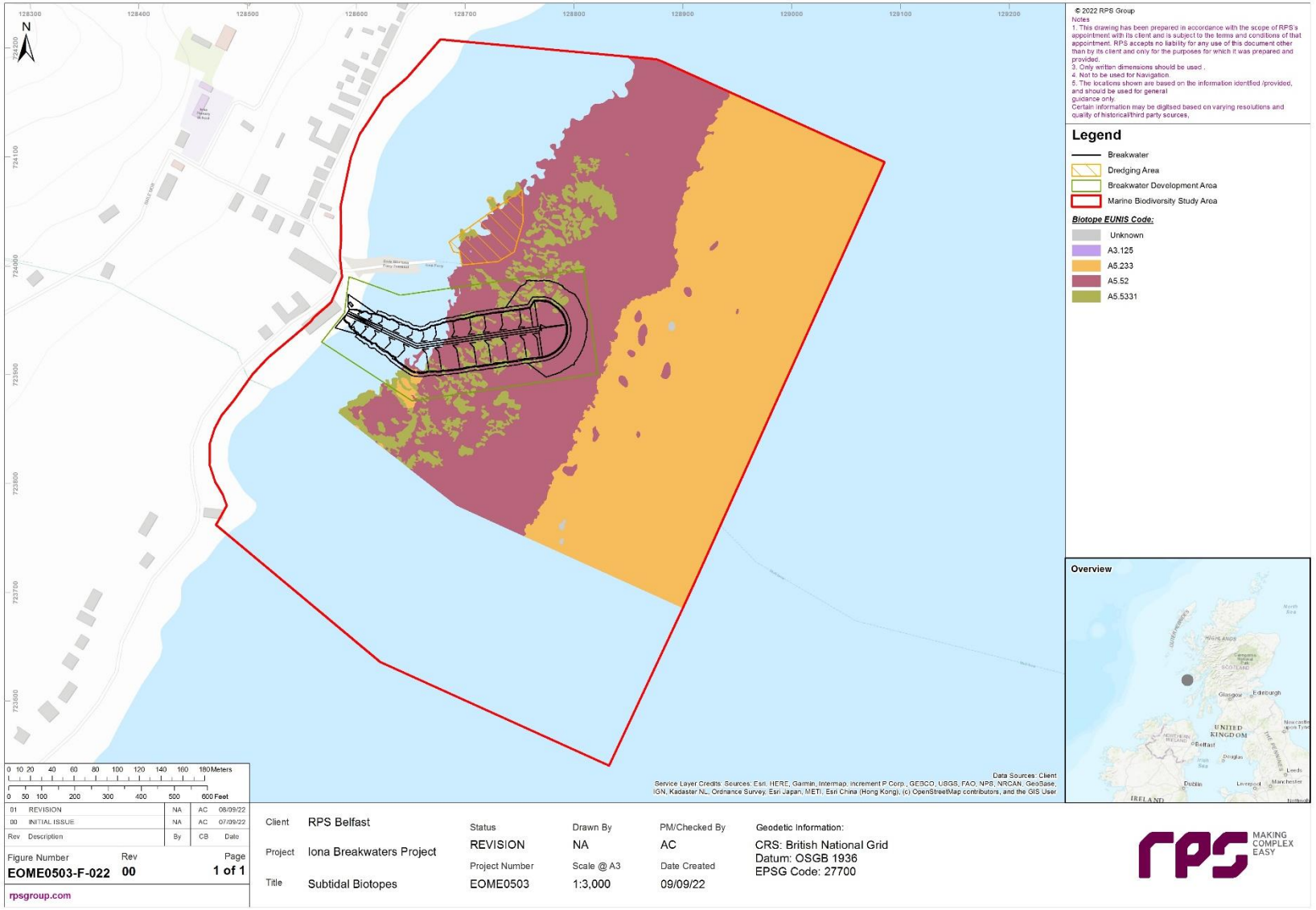

Figure 8-5: Subtidal biotopes classified within the Marine Biodiversity Study

8.3.4.3 Seagrass

Out of 55 seagrass species worldwide (Green and Short, 2003), three are found in the UK: the eelgrass *Zostera marina*, the narrow-leaved eelgrass *Zostera angustifolia* and the dwarf eelgrass *Zostera noltei*. The presence of common eelgrass *Z. marina* was recorded during seagrass mapping surveys in the vicinity of the Proposed Development.

Seagrasses are aquatic angiosperms (flowering plants) adapted to an aquatic environment. *Z. marina* grows in depths of up to 10 m depending on water clarity. The plant has dark green, narrow blade-like leaves with leaf widths varying between 2 cm for young individuals and up to 10 cm for mature plants. The leaves grow between 30 and 60 cm in length but can in some cases reach 1.5 m (D'Avack *et al.,* 2014). Morphological differences may vary with environmental conditions (Phillips & Menez 1988). *Z. marina* can be a perennial or annual species. It exhibits seasonal changes, particularly in leaf growth. The long summer leaves are replaced by shorter, slower-growing ones during the winter months.

The seagrass is found on soft sediments such as sand, mud or a mixture of sand, gravel and mud in sheltered environments such as bays, estuaries, shallow inlets and saline lagoons (D'Avack *et al.,* 2014). All three British seaweed *Zostera* species are found on sedimentary substrata, in sheltered or extremely sheltered locations with slow current velocity. Therefore, excessive sedimentation can be harmful as it smothers plants and turbid water may inhibit growth by reducing the amount of light available for photosynthesis (D'Avack *et al.,* 2014).

Seagrasses reproduce sexually via pollination of flowers and resultant sexual seed but can also reproduce and colonize sediment asexually (D'Avack *et al.,* 2019). In subtidal areas where salinity fluctuation is minimal, dense stands of perennial plants reproduce vegetatively (i.e., by the growth of rhizome (Phillips *et al.,* 1983)). Boese *et al*. (2009) found that natural seedling production was not of significance in the recovery of seagrass beds, but that recovery was due exclusively to rhizome growth from adjacent perennial beds. Manley *et al.* (2015) reported a rhizome growth rate of 26 cm/yr. *Z. marina* plants are monomorphic, restricted to the horizontal growth of roots and, hence, unable to grow rhizomes vertically. This restriction to horizontal elongation of the roots makes the recolonization of adjacent bare patches difficult and is the reason why large beds are only found in gently sloping locations. A depression of the seabed caused by disturbance of the sediment can therefore restrict the expansion of the bed (D'Avack *et al.,* 2019). Maxwell *et al.* (2014) reported that phenotypic plasticity can increase the length of time seagrass can persist in unfavourable environments such as reduced light availability and it is therefore a key element in the resilience of seagrass biotopes. This finding also indicated that different populations would have different resilience to external pressures.

Seagrass beds provide a range of environmental services and are considered of considerable economic and conservation importance. Seagrass beds can improve water clarity by trapping re-suspended sediments and their extensive root systems act as bottom stabilisers reducing the risk of coastal erosion. Roots and leaves provide important food for wildfowl, such as brent geese, and nutrients to support animal communities on the seabed (d'Avack *et al*., 2014). Bertelli & Unsworth (2012) reported that seagrass beds provide fish nurseries for economically important species such as plaice, pollock,

herring, cod and whiting and constitute permanent habitats for species of principle importance for conservation such as stalked jellyfish and seahorses (Hiscock *et al.,* 2005).

Furthermore, consultation undertaken with the local community has provided further local knowledge on the extent of seagrass beds in and around the Isle of Iona. It is important to note that this information was subjective and undertaken by visual observation, however, using the precautionary principle, these observations will be considered during the assessment. From these visual observations, seagrass beds were found to be present at Martyr's Bay, St Ronan's Bay and Traighmor to the south, all on the east coast of Iona.

Seagrass Survey Results

Survey results confirmed the presence of extensive seagrass beds representative of the PMF "seagrass beds". Seagrass beds with at least 5% coverage were identified across 23% of all DDC stations and 25% of DDC transects. Areas of dense seagrass coverage (76-100% coverage) were mostly observed in the near-shore areas across 9.5% and 17.8% of all DDC stations and transects, respectively. In total, seagrass habitats (A5.5331) covered 5.1% of the surveyed area (circa 9422 m^2) and were confined to the shallow subtidal zone towards the southern extent of the survey area, perpendicular to the shoreline and almost exclusively present in areas of kelp habitat (A5.52). Aerial imagery results suggest that the seagrass beds observed are very likely to extend along the coast beyond the areas mapped and potentially along much of the shallow subtidal areas of the Sound of Iona.

8.3.4.4 Important Ecological Features

Table 8-4 summarises the Important Ecological Features (IEFs) and the value of each IEF for benthic ecology considered within the Marine Biodiversity Study Area based on definitions provided in Table 8-8.

Table 8-4 Benthic Ecology IEFs identified for this assessment

Benthic ecology IEFs	Representative biotopes	Value within the Marine Biodiversity Study Area	Justification
Littoral rock	A1.1131 A1.1132 A1.1133 A1.123 A1.211 A1.2141 A1.2142 A2.82	Regional	Identified flora and fauna is common throughout the UK, however biotope A1.2142 is listed as a UK BAP Priority habitat (Intertidal Underboulder Communities). No littoral rock biotopes were deemed to qualify as Annex I reefs.
Littoral sediment	A2.111 A2.22 A2.24	Regional	Identified flora and fauna is common throughout the UK, however biotope A2.24 is listed as a UK BAP Priority habitat (Intertidal Mudflats). No biotopes were deemed to qualify as Annex I habitats.

Benthic ecology IEFs	Representative biotopes	Value within the Marine Biodiversity Study Area	Justification
Infralittoral rock	A3.125 A3.21	National	Biotope A3.125 is considered as PMF.
Sublittoral sediment	A5.233	Regional	UK BAP Priority habitat "Subtidal Sands and Gravels".
	A5.52	National	A5.52 is considered a PMF.
	A5.5331	National	OSPAR threatened and/or declining habitats.

8.3.5 Fish and Shellfish

8.3.5.1 Regional Fish and Shellfish Assemblages

The regional fish assemblage of the area is typical of species found within the northern Atlantic including species of both commercial and conservation value. Migratory species such as Atlantic salmon *Salmo salar* and sea trout *Salmo trutta* have been found to spawn and migrate to and from Scottish rivers and lochs, including Loch Ba, Loch Assapol, Loch Scridain and Loch Na Keal (Argyll Fisheries Trust, 2011). European eel *Anguilla anguilla* may also be present in the wider area of the western isles, Sea of the Hebrides and the Minch (National Biodiversity Network (NBN) Atlas Scotland, 2021). The Sea of Hebrides MPA has been proposed for the protection of basking shark, which occurs consistently at higher than average densities in the south and east of the MPA proposal, particularly around Coll and Tiree. In addition, common skate *Dipturus intermedia* have been found distributed throughout the west coast of Scotland. Loch Sunart to the Sound of Jura MPA has been shown to support a good number of resident mature common skate that may also be breeding in the area.

The following commercial fish and shellfish stocks were recorded in the wider area of the western isles, Sea of the Hebrides and the Minch (Marine Scotland, 2021):

- Cod *Gadus morhua;*
- European hake *Merluccius merluccius;*
- Haddock *Melogrammus aeglefinus;*
- Herring *Clupea harengus;*
- Horse mackerel *Trachurus trachurus;*
- Mackerel *Scomber scombrus;*
- Norway lobster *Nephrops norvegicus;*
- Norway pout *Trisopterus esmarkii;*
- Plaice *Pleuronectes platessa;*
- Saithe *Pollachius virens;*

- Sandeel *Ammodytes* spp.;
- Sprat *Sprattus sprattus*; and
- Whiting *Merlangius merlangus.*

These results were corroborated by the International Council for the Exploration of the Sea (ICES) (2018) during surveys along the northeastern Atlantic. Target species such as cod, European hake, haddock, herring, mackerel, Norway pout, saithe, sprat, whiting and plaice were recorded along the west coast of Scotland. Shellfish stocks were not included in the scope of this study. In 2020 National Statistics published a report about the landings of sea fish and shellfish by Scottish vessels and stated that landings into the south-west were dominated by shellfish with crabs (edible and velvet), lobsters and whelk caught alongside major fisheries for scallop and *Nephrops* (Scottish Government, 2020).

8.3.5.2 Local Fish Assemblages

The fish assemblages in the vicinity of the Isle of Iona would be expected to reflect species known to occur within the wider area of the western isles, Sea of the Hebrides and the Minch. No fish and shellfish surveys have been undertaken within the Sound of Iona. Based on studies conducted in the wider area, the key fish species likely to be present within and in close proximity to the Marine Biodiversity Study Area include elasmobranchs such as lesser spotted dogfish *Scyliorhinus canicula*, spurdog *Squalus acanthius*, common skate *Dipturus intermedia*, cuckoo ray *Leucoraja naevus*, nursehound *Scyliorhinus stellaris* and thornback ray *Raja clavate* (NBN Atlas, 2021). The Marine Biodiversity Study Area is located within the area designated for basking shark *Cetorhinus maximus* and approximately 35 km from the area that supports a resident population of common skate (Nature Scot, 2021a).

A number of commercially important fish species are expected to be encountered within or in the vicinity of the Marine Biodiversity Study Area, either as adults or juveniles, including sandeel, herring, mackerel, cod, haddock and saithe (Marine Scotland, 2021). Norway pout, cod, horse mackerel, sandeel, saithe (juvenile) and whiting (juvenile) are recognised as PMFs.

8.3.5.3 Migratory Species

Two species of anadromous[14] fish, the Atlantic salmon and sea trout have the potential to be present in the Marine Biodiversity Study Area.

Atlantic Salmon

The juvenile life stage typically lasts between one to four years before migrating to the sea. Following migration to the sea, salmon are known as post-smolts until the spring of the following year and after one winter as grilse. Adult Atlantic salmon spend the majority of their lives at sea, growing rapidly and only returning to freshwater environments to spawn from November to December (extending from October to late February) (SNH, 2017). Due to a highly acute sense of smell, the Atlantic salmon is able

[14] Anadromous: Migrating from sea to fresh water to spawn.

to locate the river in which it originated and on maturity migrates back to spawn (Dipper, 2001; Lockwood, 2005).

Atlantic salmon are widely distributed throughout Scotland and are recognised as Annex II (EU Habitats Directive), UK BAP species, Scottish PMF (juvenile) and an OSPAR species. They are currently both nationally and internationally important species. In recognition of the importance of Scottish salmon populations, numerous rivers have been designated as SACs for the Atlantic salmon. However, no SACs are located within a 100 km radius of the Marine Biodiversity Study Area. The nearest area where salmon presence was recorded is Bunessan River, located approximately 10 km to the east of the isle of Iona and for which the fishery catch data has been historically collected. Argyll Fisheries Trust (2011) reported that in 2010, salmon fry and parr were found at only one of the five sites surveyed where abundance was high for fry and moderate for parr. Although more parr was found in the catchment in 2010 when compared with 2003, the relatively low distribution and abundance suggest a potential threat of local extinction. The ecological potential of the Bunessan catchment was identified as bad due to the use of Loch Assapol as a resource for supplying drinking water to nearby communities. The main factors affecting trout habitats were identified as modified river morphology and channel characteristics, condition of riparian habitats (influenced by land use - grazing and forestry), aquaculture-related aspects and climate change (Argyll Fisheries Trust, 2011).

Data and information on the movements of salmon during their sea migration are limited. Smolts are believed to school and move to deep-sea feeding areas. Prior to seaward migration, the fish undergo a preparatory smolting process involving morphological, biochemical, physiological and behavioural changes that preadapt them for life within the marine environment (Hoar, 1988; Høgasen, 1998; Thorpe *et al*., 1998; Finstad & Jonsson, 2001). The migration from freshwater through the estuary and into the marine environment is predominantly nocturnal during the early part of the smolt run. During the latter part of the season, a significant proportion of the smolts switch to migration during both day and night (Thorstad *et al.,* 2012). The average total body length of wild smolts is usually 10–20 cm, and they may weigh from 10 to 80 g (Thorstad *et al*., 2011). The EU SALSEA–Merge project reported that the increase in body length after the post-smolts enter the sea was estimated to be 0.6% per day (Salsea Merge, 2012).

Malcolm *et al.* (2010) reported that salmon post-smolts originating from Scottish rivers inevitably use near-shore areas at the commencement of the marine migration. Some post-smolts migrate northwards off the western coast of Scotland along the continental shelf edge, apparently making use of the dominant ocean currents. High densities of post-smolts were reported to the northwest of Scotland in a highly dispersed pattern distribution throughout much of the Norwegian Sea. The EU SALSEA–Merge project investigated salmon migration and corroborated that the post-smolts migrate northward, through the Faroe-Shetland Channel or Faroese, to the North of the Norwegian Sea (Salsea Merge, 2012). The migration direction may alter between the years because of shifts in the surface currents due to wind changes.

Sea Trout

The sea trout *Salmo trutta* (also known as brown trout) has a similar ecology to the Atlantic salmon but is smaller in size, has a much larger distribution and remains within nearshore waters rather than undergoing extensive migration offshore (Sindre, 2020).

Trout spawn in winter from October to January, with the eggs deposited in redds[15], small deviations in the riverbed, cut by the female in the river gravel. A review carried out by Malcolm *et al.* (2010) concluded sea trout may spend a variable number of years in freshwater before migrating to sea, where they may spend variable periods of time before reaching maturity. On reaching maturity sea trout may spawn one or more times, normally annually. Pemberton (1976) studied the abundance of sea trout in sea lochs on the west coast of Scotland and concluded that post-smolts move from rivers to sea lochs primarily between April and early June, moving to the open sea in late June and July, before returning in August and September. Malcolm *et al.* (2010) also reported that post-smolts disperse slowly into the marine environment in the weeks following emigration from fresh water, with only 36% of fish detected further than 6 km from their release site.

Fishery catch data has been historically collected for three fishery districts on Isle of Mull, including Bunessan (Loch Assapol), located approximately 10 km from Iona. Argyll Fisheries Trust (2011) reported that in 2010, trout fry and parr abundances were variable, with relatively low minimum abundance and moderate (fry) and very high (parr) maximum abundance. The abundance of trout fry and parr in the Bunessan in 2010 decreased when compared to 2003 data. The ecological potential of the Bunessan catchment was identified as bad due to the use of Loch Assapol as a resource for supplying drinking water to nearby communities. The main factors affecting trout habitats were identified as modified river morphology and channel characteristics, condition of riparian habitats, aquaculture-related aspects and climate change (Argyll Fisheries Trust, 2011).

As mentioned above, sea trout have a large distribution throughout Scotland and are a UK BAP Priority Species. The nearest loch that supports a significant breeding sea trout population is Loch Pottie. Fish migrate to the sea via a stream which has its outlet near Fidden (Tobermory Angling Club, 2021). The loch is located on the Isle of Mull approximately 3km from Iona.

8.3.5.4 Elasmobranchs

Elasmobranchs are a cartilaginous fish group that comprises sharks, rays and skates. Shark species expected to be present in the wider area, as well as the Marine Biodiversity Study area, include basking shark *Cetorhinus maximus*, spurdog *Squalus acanthias*, lesser spotted dogfish *Scyliorhinus canicular*, common skate *Dipturus spp.*, cuckoo ray *Leucoraja naevus*, nursehound *Scyliorhinus stellaris* and thornback ray *Raja clavata*. The basking shark and common skate are PMFs and as such have been given a species account.

[15] 'Nests' of spawning fish.

Basking Shark

The basking shark is the second largest fish in the world, growing up to a typical length of 6 – 8 m. Mating is thought to occur in early summer with males following females into shallow water and birthing occurring in late summer approximately a year later. Basking sharks are ovoviviparous, developing embryos with a yolk sac. The young are born fully developed, measuring 1.5 – 2 m.

The basking shark has been identified as being of both commercial and conservation value and has been categorised as a UK BAP species, PMF, OSPAR species, International Union for the Conservation of Nature (IUCN) red list species (vulnerable) and is listed on the Bern Convention Appendix II and the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) Appendix II.

The Marine Conservation Society (MCS) has been collating UK-wide sightings of basking sharks since 1987 in a project called the Basking Shark Watch Project, through which they have temporal and spatial data of over 21,000 sharks from over 5,200 records. Over 90% of basking shark sightings in the UK are reported between May and August when sightings peak earliest in the southwest UK and lastly in Scotland around August (MSC, 2008). Sightings in 2009 were highest from July to September (MSC, 2009).

Witt *et al*. (2016) in the satellite tagging study found that sharks demonstrated inter-annual fidelity to waters around the Isles of Coll and Tiree (approximately 30 km north-west from Iona) in the Sea of Hebrides during summer months (July to September), returning to the same coastal waters in consecutive summers. Based on that evidence, a Sea of Hebrides MPA was designed to protect this species. Basking sharks tend to occupy shallow coastal waters during summer, predominantly using surface waters, but move to deeper waters from autumn onwards. Most frequently occupied depths were between 25 and 50 m. When occupying near surface waters (top 10 m), basking sharks spend more time in the top 1 m of the water column. Basking sharks demonstrated foraging behaviour within the Sea of Hebrides MPA and it is anticipated that the site fidelity might be associated with the availability of prey. Basking sharks are selective filter-feeders that choose the richest, most profitable plankton patches. Sims and Quayle (1998) reported that they forage along thermal fronts and actively select areas that contain high densities of large zooplankton above a threshold density. They migrate into the Sea of Hebrides during the summer and can be seen feeding at the surface between June and October each year before heading into deeper water for the winter (NatureScot, 2021b).

Common Skate

Common skate are a demersal species that is distributed along the west and north of Scotland, and throughout the UK and can be found at depths of 10 – 600 m. Juveniles will often occupy shallower waters on sandy and muddy sediments. Common skate tend to remain in a relatively small geographical area throughout the year, feeding on crustaceans and shellfish, as well as other fish such as flatfish. Larger skate will also hunt in mid-water for pelagic fish (Nature Scot, 2021).

Common skate have been identified as having conservation importance and have been categorised as a UK BAP species, PMF, OSPAR species and critically endangered on the IUCN red list.

During an acoustic study in the Firth of Lorn and Sound of Mull, Thornburn *et al.* (2018) found that skate mostly remain in water depths between 100 – 150 m over summer months (March-August) with some individuals having a larger depth range over winter months (September – February). In addition, tagged females displayed higher occupancy in the surveyed area of the MPA than males. The tag-recapture data suggest that up to 400 individuals are residents within the Sound of Jura (Neat *et al*., 2014), but it is not clear how many individuals inhabit the full extent of the MPA.

8.3.5.5 Local Shellfish Assemblages

Shellfish are aquatic demersal-shelled molluscs. Using commercial landing data as a proxy for species present in the Marine Biodiversity Study Area, species most landed within ICES rectangle 41E3 in 2019 include the Norway lobster *Nephrops norvegicus*, Nehrops *Nephrops norvegicus,* brown crab *Cancer pagarus*, green crab *Carcinus maenas,* velvet crab *Necora puber*, razor clams *Solen spp*., great Atlantic scallop *Pecten maximus,* crawfish *Palinurus elephas* and squid (ICES, 2020).

There are no classified shellfish harvesting waters or shellfish water-protected areas within the Marine Biodiversity Study Area. The nearest classified shellfish harvesting waters and shellfish water protected area is located within Loch Scridain (common mussels), circa 16 km east of Iona.

8.3.5.6 Spawning and Nursery Grounds

The Marine Biodiversity Study Area and the wider area of the western isles, Sea of the Hebrides and the Minch have been identified as a spawning ground for a range of demersal and pelagic species and a nursery ground for species, such as cod *Gadus morhua,* saithe *Pollachinus virens, sprat Sprattus sprattus,* whiting *Merlangius merlangus* and sandeel *Ammodytidae.* The species identified as having spawning, or nursery grounds within the wider Marine Biodiversity Study Area, based on existing data, are summarised in Table 8-5. Nursery and spawning habitats were categorised by Ellis *et al.* (2012) as either high or low-intensity dependant on the level of spawning activity or abundance of juveniles recorded within these habitats. Species with nursery grounds within the Marine Biodiversity Study Area have been given individual species accounts, except migratory species Atlantic salmon, sea trout, basking shark and common skate, which have been described above.

Table 8-5 Key species with spawning and nursery areas (Coull *et al.*, 1998 and Ellis *et al.*, 2012) in the wider Marine Biodiversity Study Area

Common Name	Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Nursery area
Atlantic Salmon	*Salmo salar*													
Cod	*Gadus morhua*	Do not spawn in the area												
Common skate	*Dipturus spp.*	Unknown												
Herring[16]	*Clupea harengus*													High Intensity
Plaice	*Pleuronectes platessa*													
Saithe	*Pollachinus virens*	Do not spawn in the area												
Sandeel	*Ammodytidae*													
Sea trout	*Salmo trutta*													
Mackerel	*Scomber scombrus*	Do not spawn in the area												
Norway lobster	*Nephrops norvegicus*													
Norway pout	*Trisopterus esmarkii*													
Sprat	*Sprattus sprattus*													
Whiting	*Merlangius merlangus*	Do not spawn in the area												High Intensity
Spotted ray	*Raja montagui*													
Spurdog	*Squalus sp.*													High Intensity
European hake	*Merluccius merluccius*	Do not spawn in the area												
Anglerfish	*Lophius piscatorius*	Do not spawn in the area												

	Spawning period
	Peak Spawning
	Overlap with Marine Biodiversity Study Area

[16] Based on data for NW Scotland (Ellis *et al.* 2012)

Cod

Cod are a widely distributed demersal species that occurs throughout the UK waters and are found from the shoreline to depths of circa 600 m. Spawning occurs between January and April, with peak spawning occurring in February to March, whereby up to 6 million buoyant eggs are released into the pelagic environment. The eggs hatch after approximately 12 days and the larvae enters the plankton for up to 2 months before settling on the seabed (Dipper, 2001). Cod do not spawn within the wider area of the western isles, Sea of Hebrides and the Minch, but low-intensity nursery areas involve most of the north-western Scottish coast (Ellis *et al.* 2012).

Cod have been identified as having both commercial and conservation importance. They have been categorised as a UK BAP species, OSPAR, IUCN red list (vulnerable), PMF and have been afforded an EU management plan.

Herring

Herring are widely distributed throughout Scottish waters and can be found in deep waters to depths of 200 m. The highest populations are located in the northern North Sea off the coast of Scotland and in Northern Irish waters. Spawning times are dependent on sub-populations and herring found in Scotland have been found to spawn from March to April and again from August to September (Ellis *et al.* 2012). Sticky eggs are deposited on a wide range of substrate types, but the preferred substrate type is gravel (Drapeau, 1973; Rogers & Stock, 2001). The eggs adhere to the seabed and can form extensive beds. After hatching, the larvae enter the plankton and drift with the current until reaching inshore nursery grounds. After a year they migrate further offshore to join adults at feeding grounds. The spawning area is situated approximately 35 km to the northwest of Iona, although high-intensity nursery grounds overlap with the Marine Biodiversity Study Area (Ellis *et al.* 2012).

Herring currently have a UK BAP designation in place and are under an EU management plan to ensure fish stocks are exploited at a maximum sustainable yield.

Saithe

Saithe are widely distributed benthopelagic species that occur throughout Britain. Saithe are distributed in coastal waters until they reach maturity, after which they migrate offshore and live in depths of 200 – 400 m. Juvenile saithe have a similar diet to adults, consuming herring, cod and sandeels as well as benthic invertebrates, often growing to 1.2 m in length. Saithe nursery areas have been found all along the inshore waters of the Scottish coast although they do not spawn near or within the wider area of the western isles, Sea of Hebrides and the Minch (Coull *et al.*, 1998). High-intensity whiting nursery areas overlap with the Marine Biodiversity Study Area.

Saithe have been categorised as a PMF (juvenile life stage).

Sandeel

There are five species of sandeel in Scottish waters and commercial catch has found that approximately 90% of this catch is *Ammodytes marinus* (Faber Maunsell, 2007). During the winter sandeel remain in the sediment only emerging to spawn. Sexual maturity is reached at the age of two. The eggs are laid in clumps within a sandy substrate until they hatch, after which they enter the water column. Sandeels will then metamorphose and settle in sandy sediments amongst adults (Van Deurs *et al.,* 2009). As a result, there is very little movement between spawning and feeding grounds. Sandeel nursery grounds occur throughout the northern coastal waters of Scotland and extend northeast towards Norway. Spawning, as well as nursery grounds, overlap with the Marine Biodiversity Study Area (Ellis *et al.* 2012).

Sandeel have been identified as a highly commercial species and have been categorised as UK BAP species and a PMF.

Norway Lobster

Norway lobster are mud-burrowing marine decapod crustaceans, distributed at depths from 20 to 800 m. A high slit and clay sediment content (>40%) is necessary to support the burrows of large *Nephrops*, as their density tends to decline in coarse sand sediments (Tuck *et al.,* 1997; Phillips, 2008). General hydrographic conditions might influence the densities of Norway lobsters. Since they are dependent on particular types of seabed sediment, Norway lobster geographical distribution is highly discontinuous, but generally dispersed on the continental shelves and upper continental slopes of the north-east Atlantic (Philips, 2008). *Nephrops* are sedentary and only rarely migrate over distances longer than a few hundred metres. In the relatively shallow water populations of north-western and northern Europe, female *Nephrops* reach maturity at a size between 23- and 30mm carapace length (Philips, 2008). Spawning occurs throughout the year, and as well as the nursery areas encompass most of the western Scottish coast (Coull *et al.* 1998).

Norway lobster is the most important commercial crustacean in Europe.

Whiting

Whiting is a gadoid benthopelagic species distributed across the northeast Atlantic, from Iceland to the Baltic and occurs in high abundance around the British Isles. It is usually found at depths of 30 m to 100 m near mud and gravel bottoms, but also above sand and rock. In the north-east Atlantic whiting prey upon species such as lesser sandeel, sprat, herring and Norway pout (Ross *et al.*, 2018*)*. They typically have extended spawning seasons, spawning from February to June across the species range, although the spawning areas do not overlap with the wider area of the western isles, Sea of Hebrides and the Minch (Coull *et al.*, 1998). High-intensity whiting nursery areas overlap with the Marine Biodiversity Study Area.

Whiting is currently listed as a UK BAP Priority Marine Species and PMF (juvenile stage). There is currently no specific management plan for the stock in the West of Scotland.

Spotted Ray

Spotted ray have been found to inhabit inshore waters to depths of 8 – 283 m. Juveniles tend to occur on sandy sediments, closer inshore and adults occur offshore in coarse gravel substrates. Low-intensity nursery grounds have been found to occur on the west coast of Scotland overlapping with the Marine Biodiversity Study Area.

Spotted ray have been identified as being of commercial importance and have been categorised as an OSPAR species.

Spurdog

The spurdog is an umbrella term for benthopelagic species in the *Squalus* genus. *Squalus spp.* are widely distributed, and tolerant of a wide range of salinities, occurring at depths between 10 m and 100 m. They are viviparous and produce live young, often with females migrating inshore to give birth. Locations and temporal stability of specific spawning grounds are not well established, although a high-intensity nursery ground extends along the west coast of Scotland and overlaps with the Marine Biodiversity Study Area (Ellis *et al.* 2010).

The most widely known species, *Squalus acanthias*, is currently listed as a UK BAP species and PMF.

European Hake

The European hake is a demersal species, usually found at depths of 70 m – 350 m. It is distributed throughout deeper offshore waters around Northern Europe. European hake mainly preys upon species such as mackerel, herring, pouting, sandeels and squid. It stays on the seabed during daylight, feeding little, and moves into mid-water to feed during darkness. Hake has an extensive spawning area, extending all along the western margin of Europe although it does not overlap with the wider area of the western isles, Sea of Hebrides and the Minch. While hake eggs are mainly found close to the shelf break and outer shelf, juveniles are usually located closer to the coast and the nursery areas overlap with the Marine Biodiversity Study Area (Alvarez *et al.*, 2004, Ellis *et al.*, 2012).

European hake is a species of great economic importance, currently listed as a UK BAP Priority Marine Species and PMF.

Angler Fish

Angler fish is a slow-moving, bottom-dwelling fish, found on sandy or muddy bottoms as well as shell, gravel and occasionally rocky areas (Reeve, 2008). Angler fish usually occur within the sublittoral zone from 18 m to over 550m, but it also migrate down to as deep as 2000 m in offshore waters to spawn. Angler fish is distributed throughout coastal waters all around the UK. The most recognisable feature is a fleshy lure at the end of its first dorsal spine to attract prey. Prey species generally include species such as spurdogs, rays, sand eels, cod, whiting, pouting, haddock and flatfishes. Occasionally, a range of other species were found in anglerfish stomachs, including lobsters, crabs and squids.

Otherwise known as monkfish, angler fish is an important commercial fish, included in the UK BAP and listed as a PMF in territorial waters with a focus on juveniles.

8.3.5.7 Important Ecological Features

Table 8-6 summarises the Important Ecological Features (IEFs) and the value of each IEF for fish and shellfish ecology considered within the Marine Biodiversity Study Area based on definitions provided in Table 8-8.

Table 8-6: Fish and Shellfish IEFs identified for this assessment

Fish and shellfish IEFs	Representative species	Value within the Marine Biodiversity Study Area	Justification
Demersal fish species	Plaice Horse mackerel	National	UK BAP Priority species and PMFs
Benthopelagic and pelagic fish species	Cod Haddock Sandeel Atlantic mackerel Atlantic herring European hake Sprat Whiting Saithe Norway pout	National	A regionally important population of UK BAP Priority species and PMFs.
Migratory fish species	Sea trout	National	UK BAP Priority species
	Atlantic salmon	National	Annex II of the EU habitats directive, OSPAR Annex V, PMF and UK BAP Priority species.
Elasmobranchs	Lesser spotted dogfish Nurse hound Cuckoo ray	Local	Species that form a key component of the ecosystem: no specific protection.
	Common skate Thornback ray Spurdog	National	PMFs, UK BAP Priority species, IUCN critically endangered, near threatened or vulnerable.
	Basking Shark	National	Internationally important protected species under the Bern Convention and CITES.
Shellfish assemblage	Periwinkles Whelks Mussel	Local	Commonly recorded within the Marine Biodiversity Study Area but no conservation value. There are no classified shellfish harvesting waters or shellfish water-protected areas within the Marine Biodiversity Study Area.
	Nephrops Brown crab Green crab Velvet crab Razor clam Great Atlantic scallop Razor clam Crawfish	Regional	Species that are of commercial value to the fisheries which operate within the wider Marine Biodiversity Study Area.
Spawning or nursery grounds	Atlantic Salmon Cod Plaice Saithe Sandeel Sea trout Mackerel Norway lobster Norway pout	Regional	Low-intensity spawning or nursery habitat overlaps the wider Marine Biodiversity Study Area.

Fish and shellfish IEFs	Representative species	Value within the Marine Biodiversity Study Area	Justification
	Sprat Spotted ray European hake Anglerfish		
	Herring Whiting Spurdog Common skate	National	High-intensity spawning or nursery habitat overlaps the wider Marine Biodiversity Study Area.

8.3.6 Marine Mammals

Over the last 25 years, a total of 23 cetacean species have been recorded in Scottish waters, of which 11 are regularly sighted. The remaining 12 are considered to be vagrants or rare visitors which do not occur regularly in Scottish waters. Cetaceans have the potential to range widely with some undertaking large-scale seasonal migrations to other parts of Europe or the rest of the world. Some species are more localised in their distribution and resident populations of some species are present in Scottish waters. Many of these species may use areas within proximity of the Proposed Development and the sound of Iona.

Based on data available from the Hebridean Whale and Dolphin Trust (HWDT, 2018), Marine Scotland (2021) and NBN Atlas Scotland (2021) within the vicinity of the Proposed Development, the most likely species to be present in the wider area of the western isles, Sea of Hebrides and the Minch include bottlenose dolphin *Tursiops truncatus*, common dolphin *Delphinus delphis*, harbour porpoise *Phocoena phocoena*, killer whale *Orcinus orca*, minke whale *Baleanoptera acutorostrata*, and white-beaked dolphin *Lagenorhynchus albirostris*. Peak sightings typically occur in summer months for basking shark and common dolphin, although killer whale, harbour porpoise, bottlenose dolphin and white-beaked dolphin sightings have been reported throughout the year (HWDT, 2018).

Two species of seals: grey seal; and harbour (common) seal, are found around Scotland's coast and inshore waters. Seal usage data presented by Russell *et al*. (2017) demonstrate that both grey seal and harbour seal are present in the vicinity of the Marine Biodiversity Study Area and the wider area of the western isles, Sea of Hebrides and the Minch. The nearest SACs designated for grey seals are the Treshnish Isles SAC, situated approximately 15.5 km to the north of Iona and Eileanan agus Sgeiran Lios mor SAC, situated approximately 51.5 km to the northeast of Iona. The nearest site designated for harbour seals is also Eileanan agus Sgeiran Lios mor SAC.

Regional abundance and density data for cetaceans was taken from the SCANS III surveys (Hammond *et al*., 2017), which were carried out in 2016, and presented to provide design-based estimates of abundance. These large-scale cetacean surveys used both aerial and boat-based transects to identify cetacean species across the European shelf. The Marine Biodiversity Study Area and the 100 km search area falls into ‘Block G’ of the Scans III survey. Figure 8-6 shows the location of Block G in the context of the wider SCANS III surveys.

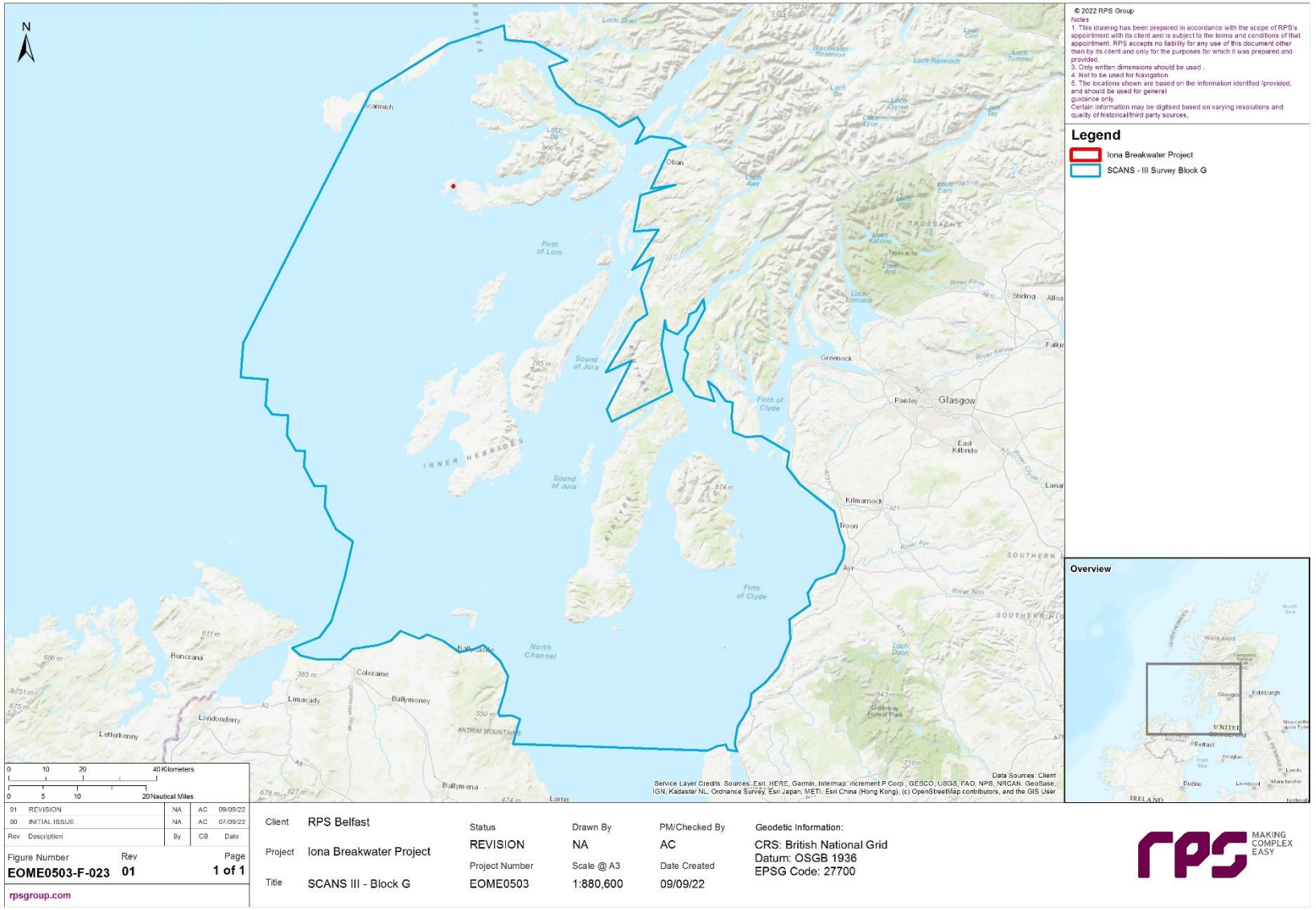

Figure 8-6: SCANS III survey area block G

8.3.6.1 Cetaceans

Bottlenose Dolphin

The bottlenose dolphins *Tursiops truncatus* encountered in the Hebrides are near the northernmost extreme of the species' global range. They generally stay close to shore, following the coastline as they travel throughout the area, and can be seen around headlands and bays. They are most often seen in and around the Sound of Barra and throughout the Inner Hebrides, with most sightings around Mull, the Small Isles and Skye. In the Hebrides, bottlenose dolphins travel in small, social groups of between three and ten individuals, but larger group sizes are not unusual (Serani and Diez, 2017).

The bottlenose dolphin feeds on a wide range of benthic and pelagic fish species in addition to cephalopods; in Scottish waters, the stomach contents of stranded animals indicate that the species prey primarily upon cod, saithe, whiting and sandeel (Santos *et al*., 2001)

Studies revealed that the west of Scotland is home to two separate groups of bottlenose dolphins, which live in the area all year round: the Inner Hebrides community, consisting of 30 to 40 animals, and a smaller group of around 15 dolphins, the Sound of Barra community (van Geel, 2016). The Sound of Barra dolphins have a restricted range, staying close to the Sound of Barra all year. In contrast, the Inner Hebrides community travel large distances throughout the Inner Hebrides and mainland coasts mainly from the Kintyre peninsula to the south of Skye (van Geel, 2016; HWDT, 2018). Distribution patterns presented by Chetney *et al.* (2013) provide evidence of the widespread occurrence of bottlenose dolphins in the Inner Hebrides. Bottlenose dolphin are one of the resident species off the west coast and remain in the area throughout the year.

The SCANS III total abundance of bottlenose dolphins in the whole survey area was calculated as 27,697 (95% CI = 17,662 – 43,432) (Hammond *et al.*, 2017). The total density estimate was predicted as 0.015 animals/km^2. Bottlenose dolphin abundance estimated for regions covered by aerial surveys was provided as 19,201 (95% Cl = 11,404 – 29,670) with density of 0.24 animals/km^2. Based on photo-identification studies, the west coast total abundance estimate is 41 (95% CI = 35 - 49) (Thompson *et al*., 2011), corroborated by Cheney *et al.* (2013) who, via integrated multiple data sources, placed the west coast bottlenose dolphin population estimate in 2007 at 45 (95% CI = 33 - 66). Abundance in block G of the SCANS III aerial survey covering the Marine Biodiversity Study Area was calculated as 1,824 (95% CI = 0 – 4,474) (Hammond *et al.*, 2017) with a density estimate of 0.121 animals/km^2 (Figure 8-6).

Common Dolphin

Short-beaked common dolphins *Delphinus delphis* were the most commonly sighted dolphin species during HWDT (2018) surveys, accounting for 4% of all marine animal sightings. Common dolphins can be seen throughout the west coast, with most sightings east of the Outer Hebrides in the Minch, Little Minch and the Sea of the Hebrides as well as in the coastal areas. Sightings of common dolphins in the Hebrides peak between April and October each year, although some animals now remain in the area throughout the winter months.

Hammond *et al.* (2017) highlighted that the total abundance of common dolphin in 2016 was estimated to be 467,7673 (95% CI = 281,129 to 777,998; density 0.261 animals/km^2). This was substantially larger than the estimates for 2005/2007 of 174,000 common dolphin. The estimated abundance for regions covered by aerial surveys was calculated as 268,540 (95% CI = 186,851 – 390,528) with density 0.222 animals/km^2. Whilst no sightings occurred in Block G of the SCANS III aerial survey, other studies reported that in the period 1992 to 2003 the relative frequency of strandings of common dolphin in northwest Scotland have increased (MacLeod *et al*., 2005). Similarly, sightings surveys conducted from May to September 2002 and 2003 show that the relative occurrence and abundance of common dolphins increased in comparison to previous surveys conducted between 1973 and 1999 (MacLeod *et al.*, 2005). These results are corroborated by HWDT (2018) who reported that during 15 years of monitoring Hebridean seas (2003 to 2017), sightings of common dolphins have increased twenty-fold and they are now the most commonly encountered dolphin species during the surveys.

Harbour Porpoise

Harbour porpoises *Phocoena phocoena* can be found in inshore waters throughout the Northern Hemisphere, but the density of porpoise in Hebridean waters is amongst the highest in Europe. They are the most frequently seen cetacean, accounting for almost half of sightings from the *Silurian* (Pierpoint, 2008). They are widespread and can be seen in most coastal areas of the Hebrides, with the highest encounter rates occurring around the Small Isles.

Often associated with near-shore headlands and strong tidal currents, porpoise are commonly observed within shallow bays, estuaries and narrow tidal channels (Pierpoint, 2008; Pierpoint *et al.*, 1999). Harbour porpoise exhibit diet flexibility, feeding on a varied diet of fish, cephalopods and crustaceans.

Data from SCANS III surveys reported a total abundance of harbour porpoises within the whole survey area as 466,569 (95% CI = 345,306 – 630,417). The mean density was estimated as 0.381 animals per km^2 for this species. The estimated abundance for regions covered by aerial surveys was calculated as 424,245 (95% CI = 313,151 – 596,827) with a density of 0.351 animals per km^2. Abundance in block G of the SCANS III aerial survey covering the Marine Biodiversity Study Area was calculated as 5,087 (95% CI = 1,701 – 10,386) (Hammond *et al*, 2017) with a density estimate of 0.336 animals/km^2 (Figure 8-6). Based on a boat-based visual survey conducted during May-August 2002-2004, Goodwin & Speedie (2008) reported that harbour porpoise density showed an increase for West Scotland over the study period and the population of West Scotland was estimated at 3105 (95% CI = 2032 – 4745) during August and September.

Killer Whale

Killer whale *Orcinus orca* can be seen throughout the west coast of Scotland and can be seen from the shore in coastal areas as well as offshore. During HWDT (2018) surveys there have been just 16 sightings between 2002 and 2017, most of which have been of a small unique group called the West Coast Community, the UK's only resident group of killer whales. The West Coast Community amounts to eight individuals. Although the group is wide-ranging (seen along the whole of the west coast of the

UK, from the Hebrides to the south of Ireland), most sightings have been within the Hebrides. Sightings of killer whales are infrequent, but they are present in Hebridean waters all year round and are generally recorded near-shore between April and October (Evans, 1988, 1992 in Reid *et al.,* 2006) and further offshore between November and March. Recent surveys north and west of Scotland suggest that killer whales concentrate along the continental slope north of Shetland between May and June (Reid *et al.*, 2006). Seasonal movements may be associated with the distribution of particular prey (e.g., seals are preyed upon close to land particularly in June to October when they haul out to breed).

There is no overall population estimate for the north Atlantic killer whale population, however, sightings surveys in the eastern north Atlantic, mainly between Iceland and Faroe Islands indicate a population in the region of somewhere between 3,500 and 12,500 (Gunnlaugsson and Sigurjonsson 1990 in Reid *et. al.,* 2003).

A study based on the photo-identification data from across the Northeast Atlantic showed that there was only one match between the Northern Isles and the Hebridean and Western Isles (recorded in May 2006 at St. Kilda) from 91 encounters between 1992 and 2008 (Foote *et al.,* 2010). That suggests a very limited movement of killer whales between the Hebrides, the Northern Isles and the North Sea.

Minke Whale

Minke whales *Balaenoptera acutorostrata* are one of the most widely distributed baleen whales and can be found from the subtropics to polar waters in the Northern Hemisphere. Their migration patterns are not fully understood, although they are thought to make a general migration between winter breeding grounds to the south of the British Isles and feeding grounds in the cooler, more productive waters during the summer. The second most frequently seen cetacean from HWDT surveys between 2003 and 2017, minke whales account for 7% of all marine animal sightings. The highest encounter rates and most frequent sightings are around the Small Isles and east of the Outer Hebrides throughout the Minch and Sea of the Hebrides.

In Scottish waters, sandeel are the most important prey species for minke whales, comprising 62% of the diet by weight (Pierce *et al*., 2004). Clupeids (herring and sprat) account for around 30% of the diet (Pierce *et al*., 2004). Minke whales often forage in areas of upwelling or strong currents around headlands and small islands.

Data from SCANS III surveys reported a total abundance of minke whales within the whole survey area as 17,759 (CI = 7,908 – 27,544). The mean density was estimated at 0.010 animals per km^2 for this species. The estimated abundance for regions covered by aerial surveys was calculated as 13,101 (CI = 7,050 – 26,721) with a density of 0.011 animals per km^2. Abundance in block G of the SCANS III aerial survey covering the Marine Biodiversity Study Area was calculated as 410 (95% CI = 0 – 1,259) (Hammond *et al*., 2017) with a density estimate of 0.0.027 animals/km^2 (Figure 8-6).

White-Beaked Dolphin

White-beaked dolphins *Lagenorhynchus albirostris* have a relatively restricted range and are only found in the temperate and subarctic waters of the North Atlantic. The Hebrides are towards the southern

extreme of their range, they are usually seen in open waters further from the coast and favour the waters around the Outer Hebrides and the north Minch. White-beaked dolphins are present in Hebridean waters all year round.

Haddock and whiting have been identified as the most important prey items in the diet of white-beaked dolphins in British waters, with cod, herring and mackerel also identified as prey (Canning *et al*., 2008).

Data from SCANS III surveys reported a total abundance of white-beaked dolphin within the whole survey area as 36,287 (Cl = 18,694 – 61,869). The mean density was estimated at 0.020 animals per km^2 for this species. The estimated abundance for regions covered by aerial surveys was calculated as 36,287 (Cl =18,694 – 61,869) with a density of 0.030 animals per km^2. Whilst no sightings occurred in Block G of the SCANS III aerial survey, other studies reported that in the period 1992 to 2003 the relative frequency of strandings of white-beaked dolphin in northwest Scotland has declined (MacLeod *et al*., 2005). Similarly, sightings surveys conducted in May-September 2002 and 2003 show that the relative occurrence and abundance of white-beaked dolphin have declined in comparison to previous surveys conducted between 1973 and 1999 (MacLeod *et al.*, 2005).

8.3.6.2 Pinnipeds

Harbour Seal

Harbour seals *Phoca vitulina*, are central place foragers, requiring haul-out sites on land for resting, moulting and breeding, and dispersing from these sites to forage at sea. In order to reduce time and energy searching for prey, animals are likely to travel directly to areas of previously or predictably high foraging success (Bailey *et al.*, 2014). Harbour seals persist in discrete metapopulations and stay within 50 km of the coast (Russel & McConnell, 2014).

Based on faecal samples collected in two sites on the west coast of Scotland (Skye and Isle of Mull) in 1993 and 1994, Pierce & Santos (2003) assessed the diet of harbour seals. It included a range of fish and cephalopod species, of which the most important were gadoids, particularly whiting *Merlangius merlangus*, along with pelagic European horse mackerel *Trachurus trachurus* and herring *Clupea harengus.*

The total harbour seal August counts for West Scotland between 2016 and 2021 were 15,600 (SCOS, 2021). Although the West Scotland region is defined as a single management unit, it is very large geographically in terms of total coastline and contains a large proportion of the UK harbour seal population; 49% of the most recent UK total count. The Isle of Mull and Marine Biodiversity Study Area fall within the southern sub-region, where there was no detectable trend in the overall population since the early 1990s, with counts varying between approximately 5,000 and 7,000 over the period 1990 to 2018. Based on surveys carried out between 2017 and 2018, the harbour seal count for Southwest Scotland was 7,053 (SCOS, 2021). Populations in West Scotland and Southwest Scotland are now increasing.

Grey Seal

The coast of the UK supports 38% of the world's grey seals *Halichoerus grypus* (Special Committee on Seals (SCOS), 2017); 88% of these animals breed at colonies in Scotland with the main concentrations in the Outer Hebrides and Orkney (SCOS, 2017).

Grey seals gather in colonies on land (known as haul-outs) where they breed, rest, moult and engage in social activity. Breeding occurs between September to December and the annual moult between November to April (Harwood & Wylie, 1987). Preferred breeding locations around the UK coast include rocky shores, beaches, caves, sandbanks and small largely uninhabited islands. Pupping tends to take place between August and November (SCOS, 2018) in the UK. The largest pupping sites are located in the Inner and Outer Hebrides, Orkney, Isle of May, Farne Islands and Donna Nook (JNCC, 2021). Grey seals tend to forage in the open sea, returning to land regularly to haul out. Foraging trips can be wide-ranging, however, tracking studies have shown that most foraging is likely to occur within 100 km of a haul-out site (SCOS, 2018).

Along the Scottish coast, grey seals exhibit offshore foraging behaviour (Damseaux *et al.,* 2021). Additionally, studies in Scotland revealed a selective diet, mostly comprised of flatfish and sandeels. Grey seal diet was proved to be composed of 50% plaice *Pleuronectes platessa* and sole *Solea solea* but also 46% sandeels *Ammodytes marinus.* Hammond and Wilson (2016) also highlighted sandeels as an important prey item for grey seals in Scottish waters where they account for approximately 50% of the diet.

Grey seal population size is normally derived from the number of pups born during their autumn breeding season. Grey seal distribution during their breeding season is, however, very different to their distribution at other times of the year. For this reason, the number of grey seal pups born in the autumn is provided as well as the summer counts of grey seals for each Management Unit (Inter-Agency Marine Mammal Working Group (IAMMWG), 2015). From 2010 to 2016 Treshnish Isles SAC produced approximately 25% of the pups born in the Inner Hebrides (SCOS, 2020).

The UK grey seal population size in regularly monitored colonies was estimated at 133,900 individuals (approximate 95% CI = 115,300 – 156,500) (SCOS, 2020). Pup production in 2016 at biennially surveyed colonies in the Inner Hebrides was estimated as 4,541 (approximate 95% CI = 3,900 – 5,200), which is a 5.8% increase since 2014 (SCOS, 2020). The total grey seal August counts for West Scotland between 2016 and 2019 were 4,174 (SCOS, 2020). The estimated size of grey seal population at Inner Hebrides at the start of 2019 was estimated as 8,200 (95% CI = 6,900 – 10,100) (SCOS, 2020).

8.3.7 Important Ecological Features

Table 8-7 summarises the Important Ecological Features (IEFs) and the value of each IEF for fish, shellfish and marine mammal ecology considered within the Marine Biodiversity Study Area based on definitions provided in Table 8-8.

Table 8-7 Marine Mammals IEFs identified for this assessment

Marine mammals IEFs	Value within the Marine Biodiversity Study Area	Justification
Harbour porpoise	International	Annex II species protected under international legislation, and a qualifying interest of the Inner Hebrides and the Minches SAC that overlaps with the Proposed Development boundary.
Minke whale	International	Scottish Protected Species, internationally protected species, protected feature of the Sea of Hebrides MPA.
Bottlenose dolphin	National	Annex II species protected under international legislation, PMF.
Common dolphin	National	Scottish Protected Species, internationally protected species.
Killer whale	National	Scottish Protected Species, internationally protected species.
White-beaked dolphin	National	Scottish Protected Species, internationally protected species.
Harbour seal	International	Annex II species protected under international legislation, and a qualifying interest of the Eileanan agus Sgeiran Lios mor SAC, South-East Islay Skerries SAC and Sound of Barra SAC.
Grey seal	International	Annex II species protected under international legislation, and a qualifying interest of the Treshnish Isles SAC.

8.4 Future Baseline Conditions

Annex IV of the EIA Directive and Schedule 4(3) of the Marine Scotland EIA Regulations set out the information required in the EIAR as: “a description of the relevant aspects of the current state of the environment (baseline scenario), and an outline of the likely evolution thereof without implementation of the Proposed Development, as far as natural changes from the baseline scenario can be assessed with reasonable effort based on the availability of environmental information and scientific knowledge” is included in the EIAR. An assessment of the future baseline conditions, should the Proposed Development not proceed, has been carried out and described in this section.

8.4.1 Benthic Ecology

Benthic communities will exhibit some degree of natural change over time, even if the Proposed Development is not developed, due to naturally occurring cycles and processes. Variability and long-term changes in physical influences may bring direct and indirect changes to benthic habitats and communities in the mid to long-term future (Department of Energy and Climate Change (DECC), 2016). Benthic communities are also predicted to be influenced by anthropogenic activities, including contamination, or seabed disturbing activities such as trawling, dredging and development (AECOM *et al*., 2010).

There is a strong evidence base indicating that climate change could have profound implications for biodiversity, including long-term changes to benthic communities (DECC, 2016). Climatic changes are considered the leading factor in the dynamics of the biomass of the macrobenthos (Manushin *et al.*, 2020). It has also been reported that benthic biomass has increased by at least 250% to 400% over the last three decades, driven by an increase in opportunistic and short-lived species and a decrease in long-living sessile animals (Krönke, 1995; Krönke, 2011). The sea surface temperature trend in Scotland has been upward at a rate of +0.2 to 0.4˚C (Hughes *et al*., 2010). Modelling sea surface temperature in relation to climate change in the UK has shown that over the coming century the sea

surface temperature will continue to rise. It has also shown that the rate of temperature increase over the previous 50 years has been greater in waters off the east coast of the UK compared to the west, as well as the south compared to the north, and this is predicted to continue for the next 50 years (MCCIP, 2013; Lowe *et al.,* 2009). In addition, oceanic changes in temperature due to global climate change are causing poleward shifts in the latitudinal distribution of species toward cooler marine environmental regions. Studies found clear evidence of change in the distribution and abundance of benthic species in response to seawater temperature change (Birchenough *et al.,* 2015). Marine benthic communities could also be impacted by sea level rise and associated coastal squeeze, resulting in loss of habitat, and environmental changes, such as steepening of the intertidal slope and sediment coarsening (Birchenough *et al.,* 2015). As such, the baseline of the benthic subtidal and intertidal Marine Biodiversity Study Area described in Section 8.3.4 *et seq.* can only be considered as a 'snapshot' of the present benthic ecosystem within a gradual yet continuously changing environment. Any changes that may occur during the lifetime of the Proposed Development should be considered in the context of both greater variability and sustained trends occurring on national and international scales in the marine environment.

8.4.2 Fish and Shellfish

There is a broad body of evidence that climatic fluctuations play an important role in changing fish and shellfish distributions and abundances. The biological and physical influence of climate change is also important in considering key life-cycle stages of various species, including the dispersal of eggs and larvae by water currents; the timing of spawning in relation to seasonal zooplankton productivity which forms key prey items for larvae; the physiological effects of temperature on growth and maturation; and the alteration of migration cues for adult fish (Heath *et al*., 2012). Therefore, variability and long-term changes in physical influences may bring direct and indirect changes to fish and shellfish assemblages in the mid to long-term future (UK Department for Business, Energy and Industrial Strategy (BEIS), 2016).

Fish and shellfish populations are subject to natural variation in population size and distribution, largely as a result of year-to-year variation in recruitment success (White *et al.,* 2019). These population trends will be influenced by broad-scale climatic and hydrological variations. Fish and shellfish are a key link in the food web, linking primary and zooplankton production to top predators and therefore facilitating the transfer of energy from some of the lowest to the highest trophic levels within the ecosystem.

Climate change may influence fish distribution and abundance, affecting growth rates, recruitment, behaviour, survival and response to changes in other trophic levels (Heath *et al.,* 2012). Due to the increasing sea temperature causing unfavourable habitat conditions, species may contract from their former range through lowered survival and failure to reproduce or recruit. For example, in British waters, the lesser sandeel (*Ammodytes marinus*) is identified as being at particular risk from climate change. Owing to its strict association with coarse sandy sediments it is unable to adapt its distribution to compensate for warming sea temperatures (Heath *et al.,* 2012). Climate change may also affect key life history stages of fish and shellfish species, including the timing of spawning migrations (DECC,

2016). However, climate change effects on marine fish populations are difficult to predict and the evidence is not easy to interpret, therefore it is difficult to make accurate estimations of the future baseline scenario for the entire lifetime of the Proposed Development.

In addition to climate change, human activities, including overfishing and species introduction have had a dramatic impact on fish and shellfish communities. Overfishing subjects many fish species to considerable pressure, reducing the biomass of commercially valuable species as well as non-target species (Thurstan *et al.,* 2010). Numerous studies suggested that global predatory fish biomass is only approximately 10% of preindustrial levels (Christensen *et al.,* 2003; Myers & Worm, 2003). A study conducted by Jennings and Blanchard suggested that the current biomass of large fishes in the North Sea weighing 4–16 and 16–66 kg, respectively, is 97.4 and 99.2% lower than it would be if no fishing had occurred. Overfishing can also reduce the resilience of fish and shellfish populations to other pressures. For example, a study on cod in an area where trawl fishing has been banned since 1932 indicated that this population was significantly more resilient to environmental change (including climate change) than populations in neighbouring fished areas (Lindegren *et al.,* 2010). There are indications that overfishing in UK waters is reducing to some degree, as recently JNCC reported an overall positive trend towards a greater proportion of stocks fished sustainably in both the long and short-term (JNCC, 2021). There is also a positive trend for fishing within safe biological limits in the long term, but a negative trend in the short term (JNCC, 2021).

The fish and shellfish baseline characterisation described in Section 8.3.5 represents a ‘snapshot’ of the fish and shellfish assemblages of the wider area of the western isles, Sea of Hebrides and the Minch, within a gradual and continuously changing environment. Any changes that may occur during the lifetime of the Proposed Development should be considered in the context of the natural variability and anthropogenic effects, including climate change, overfishing and other likely significant effects.

8.4.3 Marine Mammals

Marine mammal populations naturally fluctuate over space and time, and changes are likely to be observed over the lifetime of the Proposed Development. The distribution of marine mammal populations is, to a large extent, mediated by the distribution and abundance of prey species. Many species range over large distances and, to a certain extent, therefore, can potentially adapt to gradual changes in the environment, such as those that may occur as a result of climate change (Hoegh-Guldberg and Bruno, 2010). However, species that have more restricted habitat ranges are likely to be more vulnerable to changes in their environment. Species such as grey seal or harbour seal (identified as IEFs in Table 8-7), whose natural foraging ranges are more restricted than cetacean species (most foraging trips remain within 145 km and 50 km, respectively, from haul-out sites (SCOS, 2015), may be more sensitive to long-term changes.

Marine mammals fulfil key and irreplaceable ecological roles in the ocean; however, they are vulnerable to global warming. Numerous consequences are caused by anthropogenic-induced climate change, including indirect effects such as decreased productivity of the oceans, altered food-web dynamics, reduced abundance of habitat-forming species, shifting species distributions, altered reproductive

success and direct effects on the survival rates by increasing stress of organisms, fostering the development of pathogens and increasing the propagation of pathogens to new species by causing species to experience range shifts (Albouy *et al.,* 2020). One of the most common responses of marine mammals to temperature changes is shifts in their spatial distributions, which could result in modifications of the ranges of the species. Various species will respond to change differently. For example, it has been reported that in the wider Marine Biodiversity Study Area, the range of the common dolphin, a warm-water species, is increasing, while the range of the white-beaked dolphin, a cold-water species, is reducing with fewer sightings and strandings of the latter being reported (Elliott & Simmonds, 2007).

Anthropogenic activities in the marine environment can influence the distribution and abundance of marine mammal populations, and therefore can affect the future baseline of populations. In the wider area of the western isles, Sea of Hebrides and the Minch, potential effects include probable mortality due to entanglement in fishing gear (particularly harbour porpoise due to their feeding behaviour), injury and disturbance from vessels, underwater noise caused by military activity as well as aquaculture and acoustic deterrent devices (ADDs) and marine pollution (including litter and organic pollutants) (HWDT, 2018).

The West Scotland SCOS region overlaps with the wider Marine Biodiversity Study Area and is the largest harbour seal population in the UK with 49% of the most recent UK total harbour seal count (SCOS, 2020). The 2015 West Scotland harbour seal count was 43% higher than the 2009 count, equivalent to an average annual increase of 5.3%. However, trajectories of counts within the south sub-division of the West Scotland region, where the Proposed Development is located, reported no detectable trend in the overall population since the early 1990s (SCOS, 2020). For grey seals, population trend objectives have been based on pup production, since that metric has been long established as the most robust for determining changes in population dynamics There has been an increase in the estimated grey seal pup production in the Inner Hebrides at an average annual change of 5.8% since 2014 (SCOS, 2020).

Changes in sea level are likely to affect the availability of protected cave sites for breeding seals, as well as low-lying areas and other haul-out sites (e.g., grey seal) and lead to increased wave action on breeding sites which can increase pup mortality (SCOS, 2020). Climate-driven changes in prey distribution and/or availability, increases in harmful algal blooms and/or increased disease prevalence are likely to impact seal populations in future however there are currently many uncertainties in predicting the consequences of climate change at a population level (SCOS, 2020).

Similar to fish and shellfish, the marine mammals' baseline characterisation described in Section 8.3.6 represents a 'snapshot' of the marine mammals within a gradual and continuously changing environment. Any changes that may occur during the lifetime of the Proposed Development should be considered in the context of the natural variability and anthropogenic effects, including climate change, overfishing and other environmental effects.

8.5 Assessment Methodology

The criterion for determining the significance of effect of an identified impact is a two-stage process that involves defining the magnitude of the impact and sensitivity of the receptors to that impact. This section describes the methodology applied in this chapter to assign values to the receptor to assist in defining the sensitivity of receptors and the magnitude of potential effects.

An assessment of the ecological effects of a Proposed Development should focus on 'Important Ecological Features' (IEFs). These are species and habitats that are valued in some way and could be affected by a Proposed Development; other IEFs may occur on or in the vicinity of the site of a Proposed Development but do not need to be considered because there is no potential for them to be affected significantly.

The value of IEFs is dependent upon their biodiversity, social, and economic value within a geographic framework of appropriate reference (CIEEM, 2018). The most straightforward context for assessing ecological value is to identify those species and habitats that have specific biodiversity importance recognised through international or national legislation or local, regional or national conservation plans (e.g., Annex I habitats under the Habitats Directive, OSPAR, BAP habitats and species). However, only a very small proportion of marine habitats and species are afforded protection under the existing legislative or policy framework and therefore evaluation must also assess value according to the functional role of the habitat or species. For example, some features may not have a specific conservation value in themselves but may be functionally linked to a feature of high conservation value. Table 8-8 shows the criteria applied to determine the ecological value of IEFs.

Table 8-8 Criteria used to inform the valuation of receptors

Value	Definition
International	• Internationally designated sites. • Habitats and species protected under international law (i.e., Annex I habitats within a SAC boundary; Annex II protected species designated as a feature of a European designated site).
National	• Nationally designated sites. • Species that are protected under national law. • Internationally protected species (including EPS) that are not qualifying features of a candidate of designated European site but are regularly recorded within the Proposed Development and its surrounding environs (Marine Biodiversity Study Area). • Annex I habitats that are not within an SAC boundary. • UK BAP priority habitats and species and PMFs that have nationally important populations within the Marine Biodiversity Study Area, particularly in the context of species/habitat that may be rare or threatened in the UK, and specifically Scotland. • OSPAR List of Threatened and/or Declining Species and Habitats. • Habitats and species that are features of MPAs.
Regional	• Internationally protected species that are not qualifying features of a European designated site and are infrequently recorded within the regional Marine Biodiversity Study Area in very low numbers compared to other regions of the British Isles. • UK BAP priority habitats or Priority Marine Features that have regionally important populations within the Marine Biodiversity Study Area (i.e., are locally widespread and/or abundant). • Habitats or species that provide important prey items for other species of conservation or commercial value.
Local	• Habitats and species which are not protected under conservation legislation and form a key component of the marine ecology within the Marine Biodiversity Study Area.
Negligible	• Habitats and species of very local importance only.

8.5.1 Magnitude of Impact

The categorisation of the ***magnitude*** of impact is topic-specific but generally takes into account factors such as:

- Extent;
- Duration;
- Frequency; and
- Reversibility.

With respect to the duration of effects, the following has been used as a guide within this assessment, unless defined separately within the topic assessments:

- **Short term**: A period of months, up to one year;
- **Medium term**: A period of more than one year, up to five years; and
- **Long term**: A period of greater than five years.

The criteria for defining magnitude in this chapter is outlined in Table 8-9.

Table 8-9 Example definitions of magnitude of impact

Magnitude of Impact	Typical Descriptors
High	Large scale loss of resource and/or quality and integrity of resource; severe damage to key characteristics, features or elements (Adverse).
	Large scale or major improvement of resource quality; extensive restoration or enhancement; major improvement of attribute quality (Beneficial).
Medium	Loss of resource, but not adversely affecting the integrity; partial loss of/damage to key characteristics, features or elements (Adverse).
	Benefit to, or addition of, key characteristics, features or elements; improvement of attribute quality (Beneficial).
Low	Some measurable change in attributes, quality or vulnerability; minor loss of, or alteration to, one (maybe more) key characteristics, features or elements (Adverse).
	Minor benefit to, or addition of, one (maybe more) key characteristics, features or elements; some beneficial impact on attribute or a reduced risk of negative impact occurring (Beneficial).
Negligible	Very minor loss or detrimental alteration to one or more characteristics, features or elements (Adverse).
	Very minor benefit to or positive addition of one or more characteristics, features or elements (Beneficial).
No change	No loss or alteration of characteristics, features or elements; no observable impact in either direction.

8.5.2 Receptor Sensitivity

To understand the effect that an impact has on an IEF, the sensitivity of that IEF has been defined by categorising according to the five-point scale presented in Table 8-8. This scale is based on:

- The **vulnerability** of the receptor to the impact;
- The potential for recovery of the receptor following the impact (**recoverability**); and
- **Value/importance** of the receptor.
- Sensitivity is generally described using the scale presented in Table 8-10 below.

Table 8-10 Example of definitions of sensitivity

Sensitivity	Typical Descriptors
Very High	International or National IEFs with high vulnerability and no ability for recovery.
High	Regional IEF with high vulnerability and no ability for recovery. International or National IEF with high vulnerability and low recoverability.
Medium	Local IEF with high vulnerability and no ability for recovery. Regional IEF with medium to high vulnerability and low recoverability. International or National IEFs with medium vulnerability and medium recoverability.
Low	Local IEF with medium to high vulnerability and low recoverability. Regional IEF with low vulnerability and medium to high recoverability. International or National IEFs with low vulnerability and high recoverability.
Negligible	Receptor is not vulnerable to effects regardless of value/importance. Local IEF with low vulnerability and medium to high recoverability.

8.5.3 Significance of Effect

The significance of the effect upon marine biodiversity receptors is determined by correlating the magnitude of the impact and the sensitivity of the receptor. A range of significance of effect is presented in Table 8-11, the final assessment for each effect is based upon expert judgement.

For the purposes of this assessment, any effects with a significance level of minor or less have been concluded to be not significant in terms of the EIA Regulations.

Table 8-11 Significance of Effect Assessment Matrix

Sensitivity	Magnitude of Impact				
	No Change	Negligible	Low	Medium	High
Negligible	No change	Negligible	Negligible or Minor	Negligible or Minor	Minor
Low	No change	Negligible or Minor	Negligible or Minor	Minor	Minor or Moderate
Medium	No change	Negligible or Minor	Minor	Moderate	Moderate or Major
High	No change	Minor	Minor or Moderate	Moderate or Major	Major or Substantial
Very high	No change	Minor	Moderate or Major	Major or Substantial	Substantial

8.6 Embedded Mitigation Measures

A number of embedded mitigation measures relevant to marine biodiversity are proposed to be incorporated into the design and construction method to manage the effect on the environment. This is further discussed in Section 8.10.1 and Table 8-17.

8.7 Description of Likely Significant Effects

This section presents an assessment of the likely significant effects associated with the construction and operation phases of the Proposed Development on marine biodiversity features within the potential ZoI.

This section should be read in conjunction with the Assessment Methodology, Section 8.5, the benthic IEFs in Table 8-4, fish and shellfish IEFs in Table 8-6 and marine mammal IEFs in Table 8-7. This section has been summarised within Table 8-18.

8.7.1 Assessment of Construction and Operational Effects

This section assesses the effects of activities which occur over both the construction and operational phases of the Proposed Development. Capital dredging will occur as part of the construction activities, and annual maintenance dredging will occur under operational activities, over the same area of the seabed. Given the geographical overlap and ongoing nature of potential effects, it has been concluded that these activities cannot be considered independent of one another. As such, the assessment of

Likely Significant Effects has considered them as a single impact: 'temporary disturbance/loss of habitat arising from capital and maintenance dredging activity'). In light of this, the assessment has also considered the effects of increased suspended sediment concentrations (SSC) and sediment deposition as a result of capital and maintenance dredging as a single impact: 'effects of increased suspended sediment concentrations and sediment deposition'.

8.7.1.1 Temporary disturbance/loss of habitat arising from capital and maintenance dredging activity

Direct temporary habitat loss and disturbance to subtidal habitats will occur during construction as a result of dredging.

Magnitude of Impact

Dredging, in the form of capital dredging, will be required to accommodate the new navigation channel. The approximate dredge area (footprint/ extent) will be 2,017 m^2, removing an approximate dredge volume of 1,225 m^3 by backhoe dredger. Currently, the depth of this area is approximately between -1.0 m and -3.5 m CD. This area will be dredged to -3.0 m CD by a self-propelled vessel with an excavator mounted on the bow (backhoe excavator).

The maintenance dredge operations are expected to be undertaken over a similar extent of an area originally dredged (2,017 m^2). As the volume of dredged material to be removed is currently unknown at this stage, the capital dredge volume will be used as a worst-case scenario (1,225 m^3). Maintenance dredge depth and volume by definition is generally less than that of capital dredging.

All dredging activities will be short-term in duration (expected maximum one week), however, there will be a requirement to undertake maintenance dredging over the course of the project life. The frequency of ongoing maintenance dredging shall be established as part of the construction contract, however it is anticipated that annual maintenance dredging will be required based on previous sedimentation reports. As stated above, the maintenance dredging footprint is expected to be equal to or smaller than the capital dredging footprint, therefore following the cessation of capital dredging, sediments are expected to gradually infill part of the footprint over time. Whilst sediment infill is not expected over the footprint of the maintenance dredging area, this area is considered to be small in the context of the wider habitat.

The magnitude is predicted to be of highly localised spatial extent, have a short-term duration (up to one week) and will likely be undertaken on an annual frequency. The magnitude is, therefore, considered to be low.

Sensitivity of Receptors

Benthic Ecology

Biotopes that directly overlap with the dredging area comprise Littoral Sediment biotopes: littoral sand and muddy sand (A2.2); Infralittoral Rock biotopes: 'Kelp beds' (A3.125); Sublittoral Sediment biotopes: *Nephtys cirrosa* and *Bathyporeia* spp. in infralittoral sand (A5.233), kelp and seaweed communities on

sublittoral sediment (A5.52) and *Zostera marina/angustifolia* beds on lower shore or infralittoral clean or muddy sand (A5.5331).

Biotopes that are present outside of the direct dredging area may be affected by the dredging campaign and have been assessed within 'Effects of increased suspended sediment concentrations and sediment deposition'.

Littoral Sediment

Amphipod-dominated mobile sand shores (A2.22) are characterised by mobile sands (coarse, medium or fine-grained), which retain little water and organic matter, and thus are subject to drying out between tides. This biotope supports a limited range of species, including amphipod, isopod and polychaetes (MarLIN, 2021a). This biotope is subject to high levels of abrasion resulting from sediment mobility, therefore if any species are present, these are robust animals that can withstand some physical disturbance, recover rapidly following the disturbance or migrate as adults into the biotope (MarLIN, 2021a). Resistance to this pressure is therefore assessed as 'High' and resilience as 'High' (MarLIN, 2021a).

The Littoral Sediment IEF has been assessed to have a regional importance, low vulnerability and have high recoverability to the temporary disturbance and habitat loss and therefore their sensitivity has been deemed as low.

Infralittoral Rock

The Priority Marine feature, 'Kelp beds' (A3.125), was recorded to have direct overlap with the dredge area. However, the result of biotope mapping indicates that this area is approximately 2 m^2. The scouring of rock through dredge action is likely to removal individuals from the area resulting in high mortality, however *Saccharina latissimi*, part of the A3.125 community, has been shown to be an early coloniser within macroalgal succession, appearing within two weeks of clearance, with *Desmarestia* spp. and *Saccorhiza polyschide*s capable of reaching maturity within a year (Stamp and Tyler-Walters, 2022).

The Infralittoral Rock IEF has been assessed to have a very small extent, national importance, high vulnerability and have high recoverability to the temporary disturbance and habitat loss and therefore their sensitivity has been deemed as low.

Sublittoral Sediment

Biotopes such as '*Nephtys cirrosa* and *Bathyporeia* spp. in infralittoral sand' (A5.233), a PMF 'Kelp and seaweed communities on sublittoral sediment' (A5.52) and '*Zostera marina*/*angustifolia* beds on lower shore or infralittoral clean or muddy sand' (A5.5331) were recorded. A5.52 and A5.5331 represent the greatest area of habitat that may be affected.

Removal of sediments associated with kelp and seaweed communities (A5.52) is likely to remove individuals from the area resulting in high mortality, however, individuals of this habitat have rapid growth rates and are likely to recover following the cessation of works within two weeks of clearance

(Stamp *et al.* 2022). Resistance to this pressure is therefore assessed as 'None' and resilience as ‘High’ (Stamp *et al.* 2022). Therefore, the sensitivity has been assessed as low.

The root systems of *M. Zostera* (A5.5331) are typically located within the top 20 cm of sediment, therefore, activities such as dredging can uproot and disturb seagrass beds, leading to a loss of seagrass cover. Recolonisation of a disturbed area by seagrass can occur via sexual reproduction (seed supply) and asexual reproduction (vegetative growth of adjacent rhizomes), and, as a clonal plant, it commonly reproduces asexually (Johnson *et al*., 2020). In general, larger plots are likely to take longer to recover than smaller scars, with horizontal expansion through rhizome growth faster in patch edges where newly available bare ground is available (Natural England, 2013). A study by Boese *et al*. (1999) found that seagrass beds in intertidal transition zones which were prone to repeated disturbance through boating activities were more vulnerable and less likely to recover, in comparison to recovery of lower intertidal continuous perennial beds which were subject to a single disturbance event. In this study, the intertidal continuous perennial beds subject to one disturbance event began recovery within a month of disturbance and fully recovered within two years. However, dredging operations at the Proposed Development will be a recurring event, therefore even if the recolonisation through vegetative growth takes place it is likely to be further disturbed by maintenance activities.

The recovery of seagrass beds after disturbance to the sub-surface of the sediment is expected to be slow with the speed depending on the extent of removal. *Zostera marina* is typically found at depths between 0.5 m and 4 m around the UK, but in clear waters, it can be found in depths up to 10 m (Davidson and Hughes, 1998 *in* Natural England, 2013). *Z. marina* roots and rhizomes are buried no deeper than 20 cm below the surface (d’Avack *et al.*, 2014). Given that the depth of the dredged area is approximately between -1.0 m and -3.0 m, and it will be dredged to -3.0 m CD, it is likely to remove seagrass roots completely. However, because dredging will occur in areas where adjacent seed sources and viable grass beds are present, the rate of the recovery is likely to be accelerated through rhizome exchange to dredged areas (Boese *et al*., 2009) but seagrass beds have been shown to take at least five years to establish, even when near adjacent established beds (d’Avack *et al.,* 2022).

In summary, recolonisation and recovery of seagrass beds after the dredging activity is unlikely, dredging will be a recurring activity and will limit the extent of recoverability i.e., no recovery. Resistance to this pressure is “none” and resilience will be “very low” (d’Avack *et al.,* 2022). Taking into account the national value of this receptor (OSPAR list of threatened and/or declining species and habitats) a resulting sensitivity score for seagrass is high. However, it is important to note that extensive seagrass beds have been found around the Isle of Iona. Loss of seagrass within the dredging footprint represents a small proportion of seagrass beds found within the wider area.

The Sublittoral Sediment IEF has been assessed to have national importance and has been assessed to have a low to high sensitivity.

Fish and Shellfish

In general, mobile fish species, such as demersal fish, benthopelagic and pelagic fish, migratory fish and elasmobranchs are able to avoid areas subject to temporary habitat disturbance (EMU, 2004). The

most vulnerable species are likely to be a part of the shellfish assemblage which are much less mobile than fish, with fragile slow-recruiting species being most highly impacted by short-term disturbance events (MacDonald *et al.*, 1996). Additionally, high and low-intensity areas may overlap with the Marine Biodiversity Study Area and may be affected during the dredging campaign. Therefore, on the basis that mobile IEFs are likely to move away from disturbance, only the 'shellfish assemblage' and 'spawning and nursery grounds' IEFs have been taken forward for further assessment.

Shellfish Assemblage

The shellfish assemblage includes periwinkles, whelks, mussel, *Nephrops*, brown crab, green crab, velvet crab, razor clam, great Atlantic scallop, razor clam and crawfish that are known to inhabit the Marine Biodiversity Study Area. Temporary habitat loss during dredging in this area will represent a relatively small temporary disturbance to these habitats, with relatively rapid recovery of sediments expected thereafter, followed by recovery of associated communities including shellfish populations into these areas. The recoverability and rate of recovery of an area after seabed disturbance are linked to the substrate type. Specifically, mud or sand habitats, similar to those found in the Marine Biodiversity Study Area, have been shown to return to baseline species abundance after approximately one to two years (Newell *et al*., 1998; Desprez, 2000).

As maintenance dredging is likely to be undertaken on an annual frequency, this will impede the ability of the shellfish assemblage to recolonise the area. However, the dredging area only comprises a small area of the available wider habitat which shellfish are able to populate.

The Shellfish Assemblage IEF has been assessed to have a local to regional importance, low vulnerability and medium recoverability to the temporary disturbance and habitat loss and therefore their sensitivity has been deemed as low.

Spawning and Nursery Grounds

The fish species within the Marine Biodiversity Study Area which are likely to be most sensitive to temporary habitat loss are those species which spawn on or near the seabed sediment (e.g., sandeel, herring and elasmobranchs, including spotted ray). Adult specimens of the majority of spawning and nursery ground IEFs are mostly pelagic and highly mobile when not spawning and are therefore likely to avoid dredging operations, recovering to baseline conditions immediately after cessation of works.

Sandeel spawn and have a nursery area within the Marine Biodiversity Study Area (Coull *et al*., 1998). Recovery of any impacted sandeel populations would be expected following construction operations, with the rate of recovery depending on the recovery of sediments to a condition suitable for sandeel recolonisation. The recovery potential of sandeel populations can also be inferred from a study by Jensen *et al*. (2010), which found sandeel populations mix within fishing grounds to distances of up to 28 km.

Herring spawn and have a high-intensity nursery ground within Marine Biodiversity Study Area, but these are unlikely to be significantly impacted as there are suitable alternative spawning areas available. Dredging carried out during spawning periods has the potential to result in the mortality of eggs and reduced opportunity due to the removal of suitable habitat. However, the area which will be dredged is

small given the abundance of similar substrate types across the Marine Biodiversity Study Area and the extensive nature of fish spawning grounds around Iona more broadly.

Dredging activities within the Marine Biodiversity Study Area may also impact spawning and nursery habitats for whiting, as these areas overlap the Marine Biodiversity Study Area. If effects do occur, larval settlement from nearby undisturbed areas will likely increase the rate of recovery (Phua *et al*., 2002).

Similarly, the year-round demersal spawning of spurdog is unlikely to be impacted significantly, and recruitment from unimpacted areas would likely allow rapid recovery.

As maintenance dredging is likely to be undertaken on an annual frequency, this will impede the ability of the spawning and nursery grounds to use the area. However, the dredging area only comprises a small area of the available wider habitat which fish can use as spawning and nursery grounds.

The Spawning and Nursery Ground IEF has been assessed to have a regional to national importance, low vulnerability and high recoverability to the temporary disturbance and habitat loss and therefore their sensitivity has been deemed as low.

Significance of Effects

Benthic Ecology

Littoral Sediment IEF is deemed to have a low sensitivity and low magnitude; therefore, the significance of effect is considered to be **negligible**, which is not significant in EIA terms.

Infralittoral Rock IEF is deemed to have a low sensitivity and low magnitude; therefore, the significance of effect is considered to be **negligible**, which is not significant in EIA terms.

Subtidal Sediment IEF is deemed to have a low to high sensitivity and low magnitude; therefore, the significance of effect is considered to be **minor**, which is not significant in EIA terms.

Overall, the significance of effect is deemed to be of **minor** significance, which is not significant in EIA terms.

Fish and Shellfish

Shellfish Assemblage IEF is deemed to have a low sensitivity and low magnitude; therefore, the significance of effect is considered to be **negligible**, which is not significant in EIA terms.

Spawning and Nursery Grounds IEF is deemed to have a low sensitivity and low magnitude; therefore, the significance of effect is considered to be **negligible**, which is not significant in EIA terms.

Overall, the significance of effect is deemed to be of **negligible** significance, which is not significant in EIA terms.

8.7.1.2 Effects of increased suspended sediment concentrations and sediment deposition

Increases in suspended sediments and associated sediment deposition are predicted to occur during the construction phase as a result of dredging activities.

The suspended sediment produced by the installation of rock armour for the breakwater is likely to be of negligible concern and hasn't been taken forward for assessment. Rock armour once placed on sediment is unlikely to produce increases in localised suspended sediment concentrations, any suspended sediments are likely to be of short duration (minutes) and taken away by the current. Similarly, only one rock is likely to be placed at any one time allowing for any sediments to fall out of suspension.

The Centre for Environment, Fisheries and Aquaculture Science (CEFAS) Climatology Report 2016 (Silva *et al.*, 2016) shows the spatial distribution of average non-algal Suspended Particulate Matter (SPM) for the majority of the UK continental shelf. Between 1998 and 2005, the greatest plumes were associated with large rivers such as those that discharge into the Thames Estuary, The Wash and Liverpool Bay, which show mean values of SPM above 30 mg/l. Using this study, it is estimated that the average SPM associated with the Iona region is approximately 10-15 mg/l.

Magnitude of Impact

As discussed above, the approximate dredge area will be 2,017 m^2, with the approximate dredge volume to be removed 1,225 m^3, with operations expected to last a maximum of one week.

To determine the fate of sediments to be released during dredging an estimate of the spill volume was calculated based on Aarninkhof *et al.* (2018) and Becker *et al*. (2015). For a backhoe dredge CEDA (2018) predicts a sediment volume of 3.5% release of the total dredge volume while Becker *et al.* (2015) states a sediment release of between 1-5% of the total dredge volume. For the purposes of this sediment plume assessment, a conservative spill volume of 5% was assumed, which equates to approximately 61 m^3 of potential overspill loss as a result of the dredging campaign.

The fate of three types of sediment fractions (gravel, sand and silt) was assessed for dredging, during flood and ebb spring tides.

Gravel fractions make up approximately 7.2% of the sediment composition in the area. This would result in a total volume of circa 4 m^3 being released.

Coarse sand (which is the same as finest gravel) makes up approximately 91.1% of the sediment composition in the area. This would result in a total volume of circa 56 m^3 being released.

For silt fractions, an average silt particle of 0.03 mm diameter will make up approximately 1.7% of the sediment composition in the area. This would result in a total volume of circa 1 m^3 being released.

Elevated suspended sediment levels would be experienced in the locality of the site due to the sand fraction, similar to those experienced during a storm event (Little *et al*., 2009). However, beyond the dredging area, the large tidal currents would provide increased dispersion and dilution and the finer material would be indiscernible from background levels (Little *et al.*, 2009).

During maintenance dredging, as volumes to be dredged are currently unknown, the capital dredging volumes can be used as a worst-case scenario. However, it should be noted that maintenance dredging

removes less sediment than the capital dredge works. Operations are expected to last a similar amount of time.

The effects of increased suspended sediment concentrations and sediment deposition are predicted to be of highly localised spatial extent, short-term duration, and reoccur on an annual basis. The magnitude of this impact is considered to be low.

Sensitivity of Receptor

Benthic Ecology

Biotopes that directly overlap with the dredging area comprise Littoral Sediment biotopes: Littoral sand and muddy sand (A2.2). Infralittoral Rock biotopes: 'Kelp beds' (A3.125). Sublittoral Sediment biotopes: *Nephtys cirrosa* and *Bathyporeia* spp. in infralittoral sand (A5.233), kelp and seaweed communities on sublittoral sediment (A5.52) and *Zostera marina/angustifolia* beds on lower shore or infralittoral clean or muddy sand (A5.5331).

Littoral sediment

Littoral sediment biotopes tend to have low sensitivity to increases in suspended solid concentrations, due largely to their typically mobile sedimentary characteristics. Combined with the lack of sediment plumes from dredging, this impact will likely have little to no effect on most identified IEF biotopes. However, the A2.24 biotope, consisting of polychaete or bivalve dominated muddy sand shores, is a BAP Priority habitat, and is therefore evaluated here as a precautionary measure. Specifically, boring polychaete species and epibenthic suspension feeders are known to be highly vulnerable to as little as 1 cm of sediment deposition (Maurer, 1981). However, the muddy intertidal habitat presents a natural risk of smothering to local species, and any spillage from the dredging activities will not represent a significant increase in sediment deposition. Also, common polychaetes such as *Nereis* species or *Arenicola marina* are important intertidal deposit feeders, and are able to cause bioturbation of deposited sediment, improving carbon flux and increasing overall biodiversity in the area (Kristensen, 2001), with this very high recoverability giving this biotope a very low sensitivity to this impact.

The Littoral Sediment IEF is of regional importance, expected to have low vulnerability, high recoverability, and therefore have low sensitivity.

Infralittoral rock

The infralittoral rock biotope in the Marine Biodiversity Study Area consists of kelp species (A3.125). An increase in turbidity has the potential to reduce photosynthetic capacity of *Laminaria* spp. by up to 50% when light attenuation decreases by 10% (Staehr and Wernberg, 2009). However, this impact is highly unlikely to occur due to lack of predicted sediment plumes from the dredging activities.

Light sediment deposition is unlikely to significantly impact adult specimens, due to their resilience to highly variable intertidal and subtidal coastal environmental conditions. However, sedimentation could potentially impact *Saccharina latissima* zoospore settlement, with possible negative implications for long term recruitment trends within this species (Moy and Christie, 2012). This is again unlikely to occur;

long term recruitment is only likely to be disrupted in this species with a minimum sediment deposition of 5 cm, which is unlikely to occur as a result of minor dredge bucket overspill. Also, *Saccarina* gametophytes are known to be resilient to direct smothering, resuming normal growth within one month of sediment removal (Dieck, 1993).

The Infralittoral Rock IEF biotope is of national importance, expected to have low vulnerability, high recoverability, and therefore have low sensitivity.

Sublittoral Sediment

Sublittoral sediment biotopes are most likely to be affected by this impact, due to close proximity to the dredging area, although the lack of sediment plumes will cause no significant impact on any biotopes present. In terms of sediment deposition, the *Nephtys cirrosa* and *Bathyporeia* spp. in infralittoral sand (A5.223) are known to be able to burrow through up to 20 cm of introduced coarse sediments (Essink, 1999), with this amount of overspill highly unlikely to occur in this instance. Therefore, the vulnerability of these species to sediment deposition is low, with the potential for high recoverability once the sediment has been removed naturally within a few tidal cycles. As well as being regionally important, this biotope is therefore considered to have low sensitivity to this impact.

The seagrass *Zostera marina* A5.5331 biotope, is listed as a PMF, and is known to have high vulnerability and medium recoverability to light smothering from dredge bucket overspill, giving medium sensitivity to this impact. This biotope also has high sensitivity to increases in fine suspended solids, although this impact is less likely to occur at this site. It is known that, globally, dredging and port construction activities can have significant negative effects on seagrass bed coverage and ecological stability (Grech *et al*., 2012). Significant increases in turbidity from dredge overspill can cause reductions in seagrass bed coverage (Giesen *et al*., 1990), arising from reduction in light availability overall, and specifically reductions in shorter wavelengths of visible light most commonly utilised by the seagrass beds (Cussioli *et al*., 2020). Despite these vulnerabilities to construction effects, seagrass is known to have a medium level of recoverability, with post-dredging recovery being seen after a small-scale harbour installation within two years in New England (Sabol *et al*., 2005). The ongoing maintenance dredging is likely to resuspend sediments but, similar to the capital dredging works, sediments are expected to dissipate following the cessation of works.

The Sublittoral Sediment IEF has national importance, the vulnerability to this impact is medium, the recoverability is medium, and the sensitivity is deemed to be medium.

Fish and Shellfish

Mobile fish species are generally able to avoid areas which experience increases in suspended sediments. Demersal fish species, benthopelagic and pelagic fish species, migratory fish species and elasmobranchs that are likely to interact with the Marine Biodiversity Study Area are only likely to do so by passing through the area. Mobile fish species may show avoidance behaviour within areas affected by increased suspended sediments (EMU, 2004). Sessile shellfish species, such as the great Atlantic scallop and razor clam, may experience smothering effects as a result of sediment deposition.

Demersal Fish Species

The demersal fish IEF species identified include plaice and horse mackerel, which heavily utilise the benthic environment in their feeding behaviours but are both highly mobile, therefore being naturally adapted for survival in sandy and mobile sediments. This mobility has been noted to allow these species, along with other macrobenthic organisms, to survive the deposition of up to 30 cm of sediment directly onto and around the organisms (Karel, 1999). As the volume of sediment deposition is likely to be low overall, the effect of this impact will similarly be low, and the potential also exists for plaice and horse mackerel to move away from disturbances (Gibson, 1980).

The Demersal Fish Species IEFs in the Marine Biodiversity Study Area have been assessed to have national importance, low vulnerability, and high recoverability to this impact. Therefore, the sensitivity has been deemed to be negligible.

Benthopelagic and Pelagic Fish Species

All benthopelagic and pelagic fish species IEFs likely to be affected by sediment deposition are mobile, and either feed or spawn on or near the seabed. Demersal spawners within the Marine Biodiversity Study Area include nationally important and mobile sandeel species, although they are likely to avoid active dredging activities. Therefore, effects on sandeel spawning populations are predicted to be limited. Sandeel populations prefer coarse to medium sands (Wright *et al.*, 2000), with sensitivity to changes in this habitat, and show reduced selection or avoidance of gravel and fine sediments (Holland *et al.*, 2005). Therefore, any increase in the fine sediment fraction of their habitat may cause avoidance behaviour until such time that currents remove fine sediments from the seabed, although the volume of expected overspill and lack of fine sediment plumes suggests this will cause a very low level of impact.

Other mobile species include herring, cod, whiting, and sprat, which live mostly in entirely pelagic habitats, and utilise a variety of habitats for feeding and spawning behaviours. The impact of sediment deposition on mobile pelagic species such as these is understood to be low, requiring high concentrations of suspended sediments to directly affect individuals to cause significant effects on survivability (Hvidt *et al*., 2002). Studies on herring juveniles showed some effects on feeding behaviour at 2.5 mg/l SSC (Mesieh *et al*., 1981), although this was caused mostly by increases in fine sediment concentration, which are not present in significant volumes in the Proposed Development dredging area and are highly unlikely to overspill from the dredge bucket in volumes required for this level of impact.

The Benthopelagic and Pelagic Fish Species IEFs in the Marine Biodiversity Study Area have been assessed to have national importance, low vulnerability, and high recoverability to this impact. Therefore, the sensitivity has been deemed to be low.

Migratory Fish Species

Migratory fish species, specifically sea trout and Atlantic salmon, are known to occur in the area and are expected to have some tolerance to naturally high suspended sediments, given that their migration routes pass through estuarine habitats, which have high suspended sediment concentrations (when compared to offshore habitats). As it is predicted that dredging and other construction activities associated with the Proposed Development will produce very little increase in suspended sediments,

with levels well below those experienced in estuarine environments, it would be expected that any mobile migratory fish species should only be temporarily affected (if at all). Any negative effects on these species are likely to be short term behavioural effects, such as avoidance (Boubee, *et al*., 1996), or temporary slightly erratic alarmed swimming behaviour (Chiasson, 2011), and are not expected to create a barrier to migration to rivers or estuaries used by these species in the Marine Biodiversity Study Area. Although effects of increased sediment depositions have been noted in terms of decreased growth and survival rates of salmonid juveniles (Suttle, *et al*., 2004), these effects were only seen upstream after direct introduction of large volumes of fine sediment during juvenile development. As any sediment is likely to be relatively coarse, of very low spillage volume, and entirely offshore, this impact will not affect salmonid species which may utilise the Marine Biodiversity Study Area for migration purposes.

Migratory Fish Species IEFs in the Marine Biodiversity Study Area are deemed to be of low vulnerability, high recoverability and regional to international importance. The sensitivity of the receptors is therefore, conservatively, considered to be low.

Elasmobranchs

The Elasmobranch IEFs identified as potentially being present within the Marine Biodiversity Study Area could potentially be impacted if individuals overlap with sediment overspill. Potential short-term physiological stress responses can occur (Skomal and Mandelman, 2012) which revert to baseline following the removal of the stressor. However, highly mobile elasmobranchs are known to be able to detect anthropogenic activity (Mickle and Higgs, 2022), and are thus likely to avoid any significant construction or operational dredging activity and are thus unlikely to remain in or around the dredge area for long enough for any overspill to cause issues.

The Elasmobranch IEFs in the Marine Biodiversity Study Area are deemed to be of local to international importance, low vulnerability, and high reversibility. Given the international importance and range of species designations, the sensitivity of the receptors is therefore considered to be low.

Shellfish assemblage

Many shellfish species, such as edible crab, have a high tolerance to suspended sediments and are reported to be insensitive to increases in turbidity; however, they are likely to avoid areas of increased suspended sediments as they rely on visual acuity during predation (Neal and Wilson, 2008). Buried crustaceans (e.g., European lobster and *Nephrops*) are likely to be more vulnerable to increased suspended sediments as the eggs carried by these species require regular aeration. Increased suspended sediments within the Proposed Development will only affect a very small area at any one time for up to two weeks, with sediments settling to the seabed quickly following disturbance. *Nephrops* are not considered to be sensitive to increases in suspended sediments or subsequent sediment deposition, since this is a burrowing species with the ability to excavate any sediment deposited within their burrows (Sabatini and Hill, 2008). This lack of sensitivity also applies to mussel species, wherein juvenile mussels are able to climb onto and embed themselves within any deposited sediment (Leeuwen *et al*., 2010), suggesting a very low sensitivity to this impact.

Great Atlantic scallop and razor clams are largely sedentary suspension feeders, with little research done on the direct effects of increased suspended sediments or smothering on either species specifically. However, it is known that higher concentrations of suspended particulate matter near to the seabed has a negative impact on tissue growth in Atlantic scallop (Emerson *et al*., 1994), although this was largely biological material and may not be applicable in this case. Research into king and queen scallops, which share ecological features and habitats with the Atlantic scallop, have found little to no long-term direct negative impact from increased suspended sediments or sediment deposition (Hendrick *et al*., 2016).

The Shellfish Assemblage IEF has been assessed to have a local to national importance, low vulnerability and have high recoverability to suspended sediment and deposition and therefore their sensitivity has been deemed as low.

Spawning or Nursery Grounds

Juvenile fish are more likely to be affected by habitat disturbances such as increased suspended sediments than adult fish. This is due to the decreased mobility of juvenile fish and therefore lower ability to avoid effects. Due to the temporary increases in suspended sediments associated with winter storm events and the occurrence of juveniles in inshore areas (where suspended sediments are typically higher), it can be expected that most fish juveniles will be largely unaffected by the low level temporary increases in suspended sediments. The concentrations are likely to be within the range of natural variability for these species and will reduce to background concentrations within a very short period (approximately two tidal cycles).

Appleby and Scarratt (1989) found that the development of eggs and larvae have the potential to be affected by suspended sediments. However, Chapter 13: Coastal Processes concluded that dredging operations required for the Proposed Development would not result in any significant impact on water quality in terms of suspended sediments. Therefore, effects on egg and larvae development by suspended sediments are considered unlikely.

Spawning areas for sandeel occur within the Proposed Development, however sandeel eggs are likely to be tolerant to some level of sediment deposition due to the nature of re-suspension and deposition within their natural high energy environment. Therefore, effects on sandeel spawning populations are predicted to be limited. Sandeel populations are also sensitive to sediment type within their habitat, preferring coarse to medium sands and showing reduced selection or avoidance of gravel and fine sediments (Holland *et al*., 2005). Therefore, any increase in the fine sediment fraction concentrated within their habitat may cause avoidance behaviour until such time that currents remove fine sediments from the seabed.

With respect to the effects of sediment deposition on herring spawning activity, it has been shown that herring eggs may be tolerant of very high levels of suspended sediments (Mesieh *et al*., 1981; Kiorbe *et al*., 1981). Detrimental effects may be seen if smothering occurs and the deposited sediment is not removed by the currents (Birklund and Wijsmam, 2005), however this would be expected to occur quickly.

The Spawning or Nursery Ground IEF has been assessed to have a regional to national importance, low vulnerability and have high recoverability to suspended sediment and deposition and therefore their sensitivity has been deemed as low.

Significance of Effects

Benthic Ecology

Littoral Sediment IEF is deemed to have a low sensitivity and low magnitude; therefore, the significance of effect is considered to be **negligible**, which is not significant in EIA terms

Infralittoral Rock IEF is deemed to have a low sensitivity and low magnitude; therefore, the significance of effect is considered to be **negligible**, which is not significant in EIA terms.

Subtidal Sediment IEF is deemed to have low sensitivity to medium (seagrass) sensitivity and low magnitude; therefore, the significance of effect is considered to be **minor**, which is not significant in EIA terms.

Overall, the significance of effect is deemed to be of **minor** significance, which is not significant in EIA terms.

Fish and Shellfish

Demersal Fish Species IEF is deemed to have a negligible sensitivity and low magnitude; therefore, the significance of effect is considered to be **negligible**, which is not significant in EIA terms.

Benthopelagic and Pelagic Fish Species IEF is deemed to have a low sensitivity and low magnitude; therefore, the significance of effect is considered to be **negligible**, which is not significant in EIA terms.

Migratory Fish Species IEF is deemed to have a low sensitivity and low magnitude; therefore, the significance of effect is considered to be **negligible**, which is not significant in EIA terms.

Elasmobranchs IEF is deemed to have a low sensitivity and low magnitude; therefore, the significance of effect is considered to be **negligible**, which is not significant in EIA terms.

Shellfish Assemblage IEF is deemed to have a low sensitivity and low magnitude; therefore, the significance of effect is considered to be **negligible**, which is not significant in EIA terms.

Spawning and Nursery Grounds IEF is deemed to have a low sensitivity and low magnitude; therefore, the significance of effect is considered to be **negligible**, which is not significant in EIA terms.

Overall, the significance of effect is deemed to be of **negligible** significance, which is not significant in EIA terms.

8.7.1.3 Potential for resuspension of contaminated sediments

Seabed sediment analysis indicated that there are no chemical determinants that exceed the CEFAS Action Levels 1 or 2, and Canadian Threshold Effect Levels (TEL) or Probable Effect Levels (PEL), see Volume III Appendix 8.1. Therefore, this impact has been scoped out on the basis that there are no

contaminated sediments, as directed by the CEFAS Action Levels and Canadian Effect Levels, to be resuspended during the construction phase.

8.7.2 Assessment of Construction Effects

This section assesses the effects of activities which occur during the construction phase of the Proposed Development. Construction phase activities include both the construction of the breakwater and dredging activities.

8.7.2.1 Temporary disturbance/loss of habitat arising from the displacement/compaction of the seabed by anchors and jack-up barge spud legs

Construction activities, such as anchor placement and jack up barge spud legs, may lead to a temporary loss/disturbance of habitat.

Magnitude of Impact

Anchors will remain on the seabed for short periods of time with a footprint of <1 m^2 per anchor, and likely to be removed during the same day. Observations from Studland Bay, Dorset, indicated that anchoring scars are typically 1 - 4 m^2 (Natural England, 2013).

A jack-up barge, with 18 m jack-up legs (circa 500 mm diameter) is expected to be used for the Proposed Development. Similarly, to the above, the legs are expected to only be in-situ for a short duration.

It is expected that there will be approximately 40-50 vessel movements over the course of 52 weeks to deliver the rock armour. It is likely that the jack-up barge will remain in place during the placement of rock armour with the barge delivery either moored or anchored in close proximity. The jack-up barge is expected to only be moved a small number of times in order to complete the breakwater.

These works will only be undertaken within the Temporary Works Area as identified within Figure 8-1.

The magnitude of this impact is considered to be low due to the relatively small spatial scale of impact and short to medium term duration.

Sensitivity of Receptor

Benthic Ecology

Physical disturbance as a result of anchor placement can cause direct mortality through smothering or displacement of benthic species in the impacted area. The subtidal habitats that overlap with the temporary working area include the Infralittoral Rock: Kelp and red seaweeds (A3.21). Subtidal Sediment: heavily dominated by kelp and seaweed communities on sublittoral sediment (A5.52), *Zostera marina/angustifolia* beds on lower shore or infralittoral clean or muddy sand (A5.5331) and *Nephtys cirrosa* and *Bathyporeia* spp. in infralittoral sand (A5.233).

Littoral Sediment

The sensitivities of Littoral Sediment habitats are expected to be similar to the 'Temporary disturbance/loss of habitat arising from dredging activity' impact. Furthermore, most of these biotopes are found within the intertidal region where it is highly unlikely that anchoring or jack-up operations will occur. Therefore, these biotopes are unlikely to be impacted.

The Littoral Sediment IEF have been assessed to have a regional importance, low vulnerability and have high recoverability to the temporary disturbance and habitat loss and therefore their sensitivity has been deemed as negligible.

Infralittoral Rock

Kelp and red seaweeds (A3.21) are characterised by epifauna/epiflora that occur on hard rock, which is resistant to subsurface penetration, however abrasion could remove a proportion of the faunal community. Evidence from Engelen *et al.* (2011) has demonstrated that complete recovery of this biotope occurs 18-24 months after complete removal of flora and fauna present.

The Infralittoral Rock IEF has been assessed to have a national importance, medium vulnerability and have medium recoverability, therefore their sensitivity has been deemed as medium.

Sublittoral Sediment

Biotopes such as '*Nephtys cirrosa* and *Bathyporeia* spp. in infralittoral sand' (A5.233), kelp and seaweed communities on sublittoral sediment (A5.52) and '*Zostera marina/angustifolia* beds on lower shore or infralittoral clean or muddy sand' (A5.5331) were recorded. A5.52 and A5.5331 represent the most important biotopes that may be affected.

The A5.52 kelp and seaweed communities on sublittoral sediment biotope is typically characterised by the sugar kelp *Saccharina latissima*, the bootlace weed *Chorda filum*, and various red and brown seaweeds, particularly filamentous types, with associated high abundance of the burrowing polychaete *Mediomastus fragilis* and a mixed infaunal community of gammarids, amphipods, and bivalves. Growth of *Saccharina latissima* is affected most strongly by seasonal fluctuations in light and nitrogen availability (Nielsen *et al*., 2014), with relatively high tolerance of physical disturbance (Andersen *et al*., 2011, Moy and Christie, 2012). This resistance to physical disturbance, alongside the known wide seasonal spore dispersal range of this species (Andersen, 2013), with currents carrying spores relatively short distances from very similar nearby habitats, suggests a high recoverability in the impacted areas, likely beginning as soon as the materials causing compaction and temporary habitat loss are removed.

Zostera root systems are typically located within the top 20 cm of the sediment and can be easily uprooted. Anchoring may damage seagrass beds through removal of plants, breakage of rhizomes and burial of seeds too deeply to allow germination (Marine Scotland, 2021). Roots and rhizomes of *Zostera* grow horizontally, rather than vertically. Therefore, due to the typically small spatial scale of anchoring, seagrass beds may be more resilient to physical damage caused by anchors, and recolonisation of

these areas may be possible (d'Avack *et al.*, 2014). However, seagrass beds have been shown to take at least five years to establish, even when near adjacent established beds (d'Avack *et al.,* 2022).

The compaction events from vessel mooring anchors will be short-term and not repeated often following construction, with recolonisation likely to occur following removal of anchors. Additionally, through embedded mitigation, sensitive features, such as seagrass, can be avoided through the careful placement of anchors and jack-up barge legs via visual direction (i.e., direct instruction of anchors and jack-up legs by members of the crew, or via the presence of sensitive features polygons on the shipboard navigation system, derived from the subtidal surveys).

The Subtidal Sediment IEF have been assessed to have a national importance, low vulnerability and have medium recoverability following removal of construction equipment, therefore the sensitivity has been deemed as medium.

Fish and Shellfish

Effects to Fish and Shellfish IEFs are expected to be similar to, or smaller than, the impact of 'Temporary disturbance/loss of habitat arising from dredging activity'.

The sensitivity of all Fish and Shellfish IEFs is considered to be low for 'Temporary disturbance/loss of habitat arising from dredging activity', therefore, the sensitivity has been deemed as low.

Significance of Effects

Benthic Ecology

Littoral Sediment IEF is deemed to have a negligible sensitivity and low magnitude; therefore, the significance of effect is considered to be **negligible**, which is not significant in EIA terms.

Infralittoral Rock IEF is deemed to have a medium sensitivity and low magnitude; therefore, the significance of effect is considered to be **minor**, which is not significant in EIA terms.

Subtidal Sediment IEF is deemed to have a medium sensitivity and low magnitude; therefore, the significance of effect is considered to be **minor**, which is significant in EIA terms.

Overall, the significance of effect is deemed to be of **minor** significance, which is not significant in EIA terms.

Fish and Shellfish

The significance of effect for all Fish and Shellfish IEFs is deemed to be of **negligible** significance, which is not significant in EIA terms.

8.7.2.2 Permanent habitat loss arising from placement of material on the seabed for the breakwater

Permanent long term habitat loss will occur directly under the new breakwater structure. The footprint of the breakwater below MHWS is approximately 10,037 m^2, with approximately 149,812 tonnes of rock

armour to be laid. The works will be carried out once but will remain in-situ up to 120 years for the design life and will be non-reversable.

The long-term habitat loss/disturbance is predicted to be of localised spatial extent, long-term duration, and continuous, and the impact will affect receptors directly. The magnitude of the impact is considered to be medium.

Sensitivity of Receptor

Benthic Ecology

Where the rock armour for the breakwater is to be installed on the seabed, there will be a permanent loss of habitat due to the fundamental change in substrate type. The introduction of hard substrate through installation of the breakwater has the potential to influence change in the benthic community and associated fauna through artificial reef effects.

Biotopes that directly overlap with the breakwater area comprised Littoral Rock biotopes: high energy littoral rock (A1.1) and moderate energy littoral rock (A1.2); Littoral Sediment biotopes: barren littoral shingle (A2.1) and littoral sand and muddy sand (A2.2) and Sublittoral Sediment biotopes: *Zostera marina/angustifolia* beds on lower shore or infralittoral clean or muddy sand (A5.5331), kelp and seaweed communities on sublittoral sediment (A5.52) and *Nephtys cirrosa* and *Bathyporeia* spp. in infralittoral sand (A5.233).

Littoral Rock

High energy littoral rock (A1.1) and moderate energy littoral rock (A1.2) are characterised by the presence of *Semibalanus balanoides, Patella vulgata, Littorina spp., Fucus vesiculosus, Himanthalia elongate, Pelvetia canaliculata, Fucus serratus* and red seaweeds. Recovery of *Semibalanus balanoides* and the limpet *Patella vulgata* will depend on re-colonization and community regulation by larvae (Petzold and Scrosati, 2014). As these are common, widespread species and the footprint of the impact will be relatively small, larval supply from adjacent populations/nearby similar biotopes are likely to support recolonisation. As such, full recovery of the A1.1 habitat to baseline levels (i.e., to the pre-construction baseline) is therefore expected within two years (Tillin & Hill, 2018a; Tillin & Hill, 2018b; Tillin, 2015; Tillin & Budd, 2016). The recovery time for A1.2 biotopes will be slightly longer with full recovery expected within two to five years.

Littoral Rock IEF have been assessed to have a regional importance, low to medium vulnerability, are commonly found within the Marine Biodiversity Study Area and have high recoverability to permanent habitat loss arising from the placement of material on the seabed, therefore their sensitivity has been deemed as low.

Littoral Sediment

Barren littoral shingle (A2.1) or amphipod-dominated mobile sand shores (A2.22) are characterised by mobile sands (coarse, medium or fine-grained), which retain little water and organic matter, and thus are subject to drying out between tides. The A2.22 biotope supports a limited range of species, including

amphipod, isopod and polychaetes (MarLIN, 2021a). The existing biotopes present within the breakwater footprint will be lost but recolonisation is expected within days or weeks, subject to adequate source population (Leewis *et al.* 2012). Sediments present in between the breakwater are likely to be recolonised quickly from nearby biotopes and larvae supply.

Littoral Sediment IEF have been assessed to have a regional importance, low vulnerability and have high recoverability to permanent habitat loss arising from the placement of material on the seabed, therefore the sensitivity has been deemed as low.

Sublittoral Sediment

Effects to Sublittoral Sediment, 'Kelp and seaweed communities on sublittoral sediment' A5.52 and '*Zostera marina/angustifolia* beds on lower shore or infralittoral clean or muddy sand' A5.5331 are expected to be similar to 'Temporary disturbance/loss of habitat arising from dredging activity', with the exception that any biotopes present within the breakwater area will be lost.

Permanent loss of the biotope A5.52 is likely to occur from within the breakwater footprint area resulting in high mortality. As sediment is to be replaced with rock, this would represent a fundamental change to the biotope (Macleod *et al.*, 2014). All the characterizing species within this biotope can grow on rock biotopes (Birkett *et al*., 1998; Connor *et al.*, 2004), however, A5.52 by definition is a sediment biotope and introduction of rock would result in a change to a rock-based habitat complex, and the A5.52 biotope would be lost. Therefore, the biotope has high vulnerability and no ability to recover but has the ability to become a different biotope. This biotope has been assessed to have a national importance, low vulnerability (as the biotope is found throughout the Marine Biodiversity Study Area) and has no ability to recover. The A5.52 biotope is expected to be lost but recovery of the characterising species is expected to occur within two weeks, thereby increasing recoverability. The sensitivity for this biotope is therefore deemed as low.

A change to another seabed type (from sediment to hard rock) will result in a permanent loss of suitable habitat for the seagrass PMF. D'Avack *et al.* (2022) assessed the resistance as 'None', as this pressure represents a permanent change; recovery is impossible as a suitable substratum for seagrasses will not be present. However, it is important to note that extensive seagrass beds have been found around the isle of Iona. The seagrass beds represent a small loss of habitat in the wider context of the area.

The Sublittoral Sediment IEF has been assessed to have a national importance, high vulnerability and have no recoverability, therefore the sensitivity has been deemed as high.

Fish and Shellfish

Fish and shellfish species that are reliant upon the presence of suitable sediment/habitat for their survival are considered to be more vulnerable to change depending on the availability of habitat within the wider geographical region. The seabed habitats removed by the installation of the breakwater will reduce the amount of suitable habitat and available food resource for fish and shellfish species and communities associated with the baseline substrates/sediments. However, this area represents a small proportion of the wider area.

Mobile fish species are generally able to avoid areas subject to long term subtidal habitat loss. Demersal fish species, benthopelagic and pelagic fish species, migratory fish species and elasmobranchs that are likely to interact with the Marine Biodiversity Study Area are only likely to do so by passing through the area. The habitats within the Marine Biodiversity Study Area are not expected to be particularly important for mobile fish species and therefore habitat loss during the construction of the Proposed Development is unlikely to cause any direct impact to mobile fish species. Conversely, once construction has been completed, the heterogenic environment is likely to act as a fish aggregation area, increasing local fish populations (Froeschke *et al.*, 2005; Cenci *et al.*, 2011).

Sessile shellfish species, such as the great Atlantic scallop and razor clam, may be affected as suitable sediments for colonisation will be lost. However, the permanent habitat lost is unlikely to affect the wider population as alternative areas are available for colonisation. Conversely, once the breakwaters have been built, they will act as suitable colonisation areas for other shellfish species, such as crabs and lobsters.

The Proposed Development coincides with low and high intensity spawning and nursery habitat. The presence of the breakwater will result in direct effects on this habitat, though the proportion of spawning and nursery area affected is small in the context of the known spawning and nursery areas. These areas are unlikely to be affected in the long term, and once constructed, the breakwater will act as a refuge site from predators, likely contributing to species nursery areas.

Therefore, on the basis that mobile IEFs are likely to move away from disturbance, only the Shellfish Assemblage and Spawning and Nursery Grounds IEF have been taken forward for further assessment.

Shellfish Assemblage

Permanent habitat loss during the placement of rock armour in this area will represent a change in substrate type from sediment to hard substrate. This will result in the sessile shellfish assemblages within the footprint being lost and unlikely to recover. However, the extent of the area is small with alternative habitats available. Additionally, mobile shellfish species, such as crab and lobster, have a preference for rocky environments and are likely to quickly colonise the breakwater (Neal & Pizzolla, 2008; Wilson, 2008).

The ‘shellfish assemblage’ IEF has been assessed to have a local to regional importance, high vulnerability and have medium recoverability to permanent habitat loss, therefore their sensitivity has been deemed as low.

Spawning and Nursery Grounds

The fish species within the Marine Biodiversity Study Area which are likely to be most sensitive to permanent habitat loss are those species which spawn on or near the seabed sediment (e.g., sandeel, herring and elasmobranchs, including spotted ray). Adult specimens of the majority of spawning and nursery grounds IEFs are mostly pelagic and highly mobile when not spawning and are therefore likely to avoid breakwater placement operations, recovering to baseline conditions immediately after the cessation of works.

Sandeel spawn and have a nursery area present within the Marine Biodiversity Study Area (Coull *et al*., 1998). Spawning and nursery areas are likely to be lost due to the preference of sediments required for spawning. However, the extent of the area lost is unlikely to affect the population due to prolific spawning behaviours, with up to 4,000 - 20,000 eggs produced (Rowley, 2008). Alternative suitable spawning grounds are found within the wider area.

Herring have spawning areas and high intensity nursery grounds within the Marine Biodiversity Study Area, but these are unlikely to be significantly impacted as there are suitable alternative spawning areas available. Rock armour placement undertaken during spawning periods have the potential to result in the mortality of eggs and reduced opportunity due to the removal of suitable habitat. However, the area which will be affected is small given the abundance of similar substrate types across the Marine Biodiversity Study Area and the extensive nature of fish spawning grounds around Iona more broadly.

Breakwater placement activities within the Marine Biodiversity Study Area may also impact on spawning and nursery habitats for herring and whiting, as these areas overlap the Marine Biodiversity Study Area. However, the impact from the breakwater will have limited impact on these. If effects do occur, larval settlement from nearby undisturbed areas will increase the rate of recovery (Phua *et al*., 2002).

Similarly, the year-round demersal spawning of spurdog is unlikely to be impacted significantly, and recruitment from unimpacted areas would likely allow rapid recovery.

The Spawning and Nursery Ground IEF has been assessed to have a regional to national importance, low vulnerability and have high recoverability to permanent habitat loss and therefore their sensitivity has been deemed as low.

Significance of Effects

Benthic Ecology

Littoral Rock IEF is deemed to have a low sensitivity and medium magnitude; therefore, the significance of effect is considered to be **minor**, which is not significant in EIA terms.

Littoral Sediment IEF is deemed to have a low sensitivity and medium magnitude; therefore, the significance of effect is considered to be **minor**, which is not significant in EIA terms

Subtidal Sediment IEF is deemed to have a low to high sensitivity and medium magnitude; therefore, the significance of effect is considered to be **minor** for the other biotope class but **moderate** due to the presence of the seagrass PMF, which is significant in EIA terms.

Overall, the significance of effect is deemed to be of **moderate** significance due to the potential impact on seagrass PMF. All other habitats have been deemed minor, which is not significant in EIA terms.

Fish and Shellfish

Shellfish Assemblage IEF is deemed to have a low sensitivity and medium magnitude; therefore, the significance of effect is considered to be **minor**, which is not significant in EIA terms.

Spawning and Nursery Grounds IEF is deemed to have a low sensitivity and medium magnitude; therefore, the significance of effect is considered to be **minor**, which is not significant in EIA terms.

Overall, the significance of effect is deemed to be of **minor** significance, which is not significant in EIA terms.

Residual Effects

Benthic Ecology

Permanent habitat loss arising from the placement of material on the seabed for the breakwater is likely to have a significant effect on the seagrass PMF found within the breakwater footprint. As the receptor is being directly affected due to the placement of rock armour, there will be no possibility of being able to mitigate for this loss. Therefore, compensation and/or monitoring has been proposed within Section 8.10.

8.7.2.3 Effects of underwater noise arising from construction activities

The installation of the Proposed Development will involve dredging and vessel noise, all of which produce noise levels which have the potential to effect fish and shellfish and marine mammal IEFs.

Magnitude of Impact

To understand the significance of impact of noise emissions of dredging and vessel noise, subsea noise modelling has been undertaken, and is presented in Volume III, Appendix 8.4. The Subsea Noise Modelling also assessed the installation of piles using drilling however, this activity is no longer part of the Proposed Development. Therefore, only dredging and vessel movements, as non-impulsive noise sources have been assessed below.

Capital dredging will require the use of a backhoe excavator for up to one week of operation. Once the dredging is complete the backhoe excavator will demobilise from site.

Vessel operations, to support the construction of the breakwater are expected to be within the area for up to 52 weeks, with approximately 40 - 50 vessel movements to delivery rock armour. However, it is unlikely that vessels will be continuously operating for this duration.

The subsea noise modelling predicted that, for fish with swim bladders (i.e., fish most sensitive to underwater noise) (using the SPL_{rms} metric), Temporary Threshold Shift (TTS) is not expected to occur beyond 10 m of the sound source (for both dredging and vessels). For low frequency cetaceans, such as baleen whales, TTS ranges were calculated at 250 m and 180 m for vessel and dredging noises, respectively. TTS ranges for cetaceans were predicted to be 30 m and 20 m for vessel and dredging activities, respectively. Note the Permanent Threshold Shift was not exceeded.

Therefore, the effects of underwater noise arising from construction activities are predicted to be of highly localised spatial extent, short-term duration, intermittent and reversable following cessation of works. The magnitude of this impact is considered to be low.

Sensitivity of Receptor

Volume III, Appendix 8.4 presents the criteria, baseline noise methodology, noise modelling outputs and predicted effects of noise arising from construction activities. The results have been summarised below within the Fish and Shellfish (specifically for fish) and Marine Mammal sections for ease of reference.

Fish and Shellfish

Underwater noise can potentially negatively impact fish species through physical injury and/or behavioural effects. Although adult fish are highly mobile and are generally able to vacate the area and avoid physical injury if they are outwith the immediate vicinity of the noise generating activity, larvae and spawn are not highly mobile and are therefore more susceptible to injury from sound energy.

For fish, the most relevant criteria for injury are considered to be those contained in ASA S3/SC1.4 TR-2014, Sound Exposure Guidelines for Fishes and Sea Turtles (Popper *et al*. 2014) (Table 8-12). The guidelines set out criteria for injury due to different sources of noise. The criteria include a mixture of indices including SEL, rms and peak sound pressure levels. Where insufficient data exists to determine a quantitative guideline value the risk is categorised in relative terms as “high”, “moderate” or “low” at three distances from the source: “near” (i.e., in the tens of metres), “intermediate” (i.e., in the hundreds of metres) or “far” (i.e., in the thousands of metres).

Table 8-12 ASA guideline criteria for injury in fish due to non-impulsive sound

Type of animal	Mortality and potential mortal injury	Impairment	
		Recoverable injury	Temporary Threshold Shift (TTS)
Fish: no swim bladder (particle motion detection)	(Near) Low (Intermediate) Low (Far) Low	(Near) Low (Intermediate) Low (Far) Low	(Near) Moderate (Intermediate) Low (Far) Low
Fish: where swim bladder is not involved in hearing (particle motion detection)	(Near) Low (Intermediate) Low (Far) Low	(Near) Low (Intermediate) Low (Far) Low	(Near) Moderate (Intermediate) Low (Far) Low
Fish: where swim bladder is involved in hearing (primarily pressure detection)	(Near) Low (Intermediate) Low (Far) Low	170 dB re 1 µPa (rms) for 48 hours	158 dB re 1 µPa (rms) for 12 hours
Eggs and larvae	(Near) Low (Intermediate) Low (Far) Low	(Near) Low (Intermediate) Low (Far) Low	(Near) Low (Intermediate) Low (Far) Low

Notes:
Range of effect classified as Near = tens of metres / Intermediate= hundreds of metres / Far = thousands of metres
Relative risk classified as high, moderate or low

Behavioural reactions of fish to sound have been found to vary between species based on their hearing sensitivity. Typically, fish sense sound via particle motion in the inner ear which is detected from sound-induced motions in the fish’s body. The detection of sound pressure is restricted to those fish which have air filled swim bladders; however, particle motion (induced by sound) can be detected by fish without swim bladders.

The most recent criteria for disturbance are considered to be those contained in ASA S3/SC1.4 TR-2014, Sound Exposure Guidelines for Fishes and Sea Turtles (Popper *et al*., 2014) which set out criteria for disturbance due to different sources of noise (Table 8-13). The risk of behavioural effects is categorised in relative terms as “high”, “moderate” or “low” at three distances from the source: “near” (i.e., in the tens of metres), “intermediate” (i.e., in the hundreds of metres) or “far” (i.e., in the thousands of metres).

Table 8-13 ASA guideline criteria for onset of behavioural effects in fish due to non-impulsive sound

Type of Animal	Relative Risk of Behavioural Effects
Fish: no swim bladder (particle motion detection)	(Near) Moderate (Intermediate) Moderate (Far) Low
Fish: where swim bladder is not involved in hearing (particle motion detection)	(Near) Moderate (Intermediate) Moderate (Far) Low
Fish: where swim bladder is involved in hearing (primarily pressure detection)	(Near) High (Intermediate) Moderate (Far) Low
Eggs and larvae	(Near) Moderate (Intermediate) Moderate (Far) Low

There are a number of species of fish which use the Marine Biodiversity Study Area as spawning and nursery grounds which may be sensitive to underwater noise. As shown in Table 8-13 above, Popper *et al*. (2014) group fish into categories dependent on their hearing capabilities.

Of highest sensitivity to underwater noise are species such as herring (clupeids) and cod (gadoids) where a swim bladder is involved in hearing. These species are most susceptible to barotrauma from underwater noise. There are spawning areas for herring within the wider study area, and high intensity nursery grounds are present within the Marine Biodiversity Study Area. Cod does not spawn in the wider study area, but the Marine Biodiversity Study Area does overlap with nursery grounds. Other species where a swim bladder is involved in hearing include saithe, Norway pout, sprat, whiting, hake and anglerfish, of which only Norway pout and sprat spawn in the wider area.

Atlantic salmon and sea trout also have swim bladders; however, these are not involved in hearing. They are still susceptible to barotrauma, but less so in comparison to clupeid and gadoid species. Flatfishes, such as plaice, mackerel, sandeels, elasmobranchs and shellfish do not have swim bladders so have low sensitivity to underwater noise as they are less susceptible to barotrauma.

The results of the subsea noise modelling determined that there is little potential for TTS to be experienced by fish due to the construction activities. For fish with swim bladders, the maximum range of impact for TTS is 10 m (using the SPL_{rms} metric), however, an individual would need to be exposed for a period of 12 hours before adverse effects are expressed.

Fish Species IEF are deemed to be of low vulnerability, high recoverability and local to international importance. The sensitivity of the receptor is therefore considered to be low.

Marine Mammals

Underwater noise has the potential to injure and/or disturb marine mammals. Auditory injury can occur as either a Permanent Threshold Shift (PTS), where there is no hearing recovery in the animal, or as a TTS, where an animal can recover from the tissue damage. Disturbance from underwater noise can result in changes in behaviour, such as migration, breeding, or feeding.

Sound propagation models can be constructed to allow the received noise level at different distances from the source to be calculated. To determine the consequence of these received levels on any marine mammals which might experience such noise emissions, it is necessary to relate the levels to known or estimated impact thresholds. The injury criteria proposed by Southall *et al.* (2019) are based on a combination of linear (i.e., un-weighted) peak pressure levels and mammal hearing weighted sound exposure levels (SEL). The hearing weighting function is designed to represent the bandwidth for each group within which acoustic exposures can have auditory effects. The categories include:

- low-frequency (LF) cetaceans (i.e., marine mammal species such as baleen whales);
- high-frequency (HF) cetaceans (i.e., marine mammal species such as dolphins, toothed whales, beaked whales and bottlenose whales);
- very high-frequency (VHF) cetaceans (i.e., marine mammal species such as true porpoises, river dolphins and pygmy/dwarf sperm whales and some oceanic dolphins, generally with auditory centre frequencies above 100 kHz);
- phocid pinnipeds (PCW) (i.e., true seals; hearing in air is considered separately in the group PCA); and
- other marine carnivores (OCW) (including otariid pinnipeds (e.g., sea lions and fur seals), sea otters and polar bears; air hearing considered separately in the group OCA).

Injury criteria proposed in Southall *et al.* (2019) are for two different types of sound as follows:

- Impulsive sounds which are typically transient, brief (less than 1 second), broadband, and consist of high peak sound pressure with rapid rise time and rapid decay (ANSI 1986; NIOSH 1998; ANSI 2005). This category includes sound sources such as seismic surveys, impact piling and underwater explosions; and
- Non-impulsive sounds which can be broadband, narrowband or tonal, brief or prolonged, continuous or intermittent and typically do not have a high peak sound pressure with rapid rise/decay time that impulsive sounds do (ANSI 1995; NIOSH 1998). This category includes sound sources such as continuous running machinery, sonar and vessels.

The criteria for non-impulsive sound have been adopted for this study given the nature of the sound source used during construction activities. A summary of the PTS onset acoustic thresholds for these categories is given in Table 8-14.

Table 8-14 Summary of PTS onset acoustic thresholds (Southall *et al*. 2019)

Hearing Group	Parameter	Impulsive	Non-impulsive
Low-frequency (LF) cetaceans	Peak, unweighted	219	-
	SEL, LF weighted	183	199
High-frequency (HF) cetaceans	Peak, unweighted	230	-
	SEL, MF weighted	185	198
Very high-frequency (VHF) cetaceans	Peak, unweighted	202	-
	SEL, HF weighted	155	173
Phocid Carnivores in Water (PCW)	Peak, unweighted	218	-
	SEL, PW weighted	185	201
Other Marine Carnivores in Water	Peak, unweighted	232	-
	SEL, OW weighted	203	219

Marine mammal species that could be present within the Iona Sound include cetaceans: bottlenose dolphin, common dolphin, harbour porpoise, killer whale, minke whale and white-beaked dolphin; and pinnipeds: grey seal and harbour seal. According to Southall *et al*. (2019), minke whale is classified as a low-frequency cetacean; killer whale, common dolphin, white-beaked dolphin and bottlenose dolphin are classed as high-frequency cetaceans; and harbour porpoise is classed as a very high frequency cetacean. The two pinniped species, grey seal and harbour seal, are classed as phocid carnivores in water. In terms of non-impulsive noise, grey seal and harbour seal have the highest threshold for PTS onset, followed by minke whale, and the four species of high frequency cetaceans. Harbour porpoise has the lowest threshold for PTS onset.

Significant (i.e., non-trivial) disturbance may occur when there is a risk of animals incurring sustained or chronic disruption of behaviour or when animals are displaced from an area, with subsequent redistribution being significantly different from that occurring due to natural variation.

The National Marine Fisheries Service (NMFS, 2005) guidance sets the marine mammal level B harassment threshold for continuous noise at 120 dB re 1 µPa (rms). The relevant criteria for marine mammals are summarised in Table 8-15. This includes the thresholds for non-impulsive sound based on the relevant guidelines (NMFS 2018, NMFS 2005). In Table 8-15 SELs are expressed as dB re 1 µPa2s (cumulative over a 24-hour period) and RMS sound pressure levels are in dB re 1 µPa (rms).

Table 8-15 Summary of acoustic thresholds for marine mammals for non-impulsive sound

Hearing Group	Parameter	PTS	TTS	Disturbance
Low-frequency (LF) cetaceans	SEL, LF weighted dB re 1 μPa^2s	199	179	-
	RMST90 dB re 1 µPa (rms)	-	-	120
High-frequency (HF) cetaceans	SEL, MF weighted dB re 1 μPa^2s	198	178	-
	RMST90 dB re 1 µPa (rms)	-	-	120
Very high-frequency (VHF) cetaceans	SEL, HF weighted dB re 1 μPa^2s	173	153	-
	RMST90 dB re 1 µPa (rms)	-	-	120
Phocid Carnivores in Water (PCW)	SEL, PW weighted dB re 1 μPa^2s	201	181	-
	RMST90 dB re 1 µPa (rms)	-	-	120
Other Marine Carnivores in Water	SEL, OW weighted dB re 1 μPa^2s	219	199	-

Hearing Group	Parameter	PTS	TTS	Disturbance
	RMST90 dB re 1 µPa (rms)	-	-	120

The subsea noise modelling (Volume III, Appendix 8.4) predicted that for both dredging and vessel movements the threshold for PTS (using the SPL_{rms} metric) was not exceeded for any marine mammal species. With regard to TTS, vessel noise resulted in the largest range of effect, with TTS onset exceeded up to 270 metres from the source.

Based on the subsea modelling, there is little potential for TTS to be experienced by marine mammals due to the Proposed Development. Impact only occurs for a stationary seal being within 30 m of the construction work for 24 hours. This represents a worst-case scenario, and it is considered highly unlikely that a marine mammal would remain within this range for a period of 24 hours.

Marine Mammals IEF are deemed to be of low vulnerability, high recoverability and national to international importance. The sensitivity of the receptor is therefore, considered to be low.

Significance of Effects

Fish and Shellfish

All Fish and Shellfish IEFs are deemed to have a low sensitivity and low magnitude; therefore, the significance of effect is considered to be **negligible**, which is not significant in EIA terms.

Marine Mammals

All Marine Mammals IEFs are deemed to have a low sensitivity and low magnitude; therefore, the significance of effect is considered to be **negligible**, which is not significant in EIA terms.

8.7.2.4 Disturbance and collision risk to marine mammals from increased vessel traffic during construction

Marine Mammals

There will be no significant increase in vessel traffic outside of the normal working ferry traffic movements during the construction of the Proposed Development. Therefore, this impact has been scoped out as there is no change in the likelihood or magnitude of marine mammal collision with vessels.

8.7.3 Assessment of Operational Effects

This section assesses the effects of activities which occur during the operational phase of the Proposed Development. Operational phase assessment considers the footprint of the breakwater post construction.

8.7.3.1 Permanent habitat creation arising from the placement of material on the seabed for the breakwater

During the operational phase, permanent long term habitat loss will have occurred within the new breakwater footprint following the construction phase. The effect on benthic receptors (i.e., habitat loss effects) will be experienced throughout the lifetime of the structure. However, the presence of hard substrate will likely result in an increase in the heterogeneity of the surrounding environment. The presence of hard structures is likely to be colonised by species in the area, therefore having a beneficial effect on benthic ecology. In addition, this potential increase in colonising species may result in an increase in prey species made available for fish and shellfish.

Habitats that are characterised by pioneering species are likely to recolonise the area resulting in high recoverability from IEFs identified within the baseline. No further habitat loss is expected due to placement of materials on the seabed.

Magnitude of Impact

Permanent habitat creation will occur due to the presence of the breakwater structure. The overall footprint of the breakwater is approximately 21,800 m^2, with approximately 149,812 tonnes of rock armour laid. The structure will remain in-situ up to 120 years for the design life.

The long-term habitat creation is predicted to be of highly localised spatial extent, long-term duration, and continuous, and the impact will affect benthic ecology receptors directly. The magnitude of this impact is considered to be medium.

Sensitivity of Receptor

Benthic Ecology

Benthic biotopes that are dependent on sediment, such as those found within the littoral sediment and sublittoral sediment benthic ecology IEFs (Table 8-4) will be affected by long-term subtidal habitat loss during the operational phase. These species will be removed along with the substratum underneath the breakwater structure, therefore all the IEFs are considered highly intolerant of, and vulnerable to, complete habitat loss. Given the small spatial scales of the total long-term habitat loss this loss is not expected to undermine regional ecosystem functions or diminish biodiversity.

Although there is an impact on IEFs, this will not create significant impact on the regional, national and international status of these features. This is because of the highly localised nature of the impact only causing biotope loss in one discrete location.

Furthermore, biotope A5.52, as described within the construction phase, will fundamentally be lost, due to the change in underlying substrate from sediment to rock, but the characterising species of this biotope are able to colonise rock substrate. These species will benefit from the creation of a hard habitat (Stamp *et al.*, 2021; Stamp *et al.*, 2022), resulting in a positive effect on characterising species.

Therefore, Benthic Ecology are deemed to be of low vulnerability, high recoverability and regional to international importance. The sensitivity of the receptor is therefore, considered to be low (positive).

Fish and Shellfish

The presence of the breakwater during the operational phase may result in an increase in heterogenic habitat, refuge areas and act as a fish aggregation area. Mobile fish species are likely to move back into the area following cessation of the construction period. Similarly, mobile shellfish species are likely to use the breakwaters as refuge areas. Overall, the likely effect on fish and shellfish species is positive during the operational phase.

Therefore, Fish and shellfish species are deemed to be of low vulnerability, high recoverability and local to international importance. The sensitivity of the receptor is therefore, considered to be low (positive).

Significance of Effects

Benthic Ecology

Benthic Ecology are deemed to have a low sensitivity and medium magnitude; therefore, the significance of effect is considered to be **minor (positive)**, which is not significant in EIA terms.

Fish and Shellfish

Fish and Shellfish are deemed to have a low sensitivity and medium magnitude; therefore, the significance of effect is considered to be **minor (positive)**, which is not significant in EIA terms.

8.7.3.2 Changes in the hydrodynamic regime due to the presence of the breakwater

Hard coastal defence structures, such as a breakwater, are designed to alter/change the hydrodynamic regime of an area. The Breakwater will reduce the intensity of wave action in inshore waters providing a safe area for the ferry to moor up against. This change in hydrodynamic regime may result in benthic ecology receptors being directly affected, by leading to increases or decreases in sediment disposition, currents and/or water flow within the protected area. However, Chapter 13: Coastal Processes has identified that there are no significant changes to the hydrodynamic regime of the area due to the presence of the breakwater.

8.8 Potential Cumulative Effects

This section considers the potential for cumulative effects arising from the Proposed Development alongside other known activities. The cumulative effects assessment uses the outcome of the assessment of effects in Section 8.7 to determine whether cumulative effects are likely and if so whether together they have the potential to increase the effects outlined for each receptor group.

A review of activities which may potentially act cumulatively with the Proposed Development was carried out. The sister breakwater project to be undertaken at Fionnphort, detailed in Chapter 21, is likely to have the potential for cumulative effects. Therefore, this project has been taken forward for assessment. It is important to note that this project is still in its design stage and therefore exact project details are currently unknown.

The above project does not overlap spatially with the Proposed Development however, the two projects may overlap temporally. The main effects that require consideration are those that were identified to have significant effects on benthic receptors. As a result, the key effect to be considered within the assessment is 'Permanent habitat loss arising from the placement of material on the seabed for the breakwater' during the construction phase on benthic receptors. All other effects were found to be not significant and therefore have been scoped out.

8.8.1 Assessment of Construction Effects

8.8.1.1 Permanent habitat loss arising from the placement of material on the seabed for the breakwater

Cumulative effects due to permanent long-term habitat loss will occur directly under the new breakwater structures at Iona and Fionnphort. The effect on benthic receptors (i.e., habitat loss effects) will be experienced throughout the lifetime of the structure.

Magnitude of Impact

At Iona, permanent long-term habitat loss will occur directly under the new breakwater structure. The overall footprint of the breakwater is approximately 10,037 m^2, with approximately 149,812 tonnes of rock armour to be laid. The works will be carried out once but will remain in situ for up to 120 years for the design life and will be non-reversible.

At Fionnphort, permanent long-term habitat loss will occur directly under the new breakwater structure. The overall footprint of the breakwater is approximately 4,200 m^2 (i.e., not including the temporary working area) (this figure is based on the Fionnphort Scoping Report dated July 2021 and therefore may be subject to slight variation). The works will be carried out once but will remain in situ for up to 120 years for the design life and will be non-reversible.

The potentially combined permanent loss of habitat due to the breakwaters would be 7,000 m^2. It is expected that construction for both projects would be over 52 weeks.

The long-term habitat loss/disturbance is predicted to be of localised spatial extent, long-term duration, and continuous, and the impact will affect receptors directly. The magnitude of this impact is considered to be medium.

Sensitivity of Receptor

Benthic Ecology

Benthic ecology receptors were assessed to have a low to high sensitivity and were found to have a major significance. However, it is important to note that the high sensitivity was determined only for the subtidal sediment IEF and specifically for the seagrass receptor. Therefore, only the seagrass receptor has been considered for the potential for cumulative effects.

Therefore, the Sublittoral Sediment IEF has been assessed to have a high sensitivity.

Significance of Effects

Benthic Ecology

Subtidal Sediment IEF is deemed to have a high sensitivity and medium magnitude; therefore, the significance of the effect is considered to be **moderate**, which is significant in EIA terms. Further compensation/mitigation measures have been discussed within Section 8.10.

Overall, the significance of the effect is deemed to be of **moderate** significance due to the potential impact on seagrass beds.

8.9 Inter-Related Effects

This section presents the results of the Likely Significant Effects in respect of the inter-related effects of the Proposed Development during its construction and operational phases.

Benthic Ecology receptors are likely to be affected most by the Proposed Development, only effects that were found to have a minor significance or above were taken forward for consideration. All other receptor groups have been screened out on the basis that there are unlikely to be significant inter-related effects.

For Benthic Ecology, the following effects have been considered within the inter-related assessment:

- Temporary disturbance/loss of habitat arising from capital and maintenance dredging activity;
- Effects of increased suspended sediment concentrations and sediment deposition;
- Temporary disturbance/loss of habitat arising from displacement/compaction of the seabed by anchors and jack-up barge spud legs;
- Permanent habitat loss arising from the placement of material on the seabed for the breakwater; and
- Permanent habitat creation arising from the placement of material on the seabed for the breakwater.

Table 8-16 lists the inter-related effects that are predicted to arise during the construction phase of the Proposed Development and also the inter-related effects that are predicted to arise for benthic ecology receptors.

Table 8-16 Likely Significant Inter-Related Effects on Benthic Ecology from Individual Effects Occurring across the Construction and Operational Phases of the Proposed Development and from Multiple Effects Interacting Across all Phases (Receptor-led Effects)

Description of Impact	Phase		Likely Significant Inter-Related Effects
	Construction	Operation	
Temporary disturbance/loss of habitat arising from capital and maintenance dredging activity	Negligible to Minor Adverse		When habitat disturbance or loss is considered additively across all phases, the total area of habitat affected is unlikely to increase. This is due to maintenance dredging during the operational phase only being undertaken within the original capital dredging area footprint (construction phase). The temporary disturbance/loss will be highly localised to the vicinity of the dredging activity (i.e., limited to the immediate footprint) during each phase. Subtidal Sediments IEF, specifically seagrass habitats are unlikely to recover. This is due to initial habitat loss during construction and repeat disturbance during the operational phase. Therefore, across the project lifetime, the effects on benthic ecology IEFs are anticipated to interact in such a way as to result in combined effects of minor significance in the construction and operational phase (i.e., not of greater significance than the assessments presented for each phase).
Effects of increased suspended sediment concentrations and sediment deposition	Negligible to Minor Adverse		The majority of the seabed disturbance (resulting in the highest suspended sediment concentrations/deposition) will occur during the construction phase, from capital dredging. During the operational phase, the material to be removed by maintenance dredging is likely to be less than that in the capital dredging phase and by extension the length of operation. The interaction across the project life cycle is not predicted to result in an effect of any greater significance than those assessed in the individual project phases.
Temporary disturbance/loss of habitat arising from displacement/compaction of the seabed by anchors and jack-up barge spud leg	Negligible to Minor Adverse	×	This effect will only arise during the construction phase and as such there will be no interaction effects across the project phases.
Permanent habitat loss arising from the placement of material on the seabed for the breakwater	Minor to Moderate Adverse	×	This effect will only arise during the construction phase and as such there will be no interaction effects across the project phases.
Receptor Led Effects			
Potential exists for spatial and temporal interactions between the effects arising from temporary/permanent habitat disturbance/loss of habitat and the effects of increased suspended sediment concentrations and sediment deposition during the lifetime of the Proposed Development. ***Based on current understanding, and expert knowledge, the greatest potential for inter-related impacts is predicted to arise through the interaction of direct (both temporary and permanent) habitat disturbance/loss from capital/maintenance dredging activity/anchor/jack-up barge spud leg placement/ breakwater placement and effects of increased suspended sediment concentrations and sediment deposition on Subtidal Sediments IEFs, specifically seagrass.*** ***These individual impacts were assigned a significance of negligible/minor/moderate adverse as standalone impacts and although potential combined impacts may arise (i.e., spatial and temporal overlap of direct habitat disturbance), it is predicted that this will not be any more significant than the individual impacts in isolation. This is because the combined amount of habitat potentially affected would be very limited (within the Marine Biodiversity Study Area) and the biotopes affected are widespread around the Isle of Iona. As such, these interactions are predicted to be no greater than the individual effects assessed in isolation.***			

8.10 Mitigation Measures

The following sections outline the mitigation measures which will be implemented to reduce the effects on key receptors.

8.10.1 Embedded Mitigation Measures

A number of embedded mitigation measures relevant to marine biodiversity are proposed to be incorporated into the design and construction method to manage the effect on the environment. These are shown in Table 8-17.

Table 8-17 Designed-In Mitigation Measures Adopted.

Measures Adopted	Justification
Construction Environmental Management Plan (CEMP)	Control of pollution during construction will be set out in a CEMP. This will include best practice measures to prevent accidental spillage of chemicals during construction activities.
Environmental Management Plan (EMP)	The EMP will manage the risks of all operational activities, facilities and cargo handled by the port and will include best practice measures to control pollution following standard guidelines such as the Environment Agency Pollution Prevention Guidelines.
Invasive and Non-Native Species (INNS) Management Plan	A document detailing how the risk of potential introduction and spread of INNS should be produced. The plan will outline measures to ensure vessels comply with the International Maritime Organization (IMO) ballast water management guidelines, it will consider the origin of vessels and contain standard housekeeping measures for such vessels as well as measures to be adopted if a high alert species is recorded. Plant, equipment and material (where required), will follow the 'check, clean, dry method'.
Sensitive features present on shipboard navigation systems	The presence of sensitive features onboard the ship's navigation systems will aid the vessel master in placing either anchor or jack-up legs to avoid these sensitive features.

8.10.2 Benthic Ecology

The assessment of Likely Significant Effects has deemed the effect of 'Permanent habitat loss arising from the placement of material on the seabed for the breakwater' on '*Zostera marina/angustifolia'* beds on lower shore or infralittoral clean or muddy sand' (A5.5331) to be moderate, which is significant in EIA terms.

As such, a 'Seagrass Compensation and Monitoring Plan' has been proposed. Direct habitat loss is predicted to occur as a result of the Proposed Development; therefore, to ensure that seagrass habitat is not permanently lost, compensation will be undertaken to ensure that the habitat is restored. An assessment has already been undertaken in the form of the intertidal and subtidal survey, with the extent of biotopes derived. This data will be used to inform the 'Seagrass Compensation and Monitoring Plan'.

This approach will be agreed upon with Marine Scotland, its advisors, and in consultation with seagrass restoration projects, with reference to documents such as Seagrass restoration in Scotland - handbook and guidance (Kent *et al*., 2021) and Seagrass Restoration Handbook (Gamble *et al.*, 2021).

Cumulative Effects Mitigation

As there is likely to be a significant effect on seagrass, an agreement will be sought between the Iona Proposed Development and the Fionnphort project on the compensation/ mitigation strategy for the seagrass.

8.11 Conclusion and Summary of Effects

The Proposed Development was assessed with respect to effects on marine environment receptors. Potential effects identified from the construction and operational phases were identified, these were temporary and permanent habitat loss, increases in suspended sediments, underwater noise emissions, presence of the breakwater structure, and permanent habitat creation.

The assessment found that almost all effects were of either negligible or minor significance, which is not significant in EIA terms. However, for the benthic habitat '*Zostera marina/angustifolia* beds on lower shore or infralittoral clean or muddy sand A5.5331', the assessment determined that 'Permanent habitat loss arising from the placement of material on the seabed for the breakwater' was deemed of moderate significant effect.

To address the moderate significant effect of the temporary and permanent habitat loss, a 'Seagrass Compensation and Monitoring Plan' has been proposed to reduce the impact of the Proposed Development on seagrass receptors.

A summary of the likely environmental effects is provided in Table 8-18.

Table 8-18 Summary of Likely Environmental Effects on Marine Environment

Description Of Effects	Magnitude Of Effects	Receptor	Sensitivity Of Receptor	Significance Of Effect	Significant /Not Significant	Residual Effects
Construction and Operational Effects						
Temporary disturbance/loss of habitat arising from capital and maintenance dredging activity	Low	Benthic Ecology	Low/High	Negligible/Minor	Not Significant	N/A
		Fish and Shellfish	Low	Negligible	Not Significant	N/A
Effects of increased suspended sediment concentrations and sediment deposition	Low	Benthic Ecology	Low/Medium	Negligible/Minor	Not Significant	N/A
		Fish and Shellfish	Negligible/Low	Negligible	Not Significant	N/A
Potential for resuspension of contaminated sediments	Scoped out of an assessment on the basis that seabed sediment analysis indicated that there are no chemical determinands that exceed the CEFAS Action Levels 1 or 2, and Canadian Threshold Effect Levels (TEL) or Probable Effect Levels (PEL), see Volume III, Appendix 8.1.					
Construction Effects						
Temporary disturbance/loss of habitat arising from displacement/compaction of the seabed by anchors and jack-up barge spud legs	Low	Benthic Ecology	Negligible/Medium	Negligible/Minor	Not Significant	N/A
		Fish and Shellfish	Low	Negligible	Not Significant	N/A
Permanent habitat loss arising from the placement of material on the seabed for the breakwater	Medium	Benthic Ecology	Benthic Receptors – Low Seagrass –High	Benthic Receptors – Minor Seagrass – Moderate	Benthic Receptors – Not Significant Seagrass – **Significant**	See Section 8.10.2
		Fish and Shellfish	Low	Minor	Not Significant	N/A
Effects of underwater noise arising from construction activities	Low	Fish and Shellfish	Low	Negligible	Not Significant	N/A
		Marine Mammals	Low	Negligible	Not Significant	N/A
Disturbance and collision risk to marine mammals from increased vessel traffic during construction	Effect was scoped out on the basis that there will be no significant increase in vessel traffic beyond the operational ferry crossings.					
Operational Phase						
	Medium	Benthic Ecology	Low	Minor (positive)	Not Significant	N/A

Description Of Effects	Magnitude Of Effects	Receptor	Sensitivity Of Receptor	Significance Of Effect	Significant /Not Significant	Residual Effects
Permanent habitat creation arising from the placement of material on the seabed for the breakwater		Fish and Shellfish	Low	Minor (positive)	Not Significant	N/A
Change in the hydrodynamic regime due to the presence of the breakwater	Effect was scoped out on the basis that there will be no significant changes to the hydrodynamic regime due to the presence of the breakwater, as assessed by Chapter 13: Coastal Processes.					

In addition to the above, a HRA has been undertaken to determine the potential for the Proposed Development to have a LSE on designated sites in the UK national network of sites ('European sites'). The potential for LSE could not be excluded at the screening stage for three European sites (Inner Hebrides and Minches SAC; Treshnish Isles SAC; and Eileanan agus Sgeiran Lios mor SAC.), without further evaluation, or the application of mitigation measures intended to reduce effects of the Proposed Development on the European sites concerned.

A subsequent assessment to inform a Stage 2 Appropriate Assessment of the implications of the Proposed Development on European sites allowed the introduction of measures intended to avoid or reduce the potential adverse effects of the Proposed Development on European sites. These measures ensure that the Proposed Development will not undermine the conservation objectives of the sites concerned, and as such will not adversely affect the integrity of any European site.

9 ORNITHOLOGY

9.1 Introduction

This chapter considers the likely significant effects on ornithological receptors associated with the construction, operation and decommissioning of the Proposed Development. The effects associated with the construction phase of the Proposed Development on ornithological receptors can be considered representative of reasonable worst-case decommissioning effects, therefore a separate assessment of the decommissioning phase has not been undertaken as part of this assessment.

The specific objectives of the chapter are to:

- Describe the ornithological baseline;
- Describe the assessment methodology and significance criteria used in completing the impact assessment;
- Describe the potential effects, including direct, indirect and cumulative effects;
- Describe the mitigation measures proposed to address likely significant effects; and
- Assess the residual effects remaining following the implementation of mitigation.

The assessment has been carried out by Ecologists with relevant accreditations (MCIEEM) of RPS. The assessment of ornithological effects follows the guidance produced by CIEEM (2018). This sets out the process for assessment as a series of stages;

- Describing the ornithological baseline in the Zone of Influence (ZoI) through survey and desk study;
- Identifying Important Ornithological Features (IOFs): these are the species of the highest ecological importance present in the ZoI;
- Determining the nature conservation importance of the IOFs present within the ZoI;
- Identifying and characterising the potential impacts on these IOFs, based on the nature of the construction, operation and decommissioning activities associated with the Proposed Development;
- Determining the magnitude of the impacts including consideration of the sensitivity of the ornithological feature and the duration and reversibility of the effect;
- Determining the significance of the impacts based on the interaction between the effect magnitude/duration, the likelihood of the effect occurring and the nature conservation value of the IOF;
- Identifying embedded mitigation that will counteract or avoid adverse impacts;
- Determining the residual impact significance after the effects of mitigation have been considered, including a description of any legal and policy consequences;

- Determining potential cumulative effects; and
- Identification of any monitoring requirements.

This chapter is supported by the following figures and technical appendices (see Volume III: EIAR Appendices):

- Figure 9-1: Nature Conservation Designated Sites in Proximity to the Application Site;
- Figure 9-2: Intertidal and Near Shore Survey Areas; and
- Appendix 9.1: Ornithology.

9.2 Assessment Methodology

9.2.1 Scope of Assessment

This report details the results of the near shore coastal surveys undertaken to inform the assessment of the Proposed Development, which is described in Chapter 3: Project Description.

The surveys were designed to assess the presence and use by protected and notable bird species of the intertidal and near shore coastal habitats within the Iona Breakwater development zone. The surveys focussed particularly on the qualifying species of coastal/marine designated sites of nature conservation interest associated with the Sound of Iona and wider area within the Seas of the Hebrides (shown in Figure 9-1 and Figure 9-2).

Given the coastal location of the Proposed Development, consideration was given to screening protected areas within foraging ranges of seabirds, using seabird ranging distances from Woodward *et al.,* (2019). Given that the Proposed Development is so small as a proportion of these foraging ranges, has such a small ZoI (including habitat footprint), and impacts being largely temporary (during construction), and there being so few individuals recorded within the survey area, the screening process completed concluded that the more distant sites designated for their ornithological features (Special Protection Areas (SPAs)) could be excluded from the assessment. Although within the Woodward *et al.,* (2019) foraging ranges of certain species (e.g., kittiwake and gannet) from these SPAs, the risk of any likely significant effects from the Proposed Development to these birds were concluded to be *de minimus* and therefore have not been considered further. SPAs within 30 km were given further consideration however, as a precaution (see Figure 9-1).

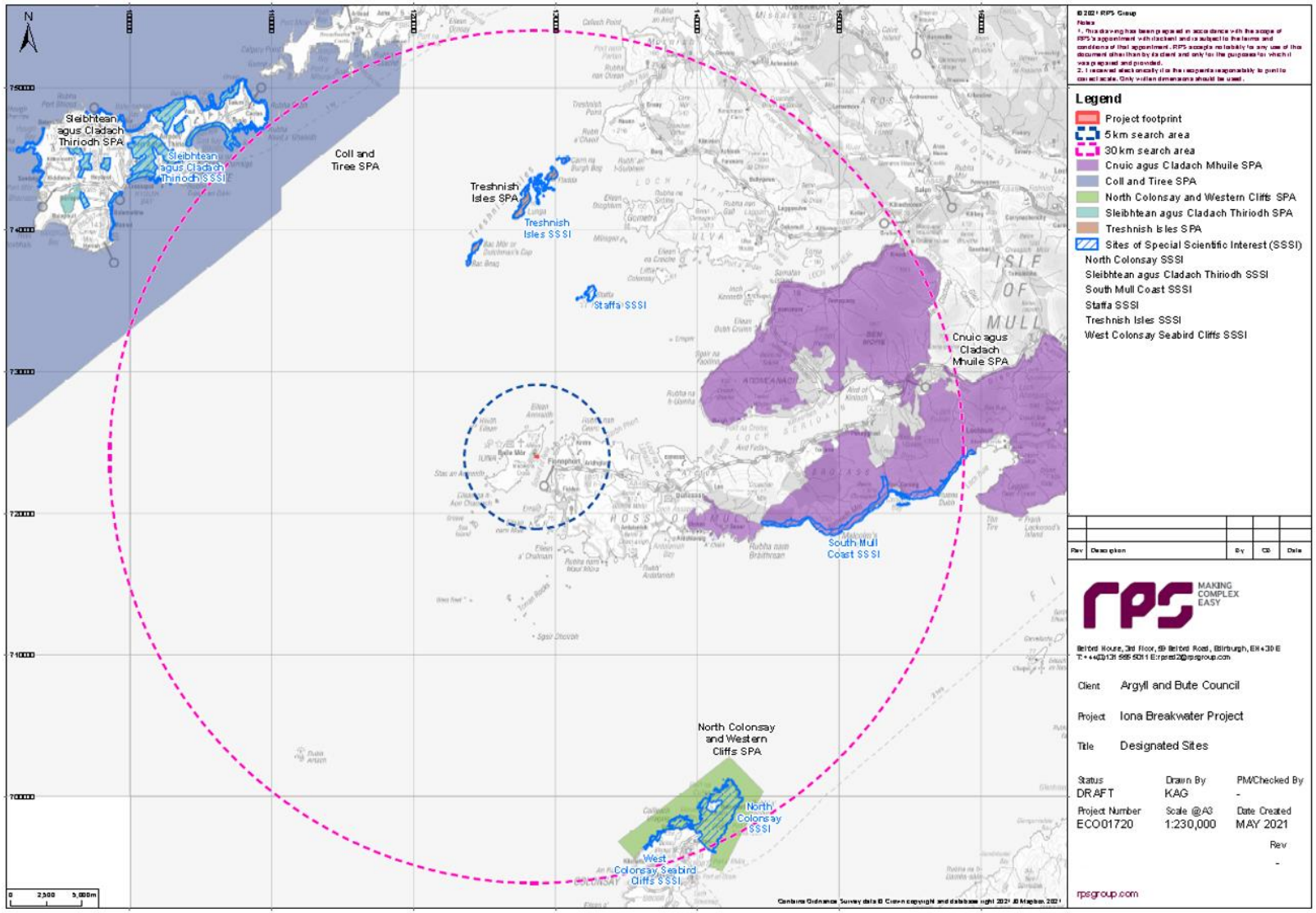

Figure 9-1 Location of sites of nature conservation interest in proximity to the Proposed Development

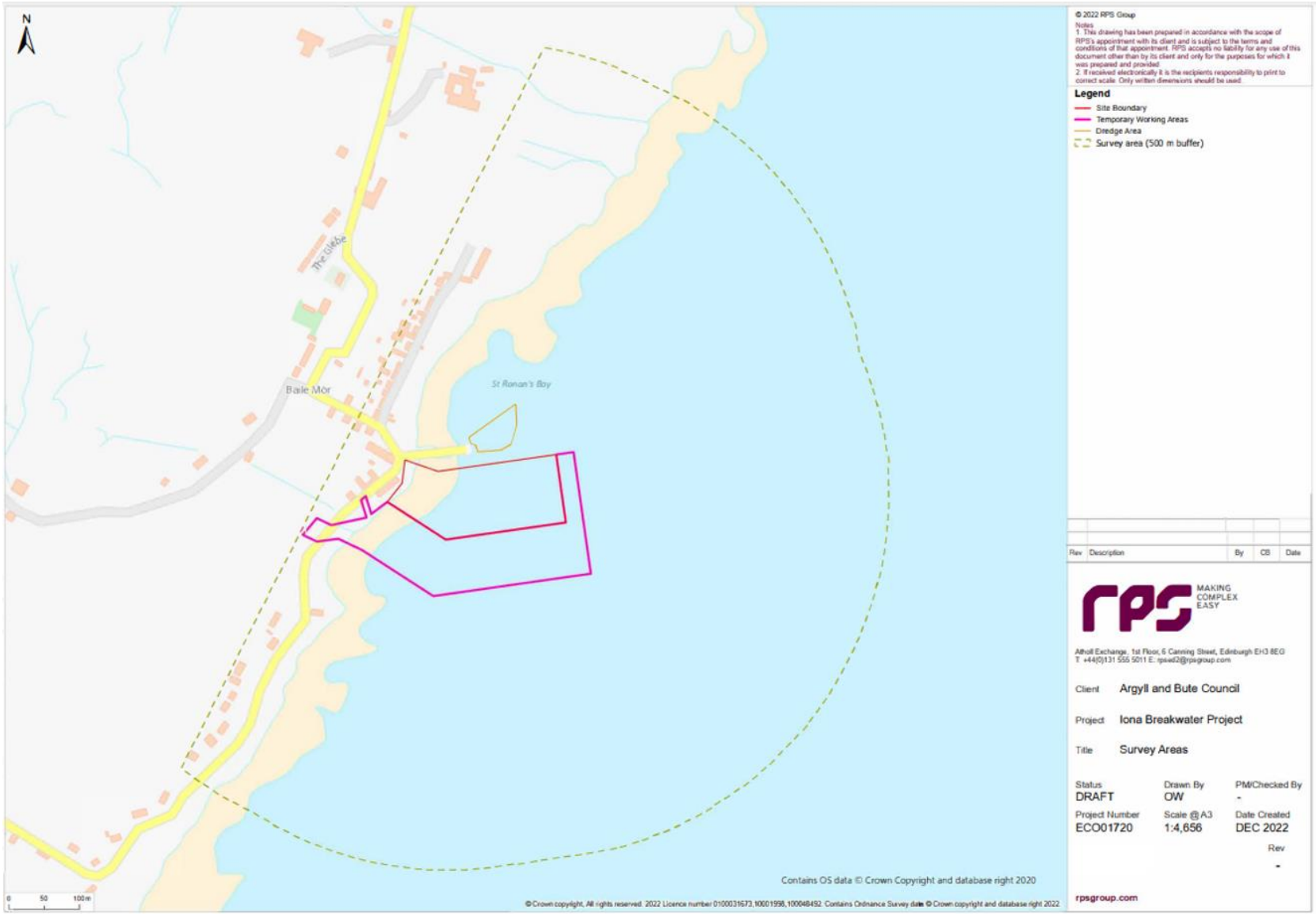

Figure 9-2 Survey Areas

The scope of the assessment has been informed by the guidelines/policies outlined below and the consultation responses summarised in Table 9-1:

- Environmental Impact Assessment Directive 2014/52/EU (the EIA Directive);
- Directive 2009/147/EC on the Conservation of Wild Birds (the Birds Directive);
- Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora (the Habitats Directive);
- The Conservation (Natural Habitats &c.) Amendment (Scotland) Regulations 2012, relating to reserved matters in Scotland;
- Wildlife and Countryside Act 1981 (as amended);
- The Nature Conservation Act (Scotland) Act 2004;
- The Wildlife and Natural Environment (Scotland) Act (2011);
- Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017, which transpose the EIA Directive into the Scottish planning system;
- Planning Circular 1/2017 – Environmental Impact Assessment regulations (Scottish Government 2017);
- PAN 51: Planning Environmental Protection and Regulation (revised 2006);
- PAN 60: Planning for Natural Heritage (Scottish Government 2000);
- Nature Conservation: Implementation in Scotland of the Habitats and Birds Directives: Scottish Executive Circular 6/1995 as amended (June 2000);
- Scottish Planning Policy (SPP);
- The State of the UK's Birds 2020;
- Guidelines for Ecological Impact Assessment in the UK and Ireland (CIEEM 2018);
- Bird Monitoring Methods; and
- Birds of Conservation Concern (BoCC) 5: the population status of birds in the United Kingdom, Channel Islands and the Isle of Man.

9.2.1.1 Consultation

Table 9-1 summarises the consultation responses and provides information on where and/or how they have been addressed in this assessment.

Information on the Scoping and Consultation processes can be found in Chapter 5.

Table 9-1 Consultation Responses

Consultee and Date	Consultation	Issue Raised	Response / Action Taken	Where issue is addressed in EIA Report
NatureScot	Ornithology survey scope	No response	N/A	N/A

The findings of these surveys have been used to inform the EIA for the Proposed Development.

This chapter also considers the potential for likely significant effects on the qualifying species of the SPAs and the additional bird species assessed to be a sensitive IOF of international, national or regional importance.

9.2.1.2 Potential Effects Scoped Out

The scope of this assessment takes account of the committed mitigation measures both incorporated into the design and those standard construction and decommissioning mitigation measures incorporated into the Proposed Development, as described in Chapter 3: Project Description. No other issues have been scoped out of the assessment.

9.2.2 Assessment Methodology and Significance Criteria

9.2.2.1 Method of Baseline Characterisation

Extent of the Study Area

The study area for the purpose of the assessment comprises a set of buffers from the Proposed Development site that are of varying distance, depending on the nature of the potential receptor. These include:

- International designated sites within 30 km of the site boundary designated for ornithological features (e.g., SPAs/ Ramsar sites);
- Sites designated for all other ornithological features with 5 km, where there may exist ecological connectivity between the Site and qualifying bird populations (e.g., Sites of Special Scientific Interest (SSSI), Local Nature Reserves (LNR) and Sites of Importance for Nature Conservation (SINCs);
- Records of notable and protected species within 2 km; and
- Monthly Through the Tide Counts (TTTC) for intertidal and nearshore birds within 500 m.

These study areas are presented in Figure 9-2.

Desk Study

A request was made to the Argyll and Bute Local Records Centre for all records of Notable and Protected Species within 2 km of the site within the last 10 years.

The desk study also sought to collate relevant information on all sites with designated ornithological features including Ramsar sites, SPAs, SSSIs and SINCs where there may be existing ecological connectivity between the Proposed Development and qualifying bird populations. This included a review of international sites with qualifying mobile species whose range (e.g., foraging, migratory, overwintering, breeding or natural habitat range) overlapped with the Proposed Development. For example, during the breeding season, the mean-maximum foraging range of gannet is 315.2 km (Woodward *et al.,* 2019) therefore there is potential for gannets observed within the Proposed Development to originate from SPA colonies located within that distance. However, it should be noted that most seabirds feed mostly offshore, with the exception of terns which may feed close inshore.

A search for relevant designated sites was made using online sources, allowing the identification of all designated sites with qualifying ornithological interests. The search radius of 30 km for internationally designated sites is consistent with published connectivity distances, across which any bird populations may have interaction with the Site. The online sources used to obtain this information were:

- NatureScot Sitelink[17];
- Joint Nature Conservation Committee (JNCC) website[18];
- Argyll and Bute Council open data website[19]; and
- Defra MAGIC website[20].

In addition, information from both confidential and public domain survey data, scientific publications, grey literature (i.e., information not produced or controlled by commercial publishers, e.g., policy documents, web content, conference proceedings, etc.) and ES/EIA/Consultations for nearby developments was searched to build understanding of ornithological interests in and around the Proposed Development.

The British Trust for Ornithology (BTO) Wetland Bird Survey (WeBS) website was also consulted to identify if count data was held for the site and immediate environs. No relevant data was held pertaining to the Proposed Development.

Field Survey

The intertidal and nearshore surveys comprised a programme of monthly surveys carried out over a period of five months between April and August 2021 inclusive.

The survey area comprised a 500 m buffer area around the Proposed Development area in the intertidal and nearshore habitats. During each survey the number of birds present along the foreshore and near

[17] https://sitelink.nature.scot/home

[18] https://jncc.gov.uk/our-work/list-of-spas/

[19] https://data-argyll-bute.opendata.arcgis.com/datasets/open-data-local-nature-conservation-site

[20] https://magic.defra.gov.uk/

shore coastal waters was counted. Observations of bird species (including the numbers of each species in a given location and behaviour – see below) were plotted onto a field map using standard BTO species codes and notation.

Surveys were scheduled to cover a range of different tidal conditions (high, low and mid-tide; spring and neap tides) throughout the survey programme. Survey methods were based on the high tide (core count) methodology of the BTO/ JNCC/ Royal Society for the Protection of Birds (RSPB)/ Wildfowl and Wetlands Trust (WWT) Wetland Bird Survey (WeBS) scheme (Musgrove *et al.* 2003 and Holt *et al.* 2011). This involved the surveyor counting birds from vantage points along the coast using binoculars and a telescope. In addition to the location and number of birds, notes were also made as to whether they were foraging, roosting or loafing. Flying birds were also recorded, although for the purposes of this report only those birds which were obviously using the habitats of the survey area (e.g., terns or gannets, as opposed to birds simply flying over/through the sectors), have been included here.

Field records were transferred to a Geographic Information System (GIS). This produced accurate information on the distribution of birds within the study area and enabled maps to be produced so that areas of ornithological importance could be identified.

Weather conditions including wind speed (using the Beaufort Scale), cloud cover (estimated as eighths or octas of the sky), visibility and temperature were also recorded as well as sources of disturbance to birds encountered during surveys. Details of the intertidal and near shore coastal bird survey effort is presented in Table 7-1 of the Technical Appendix 7.1: Ornithology.

9.2.2.2 Assessment Criteria and Assignment of Significance

The method of assessment for this Chapter follows that of CIEEM (2018) guidance. The term IOFs is used for those species and habitats identified in the assessment. For each impact with the potential to affect the relevant IOFs, the assessment considers the following parameters:

- Whether the impact is positive or negative in its influence;
- The extent of the impact;
- The magnitude, duration and timing of the impact; and,
- The impact's frequency and ease of reversibility.

The assessment similarly includes consideration of any proposed mitigation to avoid or minimise the effect of any potential impact to the relevant IOFs and identifies any potential cumulative impacts from surrounding developments prior to determining the residual significance of any effect, be this negligible, minor, moderate or major. Effects can be either adverse or beneficial.

Criteria for Assessing the Sensitivity of Receptors

The identification of IOFs and assessment of their level of importance is guided by a range of criteria, as defined in Table 9-2. These criteria are a guide and not definitive; ecologists should apply judgment based on knowledge of the region and populations involved.

Table 9-2 Approach to Valuing Ecological Receptors

Level of importance	Example of IOF
International	Species listed as qualifying feature of an internationally designated site (SPA/Ramsar Site, including candidate sites). Birds listed as Annex I/Schedule I. This includes birds outside of protected areas, particularly when clear connectivity with internationally designated populations or where population at levels with sufficient conservation importance to meet criteria for SPA selection.
National*	A species listed as a qualifying feature of a nationally designated site (e.g., SSSI).
Regional*	Species that are subject to conservation action plans e.g., Scottish Biodiversity List (SBL)/UKBAP/LBAP. Birds that form part of the cited interests of a LNR, or some local–level site designation.
District*	Bird species where a significant proportion (greater than 1%) of the sub-region/district population uses the Site.
Local*	A species or habitat that is of nature conservation value in a local context only, with insufficient value to merit a formal designation (e.g., Red and Amber-listed BoCC species).
Negligible	Common and widespread species of little or no conservation importance (Green-listed BoCC species).
*"National" refers to the whole of the UK; "Regional" refers to Scotland, "District" refers to Argyll and Bute and "Local" refers to the Project site and immediate environs	

For the purposes of this assessment, the important populations described in Table 9-2 are graded as High, Medium and Low sensitivity as follows:

- High: Site population is of International / National importance;
- Medium: Site population is Regional / District importance;
- Low: Site population is Local / Negligible importance.

Whilst it is important to assess the importance or value of the species found during baseline surveys, the most critical consideration with regards to the EIA is the importance of the Proposed Development for these species at a population level. This is because the EIA process requires an assessment of impacts on the populations using the site of the Proposed Development.

Therefore, in the following assessment, each IOF present at the Proposed Development site is assigned a level of importance from International to Negligible. The Site level of importance is a function of the species value in combination with the size of the population that occupy or are reliant on, the Site. For example, if an internationally important species has been recorded at a site only once, or only over-flying the survey area, then the Site level of importance would be considered negligible.

Criteria for Assessing the Magnitude of Change

The magnitude of change is described in the EIAR as a quantitative value as far as is practicable. For example, magnitude of change can be quantified as a percentage decline of a population or as area of habitat from which birds will be displaced.

The magnitude of change resulting from a given development will differ between species and populations, and therefore assessing the magnitude requires consideration of a species' behavioural

sensitivity, population size and condition (among other considerations, notably (relevant to this site), the degree or habituation to pre-existing background levels of human activity – walkers, dog walkers, fishing vessel, ferries and recreational craft). Examples include different species' responses to disturbance, and the greater vulnerability of small, declining and isolated populations to the impacts of additional pressures.

In addition, the magnitude of an impact is influenced by the duration of the impact, irreversibility and cumulative effects of other impacts. With regard to the duration of an impact, it can be defined as permanent (beyond 25 years duration), long-term (15-25 years), medium-term (5-15 years) or short-term (up to 5 years). Again, knowledge of the populations' ability to recover from impacts is required to assess the duration of the effect. For example, mortality events for species with relatively small population sizes and low reproductive output (such as raptors) will take considerably longer than abundant and widespread species that have high output and will fill vacant territories and replace numbers rapidly (e.g., small passerines such as skylark and meadow pipit).

Consideration of the above factors allows quantification as to the magnitude of effect. Table 9-3 presents magnitude at four levels, from major to negligible and this is the scale by which effect or change is quantified in this chapter. Note that the magnitude of effect is sometimes referred to as magnitude of change, as the level of effect can be quantified in terms of change in population, range etc. Note that some of the lower magnitudes of effect can typically also be applied to beneficial (positive) impacts.

Table 9-3 Defining the Magnitude of Effect on Important Ornithological Features

Magnitude	Typical Descriptors of Effect
Major	Would cause the loss of a major proportion or whole feature/population, or cause sufficient damage to a feature so as to immediately compromise long-term viability. Irreversible. For example, more than 20% decline in population an area is able to support in the long-term.
Moderate	Effects that are detectable in short and longer-term, but which should not alter the long-term viability of the feature/population, for example 10-20% decline in population an area is able to support.
Minor	Minor effects, ether sufficiently small-scale or short-duration, which cause no long-term decline in feature/population, for example less than 10% decline in population an area is able to support.
Negligible	A potential impact that is not expected to affect the feature/population in any meaningful way, with no detectable decline in population/distribution. Any change from baseline conditions predicted at <1%.

Criteria for Assessing Cumulative Effects

Cumulative Impact Assessment (CIA) requires the availability of EIA Report chapters and appraisals for adjacent developments which have concluded effects on the same IOFs that this chapter has identified to be subject to effects from the Proposed Development. This includes a consideration of other developments that are operational, consented, or for which a valid application has been submitted.

Varying degrees of access to these appraisals, and their differing degrees of detail, divergent survey design and effort, and changes in guidance over time can all be obstacles to achieving a completely systematic cumulative impact assessment. Furthermore, some schemes may have been in operation for many years, in which case contemporary data would not be available.

These considerations aside, for cumulative impacts on avian receptors, NatureScot guidance was followed.

Criteria for Assessing Significance

Having followed the process of assessing the importance of IOF populations and quantifying the magnitude of impact (through consideration of the sensitivity of the population and duration of effect), the final stage of the EIA process is to establish the significance of the effect.

CIEEM (2018) guidance requires a determination of whether an effect is significant or not significant. Significance of an effect is determined by a combination of the magnitude of the impact and the importance of the population/ feature.

This chapter uses the definition of a significant effect, as defined by the EIA Regulations, as *an effect that threatens the integrity of a designated ecological feature of international importance*, such as the viability of SPA populations.

CIEEM discourages the use of matrices for determination of significant effects, advising that professional judgement is to be used. However, a matrix for determining significant effects is often requested by stakeholders, and it is often useful in illustrating the process behind determination of significance.

Table 9-4 shows the matrix used here for determination of significance. This is a generic matrix (for all EIA considerations) and notes have been added to illustrate the considerations for birds.

Table 9-4 Matrix for Determination of Significant Impacts

		Magnitude of change			
		Major	**Moderate**	**Minor**	**Negligible**
Sensitivity	**High**	Major	Major/ Moderate	Moderate	Moderate/Minor
	Medium	Major/ Moderate	Moderate	Moderate/ Minor	Minor
	Low	Moderate	Moderate/ Minor	Minor	Minor/ Negligible

Sensitivity: Conservation importance of IOF
High: Site population is of **International / National importance**
Medium: Site population is **Regional / District importance**
Low: local: Site population is **Local / Negligible importance**
Magnitude of change: Size of effect on population/feature. Assessed with consideration of sensitivity of species/feature to impact, duration of effect and ability of species/feature to recover (among other factors)
***Potentially* significant impacts are in dark shading**

Limitations and Assumptions

The desk study data is third party controlled data, purchased for the purpose of this report only. RPS cannot vouch for its accuracy and cannot be held liable for any error(s) in these data.

The assessment of likely significant effects is based, as much as possible, on published scientific research and the most current known population data. When empirical data is lacking or insufficient, the judgement of experienced ecologists with detailed knowledge of animal behaviour and ecology is required. Any assumptions made during this assessment are clearly stated. With regard to uncertainty

in the magnitude of adverse effects, the precautionary principle is applied; i.e., lack of full scientific certainty should not be used as a reason for postponing or failing to take measures to mitigate these adverse effects.

9.3 Baseline Scenario

9.3.1 Current Baseline

9.3.1.1 Desk Study

Designated Sites

The desk study identified the following three international sites with seabirds or migratory waterbirds as qualifying interest features within 30 km of the Proposed Development (Figure 9-1 and 9-2). These sites are:

- Treshnish Isles SPA;
- Coll and Tiree SPA; and
- North Colonsay and Western Cliffs SPA.

A fourth SPA, Cnuic agus Cladach Mhuile, was located within the 30 km search radius, to the east of the Proposed Development. Cnuic agus Cladach Mhuile SPA is a large, predominantly upland site on the island of Mull in the Inner Hebrides, designated for its breeding population of golden eagles.

No other statutory designated sites (e.g., SSSIs) were located within a 5 km search radius of the Proposed Development.

Further details of each of these SPAs can be found in the Technical Appendix 9.1: Ornithology.

The SPA qualifying species that were either recorded using the Site during baseline surveys or were reported from the Site in desk study sources are described in Section 9.4 of the Technical Appendix 9.1: Ornithology.

9.3.1.2 Field Surveys

Bird Survey Results

A total of 16 bird species were recorded during the surveys undertaken between April and August 2021, of which two were qualifying species for SPAs within 30 km: black-legged kittiwake and great northern diver. The most commonly observed species recorded was greylag goose (peak count 130 individuals in July 2021) and shag (peak count 114 individuals in August 2021). Other species were generally observed in numbers between 1 and 20 individuals.

Black-legged kittiwake (one individual) was recorded on only one occasion in August, along the intertidal foreshore.

Great northern diver was recorded on just two occasions and were represented by no more than two individuals (recorded in April).

All other species recorded in the survey area were typically coastal birds which included gulls, other seabirds (e.g., shags, cormorant and Manx shearwater) and waterfowl (e.g., Canada and greylag geese).

All of these species recorded are common and widespread and regularly occur in the coastal waters of west Scotland either throughout the year, or during the breeding or non-breeding season. All species were recorded in very low or low numbers compared to their national breeding and wintering populations, revealing the site to be of local importance for these species.

Further details of the results of the field surveys undertaken is included in the Technical Appendix 9.1: Ornithology.

9.3.1.3 Identification of Important Ornithological Features

The IOFs included within the assessment are those species recorded during the surveys that could be potentially affected by the Proposed Development. Species that were recorded in very small numbers or very infrequently during the baseline surveys are excluded because the risk of a significant effect on their populations is negligible.

The importance of ecological features is dependent upon their biodiversity, social, and economic value within a geographic framework of appropriate reference (CIEEM, 2018). IOFs have been identified based on biodiversity importance, recognised through international or national legislation, or through local, regional or national conservation plans, and on assessment of value according to the functional role of the species. This includes:

- Species listed on Annex 1 of the Birds Directive;
- Species populations which are of international importance in Scotland; and
- Populations occurring within the Proposed Development area which are considered to be of regional, national or international importance.

Geographical thresholds were defined as follows:

- International importance: a peak population estimate within the survey area which exceeds 1% of the international population estimate;
- National importance: a peak population estimate within the survey area which exceeds 1% of the national population estimate; and
- Regional importance: a peak population estimate within the survey area which exceeds 1% of the regional population estimate.

Of the potential receptors which could be impacted, a number were discounted:

- Designated sites (within 30 km) – the closest international site to the Proposed Development is Treshnish Isles SPA, 14.3 km to the north of the site. SPAs will not directly be impacted by the Proposed Development. Due to the distance from site, there are not anticipated to be any indirect impacts relating to noise disturbance. It is therefore considered that activities at the Proposed

Development (including construction) will not impact any SPA located within the 30 km search area (or beyond);

- Designated sites with qualifying features/interests within mean-maximum foraging range – the Proposed Development lies within the mean-maximum foraging range of a number of qualifying features/interests of SPAs outwith the 30 km search radius, for example gannet (mean-maximum foraging range of 315.2 km) which is a qualifying feature of Ailsa Craig SPA and St Kilda SPA, located 174 km and 234 km from the Proposed Development respectively. Given the very low number of individual birds recorded during the survey and the nature of the Proposed Development (i.e., the works are of a small-scale and local spatial extent), the impact on qualifying features of these SPAs is considered *de minimis* and therefore not considered further in this assessment; and
- Seabirds – with the exception of gull species, seabirds are obligate marine foragers and therefore the Proposed Development is unlikely to affect foraging opportunities. Shag and cormorant are the only species likely to consistently forage in the near shore zone, the remaining species are highly pelagic foragers. The near shore area of disturbance is small in size and distant from colonies and seabirds have a great deal of flexibility in their foraging behaviour.

Therefore, it is expected that adverse effects on seabirds would be negligible, and they are scoped out of further consideration in this assessment.

Further details of species scoped out of the assessment are provided in the results sections of the Technical Appendix 9.1: Ornithology.

The following IOFs have therefore been identified for the main Proposed Development site and are considered further in the assessment: greylag goose, oystercatcher and shag.

9.3.2 Future Baseline

The Overview Report for Climate Change Projections and factsheets (MOHC, 2018) indicate that in general, warmer, wetter winters and hotter, drier summers are predicted, though of course still with natural variations in that pattern from year to year. No clear trend in wind speeds or storms is predicted, though the data currently published cannot make projections for local conditions and wind gusts. Sea levels are predicted to rise overall with increases in extreme coastal water levels.

In the short term, between the time of survey and the start of construction, there are no predicted changes to the baseline scenario. In the longer term, in the absence of development it is likely that the same intertidal habitats will be present in the survey area but in different proportions due to increased fluctuations in sea level and a gradual increase in coastal water levels. This could lead to a loss of intertidal habitats and modification of subtidal zone habitats which wintering, migratory and breeding wildfowl and waders rely upon.

9.3.3 Summary of Sensitive Receptors

Table 9-5 summarises the IOF's to be included in the assessment and their sensitivity.

Table 9-5 Summary of Receptor Sensitivity

Receptor	Sensitivity	Justification
Greylag goose	Low	BoCC Amber species, recorded in moderate abundance within the site boundary.
Oystercatcher	Medium	BoCC Amber species, recorded in moderate abundance within the site boundary during both low and high tide states.
Shag	Medium	BoCC Red species, recorded in high abundance within the site boundary.

9.4 Description of Likely Significant Effects

During construction, all works will be undertaken offshore using barges to ship in materials and undertake the construction works. Welfare facilities will be located on the barge, however there will likely be a small compound established within the Temporary Work Area (Figure 9-2). Full details of the construction methods to be employed are outlined in Chapter 3, Section 3.2.

9.4.1 Potential Effects

The following potentially significant impacts have been identified for the works associated with the construction phase of the Proposed Development:

- Temporary disturbance/loss of habitat arising from activities within the terrestrial area of the Temporary Work Area (namely the establishment of a work compound and storage of rock);
- Temporary disturbance/loss of habitat due to airborne noise and visual disturbance from construction activities;
- Permanent loss of habitat arising from reclamation of seabed during the construction of a new rock armour breakwater to the south of the existing slipway; and
- Temporary effects on prey species due to underwater noise arising from construction activities (notably dredging and vessel noise), increased suspended sediment concentrations and sediment deposition.

The following potential impacts have been identified during the operational phase of the Proposed Development:

- Long-term increase in disturbance to habitat arising from increased levels of marine activity due to improved ferry services;
- Long-term increase in disturbance of habitat due to airborne noise and visual disturbance associated with the increase in terrestrial activity; and
- Long-term effects on prey species due to noise arising from vessels and potential for pollution events linked with potential increased levels of marine activity.

9.4.2 Assessment of Construction Effects

The predicted effects on the assessed IOFs at the site comprise disturbance of short duration during construction. Other effects of habitat loss and/or population decline (of wintering populations) are considered to be absent or negligible. Such effects are considered highly improbable as:

- There would be limited impacts on the extent or condition of intertidal habitat during construction or operation. Therefore, effects by loss of intertidal foraging and roosting habitat for waders will be negligible; and
- There are no bird populations for which sites are designated within 30 km of the Proposed Development where effects on survival are considered likely (either direct impacts on breeding site or indirect effects on foraging adults).

Therefore, discussion and assessment of potential effects on IOFs is focussed on the effects of disturbance during construction.

The potential responses to disturbance by estuarine birds include the following behaviours:

- Redistribution of birds (either short-term or complete avoidance/abandonment);
- Reduced food intake; either due to reduced foraging time or by displacement from high quality foraging sites;
- Increased energy expenditure due to energetic cost of being flushed from roost /feeding sites and, where occurring, redistribution to new locations;
- Physiological cost from increased stress; and
- Direct mortality.

The response of roosting (and feeding) waders to disturbance at the Proposed Development site is difficult to predict, as studies have revealed that this is affected by the species involved, type of disturbance, degree of habituation, availability of alternative roost/feeding locations, and other factors such as the individual bird's condition and need for feeding or resting.

Kirby *et al.* (1993) studied disturbance effects on waders roosting at the Dee Estuary, including oystercatcher. Roosting oystercatcher exhibited a 'medium' response to disturbance (redistributing to alternative roosts outside the study area but within the estuary).

Several studies show that the behavioural response to disturbance is mediated significantly by habituation to the source of disturbance. For example, Urfi *et al.* (1996) found that oystercatcher 'escape distance' (i.e., the distance at which birds take flight on approach of people) reduced when people are present more frequently, which is likely to be true at this location given the existing ferry services and regular anthropogenic disturbance. However, habituation to one source of regular disturbance would not necessarily lead to greater tolerance of novel disturbance, such as construction activity.

Studies at major construction sites within estuaries has been demonstrated to lead to reduced densities of waders and wildfowl at Cardiff Bay (Burton *et al.*, 2002). Noise is often a significant source of

construction-related disturbance, particularly where activities such as piling are undertaken. Kusters *et al.* (1998) found that the strength of reaction to noise and other disturbance was greater when large numbers of birds are closely aggregated (such as roosting birds).

Pollution events could result in a slight reduction of prey availability and injury/fatality to species present using the site. However, the magnitude of change in relation to injuries or fatalities is considered to be minor.

The impact of disturbance caused by construction activities is predicted to be of local spatial extent, short-term duration, and reversible. Given that there is suitable alternative roost and foraging locations within a short distance of the location of proposed construction activity, the overall magnitude of change for all species is assessed as minor or negligible.

When considering the conservation value and low sensitivity at the site level, the overall assessment is deemed to be minor or negligible adverse. In terms of the EIA Regulations this is deemed a non-significant effect.

The impact matrix for the IOFs assessed is presented in Table 9-6 below.

Table 9-6 Impact assessment for construction effects on IOFs

Receptor	Effect	Sensitivity to effect	Receptor sensitivity	Magnitude of change	Impact	Significance of impact
Greylag goose	Disturbance at foraging and roosting locations; short duration	Low	Low	Low/negligible	Minor/Negligible	Not significant
Oystercatcher	Disturbance at foraging and roosting locations; short duration	Medium	Low	Low/negligible	Minor/Negligible	Not significant
Shag	Disturbance at foraging locations; short duration	Medium	Low	Low/negligible	Minor/Negligible	Not significant

9.4.3 Assessment of Operational Effects

During the operational phase there is the potential for disturbance to breeding and wintering birds through human presence on the site and from an increase in marine activity due to the improved ferry services. It is likely that birds using the site will be tolerant to disturbance from the existing ferry services and therefore no additional impacts above those assessed for the construction stage are considered likely. This is also considered the case for prey species.

Due to the low likelihood of this work disturbing protected species these potential impacts are assessed as being of low magnitude and their effects as of negligible significance. In terms of the EIA Regulations this is deemed a non-significant effect.

9.5 Mitigation Measures

9.5.1 Mitigation During Construction

The only effect predicted to have a minor impact is disturbance during construction. The greatest magnitude of change is anticipated for waders and waterfowl foraging in near shore waters and for roosting aggregations of those individuals at high tide. Therefore, the following mitigation describes methods that will reduce disturbance for these IOFs, which are additional to standard practice construction environmental management, as outlined in the Construction Environmental Management Plan (CEMP).

The most highly sensitive IOFs are non-breeding populations and therefore measures to reduce disturbance around the nearshore area shall be undertaken as far as is practical during the period between September and April.

Noise from construction activities has been identified as a significant source of disturbance for roosting (and breeding) birds. Methods to attenuate noise will be utilised, notably the use of sound walls and any modification of drilling rigs that would reduce noise levels. Works undertaken in the vicinity of roosting birds or near occupied nests of sensitive species will be supervised by a suitably qualified and experienced Ecological Clerk of Works (ECoW) to determine if additional measures may be required. It is assumed here that no significant noise-creating activities will be undertaken in the marine environment (drilling, piling etc).

Near-shore vessel-based activities should aim to reduce disturbance to foraging seabirds and waterfowl, particularly if works coincide with the winter period when divers, grebes and sea duck may be present.

9.5.2 Mitigation During Operation

No further mitigation is anticipated to be required for the operational phase of the Proposed Development. Documentation should be reviewed and updated throughout the construction phase if further effects or mitigation are identified.

9.6 Potential Cumulative Effects

The above sections have considered the implications of the Proposed Development on IOFs in isolation from the potential effects of other plans and projects. The CIEEM (2018) guidelines also require that the Proposed Development be assessed cumulatively, so any cumulative effects can be identified.

Chapter 20 summarises the criteria for selecting the list of projects to be considered. Two projects have been identified in the vicinity of the Proposed Development. These are listed below:

- The Fionnphort Breakwater and Overnight Berthing Project c.1.3 km to the east. No assessment has been made in respect to this development as yet, but it is anticipated that the impacts would be of a similar nature to the Proposed Development. Due to the distance and separation of the two

developments by the Sound of Iona, it is unlikely that any in-combination effects on IOFs would occur;

- Cable installation – Iona to Fionnphort c.900 m to the south. The project involves the installation of fibre optic cable and is proposed in the first half of 2023. No information on the potential impacts of this work on birds was available through the Marine Scotland website[21]. Given the distance between the sites and the presence of alternative foraging habitats along the coastline and inland, it is considered that that any in-combination effects would be negligible.

9.7 Residual Effects

9.7.1 Residual Construction Effects

Following implementation of the mitigation outlined in Section 9.5 and Technical Appendix 9.1, the magnitude of the impact has been assessed as minor. When considering the conservation value and low sensitivity at the site level, the overall assessment of effects is deemed to be minor to negligible. In terms of the EIA Regulations this is deemed a non-significant effect.

9.7.2 Residual Cumulative Effects

Following implementation of the mitigation outlined in Section 9.5, it is considered that in-combination effects relating to ornithology would be of negligible magnitude and their effects as of minor significance. In terms of the EIA Regulations this is deemed a non-significant effect.

9.8 Conclusions and Summary of Effects

In summary, the only predicted effect on sensitive IOFs is disturbance during construction. Species regarded as particularly sensitive to disturbance are waders and waterfowl at high-tide roosts and foraging areas and shag, which were recorded in moderate abundance in the near shore zone.

Due to the localised and temporary nature of the activities and the small number of birds affected as a result, these were considered to be of minor to negligible adverse impact.

In addition to the above, a HRA has been undertaken to determine the potential for the Proposed Development to have a LSE on designated sites in the UK national network of sites ('European sites'). The initial screening process (Stage 1: Screening) did not identify any sites designated for ornithological features to be taken forward for determination of LSE via a Stage 2 Appropriate Assessment.

[21] Marine Licence Application - Cable Installation - Iona to Fionnphort - 00009614 | Marine Scotland Information

10 TERRESTRIAL NOISE & VIBRATION

10.1 Introduction

This chapter outlines the noise and vibration impact assessment for the Proposed Development, and assesses the potential impacts and likely significant effects of noise and vibration associated with the construction of the Proposed Development.

During the construction phase, there is potential for noise impacts at the nearest noise sensitive properties from the use of associated construction plant and equipment. The effect of construction noise has been assessed in full within this noise and vibration chapter. The construction noise targets are set out along with the assessment methodology and results of the construction noise predictions. Construction noise mitigation measures are detailed such that noise targets are met throughout the construction phase.

The specific objectives of the noise and vibration assessment are to:

- Describe the existing noise baseline;
- Define the assessment methodology and significance criteria used in completing the noise and vibration impact assessment;
- Describe the potential effects, including direct, indirect and cumulative effects;
- Describe the mitigation measures proposed to address the likely significant effects; and
- Assess the residual effects remaining following the implementation of mitigation.

This Chapter is supported by the following Volume III Technical Appendices:

- Appendix 10.1: Noise Monitoring Methodology;
- Appendix 10.2: Noise Monitoring Location;
- Appendix 10.3: Baseline Noise Monitoring Survey Data;
- Appendix 10.4: Construction Noise Receptors; and
- Appendix 10.5: Construction Noise Assessment.

Operational vibration affecting construction noise receptors has been scoped out as there are no known significant vibration sources associated with the Proposed Development. There are no significant operational vibration impacts. Baseline vibration monitoring was not undertaken within the Proposed Development site.

10.2 Assessment Methodology

10.2.1 Noise Policy and Guidance

The noise assessment has considered the following relevant policy and guidance documents:

- **Institute of Environmental Management and Assessment (IEMA) Guidelines for Environmental Noise Impact Assessment (IEMA, 2014);**

IEMA noise impact assessment guidelines address the key principles of noise impact assessment and are applicable to development proposals where noise effects are likely to occur.

The guidelines provide specific support on how noise impact assessment fits within the Environmental Impact Assessment (EIA) process. They cover:

- how to scope a noise assessment;
- issues to be considered when defining the baseline noise environment;
- prediction of changes in noise levels as a result of implementing development proposals; and
- definition and evaluation of the significance of the effect of changes in noise levels (for use only where the assessment is undertaken within an EIA).

The guidelines define core methods and techniques, used within the noise impact assessment process, and endeavour to highlight their limitations, where relevant. They can be applicable to all stages of a project, from construction through operation to restoration and decommissioning.

- **Scottish Government Planning Advice Note (Scotland) PAN 1/2011 and Technical Advice Note;**

The Planning Advice Note (Scotland) PAN 1/2011 provides advice on the role of the planning system in helping to prevent and limit the adverse effects of noise. It should be read in conjunction with "Planning Guidance (Scotland): Planning Policy, Technical Advice Note (TAN) and circulars.

"This note provides advice on how the planning system can be used to minimise the adverse impact of noise without placing unreasonable restrictions on development or adding unduly to the costs and administrative burdens of business."

It includes details of the legislation, technical standards and codes of practice for specific noise issues. The PAN promotes the principles of good acoustic design and a sensitive approach to the location of new development. It promotes the appropriate location of new potentially noisy development, and a pragmatic approach to the location of new development within the vicinity of existing noise generating uses, to ensure that quality of life is not unreasonably affected, and that new development continues to support sustainable economic growth. Environmental Health Officers and/or professional acousticians should be involved at an early stage in development proposals which are likely to have significant adverse noise impacts or be affected by existing noisy developments.

The Environmental Noise (Scotland) Regulations 2006 transposed the European Directive 2002/49/EC (the Environmental Noise Directive) into Scottish law. The Regulations affect large urban areas, major transport corridors and major airports. They require Scottish Ministers and airport authorities to manage noise through a process of strategic noise mapping and noise action plans. In the areas affected by the Regulations, planning authorities have a role in helping to prevent and limit the adverse effects of

environmental noise. Areas affected by the Regulations can be seen on the Scottish Noise Mapping website.

- **British Standard BS5228 BS 5228:2009+A1:2014 Noise and Vibration Control on Construction and Open Sites;**

BS 5228 consists of two parts and covers control of noise and vibration for persons living and working in the vicinity of construction and open sites. The standard recommends procedures for noise and vibration control in respect of construction operations and for architects, contractors and site operatives, designers, developers, engineers, local authority environmental health officers and planners. This guidance document has been used for the assessment control of construction noise from the Proposed Development.

British Standard BS5228: 2009+A1:2014, Code of Practice of Noise and Vibration Control on Construction and Open Sites Part 1: Noise

Part 1 of the standard provides a method of calculating noise from construction plant, including:

- Tables of source noise levels;
- Methods for summing up contributions from intermittently operating plant;
- A procedure for calculating noise propagation;
- A method for calculating noise screening effects; and
- A way of predicting noise from mobile plant, such as haul roads.

The standard also provides guidance on legislative background, community relations, training, nuisance, project supervision and control of noise and vibration.

The ABC method outlined in Section E3.2 has been used for the purposes of determining whether the predicted noise levels from the construction activities will result in any significant noise impact at the nearest noise sensitive properties. Table 10-1 outlines the applicable noise threshold of significant effect at the nearest construction noise receptors. The determination of what category to apply is dependent on the existing background ambient (L_{Aeq}) noise level (rounded to the nearest 5 dB) at the nearest noise sensitive property. For daytime, if the ambient noise level is less than the Category A threshold limit, the Category A threshold limit (i.e., 65 dB) applies. If the ambient noise level is the same as the Category A threshold limit, the Category B threshold limit (i.e., 70 dB) applies. If the ambient noise level is more than the Category A threshold limit, the Category C threshold limit (i.e. ,75 dB) applies.

Table 10-1 Noise Threshold Limits at Construction Noise Receptors for Construction Activities (Ref BS5228)

	Threshold Limits [dB(A)]		
	Category A	Category B	Category C
Night-time (23:00 - 07:00)	45	50	55
Evening and Weekends (19:00 - 23:00 Weekdays, 13:00-23:00 Saturdays, 07:00-23:00 Sundays)	55	60	65
Weekday day-time (07:00-19:00) and Saturdays (07:00-13:00)	65	70	75

NOTE 1 A significant effect has been deemed to occur if the total LAeq noise level, including construction, exceeds the threshold level for the Category appropriate to the ambient noise level.

NOTE 2 If the ambient noise level exceeds the threshold values given in the table (i.e., the ambient noise level is higher than the above values), then a significant effect is deemed to occur if the total LAeq noise level for the period increases by more than 3 dB due to construction activity.

NOTE 3 Applied to residential receptors only.

A) Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are less than these values.

B) Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are the same as category A values.

C) Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are higher than category A values.

D) 19.00–23.00 weekdays, 13.00–23.00 Saturdays and 07.00–23.00 Sundays.

British Standard BS5228: 2009+A1:2014, Code of Practice of Noise and Vibration Control on Construction and Open Sites Part 2: Vibration

Part 2 of the standard gives recommendations for basic methods of vibration control relating to construction and open sites where work activities/operations generate significant vibration levels, including industry-specific guidance.

Human beings are known to be very sensitive to vibration, the threshold of perception being typically in the Peak Particle Velocity (PPV) range of 0.14 $mm \cdot s^{-1}$ to 0.3 $mm \cdot s^{-1}$. Vibrations above these values can disturb, startle, cause annoyance or interfere with work activities. At higher levels they can be described as unpleasant or even painful. In residential accommodation, vibrations can promote anxiety lest some structural mishap might occur. Guidance of effects of vibration levels are illustrated in Table 10-2.

Table 10-2 Guidance on the Effects of Vibration Levels (Reference BS5228 Part 2, Table B.1)

Vibration Level mms^{-1}	Effect
0.14	Vibration might just be perceptible in the most sensitive situations for most vibration frequencies with construction. At lower frequencies people are less sensitive to vibration
0.30	Vibration might be just perceptible in residential environments
1.00	It is likely that vibration of this level in residential environments will cause complaint, but can be tolerated if prior warning and explanation has been given to residents
10.00	Vibration is likely to be tolerable for any more than a very brief exposure to the level

Limits of transient vibration, above which cosmetic damage could occur, are given numerically in Table 10-3 (Ref: BS5228-2:2009+A1:2014). Minor damage is possible at vibration magnitudes which are greater than twice those given in Table 10-3, and major damage to a building structure can occur at values greater than four times the tabulated values.

Table 10-3 Transient Vibration Guide Values for Cosmetic Damage

Type of Building	Peak Component Particle Velocity in Frequency Rand of Predominant Pulse	
	4 Hz to 15 Hz	15 Hz and above
Un-reinforced or light framed structures Residential or light commercial buildings	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above

The majority of people are known to be very sensitive to vibration, the threshold of perception being typically in the peak particle velocity (PPV) range of between 0.14 mms^{-1} and 0.30 mms^{-1}. Vibration levels above these values can cause disturbance.

- **Environmental Protection Act, 1990;**

Environmental Protection Act gives Scottish Local Authorities considerable and wide-ranging powers to tackle noise nuisance. Section 79 of the 1990 Act imposes a duty on Local Authorities to take reasonable steps to investigate complaints of nuisance and to inspect their area from time to time to detect statutory noise nuisances. Where a Local Authority is satisfied that the noise emitted is prejudicial to health or constitutes a 'nuisance', it must serve an abatement notice on the person responsible for the noise. The notice may require the noise to be stopped completely, reduced, or limited to certain times of the day. Local Authorities can exercise these controls at any time if satisfied there is a statutory nuisance, regardless of the terms of any planning permission.

- **Highways England (2019). Design Manual for Roads and Bridges, Sustainability & Environment Appraisal LA111 Noise and Vibration (formerly HD213/11, IAN 185/15) Revision 0**

The United Kingdom Design Manual for Road and Bridges (UK DMRB), Sustainability & Environment Appraisal LA111 Noise and Vibration, gives advice on the appraisal of noise and vibration impacts due to changes in road traffic noise and vibration for UK trunk roads. The UK DMRB identifies various stages of assessment, with each stage becoming increasingly detailed. The objective of the UK DMRB noise assessment is to establish the magnitude of the significance of noise changes for areas where existing traffic is likely to at least increase by 25% or reduce by 20%. The UK DMRB advises that these changes are equivalent to a change in noise level of 1 dB(A), which is the minimum change that can be detected by the human ear in the short term (e.g., on opening of a development or scheme).

The UK DMRB assessment methodology dictates that all properties experiencing changes in noise greater than 1 dB(A) due to the Proposed Development should be assessed. Properties experiencing a change in noise of less than 1 dB(A) do not need to be considered, the inference being that such a slight change in the level of noise is so small as to be negligible. A doubling or halving of the total flow of traffic would cause the noise level to change by 3 dB(A) which is considered the minimum perceptible change under normal conditions. A change in the noise level of 1 dB(A) is generally only perceptible under controlled conditions. However, the UK DMRB indicates that those subjected to a sudden change in noise level as low as 1 dB(A), such as that which accompanies the opening of a road scheme, may just perceive the change and experience either a benefit or disbenefit.

- **British Standard BS 7445-1 Description and Measurement of Environmental Noise – Part 1: Guide to Quantities and Procedures (BS, 7445-1);**

British Standard BS7445 provides the framework within which environmental noise should be quantified. BS 7445: Part 1 provides guidance to quantities and procedures in relation to environmental noise monitoring. BS7445-1 states that sound level meters that are used should conform to specifications of Class or Type 1 (or Class or Type 2 as a minimum) as given in BESN 61672.

The Class of a noise level meter describes its accuracy as defined by the relevant international standards. Sound level meters are defined by International Standards such as IEC 61672-1:2013 (or BS EN61672-1:2003). These standards define a wide range of complex accuracy, performance and calibration criteria that instruments must meet to be fit for purpose. Within the Standard, there are two allowable levels of tolerance, and these are known as Class 1 and Class 2. Class 1 is more accurate than Class 2.

These Class 1 and Class 2 tolerances are necessary as a way of dealing with variations in the instruments. The variations are caused by the different electronic components used inside the sound level meters and because of the way different meters have been designed and verified. Even the test equipment used to check the sound level meters during manufacture will introduce some variation.

All equipment shall be calibrated and the configuration for calibration shall be in accordance with the manufacturer's instructions. A comprehensive recalibration at certain time intervals (for example annually) may be prescribed by authorities responsible for the use of the measurement results. A field check shall be made by the user at least before and after each series of measurements, preferably including an acoustic check of the microphone. Meteorological conditions are not prescribed but it is

recommended that wind speed should not exceed 5 m /s at height of 3-11 m above ground, any temperature inversions near ground, or heavy precipitation.

10.2.2 Potential Effects Scoped Out

Having considered the proposed works, it was concluded that several factors could be scoped out of the detailed assessment including:

- Operational Noise. This has been scoped out as there is no inclusion of new significant noise sources likely to generate perceptible noise levels when the Proposed Development is operational. In addition, there are no operational cumulative effects;
- Construction vibration. This has been scoped out as the proposed construction activities do not include piling; and
- Operational vibration. This has been scoped out as there shall be no new significant vibration sources likely to generate perceptible levels of vibration when the Proposed Development is operational.

Reference to the relevant vibration legislation is still included for completeness.

10.2.3 Potential Effects Scoped In

The noise and vibration effects of the construction stage and all operations associated with the Proposed Development have been assessed at the nearest construction noise receptors.

Construction phase includes:

1. Construction noise from on-site activities affecting nearby sensitive receptors; and
2. Construction noise from construction traffic affecting nearby sensitive receptors. Chapter 3 Project Description states "*Transport by road will be minimal – there is no estimated impact on the road transport network"*. Therefore, there is no construction traffic noise impact associated with the Proposed Development.

10.3 Baseline Scenario

A description of the Proposed Development is presented in Chapter 3. Figure 3-5 illustrates the design of the proposed breakwater.

The Iona Ferry Terminal consists of a slipway and pier jutting out into the Sound of Iona. The site boundary and associated 500 m buffer highlighting the construction noise study area is shown below in Figure 10-1.

Figure 10-1 Location of Proposed Development and 500 m Site Boundary

The primary study area for construction noise is based upon guidance detailed in DMRB LA111 Noise and Vibration:

> *"A construction noise study area shall be defined, where the need for further assessment has been established to include all noise sensitive receptors: 1) that are potentially affected by construction noise; in areas where there is a reasonable stakeholder expectation that a construction noise assessment will be undertaken."*

DMRB LA111 Noise and Vibration guidance 2019 suggests that "*a study area of 300m from the closest construction activity is normally sufficient to encompass noise sensitive receptors*."

The study area for the construction noise and vibration assessment encompasses the Proposed Development extended to include noise sensitive receptors within a 500 m radius.

10.3.1 Baseline Noise Monitoring Survey

A baseline noise monitoring survey consisting of attended and unattended noise measurements was conducted within the vicinity of the Proposed Development site.

The noise monitoring location (NML) was chosen to be representative of the nearest construction noise receptors within and near the Proposed Development site. The purpose of the noise monitoring survey

was to determine the baseline noise levels at the nearest noise sensitive receptors and to assess these levels in accordance with the relevant guidance to determine the following:

- The applicable BS 5228 construction noise threshold limit in accordance with British Standard BS5228, Code of Practice of Noise Control on Construction and Open sites; and
- Evaluate the noise climate in the Noise and Vibration Study Area.

The NML and respective dates of monitoring and equipment used are summarised below in Table 10-4.

Table 10-4 Summary of Baseline Noise Monitoring Survey

Noise Monitoring Location	Description of Noise Monitoring Location	Start Date and Time	End Date and Time	Sound Level Meter
NML 1	Iona House, Iona.	17:00 29/06/2021	12:45 02/07/2021	Norsonic 140

A summary of the noise monitoring methodology, instrumentation and calibration certificates are illustrated in Volume III Appendix 10.1.

The NML is detailed in Volume III, Appendix 10.2, which also includes a photograph of Noise Monitoring Location 1.

Results of the baseline noise monitoring survey are detailed in Volume III, Appendix 10.3.

Measurements were made at a height of 1.2 – 1.5 m above ground level. The weather conditions were in accordance with the requirements of ISO 1996: *Acoustics - Description, Measurement and Assessment of Environmental Noise*.

The following parameters were recorded during each monitoring period:

- **$L_{Aeq:}$** The continuous equivalent A-weighted sound pressure level. This is an 'average' of the sound pressure level.
- **$L_{Amax:}$** This is the maximum A-weighed sound level measured during the sample period.
- **$L_{Amin:}$** This is the minimum A-weighted sound level measured during the sample period.
- **$L_{A10:}$** This is the A-weighted sound level that is exceeded for noise for 10% of the sample period.
- **$L_{A90:}$** This is the A-weighted sound level that is exceeded for 90% of the sample period.

The 'A' suffix for the noise parameters denotes the fact that the sound levels have been 'A-weighted' in order to account for the non-linear nature of human hearing. All sound levels in this report are expressed in terms of decibels (dB) relative to $2x10^{-5}$ Pa.

The typical measured ambient (L_{Aeq}) noise level has been used as the baseline for the construction noise assessment.

10.3.2 Background Vibration Monitoring Survey

Background vibration monitoring was not undertaken as there are currently no vibration sources on site.

10.3.3 Construction Noise Receptors

Noise sensitive receptor locations, referenced as construction noise receptors, were obtained from the following data sources:

- Aerial mapping included Google and Bing aerial maps

The construction noise receptor locations[22] are shown in Volume III Appendix 10.4.

(N. B. Addresses of the construction noise receptors have not been included due to General Data Protection Regulations (GDPR) and publication of personal data).

The majority of construction noise receptors identified within the noise and vibration study area are residential properties.

10.4 Description of Likely Significant Effects

10.4.1 Likelihood of Impacts

In keeping with the typical scope of an Environmental Impact Assessment (EIA), the emphasis of this Noise and Vibration Chapter is on the assessment of the potential effects of the Proposed Development upon the surrounding environment (nearest noise sensitive receptors) during the construction phase.

As detailed in IEMA Guidelines for Environmental Noise Impact Assessment the following terminology and definitions are detailed as:

1. Noise Impact -The difference in the acoustic environment before and after the implementation of the proposals (also known as the magnitude of change). This includes any change in noise level and in other characteristics/features, and the relationship of the resulting noise level to any standard benchmarks.
2. Noise Effect -The consequence of the noise impact. This may be in the form of a change in the annoyance caused, a change in the degree of intrusion or disturbance caused by the acoustic environment, or the potential for the change to alter the character of an area such that there is a perceived change in quality of life. This will be dependent on the receptor and its sensitivity.
3. Significance of Effect -The evaluation of the noise effect and, particularly if the noise impact assessment is part of a formal EIA, deciding whether or not that impact is significant.

[22] (N. B. Addresses of the construction noise receptors have not been included due to General Data Protection Regulations (GDPR) and publication of personal data).

10.4.1.1 Receptor Sensitivity / Value

Sensitive receptors, in the context of noise and vibration, are typically residential premises but can also include schools, places of worship and noise sensitive commercial premises. This is taken from the Scottish Government's Technical Advice Note (TAN) on Assessment of Noise, Table 2.1 Level of sensitivity associated with various examples of noise sensitive receptors. Section 2.21 of TAN States:

> "*There are three levels of sensitivity "high" "medium" and "low". The ranking is primarily based on the relationship between the amenity associated with a NSR and its susceptibility to noise*."

TAN Chapter 2, Table 2.1 Level of Sensitivity Associated with Various Examples of Noise Sensitive Receptors provides sensitivity, description and examples of noise sensitive receptors. Therefore, sensitivity of receptors, as defined in TAN has been used as reference criteria for sensitivity of receptors within this chapter.

The sensitivity of receptors to noise and vibration during construction is defined below in Table 10-5.

Table 10-5 Receptor Sensitivity (Ref: TAN Assessment of Noise)

Sensitivity	Description	Examples of NSR
High	Receptors where people or operations are particularly susceptible to noise	Residential, including private gardens where appropriate. Quiet outdoor areas used for recreation Conference facilities Theatres/Auditoria/Studios Schools during the daytime Hospitals/residential care homes Places of worship
Medium	Receptors moderately sensitive to noise, where it may cause some distraction or disturbance	Offices Bars/Cafes/Restaurants where external noise may be intrusive. Sports grounds when spectator noise is not a normal part of the event and where quiet conditions are necessary (e.g,. tennis, golf, bowls)
Low	Receptors where distraction or disturbance from noise is minimal	Buildings not occupied during working hours Factories and working environments with existing high noise levels Sports grounds when spectator noise is a normal part of the event Night Clubs

The majority of receptors expected to be affected by noise and vibration impacts from the Proposed Development are residential receptors who are deemed to be sensitive.

The significance of the effect is determined as a function of the sensitivity of the receptor and the magnitude of impact it is exposed to, as summarised below in

Table **10-6**.

Table 10-6 Matrix for Determining Significance of Effect for Receptors of High Sensitivity

Magnitude of Impact (Beneficial or Adverse)	Significance of Effect for Receptors of High Sensitivity
Major	Large or Very Large
Moderate	Moderate or Large
Minor	Slight
Negligible	Slight
No Impact	Neutral

10.4.1.2 Magnitude of Impact / Level of Significance

10.4.1.2.1 Construction Noise

Construction noise comprises both plant noise and site traffic noise. The construction noise 'of effect' for this assessment is based on the '5 dB change' method in BS5228-1:2009 2014 'Code of practice for noise and vibration control on construction and open sites – Part 1: Noise' which is summarised in Table 10-7 below.

BS 5228:2009+A1:2014 does not contain any significance criteria equivalent to that presented in Table 10-1, although examples of how limits of acceptability have been applied historically and some examples of assessing significance are presented. In this case Example Method 2, which refers to change of 5 dBA in the ambient noise level, has been used to assess the effects at residential receptors.

The magnitude of construction noise Impacts has been determined in accordance with Annex E of BS 5228-1:2009+A1:2014. The significance criteria for assessing noise impact from construction works have been based on example Method 2 contained within Annex E.3.3 of BS 5228-1:2009+A1:2014, as referred to above. This indicates that:

> *"Noise levels generated by site activities are deemed to be potentially significant if the total noise (preconstruction ambient plus site noise) exceeds the pre-construction ambient noise by 5dB or more, subject to lower cut off values of 65dB, 55dB and 45dB L_{Aeq} period, from site noise alone, for the daytime, evening, and night-time periods, respectively, and a duration of one months or more, unless works of a shorter duration are likely to result in a significant effect. "*

Noise levels generated by construction activities are deemed to be significant if the total noise (pre-construction baseline plus construction noise) exceeds the pre-construction baseline by more than 5 dBA subject to the lower cut-off value of 65 dBA noise from construction activities alone.

For the majority of noise sensitive receptors, pre-construction ambient noise levels are relatively low, resulting in the criteria set within the lower cut-off levels given in Table 10-7 below applying the most stringent limits. As such the lower cut-off levels are used throughout the construction assessment to all noise sensitive receptors.

This classifies the magnitude of effect based on the sound level difference between the ambient noise level with and without construction. This is calculated by finding the difference between the baseline ambient level and the total level (construction noise plus baseline ambient level) at each location.

Table 10-7 Magnitude of Impact: Construction Noise Day-time (Ref: BS 5228 Part 1)

Sound Level Difference between Ambient Noise and Total Noise (dB, L_{Aeq})	Total Day-time Noise Level (dB $L_{Aeq, 12h}$) (Ambient and Construction Noise)	Magnitude of Impact
< 0 dB	< 65 dB (lower cut-off level)	Negligible
0 - 5 dB	65 - 70 dB	Low
5 – 10 dB	70 –75 dB	Medium
> 10 dB	> 75 dB	High

Table 10-8 Magnitude of Impact: Construction Noise Night-time (Ref: BS 5228 Part 1)

Sound Level Difference between Ambient Noise and Total Noise (dB, L_{Aeq})	Total Night-time Noise Level (dB $L_{Aeq, 12h}$) (Ambient and Construction Noise)	Magnitude of Impact
< 0 dB	< 65 dB (lower cut-off level)	Negligible
0 - 5 dB	65 - 70 dB	Low
5 – 10 dB	70 –75 dB	Medium
> 10 dB	> 75 dB	High

On account of the temporary nature of construction activities, higher noise threshold limits apply to construction phase activities when compared to permanent operational phase activities.

10.4.1.3 Significance of Effects

Following the identification of receptor importance and magnitude of the effect, it is possible to determine the significance of the impact. TAN Chapter 2 Table 2.6 Significance of Effects provides the framework in determining the level of significance, by relating the magnitude with the sensitivity of the receptor.

The significance of the effect is determined as a function of the sensitivity of the receptor and the magnitude of impact the receptor is exposed to. The significance of effects for receptors of high sensitivity are summarised below in Table 10-9.

Table 10-9 Matrix for Determining Significance of Effect for Receptors of High Sensitivity (Ref: TAN Table 2.6)

		Magnitude of Impact			
		Negligible	Low	Medium	High
Sensitivity of receptor	Negligible	Imperceptible	Imperceptible or slight	Imperceptible orslight/ minor	Slight/ minor
	Low	Imperceptible or slight	Imperceptible or slight/ minor	Slight/ minor	Slight/ minor or moderate
	Medium	Imperceptible or slight/ minor	Slight/ minor	Moderate	Moderate or major
	High/ Particularly Sensitive	Slight/ minor	Slight/ minor or moderate	Moderate or major	Major or Profound

In line with the guidance:

- Major or Profound adverse effects are considered to be significant and should be prevented;
- Moderate adverse effects are significant and should be mitigated, where possible;
- Slight/ minor adverse effects are not significant but should be mitigated where possible; and
- Imperceptible/ negligible adverse effects are not significant and should not require mitigation.

Effects are considered to be significant when identified as likely to have a Moderate/ Major or Profound effect.

10.4.2 Assessment of Construction Effects

The outline construction method statement is described in Section 3.3.

Based on the information presented in Chapter 3, the likely significant noise impacts are considered for the construction activities.

The predicted construction noise impacts are assessed in accordance with BS 5228: Noise and Vibration Control on Construction and Open Sites Noise threshold limits.

The proposed construction phasing, construction noise receptors ID's eastings and northings, together with applicable BS 5228 noise limits are detailed in Volume III, Appendix 10.5.

10.4.2.1 Construction Traffic

Materials are expected to be transported to site by barge and installed from a barge. Transport by road will be minimal. Therefore, there is no estimated construction road traffic impact on the road transport network.

10.4.2.2 Construction Duration and Hours

The total time to complete construction works at Iona is estimated to be 52 weeks.

BS 5228 defines the day-time period as 07:00 to 19:00 hrs; the evening period as 19:00 to 23:00 hrs; and the night-time period as 23:00 to 07:00 hrs. There is potential for day-time, evening and night-time construction works, dependent on the awarded contractor.

Dredging

Dredging is likely to occur during night-time hours to prevent disruption to the current ferry operation. The breakwater will be constructed 70 m south of the slipway, and therefore will not impact on the ferry operation. Therefore, construction works will be during daytime hours.

10.4.2.3 Construction Noise Receptors

As previously detailed, there are residential properties adjacent to, and in close proximity to, the Proposed Development. Construction Noise Receptor locations are detailed in Volume III Appendix 10.4.

10.4.2.4 Construction Activities

There is no piling proposed for the construction of the Proposed Development.

The two construction activities to be undertaken for the Proposed Development include construction of a breakwater and dredging.

Construction of the breakwater includes all material brought to site on the flat top barge that will then be manoeuvred from the barge to construct the breakwater using the Jack up barge (OCM-50).

The dredging will be undertaken using a self-propelled backhoe dredger and a secondary spud legged barge with long reach will be used to move the dredge material onto a vessel for disposal at sea.

Construction of Breakwater

In order to predict worst-case construction noise impacts, it was necessary to define the plant and equipment to be used as part of the construction phase activities associated with the construction of the breakwater. Vessels will be used for the construction activities for the Proposed Development. The vessel type will be contractor specific, however these are likely to be used:

- Typical vessel type for rock armour delivery could be similar to Flat Top Barge – Mormaen 15 | Keynvor MorLift Ltd; and
- Typical Jack-up barge 1 - OCM 50 - 18m jack legs.

The plant shown in Table 10-10 is generally representative of the type of plant that will be in use during the construction of the breakwater of the Proposed Development.

Table 10-10: Noise Levels for Construction Plant for Breakwater

Construction Activity	Construction Plant	Sound Power Level (dB)	Sound Pressure Level at 10m (dB)
Construction of Breakwater Dredging	Flat top barge	115	87
	Jack-up barge	115	87

The typical sound power level of 115 dB has been assumed for the 2 vessels as a worst-case scenario.

The sound power level of the equipment was converted to sound pressure level at 10 m.

The following formula is used to convert sound power level (L_W) to sound pressure level (L_P) at distance r.

This calculation assumes hemispherical propagation:

$$L_P = L_W - 10*\log_{10}(2*\pi*r^2)$$

Where:

L_P = Sound Pressure level

L_W = Sound Power Level

r = Distance from source to receiver

The construction noise predictions for the breakwater are deemed to be worst case based on the following:

- Full power operation of each construction activity throughout the daytime period;
- Ground absorption effects are ignored (ground absorption can provide some attenuation);
- Construction plant is assumed to be operational at closest point to receptors, the worst-case result for each receptor is chosen for the report; and/ or
- Predictions are based on the construction plant simultaneously operational, where applicable.

All plant is assumed to be operational at the closest point to receptors, e.g., for construction of the breakwater all vessels were assumed to be operational at the closest point within the construction area to the receptors; the worst-case result for each receptor is chosen for the report.

The worst-case predicted construction noise levels have been compared to the derived threshold noise limits using ABC Method from British Standard BS 5228 as detailed in Table 10-1.

Dredging

In order to predict worst-case construction noise impacts, it was necessary to define the plant and equipment to be used as part of the dredging construction phase activities.

Given the small dredge area and quantities, it is anticipated that the dredging can be undertaken by a self-contained, self-propelled vessel with an excavator mounted on its bow; and given the small dredge area and quantities, it is anticipated that a secondary spur legged barge with long reach can be utilised.

The plant shown in Table 10-11 is generally representative of the type of plant that will be in use for the dredging phase of the Proposed Development. Typical noise levels from the dredging construction plant are obtained from BS 5228:2009+A1:2014 Part 1.

Table 10-11: Typical Construction Plant for Dredging (Ref: BS5228)

Construction Activity	Construction Plant	Reference from Annex C & D BS5228	Sound Pressure Level at 10m (dB	Numbers
Dredging	Grab hopper dredging ship	C.7.2	82	2

Construction noise predictions have been undertaken for the proposed dredging at all noise sensitive receptors within the construction noise study area.

The construction noise predictions are deemed to be worst-case based on the following:

- Full power operation of each construction activity throughout the daytime period;
- Ground absorption effects are ignored (ground absorption can provide some attenuation); and
- Dredging plant is assumed to be operational at the closest point to receptors, e.g., for dredging both dredging vessels were assumed to be operational at the closest point within the dredging area to the receptors; the worst-case result for each receptor is chosen for the report.

The worst-case predicted dredging noise levels have been compared to the derived threshold noise limits using ABC Method from British Standard BS 5228 as detailed in Table 10-1.

10.4.2.5 Predicted Effects of Construction Noise

The precise construction strategy to be adopted will be a matter for the contractor, but it is likely that construction noise levels experienced during the construction phase will be similar to the typical construction noise levels indicated in Table 10-10 and Table 10-11 for the construction plant/ vessels.

In order to assess the worst-case construction noise level from the Proposed Development, the noise level for each of the construction plant detailed in Table 10-12, at a distance of 10 m will be used for the purpose of the construction noise assessment. Distances from the construction phase boundaries for each of the construction activities were measured to each of the construction noise receptors as detailed within Volume III Appendix 10.5.

The attenuation calculation assumes a direct line of sight from the noise source to the receiver and without a barrier being considered, which is a worst-case scenario. Construction noise predictions were calculated for each construction activity as detailed in Volume III Appendix 10.5.

The construction programme indicates that it is unlikely that construction of the breakwater and dredging will occur simultaneously.

Predicted Noise Effects from Breakwater Construction

Predicted noise levels due to the construction of the breakwater are summarised below in Table 10-12. This table illustrates the worst-case predicted noise from construction activities associated with the breakwater construction. These worst-case predicted noise levels assume a level of simultaneous activity of plant/ equipment close to the receptor. This is unlikely to occur in practice but is used to present potential worst-case noise levels that may occur during the construction phase of the Proposed Development.

Table 10-12: Predicted Noise Levels from Breakwater Construction

Construction Receptor ID	Residential	Sensitivity	BS5228 Category A Guideline (Day-time)	BS5228 Category A Guideline (Night-time)	Construction of Breakwater Total SPL (dB)
1	Yes	High	65	45	54.7
2	No	Medium	65	45	55.3
3	No	Medium	65	45	56.4
4	Yes	High	65	45	56.7
5	No	Medium	65	45	58.0
6	No	Medium	65	45	57.8
7	No	Medium	65	45	58.5
8	No	Medium	65	45	61.2
9	Yes	High	65	45	61.2
10	Yes	High	65	45	59.7
11	No	Medium	65	45	60.7
12	No	Medium	65	45	61.6
13	Yes	High	65	45	63.8
14	No	Medium	65	45	66.3
15	Yes	High	65	45	63.5
16	No	Medium	65	45	**70.8**
17	No	Medium	65	45	**71.9**
18	Yes	High	65	45	**82.9**
19	Yes	High	65	45	62.7
20	Yes	High	65	45	63.3
21	No	Medium	65	45	**78.0**
22	No	Medium	65	45	**73.8**
23	No	Medium	65	45	60.9
24	Yes	High	65	45	59.6
25	Yes	High	65	45	63.8
26	Yes	High	65	45	62.4
27	Yes	High	65	45	61.3
28	Yes	High	65	45	59.5
29	Yes	High	65	45	59.1
30	Yes	High	65	45	58.8
31	Yes	High	65	45	58.2
32	Yes	High	65	45	57.7
33	No	High	65	45	57.2

Construction Receptor ID	Residential	Sensitivity	BS5228 Category A Guideline (Day-time)	BS5228 Category A Guideline (Night-time)	Construction of Breakwater Total SPL (dB)
34	Yes	High	65	45	56.5

Exceedances of Category A Guideline (day-time) are highlighted in dark shading

Worst-case construction noise predictions exceed the 65 dB BS 5228 noise limit at a number of construction noise receptors during daytime hours.

Worst-case construction noise predictions exceed the 45 dB BS 5228 noise limit at a number of construction noise receptors during night-time hours.

Unmitigated construction noise daytime predictions in excess of 65 dB would be deemed to have a temporary moderate impact at four receptors of medium sensitivity, and temporary moderate / major impact at one receptor of high sensitivity as summarised below in Table 10-13.

Table 10-13: Breakwater Construction Impact Significance

Construction Receptor ID	Residential	Receptor Sensitivity	Construction of Breakwater Total SPL (dB)	Magnitude of Impact Ref: Table 10:7)	Impact Significance (Ref: Table 10:8)
16	No	Medium	70.8	Medium	**Moderate**
17	No	Medium	71.9	Medium	**Moderate**
18	Yes	High	82.9	High	**Moderate or major**
21	No	Medium	78.0	High	**Moderate**
22	No	Medium	73.8	Medium	**Moderate**

The receptors most likely to be impacted are non-residential. The worst-case noise predictions are based on closest proximity of proposed construction activities to receptors, which will have temporary duration and subsequent impacts. Noise mitigations for construction activities are outlined in Section 10.5.

Predicted Noise Effects from Dredging

Predicted noise levels due to dredging are summarised below in Table 10-14. This table illustrates the worst-case predicted noise from dredging. These worst-case predicted noise levels assume a level of simultaneous activity of plant/equipment close to the receptor. This is unlikely to occur in practice but is used to present potential worst-case noise levels that may occur during the dredging.

Table 10-14: Predicted Worst-Case Noise Levels from Dredging

Construction Receptor ID	Residential	Sensitivity	BS5228 Category A Guideline (Day-time)	BS5228 Category A Guideline (Night-time)	Dredging (dBA)
1	Yes	High	65	45	50.7
2	No	Medium	65	45	51.7
3	No	Medium	65	45	52.6
4	Yes	High	65	45	52.2
5	No	Medium	65	45	53.9
6	No	Medium	65	45	53.3
7	No	Medium	65	45	53.7
8	No	Medium	65	45	59.1
9	Yes	High	65	45	58.7
10	Yes	High	65	45	54.4
11	No	Medium	65	45	55.6
12	No	Medium	65	45	56.0
13	Yes	High	65	45	60.3
14	No	Medium	65	45	61.8
15	Yes	High	65	45	56.5
16	No	Medium	65	45	62.4
17	No	Medium	65	45	61.8
18	Yes	High	65	45	64.1
19	Yes	High	65	45	55.1
20	Yes	High	65	45	55.0
21	No	Medium	65	45	61.2
22	No	Medium	65	45	59.6
23	No	Medium	65	45	53.3
24	Yes	High	65	45	52.1
25	Yes	High	65	45	54.8
26	Yes	High	65	45	53.7
27	Yes	High	65	45	53.0
28	Yes	High	65	45	51.8
29	Yes	High	65	45	51.5
30	Yes	High	65	45	51.3
31	Yes	High	65	45	50.9
32	Yes	High	65	45	50.5
33	No	High	65	45	50.1
34	Yes	High	65	45	49.6

Worst-case construction noise predictions do not exceed that 65 dB daytime BS 5228 noise limits at all receptors, concluding negligible impact.

Worst-case construction noise predictions exceed the 45 dB night-time BS 5228 noise limit for all construction noise receptors during night-time hours. Unmitigated construction noise night-time predictions in excess of 45 dB would be deemed to be temporary moderate / major adverse impact at all medium and high sensitivity receptors

The noise level predictions are based on close proximity to receptors which will be of a temporary duration with dredging anticipated to occur over a one-week period. Noise mitigation measures for construction activities are outlined in Section 10.5. Generating peak levels of noise will be carried out intermittently over this time and will not be constant for those periods.

On the basis of the predicted worst-case construction noise levels from the Proposed Development, it is clear that there will be a requirement for mitigation measures to be put in place in order to ensure that construction noise levels are reduced as much as practicable and that they do not exceed the daytime noise threshold limit of 65 dB and night-time noise threshold limit of 45 dB.

10.4.3 Assessment of Operational Effects

Occasional maintenance to the various scheme elements may be required during operation, but the earthworks and traffic movements associated with this maintenance are likely to be minimal, and therefore operational phase noise and vibration impacts were scoped out of the assessment.

Operational noise has not been included as there is no inclusion of new significant noise sources likely to generate perceptible noise levels when the Proposed Development is operational. The Proposed Development will not result in any significant permanent adverse effects on the noise environment within the Study Area.

Operational vibration has not been included as there is no inclusion of new significant vibration sources likely to generate perceptible levels of vibration when the Proposed Development is operational.

10.4.4 Assessment of Decommissioning Effects

The design life of the structure is 120 years in accordance with the UK National Annex to BS EN 1990:2002, Category 5. It is unlikely that it will be decommissioned in its entirety. It is more likely that the scheme will be repaired, or sections replaced or improved if needed in the future.

10.5 Mitigation Measures

10.5.1 Construction Phase

Worst-case construction noise predictions can be reduced through use of appropriate mitigation measures, as detailed below.

BS 5228-1 states that:

> "…*if the site noise level exceeds the appropriate category value, then a potential significant effect is indicated. The assessor then needs to consider other project specific factors, such as the number of receptors affected and the duration and character of the impact, to determine if there is a significant effect*."

These factors have therefore been considered to determine the effect significance.

To summarise the proposed construction works:

- Construction works will be temporary and limited in duration;
- Construction plant and machinery has been assessed as operating for the full working period of the day, i.e., 100% duty cycle. Due to natural pauses in activity and rest breaks equipment will not be fully operational during the working day; and
- Construction works associated with the breakwater construction are not proposed to occur during night-time or on Sundays, unless for emergency works. Therefore, there will be no associated construction noise impact during these times at construction noise receptors. However, dredging is likely to occur during night-time hours but for a short, temporary (one week) duration.

Night-time Noise Impacts

Night-time noise impacts will be required during the dredging on occasions. BS 82233 night-time noise limit of 45 dB will be applicable at the receptor locations. Night-time construction noise impact indicates that there is the potential for significant impact without mitigations. Screening at source of potentially affected receptors would ensure that the BS 5228 noise limit is achieved, reducing impact to temporary minor adverse.

Construction mitigation measures will be put in place to ensure construction noise levels are attenuated and reduced where necessary.

Best practice measures will be employed to ensure that construction phase noise levels are reduced to the lowest possible levels.

BS5228:2009+A1:2014 – Noise and vibration control on construction and open sites outlines a range of measures that can be used to reduce the impact of construction phase noise on the nearest noise sensitive receptors. These measures will be applied by the contractor where appropriate during the construction phase of the Proposed Development. Construction best practice measures which will be implemented include:

1. Ensuring that mechanical plant and equipment used for the purpose of the works are fitted with effective exhaust silencers and are maintained in good working order;
2. Careful selection of quiet plant and machinery to undertake the required work where available;
3. Machines in intermittent use will be shut down in the intervening periods between work;
4. Ancillary plant such as generators, compressors and pumps will be placed behind existing physical barriers, and the direction of noise emissions from plant including exhausts or engines will be placed away from sensitive locations, in order to cause minimum noise disturbance. Where possible, in potentially sensitive areas, temporary construction barriers or enclosures will be utilised around noisy plant and equipment;
5. Handling of all materials will take place in a manner which minimises noise emissions; and
6. Audible warning systems will be switched to the minimum setting required by the Health & Safety Executive.

The use of the proposed construction noise mitigation measures will ensure that construction noise levels are controlled to the lowest levels practicable.

Dredging Mitigation

Although recognised that the choice of dredgers is likely to be determined by the engineering requirements and the suitability of available equipment, dredging activities should be planned where possible to reduce the overall source noise level during the works – e.g., limiting night-time works directly adjacent to noise-sensitive properties etc.

Any dredger used for the works will be expected to be fitted with effective engine exhaust silencers, and there will be a requirement placed on the chosen dredger operator to ensure that all engine silencers are effective and reducing engine exhaust noise levels to the lowest reasonably practicable level.

Screening shall be provided nearest to those properties most likely to experience high noise levels from dredging, particularly during more sensitive night-time periods.

10.5.1.1 Consultation and Communication

Mitigation in the form of timely and effective stakeholder consultation is outlined within the oCEMP. This would ensure that residents are kept informed of on-going and future operations. For example, local residents would be informed by letter drop of proposed works, particularly where these are due to occur outside standard working hours. The letter would include details of proposed cause, start dates and duration of works to be carried out.

In order to minimise the likelihood of complaints, Argyll & Bute Council and affected residents should be kept informed of the works to be carried out and of any proposals for work outside normal hours. All complaints will be recorded by the appointed contractor. The appointed contractor will investigate the circumstances and ensure the necessary corrective measures are taken.

10.5.1.2 Construction Noise Monitoring

Construction noise monitoring will be undertaken as part of noise control planning at nearby sensitive receptors.

The need for monitoring of construction noise during key periods of the construction programme for the dredging activities would be discussed in consultation with Argyll & Bute Council.

There will be no requirement for post-construction surveys or monitoring for operational noise.

10.5.2 Operational Phase

10.5.2.1 Operational Noise

No operational noise impacts resulting from the operation of the Proposed Development are anticipated. Therefore, no specific mitigation measures are proposed during the Project operation.

10.5.2.2 Operational Vibration

No operational vibration impacts resulting from the operation of the Proposed Development are anticipated. Therefore, no specific mitigation measures are proposed during the Project operation.

10.6 Residual Effects

10.6.1 Construction Phase

Pre-mitigation, the predicted construction noise impacts are anticipated to result in effects ranging from negligible to major at construction noise receptors.

However, mitigation by careful scheduling of the works, timing of activities and using best practice will be implemented such that no significant effects arise, and levels are as low as possible.

Residents will be informed of the timing and duration of activities that may produce high noise. Elevated levels can be tolerated if prior notification and explanation is given.

Temporary slight adverse impacts due to construction noise have been identified at the closest receptors to the proposed construction works. No permanent residual noise and vibration impacts are predicted during construction of the Proposed Development. With construction mitigation measures in place as proposed through the oCEMP and associated appendices, construction noise monitoring, and a temporary construction noise barrier, the noise impacts of construction activities is predicted to be reduced to temporary slight/ moderate.

No significant residual impacts will arise.

10.6.2 Operational Phase

No residual impacts or residual significant effects are predicted for the operational stage of the Proposed Development.

10.6.3 Decommissioning Phase

No permanent residual noise and vibration impacts are predicted during decommissioning of the Proposed Development.

10.6.4 Transboundary

The Proposed Development is not located close to any international boundaries and there will be no transboundary effects in relation to noise and vibration.

10.7 Potential Cumulative Impacts

The potential for cumulative effects has been considered for the construction, operation and decommissioning of the Proposed Development cumulatively with other projects. There are two

proposed projects in the vicinity of the Proposed Development. These are listed below and fully detailed in Chapter 21:

- The Fionnphort Breakwater and Overnight Berthing Project
- Cable installation – Iona to Fionnphort

The potential for cumulative vibration and operational noise impacts are screened out of the assessment.

The assumed worst-case scenario is that construction impacts of the Proposed Development may overlap with the construction of the Fionnphort Breakwater and Overnight Berthing Project, or cable installation – Iona to Fionnphort. Any cumulative construction noise or vibration impact is predicted to be of local spatial extent, temporary duration, and intermittent. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore, considered to be low and therefore not significant.

10.8 Conclusions and Summary of Effects

An assessment of potential noise effects associated with the Proposed Development has been carried out.

During the construction phase, there is potential for noise impacts at the nearest noise sensitive properties from construction plant and equipment. The effect of construction noise has been assessed in full within this noise and vibration chapter.

The construction noise targets are set out along with the assessment methodology and results of the construction noise predictions.

Construction noise mitigation measures are detailed such that noise targets are met throughout the construction phases.

No operational noise or vibration impacts resulting from the operation of the Proposed Development are anticipated. There will be no significant effects arising from the operational phase.

Overall, it is concluded that there is the potential for moderate to major significant impacts arising from the Proposed Development during the construction phase. These are associated with the dredging activity, should this occur over the night-time period, however these effects will be temporary in nature.

With construction mitigation measures in place as proposed through the oCEMP and associated appendices, construction noise monitoring, and temporary construction noise barrier, the noise impacts associated with night-time dredging is predicted to be reduced to temporary slight or moderate.

11 WATER QUALITY

This chapter of the EIAR assesses the potential impact of the Proposed Development on water quality within the receiving environment. Existing water quality in the vicinity of the Proposed Development is established based on available water quality information. The assessment of impacts includes analysis and interpretation of baseline data acquired from existing water quality monitoring stations included in the Scottish Environment Protection Agency (SEPA) Water Framework Directive (WFD) monitoring programme. The potential impacts related to the construction and operational phases of the Proposed Development have been assessed and mitigation measures proposed to reduce significant environmental impacts on the receiving water environment. The assessments are based on the project description detailed in Chapter 3.

The main aspects of the Proposed Development that have the potential to impact on water quality and the overall status of water bodies in the vicinity of the Proposed Development are from dredging, physical changes to the water bodies and/ or construction activities. In general terms the construction of the Proposed Development and dredging activities could have the following impacts:

- Short term construction impacts particularly due to sediment release and/ or contaminant dispersal;
- Pollution from accidental spillage/ leakage;
- Changes to the hydromorphological supporting conditions affecting the hydromorphological status and the biological elements which it supports, and
- Impacts on biodiversity, particularly on harbour porpoise within the Inner Hebrides and the Minches Special Area of conservation (SAC).

The assessment presented is informed by and inclusive of information further described in the following EIA chapters:

- Chapter 8 Marine Biodiversity; and
- Chapter 13 Coastal Processes.

11.1 Assessment Methodology

This section outlines the policy context relevant to the assessment of potential impacts to water quality.

11.1.1 International Policy Context

The Water Framework Directive (WFD) (Council Directive 2000/60/EC establishing a framework for community action in the field of water policy) was adopted by the European Commission in December 2000. The WFD requires that all European Union Member States prevent deterioration and protect, enhance and restore all bodies of water. This means that Member States must ensure that new schemes do not adversely impact upon the status of aquatic ecosystems, and that they must address historical modifications that are already impacting a water body. Whilst the WFD originates from the EU it has been retained in UK law

following the UK's exit from Europe. The Environment (EU Exit) (Scotland) (Amendment etc.) Regulations 2019 is the implementing legislation which ensures principals of the Directive are largely retained with Scottish legislation.

The key focus of the water quality assessment is to ensure that the Proposed Development is undertaken in a manner which is consistent with the objectives of the Water Framework Directive (2000/60/EC) (WFD). The WFD is the European legislation which was developed to establish systems to manage Europe's water environment - rivers, lochs, estuaries, coastal waters and groundwater; a fundamental requirement of the WFD is to attain good ecological and chemical water quality status and ensure that any deterioration in the status of waters is prevented. Any new development must ensure that these two fundamental requirements of the Directive are not compromised, nor are there any detrimental impacts to the protected area objectives of water dependent protected areas that are associated with the water body e.g., nearby designated European Sites on the national site network.

11.1.2 National Policy Context

The Proposed Development will be undertaken in line with the Marine (Scotland) Act 2010. This Act makes provisions for those functions and activities in the marine area, including provision about marine plans, licensing of marine activities, the protection of the area and its wildlife including seals and regulation of sea fisheries, and for connected purposes.

The following relevant national legislation was also considered during the preparation of this chapter:

- The Water Environment and Water Services (Scotland) Act 2003; this Act transposes the requirement of the WFD into Scottish law;
- The Environment (EU Exit) (Scotland) (Amendment etc.) Regulations 2019; and
- The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended); these regulations were introduced under the 2003 Act to specify the control regimes for discharges to, abstractions from and impoundments and engineering activities affecting the water environment (i.e., rivers, lochs, transitional waters (estuaries), coastal waters groundwater, and groundwater dependant wetlands).

11.1.3 Relevant Guidance

The Marine Scotland Licensing Operations Team (MSLOT) consider that any impact from a development that compromises the achievement of WFD objectives or causes deterioration in the status of waters, to be a significant environmental impact in terms under Part 2, Regulation 11 of the Marine Works (Environmental Impact Assessment) Scotland Regulations 2017 (as amended). A key requirement of the WFD is that surface water bodies attain at least good surface water status, requiring ecological status to be at least good and chemical status to pass the environmental quality standards for hazardous and priority hazardous substances, and that there should be no deterioration in existing status. This is particularly important for the

Sound of Iona coastal water body which is currently classified at high ecological status and therefore must not be allowed to deteriorate unless a derogation under Article 4(7) of the Habitats Directive is justified.

The EIA scoping report identified potential impacts to water quality and has proposed that further assessment is required in line with the WFD. The source of these impacts has been identified as dredging, potential effects of the proposed works on hydromorphology from the operation of the breakwater, and potential accidental pollution events. The suitability for disposal of dredge material at sea is based on chemical action levels (cALs) identified by Marine Scotland (2017).

Guidance relevant to the EIA for the water quality chapter is as follows:

- Environmental Impact Assessment Handbook: Guidance for competent authorities, consultation bodies, and others involved in the EIA process in Scotland (SNH, 2018);
- Pollution Prevention Guidance 1 (PPG): General guide to the prevention of pollution;
- PPG3: Use and design of oil separators in surface water drainage systems (to be read in conjunction with 'Oil Separator Manufacturers – Version 7 – November 19th, 2007);
- PPG 6: Working at construction and demolition sites;
- PPG 7: Refuelling facilities;
- PPG 18: Managing for water and major spillages;
- PPG 22: Incident response – dealing with spills;
- PPG26: Storage & handling of drums & intermediate bulk containers;
- Guidance for Pollution Prevention (GPP) 2: Above ground oil storage tanks;
- GPP 5: Works and maintenance in or near water;
- GPP 8: Safe storage and disposal of used oils;
- GPP 21: Pollution incident response planning;
- WAT-SG-26: Good Practice Guide – Sediment Management; and
- WAT-SG-29: Good Practice Guide – Construction Methods.

11.1.4 TraC MiMAS Assessment

Whilst the supporting physico chemical conditions of a water body can be impacted through construction of the Proposed Development (through suspended sediment and the potential impact from oils, fuels, cement/concrete spillages, which has the potential to have a significant effect on the biological elements), an important element of WFD ecological status is the supporting hydromorphological conditions. Hydromorphology considers elements such as hydrodynamic regime, the quantity, structure and substrate of the seabed and the structure of the intertidal zone and sub-tidal zones; all of which can affect the ecology of aquatic ecosystems. Good hydromorphological conditions support aquatic ecosystems (i.e.,

morphological elements such as flow regime and substrate provide physical habitat for biota such as fish, invertebrates and aquatic macrophytes). As part of WFD classification for ecological status of a water body, if the supporting morphological elements are not consistent with the conditions required to support “high status” for the biological element, then the ecological status of the water body is limited to “good status”, i.e., a water body cannot be classed as high ecological status if the morphological status is not classed as high.

There is also the risk that by allowing morphological conditions to fall below those consistent with ‘good’, the biological elements will also deteriorate, resulting in less than good ecological status and by extension, non-compliance with the WFD. Therefore, it is essential that any changes to the physical conditions of a water body that could have the potential to affect morphological conditions or the capacity of a water body to assimilate these pressures are assessed to ensure that the biological elements and the water body environmental objectives are not compromised.

The Transitional and Coastal waters Morphological Impact Assessment System (TraC-MImAS) is a risk-based decision support tool which helps regulators identify projects that may result in a deterioration of water body status as a result of hydromorphological changes. The assessment is geographically limited to aspects of projects within 3 nautical miles of the coast.

TraC-MImAS is used to help assess the impact of a new project on the system capacity of the waterbody into which the proposed project will be built. This assessment is currently carried out by MSLOT with results provided to SEPA for WFD reporting. The assessment examines the total footprint of a project based on the individual types of pressures that may be applied to a waterbody from a new development. The assessment requires details of a proposed project’s built footprint, including morphological changes such as dredging.

The TraC-MImAS tool is based on five modules (Figure 11-1). Collectively the modules provide an assessment of impacts to morphological conditions.

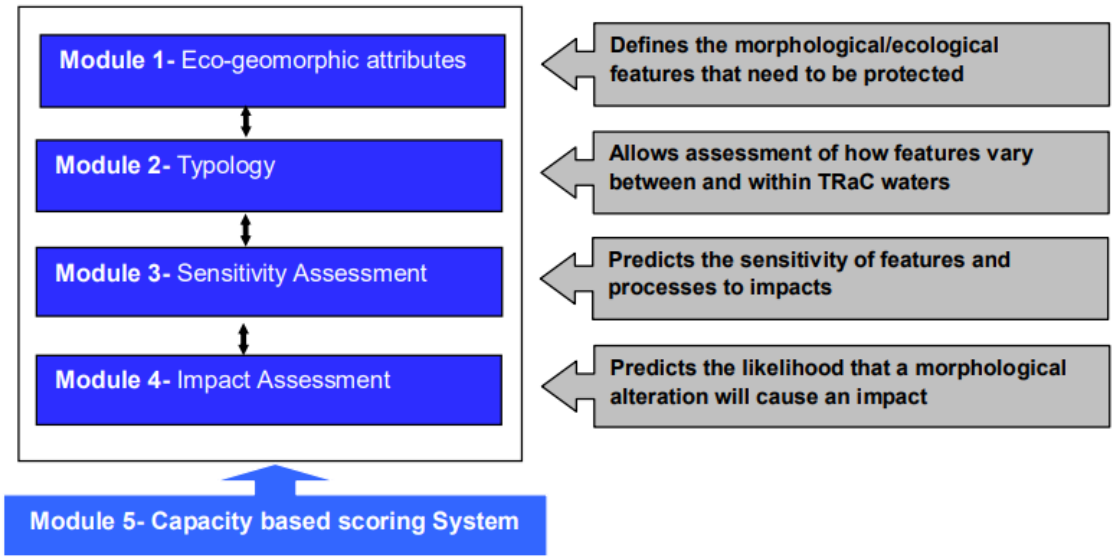

Figure 11-1 Overview on the modular components of TraC-MImAS

It is assumed that different morphological alterations will use up different amounts of system capacity, with the amount of capacity being used dependant on:

- The type of alterations;
- The sensitivity of the water environment to the alterations; and
- The spatial scale of the alterations.

Where a new development is proposed, the tools can be used to predict the impact of the proposal on "system capacity". By considering impacts on system capacity, the tool can be used to determine the level of risk presented by a new proposal. This information can then be used to inform regulatory decisions, for instance, to identify where more detailed assessments may be necessary, or to identify where there is a high risk of a deterioration in status, and, therefore, where a regulatory exemption test to determine if the work should proceed on the basis of benefits to human health, human safety or sustainable development may be required. To help quantify the risk that a new morphological alteration could impair achievement of the ecological objectives of the WFD, a series of "morphological condition limits" have been defined.

11.1.5 Assessment Criteria and Assignment of Significance

11.1.5.1 Receptor Sensitivity/ Value

The significance of effects on water quality likely to occur during the Proposed Development works (particularly from dredging activities and physical changes to the water body) at Iona are determined using the predominantly qualitative process described below. The criteria for determining the significance of effects is a two-stage process. The first step in the process is to determine the sensitivity of the receiving environment and then to define the magnitude of the potential impact This section describes the criteria applied in this chapter to assign values to the receptor to assist in defining sensitivity of receptors (Table 11-1) and the magnitude of potential impacts.

Table 11-1 Sensitivity Indication

Value (Sensitivity)	Typical descriptors
Very High	**Very high importance and rarity, international scale and very limited potential for substitution.** Examples: Water body protected area, interests are of international importance and are included on the WFD Register of Protected areas, having been designated under the Habitats, Birds, Shellfish, Bathing Water, Drinking Water or Nitrate Directives. High Status Water bodies.
High	**High importance and rarity, national scale, and limited potential for substitution.** Examples: Water body where the current status is good or better and no deterioration is permitted. National designation e.g., Sites of Special Scientific Interest (SSSI),
Medium	**High or medium importance and rarity, regional scale, limited potential for substitution.** Examples: Moderate Status with an objective of good status by 2027, regionally important resource in terms of ecology or fisheries interest.
Low	**Low or medium importance and rarity, local scale.** Examples: Local potable water source supplying <50 homes. WFD Status Poor. Amenity site used by small numbers of local people.
Negligible	**Very low importance and rarity, local scale.** Examples: WFD Status Bad, limited amenity value or fisheries interest.

11.1.5.2 Magnitude of Impact

The magnitude of the impact has also been adapted from the generic methodology for environmental assessment outlined in the Design Manual for Roads and Bridges (2011) (Table 11-2). Impacts may be considered to have no affect or be negligible to major adverse or beneficial and their magnitude has necessarily been assessed on a qualitative basis.

Table 11-2 Magnitude of Impact Indicating Type and Scale of Effect (DMRB, 2011)

Magnitude	Type and scale of effect
Major	Major alteration to water body status causing deterioration in either the ecological status including supporting elements, i.e., physico-chemical, specific pollutants and hydromorphology, chemical status or protected area status. Severe damage to key water body characteristics, features or elements (Adverse). Large scale or major improvement to water body status, extensive restoration or enhancement of water body (Beneficial).
Moderate	Water quality impact but not adversely affecting the integrity or status of the water body, partial loss or damage of certain characteristics or water body attributes (Adverse). Benefit to or addition of key characteristics or features of the water body, improvement in water status (Beneficial).
Minor	Some measurable change in water quality attributes, minor loss or alteration to one (maybe more) key characteristics (Adverse). Minor benefit to one or more key characteristics, features or elements of the water body (Beneficial)
Negligible	Very minor loss to water body characteristics, features or elements (Adverse). Very minor benefit to or positive addition of one or more water body characteristics, features or elements (Beneficial).
No change	No loss or alteration to water quality or water body status.

11.1.5.3 Significance of Effects

Applying the formula, the greater the environmental sensitivity or value of the receptor or resource, and the greater the magnitude of impact, the more significant the effect. The consequences of a highly valued environmental resource suffering a major detrimental impact would be a very significant adverse effect. Table 11-3 illustrates how the sensitivity of attributes was considered against the magnitude of impacts to determine the significance of potential impacts.

Table 11-3 Assessment Matrix

Sensitivity	Magnitude of Impact				
	No Change	**Negligible**	**Minor**	**Moderate**	**Major**
Negligible	No change	Negligible	Negligible or Minor	Negligible or Minor	Minor
Low	No change	Negligible or Minor	Negligible or Minor	Minor	Minor or Moderate
Medium	No change	Negligible or Minor	Minor	Moderate	Moderate or Major
High	No change	Minor	Minor or Moderate	Moderate or Major	Major or Substantial
Very high	No change	Minor	Moderate or Major	Major or Substantial	Substantial

Based on the importance of the receiving water body, which has been assessed to be of extremely high importance (due to the presence of Natura 2000 sites and bathing waters), and the impact significance, an assessment of the potential environmental impacts of the Proposed Development has been made based on the matrix presented in Table 11-1 to Table 11-3 above.

11.2 Baseline Scenario

The Iona ferry terminal is located along the western edge of the Sound of Iona, a coastal water body (ID: 200063), in the Scotland River Basin District (RBD) as illustrated in Figure 11-2. It is 12.1 km^2 in area and the most recent available WFD reporting data (2018) is outlined in Table 11-4.

Figure 11-2 Coastal and Surface Waterbodies

Table 11-4 WFD Reporting Data for coastal water bodies in the vicinity of the development (2020)

Parameter	Sound of Iona ID: 200063	West Mull ID: 200083	South Mull ID: 200059
1: Overall status	High	High	High
1-1: Pre-HMWB status	High	High	High
1-3: Overall ecology	High	High	High
1-3-1: Physico-Chem	High	High	High
1-3-1-4: Dissolved Oxygen	High	High	High
1-3-1-8: Dissolved inorganic nitrogen	High	High	High
1-3-2: Biological elements	High	High	High
1-3-2-3: Invertebrate animals	High	High	High
1-3-2-3-4: Benthic invertebrates (IQI)	High	High	High
1-3-2-9-1: Phytoplankton	High	High	High
1-3-3: Specific pollutants	Pass	Pass	Pass
1-3-3-15: Unionised ammonia	Pass	Pass	Pass
1-3-4: Hydromorphology	High	High	High
1-3-4-1: Morphology	High	High	High
4-1 : Water Quality	High	High	High

There are designated sites in the vicinity (Figure 11-3), in particular the Sea of the Hebrides Marine Protected Area (MPA), the Inner Hebrides and the Minches SAC and the Cnuic agus Cladach Mhuile Special Protection Area (SPA). The SAC is designated for migrating harbour porpoise (*Phocoena phocoena*), the SPA for golden eagle (*Aquila chysaetos*) while the MPA conservation objectives encompass basking shark (*Cetorhinus maximus*), Fronts, minke whale (*Balaenoptera bonaerensis*) and marine geomorphology of the Scottish Shelf.

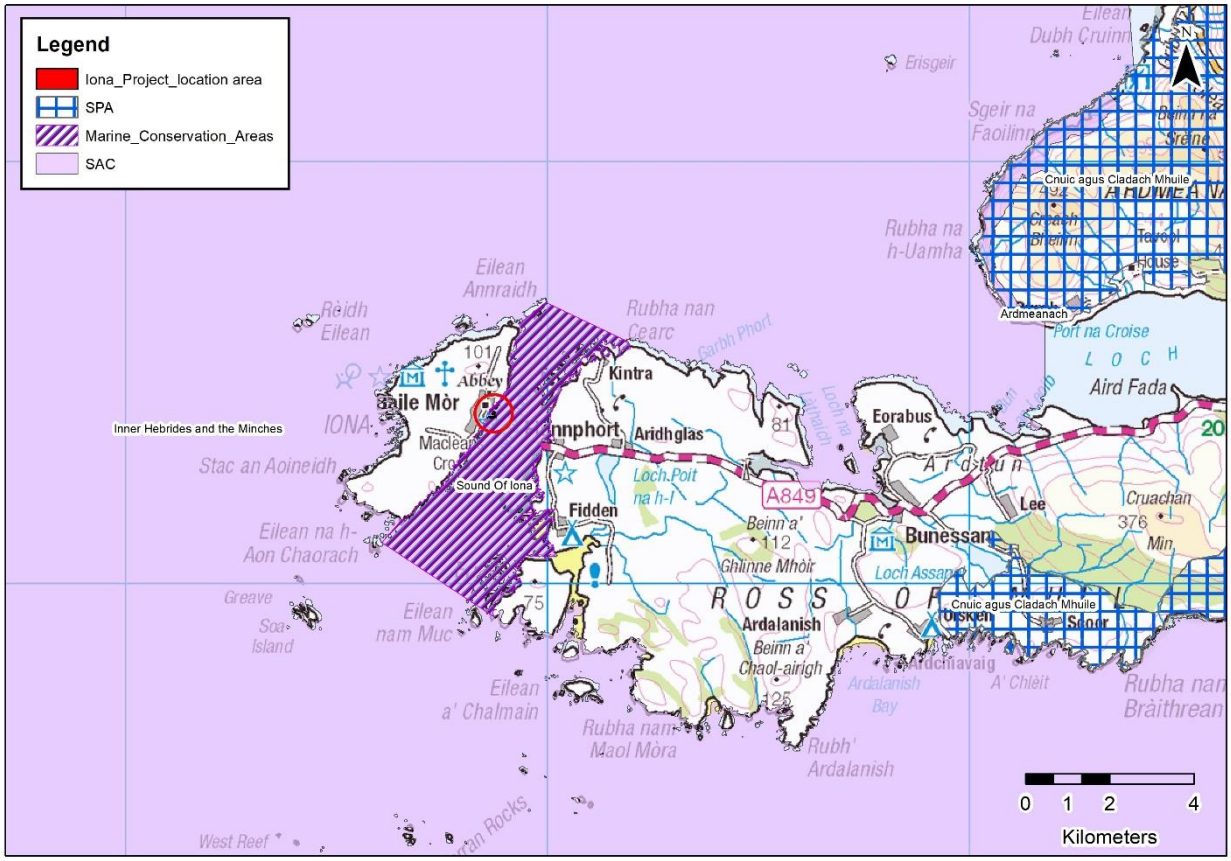

Figure 11-3 Location of Iona and surrounding designated sites

11.2.1 Consultation

Consultations were undertaken with relevant parties in order to determine the existing water quality status in the context of the Water Framework Directive (WFD) and to establish a scope for the assessment of water quality impacts, thereby enabling an appropriate assessment of the impact of the development to be made. A summary of the relevant issues identified and how these have been addressed are included in

Table **11-5**.

Table 11-5 Consultation Responses Relevant to this Chapter

Date	Consultee and Issues Raised	How/ Where addressed
October 2020	Argyll and Bute Council: Assessment of the effects on water quality from suspended sediment and possible contaminant dispersion should be included (dredging activities).	Mitigation measures to address the impact from suspended sediments and contaminant dispersion will follow best practice guidance and sound design principals. Sediment control measures will be consistent with the relevant legislation and guidance.
September 2021	Scottish Environment Protection Agency (SEPA): Referred out to SEPA triage guidance and standard scoping advice for marine developments.	Advice reviewed and adhered to.
29th September 2021	Marine Scotland: Advised that dredging/disposal activities and the placement of rock armour could have a potential impact to marine mammals through pathways other than underwater noise. It was also noted that changes in hydrological conditions (current, water flow, wave height and strength) and the effect on surrounding benthic and intertidal communities should be assessed.	Mitigation measures to address the impact from the dredging activities will be adhered to. A MImAS Assessment in conjunction with modelling from the Coastal Processes chapter has been analysed to establish any hydromorphological considerations.

11.2.2 Study Area Water Bodies

The Inner Hebrides and the Minches SAC has been designated for the Annex II species harbour porpoise (*Phocoena phocoena*). A scoping assessment has determined that the Proposed Development at Iona has the potential to affect harbour porpoise by noise, sedimentation and pollution risk associated with the construction and dredging activities.

Table 11-6 below details the water quality information for the Sound of Iona where the Proposed Development is to be located and the surrounding waterbodies in West Mull and South Mull. All three of these waterbodies have achieved high ecological status under the WFD since 2014. It is essential that the Proposed Development does not cause a deterioration in this high status achieved.

Table 11-6 Water quality information for the Sound of Iona and surrounding waterbodies from 2014- 2020[23]

Parameter	Sound of Iona ID: 200063		West Mull ID: 200083		South Mull ID: 200059	
	2014	2020	2014	2020	2014	2020
Overall status	High	High	High	High	High	High
Physical condition	High	High	High	High	High	High
Freedom from invasive species	High	High	High	High	High	High
Water quality	High	High	High	High	High	High

[23] https://www.sepa.org.uk/data-visualisation/water-environment-hub/

[H= high, G= good, P= poor]

There are no designated bathing waters within proximity to the Proposed Development.

11.2.3 Sediment Analysis of Area to be Dredged

In line with Marine Scotland Licencing Operations, dredged material must be analysed in order to assess suitability for disposal at sea. Dredging works will be minor in nature and will comprise overburden dredging only. The approximate dredge area is 2,017 m^2. The approximate dredge volume to be removed is 1,225 m^3. It is proposed that this is carried out by backhoe dredger, with the material deposited at the location shown in Figure 11-4.

Sampling and analysis of dredge material was undertaken to determine suitability of the dredge material for disposal at sea or disposal at an off-site licenced landfill; or a combination of these solutions. This included three sediment cores to 0.65 m depth and 6 grab samples of the seabed sediment in compliance with the requirements of MSLOT seabed sampling and testing. These results from the seabed sediment analysis are included in Appendix 8.1 and the proposed dredge disposal location are included in Figure 11-4.

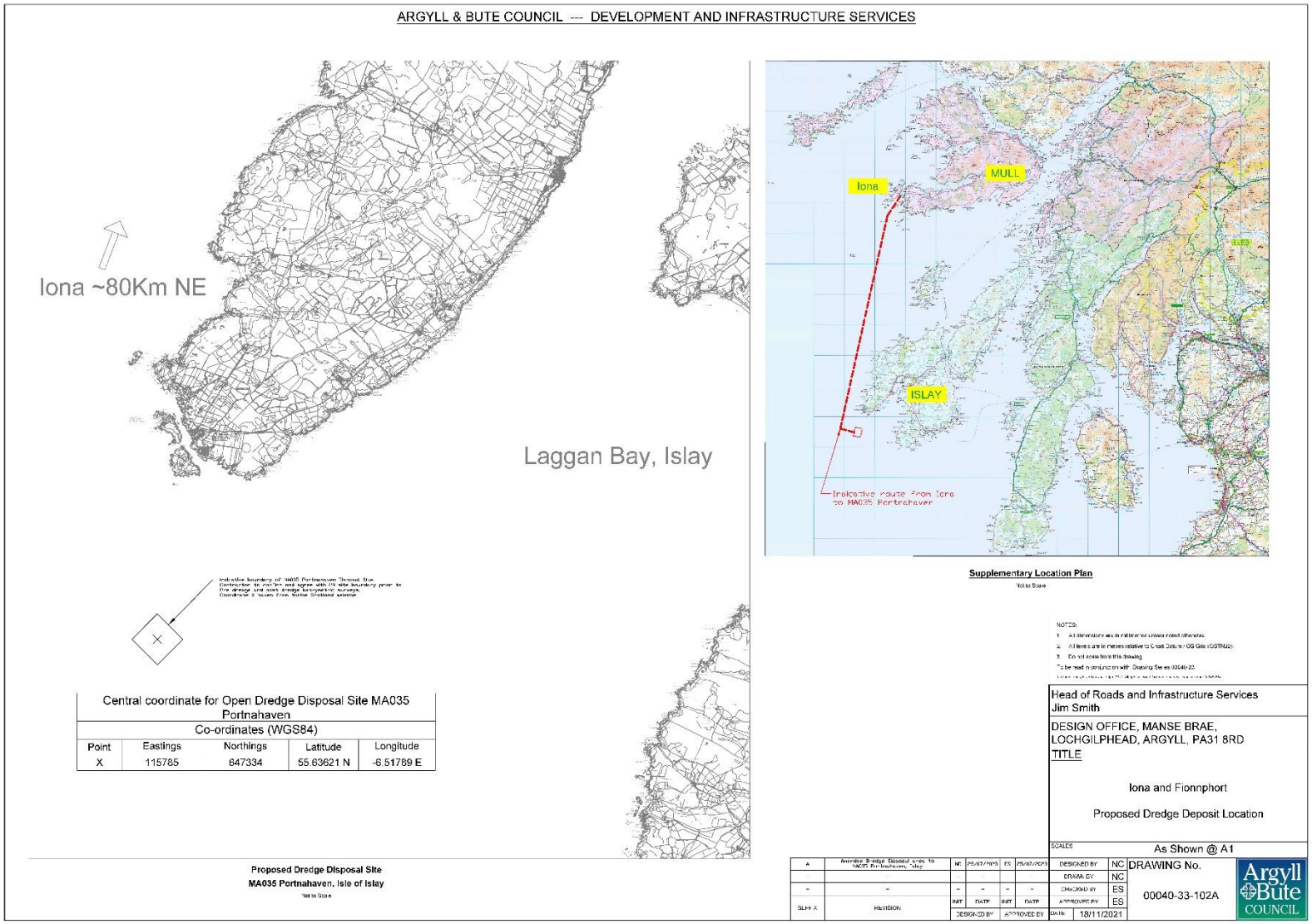

Figure 11-4: Dredge deposit location

Ground investigations and sediment samples have been undertaken to determine the nature of the dredge material. This included 3 seabed sediment cores within the dredge area and 6 grab samples in the vicinity of the breakwater.

Chemical Action Levels (cALs) as determined by Marine Scotland (2017) are used as part of a 'weight of evidence' (WOE) approach to licensing the disposal of dredged material at sea. Contaminant levels in dredged material below chemical Action Level 1 (cAL1) are generally assumed to be of no concern and are unlikely to influence the licensing decision, however for samples that fall between cAL1 and cAL2, further consideration is required before a licensing decision is made.

There is currently no formal guidance or procedures in place for handling of samples between cAL1 and cAL2, however an informed decision is made by MSLOT, given further assessment against: historic levels of contamination; the extent of contamination (i.e., if localised or widespread); the level of contamination (i.e., if concentrations are closer to cAL1 or cAL2); and how concentrations compare to natural background concentrations in the area.

The sediments were analysed for a suite of chemical parameters and screened against Marine Scotland cALs in order to identify any contamination which may be present. All samples within the dredge area were below the revised Chemical Action Levels (both cAL1 and cAL2).

11.3 Description of Likely Significant Effects

11.3.1 Assessment of Construction Effects

The key issues identified with regards to water quality are associated with the physical disturbance of the surrounding environment during dredging and construction. There may be a potential issue arising for sediment release which may have a negative impact on water quality on the Sound of Iona waterbody and on the Inner Hebrides and the Minches SAC, having a negative effect on these sites meeting their WFD objectives. In addition, dredging and construction activities may cause noise that could have a negative effect on the harbour porpoise for which the SAC is designated.

The Proposed Development has the potential to affect nearby designated sites by noise, sedimentation and pollution risk associated with construction and dredging activities and through accidental fuel spillage/ leakage. The status of the sites mean that the requirements of the Conservation (Natural Habitats, &c.) Regulations 1994 as amended (the "Habitats Regulations") apply and as such, Marine Scotland is required to consider the effect of the proposal on these sites before it can be consented (commonly known as Habitats Regulations Appraisal).

An assessment of the Proposed Development in terms of current status and the WFD objectives for the Sound of Iona (ID: 200063), West Mull (ID: 200083) and South Mull (ID: 200059) coastal water bodies was undertaken, including an assessment of potential impact.

To determine the impact of the Proposed Development upon the water quality of the Sound of Iona, West Mull, South Mull and the Inner Hebrides and the Minches SAC, baseline data have been analysed

from existing monitoring stations included in the SEPA WFD monitoring programme, as part of their River Basin Management Plan (RBMP) reporting.

The key issues surrounding the construction phase, which relate to water quality are further discussed in detail in sections 11.3.1.1 to 11.3.1.3. Those identified have the potential to negatively affect water quality and subsequently the marine biodiversity of the waters. As detailed in previous sections, it is imperative that the objectives of the WFD and the protected area objectives are not impacted by the Proposed Development. Chapter 8 (Marine Biodiversity) has determined that during the construction phase, in the absence of mitigation the impact on biological elements that contribute to the ecological status of the waters are not all negligible or minor, therefore significant in EIA terms and mitigation has been deemed necessary.

11.3.1.1 Suspended Sediment and dredging

There is the potential for increased suspended sediment during the construction works of the breakwater and the dredging process. However, the Coastal Processes chapter anticipates that the impacts of dredging resulting in suspended sediment in the water column are low due to the larger particle size of the dredge area. Sand and gravels disposed of at the open licensed offshore dumping site are expected to remain at the site and not increase the background level of suspended sediments outside of the area. In the absence of mitigation measures, the impact of construction activities may result in temporary, localised impact to water quality in the immediate vicinity of the breakwater.

Any sediment plumes generated during disposal are expected to be limited but may result in a temporary increase in turbidity. Given the distance between the dredge site and the proposed disposal site, and that the dredged material is classed as medium to coarse sand, the Coastal Processes assessment of disposal of dredge spoil arising from the Proposed Development concluded that the disposal operations would not likely result in any significant increases to the background level of suspended sediments and would not, therefore, impact the existing water quality in the area.

In addition, the journey by vessel to and from the proposed disposal site is not expected to result in ecological impacts unless there is accidental spillage. Mitigation methods include following standard pollution prevention guidelines and GPP 21: Pollution incident response planning (NIEA/ DAERA/SEPA/ NRW, 2017) to mitigate against the potential for vessel fuel spillage.

The sediments were analysed for a suite of chemical parameters and screened against Marine Scotland cALs (cAL1 and cAL2) in order to identify any contamination which may be present. All samples within the dredge area were below the revised cALs (both AL1 and AL2). Therefore, dredging will not result in release of contaminants nor impact on the physico-chemical supporting conditions, the chemical status and ultimately the biological elements of the waterbodies.

Given the scale of the Proposed Development, the magnitude of the impact is considered to be minor, however, the Sound of Iona water body is considered to be of very high importance and based on the rating of the environmental impact presented in Table 11-3 the impact is assessed as moderate to major in the absence of mitigation.

11.3.1.2 Noise impacts on biological elements and protected area objectives

Various fish species are likely to be in the waters surrounding Iona. Dredging activities associated with the Proposed Development are likely to produce noise which is likely to disturb species in the area. The works are located within the Inner Hebrides and the Minches SAC and therefore, in accordance with Article 6 of the WFD ANNEX IV, Protected Areas are afforded protection to conserve habitats or species directly dependent on waters.

The effects of underwater noise arising from construction activities are predicted to be of highly localised spatial extent, short-term duration, intermittent and reversable following cessation of works. In conjunction with this, the modelling undertaken in Chapter 8 (Marine Biodiversity) determined the impact on the marine mammals to be low in the absence of mitigation measures as the threshold for Permanent Threshold Shift (PTS) was not exceeded for any of the marine mammals. Therefore, the impact of construction and dredging activities on harbour porpoise is limited but may result in temporary, localised impact to those in the immediate vicinity. Works are unlikely to negatively affect the potential of the waterbody to maintain its WFD Protected Area objectives.

Given the scale of the Proposed Development, the magnitude of the impact is considered to be negligible, however, the Sound of Iona water body is considered to be of very high importance and based on the rating of the environmental impact presented in Table 11-3 the impact is assessed as minor in the absence of mitigation which is not significant in EIA terms.

11.3.1.3 Fuel, oil and other chemicals

During the construction phase, there is potential for accidental oil/ fuel spillages on site due to increased vessel presence and associated fuel storage. The use of oils and chemicals on-site requires significant care and attention and will adhere to the requirements of the Water Environment (Controlled Activities) (Scotland) Regulations 2011. It is important to ensure that the following mitigation measures are adhered to, to reduce the potential risk from oils and chemicals:

- Fuel, oil and chemical storage must be sited on an impervious base within a bund and secured. The base and bund walls must be impermeable to the material stored and of adequate capacity. GPP2 shall be implemented to ensure safe storage of oils and chemicals;
- The safe operation of refuelling activities shall be in accordance with PPG 7 “Safe Storage – The safe operation of refuelling facilities” (Environment Agency, 2011b);
- All machinery used during the construction phase of the works will be required to be in good working order and free from oil and hydraulic fluid leakages. Where machinery maintenance has to take place, it will be carried out at the allocated Contractor's compound;
- With regard to potential oil spills during construction, an emergency spill kit and oil spill containment equipment will be located at strategic locations adjacent to the works; and

- An Oil Spill Contingency Plan must be adhered to in the event of an accidental discharge of oil and/or Hazardous Noxious Substances (HNS). Its primary purpose is to set in motion the necessary actions to stop or minimise the discharge and to mitigate its effects. Effective planning will ensure that the necessary actions are taken in a structured, logical and timely manner.

Given the scale of the Proposed Development, the magnitude of the impact is considered to be medium, however, the Sound of Iona water body is considered to be of very high importance and based on the rating of the environmental impact presented in Table 11-3 the impact is assessed as major or substantial in the absence of mitigation.

11.3.2 Assessment of Operational Effects

The key issues surrounding the operational phase which relate to water quality are listed below in Sections 11.3.2.1 to 11.3.2.2. Those identified, have the potential to negatively affect water quality or the marine biodiversity of the waters thus potentially impacting the WFD objectives of the waterbodies. As detailed in previous sections, it is imperative that the objectives of the WFD and the protected areas objectives are not impacted by the Proposed Development. Chapter 8 (Marine Biodiversity) has determined that during the operational phase, in the absence of mitigation, the impact on biological elements that contribute to the ecological status of the waters is considered to be medium. Overall, the significance of the effect is deemed to be of moderate significance due to the potential impact on seagrass beds. This is due to the permanent long term habitat loss of Seagrass beds within the new breakwater footprint following the construction phase. However, it is also recognised that this will also create other permanent habitat occurrence due to the presence of the breakwater structure. The presence of the rubble mound breakwater is likely to be colonised by species in the area, therefore having a beneficial effect on benthic ecology. In addition, this potential increase in colonising species may result in an increase in prey species made available for fish and shellfish. With the exception of the loss in footprint of seagrass, the remaining biological elements are deemed to be of low vulnerability, high recoverability and local to international importance. Therefore, the assessment determined the significance of effect on these elements as minor (positive) and not significant in EIA terms. However, the assessment of Likely Significant Effects has deemed the effect of ‘permanent habitat loss arising from the placement of material on the seabed for the breakwater’ on seagrass to be moderate, which is significant in EIA terms.

11.3.2.1 Physical alterations/Hydromorphology

The presence of physical alterations within a waterbody has the potential to impact on the hydromorphology of the waterbody. Therefore, should the inclusion of the breakwater within the Sound of Iona waterbody impact negatively on the hydromorphology, the waterbody may potentially be at risk of deterioration and unable to maintain its current high status under the WFD.

To determine the impact the proposed breakwater will have on the waterbody during the operational phase, the Transitional and Coastal waters Morphological Impact Assessment System (TraC-MImAS)

risk assessment was undertaken. As discussed in Section 11.1.4, TraC-MImAS is a risk-based decision support tool which helps regulators identify projects that may result in a deterioration of water body status as a result of hydromorphological changes.

It is used to help assess the impact of a new project on the system capacity of the waterbody into which the proposed project will be built by examining the total footprint of a project based on the individual types of pressures that may be applied to a waterbody from a new development. The assessment requires details of a proposed project's built footprint and detail on the morphological changes such as dredging and breakwater construction in this case. The waterbody is assessed under three zones established for their different ecogeomorphic attributes; Hydrodynamics, Intertidal and Subtidal zones.

The outputs of the assessment showed that under the Stage 1 assessment at a preliminary scale - 0.5 km^2, the local area was at risk of deteriorating from its current high status to less than good status. This was due to all three zones assessed breaching the 5% high status Morphological Condition Limit (MCL) at the local scale.

A Stage 2 assessment was then undertaken at a waterbody scale which determined that the predicted waterbody status post construction would remain at high status and not breach MCLs for each of the three zones. Therefore, the Proposed Development would not result in an overall deterioration in the ecological status at the water body status, i.e., would remain within high WFD status and the breakwater would not pose a risk to the supporting hydromorphological supporting conditions of the waterbody or a risk of a deterioration in ecological status. Additional detail of the assessment is included in Volume III Technical Appendices Appendix 11.1.

Furthermore, this risk assessment is supported by the detailed assessment undertaken in Chapter 13 (Coastal Processes) which concludes that the tidal regime is predicted to remain substantially unchanged during operation. Given the localised nature and small absolute magnitude of any predicted changes in tidal current velocity, it is unlikely that there will be any significant change in net scouring or deposition of sediments within the centre of the Sound of Iona. The risk of impact is determined to be negligible, and no mitigation is required. The Proposed Development is therefore not expected to have a significant effect on coastal processes or make a significant change to the existing morphology.

11.3.2.2 Operational Maintenance

Upon completion of the construction of the Proposed Development, little will be required in terms of maintenance. Any impact from such maintenance works associated with the Proposed Development can be considered negligible/ imperceptible.

Given the small scale of the Proposed Development, the magnitude of the impact is considered to be negligible however the Sound of Iona waterbody is considered to be of very high importance and, based on the rating of the environmental impact presented in Table 11-3, the impact is assessed as minor in the absence of mitigation which is not significant in EIA terms.

11.4 Mitigation Measures

Mitigation measures will be adopted through the construction and operational phases of the Proposed Development to minimise the impact on water quality.

11.4.1 Construction Phase Mitigation

Mitigation measures required to reduce the potential impacts from noise have been identified and included and the impacts of dredging and suspended solids on general marine life. These measures follow the Joint Nature Conservation Committee recommendations and guidance for minimising risk to marine wildlife (JNCC, 2010). Sediment control measures will be consistent with the following guidance:

- Technical Guidance C648: Control of Water Pollution from Linear Construction Projects, (CIRIA, 2006);
- Technical Guidance C532: Control of Water Pollution from Construction Sites: Guidance for Consultants and Contractors (CIRIA, 2001);
- GPP 5: Works and maintenance in or near water (NIEA / DAERA / SEPA / NRW, 2017);
- PPG 6: Working at construction and demolition sites (EA / NIEA / SEPA, 2012); and
- GPP 21: Pollution incident response planning (NIEA / DAERA / SEPA / NRW, 2017)

The use of oils and chemicals on-site requires significant care and attention and will adhere to the requirements of the Water Environment (Controlled Activities) (Scotland) Regulations 2011, particularly General Binding Rule 28 and GPP2, Above Ground Oil Storage Tanks. It is important to ensure that the following procedures are followed to reduce the potential risk from oils and chemicals:

- No losses of concrete (cement) to the waters will be permitted during the works;
- Fuel, oil and chemical storage must be sited on an impervious base within a bund and secured. The base and bund walls must be impermeable to the material stored and of adequate capacity. GPP2 shall be implemented to ensure safe storage of oils and chemicals;
- The safe operation of refuelling activities shall be in accordance with PPG 7 “Safe Storage – The safe operation of refuelling facilities” (Environment Agency, 2011b);
- With regard to potential oil spills during construction, an emergency spill kit and oil spill containment equipment will be located at strategic locations adjacent to the works;
- An Oil Spill Contingency Plan which must be adhered to by all staff including those employed to carry out works. Its primary purpose is to set in motion the necessary actions to stop or minimise the discharge and to mitigate its effects. Effective planning will ensure that the necessary actions are taken in a structured, logical and timely manner; and
- Given that there will be berthing of oil, gas and renewables supply vessels and associated refuelling, a full retention oil separator is recommended to mitigate for the potential impacts of fuel/

oil spillage or leakage. This is recommended to be maintained in accordance with the manufacturer's instructions by experienced personnel.

Furthermore, SEPA's Standing Advice for Construction activities – pollution prevention has been consulted and will be adhered to. In relation to the standing advice, the contractors Environmental Clerk of Works will be required to monitor mitigation measures and auditing of the contractor's environmental controls will be undertaken by the clients representative.

11.4.1.1 Suspended Sediment and dredging

The dredging activities will not result in a release of contaminated sediments due to the analysed sediment sample results within the dredge area being below the revised CALs (both AL1 and AL2). Therefore, dredging will not impact on the physico-chemical supporting conditions, the chemical conditions and ultimately the biological elements of the waterbodies. Furthermore, during the construction of the breakwater structure, the good practice construction measures listed above in Section 11.4.1, together with SEPAs standing advice for "Construction Activities – Pollution Prevention" will be used.

Given the scale of the Proposed Development, the magnitude of the impact is considered to be negligible with mitigation applied. Given that the Sound of Iona water body is considered to be of very high importance, and based on the rating of the environmental impact presented in Table 11-3, the impact is assessed as minor where mitigation is applied ensuring that the impact is not significant in EIA terms.

11.4.1.2 Noise and vibration impacts on biological elements and protected area objectives

Given that the impact is assessed as minor in the absence of mitigation, no mitigation is proposed.

11.4.1.3 Fuel, oil and other chemicals

The significance of the impact is assessed as potentially moderate in the absence of mitigation. However, with the mitigation measures proposed in Section 11.4.1, the risk of accidental spillage of oil and chemicals means the potential significance of the impact is considered to be minor.

11.4.2 Operational Phase Mitigation

The installation of the breakwater structure will result in permanent long-term habitat loss within the new breakwater footprint following the construction phase. The effect on benthic receptors, one of the biological elements contributing to WFD Status (i.e., habitat loss effects), will be experienced throughout the lifetime of the structure. However, the presence of the breakwater will also create permanent habitat occurrence. The new structure is likely to be colonised by species, therefore having a beneficial effect on other benthic ecology. Therefore, Chapter 8 (Marine Biodiversity) stated that, with the exception of the loss in footprint of seagrass, the remaining biological elements are deemed to be of low vulnerability,

high recoverability and of local to international importance. Therefore, the assessment determined the significance of effect on these elements as minor (positive) and not significant in EIA terms.

However, the assessment of Likely Significant Effects has deemed the effect of 'Permanent habitat loss arising from the placement of material on the seabed for the breakwater' on seagrass to be moderate, which is significant in EIA terms.

As such, a 'Seagrass Compensation and Monitoring Plan' has been proposed to counter the direct habitat loss predicted to occur as a result of the Proposed Development. This will ensure that the loss of existing seagrass habitat is compensated ensuring no net loss of habitat.

11.4.3 Future Monitoring

Given the temporary and localised nature of the construction and dredging activities, continuous in-situ water quality monitoring is not considered necessary as the sediment plume will remain within the immediate area, with the concentrations returning to background levels in the wider waterbody. However, the contractor's Environmental Clerk of Works will undertake regular checks and monitoring of grab samples, while auditing of the contractor's environmental controls will also be undertaken by the clients representative.

During the operational phase of the works, it is not anticipated that monitoring will be required.

11.5 Potential Cumulative Effects

11.5.1 Assessment of Cumulative Effects

The EIA Directive 2014/52/EU specifies at Annex III that "the likely significant effects of projects on the environment must be considered […] taking into account [inter alia] the cumulation of the impact with the impact of other existing and/or approved projects"; and at Annex IV that "a description of the likely significant effects of the project on the environment resulting from, inter alia […] the cumulation of effects with other existing and/or approved projects, taking into account any existing environmental problems relating to areas of particular environmental importance likely to be affected or the use of natural resources" is required.

This obligation is mirrored in Schedule 4 to The Marine Works (Environmental Impact Assessment) (Scotland) Regulations 2017. As such, a desk study involving general internet searches and in particular, the Highland Council planning website and MSLOT website have been undertaken to identify other projects which could act cumulatively with the Proposed Development.

The following guidelines and publications were considered when determining the other projects to be considered for their potential to generate cumulative effects with the proposed redevelopment:

- Scottish Natural Heritage Environmental Impact Assessment Handbook (v5) (2018);
- Scottish Government Planning Circular 1/2017: Environmental Impact Assessment Regulations (2017);

- The Planning Inspectorate Advice Note 17: Cumulative Effects Assessment (2015); and
- European Commission (EC) Guidelines for the Assessment of Indirect and Cumulative Impacts (1999).

The Proposed Development at Fionnphort which could potentially give rise to in-combination effects from a water quality perspective was included for further assessment. Based on the modelling undertaken in the Coastal Processes chapter and the outputs of the MImAS assessment of both projects on the Sound of Iona costal water body (see Volume III Technical Appendices, Appendix 11.1), the cumulative impacts of both projects is unlikely to have a significant impact on during the construction and operational phases of the Proposed Developments.

The potential for cumulative effects has been identified in Chapter 8 (Marine Biodiversity), due to the permanent long-term habitat loss experienced as a result of the structures' footprints during the operational phases. As there is likely to be a significant effect on seagrass, an agreement will be sought between the Iona Proposed Development and the proposed Fionnphort Project on the compensation/ mitigation strategy of the seagrass to ensure that the ecological status of the water body is not affected.

11.5.2 Inter-relationships

The impact assessment also considers the inter-relationship of impacts on individual receptors. Inter-relationships are considered to be the impacts and associated effects of different aspects of the proposal on the same receptor.

There are not considered to be any potential marine biodiversity inter-related effects.

The aforementioned inter-relationship between disposal of dredged material at sea and the potential for impact on water quality from dredging and disposal has been assessed. Given that the sand and gravels disposed of at the proposed licensed offshore dumping site are uncontaminated and expected to remain at the site and not increase the background level of suspended sediments outside of the area Chapter 13 (Coastal Processes), there is unlikely to be any significant inter-related impact to water quality.

11.6 Residual Effects

In circumstances where the mitigation measures are fully implemented during the construction and operational phases, as outlined in in the above sections, the impact of the Proposed Development on the water quality and WFD Status within the Sound of Iona would consist of small-scale, minor impacts on hydromorphology, physico-chemical supporting conditions and the biological elements of WFD Status.

The Proposed Development is therefore not expected to have a significant effect on water quality or the ability of the waterbody to continue to achieve its WFD objectives.

11.7 Conclusions and Summary of Effects

The key issue in relation to water quality throughout the construction phase is associated with the physical disturbance in the marine environment, particularly dredging activities and the potential impact this may have on the Inner Hebrides and the Minches SAC.

The sediments were analysed for a suite of chemical parameters and screened against Marine Scotland revised Chemical Action Levels (cAL1 and cAL2) in order to identify any contamination which may be present. All samples within the dredge area were below the revised cALs (both cAL1 and cAL2).

Coastal process modelling of sediment plume dispersal has determined that the impact of the construction activities, i.e., dredging of sediment, will result in low impact due to the larger particle size present leading to immediate settlement from any overspill. Furthermore, sand and gravels dumped at the licensed offshore dumping site are expected to remain at the site and not increase the background level of suspended sediments outside the area. The magnitude of the potential impacts arising from dredged sediment entering the aquatic environment are therefore considered to be minor with regard to localised water quality and negligible in relation to the wider coastal water body.

Additional pressures with regards to the potential for oil/ fuel spillages both during the construction and operational phases of the Proposed Development have been assessed. The use of oils and chemicals on-site requires significant care and attention and will adhere to the requirements of the Water Environment (Controlled Activities) (Scotland) Regulations 2011 and GPP2, Above Ground Oil Storage Tanks.

The key issue in relation to the water environment throughout the operational phase of the Proposed Development is the direct permanent long-term habitat loss within the new breakwater footprint which could impact on the seagrass which is a biological element contributing to the water body status. However, this will also create permanent habitat occurrence due to the presence of the rubble mound breakwater. The new rubble mound breakwater is likely to be colonised by species, therefore having a beneficial effect on benthic ecology. With the exception of the loss in footprint of seagrass currently present, the remaining biological elements are deemed to be of low vulnerability, high recoverability and local to international importance. Therefore, the assessment determined the significance of effect on the biological elements, other than seagrass (angiosperms) as minor (positive) and not significant in EIA terms. In order to counteract the loss in seagrass habitat a ‘Seagrass Compensation and Monitoring Plan’ has been proposed with compensatory measures to ensure there is no net loss in this habitat within the water body.

The Proposed Development is therefore not expected to have a significant effect on water quality or the ability of the waterbody to continue to achieve its WFD objectives.