REPORT

Millport Flood Protection Scheme

Environmental Scoping Report

Client: North Ayrshire Council

Reference: IPB4749

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Date: 14 March 2017

Royal HaskoningDHV

Enhancing Society Together

HASKONINGDHV UK LTD.

74/2 Commercial Quay
Commercial Street
Leith
Edinburgh
EH6 6LX
Industry & Buildings
VAT registration number: 792428892

+44 131 5550506 **T**
info.edinburgh@uk.rhdhv.com **E**
royalhaskoningdhv.com **W**

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Author(s): Jen McMillan

Drafted by: Jen McMillan and Steven Rayner

Checked by: Alistair Davison

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Approved by: Amy Savage

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1 Introduction

1.1 Background

The town of Millport is located at the southern end of the island of Great Cumbrae, 2.5km offshore from mainland North Ayrshire in the Firth of Clyde, as shown in **Figure 1.1**. Most of the residential and commercial properties in the town are built on a low lying coastal strip immediately inshore of the coastal protection structures, promenade and coastal road. Tourism is a strong component of the local economy of Millport.

A number of important areas of ecological interest are located around the island. Kames Bay and Ballochmartin Bay are both designated as Sites of Special Scientific Interest (SSSI) for ecological interest. The island also supports a large variety of bird life.

Millport is at risk from flooding and erosion due to overtopping and potential failure of the existing coast protection structures. There is a history of flooding due to overtopping of the sea wall adjacent to the harbour, with minor to moderate flooding occurring most years. Many residents have taken individual action to reduce flood damages, such as installing flood boards to their doors and storing sandbags in case of need. Flooding also affects use of the coastal road and promenade, and impacts on revenue from visitors. This risk is reflected by the Scottish Environmental Protection Agency (SEPA) third generation flood map[1]. The flood protection risks to Millport are also recognised in Scotland's national flood risk strategy, with the delivery of a flood protection scheme for Millport prioritised at 10 in a list of 42 proposed schemes for implementation over the next six years.

1.2 Need for scheme

In 2015, Royal HaskoningDHV, on behalf of North Ayrshire Council completed an assessment of coastal flood risk and an appraisal of management options for Millport. These reports concluded that Millport is at risk from coastal flooding due to wave overtopping which occurs during storms originating to the south or south west within the Firth of Clyde. If nothing is done to provide improved protection to Millport's residential and commercial properties and infrastructure located within the flood risk zone, flooding and erosion would cause economic losses in excess of £44 million over the next 100 years.

In addition to providing flood protection to the community of Millport, it is hoped that the proposed scheme will create a springboard to encourage regeneration of the town, improving facilities for tourists, enhancing Millport's frontage and encouraging investment to the town to help boost the local economy in line with targets within the Local Development Plan (**Appendix 1.1**). North Ayrshire Council understand the need for the project to be visually sympathetic to the character and needs of Millport, and are supportive of considering the incorporation of improvements within the project design. An example of this is through the review of use of the harbour area and careful project design to enable these uses to continue as a minimum and potentially to be enhanced.

1.3 The proposed solution

A range of coastal flood risk management options were assessed prior to selection of the proposed scheme, as presented within this report. The scheme, for the purposes of this report, includes works on land, works on the foreshore and one of three options for works within the coastal waters at Millport Bay (see **Figure 1.1** to **1.3**). As the scheme as a whole is not yet fully defined, we will be undertaking further

[1] *http://map.sepa.org.uk/floodmap/map.htm*

consultation, design and assessment works, with consent ultimately being sought to construct a single, preferred scheme only (once this has been identified), i.e. we will not be seeking consent for all three of the options in the coastal waters at Millport.

This environmental scoping process is being undertaken on the proposed scheme (including each of the three options in the coastal waters at Millport Bay) to present a transparent dialogue with regulators, stakeholders and the local community.

In summary, the proposed scheme includes a number of elements, specifically:

- Flood walls (landside);
- Improvement works to existing coast protection structures (landside);
- Construction of shore-connected rock armour breakwaters and revetments (foreshore); and,
- Construction of either a rock armour breakwater extension to Millport Pier or an offshore breakwater in the vicinity of the rock islets (two alternative alignments proposed), i.e. the three options for works within the coastal waters at Millport Bay.

Reference to the 'proposed scheme' throughout the remainder of this report therefore includes the works on the land, works on the foreshore and works in the coastal waters at Millport (with specific reference being made to each of the three options in the coastal waters, as required, where there is a differentiating factor between the three options).

The proposed scheme as a whole aims to minimise the wave energy that can reach the sea walls around the shores of Millport Bay, reducing wave overtopping volumes and wave loading during storms, and the associated flood risk and chance of failure of the coast protection structures.

Related issues for Millport include the condition of the harbour, which is within the project area. Millport pier has a role in supporting the marine and tourism economy. The pier requires urgent repairs and the ongoing cost of maintenance is a substantial financial burden on North Ayrshire Council. In addition, the inner harbour is heavily silted and is of limited use. The Council is therefore considering options for repair of the pier and restoring the function of the inner harbour. Millport has been the subject of regeneration activity by North Ayrshire Council, which has invested in the regeneration of Millport through the provision of new teaching accommodation for the Millport Field Centre, affordable housing, and the successful application for funding for a Conservation Area Regeneration Scheme which will allow North Ayrshire Council the finances to invest in the town's built heritage and enable wider economic and social regeneration for communities. The proposed investment in coastal flood protection has the potential to further encourage additional projects of economic development in Millport (which is identified as a target for the island in the Local Development Plan, **Appendix 1.1**), for example through improvements to the harbour area including facilities for leisure boat traffic and potential expansion of the Royal George Hotel, located on land adjacent to the Pier.

1.4 Purpose of this scoping report

Screening and scoping are the first two stages of the Environmental Impact assessment (EIA) process (discussed further in **Section 2.5**). The EIA process is intended to improve environmental protection. It informs the decision making processes by which public bodies, referred to as 'competent authorities', determine whether certain projects should go ahead. It provides these bodies with a report about the project's effects on the environment that are likely to be significant, together with the comments of the public and statutory environmental organisations. For the purposes of the proposed scheme, the competent authorities are Marine Scotland for works below Mean High Water Springs (MHWS) and North Ayrshire Council for works above Mean Low Water Springs (MLWS).

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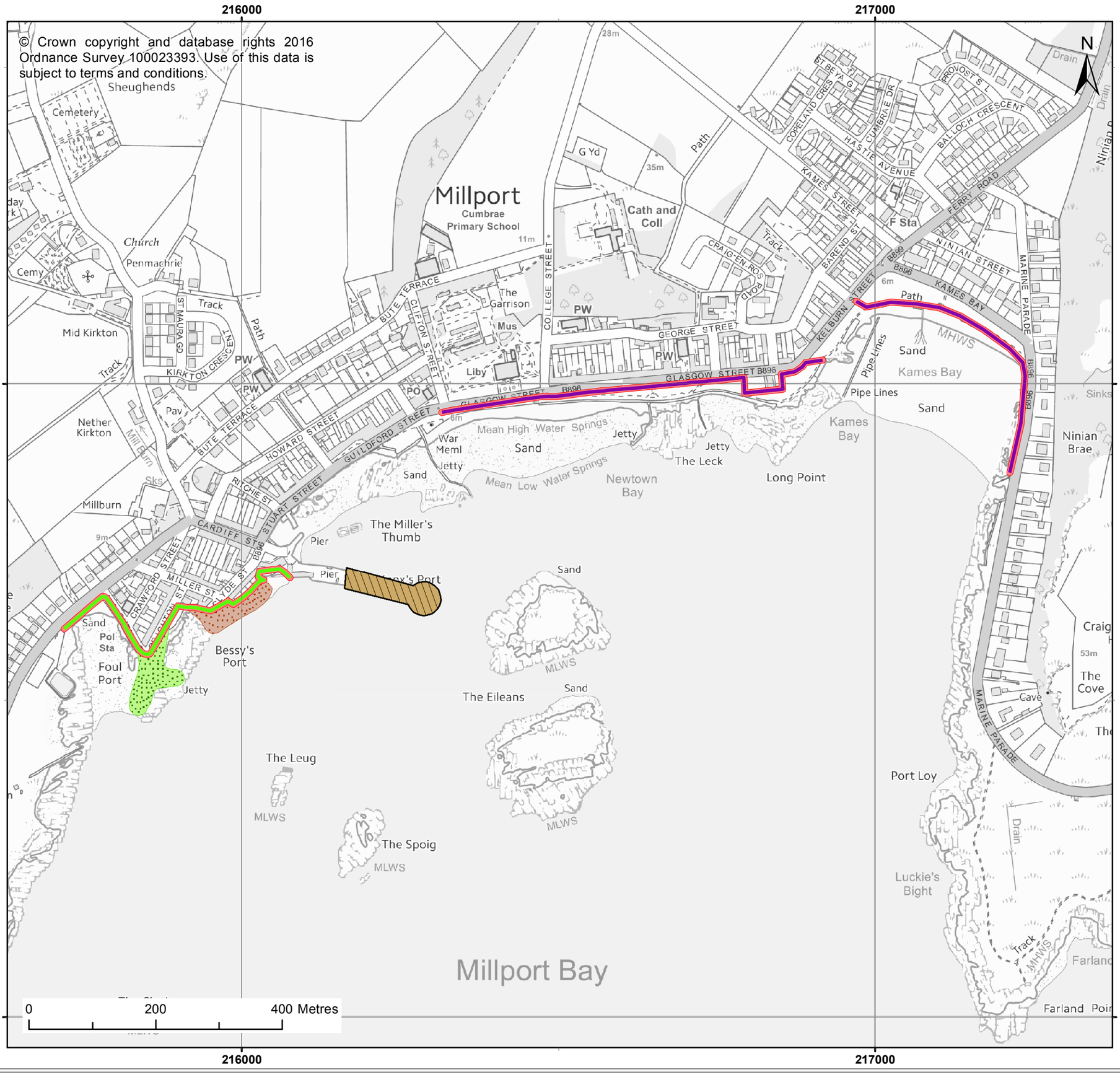

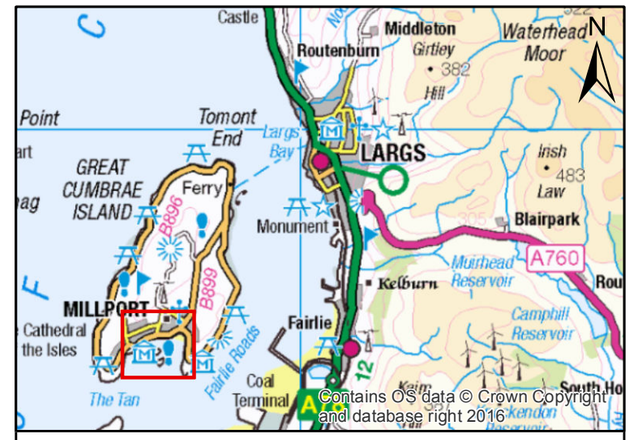

Legend

Proposed Works

Onshore Works

- Works to existing coastal defences
- New Flood Wall
- Working footprint

Works on the foreshore

- Rock Breakwater
- Rock Revetment

Offshore works - Option 1

- Harbour breakwater

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Client:	Project:
North Ayrshire Council	Millport Flood Protection Scheme - Environmental Scoping Report

Title:

Location Plan and Proposed Scheme (including offshore works Option 1)

Figure: 1.1 | Drawing No:

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Royal HaskoningDHV
Enhancing Society Together

ROYAL HASKONINGDHV
Marlborough House
Marlborough Crescent
Newcastle-upon-Tyne, NE1 4EE
+44 (0)191 211 1300
www.royalhaskoningdhv.com

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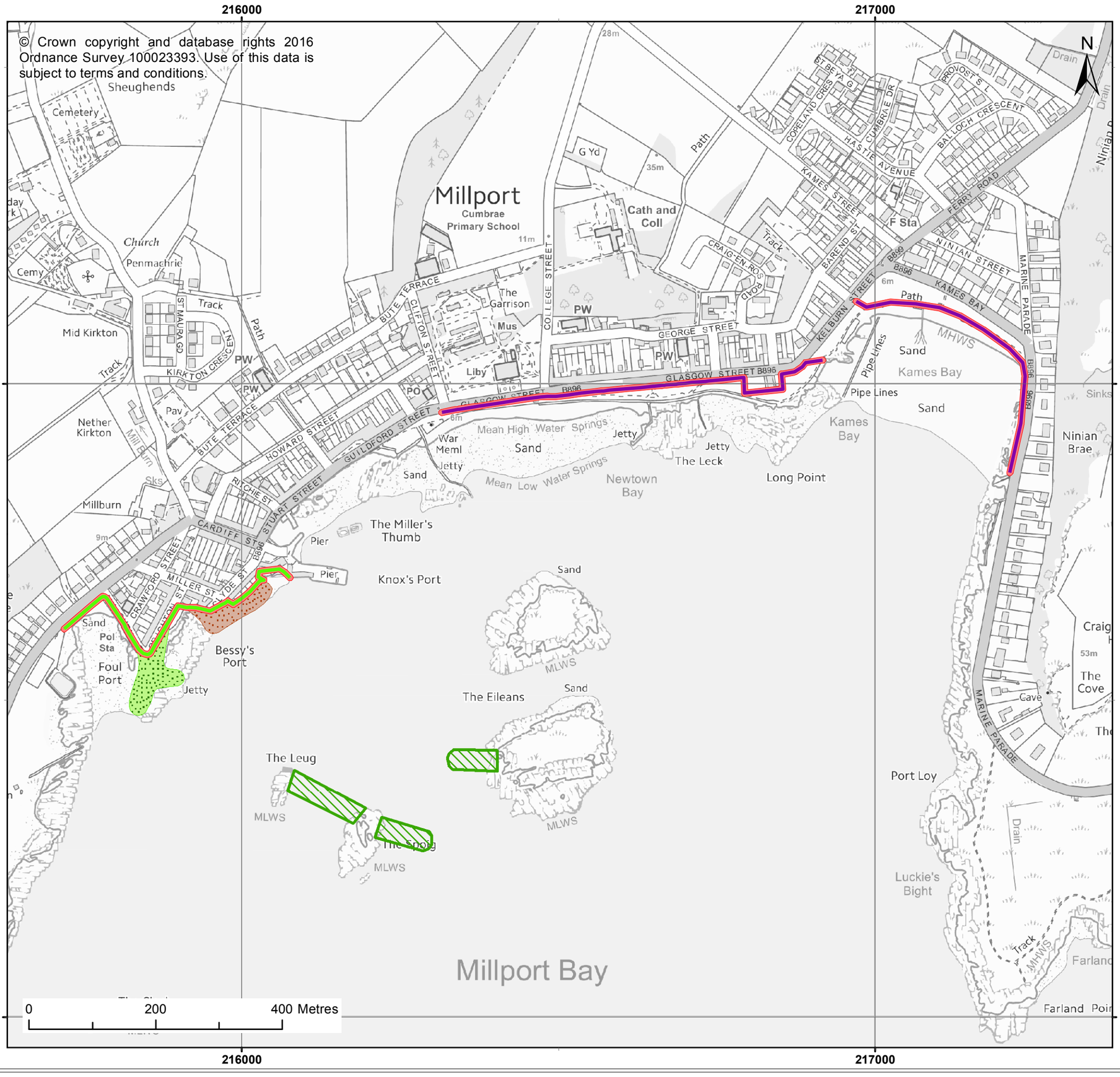

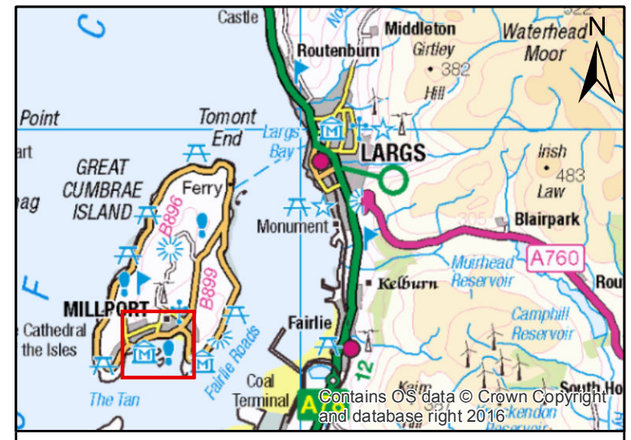

Legend

Proposed Works

Onshore Works

- Works to existing coastal defences
- New Flood Wall
- Working footprint

Works on the foreshore

- Rock Breakwater
- Rock Revetment

Offshore works - Option 2

- Potential offshore breakwater

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Title:

Location Plan and Proposed Scheme (including offshore works Option 2)

Figure: 1.2 | Drawing No:

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Royal HaskoningDHV
Enhancing Society Together

ROYAL HASKONINGDHV
Marlborough House
Marlborough Crescent
Newcastle-upon-Tyne, NE1 4EE
+44 (0)191 211 1300
www.royalhaskoningdhv.com

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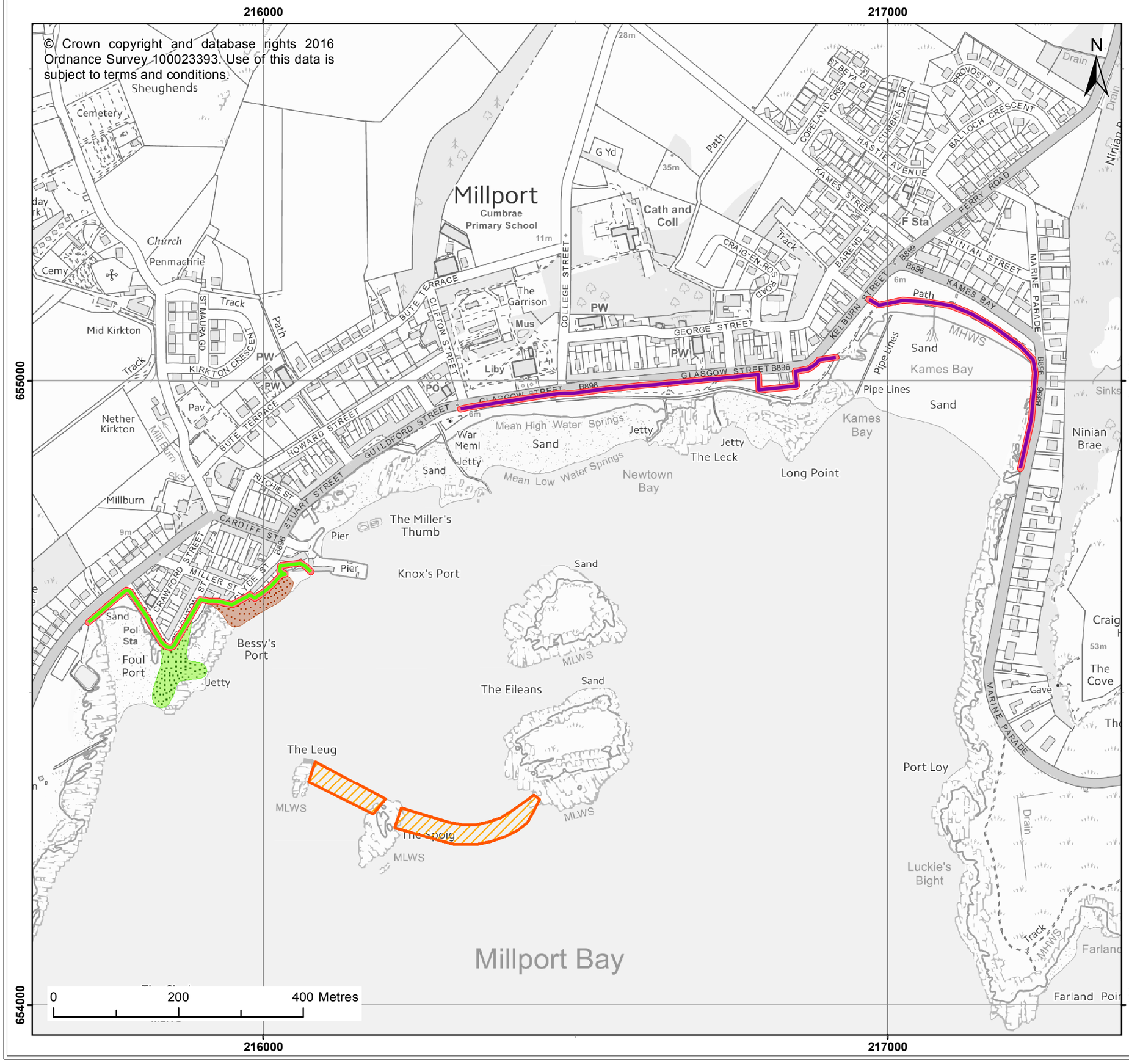

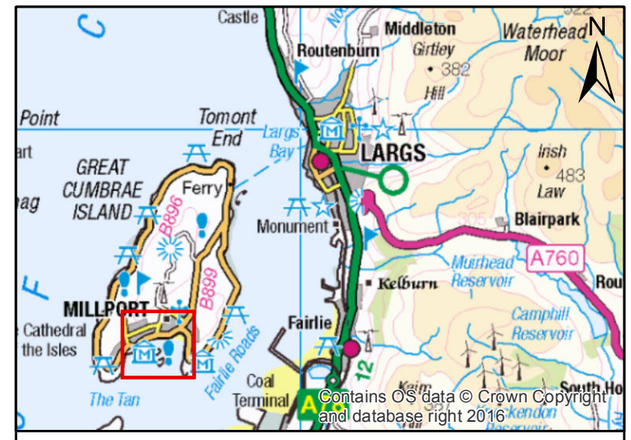

Legend

Proposed Works

Onshore Works

- Works to existing coastal defences
- New Flood Wall
- Working footprint

Works on the foreshore

- Rock Breakwater
- Rock Revetment

Offshore works - Option 3

- Potential offshore breakwater

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Client:	Project:
North Ayrshire Council	Millport Flood Protection Scheme - Environmental Scoping Report

Title:

Location Plan and Proposed Scheme (including offshore works Option 3)

Figure: 1.3 | Drawing No:

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Royal HaskoningDHV
Enhancing Society Together

ROYAL HASKONINGDHV
Marlborough House
Marlborough Crescent
Newcastle-upon-Tyne, NE1 4EE
+44 (0)191 211 1300
www.royalhaskoningdhv.com

For this project, the screening and scoping phases have been combined into this one document, allowing the competent authorities to make a more informed decision regarding the requirement for EIA. **Section 2.5** of this report provides further details on the proposed methodology for impact assessment for the proposed scheme.

Following completion of the screening and scoping process, the design of the scheme will be developed further and a preferred scheme will be selected based on the elements presented in this scoping report (the intention is to seek consent for one scheme only). At this stage, we are seeking comments from regulators on the scheme (including the options within the coastal waters at Millport Bay) which represents the worst case scenario from an environmental impact perspective.

As discussed in **Section 2.5 and Section 7**, it is considered that there is potential for the proposed scheme (including the scheme options) to be considered as EIA development, requiring the production of an Environmental Statement (ES). If it is determined that the EIA is not required, a targeted Environmental Report (ER) will be produced to present the findings of the assessment.

The purpose of this environmental scoping report is therefore twofold:

1) Firstly it formally requests an EIA screening opinion for the proposed scheme:
    - *Terrestrial Planning Route*: It is anticipated that North Ayrshire Council will seek to consent the elements of the scheme above Mean Low Water Springs (MLWS) under Section 60 of The Flood Risk Management (Scotland) Act 2009. North Ayrshire Council also aim to seek deemed planning permission under Section 57 of the Town and Country Planning (Scotland) Act 1997 (as amended by Section 65 of the FRMA) for works above MLWS.
    - *Marine Planning Route*: North Ayrshire Council will seek consent under Part 2 of the Marine Works (EIA) Regulations 2007 (as amended) and under Regulation 5 of the Marine Licensing (Pre-application Consultation) Regulations 2013 for works below MHWS.

2) The report also sets out the proposed approach to the assessment of environmental impacts and seeks a scoping opinion from the planning authority and statutory consultees on the adequacy of the proposed approach. Letters to Marine Scotland Licencing Operations Team and North Ayrshire Council Planning and Building Standards Department formally requesting a Screening and Scoping Opinion are presented in **Appendix 1.2**.

The report enables anyone potentially affected by the proposed scheme (including the scheme options) (regulators, stakeholders and local community) to be well informed of the development of the proposed project, allowing all parties to make well informed decisions during the consents process.

1.5 Scoping report structure

This environmental scoping report comprises nine sections. Following the introduction (**Section 1**), **Section 2** examines the need for EIA under existing legislation and policy context, details any designated sites in the vicinity of the proposed scheme and provides the methodology for this environmental scoping report.

Section 3 describes the outline of the proposed scheme (including the scheme options currently being considered) and the construction phase of the proposed scheme.

Sections 4, 5 and 6 identify the environmental receptors within the physical, biological and human environments respectively, and detail the potential issues under each receptor associated with the

proposed scheme (identifying differences between the scheme options where applicable). For each environmental receptor, the following are considered:

i) Overview of existing environment - a description and evaluation of the environmental receptors and the data and/or information that is available for assessment purposes.

ii) Identification of key issues - identification of the likely beneficial and adverse impact(s) that could arise as a result of the construction and operational phases of the proposed scheme including any opportunities for environmental enhancement.

iii) Recommendations of potential mitigation and monitoring that may be included within the scheme design.

iv) Discussion of the approach to assessment, highlighting key guidance documents and identifying further data to be gathered.

In considering the likely environmental impacts of the proposed scheme, this report concentrates on the potentially significant impacts that need (or are considered likely to need) further investigation.

Section 7 sets out the recommendations for the impact assessment and the way forward with regards to additional works.

Finally, **Section 8** provides a conclusion of all the impacts scoped out of the impact assessment process and identifies all of those which need to be considered further.

Details of references used in this report are provided in **Section 9**, which are followed by the appendices.

1.6 Consultation

1.6.1 Consultation to date

North Ayrshire Council representatives held informal discussions within North Ayrshire Council and with members of the public regarding the scheme proposals following completion of the 2015 FRA and Options Appraisal.

Consultation with members of the public has now also been undertaken, through the following means:

- Newsletters issued to the residents of Millport to provide updates on progress with development of the scheme proposals.
- A meeting was held with representatives of the harbour users in August 2016 to discuss their concerns with the initial scheme proposals.
- Community design workshops were held in November 2016 where information about the proposed scheme was presented and community feedback obtained during round-table discussions and notes made on plans of the area, plus a questionnaire.

The newsletters and exhibition materials have been made available digitally on North Ayrshire Council's website (http://www.north-ayrshire.gov.uk/resident/community-safety/flooding.aspx).

A project email address is available for the public to make ongoing comments relating to the scheme.

Ayrshire Flood Risk Management Plan

North Ayrshire Council is required to produce an Ayrshire Local Flood Risk Management Plan (LFRMP) under the Flood Risk Management (Scotland) Act 2009. The LFRMP was published on 22nd June 2016 and incorporates the Millport Coastal Flood Prevention Scheme.

A screening report was undertaken by North Ayrshire Council (18th January 2016) to fulfil the requirements of the Environmental Assessment (Scotland) Act 2005 under section 5(3) (b). This report determined environmental effects were unlikely to be significant and a Strategic Environmental Assessment (SEA) would not be required for the plan. Consultation on the screening report by Marine Scotland, Scottish Natural Heritage (SNH), SEPA and Historic Environment Scotland agreed with this conclusion.

Environmental Scoping report for Millport Coastal Flood Prevention Scheme

The following statutory stakeholders have been consulted in preparation of this Environmental Scoping Report to inform the environmental assessment:

- SEPA;
- Marine Scotland - Licensing Operations Team - Major Projects;
- SNH;
- Historic Environment Scotland; and,
- North Ayrshire Council's Planning Authority.

Consenting route for works within the Conservation Area

Consultation has been undertaken with North Ayrshire Council regarding the consenting route required for the sections of flood walls which fall within Millport Conservation Area. North Ayrshire Council, in consultation with the Scottish Government and the Conservation Area Appraisal has advised that deemed consent would be appropriate and that planning permission would not be required.

North Ayrshire Council has also recommended the following planning conditions for the proposed development to protect and enhance the character and appearance of the Conservation Area:

- Prior to commencement of development full details and samples of the materials for the proposed flood walls located within Millport Conservation Area shall be submitted and agreed in writing with the Planning Authority. The details which may be agreed shall be implemented in compliance with the approved materials. For the avoidance of doubt the walls should be faced in stone or a similar material which reflects the historic character of the area.
- Prior to the submission of the scheme to Scottish Ministers full details of the scale, design and location of the flood walls be submitted and agreed in writing with the Planning Authority. The details which may be agreed shall be implemented in compliance with the approved plans.

1.6.2 Further consultation proposed

Under the Town and Country Planning (Scotland) Act 1997, "statutory consultees" are described as "key public sector organisations who must be consulted on all proposals that have a bearing on their particular area of operation."

In addition to the planning authority and flooding section of the North Ayrshire Council (the latter of whom is leading on the proposed scheme) the organisations that are required to be consulted for the Millport Flood Protection Scheme are as follows:

- Community Councils of Great Cumbrae;
- Marine Scotland;
- Scottish Water;
- SEPA;
- SNH; and,
- Historic Environment Scotland.

North Ayrshire Council will also undertake consultation with local communities and non-statutory interest groups. The consultee list will be developed through discussions with Marine Scotland, local authorities, key stakeholders and augmented by North Ayrshire Council's existing knowledge of the area.

In consulting on this project it is North Ayrshire Council's aim to:

- introduce the proposed project;
- identify and discuss particular issues of concern;
- establish what existing information is available;
- discuss the need and scope of studies/surveys that may be required to inform the assessment process;
- establish the design of the proposed scheme;
- agree how any potential environmental impacts will be assessed; and
- agree what appropriate mitigation measures will be devised.

It is North Ayrshire Council's intention to work closely with the local community throughout the life of proposed project (and particularly during the development and ultimate selection and design of the preferred scheme). During design development and in advance of formal consultation associated with the consents processes, local consultation and community engagement will take the form of:

- public Meetings;
- newsletters;
- questionnaires;
- local paper;
- council website; and,
- working with the local school.

2 Policy and legislative context

The aims of this section are:

- to demonstrate the alignment of the proposals with relevant national policies; and,
- to identify the consents and licences required for the construction, operation, maintenance and removal of this type of project.

2.1 Consents and licencing

In order to permit the proposed scheme, it is anticipated that the following consents and agreements may be required:

- Marine Licence under the Marine (Scotland) Act 2010 (replacing Section 5 Part II of the Food and Environment Protection Act (FEPA), 1985 and Section 34 of Coast Protection Act, 1949) for works below MHWS to be granted by Marine Scotland.
- It is anticipated that North Ayrshire Council will seek to consent the elements of the scheme above MLWS under Section 60 of The Flood Risk Management (Scotland) Act 2009. North Ayrshire Council will seek deemed planning permission under Section 57 of the Town and Country Planning (Scotland) Act 1997 (as amended by Section 65 of the FRMA) to be granted by Scottish Ministers on confirmation of the scheme.

In additional to the above, further consents may also include:

- Harbour Works Licences from the North Ayrshire Harbour Authority. This may be required for works within the statutory Harbour Authority limits, and where authority has Works Licensing Powers (ability to regulate right of navigation and fishing within area);
- Approvals from SEPA under Section 20 of the Water Environment & Water Services (Scotland) Act 2003 and Water Environment (Controlled Activities) (Scotland) Regulations 2005 for activities liable to pollute or significantly affect the water environment; and
- A European Protected Species licence under The Conservation (Natural Habitats, & c.) Regulations 1994

2.2 Legislative context

2.2.1 The Flood Risk Management (Scotland) Act 2009

North Ayrshire Council is working closely with SEPA, Scottish Water and other local authorities to produce new national strategies and local plans. North Ayrshire Council is responsible for promoting a flood protection scheme for management of flood risk within its area. North Ayrshire Council must 'make' the scheme in accordance with Schedule 2 of the Flood Act and Regulation 11 of the Flood Risk Management (Flood Protection Schemes, Potentially Vulnerable Areas and Local Plan Districts) (Scotland) Regulations 2010. It is expected that approval from the Scottish Ministers will be required for the proposed scheme.

2.2.2 Marine (Scotland) Act 2010

This Act provides a framework for the sustainable management of Scotland's seas and one of its key aims is to streamline and simplify the licensing and consenting process for marine projects. A co-ordinated application for planning consent and associated licences can be made via Marine Scotland Licensing Operations Team (MS-LOT), as part of a unified licensing and consenting process.

2.2.3 Environmental Assessment (Scotland) Act 2005

This Act requires the responsible authority to secure the carrying out of an environmental assessment in relation to the plan or programme during the preparation of a qualifying plan or programme. In accordance with Part 2 of this Act, an environmental assessment requires:

- the preparation of an environmental report;
- the carrying out of consultations; and,
- the taking into account of the environmental report and the result of the consultations in decision-making.

2.2.4 The Town and Country Planning (Scotland) Act 1997

The Town and Country Planning (Scotland) Act 1997 is the principle legislation that governs the use and development of land in Scotland. The primary objectives of the Act are to promote sustainable economic development, encourage regeneration and to maintain and enhance the quality of the natural heritage and built environment.

Under Section 60 of the FRMA, flood protection schemes do not require separate planning permission. Section 57 of the Town and Country Planning (Scotland) Act 1997 (as amended by Section 65 of the FRMA) allows for deemed planning permission to be granted by Scottish Ministers on confirmation of a scheme. As part of the proposed scheme falls within the Millport Conservation Area, an application may be required under the Town and Country Planning (Scotland) Act 1997 and this will be confirmed in ongoing consultation with North Ayrshire Council. However, as noted in Section 1, North Ayrshire Council, in consultation with the Scottish Government and in accordance with the Conservation Area Appraisal has advised that deemed consent would be appropriate and that planning permission would not be required.

2.2.5 The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2011

The requirement for EIA for projects requiring planning permission is considered under the Town and Country Planning (EIA) (Scotland) Regulations 2011, which came into force in June 2011.

2.2.6 Marine Works (EIA) Regulations 2007 (as amended) and Marine Licensing (Pre-application Consultation) Regulations 2013

Under Part 2 of the Marine Works (EIA) Regulations 2007 (as amended) and under Regulation 5 of the Marine Licensing (Pre-application Consultation) Regulations 2013, Marine Scotland must determine if an EIA and/or pre-application consultation (PAC) is required for the works proposed below MHWS. In order to facilitate this North Ayrshire Council is required to submit a formal request for an EIA screening opinion and PAC statement, which must be accompanied by:

- *a chart or map (or both) sufficient to identify the location of the project and of the regulated activity;*
- *a brief description (including a plan) of the nature and purpose of the project and the regulated activity and their possible effects on the environment;*
- *a statement of the working methods to be used in the course of the project and in carrying out the regulated activity; and,*
- *such other information or representations as the applicant may wish to provide or make*.

The formal request for screening opinion and Stakeholder Engagement Plan accompanies this Scoping Report in **Appendices 1.2 and 2.1** respectively.

In the marine environment it is normal practise for the Marine License process within the Marine Scotland Act to take precedence over the CAR (Controlled Activities Regulations) license process, administered by SEPA.

2.3 Policy context

Scottish national planning policy is currently set out through the following documents:

- National Planning Framework (NPF);
- Scottish Planning Policy (SPP) ;
- Designing Places - Designing Streets - A Policy Statement for Scotland; and,
- Circulars.

Statements within these documents represent material considerations to be taken into account in development planning decisions. Details of the relevant sections of Scotland's planning policy are provided in **Appendix 1.1.**

2.4 Nature conservation designated sites

Table 2.1 below identifies the designated sites located within 10km of the proposed scheme. All designated sites presented below are SSSIs. No Special Areas of Conservation (SACs), Special Protection Areas (SPAs) or Ramsar sites are present within this buffer. The distance from the relevant designated sites to the proposed scheme footprint (including the scheme options) are shown in **Figure 2.1**.

Table 2.1 Nature conservation designated sites

Site Name	Designation	Distance from proposed scheme (and scheme options) (km)	Designated / Notified features
Kames Bay	SSSI	Adjacent	Biological: Habitat: Coastland
Southannan Sands	SSSI	2.8	Biological: Intertidal marine habitats and saline lagoons: Sandflats
Ballochmartin Bay	SSSI	2.6	Biological: Habitat: Coastland
Largs Coast Section	SSSI	7.7	Geological: Stratigraphy: Non-marine Devonian
Portencross Woods	SSSI	4.3	Biological: Woodlands: Upland mixed ash woodland

205000 210000 215000 220000 225000

665000 660000 655000 650000 645000

N

Largs Coast Section SSSI

Bell Bay to Whitebay

Barbay Hill

Ballochmartin Bay SSSI

Fintray Bay to Portachor Point

Ninian Brae Wood

Kames Bay SSSI

Farland Point

Southannan Sands SSSI

Portencross Woods SSSI

Rothesay
Ascog
Meikle Kilmichael
Kerrycroy
Scoulag
Ambrismore
Piperhall
Kerrymenoch
Kingarth
Kilchattan Bay
Millport
Middleton
Routenburn
Largs
Fairlie
Routenburne
Portencross
Gill
Giffordland
West Kilbride
A78(T)

0 5 Kilometres

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Legend

Proposed Works

- Indicative Site Location
- Scheme buffer 10km
- Site of Special Scientific Interest (SSSI)
- Wildlife Sites

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Client: North Ayrshire Council	Project: Millport Flood Protection Scheme - Environmental Scoping Report

Title: **Designated Sites**

Figure: 2.1 | Drawing No:

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
0	01/07/2016	TC	JMcM	A3	1:80,000

Co-ordinate system: British National Grid

Royal HaskoningDHV
Enhancing Society Together

ROYAL HASKONINGDHV
Marlborough House
Marlborough Crescent
Newcastle-upon-Tyne, NE1 4EE
+44 (0)191 211 1300
www.royalhaskoningdhv.com

2.5 Proposed impact assessment methodology

Sections 4 to 7 of this report provide details of the potential impacts that the proposed scheme (including the scheme options for works in the coastal waters at Millport Bay) could have on the physical, biological and human environment in and around Millport. The nature, extent and magnitude of many of the anticipated impacts associated with the onshore elements of the proposed scheme are comparatively minor. However, it is considered that the offshore elements of the proposed scheme (i.e. installation of a rock armour breakwater extension to Millport Pier or offshore rock armour structures) could result in relatively significant environmental impacts, which may result in the proposed scheme being classified as EIA development.

Whether a full EIA or a targeted ER is undertaken, the approach taken and detail of assessment will be the same and will adhere to EIA standards. Whichever route is progressed, we will aim to produce a report (focus on a single preferred scheme) which will allow North Ayrshire Council, regulators and stakeholders the opportunity to concentrate on the potential issues which really matter to Millport, allowing the time and resources to bring all potential impacts to an acceptable level through agreed mitigation and adaptations to the design of the proposed scheme.

A review on EIA approach is made as part of the conclusions of this scoping report (**Section 8**).

Environmental assessment (in the form of a full and formal EIA or a non-statutory impact assessment) is required to support the consent applications associated with the proposed scheme. **Table 2.2** below identifies the main stages of the environmental assessment process that the proposed scheme will follow.

Table 2.2 Stages of the impact assessment process

Stage	Task	Aim/objective	Work/output (examples)	Public participation and consultation
Screening	Screening request	To determine the requirement for EIA. A formal request for screening opinion is submitted to North Ayrshire Council and Marine Scotland with this scoping report.	Scoping report including screening request. Identification of all issues scoped out of further assessment where the nature, extent and magnitude of potential impacts are predicted to be minor and can be reduced through standard guidance and best practice. Identification of specialist studies and proposed method for assessment for those issues scoped in.	Consultation with statutory and non-statutory consultees
Scoping	Scoping report	To identify the potentially significant direct and indirect impacts of the proposed development and determine the key issues requiring further assessment in ER/ ES		
Impact assessment of key issues identified during scoping phase	Baseline data collection	To characterise the existing environment	Background data including existing literature and specialist studies	Public participation is an important part of the planning process, in particular at the impact assessment and pre-application stages. Preliminary consultation with key consultees is considered important for setting the framework for consent. Consultation with statutory and non-statutory organisations and individuals with an interest in the area and the proposed development throughout the impact assessment process forms an integral part of the North Ayrshire Council approach to impact assessment.
	Specialist studies	To further investigate those environmental parameters which may be subject to potentially significant effects	Specialist reports	
	Impact assessment	To evaluate the existing environment, in terms of sensitivity To evaluate and predict the impact (i.e. magnitude) on the existing environment To assess the significance of the predicted impacts To assess the significance of cumulative and in-combination effects	Series of significant adverse and beneficial impacts Identification of those impacts not assessed to be significant	
	Mitigation and optimisation measures	To identify appropriate and practicable mitigation measures and enhancement measures	The provision of solutions to minimise adverse impacts and maximise opportunities as far as possible Feedback into the design process, as applicable	
	ER / ES	Production of the ER / ES in accordance with relevant EIA guidance Including a Non-Technical Summary (NTS).	ER / ES Four main volumes: NTS; ER / ES; Appendices; Figures Environmental Action Plan	
	Pre-Application Consultation	With statutory and non-statutory stakeholders, including the local community	Letters, workshops, meetings, questionnaires etc.	
	Post submission	Liaison and consultation to resolve matters or representations/objections	May result in an addendum to ER / ES	
Consent Decision				

2.5.1 Characterisation of the existing environment

A characterisation of the existing environment will be undertaken to determine the baseline conditions in the vicinity of the proposed scheme. This will involve a review of available information, and any additional data gathering will be targeted and directed at answering the key question and filling key data gaps. The information gathered will be reviewed to ensure the environment can be sufficiently characterised (i.e. described).

2.5.2 Assessment of impacts

The approach the impact assessment team will take to making balanced assessments will be guided by technical specialists using a combination of existing data, new data, experience and expert judgement. In order to provide a consistent framework and system of common tools and terms, where appropriate, a matrix approach will be used to frame and present the judgments made. The impact assessment will consider the targeted suite of potential impacts during the construction, operation and decommissioning phases of the proposed scheme.

Determining receptor sensitivity

The overall sensitivity is informed by the characterisation of the existing environment and is determined by considering a combination of value, adaptability, tolerance and recoverability and applying professional judgement and/or past experience.

Predicting the magnitude of impacts

In order to predict the significance of an impact, it is fundamental to establish the magnitude and probability of an impact occurring, through consideration of:

- scale or spatial extent (small scale to large scale or most of the population or a few individuals);
- duration (short term to long term);
- frequency; and,
- change relative to baseline.

Evaluation of significance

Subsequent to establishing the sensitivity and the magnitude of an impact, the significance will be predicted by using quantitative criteria where available to ensure a robust assessment. Where possible a matrix such as the one presented in **Table 2.3** will be used to assess impact significance. For each section of the ER / ES, the methodology will be informed by the latest available guidance and, when more appropriate, another approach than the matrix may be used. **Table 2.4** provides an indication of the definitions which will be used in the assessment process for the majority of parameters. Only major and moderate impacts are considered to be significant in terms of the EIA Regulations.

Table 2.3 ***Significance of an impact resulting from each combination of receptor sensitivity and the magnitude of the effect upon it***

		Magnitude			
		High	**Medium**	**Low**	**Negligible**
Sensitivity	**High**	*Major*	*Major*	*Moderate*	*Minor*
	Medium	*Major*	*Moderate*	*Minor*	*Minor*
	Low	*Moderate*	*Minor*	*Minor*	*Negligible*
	Negligible	*Minor*	*Negligible*	*Negligible*	*Negligible*
Note: Shaded cells (red and orange) indicate significant impacts					

Table 2.4 Terminology for definition of impact significance

Impact significance	Definition of significance
No change	There is an absence of one or more of the following: an impact source, a pathway or a receptor
Negligible	The impact is assessed as not being of concern
Minor adverse	The impact is undesirable but assessed as being of limited concern
Moderate adverse	The impact gives rise to some concern, but is assessed as being tolerable (dependent upon the scale and duration of the impact)
Major adverse	The impact gives rise to serious concern and therefore should be considered as unacceptable
Minor beneficial	The impact is of minor significance, but has been assessed as having some environmental benefit
Moderate beneficial	The impact is assessed as providing a moderate gain to the environment
Major beneficial	The impact is assessed as providing a significant positive gain to the environment

A description of the approach to impact assessment and the interpretation of significance levels will be provided within each section of the ER / ES. This approach will ensure that the definition of impacts is transparent and relevant to each topic under consideration. An assessment of the confidence of the judgement made will also be provided.

Mitigation

Where impact assessment identifies that an aspect of the proposed scheme is likely to give rise to significant environmental impacts, mitigation measures will be proposed and discussed with the relevant authorities to avoid, reduce and if possible, enhance them.

Two types of mitigation have been defined and these will be identified in the ER / ES:

- Embedded mitigation, consisting of mitigation measures that are identified and adopted as part of the evolution of the project design and will be included in the Project Design Statement that describes the project as assessed in the ER / ES; and,
- Additional mitigation, consisting of mitigation measures that are identified and agreed between North Ayrshire Council and regulators during the impact assessment process to reduce or eliminate any predicted impacts and which are subsequently adopted by North Ayrshire Council as project commitments.

Assessing residual impacts

Following identification of mitigation measures, impacts will be re-assessed and all residual impacts will be described. Where no mitigation measure is proposed, a discussion will explain why the impact cannot be reduced.

Cumulative impacts

Cumulative impact assessment (CIA) forms part of the impact assessment process. The scope of the CIA (in terms of relevant issues, projects and plans) will be established with consultees (including other developers) as the impact assessment progresses.

Inter-relationships

Inter-relationships consider impacts of the development on the same receptor. These occur where a number of separate impacts, e.g. noise and air quality, affect a single receptor. The ER / ES will address the potential inter-relationships and highlight these, whilst recognising the need to avoid double-counting.

3 Description of the proposed works

3.1 Construction phase

3.1.1 General description of the proposed scheme

This section describes the indicative details of the construction phase of the proposed scheme (including the scheme options). At this stage in the process, the preferred scheme design has not been finalised; rather, there is a single flood protection scheme which will comprise works on land, works on the foreshore, and one of three options for works in the coastal waters at Millport Bay, any of which could be progressed alongside the works on land and on the foreshore. The selection of the preferred solution (which will form the subject on the ER / ES used to support applications for consent) will be informed through additional consultation with stakeholders and the local community, as well as cost-benefit analysis and additional engineering / environmental assessment.

Onshore works are expected to include flood walls and improvement works to existing coast protection structures. Works on the foreshore include shore-connected rock armour breakwaters and rock armour revetments. Offshore in Millport Bay, three options are currently being considered, specifically a rock armour breakwater extension to Millport Pier (Option 1), or offshore rock armour structures in the vicinity of the rock islets within the bay (with two possible arrangements which differentiates between Option 2 and Option 3).

Many of the design decisions are being reviewed during this stage of the project and are therefore subject to change as the project evolves. Any significant changes will be discussed with consultees to ensure they do not change the formal Scoping Opinion provided. The potential layouts for the proposed scheme (and the three options) are illustrated in **Figure 1.1** to **1.3**.

The total construction period (for any of the options) is estimated to be 12 to 18 months, commencing in autumn 2018. Ongoing consultation will seek to minimise the disruption caused to the local community through noise, traffic, air quality and tourism activities during the construction process, as discussed in **Section 4.1**.

3.1.2 Offshore works

Option 1: Breakwater extension to Millport Pier

Under this option, Millport Pier would be extended in a south-easterly direction by approximately 150m (Plate 3.1). This breakwater would be approximately 60m wide, reaching a height of 9 to 10m above the sea bed.

The breakwater would be constructed from rock armour and would most likely be built by land-based plant out from the existing pier or using a causeway built out from within the existing harbour. The use of a barge may be required for construction of some sections. The additional working footprint for construction is anticipated to be very small unless a barge is required.

It is possible that a limited amount of dredging will be required to remove loose sands and gravels from the sea bed prior to constructing the breakwater. Alternative options to the disposal of dredged material offshore will be considered, following the principles of the waste hierarchy, however there is a potential requirement for the offshore disposal of the dredged material.

The outer section of the breakwater is anticipated to be made of 3 to 6 tonne rocks, with 0.3 to 1 tonne rocks forming an underlayer, with a quarry-run core. Geotextiles may be required around the toe of the breakwater, and the design process is currently investigating if it is possible to avoid any drilling or excavation activity at the toe.

Plate 3.1 ***Existing harbour entrance and pier at Millport. The harbour breakwater (if this option is selected over the offshore breakwater) will extend out from the existing pier***

As part of the construction process, the existing timber section of the pier (which is currently condemned as unsafe to use) will need to be demolished. It is also expected that improvements will be made to the existing masonry and concrete section of the pier to improve its condition and reduce the risk of structural failure of the pier in the future. This work might involve replacing the infill material to the existing pier, grouting of the masonry and replacement of the concrete deck. Construction works would be undertaken from land.

The design development is investigating the potential for additional moorings and associated pontoons to be attached to the breakwater to improve facilities for vessels using the bay. The design will also consider ways in which docking facilities could be incorporated for the Waverley Paddle Steamer or other large vessels.

A compound will be fenced off on the existing pier for the duration of the breakwater construction works. For health and safety and access reasons, the harbour may need to be closed during construction. This will be further investigated during the consultation process to minimise disruption to the existing harbour users.

It is currently assumed that the rock required for construction of the breakwater will be delivered by sea.

Options 2 and 3 – Offshore breakwater

Two alternative arrangements of offshore breakwaters are being considered, as shown in **Figures 1.2** and **1.3**:

- Option 2 - A 120m breakwater connecting The Leug and The Spoig rock outcrops and two breakwaters between The Spoig and the southern Eilean islet (**Figure 1.2**). These breakwaters would be between 70m and 90m long, with a gap of about 100m between them; or
- Option 3 – A 120m breakwater connecting The Leug and The Spoig rock outcrops and a 200m breakwater connecting The Spoig and the southern Eilean islet (**Figure 1.3**).

The offshore breakwaters would be constructed from 5 to 7 tonne primary rock armour, with 0.3 to 1 tonne rocks forming an underlayer and a quarry-run core. Geotextiles may be required around the toe of the breakwater, and the design process is currently investigating if it is possible to avoid any drilling or excavation activity at the toe.
The 120m rock breakwater extending between The Leug and The Spoig rock outcrops would be about 50m wide at its base, reaching a height of 7.5m above the sea bed. The crest level of the breakwater is expected to be about +4.0m AOD, 2.2m above MHWS (1.8m AOD) and 5.2m above MLWS (-1.2m AOD).

The rock breakwaters between The Spoig and the southern Eilean would be about 60m wide, reaching a height of 10m above the sea bed.

The breakwaters would be located between 300m and 700m from the shoreline. Construction will therefore take place via barge. It is currently assumed that delivery of rock and other materials will be by barge. The working footprint is likely to be quite large due the use of barges.

It is possible that a limited amount of dredging will be required to remove loose sands and gravels from the sea bed prior to constructing the breakwater. Although waste will be generated during the construction phases, this will be dealt with through standard site waste management planning and no unusual wastes will arise in terms of type of waste or quantity. Alternative options to the disposal of dredged material offshore will be considered, following the principles of the waste hierarchy, however there is a potential requirement for the offshore disposal of the dredged material.

3.1.3 Onshore works

Flood wall

A new flood wall is proposed along the length of Glasgow Street and to the south of Kames Bay Road. These roads form part of the main promenade of Millport. They are lined by a number of historic and tourist attractions on the seaward side, including the war memorial, a wishing well, crazy golf and children's play park. Shops, houses and holiday accommodation are located on the landward side of the roads. As such the visual appearance and alignment of the flood wall will be carefully considered throughout the consultation process, as discussed further within this document.

Along Glasgow Street the flood wall could be positioned along the seaward side of the footpath along the road, or along the landward side of the promenade. Around Kames Bay, the flood wall could be positioned either along the south side of the green (immediately inland of the promenade) or along the north side of the green (south of the footpath along the road). The preferred position for these walls will be confirmed based on the results of wave overtopping modelling and community consultation feedback.

Access will be provided through the flood walls via flood gates, steps and/or ramps, with the details for these yet to be confirmed.

It is expected that the flood wall will be constructed from reinforced concrete, possibly with cladding using brick or stone, some footpath excavation and reinstatement may be required as part of the construction activities. To provide a suitable level of flood protection, it is anticipated that the wall will extend to a height of up to 1.2m above ground level, with a foundation approximately 1m deep. The width of the base of the wall is anticipated to be 1m, and therefore an exaction width of 2-2.5m is expected to be required. An additional working area of up to 5m either side of the wall is likely to be required by construction vehicles.

Construction plant is likely to include small excavators, small dumpers, small compaction rollers, jackhammers and concrete trucks and pumps, with all activities being undertaken from land.

Fencing will be erected around the works area, and a site compound will be required for storage of plant and materials. A search will be undertaken for existing buried services in the working footprint and if necessary, services will be diverted. Excavation of the site and ground preparation works will be undertaken.

It is anticipated that wherever possible the flood walls with be constructed from precast concrete. Precast wall units will be lifted into place by a small crane. It is possible that concrete will be cast in situ in some locations, which will require a steel reinforcement cage to be fixed in place followed by pouring of concrete. Backfilling, landscaping and cladding will then take place. Drainage improvements may also form part of the construction process.

It is most likely that the precast concrete flood wall units will be delivered by barge, to minimise the volume of construction traffic. It may be necessary to deliver other materials via the existing ferry from Largs.

Improvement works to existing coast protection structures

Existing coast protection structures (**Plate 3.2**) present along West Bay Road, Millburn Street, Crichton Street and Marine Parade will be developed to improve their flood protection capabilities. The sea walls will be increased in height by up to 1.2m above the promenade level. The coast protection structures traverse a predominantly residential area and, as for the new flood wall, the visual appearance and alignment of the flood wall will be carefully considered throughout the consultation process, as discussed further within this document.

It is anticipated that a reinforced concrete crest wall will be fixed onto the existing coastal walls, with most construction activities being undertaken from the landward side. It is possible that some footpath excavation would be required as part of the construction process.

Further construction works may also be required to improve the condition of existing masonry and concrete revetments and vertical walls that are present at various locations around Millport Bay (**Plate 3.3 and Plate 3.4**). This work is expected to include grouting of existing masonry, infilling of any voids and construction of concrete toe protection to a depth of about 1m below the beach level. It is possible that some sections of masonry revetment may need to be rebuilt, reusing the existing masonry blocks.

Construction activities would be undertaken from the landward and seaward side of the existing coast protection structures. These improvement works may require excavation of the beach adjacent to the existing structures to a depth of about 1m over a width of up to 3m. It is possible that some footpath excavation would also be required as part of the construction process.

Plate 3.2 *Existing coast protection structures on Millburn Street leading to Crichton Street*

It is most likely the materials for the improvements to the coast protection structures will be delivered by road via the existing ferry from Largs. Several options are already being considered reduce the volume of construction traffic required for the flood wall, including prefabrication of materials, use of a barge to transport all materials and local production of concrete.

Fencing will be erected around the works area, and a site compound will be required for storage of plant and materials.

Plate 3.3 *Existing vertical walls along Guildford Street*

Plate 3.4 Masonry revetment

3.1.4 Works on the foreshore

Shore connected rock armour breakwaters

A shore connected rock breakwater will be constructed, extending seaward over the rock foreshore by up to 80m from the existing coast protection structures at the junction of Millburn Street and Crichton Street. The breakwater will be about 40m wide, with the height above the rock foreshore varying depending on the level of the rock.

The breakwater will be constructed from rock armour and will most likely be built by land-based plant using a raised platform or causeway built out from the beach. The working footprint for construction is anticipated to be small in addition to the footprint of the breakwaters.

It is possible that excavation of beach materials will be required to remove a limited volume of sands and gravels from over the rock outcrops prior to constructing the breakwaters.

The outer section of the breakwaters are anticipated to be made of 3 to 6 tonne rocks, with 0.3 to 1 tonne rocks forming an underlayer, with a quarry-run core. Geotextiles may be required around the toe of the breakwaters, and the design process is currently investigating if it is possible to avoid any drilling or excavation activity at the toe. It is currently assumed the rock for the breakwaters will be delivered by sea.

A fenced site compound will be required for the construction plant and materials.

Rock armour revetment

It is currently expected that a rock armour revetment will be constructed over the existing rock foreshore to the seaward side of Clyde Street for a length of about 150m. The revetment will have a base width of up to 25m and will be up to 7m high above the foreshore.

The revetment will be constructed from rock armour and will most likely be built by land-based plant using a raised platform or causeway built out from the beach. The working footprint for construction is anticipated to be small in addition to the footprint of the breakwaters.

It is possible that excavation of beach materials will be required to remove a limited volume of sands and gravels from over the rock outcrops prior to constructing the revetment.

The outer section of the revetment is anticipated to be made of 3-6 tonne rocks, with 0.3-1 tonne rocks forming an underlayer, with a quarry-run core. Geotextiles may be required beneath the core material, and the design process is currently investigating if it is possible to avoid any drilling or excavation activity at the toe.

A fenced site compound will be required for the construction plant and materials.

It is currently assumed the rock for the revetment will be delivered by sea.

3.1.5 Summary of possible scheme scenarios

As noted above, there are three options available for the offshore works, all of which would require the onshore and foreshore works to be undertaken alongside to provide the required standard of coastal protection to Millport. The possible scenarios which could be progressed are presented visually in **Table 3.1**.

As the scheme as a whole is not yet fully defined, we will be undertaking further consultation, design and assessment works to assist with the identification of the preferred scheme. North Ayrshire Council's intention is to work closely with the local community throughout the life of proposed project, and particularly during the development and ultimate selection and design of the scheme.

Table 3.1 Summary of possible scenarios for the proposed scheme

Offshore works			Onshore works		Foreshore works	
Option 1 – Breakwater extension to Millport Pier	Option 2 - Offshore breakwater	Option 3 – Offshore breakwater	Flood walls	Improvement works to existing structures	Shore connected rock armour breakwater	Rock armour revetment
√			√	√	√	√
	√		√	√	√	√
		√	√	√	√	√

3.1.6 Operation phase

No operational works are required for the proposed scheme. Maintenance works will be low level and will be the responsibility of North Ayrshire Council. Maintenance will be undertaken as required to check the integrity of the flood walls, sea walls and breakwater, and conduct any remedial works required. Maintenance of surface water drainage will require regular inspection and work as required.

3.1.7 Decommissioning phase

The lifespan of the flood prevention scheme will be designed to be 50 years. As the purpose of the proposed scheme is for flood prevention, it is unlikely it will be decommissioned in entirety; it is more likely that the scheme will be repaired or sections replaced or improved if needed in the future. To ease the process of decommissioning should it be required, the project design will aim to avoid excavation or

drilling into the bedrock for the toe of the rock structures. Decommissioning of the flood walls are anticipated to require a similar process to that discussed above for the construction phase.

3.2 Consideration of alternatives

3.2.1 Flood Risk Assessment (FRA)

In November 2014 Royal HaskoningDHV was commissioned to review the risk of coastal flooding at Millport. This study provided an update and improvement to the existing flood risk maps through assessing the impact of wave action on flood risk and an initial review of potential options to reduce flood risk to properties in Millport.

The study concluded the following:

- Millport is at risk from flooding due to overtopping resulting from wave action during storms originating to the south or south west within the Firth of Clyde.
- The relatively steep slope of the coastal frontage means that it is difficult for flood water to propagate inland.
- The following options are considered to be appropriate to reduce flood risks to properties in Millport:
    - Option 1: Linear onshore flood protection (Upgrade existing structures plus new flood walls);
    - Option 2: Nearshore rock breakwater and flood walls; and
    - Option 3: Individual property protection.

An initial, qualitative, option comparison was carried out against the following criteria:

- Coastal/flood protection – will the option address the flood risk, now and into the future;
- Relative cost – implementation costs;
- Amenity benefit – amenity benefits associated with the implementation of this option, e.g. stable beach levels;
- Health and Safety – during construction and following implementation, particularly considering public safety;
- Maintenance obligation – requirement for the Council to maintain the implemented solution following construction;
- Legal – licencing requirements and liability;
- Environmental Impact – impact on nationally important designations; and,
- Local Development Plan Compliance – compliance of the option with the aspirations, through the LDP, for Millport.

This assessment determined Option 1 to be the highest ranked option, however the option scores were not greatly different to each other. As a result, the study recommended that a more detailed options appraisal was required to assess the most appropriate solution for Millport.

3.2.2 Initial options appraisal

Royal HaskoningDHV subsequently undertook an initial Option Appraisal in 2015. The Options Appraisal assessed the erosion and flooding damages and benefits associated with various potential coast protection options for Millport, based on flood risk mapping from the 2015 FRA.

This was a high level study, undertaken with the aim of providing an initial assessment of the likely viability of a flood protection scheme for Millport. Further work to develop the proposed options, as well as public

and statutory consultation, was expected to be required if the study confirmed that a flood protection scheme was justified.

The outputs from the 2015 FRA informed the development of the following primary options that were assessed by Options Appraisal:

- Option 1a – Flood walls;
- Option 1b – Flood walls and revetments;
- Option 1c – Flood walls, revetment and rock breakwaters;
- Option 2a – Offshore breakwater and flood walls;
- Option 2b – Offshore breakwater, flood walls and rock breakwaters;
- Option 3 – Property level protection;
- Option 4a – Harbour breakwater (rock armour breakwater extension to Millport Pier) and flood walls; and
- Option 4b – Harbour breakwater (rock armour breakwater extension to Millport Pier), flood walls and rock breakwaters.

Outline design was undertaken for the proposed options to provide an indicative assessment of construction costs. The economic benefits associated with the proposed options were assessed based on the outcomes from the 2015 FRA. Based on these costs and benefits, an economic appraisal was completed in accordance with SEPA guidance. Options were assessed over a 100-year period and costs and benefits discounted in accordance with the Treasury Handbook.

The report concluded that all options were economically viable, with a positive net present value and a benefit cost ratio greater than 1.0. Option 4b (Harbour breakwater, flood walls & breakwaters) would have the highest net present value and the highest benefit cost ratio of 5.07. **Based on the high-level options appraisal, Option 4b (Harbour Breakwater with Flood Walls and Rock Breakwaters) was considered to be the preferred option on technical and economic grounds.**

A sensitivity analysis considered the main items that could affect the outcome of the economic appraisal (flood level/depth, construction costs, property values, residual life of the existing coast protection structures, erosion rates and climate change). All options would remain economically viable with the sensitivity adjustments applied, although the benefit cost ratios may be reduced.

In summary, the initial options appraisal for Millport identified various options for improving the protection of Millport against flooding and erosion risks. All of these options were found to be technically and economically viable. The potential environmental impacts of all options were assessed at a high level as part of these studies, and it was identified that those options involving works to the foreshore could have negative impacts on natural habitats. All options would change the appearance of the seafront area. However, it was expected to be possible to minimise and mitigate against the environmental impacts of all potential options. Consultation and environmental assessment had not yet been undertaken as part of these studies, therefore it was recognised that the scheme components might change as the design development progressed.

3.2.3 Further option development

Based on the findings of the 2015 FRA and initial Options Appraisal, the flood risks to Millport are recognised in Scotland's national flood risk strategy. The delivery of a flood protection scheme for Millport has been prioritised at 10 in a list of 42 proposed schemes for implementation over the next six years.

Following a competitive tender process, North Ayrshire Council appointed Royal HaskoningDHV to develop a Coastal Flood Protection Scheme for Millport. Development of the scheme is progressing in three phases:

- Stage A – Outline Design Development, Risk Review and Optimisation
- Stage B - Consultation, Consents and Licences
- Stage C – Detailed Design and Contract Documents

Stages A and B of scheme development are currently being progressed in parallel. The starting point for scheme development was the outcome of the initial Option Appraisal, with the preferred option being Option 4b (Harbour Breakwater with Flood Walls and Rock Breakwaters).

Consultation with stakeholders and the community commenced with issue of a newsletter setting out the work that had been done to date to identify flood risks and potential scheme options. The proposed scheme option was presented in this newsletter. Feedback on this newsletter highlighted community concerns with the proposed solution and as a result, a meeting was held with harbour users to understand these issues and reflect them in the scheme development.

Following this meeting, the scheme options to be assessed by numerical modelling were reviewed. The layout of the proposed harbour breakwater (rock armour breakwater extension to Millport Pier) was refined (Option 1, Figure 1.1). An offshore breakwater option was also considered. This potential solution included two breakwater arms between the islets in Millport Bay (the Spoig and the southern Eilean) and a further breakwater section joining the Leug and the Spoig islets. This option (Option 2, Figure 1.2) aims to maintain the existing navigation channel.

Community design workshops were held in late November and early December 2016 where the findings of the option development to date were presented and community feedback obtained. During the workshops a further offshore breakwater option was discussed and developed. The harbour users commented that the defined navigation channel was not their preferred route to navigate into Millport Bay due to the high shelf in the sea bed between the Spoig and the Eileans. The channel to the west of the Leug was considered to be an easier navigation route, and therefore an option which closed the channel between the Spoig and the Eileans was proposed (Option 3, Figure 1.3).

Numerical modelling has now been undertaken to assess the impact of these three options on the nearshore wave climate and wave overtopping of the existing coast protection structures. The expected performance of the proposed onshore flood protection structures (flood walls and raised crest walls) was also assessed for these alternative options.

4 Possible impacts on the physical environment

This Chapter considers the potential impacts of the proposed scheme on the following receptors:

- coastal processes;
- marine water and sediment quality;
- onshore ground conditions and contamination; and,
- onshore water resources and flood risk.

An overview of the relevant existing environment is provided for each along with the anticipated impacts, identification of mitigation and monitoring measures and discussion of the additional work.

4.1 Coastal processes

The proposed scheme has the potential to directly and indirectly change the physical (waves and tidal currents) and sedimentary process regimes, both locally and regionally. There is potential to affect the wave climate and tidal current speeds and direction, both of which drive sediment transport and patterns of erosion and deposition in the coastal and nearshore zones.

This section describes the existing physical regime and coastal geomorphology of the potentially affected areas and summarises the anticipated potential effects of the proposed scheme, followed by a description of the proposed methodology to predict the magnitude of those effects during subsequent phases of the assessment process.

The study area for this scoping assessment is Millport and the immediate surrounding coastal and marine areas of the island of Great Cumbrae and Firth of Clyde.

4.1.1 Summary of approach

The methods adopted to understand potential changes to coastal processes are different to those adopted for other sections of this scoping report. This is because the scheme will have effects on the physical and sedimentary processes regimes, but these effects in themselves are not considered to be impacts; the impacts will be consequential effects of the changes on other receptors such as coastal ecology and fish and shellfish resource. For example, changes in the transport and deposition of sediment may impact upon the character of coastal and marine habitats and their associated species. Similarly, changes in hydrodynamic processes may alter the erosion and deposition patterns at the shoreline.

Therefore, the commentary in this section focuses on the potential for changes/effects rather than impacts. The potential impacts on coastal ecology and fish and shellfish resource resulting from changes in physical processes, geomorphology and sedimentary processes are considered in **Section 5.1 (Terrestrial and Coastal Ecology**) and **Section 5.4 (Fish and Shellfish Resource**).

4.1.2 Existing environment

This section provides a high-level description of the baseline physical and sedimentary processes of the coastal and marine areas at and adjacent to Millport.

Geomorphological Setting

The inner Firth of Clyde consists of a number of narrow fjords and the islands of Bute, Inchmarnock, Great Cumbrae and Little Cumbrae. The inner Clyde forms a broader embayment which is aligned north-south between Fairland Head and Dunoon and then takes a west-east alignment to its head on the River Clyde.

In the outer Firth of Clyde, the Isle of Arran provides shelter to the inner part of the Firth against waves from the southwest.

The island of Great Cumbrae is located in the Firth of Clyde about 1.5km from the mainland. The majority of the coastline of the island is characterised by an emergent rock platform, with isolated pocket bays containing beaches. The rock foreshore is currently stable with low rates of change. Millport Bay is the part of the island coastline that contains larger lengths of mobile beach sediment. The bay can be divided into three parts; Kames Bay located in the northeast corner of Millport which contains a 150m-wide sandy beach, a sandy beach (about 50m wide) on rock platform along the central part of the bay (and fronting the proposed new flood wall) and the rest of the Millport shore, which has a sand and gravel veneer overlying rock platform.

Millport Bay faces south, with Kames Bay (at the eastern end) aligned to the south-southwest. Within the bay, there are large rock outcrops, known as The Eileans, which provide shelter to the central section of Millport Bay against waves from the south. The water depth inshore of The Eileans is generally less than 5m. The shelter provided by these outcrops has led to the deposition of sand in their lee along the central part of the Millport Bay shoreline (i.e. forming a small salient).

Waves

The enclosed nature of the Firth of Clyde combined with the narrow fjords limits the wave fields affecting the coastline of this area. As a result both the height and direction of waves reaching the coast are highly dependent on wind direction. The waves in the Firth of Clyde are therefore mainly generated within the confines of the estuary. The entire coast of the study area is exposed to a dominant southwesterly wind.

Royal HaskoningDHV (2007) modelled the nearshore wave climate at Millport. The model used included a broad-scale model of the outer Firth of Clyde and a smaller scale model focussing on the Inner Firth of Clyde and covering the island of Great Cumbrae. At Millport, the dominant wave direction in the nearshore area in terms of frequency is from the southwest. However, the dominant direction in terms of energy is from the more southerly sector. Within the bay itself the wave climate, both in terms of frequency and energy, varies, reflecting the importance of the local rock outcrops.

Water levels

Tide levels are taken directly from Admiralty Tide Tables. Millport is a secondary port, with tide levels referenced to the primary port at Greenock. The astronomical tide levels for Millport are shown in **Table 4.1.**

Table 4.1 Tide levels at Millport

Location	Datum (m AOD)					
Millport	MLWS	MLWN	MHWN	MHWS	Mean tidal range	
					Spring	Neap
	-1.2	-0.6	1.1	1.8	3.0	1.7

Tidal currents

The regional area is covered by two Admiralty tidal stream points (tidal diamonds), recording flows not exceeding 0.8m/sec under normal tidal conditions. The moderate tidal range in the Firth of Clyde results in weak currents that are unlikely to have the capacity to transport significant quantities of sediment. Tidal streams, identified from the tidal diamond to the west of Hunterston (on the mainland), are moderately strong, due to the constriction by the Cumbrae Islands and the Isle of Arran; currents do not however

exceed 0.72m/s at any stage of the tide. Flows local to Millport are likely to be less than this and will be strongly (and locally) influenced by the various structures, islands and rock outcrops.

Tidal flushing

Tidally driven water enters and exits Millport Bay either side of and between the offshore rock outcrops. Hence, the system is effectively flushed on the flood and ebb tides.

Bedload sediment transport

Sediment transport around Millport and the island of Great Cumbrae has not been investigated. However, given the dominance of emergent rock platforms and the general lack of mobile sediment, the transport rates are likely to be very low. However, there are sediment sinks around Millport Bay. These are in Kames Bay and in the shelter of The Eileans along the central part of the Bay. Kames Bay is acting as a sediment trap between two resistant headlands and the central coast is a salient caused by the reduction in wave energy behind the rock outcrops.

The primary source of sediment to these beaches is likely to be fluvio-glacial deposits located along the nearshore zone of the Firth of Clyde. These sediments are susceptible to erosion and movement by waves. Additional sediment may be sourced from eroding marine raised beach deposits.

4.1.3 Identification of key issues

The effect on wave heights has been modelled for all three options for a 0.08 year event and a 200 year event. The extreme 200 year waves with the options in place are compared here with the baseline waves (**Figure 4.1**), along the three stretches of coast at Millport, categorised in the geomorphological setting above. The predicted wave heights at Kames Bay change very little between the three options. This is because the structures have little effect on the passage of waves east of The Eileans. Similarly, the predicted wave heights directly in the lee of The Eileans are similar for all three options. Further west (between the existing jetty and pier) the predicted wave heights are different depending on the option. For Options 1 and 3 there is a small reduction in predicted wave height at the coast caused by the protection afforded by the pier extension breakwater (Option 1) or the breakwaters connecting the rock outcrops (Option 3). For Option 2, there is a reduction in predicted wave height, but it is less pronounced as some wave energy can pass through remaining navigation gap between The Spoig and southern Eileans. Southwest of the pier, predicted wave heights do not change for Option 1 and are lower for Option 3 because of the protection afforded by the structures. For Option 2, the predicted wave heights are lower directly behind the western breakwater connected to The Leug, but slightly higher outside its protection (south of Bessy's Port) because of the constriction of wave passage create by it.

Tidal flushing

The operation of offshore works Options 1 and 2 will have no effect on the flushing capacity of the system because the three passages for entry and exit of water to and from the bay will remain open (although slightly modified in size). Offshore Option 3 will present a barrier across the central passage (between The Spoig and Eileans), but given the two widest passages continue to allow entry and exit of water means that the flushing ability of the bay will be affected very little.

Bedload sediment transport

Given the absence of change in predicted wave heights at Kames Bay for all three options, the sediment transport patterns at this location are also unlikely to change. Between Kames Bay and the existing jetty (i.e. in the direct lee of The Eileans) the wave heights for all three options are also similar to the baseline, and so sediment transport conditions are unlikely to change. Further west the subtle changes in wave

height caused by the structures in each option may have a very small effect on transport and change the patterns of erosion and accretion local to the jetty, the pier and at Bessy's Port.

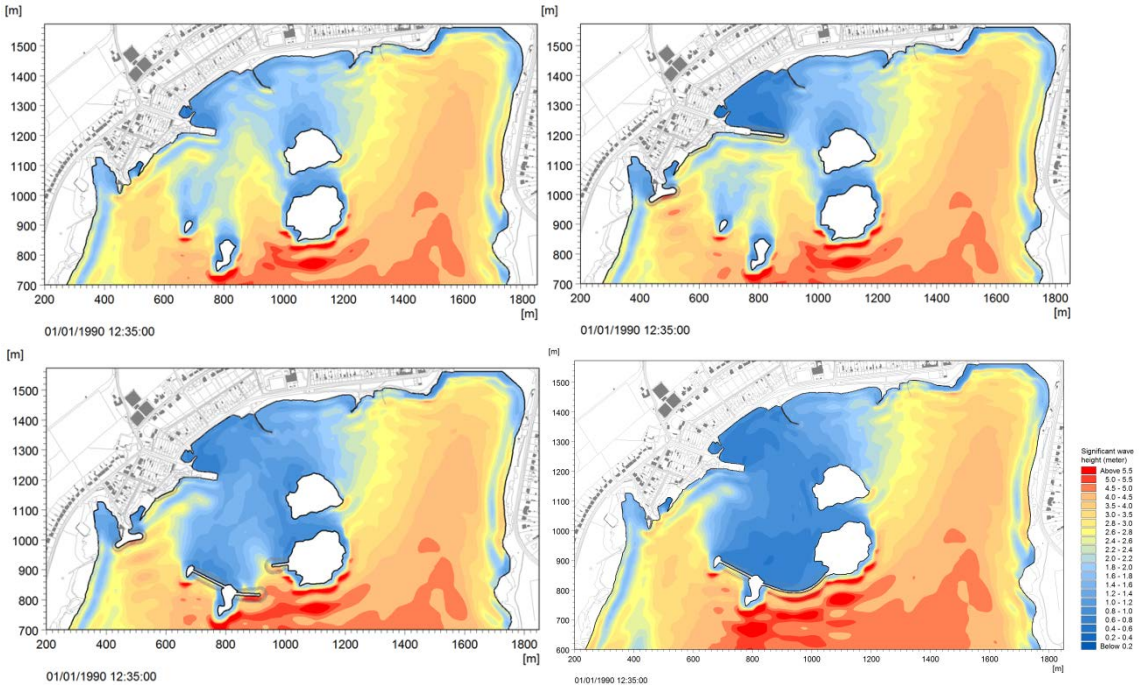


Figure 4.1 ***Comparison of predicted waves for a 200 year event with waves approaching from the south. Existing situation (top left), offshore works option 1 (top right), offshore works option 2 (bottom left) and offshore works option 3 (bottom right)***

4.1.4 Identification of key issues

The potential effects on coastal processes associated with the construction and operational phase of the proposed works are summarised in **Table 4.2** below.

Table 4.2 ***Key issues for coastal processes***

Potential Effect	Phase	Potential significance	Comment
Potential temporary increase in suspended sediment concentrations due to construction activities	Construction	Impact unlikely to be significant and therefore scoped out of assessment	The Bay coast is dominated by rock platform and relatively coarse mobile sediments. Hence, any plume created by construction activities associated with the nearshore (i.e. option 1) or offshore options (i.e. options 2 and 3) will be of very low concentration, locally distributed and temporary in nature.
Potential erosion of the beach along the central part of the Bay caused by wave reflection off the new flood wall	Operation	Impact unlikely to be significant and therefore scoped out of assessment	The new flood wall will be set back beyond the high tide level. The purpose of the wall is to stop water that has overtopped the existing coast protection structures from reaching the road and properties.
Potential changes to local waves and bedload sediment transport in the Bay due to presence of the structures	Operation	Impact unlikely to be significant and therefore scoped out of assessment	The layout of options 1, 2 and 3 will affect waves and bedload sediment transport. However, the presence of existing structures already creating obstructions and the limited amounts of sediment available for transport will make this effect very small. As the amount of sediment transported is comparatively small, the anticipated impact of the project on the natural sediment transport system within the Millport Bay is considered unlikely to have a significant impact.

Potential changes to local tidal currents in the Bay due to presence of the structure	Operation	Impact unlikely to be significant and therefore scoped out of assessment	The layouts of options 1, 2 and 3 is only likely to have a very small effect on tidal currents because (the tidal currents themselves) are very low velocity and not capable of transporting sediment. Hence, there will be a very small change local to the options with very little change elsewhere.
Potential changes to tidal flushing	Operation	Impact unlikely to be significant and therefore scoped out of assessment	The layouts of options 1 and 2 will have no effect on tidal flushing because all passages for entry and exit of water remain open. Option 3 is only likely to have a very small effect because only the narrowest passage for entry and exit of water is blocked. This potential effect is therefore scoped out of the assessment.

4.1.5 Approach to assessment and data gathering

As noted in **Table 4.1**, all potential impacts of the proposed scheme on coastal processes are considered unlikely to be significant, and are therefore scoped out of the assessment. No further assessment of impacts to coastal processes will therefore be undertaken.

4.2 Marine water and sediment quality

4.2.1 Existing environment

Water quality

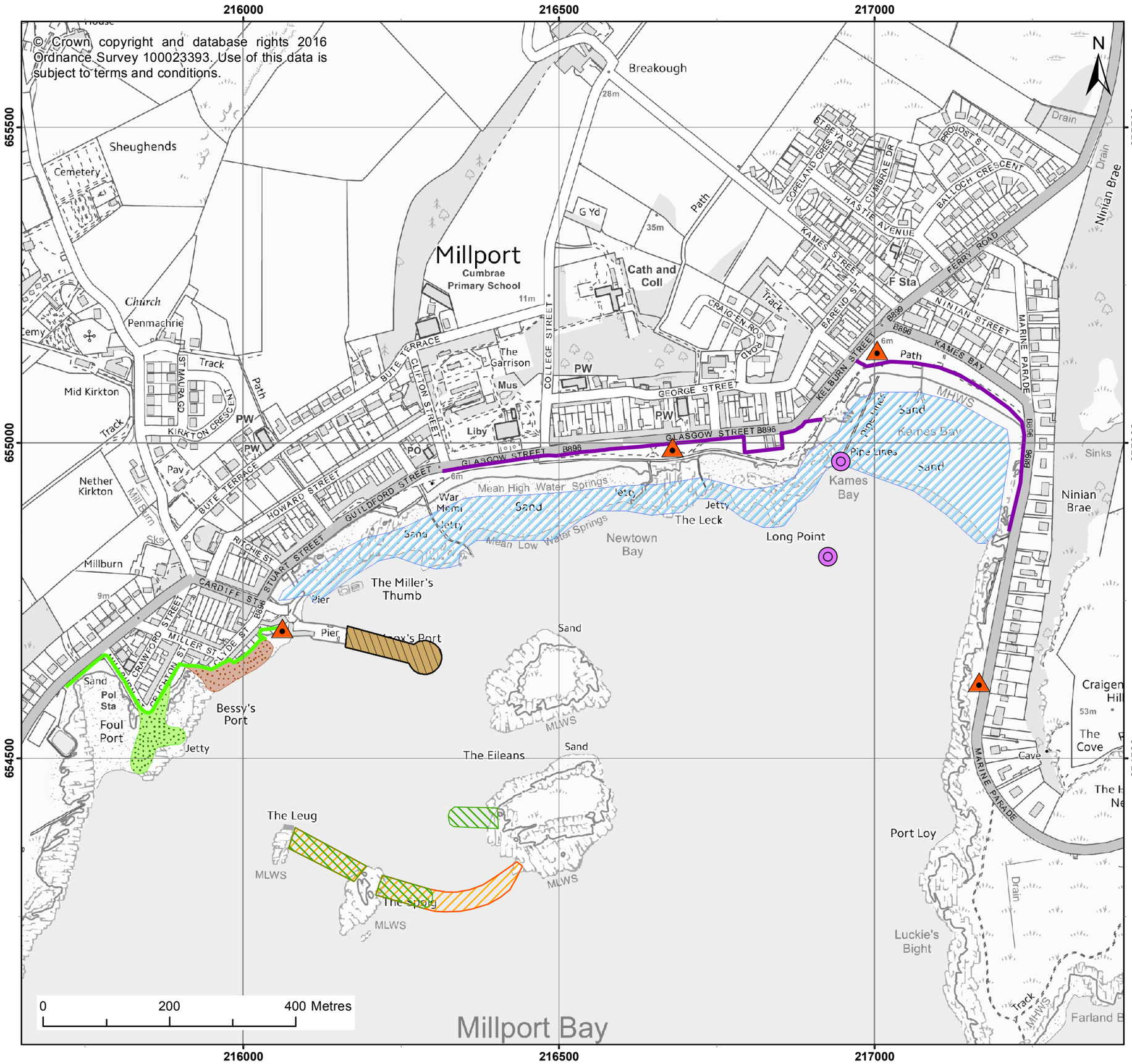
Millport Bay bathing water is located between Marine Parade in the east and Knox's Pier in the west (**Figure 4.1**). During the bathing season (1 June to 15 September), designated bathing waters are monitored by SEPA for faecal indicators (bacteria) and classified according to the levels of these indicators in the water. A summary of the analysis undertaken on water quality samples recovered during 2015 from Millport Bay bathing water is provided in **Table 4.3.**

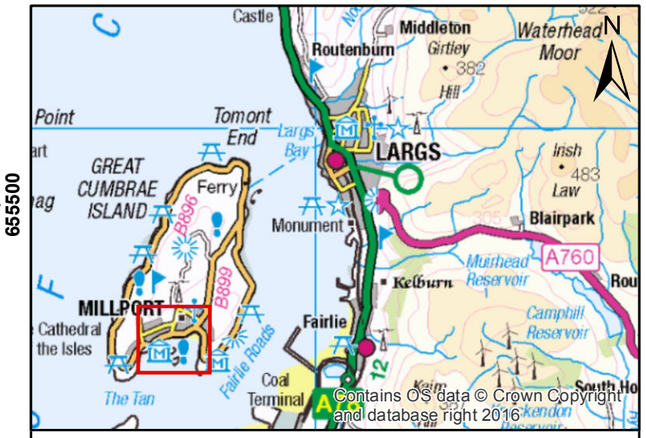
Table 4.3 Summary of water quality data from Millport Bay bathing water during 2015

Date	Escherichia coli (colony forming units) (cfu)/100ml)	Intestinal enterococci (cfu/100ml)
20 May 2015	<10	<10
2 June 2015	60	30
11 June 2015	<10	<10
16 June 2015	10	10
18 June 2015	20	<10
23 June 2015	<10	10
2 July 2015	90	30
7 July 2015	1300	2300
16 July 2015	<10	<10
21 July 2015	40	60
23 July 2015	<10	<10
28 July 2015	60	10
6 August 2015	110	50
11 August 2015	160	480
20 August 2015	30	<10
25 August 2015	<10	<10
3 September 2015	<10	<10
8 September 2015	<10	10

Source: SEPA (http://apps.sepa.org.uk/BathingWaters/ViewResults.aspx?id=124651)

SEPA reports that single sample results above 500 cfu/100ml for escherichia coli (E. coli) and 200 cfu/100ml for intestinal enterococci (IE) are indicative that water was of low quality when the sample was recovered. It is evident that water quality (from a bathing waters perspective) can be considered as being of low quality on two separate occasions during the 2015 bathing season (7 July 2015 and 11 August 2015).





Legend

Proposed Works

- Works to existing coastal defences
- New Flood Wall
- Rock Breakwater
- Rock Revetment
- Harbour breakwater (Offshore works Option 1)
- Potential offshore breakwater (Offshore works Option 2)
- Potential offshore breakwater (Offshore works Option 3)

Potential pollutant sources

- Sewer Pumping Station
- Surface Water Discharge
- Bathing Waters

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Client:	Project:
North Ayrshire Council	Millport Flood Protection Scheme - Environmental Scoping Report

Title: **Potential pollutant sources to Millport Bathing Waters**

Figure: 4.1 | Drawing No:

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
3	21/02/2017	TC	AS	A3	1:6,000
2	20/02/2017	TC	SR	A3	1:6,000

Co-ordinate system: British National Grid

Royal HaskoningDHV
Enhancing Society Together

ROYAL HASKONINGDHV
Marlborough House
Marlborough Crescent
Newcastle-upon-Tyne, NE1 4EE
+44 (0)191 211 1300
www.royalhaskoningdhv.com

Overall, the bathing water quality within Millport Bay during 2015 has been reported by SEPA as 'Good'. SEPA reports that the potential pollutant sources at, or near the Millport Bay bathing water include four sewage pumping stations, and a surface water discharge; the locations of these pollution sources are shown on **Figure 4.1**. However, SEPA reports that there are no significant pollution inputs to the Millport bathing water under normal situations.

Although the seawater in Millport Bay is fully marine, Smith (1955) observed that there was a significant interstitial input of freshwater creating permanently brackish conditions locally on the beach. Smith (1955) suggested that this was the result of rainwater which collects on a clay layer above the underlying rocks in the dip of the Great Cumbrae Fault, and subsequently seeping through the sand (creating local brackish conditions).

Water Framework Directive classification

The proposed scheme footprint is located partially within the Largs Channel (Fairlie Roads) coastal waterbody (asset ID 200026). SEPA produces an annual classification for all waterbodies in Scotland. A review of the most recent data published by SEPA (2014) shows that the overall chemistry of the Largs Channel waterbody has been classified as 'Pass'. Further detail is provided in **Table 4.4.**

Table 4.4 SEPA classification for the Largs Channel (Fairlie Roads) coastal waterbody (2014)

Parameter	Status	Confidence of class
Overall chemistry	Pass	High
Priority substances	Pass	High
Cadmium	Pass	Low
Hexachlorobenzene	Pass	Low
Lead	Pass	High
Nickel	Pass	High
pp-DDT	Pass	Low
Hexachlorobutadiene	Pass	Low

Sediment quality

There is no readily available sediment quality data from or adjacent to the proposed scheme footprint. The chemical and physical composition of the sediment is therefore unknown at this stage. However, the results of a bathymetric survey undertaken in 2016 has illustrated that the bedrock within the footprint of the proposed breakwater is covered in only a thin layer of sediment.

Given the lack of contamination sources in the vicinity of the Isle of Cumbrae (i.e. no major industrial / commercial processes which are likely to have impacted upon sediment quality) it is considered likely that the sediment quality may be expected to be relatively free from contamination. However, this is as yet, unconfirmed.

4.2.2 Identification of key issues

Possible impacts acting upon water and sediment quality as a result of the proposed scheme are considered in **Table 4.5** below.

Table 4.5 Potential impacts with regard to sediment and water quality

Potential impact	Phase	Potential significance	Comments
Reduced water quality associated with sediment disturbance during construction of the offshore options and works on the foreshore	Construction	Impact unlikely to be significant and therefore scoped out of assessment	As noted in **Section 3**, it is possible that a limited amount of dredging will be required to remove loose sands and gravels from the sea bed prior to constructing any of the options within Millport Bay (i.e. option 1, 2 and 3). The potential therefore exists for sediment disturbance / re-suspension during construction of the proposed scheme. The potential for increased concentrations of suspended sediment in the coastal waters also exists due to the proposed construction of the revetment / breakwater on the foreshore. Such disturbance / re-suspension of sediment has potential to reduce the coastal water quality at Millport due to an increased concentrations of potentially contaminated suspended solids. However, the Bay coast is dominated by rock platform and relatively coarse mobile sediments, which reduces the potential for contaminants to be present. The plume created by construction of any of the offshore options (or equally during works on the foreshore) will be of very low concentration, locally distributed and temporary in nature. The temporarily increased concentrations of suspended sediments which are considered unlikely to be contaminated are therefore not expected to result in a significant impact to water quality and therefore such issues are scoped out of the assessment.
Reduced water quality due to accidental spills or leakages of fuels / construction materials	Construction	Impact unlikely to be significant and therefore scoped out of assessment	All construction works required for options 1, 2, and 3 which are carried out near to and within waterbodies (namely plant working on the foreshore, along the promenade and on Millport Pier) have the potential to impact upon sediment and water quality through accidental spills and leakages. It will therefore be necessary to undertake all site works in accordance with CIRIA best practice guidelines for coastal and marine site working, as well as SEPA Pollution Prevention Guidelines. **As best practice mitigation measures would be incorporated into the construction works, potential impacts upon water quality as a result of spillages / leakages are proposed to be scoped out of the assessment.**
Reduced potential for transportation of entrained contaminants into the coastal waters following flood events	Operation	Impact unknown or has potential to be significant	The proposed scheme (including the three options for works within the coastal waters at Millport Bay) will minimise the potential for wave overtopping and coastal flooding within Millport. The risk of reductions in water quality associated with the

			transport of contaminants entrained in flood waters as they flow back into the sea would therefore be greatly reduced as a result of the proposed scheme.
Reduced flushing of water within Millport Bay due to the presence of the breakwater between The Leug, The Spoig and The Eileans (Offshore works option 3).	Operation	Impact unlikely to be significant and therefore scoped out of assessment	The presence of an offshore breakwater (due to progression of either option 1, 2 or 3) has potential to result in reduced flushing of water in Millport Bay, potentially leading to a reduction in coastal water quality. However, as noted in **Section 4.1**, the elements of the proposed scheme located within the coastal waters at Millport Bay are unlikely to have a significant impact on coastal processes, and therefore this potential impact has been **scoped out of the assessment.**

4.2.1 Potential mitigation measures for key issues

It is likely that mitigation measures will be implemented through appropriate design and the construction methodology. Relevant guidance published by SEPA and CIRIA will be used to inform the design of mitigation measures, in addition to consultation with key stakeholders. The environmental assessment will determine the requirement for the implementation of mitigation measures as part of the proposed scheme.

4.2.2 Approach to assessment and data gathering

For the assessment of water quality impacts, a desk-based study will be undertaken using existing information to characterise the baseline environment. Consultation with SEPA and North Ayrshire Council will be undertaken to source existing water quality data in the area. The potential impacts will be assessed in relation to the existing environment and the potential for exceeding Environmental Quality Standards (EQS).

As noted in **Section 3**, it is possible that a limited amount of dredging will be required to remove loose sands and gravels from the sea bed prior to constructing options 1, 2 or 3. Although waste will be generated during the construction phases, this will be dealt with through standard site waste management planning and no unusual wastes will arise in terms of type of waste or quantity. If dredging is required during the construction phase for any options, alternative options to the disposal of dredged material offshore will be considered, following the principles of the waste hierarchy. Once the requirement for dredging is known and the disposal route if more fully understood, we will undertake additional consultation with Marine Scotland to agree an approach to the assessment of potential environmental impacts.

4.3 Ground conditions and contamination

4.3.1 Existing environment

This section of the report has been informed by a combined geotechnical and land contamination desk study, produced specifically for the proposed scheme by Royal HaskoningDHV in May 2016. The purpose of the desk study was to review available published information on the geology and ground conditions at the site, to review historical land use, to review the geotechnical and land contamination risks associated with the proposed works and to recommend a scope of ground investigation sufficient to enable design of the proposed works. The desk study is included in full in **Appendix 4.1**, however the key findings from the study presented below.

Site history

Ainslie's Map of the Southern Part of Scotland dated 1821 shows the settlement of Millport on the island of "Big Cambray". A ferry route is shown between Largs on the mainland and a ferry terminal on north east of the island. A road is shown running between the ferry terminal and Millport.

The Admiralty Chart entitled Frith of Clyde Sheet 1 between "Little Cumbrae" and Toward Point dated 1846 shows Millport Pier and shows a number of buildings on the sea front. The chart shows a watercourse running in a north south direction and discharging into "Kames Bay". There is a "Mill" adjacent to the watercourse approximately 100m to the north of high water at the bay.

The Ordnance Survey 1st Edition 25 inch to the mile map (Argyll and Bute Sheet CCXVI.14 Great Cumbray) surveyed in 1856 and published in 1869 shows Millport Pier and the adjacent harbour. Further developments shown on the map include the construction of a Garrison on the landward side of Glasgow Street (B896). There is a small smithy recorded at the eastern end of Glasgow Street and a small building marked as "Female School of Industry" on what is now known as George Street. A number of wells are recorded between 50m and 100m inland of the high water mark

Geology

The British Geological Survey (BGS) Geology of Britain viewer indicates that superficial deposits of sand and gravel exist in the western portion of the site at Newtown Bay, and the eastern part of the site at Kames Bay. The superficial deposits overlie sedimentary rock strata of Carboniferous Age with igneous intrusions of Carboniferous Age and Palaeogene Age.

Significant rock outcrops at the site include Bessy's Port, Long Point and the island group known as "The Eileans". The anticipated stratigraphy at the site in order of superposition is summarised in **Table 4.6**. It is anticipated that made ground will be present along roadsides and the waterfront.

Table 4.6 Summary of published geology within the footprint of the proposed scheme

Age	Name	Description
Pleistocene and Holocene (Quaternary)	Glacial till	Moraines of till with outwash sand and gravel deposits. Superficial deposits formed up to 2 million years ago.
	Raised marine deposits	Sand and gravel. Superficial deposits formed up to 2 million years ago in the Quaternary Period.
	Marine Beach Deposits - Sand And Gravel	Superficial deposits formed up to 3 million years ago in the Quaternary Period. Local environment previously dominated by shorelines.
Palaeogene	Mull Dyke-swarm – Microgabbro	Igneous Bedrock formed approximately 23 to 66 million years ago in the Palaeogene Period. Local environment previously dominated by intrusions of

Age	Name	Description
		silica-poor magma.
Carboniferous	Dinantian Dykes	Microgabbro. Igneous Bedrock formed approximately 326 to 359 million years ago in the Carboniferous Period. Local environment previously dominated by intrusions of silica-poor magma.
	Millport Cornstones Member	Sandstone, Silty Mudstone And Cornstone. Sedimentary Bedrock formed approximately 343 to 352 million years ago in the Carboniferous Period. Local environment previously dominated by rivers.
	Ballagan Formation	Mudstone, Limestone And Calcareous Mudstone. Sedimentary Bedrock formed approximately 343 to 359 million years ago in the Carboniferous Period. Local environment previously dominated by lakes and lagoons.
	West Bay Cornstone Member	Sandstone And Nodular Limestone (cornstone). Sedimentary Bedrock formed approximately 352 to 359 million years ago in the Carboniferous Period. Local environment previously dominated by rivers.
Devonian	Kelly Burn Sandstone Formation	Interbedded sandstone and conglomerate. Sedimentary bedrock formed approximately 359 to 385 million years ago in the Devonian period.

The British Geological Survey (BGS) Geology of Britain viewer holds no records of boreholes in the vicinity of Millport.

Hydrogeology

It is assumed that groundwater flow in the vicinity of Millport is likely to be dominated by flow from the centre of the island radially towards the coast. Locally, the flow is likely to be modified slightly by the presence of dykes. Given the proximity of Millport to the coast, it is considered that groundwater levels are likely to be tidally influenced.

There are records of seepage of brackish water onto Kames Bay and the presence of relatively fresh water is supported by the number of wells recorded within 100m of the shore in Millport.

Mining

A search of the Coal Authority Interactive Map showed that the site is not close to any zones defined as “Development High Risk Areas”. However the interactive map showed two abandoned mines located to the north of the island. The historical maps indicate that a quarry located to the east of Kames Bay existed in the mid-19th Century (coinciding with the construction of many of the buildings within Millport). The quarry is not shown on maps dating from 1869.

Previous investigations

An intrusive Ground Investigation was undertaken in 2014 on Millport Pier consisting of seven boreholes. The intrusive investigation on the pier identified a surface layer between 0.3m and 0.9m thick, consisting of tarmac, overlying various layers of concrete, dolerite blocks, sand and cobbles. Beneath this surface layer, the fill material within the pier contained some cobbles of concrete. It is possible that either the surface layer or fill material may have been constructed using contaminated material.

No samples of fill material or groundwater were analysed for potential contaminants, however, during the intrusive investigation a ‘petrol odour’ was noted when progressing three of the seven boreholes (at 0.3m, 0.3m and 0.8m bgl). All observations related to the fill material located immediately beneath the surface layer. In all three cases the observations of odour were made at greater than 2m above the highest observed groundwater level. The odours may indicate the presence of some Light Non-Aqueous Phase

Liquid (LNAPL) within the fill material. Potential sources of LNAPL include spillage or leakage from fuel stores on the pier (including within the small buildings), leakage from vehicles using the pier, or exchange of groundwater with seawater contaminated with fuel from vessels.

4.3.2 Identification of key issues

The proposed scheme has potential to result in the following impacts.

Table 4.7 Key issues for ground conditions and contamination

Potential impact	Phase	Potential significance	Comments
Risks to the health of construction workers due to dermal contact, ingestion and particulate inhalation of any contaminants which may be present within the soils or waters during the construction phase	Construction	Impact unknown or has potential to be significant	A low level of risk remains for these potential impacts - Further details are provided in Table 4.8.
Risks to the health of public and residents during the construction phase due to dermal contact, ingestion and particulate inhalation of any contaminants which may be present within the soils or waters	Construction	Impact unknown or has potential to be significant	
Risks to controlled waters (the Firth of Clyde) due to groundwater migration during construction and operation.	Construction and operations	Impact unknown or has potential to be significant	

Further detail regarding these potential impacts (in terms of the source, pathway and receptor) is provided in **Table 4.8.**

Table 4.8 Preliminary pollutant linkage assessment for the proposed scheme

Source	Pathway	Receptor	Consequence of risk being realised (severity)	Probability of risk being realised (likelihood)	Description of Pollution Linkage	Risk
Contaminants within the shallow strata or made ground.	Dermal Contact, Ingestion, Particulate Inhalation	Human health (public and residents)	Medium	Unlikely	Across most of the works areas there is no evidence for the presence of contaminants, or known contaminative land use. However some asbestos or other contamination may be present in made ground, particularly within the pier.	Low Risk
		Human health (construction workers)	Medium	Unlikely	There is no evidence for the presence of contaminants, or known contaminative land use, other than within the pier.	Low Risk

					Short term risks can be mitigated using appropriate Personal Protective Equipment (PPE) and adopting the approaches of Construction Design and Management (CDM), and Control of Substances Hazardous to Health (COSHH) guidance.	
	Direct contact	Structures and services	Mild	Low likelihood	There is no evidence for the presence of contaminants across most of the works, or known contaminative land use. There may be some hydrocarbon contamination within the infill material of the pier, which could impact upon the structural developments involving the pier, although presence has not been confirmed.	Low Risk
Contaminants within the shallow strata or made ground. Contaminated groundwater within shallow strata.	Dissolved phase and free phase lateral groundwater migration.	The Firth of Clyde	Mild	Low likelihood	Other than within the pier, there is no evidence for the presence of contaminants, or known contaminative land use. Given the proximity and likely emergence of groundwater into the sea, the presence of free phase contaminant would be visually evident. Potential sources of contamination to the north of Kames Bay (garage, mill and infilled quarry) are unlikely to be up-gradient of the proposed works The intrusive investigation undertaken at pier shows considerable exchange between seawater and groundwater within the pier structure. Significant contamination of the seawater would be likely to be manifest as a visible sheen and strong odour. The proposed works are unlikely to involve creation of significant new pathways.	Low Risk

					Remediation of voids found within the pier is likely to reduce any current pathways.	

4.3.3 Potential mitigation measures

It is likely that mitigation measures will be implemented through appropriate design and the construction methodology. Relevant guidance published by SEPA and CIRIA will be used to inform the design of mitigation measures, in addition to consultation with key stakeholders. Likely mitigation measures include:

- implementation of health and safety measures, such as appropriate personal protective equipment (PPE) to prevent workers coming into contact with contaminants;
- adoption of best practice pollution prevention measures, including use of bunds around potentially polluting activities, designated areas for refuelling and storage of potentially contaminative substances; and,
- adherence to an Environmental Action Plan.

4.3.4 Approach to assessment and data gathering

It is proposed that as part of the landside ground investigation (which will be required to inform the engineering design of the proposed scheme), a limited number of samples would be recovered to inform the contamination risk assessment on a precautionary basis. The sample locations and suite of analysis would be agreed with the environmental health officer at North Ayrshire Council and SEPA prior to the investigation works being undertaken.

The results of the ground investigation would be presented in a Phase 2 site investigation report. All assessment work would be undertaken in accordance with The Model Procedures for the Management of Land Contamination (CLR11) and would identify potential pollutant linkages through a risk assessment process. The findings of the Phase 2 site investigation report will be used to inform the environmental assessment process.

4.4 Water resources and flood risk

This section sets out the proposed scope and methodology for the water resource and flood risk assessment of the proposed scheme. This shall only include inland water courses because WFD designated surface water bodies have been covered in **Section 5.5** and Groundwater has been covered in **Section 5.6**. The section has been informed by a desk study using the Millport Coastal Flood Risk Assessment (Royal HaskoningDHV, May 2015) and publicly available information including:

- Drinking Water Protected Areas - Scotland River Basin District - Surface Water - map 3 of 22;
- SEPA Flood Maps; and,
- Ordnance Survey Map Landranger 63.

4.4.1 Existing environment

The proposed scheme is located along the Newtown Bay, across Knox's Port, and along Bessy's Port. There are two watercourses present in the area that surround the proposed scheme site. These are:

1. **Mill Burn** originates at Lower Cumbrae Reservoir and flows in a southerly direction before discharging to sea at Foul Port roughly halfway along Millburn Street. For much of its length the watercourse is culverted. The western most part of the proposed scheme may have some impact on this discharge point but will not have an impact on the rest of the channel.
2. **Minnemoer Burn** (unnamed on maps) runs south from the two Minnemoer lochs at the highest point on Great Cumbrae. There is evidence the Burn has been straightened in places before running in to a culvert and discharging in to Kames Bay. The proposed scheme does not extend as far as Kames Bay and will therefore have no impact on this discharge point or the rest of the channel.

There are no Drinking Water Protected Areas (Lochs or Rivers) on the island of Great Cumbrae.

Existing flood risk

Flood risk has been assessed for fluvial, pluvial, and coastal risks as follows:

- **Fluvial Flood Risk** – SEPA Flood Maps show no areas of fluvial flood risk in the vicinity of the proposed works. The only area showing any risk of flooding from fluvial means is the Lower Cumbrae Reservoir which is shown to have a high likelihood of flooding;
- **Pluvial Flood Risk** – an area to the north of Kames Bay is shown to have a high livelihood of flooding from rainwater accumulation. OS Maps show that this is an area where the Minnemoer Burn has been straightened and flows in to a wetland that was, presumably, the original orientation of the burn before straightening. This, however, is not in the vicinity of the proposed works. There are also some small areas of pluvial flood risk along Kames Street, and Ninian Street but it is unlikely that the proposed works will effect these.
- **Coastal Flood Risk** – extensive numerical modelling has been undertaken by Royal HaskoningDHV to assess the existing flood risk from tidal flooding and the residual risk from various options. The majority of the frontage is at risk from events with return periods between 1yr and 10 yrs (100% to 10% annual likelihood). This underpins the development of this flood protection scheme and will therefore not be considered further.

4.4.2 Identification of key issues

Possible impacts acting upon water resources and flood risk as a result of the proposed scheme are considered in **Table 4.9** below.

Table 4.9 ***Potential impacts with regard to water resources and flood risk***

Potential Impact	Phase	Potential Significance	Comment
Pollution or increased sedimentation of surface water channel	Construction	Impact unlikely to be significant and therefore scoped out of assessment	There are two Burns within the vicinity of the landside elements of the proposed scheme but neither of them flow through the scheme footprint (landside) and will, therefore, not be affected by run-off from construction works.
Increased flood risk due to blocked discharge points and back flow along channels	Construction	Impact unlikely to be significant and therefore scoped out of assessment	Of the two discharge points only one is within the scheme boundaries. It is clear where the discharge point is and will be included in the design process going forwards therefore remaining unaltered.
Reduced flood risk from coastal processes	Operation	Beneficial	As a flood protection scheme, the outcome of the works will be considerably reduced risk of flooding.

4.4.3 Potential mitigation measures

This assessment finds that there are no significant risks to the water resource environment that have not been covered elsewhere in the report. Mitigation strategies detailed in **Sections 5.5.2** and **5.6.4** will cover residual risks due to fuel spillages or contamination.

The only impact on the flood risk regime that may not have been included in the wider scheme design is to the discharge point of Millburn. The discharge point will be kept clear as an objective of the design process if it is found that rock armour is needed in its vicinity that may cause a blockage.

4.4.4 Approach to assessment and data gathering

No further assessment or data gathering is proposed as part of the environmental assessment process.

5 Possible impacts on the biological environment

This Chapter considers the potential impacts of the proposed scheme on the following receptors:

- terrestrial and coastal ecology
- ornithology;
- benthic ecology;
- fish ecology; and,
- marine mammal ecology.

An overview of the relevant existing environment is provided for each along with the anticipated impacts, identification of mitigation and monitoring measures and discussion of the additional work.

5.1 Terrestrial and coastal ecology

5.1.1 Existing environment

Baseline description

Millport is a coastal town with properties extending down to the waterfront. Strips of mown amenity grassland are present between the coast road and the waterfront, and several New Zealand cabbage trees *Cordyline australis* have been planted. There are no native trees within the footprint of the proposed scheme however woodland and scrub habitat is present in the surrounding area.

To the west of the landside elements of the proposed scheme footprint, along West Bay Road on the western headland, an area of scrub land and deciduous trees are present. Inland of the small town, the ground rises and the land open out to fields, hedgerows, small watercourses and deciduous woodlands.

Non-statutory designated sites

There are no Local Nature Reserves or National Nature Reserves on Great Cumbrae. **Table 5.1** details wildlife sites located on Great Cumbrae.

Table 5.1 Wildlife sites located on Great Cumbrae

Wildlife Site Name	Grid Reference	Distance from proposed scheme (km)
Barbay Hill	NS171569	1.8
Bell Bay to Whitebay	NS166586	2.4
Farland Point	NS172542	0.9
Fintray Bay to Portachur Point	NS151555	0.4
Ninian Brae Wood	NS174552	0.4

Protected species

The NBN gateway holds records for bats (species indet) on the south east headland of Great Cumbrae.

NBN Gateway holds records for otter on the south east headland of Great Cumbrae. The European otter *Lutra lutra* is a semi-aquatic mammal, which is common around the freshwater and coastal areas of Scotland. UK Populations are internationally important, especially since their widespread decline across much of their western European range (JNCC, 2004). Populations in coastal areas utilise shallow, inshore marine areas for feeding and require fresh water for bathing and terrestrial areas for resting and breeding holts (JNCC, 2004). Where otters live in coastal areas (particularly in Scotland) they tend to have a

largely diurnal habit, live in group territories, and have comparatively small home ranges, typically below 5km (Kruuk, 1996).

Local Biodiversity Action Plan

Ayrshire is comprised of the three unitary authorities of East, North and South Ayrshire, including a range of islands (Arran, Greater Cumbrae, Little Cumbrae and Ailsa Craig etc). It is a cohesive bio-geographical unit from an environmental perspective as it is bounded by the sea and by watersheds. The delivery of the Local Biodiversity Action Plan (LBAP) within Ayrshire was historically a joint project with the neighbouring authorities of South and East Ayrshire and led by the Ayrshire Joint Planning Unit (AJPU). The latest Ayrshire LBAP was for 2007 – 2012 Its content included work on priority species and habitats which were not already being acted on by the conservation orientated organisations operating in Ayrshire. The Plan became a working document allowing it to be updated regularly and to enable it to adjust to the progress towards the Plan's targets. Specifically the revised Action Plan was more flexible and had a reduced number of actions (2 habitat action plans for lowland raised bogs and coastal habitats and 2 species action plans for water vole and farmland birds) to ensure that it only covered priorities and local actions.

With the closure of the AJPU in the summer of 2013, a revised approach was required to address North Ayrshire Council's statutory biodiversity duty and address the Scottish Government's 2020 Challenge for Scotland's Biodiversity for the conservation and enhancement of biodiversity in Scotland.

As such, the Local Biodiversity Action Plan (LBAP) for North Ayrshire 2014 to 2017 was produced and is currently in draft form. The proposed actions for the new North Ayrshire LBAP are habitat based rather than species based, in recognition that habitat protection and enhancement will in turn help to conserve and benefit species. The actions have emerged from consideration of the previous iterations of the Ayrshire LBAP, as well as expert knowledge from the various members of the Biodiversity Partnership. The action plan includes actions on coordination and monitoring as well practical delivery on habitat projects targeted at coastal, river, farmland, urban and woodland habitats.

5.1.2 Identification of key issues

Possible impacts along with the potential significance on effect on terrestrial and coastal ecology are considered in **Table 5.2** below:

Table 5.2 Key issues for terrestrial and coastal ecology

Potential Impact	Phase	Potential Significance	Comment
Direct and indirect impacts to terrestrial habitat and species (excluding otters and breeding birds)	Construction, maintenance and decommissioning	Impact unlikely to be significant and therefore scoped out of assessment	Terrestrial habitats in the footprint of the landside elements of the proposed scheme are limited to areas of mown amenity grassland and non- native trees, of limited ecological value and providing limited habitat potential for protected species. Consequently there is not anticipated to be direct (habitat loss, injury or death) or indirect impacts (from increased noise and human activity, lighting, reduced air quality or pollution events during construction and maintenance activities) of terrestrial species (excluding otters and breeding birds). **Therefore this impact is scoped out.**
Direct and indirect impacts to otters	Construction, maintenance and decommissioning	Impact unknown or has potential to be significant	Although Millport is a busy tourist town, there is potential for otters to traverse the Millport coastline as they move between the headlands and records of the species have been made in the area. As such there is potential for the direct and indirect impacts to occur to otters.

5.1.3 Potential mitigation measures

The environmental assessment will determine the requirement for the implementation of mitigation measures to reduce the significance of the impact on terrestrial and coastal ecology. This is likely to include production of an Environmental Action Plan to ensure construction activities adhere to all relevant current best practice guidance. This would detail methods to minimise working footprint, and may include for provision of an Ecological Clerk of Works during construction.

A pre-construction walkover survey will be undertaken to confirm no protected species or their resting sites are present within the footprint or appropriate species specific buffer of the proposed scheme.

5.1.4 Approach to assessment and data gathering

The Ecological Impact Assessment (EcIA) will be undertaken by Royal HaskoningDHV's ecology team, in accordance with guidance provided by the Chartered Institute of Ecology and Environmental Management CIEEM).

The following surveys are proposed in a 250m buffer of the footprint of the proposed works:

- Extended Phase 1 Habitat Survey;
- Phase1 Intertidal Survey; and
- Otter Survey.

The findings of these surveys will map the key ecological constraints and provide any recommendations to inform detailed design, site specific mitigation or further work if required. Further consultation will be undertaken with SNH, and local sources of ecology data including North Ayrshire Council and Millport Field Studies Centre.

The surveys and EcIA will take account of the following guidance and standards:

- Guidance for ecological impact assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal (CIEEM, 2016);
- A Handbook on Environmental Impact Assessment (SNH, 2002);
- British Standard 42020:2013 – Biodiversity. Code of Practice for planning and development (British Standard, 2013);
- CIRIA Guidance note C692 Environmental Good Practice on Site Guide (3rd edition) (CIRIA, 2010);
- Planning Advice Note 1/2013: Environmental Impact Assessment (Scottish Government, 2013);
- Scottish Biodiversity List (Biodiversity Scotland, undated);
- National Planning Policy Guidance (NPPG) 14 Natural Heritage (Scottish Government, 1999); and
- Planning Advice Note (PAN) 60 (Planning for Natural Heritage) (Scottish Government, 2008).
- Scottish Natural Heritage website: guidance on protected species (http://www.snh.gov.uk/protecting-scotlands-nature/protected-species/protected-species-az/) (SNH, 2016a);
- Scottish Natural Heritage website: guidance on otter surveys (2016) http://www.snh.gov.uk/protecting-scotlands-nature/species-licensing/mammal-licensing/otters/surveys-research/) (SNH, 2016b); and,
- Handbook for Phase 1 Habitat survey – A technique for environmental audit (JNCC, 2010).

5.2 Offshore and coastal ornithology

5.2.1 Existing environment

On Great Cumbrae Island, red-breasted merganser, shelduck and oystercatcher are regularly found, with gannets, eider and possibly terns often present. Common sandpiper, redshank, mallard, cormorant and shag are found on the shore and grey heron may also be found on the island's coastline. Curlew, dunlin and sand martin are also present along the shore (Royal Haskoning, 2007).

A data review by SNH (ASML, 2014) reports there to be less bird activity on the beach in Kames Bay than there is in nearby Ballochmartin Bay; oystercatchers and redshanks have been recorded at Kames Bay but only in small numbers. The distribution of the lug worm *Arenicola marina* across the whole beach may be due to the absence of birds feeding in Kames Bay in contrast to Ballochmartin, where bird feeding pressure around low tide restricted *A. marina* to the upper shore.

As Millport is a busy coastal town, there is already a baseline level of noise and human disturbance from seafront and harbour activities that local birds will be habituated to. The rocky habitat along the seafront at Millport has potential to support breeding birds. During a site visit (18 May 2016), eider duck, herring gull, and oystercatcher were observed along the shore in the vicinity of the scheme footprint.

Designated sites

Arran Moors SPA and Renfrewshire Heights SPA are the nearest statutory nature conservation sites dedicated for ornithological interest. They are located 10 and 17km from the proposed scheme respectively, and both are protected for populations of hen harrier *Circus cyaneus*.

Breeding seabird counts

The Seabird 2000 dataset is held by the JNCC and contains data from a full census of all 25 seabird species that regularly breed in Britain and Ireland (Mitchell *et al*. 2004). The data were gathered between the years 1999 and 2002 from both coastal and inland colonies. The counts of breeding seabirds within Great Cumbrae are displayed in **Table 5.3** (source: http://www.magic.gov.uk)

Table 5.3 Seabird nesting counts

Site	Subsite	Species	Number	Distance of site from proposed scheme (km)
Great Cumbrae Island	Doughend Hole	Northern fulmar *Fulmarus glacialis*	10	0.8
Great Cumbrae Island	Keppel	Northern fulmar *Fulmarus glacialis*	16	0.8
Great Cumbrae Island	Barbay Hill	Common gull *Larus canus*	144	2

Data on occurrence and abundance of wetland birds and breeding birds

A search of the relevant part of the BTO's Wetland Bird Survey (WeBS) site shows that there have been no WeBS counts undertaken in the Millport Bay area of Great Cumbrae since at least 2000. Similarly no data on the occurrence or abundance of breeding birds from this area are known of.

5.2.2 Identification of key issues

Possible impacts along with the potential significance on effect on ornithology are considered in **Table 5.4** below:

Table 5.4 Key issues for ornithology

Potential Impact	Phase	Potential Significance	Comment
Disturbance (noise or visual) or displacement due to increased human activity and construction works	Construction, maintenance, decommissioning	Impact unknown or has potential to be significant	The presence of increased human activity and specific construction, operation and decommissioning impacts (associated with all scheme options), including increase of vessel traffic in the area, construction noise and vibration will have the potential to disturb and displace birds from an area of use (for breeding, feeding, resting, passage, etc.). Although the proposed scheme (including options) is located in a tourist town with existing background noise, which is not considered to be an important area for birds, there is potential for such disturbance effects to occur. This is particularly, but not exclusively, in relation to such effects extending across to the islands in Millport Bay (either option 1, 2 or 3), where background disturbance levels are likely to be lower.
Changes in water quality	Construction maintenance, decommissioning	Impact unlikely to be significant and therefore scoped out of assessment	Potential temporary increases in suspended sediment concentrations during construction activities of either option 1, 2 or 3 (**Section 4.1**) may affect near-shore / offshore foraging habitat for wetland birds and / or seabirds. Accidental contaminant release, such as fuel, from vessels associated with the construction, maintenance and decommissioning will be managed through compliance with SEPA and CIRIA guidance and has been scoped out of the assessment (**Section 4.2**)
Effects on coastal processes leading to changes in intertidal habitats, potentially affecting foraging birds	Construction, operation and decommissioning	Impact unlikely to be significant and therefore scoped out of assessment	Each of the offshore options which could be implemented as part of the proposed scheme (either option 1, 2 or 3) are considered unlikely to significantly impact the sediment transport system, and are considered likely to have only a very small effect on tidal currents (irrespective of the option selected for the offshore works). All potential coastal process effects have been scoped out of the assessment. Consequently, any impact arising to foraging habitat from a change in coastal processes is unlikely to be significant, and is **scoped out of the assessment.**
Habitat loss	Construction, operation and decommissioning	Impact unknown or has potential to be significant	Any of the offshore options (either option 1, 2 or 3) required as part of the proposed scheme will result in a loss of a small area of potential near-shore/offshore foraging for birds.

5.2.3 Possible mitigation measures

The following possible mitigation and monitoring measures will be considered during the environmental assessment and project development activities:

- If works commence within the breeding birding season (April – September inclusive) a pre-construction walk over survey will be undertaken, which would be also be informed by the findings of any breeding bird surveys that had been undertaken as part of the environmental assessment work (see below). Consultation will be undertaken with SNH in the event that any evidence of breeding birds is found.
- The detailed design will consider methods to reduce impacts from noise and visual disturbance during construction.
- Creation of an Environmental Action Plan and current working best practice guidance will minimise the risk of spillages and pollution events into the marine environment (See **Section 4.2 Marine water and sediment quality**).

5.2.4 Approach to assessment and data gathering

Consultation will be conducted with SNH to determine any additional species or populations of concern. Consideration will be given to undertaking the following surveys, which would extend over a full one year period:

- Breeding birds – along the Millport foreshore within the development footprint plus 200m buffer, and across each of the islands of 'The Eileans', 'The Spoig' and 'The Leug'.
- Wintering birds along the coastal and near-shore areas encompassed by the development footprint plus 200m buffer.
- Seabirds or other marine birds using the near-shore and offshore areas within the development footprint plus surrounding 200m buffer (which would be incorporated within the above surveys for breeding and wintering birds).

The need for these surveys will be determined following the consultation with SNH.

5.3 Marine mammals and basking shark

5.3.1 Existing environment

Several species of marine mammal have been recorded in and around the Firth of Clyde (Reid *et al*., 2003). The Clyde Marine Mammal Project (CMMP, 2017) documents recordings of marine mammals and basking sharks in the Clyde, and are undertaking a visual and acoustic marine mammal survey of the Clyde waters. A summary of the Project's records are detailed below.

Cetaceans

Harbour porpoise

Harbour porpoise (*Phocoena phocoena*) is the most commonly identified cetacean species in the Clyde and is resident throughout the year. The species is regularly recorded in the waters surrounding Great Cumbrae, and strandings have been recorded on the island (including the town of Millport) in 1994, 2004 and 2005 (CMMP, 2017).

Minke whale

There are regular sightings of minke whale (*Balaenoptera acutorostrata*) in the Clyde including the waters surrounding Great Cumbrae and it is suggested there has been a general increase in the numbers on the west coast of Scotland with younger animals coming to the Clyde to look for food during autumn months (CMMP, 2017).

Common dolphin

Short beaked common dolphin (*Delphinus delphis*) is recorded in West Scotland, including the waters around Great Cumbrae, in the summer months, between May and October when food is most abundant (CMMP, 2017).

Bottle-nose dolphin

Bottle-nose dolphin (*Tursiops truncatus*) is recorded in the Clyde, in the areas to the north and south of Great Cumbrae (CMMP, 2017).

Humpback whale

Sightings of a humpback whale (*Megaptera novaeangliae*) have been recorded along the Skelmorlie and Largs Channels, close to Great Cumbrae (CCMP, 2017).

Killer whale

Several records of killer whale (*Orcinus orca*) have been made in the Clyde, including the waters between Great Cumbrae and the Isle of Arran (CCMP, 2017).

Basking shark

Basking shark (*Cetorhinus maximus*) often appears in summer months in the Clyde, with numerous records in the waters around Great Cumbrae. A stranding was recorded on the island in 1999 (CMMP, 2017).

NBN Gateway (NBN, 2015) has records for Atlantic white-sided dolphin (*Lagenorhynchus albirostris*), harbour porpoise, minke whale, bottle nose dolphin and white beaked dolphin in the waters close to Great Cumbrae.

Pinnipeds

There is a small haul-out for grey seal (*Halichoerus grypus*) and harbour seal (*Phoca vitulina*) on The Eileans in Millport Bay (Brown *et al*., 2012). Both species are regularly observed from the shore.

Harbour seal counts, which are conducted by SMRU using aerial surveys during the harbour seal August moult when the harbour seals are on land, indicated a small number of harbour seal hauled on Great Cumbrae (SCOS, 2015).

Ballochmartin Bay SSSI, on the east coast on Great Cumbrae is frequented by both grey and harbour seals.

Designated sites

There are no nature conservation sites designated for marine mammals or basking sharks in the immediate vicinity of Millport. Nearby designated sites for marine mammals include:

- The Inner Hebrides and Minches candidate Special Area of Conservation (cSAC) for harbour porpoise is the largest protected area in Europe for harbour porpoise and covers over 13,800km^2 and supports over 5,000 individuals (SNH, 2017).
- The South-East Islay Skerries SAC for holds a nationally-important population of harbour seal, with the south-east coastline areas used as pupping, moulting and haul-out sites by the seals, which represent between 1.5% and 2% of the UK population (JNCC, 2017).

5.3.2 Identification of key issues

Possible impacts along with the potential significance on effect on marine mammals and basking sharks are considered in **Table 5.5** below.

Table 5.5 Key issues for marine mammals and basking sharks

Potential Impact	Phase	Potential Significance	Comment
Disturbance from underwater noise during drilling and excavation activities	Construction, maintenance, decommissioning	Impact unknown or has potential to be significant	Underwater noise generated by the construction / decommissioning of the offshore elements of the proposed scheme (either option 1, 2 or 3) has the potential to disturb marine mammals in the area. The significance of the impact is likely to be greater due to the progression of option 2 and 3, in comparison with option 1 given the location of option 2 and 3 further out into the coastal waters. Any potential impacts are considered to be temporary and short-term, however as the construction methodology is not confirmed, this impact will be scoped into the assessment and assessed further.
Reduced water quality from sediment release or pollution event	Construction, maintenance, decommissioning	Impact unlikely to be significant and therefore scoped out of assessment	A potential temporary increase in suspended sediment concentrations during construction activities for all options is proposed to be scoped out of the assessment (**Section 4.1**). Accidental contaminant release, such as fuel, from vessels associated with the construction, maintenance and decommissioning will be managed through compliance with SEPA and CIRIA guidance and has been **scoped out of the assessment** (**Section 4.2**)
Collision with construction / delivery vessel	Construction, maintenance, decommissioning	Impact unlikely to be significant and therefore scoped out of assessment	Vessels associated with delivery of materials for the proposed scheme (particularly the works within the coastal waters at Millport Bay, either option 1, 2 or 3) could cause physical harm and possible fatality to marine mammals if collisions were to occur. Vessels delivering to site would maintain constant speed and direction, reducing the risk of

			collision and therefore this risk is **scoped out of the assessment.**
Disturbance (and potential habitat loss) to seal haul outs	Construction, maintenance, decommissioning	Impact unknown or has potential to be significant	The proposed scheme (particularly options 2 and 3) could displace the local seals from the Eileans haul-out site, however this is not believed to be a breeding site. Any potential impacts are considered to be temporary and short-term, however as the construction methodology is not confirmed, this impact will be scoped in and assessed further.

5.3.3 Potential mitigation measures

The environmental assessment will determine the requirement for the implementation of mitigation measures to reduce the significance of the impact on marine mammals and basking sharks. An Environmental Action Plan will be used to ensure correct procedures are adhered to in order to minimise the risk of a pollution incident. Consultation with SNH will be undertaken as the project description is developed further and any further monitoring and/or mitigation will be agreed. The selection of offshore option 1 would also represent a significant mitigation measure from a marine mammal perspective.

5.3.4 Approach to assessment and data gathering

Additional marine mammal surveys are not proposed; however data sources to inform the assessment for marine mammals, will include, but not be limited to:

- Consultation and site visit by ecologist to determine location of hauled out seals on the islets;
- Revised Phase III data analysis of Joint Cetacean Protocol (JCP) data resources (Paxton *et al*., 2016);
- The identification of discrete and persistent areas of relatively high harbour porpoise density in the wider UK marine area (Heinänen and Skov, 2015);
- Small Cetaceans in the European Atlantic and North Sea (SCANS) Cetacean abundance and distribution in European Atlantic shelf waters to inform conservation and management (Hammond *et al*., 2013) and SCANS III data, if available;
- Management Units for cetaceans in UK waters (IAMMWG, 2015);
- UK grey and seal usage maps (Jones *et al*., 2015); and
- Special Committee on Seals (SCOS) annual reporting of scientific advice on matters related to the management of seal populations (SCOS, 2015 and SCOS, 2016, when available).

As the project description is developed, further consultation will be undertaken with SNH to agree the approach to the assessment.

5.4 Fish and shell fish resource

5.4.1 Existing environment

The coast around Millport lies within the ICES rectangle[2] 40E4 and 40E5. All species of which more than one tonne was landed from this rectangle between 2010 and 2014 are shown in **Table 5.6**.

Table 5.6 ICES rectangle landings by weight

ICES Rectangle	Demersal / Pelagic (live weight, tonnes)		Shellfish (live weight, tonnes)	
40E4	Cod *Gadus morhua* (1)	Skates and rays (17)	Brown shrimp *Crangon crangon* (1)	Razor clam *Solen spp* (884)
	Haddock *Melanogrammus aeglefinus* (3)	Sole *Solea solea* (1)	Crab *Cancer pagurus* (mixed sexes, 783)	Scallops *Pecten Maximus* (4,233)
	Hake *Merluccius merluccius* (3)	Spurdog *Squalus acanthias* (2)	Velvet swimmer crab *Necora puber* (604)	Whelks *Buccinum undatum* (310)
	Herring *Clupea harengus* (1,395)	Squid *Loligo spp* (1)	Green crab *Carcinus maenas* (34)	
	Horse mackerel *Trachurus spp* (53)	Thornback ray *Raja clavata* (5)	Squat lobster *Galatheidae* (14)	
	Ling *Molva molva* (1)	Turbot (1)	Lobster *Homarus gammarus* (61)	
	Mackerel *Scomber scombrus* (6)	Whiting *Merlangius merlangus* (1)	*Nephrops* (13,003)	
	Monks or anglers *Lophius sp. Squatina*. Sp (1)	Witch *Glyptocephalus cynoglossus* (1)	Other shellfish (2)	
	Other or mixed demersal (6)		Queen scallops (126)	
40E5	Sprat *Sprattus sprattus* (620)		Queen scallops (40)	Crab (mixed sexes, 5)
			Razor clam (117)	Velvet swimmer crab (1)
			Scallops (74)	Lobster (3)
			Whelks (6)	Mixed clams (3)
				Nephrops (3,292)

As can be seen in **Table 5.6**, the landings are dominated by shellfish, with the large majority of landings for *Nephrops*, with scallops, crabs and razor clams also present in large numbers. Herring and sprat also provide a sizable contribution in the data set.

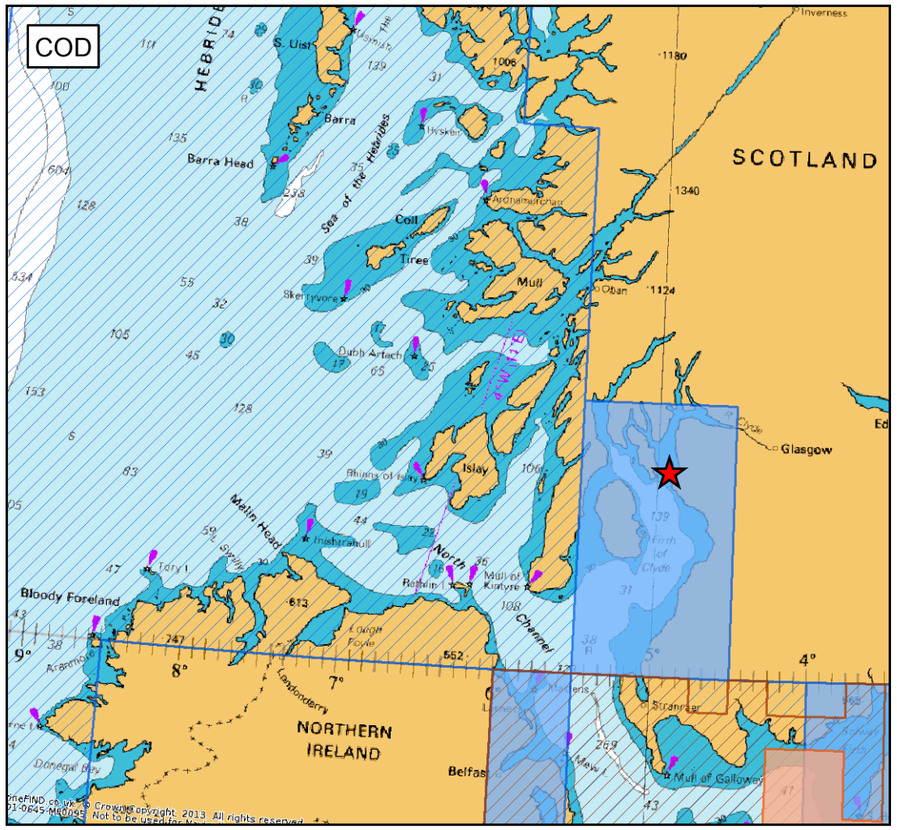
[2] *The International Council for the Exploration of the Sea (ICES) has developed a grid system derived from degrees latitude and longitude that divides the seas into rectangles.*

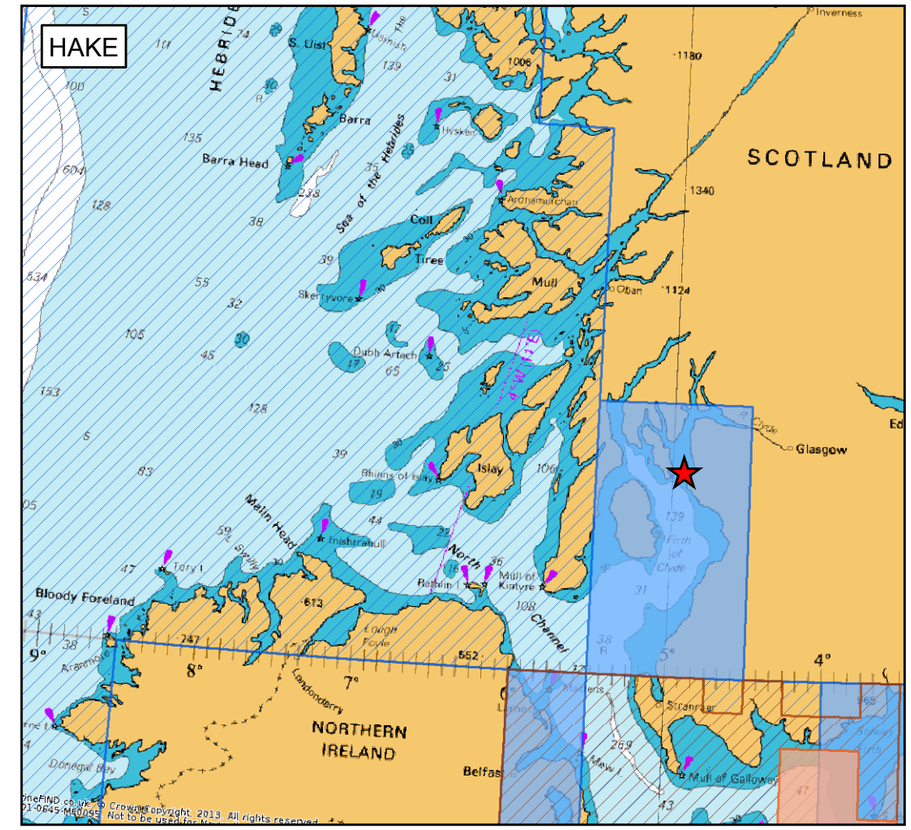
Spawning and nursery habitat

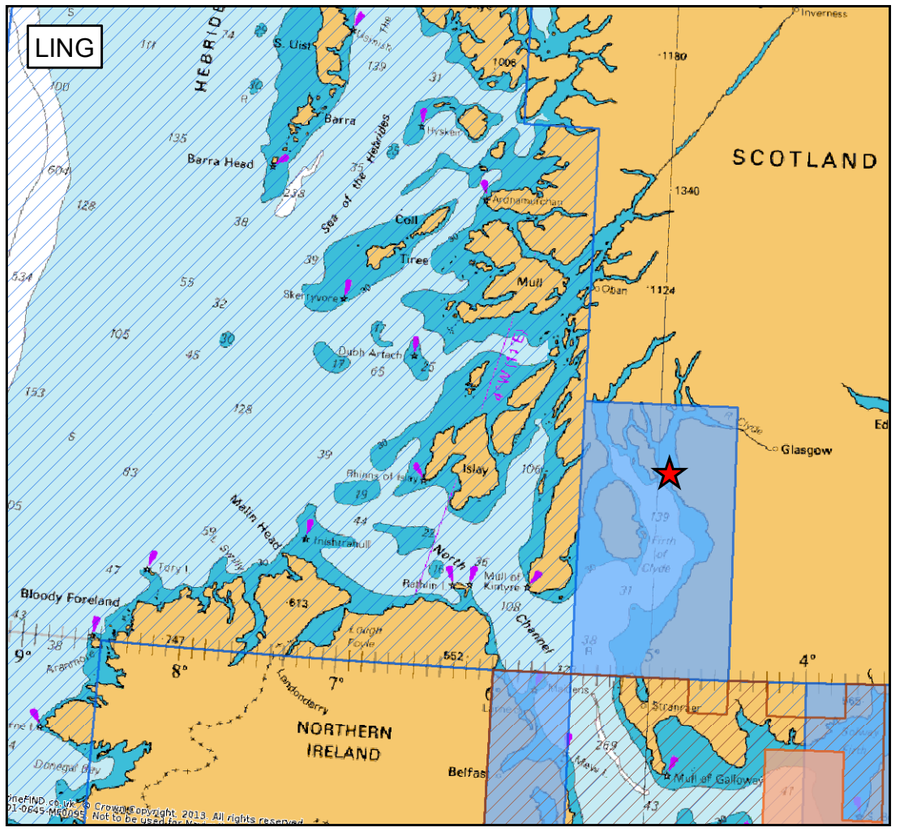
The Clyde (including the footprint of the proposed scheme) is identified as high intensity nursey grounds for cod, hake, ling mackerel, herring and spurdog (Ellis *et al.,* 2010) as shown in **Figures 5.1** to **5.5.** however the shallow depth of water (Marine Space *et al*., 2013) and mobile sediment veneer at Millport Bay makes the footprint of the proposed scheme an unlikely location for fish spawning to successfully occur.

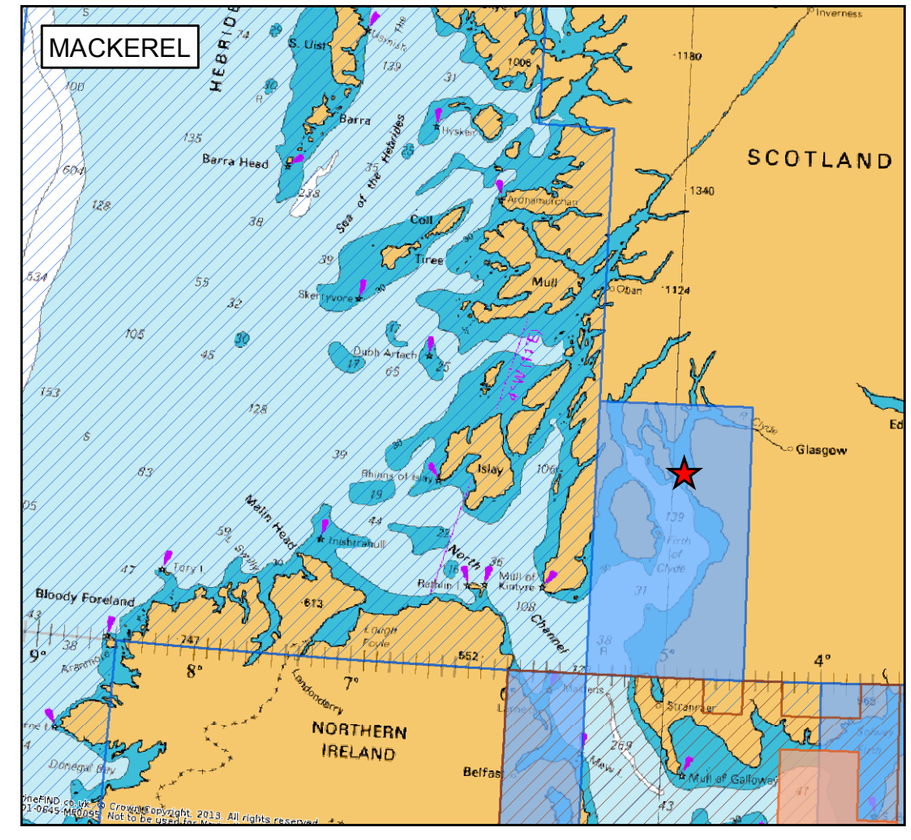
Migratory fish

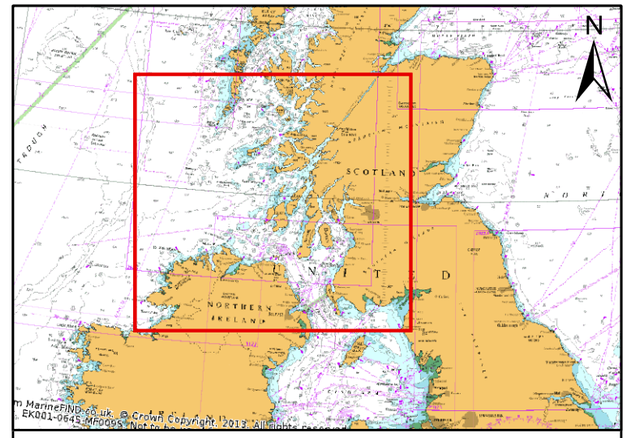
Endrick Water SAC is located upstream of the proposed scheme and is designated for Atlantic salmon *Salmo salar*, Brook lamprey *Lampetra planeri* and river lamprey *Lampetra fluviatilis*. The population of brook lamprey are non-migratory. River lamprey and Atlantic salmon would need to pass Great Cumbrae on their migration route out of the Clyde, however the fish are considered unlikely to enter Millport Bay on their normal course.











Legend

★ Site Location

Spawning Grounds

- High Intensity (Ellis et al. 2010)
- Low Intensity (Ellis et al. 2010)

Nursery Habitat

- High Intensity (Ellis et al. 2010)
- Low Intensity (Ellis et al. 2010)

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Title:

Fish Spawning Grounds and Nursery Habitat

Figure: 5.1 | Drawing No:

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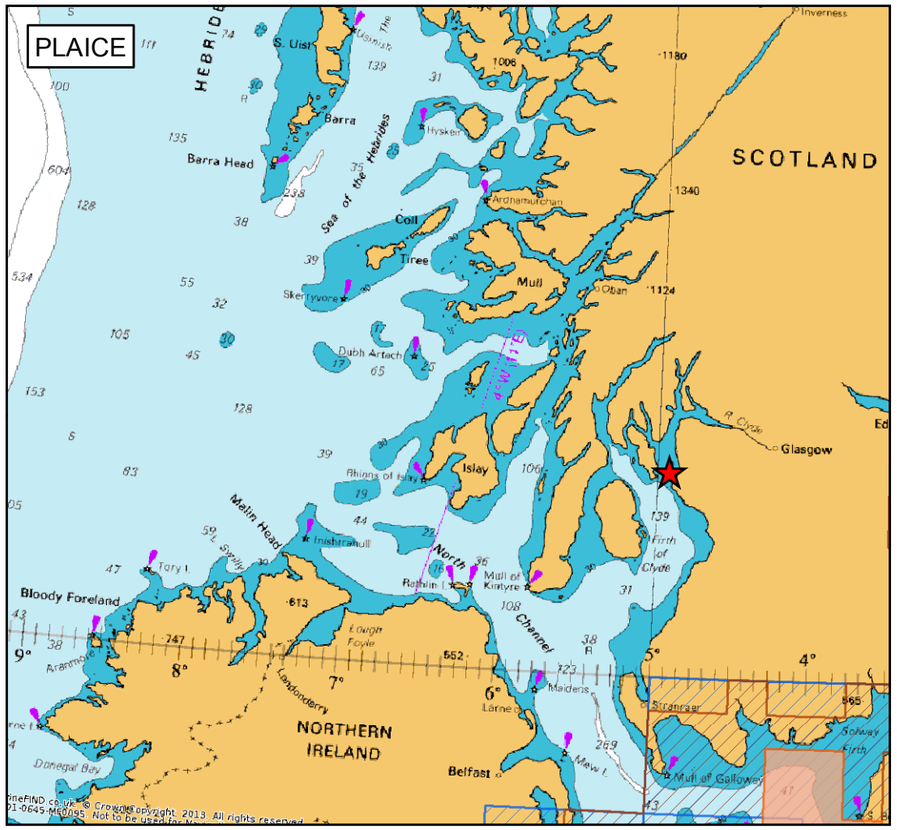

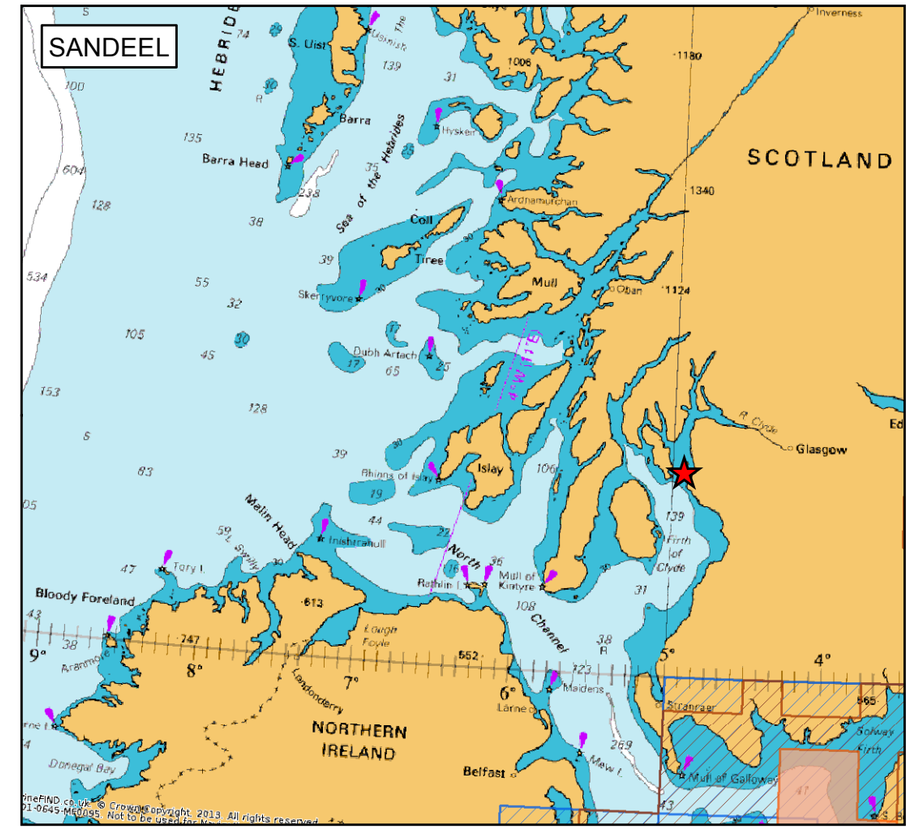

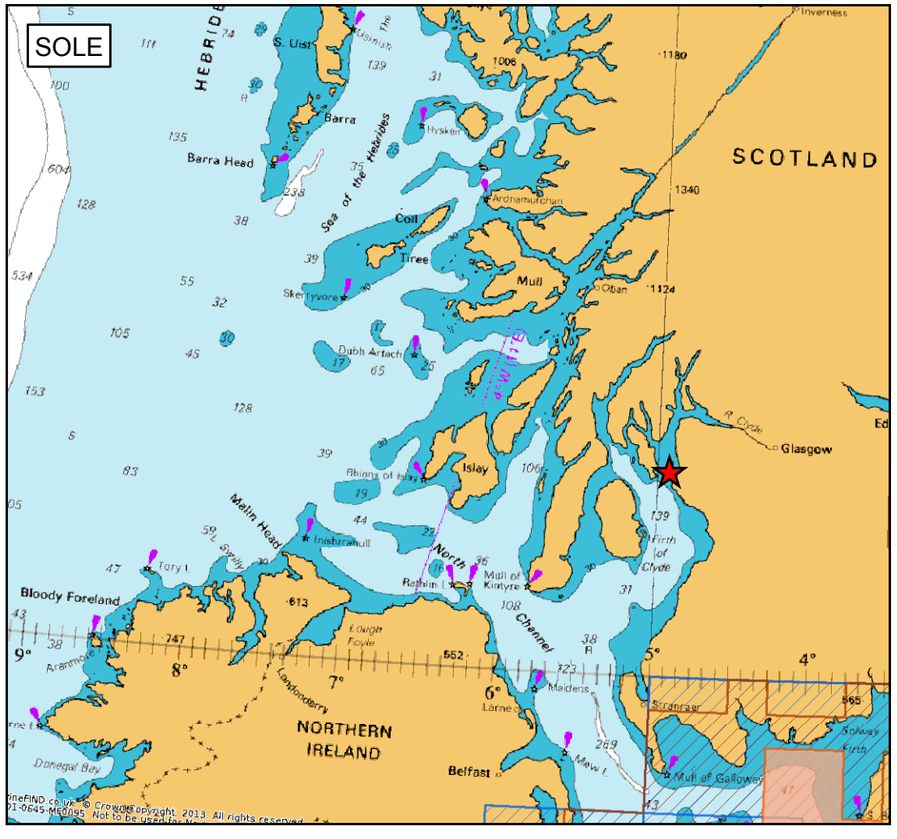

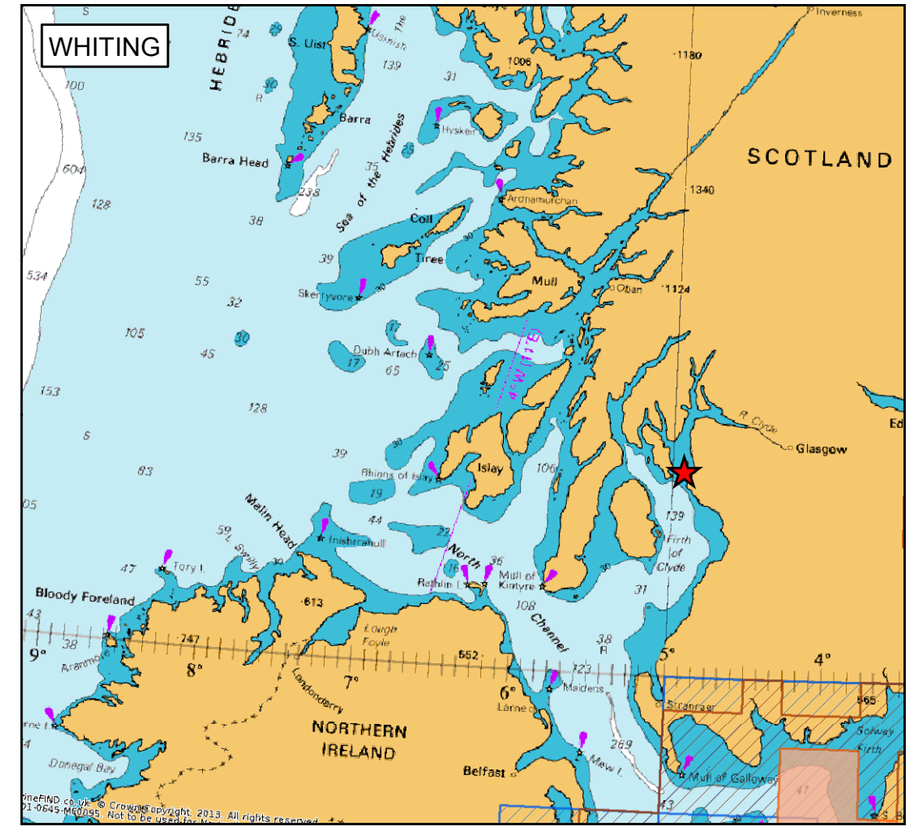

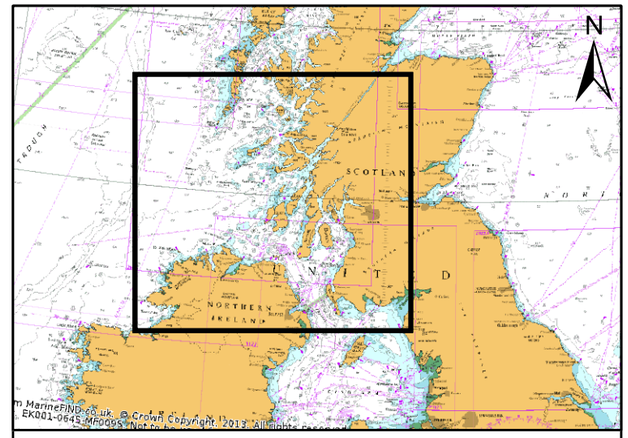

Legend

- Site Location

Spawning Grounds

- High Intensity (Ellis et al. 2010)
- Low Intensity (Ellis et al. 2010)

Nursery Habitat

- High Intensity (Ellis et al. 2010)
- Low Intensity (Ellis et al. 2010)

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Fish Spawning Grounds and Nursery Habitat

Figure:	Drawing No:
5.2	

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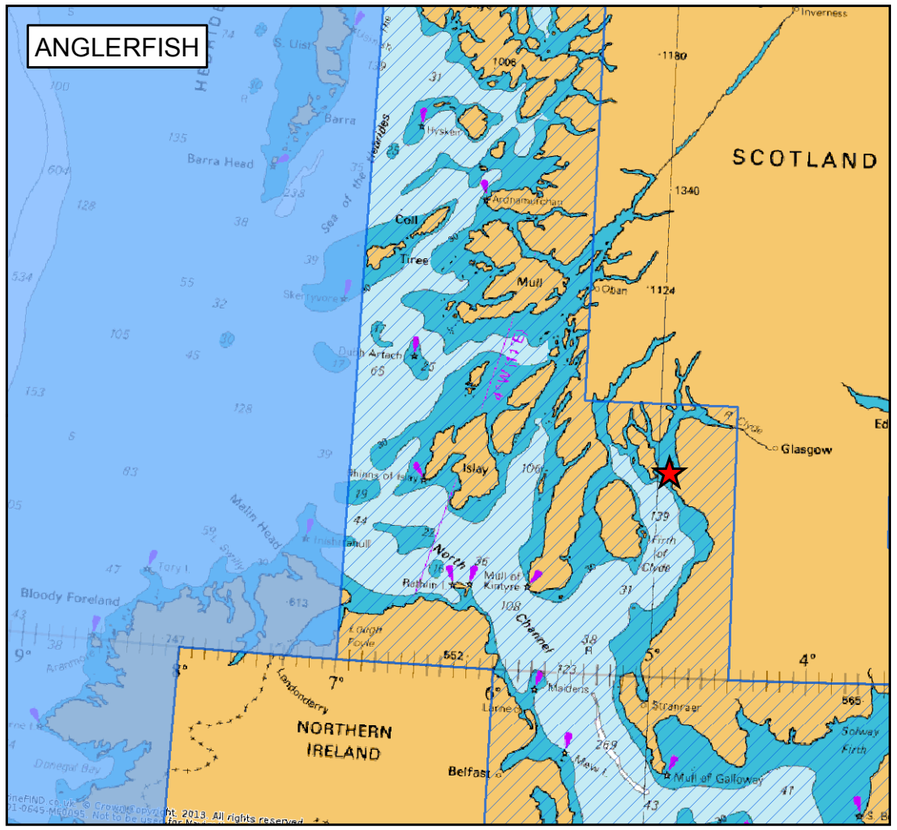

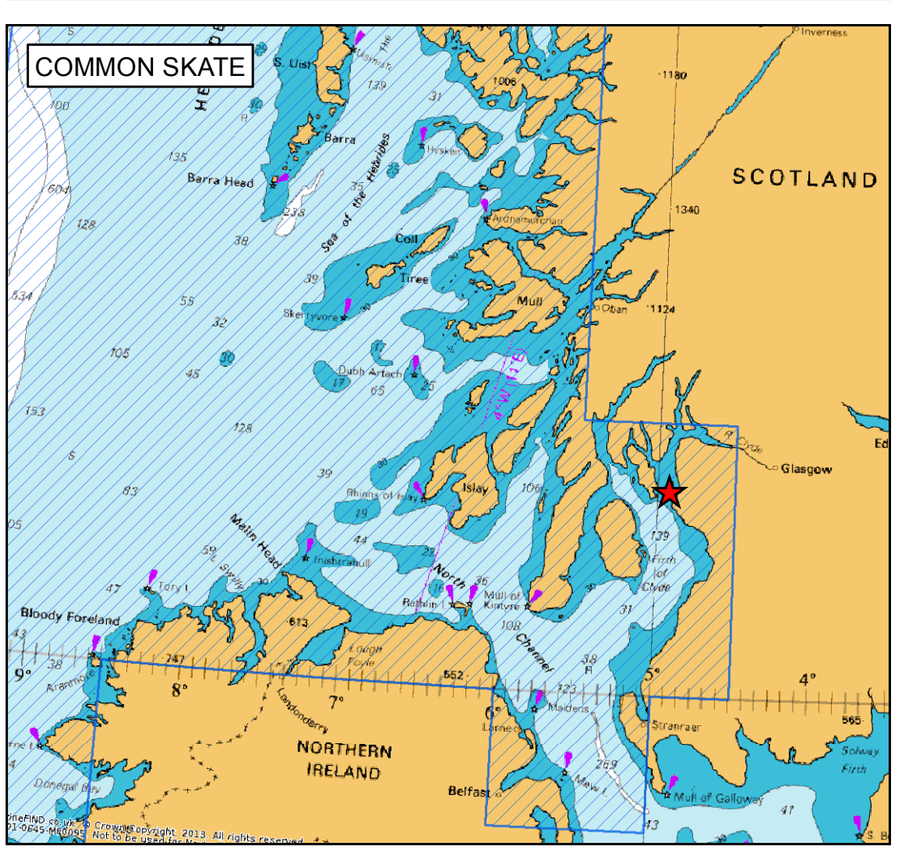

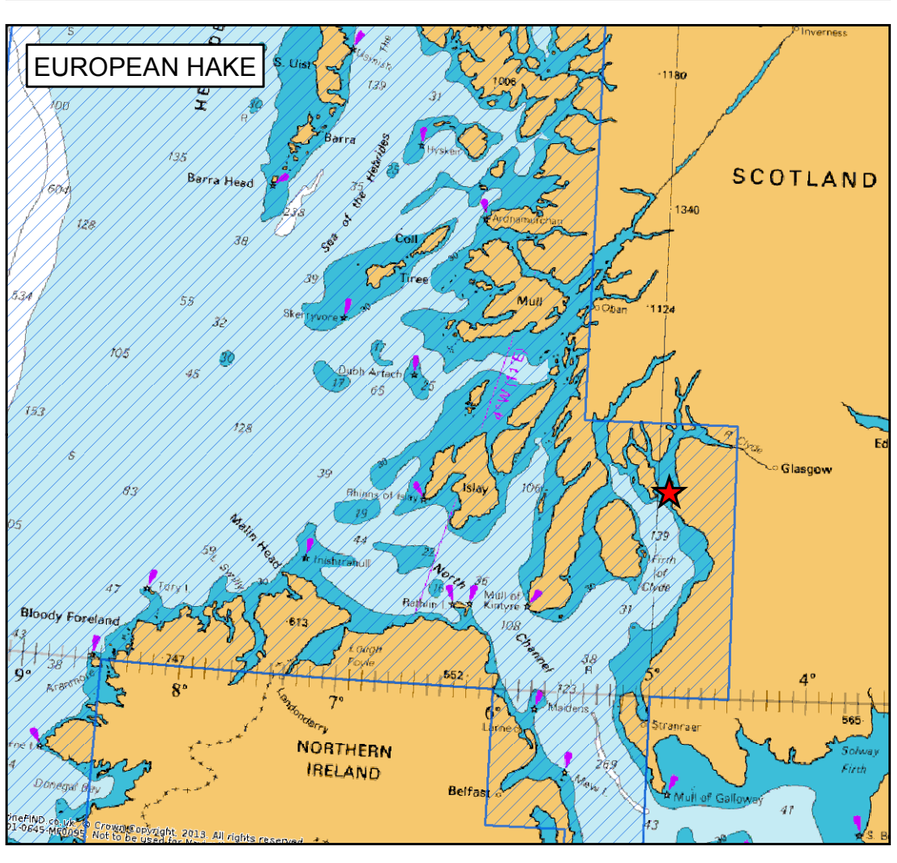

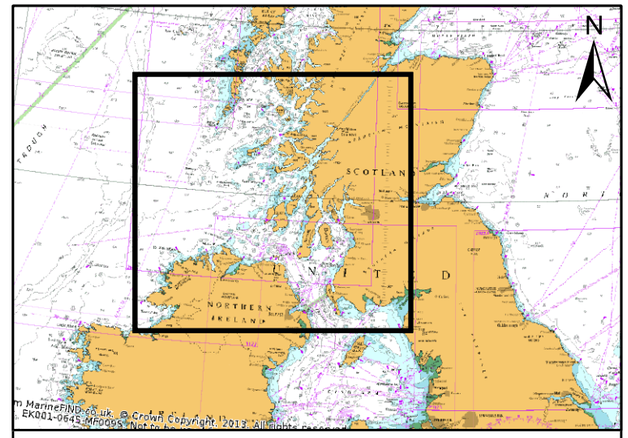

Legend

★ Site Location

Nursery Habitat

- High Intensity (Ellis et al. 2010)
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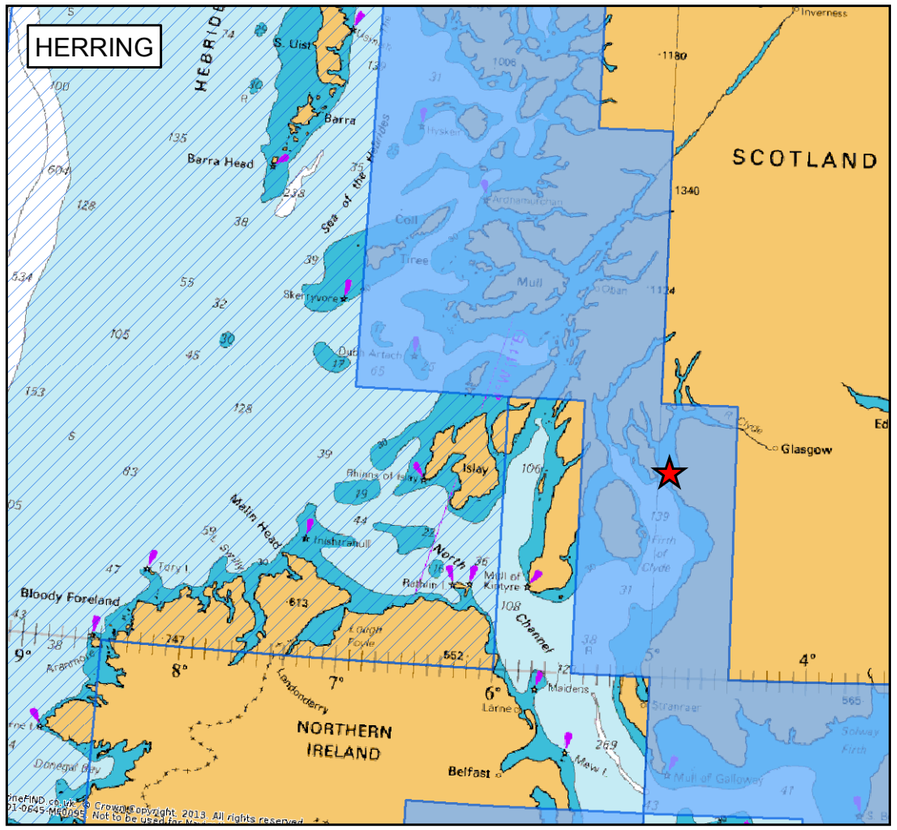

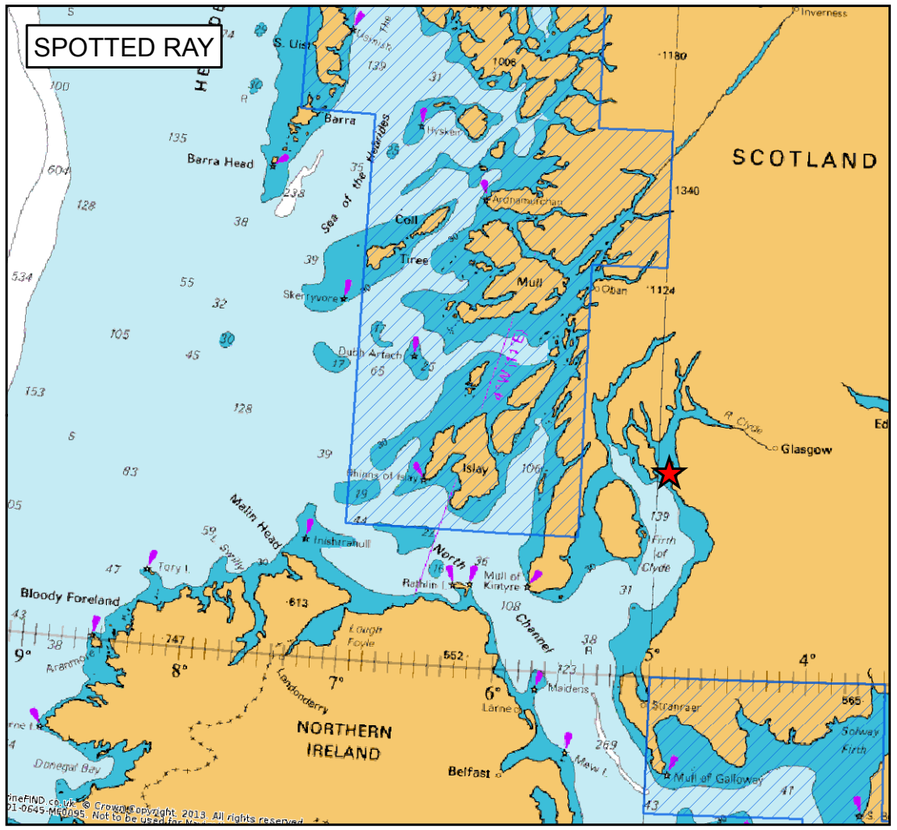

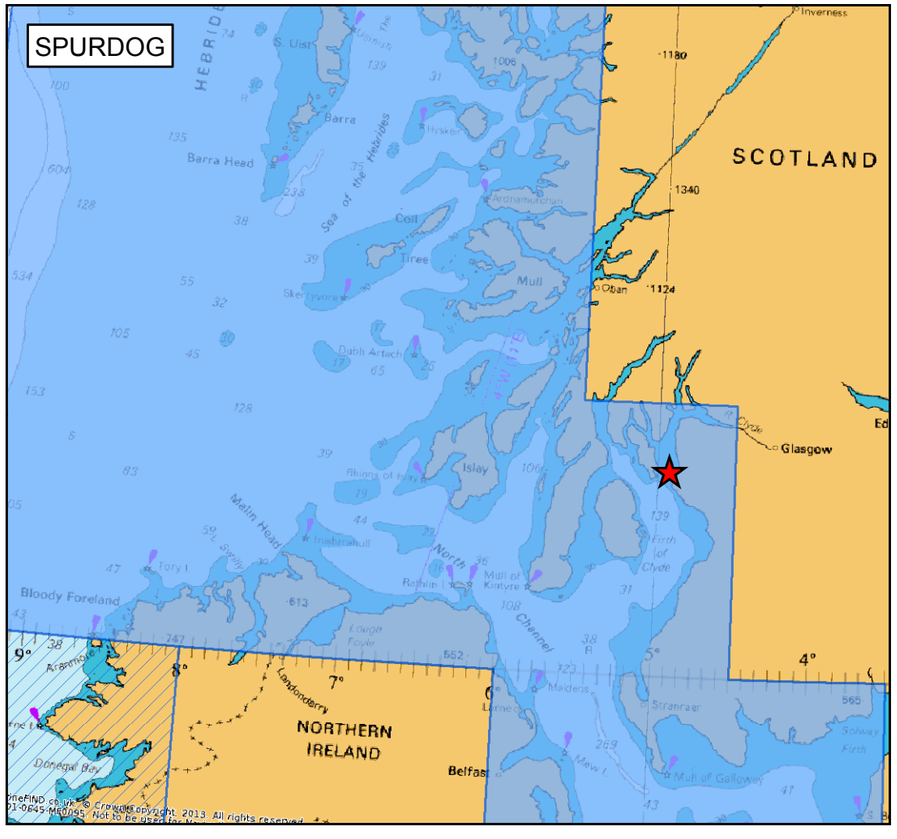

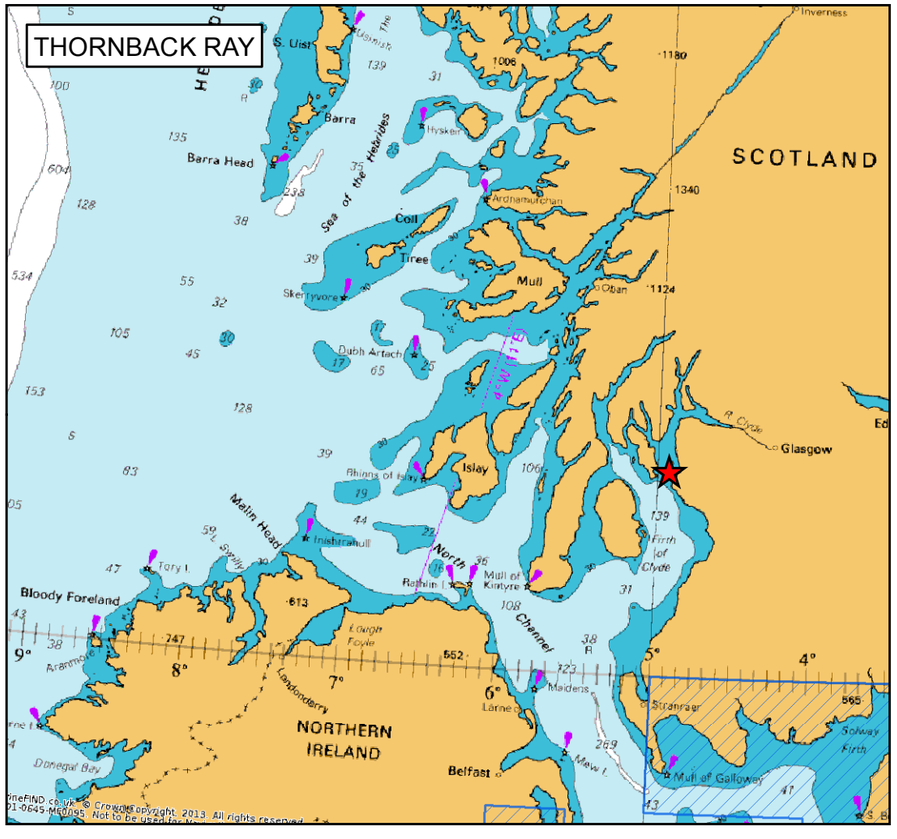

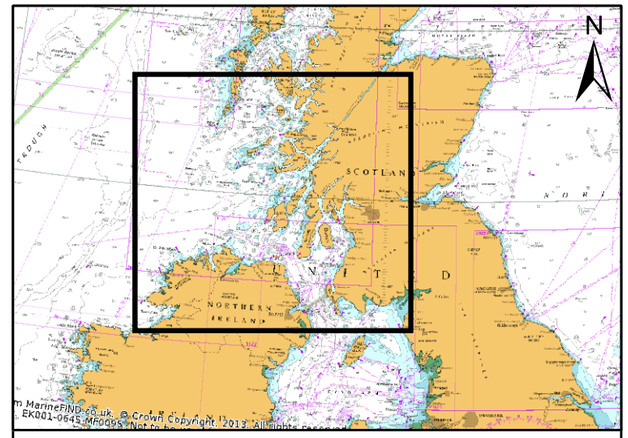

Legend

★ Site Location

Nursery Habitat

- High Intensity (Ellis et al. 2010)
- Low Intensity (Ellis et al. 2010)

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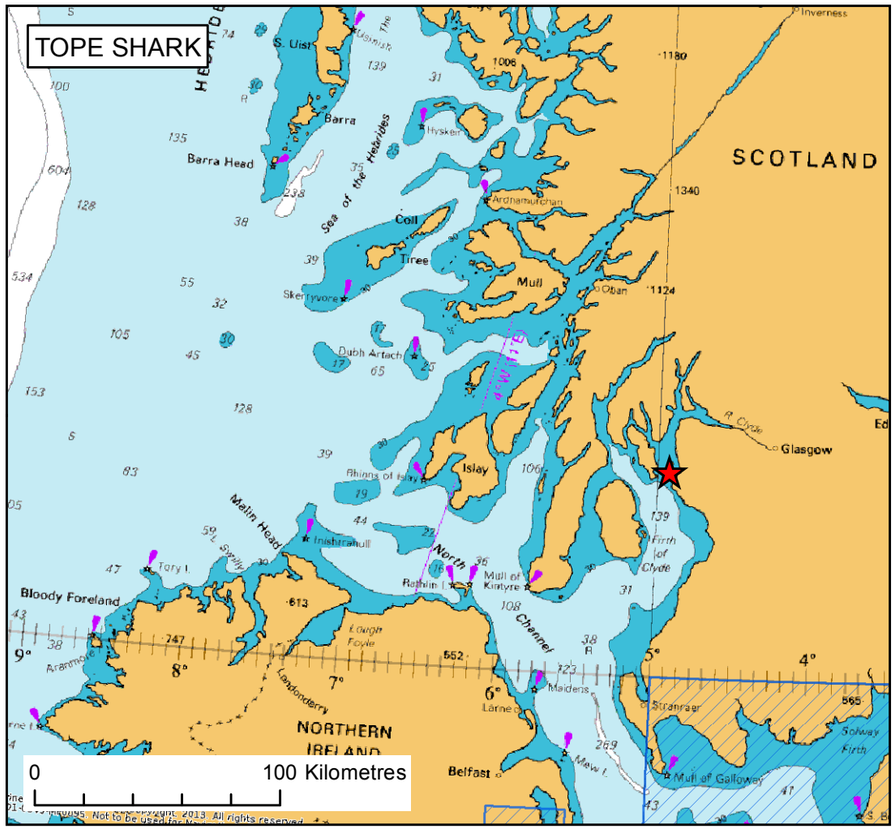

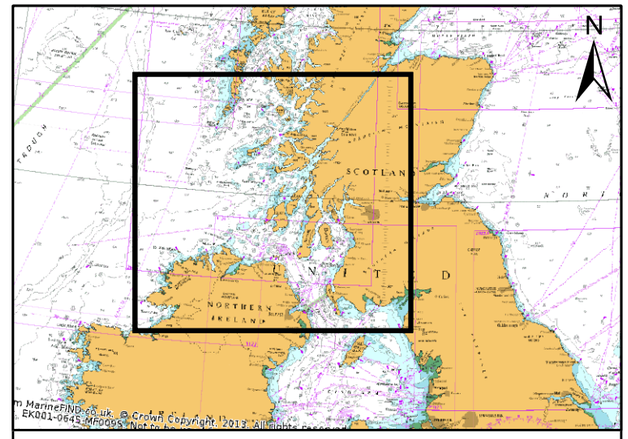

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Site Location

Nursery Habitat

High Intensity (Ellis et al. 2010)

Low Intensity (Ellis et al. 2010)

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Nursery Habitat (only)

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5.4.2 Identification of key issues

Possible impacts along with the potential significance on effect on fish and shellfish resource are considered in **Table 5.7** below:

Table 5.7 Key issues for fish and shellfish resource

Potential Impact	Phase	Potential Significance	Comment
Reduced water quality from re-suspension of sediment or pollution event	Construction	Impact unlikely to be significant and therefore scoped out of assessment	Temporary increases in suspended sediment concentrations during construction works of all options are proposed to be scoped out of the assessment (**Section 4.1**). Accidental contaminant release, such as fuel from vessels associated with the construction, maintenance and decommissioning will be managed through compliance with SEPA and CIRIA guidance and has been **scoped out of the assessment** (**Section 4.2)**
Habitat loss	Construction	Impact unlikely to be significant and therefore scoped out of assessment	The physical presence of option 1, 2 or 3 within the coastal waters will result in the direct, permanent loss of subtidal benthic habitat, which could represent fish feeding / spawning areas. The benthic habitat present at Millport Bay within the footprint of all options is mobile in character and shallow in depth, and as such is not considered to be suitable as spawning habitat. In addition, the footprint of the works under any of the options is very small however in comparison to the habitat available in the wider area and therefore the loss of habitat due to the proposed offshore works is considered to be negligible. **This impact is therefore scoped out of the assessment.**
Noise and vibration disturbance	Construction	Impact unlikely to be significant and therefore scoped out of assessment	An increasingly significant body of work has been carried out into the study of the effects of underwater noise upon sensitive fish species (Popper & Hastings 2009; Nedwell, *et. al.*, 2008; Parvin *et. al.*, 2006; Nedwell, *et al.*, 2003). Such studies have suggested that spawning activity, by hearing specialist species such as herring, may be disrupted (and eggs damaged) through the noise and vibration effects associated with the construction activities such as pile driving. Hearing specialists (Nedwell *et. al.*, 2004) that may be present in the area include herring, which are known to be sensitive to noise disturbance however the shallow water depth and mobile sediments make it unlikely for herring to be spawning within the footprint of the proposed scheme (Marine Space ltd *et al.,* 2013). Noise and vibration generated during construction of all options may be generated by a number of sources including, vessels activity and drilling if required. Use of vessels and noisy activities will be short term and limited in nature to the areas around the footprint of the offshore elements of the proposed scheme. **This impact is therefore scoped out of the assessment.**
Impacts to populations from designated sites	Construction	Impact unlikely to be significant and therefore scoped out of assessment	Migratory fish on route to Endrick Water SAC are unlikely to divert and enter Millport Bay when passing Great Cumbrae and are therefore unlikely to come into contact with the effects of the proposed scheme. **This impact is therefore scoped out of the assessment.**
Increase in diversity/number of individuals	Operation	Beneficial	The presence of rocky structures in the coastal waters at Millport (either option 1, 2 or 3) are likely to become colonised by marine organisms once in position, providing shelter and supporting additional food resource for fish.

Reduced water quality due to reduced tidal flushing	Operation	Impact unlikely to be significant and therefore scoped out of assessment	The presence of rocky structures in the coastal waters at Millport (particularly option 3) has potential to reduce tidal flushing within Millport Bay, which may result in a localised reduction in water quality, which consequently could impact upon fish. However, as noted in **Section 4.1**, all potential coastal processes effects have been scoped out of the assessment (for all options), on the basis that the effects are considered to be insignificant. **Consequently, this impact is scoped out of the assessment.**

5.4.3 Potential mitigation measures

The following possible mitigation and monitoring measures will be considered during the ongoing assessment and project development activities:

- Consideration will be given in detailed design to reduce the benthic footprint of the breakwater (either option 1, 2 or 3) where possible.
- Best practices will be adhered to minimise a risk of spill or pollution event. In addition, and EAP will be developed to ensure correct procedures are adhered to in order to minimise the risk of a pollution incident.

5.4.4 Approach to assessment and data gathering

Adverse impacts to fish and shellfish resource are not anticipated to occur. The only impact proposed to be scoped into the assessment is beneficial in nature (generation of additional food resource for fish due to the offshore elements of the proposed scheme). This potential impact will be assessed through desk based assessment and consultation with Marine Scotland, (any) local fishermen and the Clyde Fisherman's Association.

5.5 Benthic ecology

5.5.1 Existing environment

The majority of the coastline of the island is characterised by an emergent rock platform, with isolated pocket bays containing beaches. The rock foreshore is currently stable with low rates of change. Millport Bay is the part of the island coastline that contains larger lengths of mobile beach sediment. Below MLWS a veneer of sand and gravel substrate covers the rock platform and it is unlikely a benthic species or habitat of significance is present within the footprint of the proposed works within the coastal waters at Millport Bay (either option 1, 2 or 3). Introduction of rock habitat into the marine environment is likely to increase biodiversity and habitat potential in the bay.

East of the harbour, the intertidal area is characterised by a shallow clean sandy beach leading to a low sea wall. West of the harbour, the shore is characterised by a series of low rock headlands and bedrock platform, with clean sands in the upper shore, leading to a low sea wall. Areas of *Entromorpha intestinalis* are present across the shore. North Ayrshire Council undertakes mechanical beach cleaning in the summer months.

Consultation with SNH during February 2017 identified the potential presence of maerl within the area.

Designated sites

Nature conservation designated sites are detailed in **Table 2.1**. The nearest is Kames Bay SSSI which is a small sandy beach present at Millport, which has a high faunal population, including the lugworm *Arenicola marina* and the bivalve *Tellina tenuis*. The area provides a feeding ground for wader species such as redshank and oyster catcher. Freshwater seepage produces a variety of salinity profiles in the sand, leading to the presence of estuarine species such as the ragworm *Nereis diversicolor* and the algae *E. intestinalis* (ASML 2014).

Non-native invasive species

Sargassum muticum, also known as wireweed, is an invasive non-native species of seaweed. The distribution of the seaweed is currently moving northwards up the west coast of Scotland, and several records have been made on Great Cumbrae. This species is highly competitive and readily outcompetes native species. There is a significant potential for the species to be present within the footprint of the development, and also potential for the species to settle on the new project elements in the lower intertidal and shallow subtidal areas following construction.

5.5.2 Identification of key issues

Possible impacts along with the potential significance on effect on benthic ecology are considered in **Table 5.8** below:

Table 5.8 Key issues for benthic ecology

Potential Impact	Phase	Potential Significance	Comment
Physical disturbance of intertidal habitats	Construction, maintenance and decommissioning	Impact unknown or has potential to be significant	The proposed works on the foreshore required as part of the proposed scheme may cause disturbance of intertidal areas through habitat loss or disturbance.
Reduced water quality from sediment release or pollution event	Construction	Impact unlikely to be significant and therefore scoped out of assessment	Potential temporary increase in suspended sediment concentrations during construction activities (for all options) is scoped out of the assessment (**Section 4.1**). Accidental contaminant release, such as fuel, from vessels associated with the construction, maintenance and decommissioning

			will be managed through compliance with SEPA and CIRIA guidance and has been **scoped out of the assessment** (**Section 4.2**)
Loss of habitat	Construction although the impact would be manifested during life of the project	Impact unlikely to be significant and therefore scoped out of assessment	There will be loss of benthic species and habitat within the footprint of option 1, 2 or 3. The footprint associated with all potential options is limited in size and the area at each location is characterised by bedrock with a thin layer of sand and gravel substrate and is not considered to support important benthic habitats or species. **This impact is therefore scoped out.** [The exact footprint of each option is currently unknown and will be refined through the detailed design process. Therefore the conclusion above is based on the loss of less than 1ha of subtidal habitat for all options. If the footprint of the preferred option is determined as being greater than 1ha, additional consultation with SNH will be undertaken to agree an approach to the assessment.]
Impacts to designated sites	Construction, maintenance, decommissioning	Impact unlikely to be significant and therefore scoped out of assessment	As discussed in **Section 4.1**, all potential effects likely to occur as a result of the proposed works in Millport Bay (either option 1, 2 or 3) are predicted to be very small at worst. As shown in **Figure 4.1**, the wave height at Kames Bay is predicted to be unchanged due to the progression of option 1, 2 or 3. In addition, SNH have confirmed in initial consultation that they consider it unlikely that there would be an adverse effect on the SSSI provided best practice is followed. **This impact is therefore scoped out.**
Spread of marine non native invasive species	Construction	Impact unknown or has potential to be significant	The presence of rocky structures in the coastal waters at Millport (either option 1, 2 or 3) would provide suitable habitat for the establishment of *Sargassum muticum*. Consultation will be undertaken with SNH to confirm their latest policy regarding the management of this species.

5.5.3 Potential mitigation measures

The following possible mitigation and monitoring measures will be considered during the ongoing project development activities:

- Consideration will be made in the detailed design to minimise the benthic footprint of the elements of the proposed scheme located in the intertidal and subtidal areas (either option 1, 2 or 3).
- Opportunities will be sought to enhance the design of the offshore elements of the proposed scheme (either option 1, 2 or 3) for the benefit of the local benthic ecology.

5.5.4 Approach to assessment and data gathering

Consultation with SNH will be undertaken throughout development of the proposed scheme. An intertidal survey will be conducted in accordance with guidance set out in JNCC's 2001 Marine Monitoring Handbook. A desk based assessment will be undertaken to determine the potential presence of maerl in the area.

6 Possible impacts on the human environment

This Chapter considers the potential impacts of the proposed scheme on the following receptors:

- Traffic and Transport;
- Tourism and Recreation;
- Commercial Fisheries;
- Archaeology and Cultural Heritage
- Landscape and Visual Impact;
- Infrastructure and Other Users;
- Onshore Noise and Vibration; and,
- Air Quality.

An overview of the relevant existing environment is provided for each along with the anticipated impacts, identification of mitigation and monitoring measures and discussion of the additional work.

6.1 Traffic and transport

6.1.1 Existing environment

The Isle of Cumbrae is a peaceful island with low levels of traffic, no Principal Roads and a network made up predominately by B and C/unclassified roads. The island is popular for cycling with locals and tourists and is linked to the mainland by ferry, with bus links between the ferry terminal and the town of Millport.

It is recognised that construction traffic that would be generated by the proposed scheme will be a key area of consideration in the ER / ES.

Existing Cumbrae highway network

The proposed scheme is located immediately adjacent to the B896 (Glasgow Street). Within the vicinity of the proposed scheme the road is a single carriageway road, subject to a 30mph speed limit with footpaths on either side.

The B896 road follows the coastline around the entire Isle of Cumbrae, and is connected to the mainland (at Largs) by ferry via the Cumbrae Ferry Terminal.

Private vehicles accessing the Isle of Cumbrae using the ferry service are reported to be limited, with many day trippers leaving their cars at Largs or at home (North Ayrshire Council, 2013). This results in traffic flows from private vehicles entering the island via the ferry being relatively limited, with flows tending to follow the 15 minute frequency of ferry arrivals or departures (North Ayrshire Council, 2013), however recent legal requirements to reduce the cost of the ferry fee for private cars is leading to an increase in cars using the ferry service.

The Isle of Cumbrae bus service runs between the Quayhead (Cardiff Street) and the Cumbrae Slip.

The 'Great Cumbrae Island Loop' is a nine mile circular route around the entire island following the B896 and is claimed to be one of Scotland's busiest cycle lanes[3].

[3] *http://www.ayrshirescotland.com/towns/cumbrae.html*

Existing Largs highway network

The Cumbrae Ferry Terminal is located off the A78. The A78 provides a north south link through the town of Largs and within the urban area is subject to a 30mph speed limit with footways on both sides of the road linked by a series of controlled crossings.

To the north, the A78 follows the coast linking to the M8 and the wider highway network to the west of Glasgow, whilst to the south the A78 provides links to the A71 towards Kilmarnock. To the east of Largs the A760 provides and east west route across the Clyde Muirshiel Regional Park towards Glasgow.

Existing ferry network

The Isle of Cumbrae is accessed from the mainland by ferries which operate from Largs by Caladonian MacBrayne. The ferry is a lifeline link to the island, and is the only option for public transport or car transfer to and from the mainland for residents, commuters, school children and tourists (the latter of which provide the main economy for the businesses on the island). Service reliability and capacity is therefore of great importance for the island.

The ferry landing point on the Isle of Cumbrae is located on the north-eastern tip of the island, with ferries taking approximately 10 minutes to travel to and from the island. The ferries run every half hour throughout the day. During peak tourist season in the summer months, two ferries operate throughout the day, increasing the service to run every 15 minutes. A bus service links the Isle of Cumbrae ferry terminal to the town of Millport.

6.1.2 Identification of key issues

No information is available for workforce numbers and associated traffic generation at this stage. The methods and modes to bring materials and workforce to the island are currently unconfirmed and will be considered throughout the development of the project design. In order to consider a worst case it is assumed that the majority of vehicles, including bulk material deliveries entering and leaving the construction site during the construction phase are likely to do so by ferry and road.

Access to the proposed scheme by road would likely be taken from the B896, or alternatively the B899, however, the proposed access route for transport of construction materials to the site is currently not defined and will be established during the detailed design phase. Based on the information available to date, the potential impacts of construction traffic are presented in **Table 6.1.**

Table 6.1 Potential impacts of the proposed scheme on traffic and transport

Potential impact	Phase	Potential significance	Comments
Adverse impacts upon highway safety	Construction	Impact unknown or has potential to be significant	The increase in construction traffic may lead to adverse impacts upon highway safety.
Capacity on Ferry utilised by daily construction worker	Construction	Impact unknown or has potential to be significant	Loss of capacity on ferry may increase waiting time for locals (including commuters and school children) and visitors. May deter visitors
Capacity on ferry utilised by bulk deliveries of material to site	Construction	Impact unknown or has potential to be significant	Loss of capacity on ferry may increase waiting time for locals (including commuters and school children) and visitors. May deter visitors
Driver delay	Construction	Impact unknown or has potential to be significant	The increase in traffic during construction has potential to lead to congestion on the highway network leading to queuing and driver delays. This impact could be particularly concentrated around

Potential impact	Phase	Potential significance	Comments
			the ferry terminal at Largs.
Pedestrian amenity	Construction	Impact unknown or has potential to be significant	The increase in construction traffic and HGV component may lead to adverse impacts upon the amenity value of pedestrians and cyclists.
Severance	Construction	Impact unknown or has potential to be significant	The increase in construction traffic could lead to severance of local communities, difficulties accessing facilities and local communities.
Abnormal loads	Construction	Impact unknown or has potential to be significant	The importing of large Abnormal Indivisible Loads (AILs) may lead to delays on the highway network. If AILs are required an AIL report will be produced to check the suitability of routes.

In addition to the impacts identified above there is the potential for traffic borne noise and vibration and air quality impacts considered separately within **Sections 6.5** and **6.6** respectively. Once more detail of the proposed traffic demand is known a more detailed transport scoping note will be prepared and submitted to the highway authority to confirm the scope of assessment.

Upon completion of the construction phase, there would be a requirement for continued maintenance of the flood protection scheme. However, it is not envisaged that the frequency or intensity of these activities will increase significantly above that currently being undertaken and therefore proposed that operational phase assessment is scoped out of the assessment.

6.1.3 Potential mitigation measures

The transportation of materials and work force will be considered throughout the development of the project design.

The environmental assessment will determine the requirement for the implementation of mitigation measures to reduce the significance of the impact to transport receptors. If it is assessed that there is the potential for significant impacts to arise, the following mitigation measures could be introduced to reduce the significance of the impact to an acceptable level (however this will be fully investigated during the environmental assessment):

- Undertaking consultation with the local authority to arrange suitable access to the construction site and identification of optimum routes and times for construction traffic to use.
- Consultation with Caledonian MacBrayne regarding use of ferries to access the construction site.
- Committing to the development of a Construction Traffic Management Plan to manage deliveries to avoid certain times, or use only defined routes, and methods to avoid use of ferries at key times etc.
- Committing to repair or make good any damage caused to existing highways due to construction and operational traffic movements.
- Investigating the potential to transport construction materials and plant to the construction site by sea rather than road to reduce the effect on the local road network.

The above list is not intended to represent an exhaustive list of potential mitigation measures; however such mitigation measures have potential to effectively manage the risk to transport receptors.

6.1.4 Approach to assessment and data gathering

To facilitate the impact assessment, the following data will be obtained:

- baseline traffic demand within the study area (including the Isle of Cumbrae and Largs);
- ferry capacity study (including week days, weekends and seasonality);
- details of sensitive receptors (such as shops, schools, etc.) within the study area;
- collision data within the study area;
- optioneering study for how and when material can be delivered to site;
- consultation with Caladonian MacBrayne;
- an assessment of existing pedestrian/cycle/bus routes within the study area;
- trip generation, including number and type of construction vehicles and staff trips; and,
- Consultation with the North Ayrshire Council Active Travel Manager regarding the siting of the proposed flood wall in association with the road and pavement network.

The transport section will assess the traffic impact that the proposed scheme could have on the local road and ferry network during the construction phase. The assessment will be guided by the following documents:

- Transport Scotland, Vessel Replacement and Deployment Plan (Clyde and Hebrides); and,
- The Guidelines for the Environmental Assessment of Road Traffic (GEART).

If it is found that the construction phase traffic impact would have a significant adverse impact on the local road and ferry network, measures will be proposed to mitigate the impact.

6.2 Tourism and recreation

6.2.1 Existing environment

Tourism

The Isle of Cumbrae (and Millport in particular) is one of the key traditional tourist destinations in Scotland. Millport is the only town on the island and is accessible by ferries which operate from Largs, located on the mainland. The town is a popular destination for day trippers from Glasgow, with visitors arriving via a paddle steamer along the River Cylde.

Although Millport can be considered as being readily accessible from the Scottish mainland, the number of visitors increases significantly during the summer months. The town has a largely tourism based economy, with many shops, cafes and restaurants catering to the demands of short stay day trippers. North Ayrshire Council (2013) reports that a number of cafes, shops and restaurants in Millport close particularly early, even during the height of the tourism season as day trippers return to the mainland via the ferry.

Millport hosts a number of events throughout the summer months, including the Classical Guitar Retreat (undertaken on the 6th to 11th July 2016), the Sail and Oar Festival (7th August 2016) and the Millport Scooter Rally (28th August 2016). In addition, Millport hosts the annual 'Millport Country and Western Festival' during the first week in September, which during 2016 was on the 2nd to the 4th September. The festival was first held during 1995, and attracts numerous visitors, a proportion of which camp within the Garrison House grounds. This festival is followed by the Millport Illuminations and fireworks display which is held annually in late September.

The town also contains a feature known as the 'crocodile rock' which is a large jagged rock on the shore, which has been painted to look like a crocodile. The crocodile rock was painted approximately 100 years ago, and has been a famous landmark attracting many generations of visitors. Additional tourism assets within Millport comprise the Cathedral of the Isles (Britain's smallest cathedral), the Garrison Museum and the Robertson Museum and aquarium.

The Island of Cumbrae War Memorial and a wishing well are located on the seafront.

Recreation

The Isle of Cumbrae offers a range of land based recreational opportunities, including:

- an 18 hole golf course with views over the Arran hills (approximately 700m from the proposed scheme footprint);
- a crazy golf course (approximately 100m west of the proposed scheme footprint);
- Millport bowling club (approximately 200m north of the proposed scheme footprint)
- cycling and walking around the approximately 10 mile circumferential route of the B896;
- eating and drinking in bars and restaurants within Millport; and,
- bird watching and rock pooling.

The waters surrounding Millport offer exceptional opportunities for water based recreational activities. Millport contains two beaches allowing people to safely access the sea for diving, canoeing, kayaking and sailing. Mooring bouys, including private moorings, are available at Millport. Millport's beaches also provide opportunities for swimming and other beach related recreational activities (e.g. sun bathing, fishing and walking).

The foreground of the town contains a series of green open spaces adjacent to the promenade which are used for leisure purposes including walking and sunbathing.

As shown on **Figure 6.1**, the Isle of Cumbrae contains a number of walking and cycle routes, including the 'Cumbrae Cycle Route Round Island Inner Circle to Glaid Stone' which circles the entire island, the Farland Point Walk, the Targets Walk and the Inner Circle Walk (all of which start from Millport Pier). The location of tourism and recreational assets identified above is shown on **Figure 6.2**.

The 'Great Cumbrae Island Loop' is a nine mile circular route around the entire island following the B896 and is claimed to be one of Scotland's busiest cycle lanes[4].

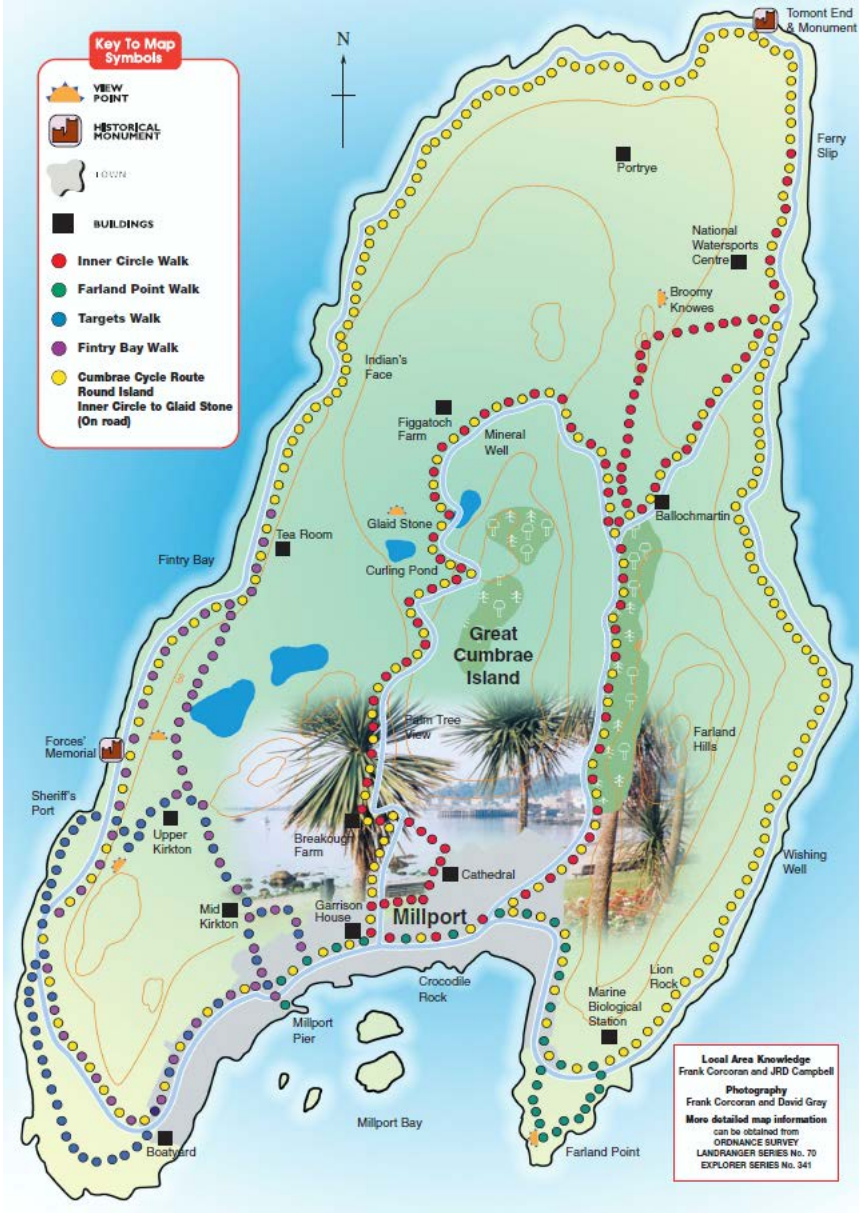

Figure 6.1 Footpaths and cycle routes in the Isle of Cumbrae

[4] *http://www.ayrshirescotland.com/towns/cumbrae.html*

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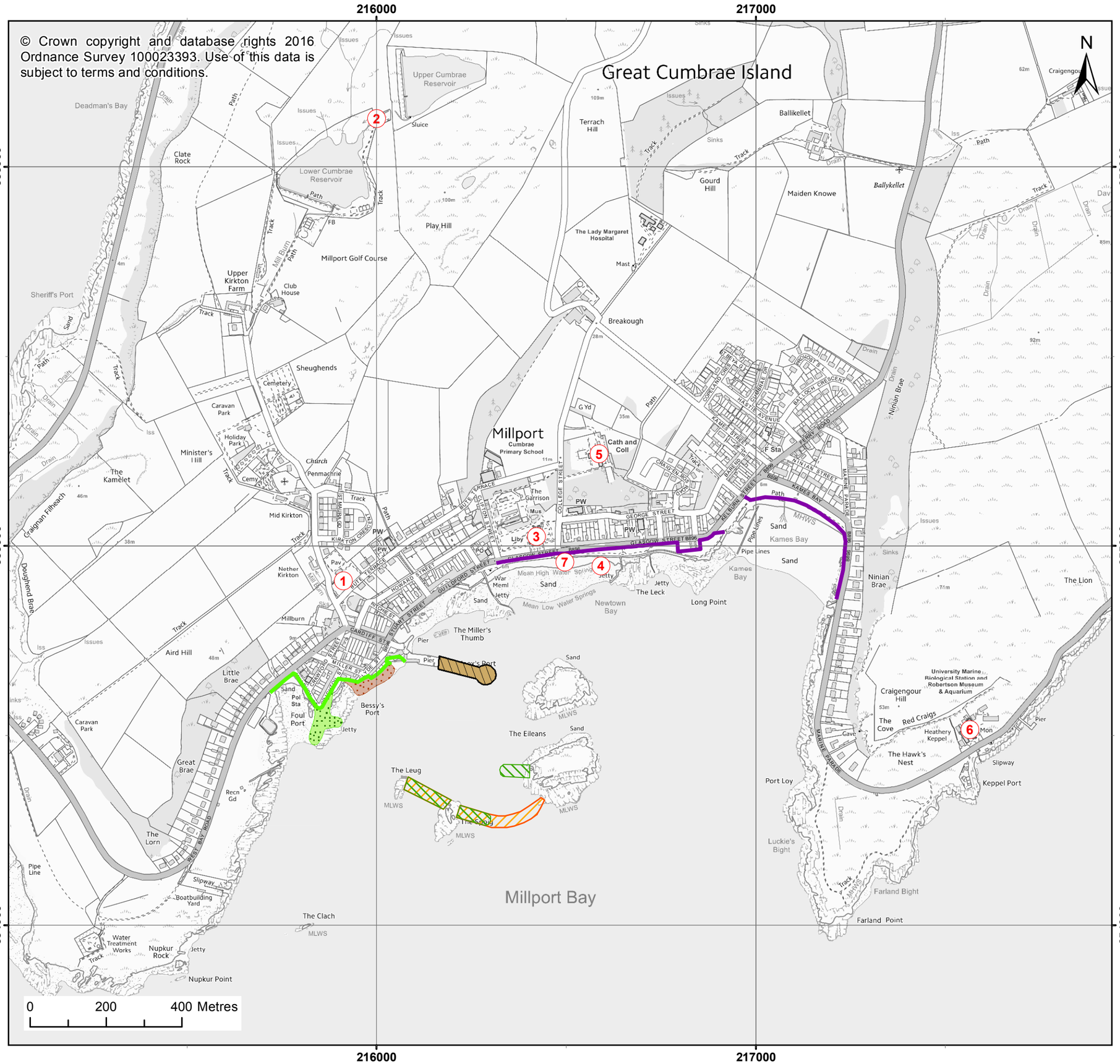

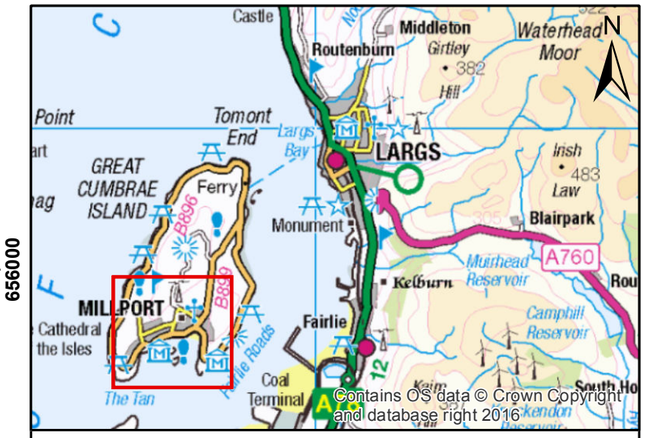

Legend

Proposed Works

- Works to existing coastal defences
- New Flood Wall
- Rock Breakwater
- Rock Revetment
- Harbour breakwater (Offshore works Option 1)
- Potential offshore breakwater (Offshore works Option 2)
- Potential offshore breakwater (Offshore works Option 3)

Tourism and recreational assets

1 - Millport Bowling Club
2 - Millport Golf Club
3 - Garrison House
4 - Crocodile Rock
5 - Cathedral of the Isles
6 - Robertson Museum and Aquarium
7 - Seafront Crazy Golf and Play Park

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Client:	Project:
North Ayrshire Council	Millport Flood Protection Scheme - Environmental Scoping Report

Title: **Tourism and recreational assets**

Figure: 6.2 | Drawing No:

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
3	21/02/2017	TC	AS	A3	1:10,000
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Co-ordinate system: British National Grid

Royal HaskoningDHV
Enhancing Society Together

ROYAL HASKONINGDHV
Marlborough House
Marlborough Crescent
Newcastle-upon-Tyne, NE1 4EE
+44 (0)191 211 1300
www.royalhaskoningdhv.com

Navigation

Commercial and recreational navigation at Millport is limited to small fishing boats and recreational vessels, a cruise vessel and a paddle steamer (PS Waverley). The cruise vessel and Waverley are the largest vessels to potentially arrive at Millport. These vessels have the following dimensions:

- Cruise vessel – 72m length, 14m width and 3m draft.
- Paddle streamer (Waverley) – 73m length, 17.5m width and 1.9m draft.

The cruise vessel and PS Waverley both visit Millport during the summer months, regularly calling on a twice weekly frequency. Although not essential, both vessels aim to visit the port at high tide. The vessels approach Millport from the southeast along the charted leading line, manoeuvring between The Spoig and The Eileans. PS Waverley berths alongside Millport Pier, however, as a result of damage to the Pier, PS Waverley now sails from Keppel Pier (located approximately 1.75km to the east of Millport Pier). Due to the draft of the cruise vessel, it is not able to berth alongside Millport Pier. The cruise vessel therefore deploys its anchor and berths in the deeper waters inland of The Eileans. Both vessels, as well as the smaller fishing vessels leave the port to the west side, manoeuvring between the coastline and The Leug.

A high level assessment has been undertaken by Royal HaskoningDHV to determine the potential implications of the offshore breakwater options (options 2 and 3) on existing navigation practices. A summary of the assessment is presented in **Table 6.2**.

Table 6.2 Summary of differences between the offshore options and the existing situation

Potential issue	Current situation	Option 2	Option 3
Navigational safety – alignment and space	Vessels approach along a straight line with an alignment of 333º, with sufficient distance between the islands.	A safe approach to Millport along the existing alignment would not be possible due to insufficient clearance between the vessel and The Eileans. Vessels could either use a slightly altered alignment, or a kink in the approach route could be introduced.	The existing approach will be blocked by the presence of the breakwater, requiring vessels to enter the port from the west.
Navigational safety – bathymetry	The bathymetry along the current alignment into Millport is generally 3.5mbCD. Local reductions in depth to approximately 2.5mCD.	Equal to the current situation.	The depth is the west passage is approximately 3.5mCD.
Stopping length	Vessels are able to commence the stopping manoeuvre between the islands. The stopping distance is more than four times the ship length.	Due to reduced space between the islands the vessel will require speed to maintain manoeuvrability between the breakwaters which will influence the stopping manoeuvre, but it is expected to remain feasible.	The vessel will require speed to maintain manoeuvrability around The Leug, which will influence the stopping manoeuvre, however it is expected that the activity would remain feasible.
Approaching anchor area (cruise vessel)	There is sufficient room to approach the anchor area.	Equal to current situation.	The vessel approaches the anchor area from the west, but the manoeuvre towards the anchor area is equivalent to the current situation.
Approaching berth (Waverley)	There is sufficient room to approach the berth.	Equal to current situation	Some more manoeuvring effort will be required, but the activity is considered feasible.
Departure	Vessels use both the marked	West passage already used. Leading	West passage already practiced. No

	leading line as well as the West passage.	line route requires a bit more effort but remains feasible. Two options available for captain to choose based on weather conditions.	alternative departure available.

6.2.2 Identification of key issues

The potential impacts anticipated to effect to tourism and recreational receptors as a result of the proposed scheme are presented in **Table 6.3**.

Table 6.3 Key issues anticipated to arise to tourist and recreational users

Potential impact	Phase	Potential significance	Comments
Disturbance to tourism and recreational users (including navigation practices)	Construction	Impact unknown or likely to be significant	The construction works for all scheme options have the potential to temporarily impact upon tourism and recreational users of the area as a result of increased disturbance and construction activity, generating noise and vibration, increased traffic, reduced air quality, visual impacts and potentially diversions of the routes of walking trail and cycle routes. There may be temporary disturbance to access to mooring buoys during construction activities. The construction works may also require temporary restrictions in access to tourism and recreational assets in and around Millport (including Kames Bay and the local footpath network) in order to minimise the potential for health and safety incidents to members of the public during the construction phase. Such effects are likely to arise as a result of heavy plant movements and cars / van movements, transporting site workers to and around the site, and could temporarily reduce the numbers of visitors (and subsequent income) to the area for the duration of the construction works. The construction phase is currently anticipated as 12 to 18 months, and as such, there is likely to be disturbance during at least one summer period. It should be noted however that coastal protection schemes can sometimes become tourist attractions in their own right, attracting a range of interested parties who come to view the construction works. The construction of rocky structures in the coastal waters (be it option 1, 2 and 3) has potential to disturb existing navigation practices around Millport, as these elements of the proposed scheme will require the use of barges. There is therefore potential for conflict (e.g. increased collision risk, delays to movements) between the construction barges and existing navigation practices. As discussed in **Section 3**, there is also a potential requirement for closure of the harbour during construction which could impact upon existing tourism and recreational practices.
Reduced availability on the ferry due to construction personnel and vehicles	Construction	Impact unknown or likely to be significant	Construction vehicles and personnel for all options are likely to arrive on site via the ferry from Largs. Temporarily increased numbers of construction personnel and construction vehicles utilising the ferry could impact upon the space available for recreational users.
Noise and dust issues	Construction	Impact unknown or likely to be significant	Construction works for all options have the potential to generate noise and create dust (particularly when undertaking construction works on land). Such noise and dust disturbance has potential to impact upon the tourism and recreational value of the area, albeit on a temporary basis.

Potential impact	Phase	Potential significance	Comments
Traffic and transport link disruption	Construction	Impact unknown or likely to be significant	Construction works for all options are likely to result in temporarily increased traffic on the existing road network. Increased vehicle numbers of local roads could directly impact upon recreational cyclists / walkers who utilise the road network (e.g. users of the Great Cumbrae Island Loop). Increased traffic on local roads could also indirectly impact upon tourism and recreational use as a result of traffic generated noise, dust generation and exhaust emissions.
Temporary visual impact of works	Construction	Impact unknown or likely to be significant	Construction works would temporarily impact on the existing visual amenity value of the area as a result of personal presence, construction materials and construction plant / machinery. A reduction in visual amenity value could impact the number of people undertaking recreational and tourism activities within Millport.
Reduced disruption to recreational activities	Operation	Beneficial impact	The scheme is being proposed to ensure long term flood protection to Millport (this is the major benefit arising from the scheme). The scheme (including all options) would result in reduced disruption to recreational users, residents, local businesses and tourists during the operational phase (in comparison with existing levels of disruption during flood events), as the proposed scheme would significantly reduce the potential for flooding at Millport. Option 1 with the coastal waters at Millport Bay would involve removal of the derelict wooden section of pier; this will result in a beneficial impact to land based recreational activity associated with this option only (i.e. primarily through the removal of the wooden section of pier which could present a safety hazard to members of the public in its current form).
Enhanced conditions for water sports	Operation	Beneficial impact	Each of the proposed options for works in the coastal waters at Millport Bay (be it option 1, 2 and 3) are intended to reduce the wave activity at Millport. This potential effect on the hydrodynamic regime has potential to result in an enhanced (safer) environment for recreational sailors, sea kayakers, swimmers and canoeists who utilise the coastal waters at Millport.
Reduced water quality associated with the potential change to coastal processes	Operation	Impact unlikely to be significant and therefore scoped out of assessment	Each of the proposed options for works in the coastal waters at Millport Bay (either option 1, 2 and 3) have potential to indirectly reduce water quality in Millport Bay. This impact could occur due a change in the coastal processes during operation, reducing the flushing / exchange of coastal water at Millport. As noted in **Section 4.1**, this effect is not predicted to be significant for any of the three potential options and the consequent impact on water quality is therefore proposed to be **scoped out of the assessment.**
Disruption to existing navigation practices	Operation	Impact unknown or likely to be significant	As shown in **Table 6.2,** there is potential for adverse impacts to the existing navigation practices at Millport due to the presence of rocky structures in the coastal waters (particularly option 2 and 3). If option 1 is chosen as the preferred approach (rock breakwater to Millport Pier), this has potential to provide enhanced berthing facilities for PS Waverley and various other fishing and recreational vessels alongside.

6.2.3 Potential mitigation measures

The potential mitigation measures outlined with regard to traffic, noise and vibration, air quality and landscape and visual are all likely to be of relevance with regard to reducing the significance of impacts to tourists and recreational users.

Additional measures which are likely to be required include appropriate scheduling of construction works by the contractor to ensure large and noisy operations take place outside of the main summer holiday period, adherence to measures outlined with a Construction Traffic Management Plan and adherence to pre-agreed working hours.

Early and effective consultation with the key sensitive receptors (including owners of mooring buoys and organisers of annual festivals (to potentially minimise particularly disruptive works during annual festivals), local bars, restaurants, hotels / B&Bs) would also likely minimise impacts upon tourism and recreational activities.

Consideration will be given in the design stage to incorporate additional moorings in the breakwater, if option 1 is selected as the preferred solution. Mitigation measures which could be adopted to minimise disruption to navigation practices include updating the aids to navigation and minimising the construction programme and working area as far as practicable.

6.2.1 Approach to assessment and data gathering

The impacts to tourism and recreational users will be assessed through desk based, qualitative assessment only. No specific surveys or studies are considered necessary to inform the assessment for any of the scheme options. The findings of the water and sediment quality, noise and vibration, landscape and visual and air quality assessments will inform the impact assessment with regard to tourism and recreation.

The impacts to existing navigational practices will be assessed through targeted consultation with the operators of the cruise vessel and PS Waverley and ongoing consultation with the local harbour users. We do not propose to undertake a navigational risk assessment given the relatively limited amount of vessels which use the area and the relatively small scale and manageable impacts which are anticipated to occur.

6.3 Commercial fisheries

6.3.1 Existing environment

The current situation at Millport provides limited opportunity for fishing boats to land in the bay. The harbour is small and heavily silted which restricts access, and the wooden section of the pier has been deemed unsafe for use and has been locked to prevent access. A number of mooring buoys are located within the bay, but these are used for small recreational vessels. Local consultation at Public Exhibitions in November 2017 suggested fishing activities at Millport to be very limited. Water in the bay is generally 5m deep or less, and therefore is at the lower extremity of creel fishing activities and only accessible to small fishing vessels.

6.3.2 Identification of key issues

Table 6.4 identifies the potential impacts (and the potential significance of those impacts) which could arise during construction and operation, with specific regard to commercial fisheries.

Table 6.4 Key issues for commercial fisheries

Potential Impact	Phase	Potential Significance	Comment
Disturbance to existing fishing activities in Millport Bay or access to fishing grounds	Construction	Impact unlikely to be significant and therefore scoped out of assessment	Construction of option 1 is currently assumed to be conducted from land, building out into the bay from the existing pier structure. The working footprint will be tight to the footprint of the breakwater and additional vessels are unlikely to be required. However, the construction of the offshore breakwaters (option 2 or 3) would involve the use of barges in and around Millport Bay, and therefore the working footprint would be larger in comparison to option 1. The use of barges during construction of any of the potential options in Millport Bay has potential to impact upon fishing activities as a result of conflict with fishing vessels. Commercial fishing activity in Millport Bay is considered to be low to non-existent and therefore direct disturbance to such activity or reduction in access to fishing grounds has been **scoped out of the assessment.**
Impacts to local fishing resource	Construction	Impact unlikely to be significant and therefore scoped out of assessment	Impacts to local fishing resource may occur through habitat loss, under water noise, or decrease in water quality from a pollution event. These are discussed in **Section 5.4 i**n further detail and have been **scoped out of this assessment**.
Improvement to landing facilities	Operation	Beneficial impact (option 1 only)	The progression of option 1 has potential to enhance the mooring facilities at the breakwater which may allow local fishermen the opportunity to land at Millport Bay. The potential to realise this benefit would be much reduced if option 2 or option 3 is selected as the preferred option.
Indirect disturbance to landing practices (applicable to option 3 only)	Operation	Impact unlikely to be significant and therefore scoped out of assessment	The construction of option 3 has potential to indirectly impact upon the route taken by fishing vessels which may land at Millport. Given that commercial fishing in Millport Bay is low to non-existent, and an alternative route will be available (to the west of The Leug), **this impact has been scoped out of the assessment.**

6.3.3 Potential mitigation measures

Best practices will be adhered to minimise a risk of spill or pollution event. In addition, an Environmental Action Plan will be developed to ensure correct procedures are adhered to in order to minimise the risk of a pollution incident.

6.3.4 Approach to assessment and data gathering

Adverse impacts to commercial fisheries are not anticipated to occur from the proposed scheme, however as best practice, consultation will be undertaken with Marine Scotland, the Clyde Fisherman's Association and local fishermen (if any) to determine local fishery activity, number and size of vessels, type of catch and frequency of activity in Millport, and the surrounding area.

6.4 Archaeology and cultural heritage

6.4.1 Existing environment

To inform our understanding of the archaeological resource within Millport, a review of publicly available information sources has been undertaken. The findings from our review of this information are presented below.

Known heritage assets

The Isle of Cumbrae contains a number of known heritage assets, with the majority of known sites focussed around Millport. Millport contains one Category A listed building, namely the 'episcopal cathedral with collegiate buildings and cloister', and numerous Category B and C listed buildings. There are also a number of sites and monuments recorded on the West of Scotland Archaeology service within the town.

There are no gardens and designated landscapes, battlefields or historic marine protected areas on the Isle of Cumbrae. The location of the known heritage assets in relation to the proposed scheme footprint (including the scheme options) is shown in **Figure 6.3**.

Millport Conservation Area

The town of Millport was designated as a conservation area in January 1971. Conservation areas are areas of special architectural or historic interest. Policy HE1 of North Ayrshire Council's Local Development Plan states that proposals for development which would adversely affect the visual amenity or historic / architectural character of a conservation area, including its setting, buildings, open space or trees, shall not accord with the Local Development Plan.

The latest Millport conservation area appraisal was undertaken by North Ayrshire Council in 2013 to assess the condition and character of the area. The text below provides a summary of the baseline information contained within the conservation area appraisal.

Millport was established and grew as a result of a decision to base a 'Revenue Cutter' in the lower reaches of the Firth of Clyde in 1634, for the collection of tolls and duties for the Crown and to assist in the prevention of smuggling (North Ayrshire Council, 2013). The strategic position of Millport was also utilised during the Second World War, as submarine listening posts for the Firth of Clyde were located here. The town has grown from an economy which was dependent on fishing, agriculture and quarrying to a town which is now dependent on tourism. Millport became the fashionable destination for Victorian holidaymakers and today is a very popular destination for day trippers and a location of choice for a variety of annual events including (as outlined within **Section 6.2 Tourism and recreation**).

It is understood that a systematic investigation of the archaeology within the Millport conservation area has not been undertaken to date. It is possible that archaeological evidence from the 18th century settlement and remains of early post medieval structures exist within the area encompassed by the growing town. Although the town has subsequently been developed with modern buildings, standing structures and deposits within the conservation area together with archaeological deposits may retain archaeological evidence for the origins and development of the town, as well as any earlier human activities within the town.

Millport has a mixed natural heritage setting, combining estuarine, pastoral and agricultural setting, with scattered semi-mature woodlands, hedgerow and parkland trees.

Rapid coastal zone assessment

A rapid coastal zone assessment was undertaken by the University of Glasgow on behalf of Historic Scotland during 2003. The text below provides a summary of the interest features recorded during the assessment.

The desk based research carried out as part of this study identified that there has been limited recorded archaeological investigation carried out on the Isle of Cumbrae. The assessment identified a total of 43 heritage sites within the study area (extending up to 100m inland from the coast), of which one site was classified as a listed building (Millport Harbour), two were classified as undesignated wrecks and 40 were classified as 'other archaeological site'. Of these 43 sites, 23 were previously recorded and 20 were new sites noted during the field survey. The location of the 43 sites is shown in **Figure 6.4** and **6.5.**

The highest density of sites present in and around Millport Bay are of direct relevance to the proposed scheme. Sites located at the coastline consisted primarily of small jetties and maritime features relating to the 18th to 20th Century, in varying states of preservation. None of the sites recorded during the assessment were considered to be at risk from coastal erosion, as the report concluded that the Cumbrae coastline is stable and not at risk of coastal erosion.

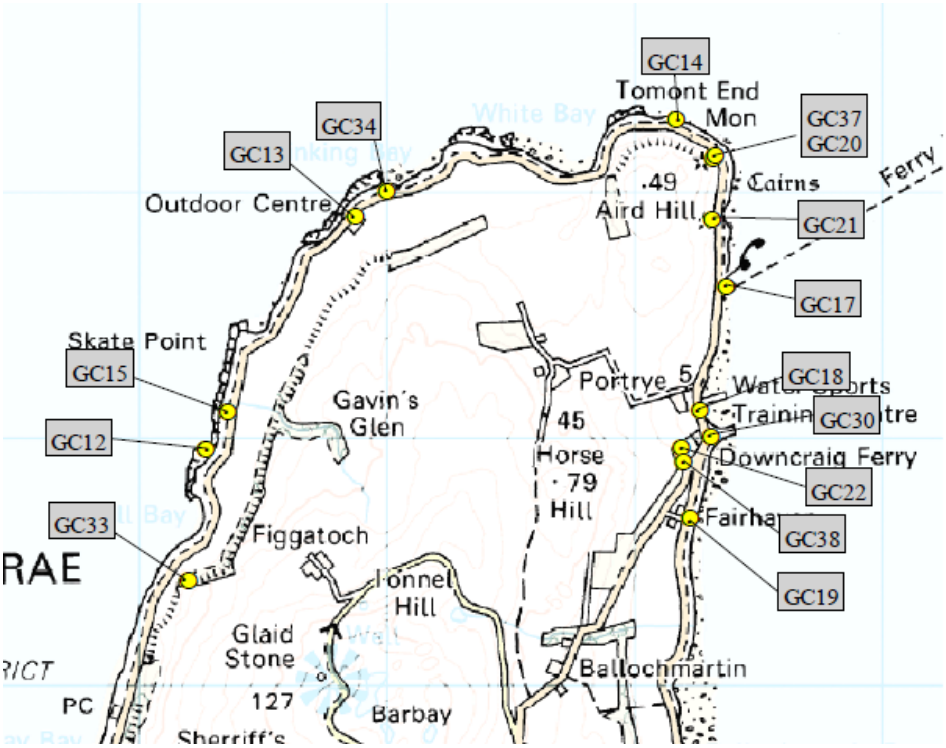
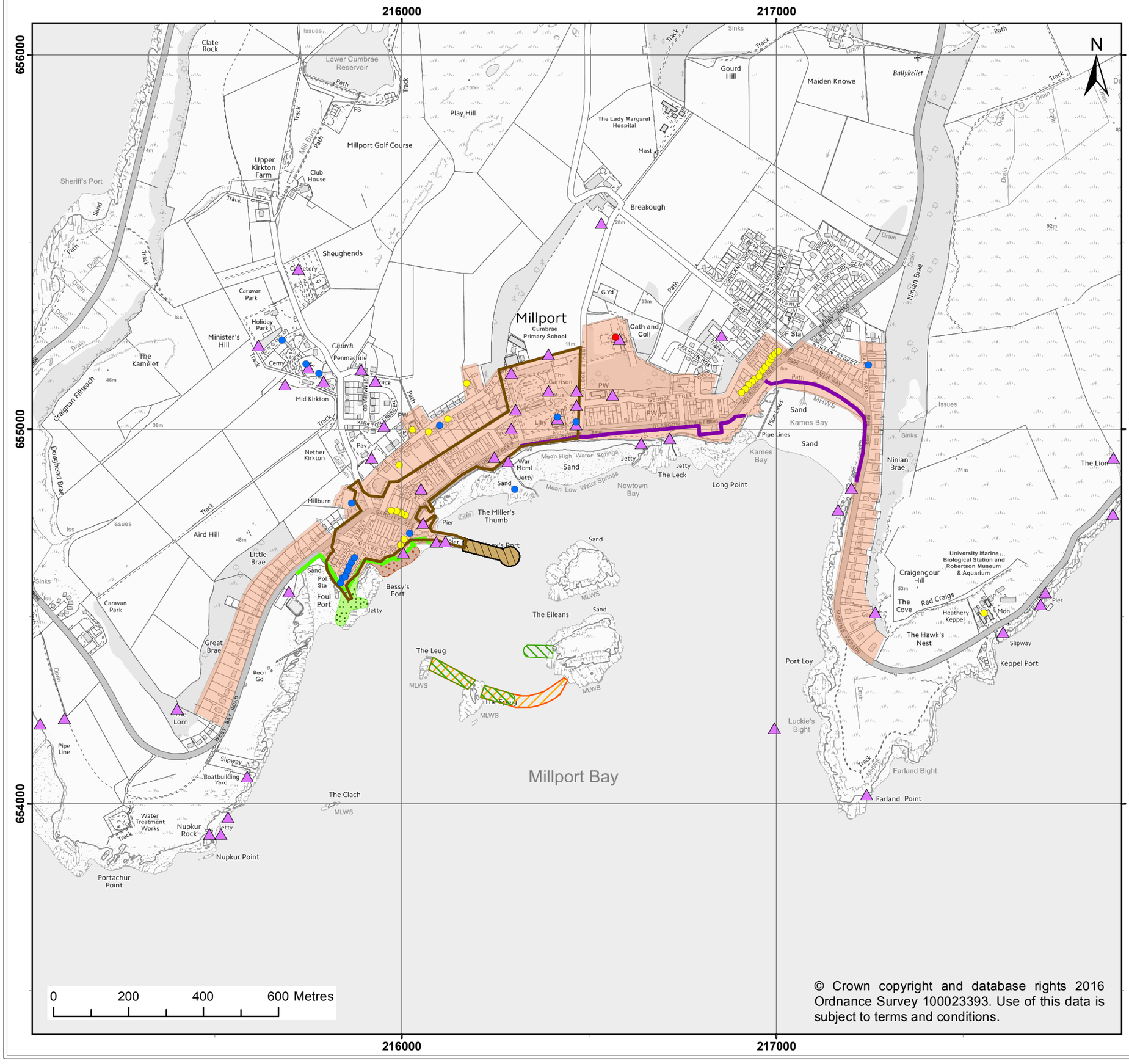


Figure 6.4 *Sites identified during the 2003 rapid coastal zone assessment in the northern half of the Isle of Cumbrae (Historic Scotland, 2003)*



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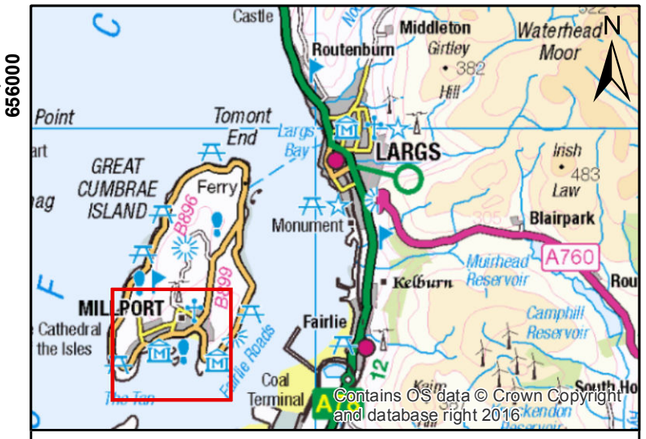

Legend

Proposed Works

- Works to existing coastal defences
- New Flood Wall
- Rock Breakwater
- Rock Revetment
- Harbour breakwater (Offshore works Option 1)
- Potential offshore breakwater (Offshore works Option 2)
- Potential offshore breakwater (Offshore works Option 3)

Listed Buildings

- A
- B
- C

- Conservation area
- Monuments area
- Monuments points

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Client:	Project:
North Ayrshire Council	Millport Flood Protection Scheme - Environmental Scoping Report

Title:

Known Heritage Assets

Figure: 6.3 | Drawing No:

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
3	21/02/2017	TC	AS	A3	1:10,000
2	20/02/2017	TC	SR	A3	1:10,000

Co-ordinate system: British National Grid

Royal HaskoningDHV
Enhancing Society Together

ROYAL HASKONINGDHV
Marlborough House
Marlborough Crescent
Newcastle-upon-Tyne, NE1 4EE
+44 (0)191 211 1300
www.royalhaskoningdhv.com

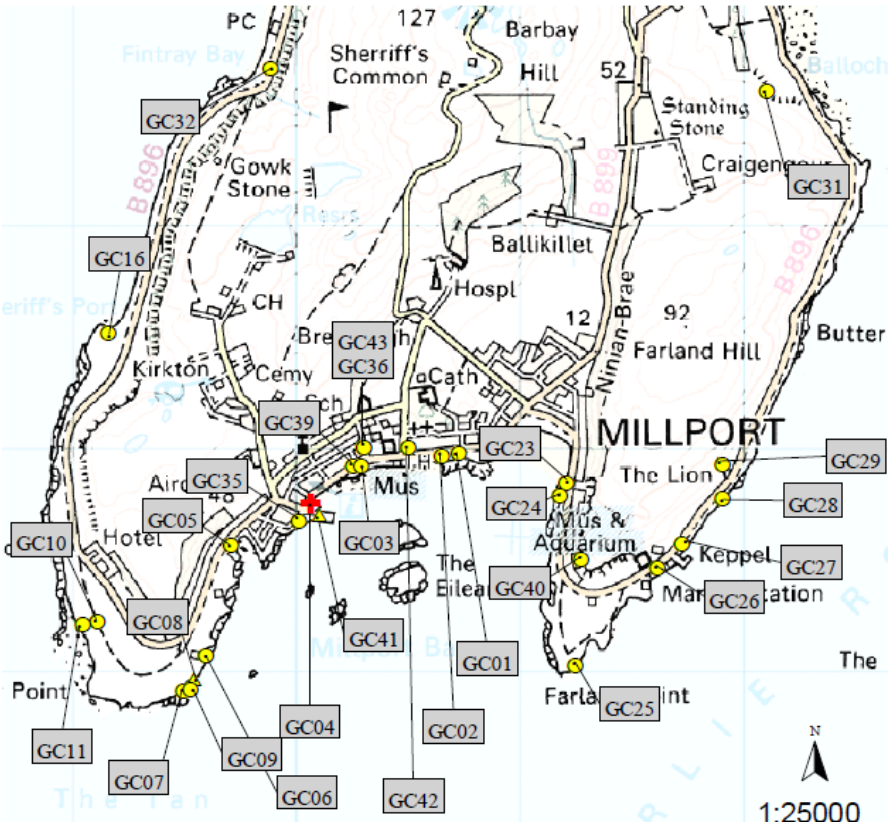

Figure 6.5 Sites identified during the 2003 rapid coastal zone assessment in the southern half of the Isle of Cumbrae (Historic Scotland, 2003)

6.4.2 Identification of key issues

The potential archaeological and cultural heritage impacts anticipated to arise as a result of the proposed scheme are presented in **Table 6.5**.

Table 6.5 Potential archaeological and cultural heritage impacts anticipated to arise as a result of the proposed scheme

Potential impact	Phase	Potential significance	Comments
Direct impacts on known and currently unknown heritage archaeological resources	Construction	Impact unknown or has potential to be significant	Direct impacts to unrecorded archaeological material may occur via the following routes: • excavation works required to construct the proposed scheme (including the offshore elements of the scheme, namely option 1, 2 or 3); • placement of rock for the shore connected structure and revetment; and, • vehicle movements across the foreshore. Direct impacts on unrecorded heritage assets, either present on land, on the seafloor or buried within seabed deposits, may result in damage to or total destruction of archaeological material, or the relationships between that material and the wider environment (stratigraphic context or setting). These relationships can often be crucial to developing a full understanding of an asset and therefore will be assessed further.

Potential impact	Phase	Potential significance	Comments
Indirect impacts on known and unknown heritage resources	Operation	Impact unlikely to be significant and therefore scoped out of assessment	Changes in coastal processes can lead to re-distribution of erosion and accretion patterns. Indirect impacts to heritage assets may occur as a result of changes to the processes acting upon a site, predominantly as a result of construction of either option 1, 2 or 3 and the shore connected structures/breakwaters. Buried heritage assets that become exposed to marine processes, due to increased wave/tidal action for example, will deteriorate faster than those protected by sediment. Conversely, if increased sedimentation results in an exposed site becoming buried (e.g. in the lee of the breakwater), this may be considered a beneficial impact. However, as outlined within **Section 4.1**, all potential effects on coastal processes are proposed to be scoped out of the assessment. Consequently potential impacts to heritage assets due to changes in coastal processes are also proposed to be **scoped out.**
Impacts to setting	Construction and operation	Impact unknown or has potential to be significant	In assessing impacts to the historic environment, it is also necessary to consider the setting of heritage assets defined as 'the surroundings in which an asset is experienced'. Setting includes visual considerations and other environmental factors such as noise, dust and vibration, spatial associations and consideration of the historic relationship between places. Given the number of listed buildings and the Millport Conservation Area in close proximity to the proposed scheme footprint, it is considered that the proposed works (for any option) could have an effect on the setting or the views to and from these heritage assets. Consultation with Historic Environment Scotland has confirmed it unlikely that the proposal would result in significant adverse impacts on the site or setting of historic environment assets and therefore setting impacts to designated assets are scoped out of further assessment, however potential setting impacts to undesignated assets will be considered further.

6.4.3 Potential mitigation measures

The environmental assessment will determine the requirement for the implementation of mitigation measures to reduce the significance of the impact to archaeology and cultural heritage. If it is determined that significant impacts have the potential to arise, it may be necessary to undertake archaeological watching brief during excavations or full archaeological recording and excavation (however this will be fully investigated during the environmental assessment). In additional, if deposits with greater than expected potential for in-situ prehistoric archaeological and palaeoenvironmental remains are encountered then further geoarchaeological assessment may be required.

The methodology for archaeological mitigation will be agreed in consultation with the archaeological adviser to North Ayrshire Council and Historic Scotland, and set out in an archaeological Written Scheme of Investigation (WSI). The WSI will include provision for a protocol for archaeological discoveries in the event that any unexpected archaeological material is identified during the construction works.

Ongoing consultation with North Ayrshire Council will be undertaken to ensure the materials used during the construction phase meet with approval so that the appearance of the works reflects the historical character of the area.

6.4.4 Approach to assessment and data gathering

The archaeological significance of the proposed scheme footprint will be assessed through a site-specific desk based assessment. A walkover / site visit will be undertaken as part of the desk-based assessment. Further recommendations, if applicable, will be made as part of the desk-based reporting. This will include consideration of any potential setting effects that the proposed scheme may have on the historic landscape and both designated and undesignated heritage assets (including built heritage) within the vicinity.

Borehole and vibrocore logs from the planned programme of geotechnical site investigation will be reviewed in order to assess the likely presence of sub-surface deposits with archaeological potential. The published geology (**Table 4.6**) indicates that only superficial deposits of sand and gravel (glacial till) are present overlying the bedrock within the footprint of the proposed scheme. This suggests that the potential for in-situ prehistoric archaeological and palaeoenvironmental remains is low although prehistoric material may be present within reworked deposits.

No intrusive archaeological investigation work is envisaged at this stage other than if potentially significant remains are identified in the vibrocore and borehole logs. This requirement would be agreed in consultation with the archaeological adviser to North Ayrshire Council.

With the exception of potential setting effects to known heritage assets during operation, any potential impacts to the archaeological and heritage resource are anticipated to occur during construction only.

The archaeological assessment will be carried out with reference to available standards and guidance, including but not limited to:

- The Assessment and Management of Marine Archaeology in Port and Harbour Development (Cooper, V and Gane, T, 2016);
- Chartered Institute for Archaeologists' Standard and Guidance for Historic Environment Desk-Based Assessments (2014) and Code of Conduct (2014);
- Marine Geophysics Data Acquisition, Processing and Interpretation Guidance Notes (English Heritage and Bates, R., Dix, J. K., Plets, R., 2013);
- Conservation Principles, Policies and Guidance for the Sustainable Management of the Historic Environment (English Heritage, 2008); and,
- JNAPC Code of Practice for Seabed Development (Joint Nautical Archaeology Policy Committee and TCE, 2006).

6.5 Landscape, seascape and visual impact

Seascape, Landscape and Visual Impact Assessment (SLVIA) forms one of the key components of the EIA process to comply with the Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2011, and allows consideration of the proposed development against the relevant planning policies, relating to landscape resource and visual amenity.

The term SLVIA is commonly used to refer to Seascape, Landscape and Visual Impact Assessment. It is used in this assessment but it must be emphasised that the process of LVIA – Landscape and Visual Impact Assessment remains the accepted methodology underpinning the assessment.

The objective of the SLVIA will be to assess the potential landscape and visual effects of the proposed scheme on the following range of landscape and visual receptors.

- Landscape & Seascape Effects: Assessment of the effects on areas of landscape and seascape character including key characteristics, elements, landscape qualities, and the effects on any designated landscapes.
- Visual Effects: Assessment of the effects on the views and visual amenity experienced by residents, tourists / visitors, recreational, and road user receptors.

The SLVIA and cumulative assessment (CSLVIA) will be produced by a chartered landscape architect at Cheviot Landscape Associates Ltd. The objective of this assessment will be to determine the landscape and visual effects of the proposed scheme on the existing landscape resource and visual amenity.

The assessment process will encompass both the construction and operational phases of the proposed scheme and will include design iteration and re-assessment of the residual effects. The process will seek to achieve an acceptable compromise between sustainable design, environmental considerations and achieving an acceptable design in terms of landscape and visual effects.

6.5.1 Existing environment

The study area for the SLVIA will be based on an approximately 3km to 5km radius circle from the boundary of the proposed scheme, along the southern edge of Great Cumbrae.

An inventory of the baseline seascape, landscape and visual receptors to be included in the SLVIA and the cumulative assessment will be developed as part of the assessment process. An outline of this is provided as follows:

Baseline conditions: Landscape receptors

- Landscape Character as defined by the SNH Report – Ayrshire Landscape Assessment 111 (LUC, 1998). Specifically, the proposed scheme falls within the Coastal Fringe with Agriculture Landscape Character Area;
- National Scenic Areas – Kyles of Bute and North Arran – although no landscape or visual effect is predicted at this distance;
- Special Local Landscape Areas within North Ayrshire, including the islands of Great and Little Cumbrae and the Clyde Muirshiel Regional Park;
- North Ayrshire Local Development Plan policies relating to the site; and,
- the Conservation Area of Millport.

Baseline conditions: Visual receptors

- residential receptors & settlements: within approximately 3km to 5km study area;
- road Users: on main transport routes including the A78, B896, B899, as well as selected local roads on Great Cumbrae;
- recreational Routes: including Public Rights of Way (PROW) eg the Ayrshire Coastal Path along the mainland coast near Hunterston, and adopted Core Paths NC4, NC77, NC2 and NC1a. Locally promoted footpaths, cycleways (NCR), riding routes and promoted viewpoints within the study area will also be reviewed;
- outdoor Recreational Destinations: including mapped or promoted features of local landscape interest and organised recreational areas including parks / public open space, golf courses, and playing fields on Great Cumbrae will be included; and,
- outdoor Tourist Destinations: including mapped or promoted destinations of local landscape interest on Great Cumbrae will be included.

Proposed scope of the assessment

The scope of the SLVIA and CSLVIA will encompass an assessment of those receptors listed above, combined with further information emerging from the consultation process, and this formal request for a Scoping Opinion.

In particular, consultees are encouraged to suggest other landscape or visual receptors and viewpoint assessment locations that should be considered in the assessment and to provide further information on other built development which may be included or excluded from the CSLVIA.

Zone of Visual Influence

A preliminary Zone of Visual influence (ZVI) will be produced based on the proposed scheme design. The ZVI of the proposed scheme is largely contained by local buildings, local land cover, hedgerows and mature trees along road sides to the north of Millport, and also the built environment.

The total number of viewpoints illustrated in the SLVIA will be approximately 10 (**see Figure 6.6 and Table 6.6**). Illustrative material to support the visual assessment will include ZVI maps and viewpoint photographs. These will all produced in accordance with industry standard guidance[5]

Table 6.6 Suggested viewpoints

Original Viewpoints	Receptor Type and Comment	Distance
1: Milburn Street	Viewpoint to illustrate site context and view from residential properties, local footpath, children's play area, visitors to West Bay, and the local road network and route NC 74. Viewpoint located within the Millport Conservation Area. Grid Ref: 215714, 654620	0.5km
2: Chricton Street	Viewpoint to illustrate site context and view from residential properties, visitors to the small bay and public footpaths. Viewpoint located within the Millport Conservation Area. Grid Ref: 215848, 654281	On the site
3: Clyde Street (rear view)	Viewpoint to illustrate site context and view from residential properties on Clyde Street. Viewpoint located within the Millport Conservation Area. Grid Ref: 216028, 654700	On the site
4: Millport Pier	Viewpoint from the Millport Pier, to illustrate the view from the pier along the promenade, and the Eileans within Millport Bay, representative of views for visitors / tourists. Viewpoint located within the Millport Conservation Area. Grid Ref: 216147, 654694	On the site
5: Stuart Street	Viewpoint on Stuart Street, to illustrate the view from residential properties along the promenade, tourists / visitors, and the local road network and route NC 77. Viewpoint located within the Millport Conservation Area. Grid Ref: 216052, 654798	On the site

5 Landscape Institute, Photography and photomontage in landscape and visual impact assessment, Advice Note 01/11, 2011

6: Guildford Street	Viewpoint on Guildford Street to illustrate the view from residential properties along the promenade, tourists / visitors, and the local road network and route NC 77. Viewpoint located within the Millport Conservation Area. Grid Ref: 216312, 654960	On the site
7: Glasgow Street	Viewpoint on Glasgow Street to illustrate the view from residential properties along the promenade, tourists / visitors, and the local road network and route NC 2. Viewpoint located within the Millport Conservation Area. Grid Ref: 216823, 655010	On the site
8: Kelburn Street	Viewpoint on Kelburn Street to illustrate the view from residential properties along the promenade, tourists / visitors, and the local road network and route NC 2. Viewpoint located within the Millport Conservation Area. Grid Ref: 217005, 655131	On eastern edge of the site
9: Farland Hill	Receptors are likely to include recreational users for the locally promoted path on a high point at the eastern end of Millport Bay. Grid Ref: 217727, 655554	0.5km
10: Promoted Viewpoint at Glaid Stone, Great Cumbrae	Receptors are likely to include recreational users for the locally promoted path at Glaid Stone, on a high point at the centre of the island, north of Millport Bay. Grid Ref: 216778, 656999	2km
Notes: Distances shown represent the approximate distance from the viewpoint to the site boundary		

Consultees are encouraged to suggest other landscape or visual receptors that should be considered in the SLVIA.

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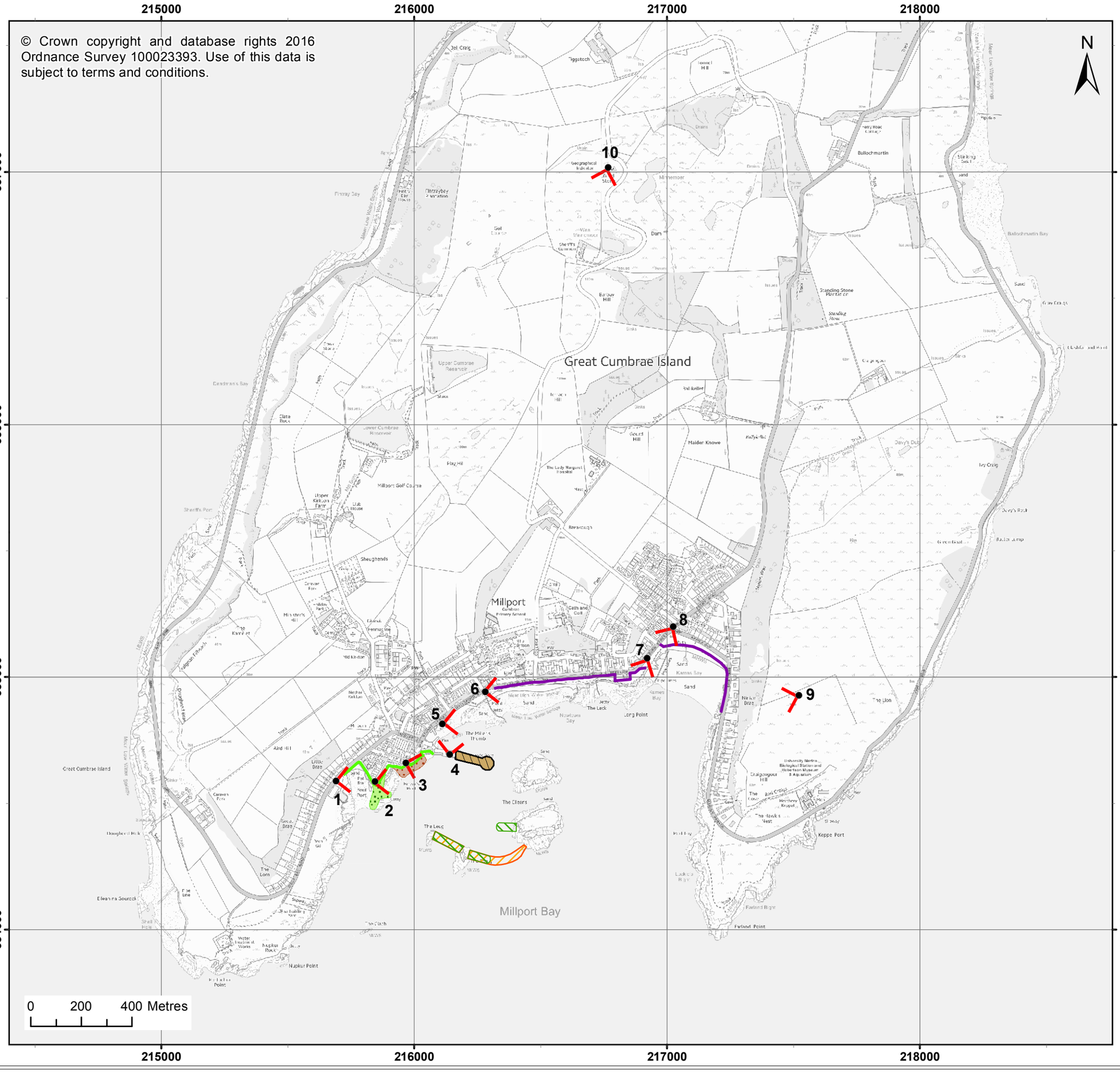

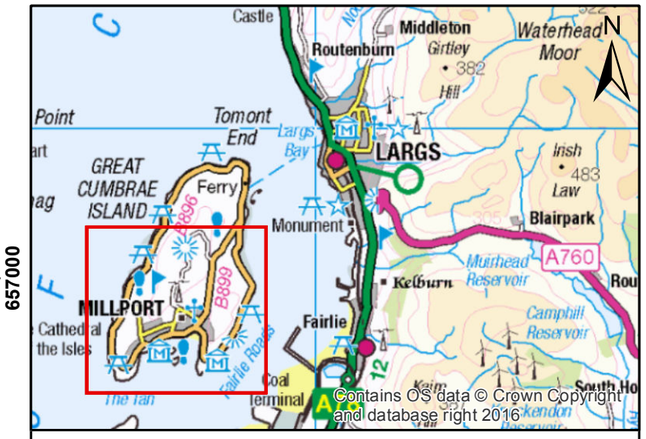

Legend

Proposed Works

- Works to existing coastal defences
- New Flood Wall
- Rock Breakwater
- Rock Revetment
- Harbour breakwater (Offshore works Option 1)
- Potential offshore breakwater (Offshore works Option 2)
- Potential offshore breakwater (Offshore works Option 3)
- 3 — Proposed viewpoints

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Client:	Project:
North Ayrshire Council	Millport Flood Protection Scheme - Environmental Scoping Report

Title: **Proposed Viewpoints**

Figure: 6.6 | Drawing No:

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
3	21/02/2017	TC	AS	A3	1:15,000
2	20/02/2017	TC	JMcM	A3	1:15,000

Co-ordinate system: British National Grid

Royal HaskoningDHV
Enhancing Society Together

ROYAL HASKONINGDHV
Marlborough House
Marlborough Crescent
Newcastle-upon-Tyne, NE1 4EE
+44 (0)191 211 1300
www.royalhaskoningdhv.com

6.5.2 Identification of key issues

Possible impacts along with the potential significance on effect on seascape, landscape and townscape character, and visual receptors, both during the construction period, and on completion of the proposed scheme (including options 1, 2 or 3), are considered in **Table 6.7** below.

Table 6.7 Key issues for seascape, landscape and visual receptors

Potential impact	Phase	Potential significance	Comment
Temporary construction compound (s)	Construction	Impact has potential to be significant, yet temporary and short to medium term landscape and visual effect	To be assessed within the SLVIA
Construction access / vehicle movements	Construction	Impact has potential to be significant, yet temporary and short to medium term landscape and visual effect	To be assessed within the SLVIA
Temporary fencing	Construction	Impact has potential to be significant, yet temporary and short to medium term landscape and visual effect	To be assessed within the SLVIA
Plant location and movement	Construction	Impact has potential to be significant, yet temporary and short to medium term landscape and visual effect	To be assessed within the SLVIA
Storage of materials	Construction	Impact has potential to be significant, yet temporary and short to medium term landscape and visual effect	To be assessed within the SLVIA
Demolition works	Construction	Impact has potential to be significant, yet temporary and short to medium term landscape and visual effect	To be assessed within the SLVIA
Works in the coastal waters at Millport Bay (either pier extension option 1 or offshore breakwaters option 2 and 3) and rock revetment and breakwater on the foreshore	Construction and on completion	Impact has potential to be significant for the duration of the scheme	To be assessed within the SLVIA
New promenade installation	Construction and on completion	Beneficial impact	To be assessed within the SLVIA
New & upgraded sea walls	Construction and on completion	Beneficial impact	To be assessed within the SLVIA

6.5.3 Potential mitigation measures

The construction phase is anticipated to cover a period of between 12 to 18 months. The scheme presents the opportunity to incorporate landscape design related mitigation, which will be considered in detail as the technical design for the scheme progresses.

The design process will involve a combination of environmental design and engineering to provide an appropriate compromise between fulfilling the engineering requirements and achieving acceptable design in terms of landscape and visual issues. As a result, the design will evolve iteratively to ensure that significant landscape mitigation is already 'embedded' within the scheme, prior to the assessment of residual effects.

The final design will evolve to meet, as far as practical, the following design objectives:

- develop ‘an acceptable design’ for this site, that responds to the local landscape character and provides an acceptable design solution in terms of scale, layout, and visual composition;
- achieve a simple, balanced, rational, and coherent image that may be viewed as an acceptable or neutral component of the visual composition;
- minimise seascape, landscape and townscape effects;
- minimise visual effects on views from local residents and communities;
- minimise landscape and visual effects from recreational areas / recreational routes and the local footpath network; and,
- opportunity to enhance and soften engineering solutions through bespoke detailing and landscaping which considers the projects wider context.

Cumulatively (considering the multiple elements of the scheme and other existing and consented medium to large scale development applications) the development should aim to appear proportional to the underlying seascape, landscape and townscape character such that the proportion of undeveloped coastal areas, the associated landscape characteristics remain as the dominant key characteristic.

The final design of the proposed scheme will be assessed against these objectives via the SLVIA / SCLVIA process and the results will be summarised in the Design & Access Statement.

Ongoing consultation will be undertaken with North Ayrshire Council regarding the appearance of the proposed scheme in historic setting with the Millport Conservation Area.

6.5.4 Approach to assessment and data gathering

The Guidelines for Landscape and Visual Impact Assessment (GLVIA[6]) sets out an accepted and well established assessment methodology. The character assessment process for seascapes and coastal landscapes is essentially the same. However, in applying the guidelines, it is important to consider the key qualities and issues that are specific to the marine and coastal environment, for example the conjunction of land, intertidal areas and open seas; the shape and scale of coastline; views from the coast and views from the sea whether on ferries, sailing boats or sea-kayaks. These are the key issues that differ from those usually considered in a landscape and visual assessment; it is not the method of impact assessment itself that differs[7].

- The SLVIA for the proposed scheme will be undertaken in accordance with ‘best practice’ guidance including (but not limited to the following)[8.]
    - Guidelines for Landscape and Visual Impact Assessment, 3rd Edition, Landscape Institute and IEMA (May 2013);
    - Landscape Institute, Photography and photomontage in landscape and visual impact assessment, Advice Note 01/11, 2011.
    - University of Sheffield and Land Use Consultants, Landscape Character Assessment: Guidance for England and Scotland, Countryside Agency and Scottish Natural Heritage publication, produced 2002.
    - Relevant planning policy and guidance at a national and local level.

The cumulative landscape and visual assessment (CSLVIA) will take account of cumulative landscape and visual effects likely to result from other existing, consented and proposed (planning application submitted) large scale built developments within the study area.

6 Guidelines for Landscape and Visual Impact Assessment, 3rd Edition, Landscape Institute and IEMA (May 2013);
[7] Offshore Renewables – guidance on assessing the impact on coastal landscape and seascape – Guidance for Scoping an Environmental Statement (SNH, March 2012), page 10, para 2.3
[8] The list of references shall be amended and expanded upon during the assessment process.

Landscape effects are defined by the Landscape Institute as "*Effects on the landscape as a resource in its own right*"[9]. *These effects can be positive or negative*." Development may have a direct (physical) effect on the landscape as well as an indirect or effect perceived from outside the landscape character area.

Essentially the level of seascape & landscape and visual effect (and whether this is significant) is determined through consideration of the 'sensitivity' of:

- the seascape & landscape element, assemblage of elements, key characteristics or character type or area under consideration bearing in mind quality and value; or,
- visual receptor; and the 'magnitude of change' posed by the proposed development, in this case the extensive construction period and on completion of the flood protection works, and associated infrastructure, and subsequent establishment of landscape planting.

The process involves re-assessment of any remaining, residual significant adverse effects that could not otherwise be mitigated or 'designed out'. Landscape or visual sensitivity is ranked from high, medium, low to negligible and the magnitude of change is similarly ranked from high, medium, low to negligible as indicated in **Table 6.8**. The type of effect is also considered and may be direct or indirect, temporary or permanent, cumulative, and positive, neutral or negative. The landscape and visual assessment unavoidably involves a combination of both quantitative and subjective assessment and wherever possible has sought to gain a consensus of professional opinion through consultation, peer review and the adoption of a systematic, impartial, and professional approach.

In accordance with the EIA Regulations it is essential to determine whether the predicted effects are likely to be 'significant'. Significant landscape and visual effects, in the assessor's opinion, resulting from the scheme would be all those effects that normally result in a 'substantial' or a 'moderate / substantial' effect with any exceptions being clearly explained (refer to **Table 6.8**). There may for example be exceptions in the case of lower magnitudes of change affecting receptors of higher landscape and or visual sensitivity and leading to a moderate effect that in some circumstances are considered to be significant.

A full description of the methodology to be used in this assessment can be provided at this stage, if required.

Table 6.8 Evaluation of Landscape and Visual Effects

	Landscape and Visual Sensitivity			
Magnitude of Change	**High**	**Medium**	**Low**	**Negligible**
High	Substantial	Substantial / Moderate	Moderate	Slight
Medium	Substantial / Moderate	Moderate	Slight	Slight / Negligible
Low	Moderate	Slight	Slight / Negligible	Negligible
Negligible	Slight	Slight / Negligible	Negligible	Negligible
Zero	None / No view	None / No view	None / No view	None / No view
Key		Significant		

[9] *GLVIA 3*

Magnitude of Change	Landscape and Visual Sensitivity			
	High	Medium	Low	Negligible
		Not significant		

6.5.5 Cumulative seascape, landscape and visual impact assessment

The cumulative assessment will consider the extent to which the scheme (with its component parts) in combination with other developments, may change landscape character through either incremental effects on characteristic landscape elements, landscape patterns and quality, or by the cumulative addition of new features. The cumulative assessment includes consideration of those developments already built, those consented but not yet built, those for which a detailed planning application has been submitted but not yet determined and those for which an appeal has been lodged. Sites which may be at screening and scoping stages have been excluded on the basis that they may not progress to full applications and do not have sufficient detail available (on location and size of development) to allow cumulative effects to be assessed with any degree of certainty.

Cumulative effects are defined as follows:

- Cumulative Landscape Effects: Where more than one development may have an effect on a landscape designation or particular area of landscape character.
- Cumulative Visual Effects: the cumulative or incremental visibility of similar types of development may accumulate and give rise to a combined visual effect with the proposed development adding an increment of change to a pre-defined baseline's presence.

    - *Simultaneous or combined* – where two or more developments may be viewed from a single fixed viewpoint simultaneously, within the viewer's field of view and without requiring them to turn their head. Note: A person's field of view is variable but is approximately 90° when facing in one direction.
    - *Successive or repetitive* – where two or more developments may be viewed from a single viewpoint successively as the viewer turns their head or swivels through 360 °.
    - *Sequential* – where a number of developments may be viewed sequentially or repeatedly from a range of locations when travelling along a route.

The cumulative development of medium to large scale developments / buildings within a particular area may build up to create different types of cumulative effect, as follows:

- The developments are seen as separate isolated features within the landscape character type, too infrequent and of insufficient significance to be perceived as a characteristic of the area
- The developments are seen as a key characteristic of the landscape, but not of sufficient dominance to be a defining characteristic of the area
- The developments appear as a dominant characteristic of the area, where medium to large scale buildings, seems to define the landscape character type.
- The level and significance of cumulative landscape or visual effects is determined in the same manner as effects in the main SLVIA, i.e. through combination of sensitivity and magnitude of change.

Further relevant guidance documents to the SLVIA include:

- SNH Draft Coastal Character Assessment Guidance Consultation (Carol Anderson Associates for SNH) February 2016.
- Offshore Renewables – guidance on assessing the impact on coastal landscape and seascape – guidance on scoping an Environmental Statement (SNH) March 2012;
- Scott, K.E., Anderson, C., Dunsford, H., Benson, J.F. and MacFarlane, R. (2005). An assessment of the sensitivity and capacity of the Scottish seascape in relation to offshore windfarms. Scottish Natural Heritage Commissioned Report No.103 (ROAME No. F03AA06) – for baseline information on coastal character types;
- JNCC Coasts and seas of the United Kingdom, Region 14 South-west Scotland: Ballantrae to Mull (1997);
- Grant, A. for the Firth of Clyde Forum (2013) Landscape/Seascape Assessment of the Firth of Clyde. http://clydeforum.com/index.php/projects/seascape-landscape-assessment; and
- The siting and design of aquaculture in the landscape; visual and landscape considerations (SNH) November 2011.

6.6 Infrastructure and other users

6.6.1 Existing environment

Existing services

Millport is occupied predominantly by residential properties, with occasional commercial premises servicing the needs of the local community. It is considered highly likely that the road and footpath network within Millport is underlain by a range of services and utilities, including telecoms, electricity, telecommunications cables and sewage pipework. Overhead power lines are present along the route of the existing footpath adjacent to the Glasgow Street. There is also potential for cables and pipework to be present within the coastal waters off Millport.

Unexploded ordnance

A review of the unexploded bomb risk map produced by Zetica for the North Scotland region has been undertaken to determine the potential for unexploded ordnance (UX) within the area. The proposed scheme footprint (including the scheme options) has been assigned a category of low risk for UXO. In addition, no World War II targets are identified on the mapping within the vicinity of the Isle of Cumbrae.

Coastal infrastructure

Coastal infrastructure within the immediate vicinity of the proposed scheme footprint (and options) includes the existing low level flood revetments and Millport Pier. In addition, SEPAs bathing water quality profile for the Millport Bay bathing water reports that there are four sewage pumping stations present in Millport as well as two surface water discharge points on the foreshore.

6.6.2 Identification of key issues

The key issues anticipated to arise as a result of the proposed scheme to infrastructure and other users are presented in **Table 6.9**.

Table 6.9 Key issues anticipated to arise to infrastructure and other users

Potential impact	Phase	Potential significance	Comments
Damage to known and unknown buried services	Construction	Impact unknown or has potential to be significant	The proposed scheme has potential to impact upon known and unknown buried services, most likely through excavations required to construct the new set-back floodwalls. There is also potential for the new flood walls and shore connected structure and revetment to impact upon outfall pipes which may be present on the foreshore, or subtidal cables / pipelines during the construction process for any of the options in the coastal waters at Millport (either option 1, 2 or 3).
Encountering UXO during earthworks	Construction	Impact unlikely to be significant and therefore scoped out of assessment	The risk of encountering UXO within the proposed scheme footprint has been classified as low (Zetica, 2016). **It is proposed that the risk of encountering UXO is scoped out of the assessment.**

6.6.3 Potential mitigation measures

The requirement for mitigation measures to be implemented as part of the proposed scheme will be fully addressed within the environmental assessment. Potential mitigation measures could include ensuring contractors are aware of the presence of any underground services, ensuring service drawings are present on site at all times and limiting the construction footprint to reduce the potential for impacts on unknown services. Such mitigation measures are considered likely to effectively manage the potential impacts to infrastructure arising from the proposed scheme.

6.6.1 Approach to assessment and data gathering

It is proposed that this section of the environmental assessment will principally be informed by a desk assessment of potential conflicts between the proposed scheme and the existing infrastructure. Results of the hydrodynamic modelling and results of any intrusive ground investigations will be used to inform the assessment.

6.7 Onshore noise and vibration

6.7.1 Existing environment

Millport is a coastal town on the southern side of the Isle of Cumbrae. The town is predominantly occupied by residential properties, with a limited number of shops, restaurants and tourist accommodation. There are no obvious significant noise sources within the immediate vicinity of the proposed scheme footprint (and the proposed scheme options). Baseline noise monitoring has not been undertaken to date within the study area and there is no existing monitoring data available. However, based on the existing land uses within the study area, existing baseline noise levels are anticipated to be low. In addition, there are no significant sources of ground-borne vibration in the immediate vicinity of the scheme footprint (and scheme options) and vibration levels are expected to be negligible.

6.7.2 Identification of key issues

The potential noise and vibration impacts anticipated to arise are presented in **Table 6.10.**

Table 6.10 Potential noise and vibration impacts anticipated to arise

Potential impact	Phase	Potential significance	Comments
Noise disturbance to residents and overnight tourist visitors	Construction	Impact unknown or has potential to be significant	Elements of the proposed scheme are located immediately adjacent to residential properties (a distance of less than 50m at its closest point). As such, there is potential for noise disturbance to residents as a result of vehicle movements within the site, enabling works and construction of the proposed scheme itself (including the options for works in Millport's coastal waters). In addition, there is potential for traffic related noise disturbance to noise sensitive receptors along the proposed transport route.
Noise disturbance to marine and terrestrial ecological receptors	Construction	Impact unknown or has potential to be significant	The construction phase (including any of the three options within the coastal waters at Millport) has potential to cause disturbance to both marine and terrestrial ecological receptors (e.g. fish, marine mammals, otter and birds).

No significant noise or vibration impacts are likely during the operational phase. Occasional maintenance to the various scheme elements may be required during operation, but the earthworks and traffic movements (and therefore noise and vibration disturbance) associated with this maintenance are not considered to be significant. It is therefore proposed that operational phase noise and vibration impacts are scoped out of the assessment.

6.7.1 Potential mitigation measures

The environmental assessment will determine the requirement for the implementation of mitigation measures to reduce the significance of the impact to noise sensitive receptors. If it is determined that significant impacts have potential to arise, mitigation measures may reduce the significance of the impact to an acceptable level (however this will be fully investigated during the environmental assessment).

To reduce construction noise at unsocial hours, the project design will seek to restrict to daytime working where possible. During the construction phase, potential mitigation measures to reduce the significance of impact from construction related activities could include adherence to the principles of Best Practicable Means (BPM), as defined in BS 5228.

6.7.2 Approach to assessment and data gathering

Construction phase noise affecting existing receptors will be assessed using the guidance and datasets contained in British Standard 5228-1:2009+A1:2014: *Code of practice for noise and vibration control on construction and open sites – Part 1*, and based on experience of noise generated during similar projects. The noise calculations will be undertaken using the calculation methodology within BS5228, taking into account the sound power levels of construction equipment, distance to receptors, screening from barriers or topography, 'on-times' of equipment and ground absorption.

A baseline noise survey is not currently proposed; instead the noise assessment will use the lowest threshold defined in BS5228 to characterise the existing environment to provide a baseline against which to assess the impact of construction noise and vehicles. Annex E of BS5228 specifies a series of noise disturbance limits and, following best practice, the assessment will consider the noise levels associated with the proposed construction methodology and vehicle movements against the lower limit. The lower limit is that which would be specified in the event that measured noise levels at sensitive receptors are below the lower threshold value and it is therefore considered that this represents a conservative approach. The environmental assessment will identify any mitigation measures which will be incorporated into the project design to minimise any adverse effects of construction and traffic noise on the local community.

Potential construction noise effects on ecological receptors will be assessed using the criteria defined in research carried out by Wright *et al.* (2010). This study undertook an investigation to determine the effects upon water birds from impulsive noise and the research identified a range of sound levels (L_{Aeq} values[10]) which caused a behavioural response.

An assessment of the road traffic noise impact will be undertaken using the standard calculation method contained in Calculation of Road Traffic Noise (CRTN). The results of this accepted standard for calculation can then be considered and used to indicate the level of impact predicted to arise due to the traffic associated with the development.

The road traffic assessment will follow the methodology contained in Highways England's Design Manual for Roads and Bridge (DMRB), Volume 11, Section 3, Part 7, where an initial screening assessment will be undertaken to assess whether there would be any significant changes in traffic volumes or composition as a result of the proposed scheme. Any road links with a predicted increase in traffic volume of 25%, or a decrease of 20%, will be identified. Such changes in traffic volume would correspond to a 1dB(A) change in noise level at the relevant road link.

A change in noise level of less than 1dB(A) in the short term is regarded as imperceptible and, therefore, of negligible significance. If there are no increases greater than 25% or a decrease of 20% or greater, then the guidance indicates that no further assessment needs to be conducted.

Consideration in the assessment will also be given to any changes in vessel movements and associated increase in noise levels.
Operational phase noise impacts are not anticipated, and as such, the assessment of operational noise is to be scoped out of the assessment.

The following scope of work is proposed with regard to noise and vibration:

[10] *The equivalent continuous sound level – the sound level of a notionally steady sound having the same energy as a fluctuating sound over a specified measurement period (T). $L_{Aeq, T}$ is used to describe many types of noise and can be measured directly with an integrating sound level meter.*

- Liaison with the local Environmental Health Department to agree the assessment method and any specific concerns that may exist with regard to noise from the site.
- Construction phase noise and vibration assessment.
- Construction phase road traffic noise assessment – an initial screening exercise will be undertaken to ascertain the change in traffic volume and composition associated with the scheme. Subject to the results of this screening exercise the impact of the change of use will be calculated using computer modelling software to indicate the level of noise impact associated with the changes in traffic flow and composition.

As noted above, we do not currently envisage the need for a baseline noise survey, however we will liaise with the Environmental Health Department at North Ayrshire Council and SNH to confirm that this approach is acceptable.

6.8 Air quality

6.8.1 Existing environment

The Isle of Cumbrae has a limited road network and no industry, with the main activities being undertaken on the island including farming, golf, cycling, water sports and tourism. As such there are limited island-generated sources of air quality impact air pollution.

The proposed scheme (including the scheme options) is not located within a statutory designated Air Quality Management Area (AQMA) and North Ayrshire Council has not declared any AQMAs within their administrative area. North Ayrshire Council undertakes monitoring of nitrogen dioxide (NO_2) using automatic analysers and passive diffusion tubes, however none of the monitoring sites are located on the Isle of Cumbrae; the closest passive diffusion tube to the site is located at Largs, approximately 6km north-east of the proposed scheme footprint (on the Scottish mainland).

Background concentrations of NO_2, particulate matter with an aerodynamic diameter of 10µm or less (PM_{10}) and particulate matter with an aerodynamic diameter of 2.5µm or less ($PM_{2.5}$) have been obtained from the background concentration maps provided by Defra for the 1km x 1km grid squares which cover Millport and the proposed scheme footprint. This information is presented within **Table 6.11**.

Table 6.11 2016 NO_2, PM_{10} and $PM_{2.5}$ concentrations for the 1km by 1km grid square covering the study area (annual means)

Grid square	Background pollutant concentrations (µg/m^3)		
	NO_2	PM_{10}	$PM_{2.5}$
216500, 654500	3.44	9.55	6.23
215500, 654500	3.32	9.55	6.23
216500, 655500	3.48	9.76	6.35

The annual mean background concentrations of NO_2 and PM_{10} concentrations shown in **Table 6.11** are 'well below' (i.e. less than 75% of) their respective Air Quality Objectives of 40µg.m^{-3}, and 'well below' the annual mean $PM_{2.5}$ Objective of 10µg.m^{-3}.

As illustrated on **Figure 1.1**, residential properties are located immediately adjacent to the landside elements of the proposed scheme (within a distance of 50m from the proposed construction works at the closest point). The Kames Bay SSSI is also located approximately 50m from the proposed scheme at its closest point.

6.8.2 Identification of key issues

The potential air quality impacts anticipated to arise as a result of the proposed scheme are presented in **Table 6.12.**

Table 6.12 Potential air quality impacts anticipated to arise as a result of the proposed scheme

Potential impact	Phase	Potential significance	Comments
Emissions to air from HGVs, cars and (non-road mobile machinery)	Construction	Impact unknown or has potential to be significant	The main emissions to air from construction works are likely to be the products of combustion from HGVs, vessels used during the offshore construction works (either option 1, 2 or 3), cars and NRMM, including NO_2, PM_{10} and $PM_{2.5}$.
Fugitive dust emissions to air from earthworks (above MWHS)	Construction	Impact unknown or has potential to be significant	The proposed construction phase has potential to result in fugitive dust emissions to air from earthworks above MWHS, construction activities and construction related transport activities.
Fugitive dust emissions to air from earthworks below MHWS	Construction	Impact unlikely to be significant and therefore scoped out of assessment	It is anticipated that works being undertaken below MHWS (i.e. works associated with options 1, 2 or 3) can be **scoped out** of further assessment due to natural suppression by the sea.

No significant air quality impacts are likely during the operational phase. Occasional maintenance to the various scheme elements may be required during operation, but the earthworks and traffic movements associated with this maintenance is likely to minimal, and therefore operational phase air quality impacts are proposed to be scoped out of the assessment.

6.8.3 Potential mitigation measures

The construction phase assessment will identify the relevant measures required to mitigate dust emissions, generated by construction works above MWHS, and reduce impacts at identified receptor locations.

Mitigation measures, as detailed in the Institute of Air Quality Management construction phase guidance, will be recommended where appropriate. Mitigation measures would be commensurate with the identified risks, and would be within the range of activities reasonably expected by a UK contractor.

6.8.4 Approach to assessment and data gathering

An air quality assessment will be undertaken as part of the environmental assessment. This will consider the impact of construction phase dust emissions generated by works above MHWS on identified receptor locations in the vicinity of the proposed scheme. The assessment will be undertaken in accordance with the latest guidance provided by the Institute of Air Quality Management '*Guidance on the assessment of dust from demolition and construction, 2014*'. The guidance will be used to determine the risk of dust impacts at identified receptor locations within 350m of the construction works, based on the scale of works to be undertaken. Mitigation measures will be recommended, which will be commensurate with the level of risk identified in the assessment.

Scheme-generated traffic has the potential to lead to increases in pollutant concentrations at sensitive human receptor locations, as it is anticipated that all construction materials and rock used during the works will be transported from the mainland to Millport via ferry and trucks. A screening assessment will be undertaken using the criteria provided in the Institute of Air Quality Management and Environmental Protection UK guidance document *'Land Use Planning and Development Control: Planning for Air Quality 2015'*. If the following criteria are exceeded then a detailed air quality assessment is required:

- an increase in vehicle flows of 500 per day or more on a road link; or,
- an increase in Heavy Goods Vehicle (HGV) flows of 100 per day or more on a road link.

It is anticipated that the proposed scheme will not generate sufficient volumes of traffic to require detailed assessment, and therefore a detailed assessment of road traffic emissions will not be undertaken as part of the assessment.

The Kames Bay SSSI is located within 200m of roads that are anticipated to experience increases in traffic flows as a result of the proposals. The Design Manual for Roads and Bridges (DMRB) guidance document 'HA207/07' details criteria above which an assessment of potential impacts on designated ecological sites should be undertaken. The criteria are as follows:

- Daily traffic flows will change by 1,000 AADT or more; and,
- HGV movements will change by 200 AADT or more.

It is not anticipated that the scheme will generate sufficient traffic to breach the above DMRB criteria. Assessment of air quality impacts on designated ecological sites will therefore not be undertaken.

Due to the minimal earthworks and traffic movements anticipated during the operational phase, it is proposed that operational phase air quality assessment is scoped out of the assessment.

7 The Environmental Report / Environmental Statement

A summary of the scoping process is presented in **Table 7.1**. The scoping process has identified that the proposed scheme has potential to generate a number of environmental impacts, the majority of which are anticipated to be insignificant and manageable through the adoption of standard best practice and guidance. There are, however, a limited number of environmental impacts which could be of greater significance, particularly those associated with the proposed works in the coastal waters at Millport Bay (either option 1, 2 or 3).

Given the potential for (albeit a limited amount) of relatively significant environmental impacts, it is considered that the proposed scheme could be considered as EIA development, in which case an ES will be produced. It is determined that the scheme does not comprise EIA development, the findings of the environmental assessment would be presented in an ER. The ER would assess the potential impacts to the same rigorous and robust standard as an EIA, however would target the approach on key areas of concern (predominantly tourism and recreation, landscape seascape and visual assessment, construction noise and transport, impacts on European protected species) to ensure the project team, regulators and stakeholders fully understand the potential impacts posed by the proposed scheme, and can concentrate on mitigating these through project design to an acceptable level.

Table 7.1 Summary of the scoping process

Potential impact	Likelihood of impact	Approach to impact assessment
Coastal processes		
Potential temporary increase in suspended sediment concentrations due to construction activities	Impacts unlikely to be significant and therefore scoped out of assessment	None
Potential erosion of the beach along the central part of the Bay caused by wave reflection off the new flood wall		
Potential changes to local waves and bedload sediment transport in the Bay due to presence of the breakwater		
Potential changes to local tidal currents in the Bay due to presence of the breakwater		
Potential changes to the flushing / exchange of water due to the presence of offshore breakwater option 3		
Marine water and sediment quality		
Reduced water quality associated with sediment disturbance during construction of works on the foreshore, and works in the coastal waters at Millport Bay (option 1, 2 or 3).	Impacts unlikely to be significant and therefore scoped out of assessment	None
Reduced water quality due to accidental spills or leakages of fuels / construction materials		
Reduced potential for transportation of entrained contaminants into the coastal waters following flood events	Impact unknown or has potential to be significant	Desk based assessment with SEPA and North Ayrshire Council
Reduced flushing / exchange of water in	Impacts unlikely to be significant and	None

Millport Bay (particularly associated with option 3).	therefore scoped out of assessment	
Ground conditions and contamination		
Risks to the health of construction workers due to dermal contact, ingestion and particulate inhalation of any contaminants which may be present within the soils or waters during the construction phase	Impact unknown or has potential to be significant	Phase 2 site investigation and production of an interpretative report, including recovery and analysis of a limited number of soil samples in agreed locations.
Risks to the health of public and residents during the construction phase due to dermal contact, ingestion and particulate inhalation of any contaminants which may be present within the soils or waters		
Risks to controlled waters (the Firth of Clyde) due to groundwater migration during construction and operation.		
Water resources and flood risk		
Pollution or increased sedimentation of surface water channel	Impacts unlikely to be significant and therefore scoped out of assessment	None. The beneficial impact associated with reduced flood risk will be addressed in the tourism and recreation section of the report.
Increased flood risk due to blocked discharge points and back flow along channels		
Reduced flood risk from coastal processes	Beneficial	
Terrestrial and coastal ecology		
Direct and indirect impacts to terrestrial habitat and species (excluding otters and breeding birds)	Impacts unlikely to be significant and therefore scoped out of assessment	None
Direct and indirect impacts to otters	Impact unknown or has potential to be significant	Extended Phase 1 habitat survey will include for otter. Pre-construction walkover survey.
Ornithology		
Disturbance or displacement due to increased human activity and construction works	Impact unknown or has potential to be significant	Desk based assessment. Consideration will be given to undertaking site specific bird surveys, through consultation with SNH.
Change in water quality	Impacts unlikely to be significant and therefore scoped out of assessment	None
Effect on coastal processes leading to changes in intertidal habitats, potentially affecting foraging birds		
Habitat loss	Impact unknown or has potential to be significant	Desk based assessment. Consideration will be given to undertaking site specific bird surveys, through consultation with SNH.
Marine mammals and basking shark		
Disturbance from underwater noise	Impact unknown or has potential to be significant	Additional marine mammal surveys are not proposed, however a desk based

		assessment will be undertaken to inform the assessment. As the project description is developed, ongoing consultation will be undertaken with SNH to agree the approach to assessment.
Reduced water quality	Impacts unlikely to be significant and therefore scoped out of assessment	None
Collision risk with vessels		
Disturbance to seal haul outs	Impact unknown or has potential to be significant	Consultation with SNH during design development.
Fish and shellfish resource		
Reduced water quality due to sediment resuspension	Impacts unlikely to be significant and therefore scoped out of assessment	None
Habitat loss		
Noise and vibration disturbance		
Impacts to populations from designated sites		
Increase in diversity / number of individuals	Beneficial	Desk based assessment
Reduced tidal flushing / exchange of water	Impact unlikely to be significant and therefore scoped out of assessment	None
Benthic ecology		
Physical disturbance of intertidal habitats	Impact unknown or has potential to be significant	Intertidal survey
Reduced water quality from sediment release or pollution event	Impact unlikely to be significant and therefore scoped out of assessment	None
Loss of habitat		
Impacts to designated sites		
Spread of marine non native invasive species	Impact unknown or has potential to be significant	Consultation will be undertaken with SNH to confirm their latest policy regarding the management of this species.
Traffic and transport		
Adverse impacts upon highway safety	Impact unknown or has potential to be significant	Traffic impact assessment, including • baseline traffic demand within the study area (including the Isle of Cumbrae and Largs); • ferry capacity study (including week days, weekends and seasonality); • details of sensitive receptors (such as shops, schools, etc.) within the study area; • collision data within the study area; • optioneering study for how and when material can be delivered to site; • consultation with Caledonian MacBrayne; • an assessment of existing
Capacity on Ferry utilised by daily construction worker		
Capacity on ferry utilised by bulk deliveries of material to site		
Driver delay		
Pedestrian amenity		
Severance		
Abnormal loads		

		pedestrian/cycle/bus routes within the study area; and, • trip generation, including number and type of construction vehicles and staff trips
Tourism and recreation		
Disturbance to tourism and recreational users	Impact unknown or has potential to be significant	Desk based, qualitative assessment
Reduced availability on the ferry due to construction personnel and vehicles		
Noise and dust issues		
Traffic and transport link disruption		
Temporary visual impact of works		
Reduced disruption to recreational activities	Beneficial impact	
Enhanced conditions for water sports		
Reduced water quality	Impact unlikely to be significant and therefore scoped out of assessment	None
Disruption to navigation practices (depending on the option chosen for the offshore works)	Impact unknown or has potential to be significant	Consultation with operators of PS Waverley and the cruise vessel. Review of bathymetric survey data.
Commercial fisheries		
Disturbance to existing fishing activities in Millport Bay or access to fishing grounds	Impact unlikely to be significant and therefore scoped out of assessment	None
Impacts to local fishing resource		
Improvement to landing facilities (applicable to option 1 only)	Beneficial impact	Consultation with fishermen as the design progresses
Disturbance to landing practices (applicable to offshore works option 3 only)	Impact unlikely to be significant and therefore scoped out of assessment	None
Archaeology and heritage		
Direct impacts on known and currently unknown heritage archaeological resources	Impact unknown or has potential to be significant	Desk based assessment, walkover survey, review of borehole and vibrocore logs from geotechnical site investigation, consultation
Indirect impacts on known and unknown heritage resources	Impact unlikely to be significant and therefore scoped out of assessment	None
Impacts to setting	Impact unknown or has potential to be significant	Desk based assessment, walkover survey, review of borehole and vibrocore logs from geotechnical site investigation, consultation
Landscape, seascape and visual		
Temporary compound(s)	Impact has potential to be significant, yet temporary and short to medium term	To be assessed within the SLVIA
Construction access / vehicle movements		

Temporary fencing		
Plant location and movement		
Storage of materials		
Demolition works		
Works in the coastal waters (either option 1, 2 or 3) and rock revetment and breakwater.	Impact unknown or has potential to be significant for the duration of the scheme.	
New promenade installation	Beneficial impact	
New & upgraded sea walls		
Infrastructure and other users		
Damage to known and unknown buried services during excavations or rock placement	Impact unknown or has potential to be significant	Desk based assessment
Encountering UXO during earthworks	Impact unlikely to be significant and therefore scoped out of assessment	None
Onshore noise and vibration		
Noise disturbance to residents and overnight tourist visitors	Impact unknown or has potential to be significant	Assessment of construction and traffic noise will be undertaken, based on current best practice
Noise disturbance to marine and terrestrial ecological receptors	Impact unknown or has potential to be significant	
Air quality		
Emissions to air from HGVs, cars and (non-road mobile machinery)	Impact unknown or has potential to be significant	Air quality assessment following best practice
Fugitive dust emissions to air from earthworks (above MWHS)	Impact unknown or has potential to be significant	
Fugitive dust emissions to air from earthworks below MHWS	Impact unlikely to be significant and therefore scoped out of assessment	None

Broadly, the ER or ES is likely to include the following:

- Project introduction, including a statement of need and a description of the environmental assessment process, including details on screening, scoping, consultation and potential impact assessment.
- Detailed description of the proposed management programme, including the alternative options considered, and the reasons for selecting the preferred option.
- Detailed description of the existing environment for those impacts taken forward to detailed assessment.
- Detailed description of the potential impacts and mitigation measures identified during the assessment process for each of the environmental issues under consideration. This part of the report will cover both the construction and operational phases of the scheme.
- Any requirements for decommissioning will also be considered separately.
- Summary of findings, including a table showing the predicted potential impacts and the potential residual impacts remaining following mitigation
- Proposals for monitoring, if required.
- A list of references of information and publications cited in the report

- Appendices, containing relevant survey information and reports that may be produced during the undertaking of the assessment.
- A non-technical summary

7.1 Environmental Action Plan

An Environmental Action Plan, including proposed timelines, responsible parties and required actions and resources will be included in the report, detailing clear steps to undertake all stated environmental mitigation measures. This will include, as a minimum, standard best practice guidance relevant to the proposed scheme, along with specific steps to minimise potentially significantly adverse impacts to an acceptable level.

The Environmental Action Plan will be a working document which can be updated should additional actions be required at a later stage, for example with the outcomes of pre-construction protected species surveys which might trigger the need for a licence to disturb a European Protected Species.

8 Conclusions

This scoping report has identified that the proposed scheme has potential to result in potentially significant adverse impacts on predominantly the human environment. The works on the foreshore and the offshore options (comprising either the breakwater extension to Millport Pier (option 1) or the offshore breakwaters (option 2 and 3)) have potential to impact upon the physical and biological environment.

As noted in **Section 3**, there are three different options for works in the coastal waters, any of which could be progressed alongside the proposed works on land and on the foreshore. This report has shown that the environmental implications of each offshore option is likely to vary, with offshore option 2 and 3 likely to result in additional environmental impacts in comparison to Option 1.

As the scheme as a whole is not yet fully defined, we will be undertaking further consultation, design and assessment works to identify the preferred overall scheme at Millport. Consent will ultimately be sought to construct a single, preferred scheme only (once this has been identified) (i.e. we will not be seeking consent for all three of the options in the coastal waters at Millport).

The ER / ES will focus on identifying, understanding the magnitude and mitigating the potential adverse impacts the proposed scheme may have on:

- tourism and recreation;
- archaeology and cultural heritage;
- landscape, seascape and visual setting;
- traffic and transport;
- onshore noise;
- ground conditions and contamination;
- disturbance and habitat loss to birds;
- disturbance to marine mammals (underwater noise and seal haul outs);
- disturbance to navigation practices.

In addition, the following topics will also be considered and assessed:

- reduced flow of contaminants following flood events;
- direct and indirect impacts on otters;
- physical disturbance of intertidal ecology;
- spread of marine non-native species;
- disruption to existing pipes and cables services; and,
- air quality.

9 References

Ainslie, J. (1821). Map of the environs of Glasgow, Paisley, Lanark, Sanquhar, Wigton, Kirkcudbright etc. Macredie, Shelly & Co. Edinburgh. 1821.

ASML. 2014. Baseline survey and mapping of intertidal features within selected Scottish SSSIs. Scottish Natural Heritage Commissioned Report No. 754.

Biodiversity Scotland, undated Scottish Biodiversity List

British Geological Survey (2016). Geology of Britain viewer. http://mapapps.bgs.ac.uk/geologyofbritain/home.html

British Standard, (2013) British Standard 42020:2013 – Biodiversity. Code of Practice for planning and development

Brown, K; Cowie, P.R; McCafferty, D,J. (2012) comparison of visual and thermal counts of seals at haulout in SW Scotland. Available at: http://www.masts.ac.uk/media/5098/kirsty_brown.pdf

BSI, (2014a); British Standards Institution [BS] 5228-1:2009+A1:2014 “Code of practice for noise and vibration control on construction and open sites – Part 1: Noise”

BSI, (2014b); British Standards Institution [BS] 5228-2: 2009+A1:2014 “Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration

Carol Anderson Associates (2016) SNH Draft Coastal Character Assessment Guidance Consultation

Chartered Institute for Archaeologists, 2014. Code of conduct

Chartered Institute for Archaeologists, 2014. Standard and guidance for historic environment desk-based assessment

Chartered Institute of Ecology and Environmental Management (2016) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal, 2nd edition. Chartered Institute of Ecology and Environmental Management, Winchester

CIRIA Guidance note C692 Environmental Good Practice on Site Guide (3rd edition)

Clyde Marine Mammal Project (2017), Available at: http://www.clydemarinemammalproject.org/

Davies, J., Baxter, J., Bradley, M., Connor, D., Khan, J., Murray, E., Sanderson, W., Turnbull, C. & Vincent, M., (2001), Marine Monitoring Handbook, 405 pp, ISBN 1 85716 550 0

Defra, (2015). Modelled background pollution data. Available at: https://uk-air.defra.gov.uk/data/pcm-data

English Heritage (2008). Conservation Principles, Policies and Guidance for the Sustainable Management of the Historic Environment

English Heritage (2013). Marine Geophysics Data Acquisition, Processing and Interpretation

Grant, A. for the Firth of Clyde Forum (2013) Landscape/Seascape Assessment of the Firth of Clyde. http://clydeforum.com/index.php/projects/seascape-landscape-assessment; and

Guidelines for Landscape and Visual Impact Assessment, 3rd Edition, Landscape Institute and IEMA (May 2013);

Guidelines for Landscape and Visual Impact Assessment, 3rd Edition, Landscape Institute and IEMA (May 2013);

Hammond P.S., Macleod K., Berggren P., Borchers D.L., Burt L., Cañadas A., Desportes G., Donovan G.P., Gilles A., Gillespie D., Gordon J., Hiby L., Kuklik I., Leaper R., Lehnert K, Leopold M., Lovell P., Øien N., Paxton C.G.M., Ridoux V., Rogano E., Samarraa F., Scheidatg M., Sequeirap M., Siebertg U., Skovq H., Swifta R., Tasker M.L., Teilmann J., Canneyt O.V. and Vázquez J.A. (2013). Cetacean abundance and distribution in European Atlantic shelf waters to inform conservation and management. Biological Conservation 164, 107-122.

Heinänen, S. and Skov, H. (2015). The identification of discrete and persistent areas of relatively high harbour porpoise density in the wider UK marine area, JNCC Report No.544 JNCC, Peterborough.

Heritage Commissioned Report No.103 (ROAME No. F03AA06) – for baseline information on coastal character types;

Highway Agency, (2007). Design Manual for Roads and Bridges.
Highways

Historic Scotland, 2003. Coastal Zone Assessment Survey Firth of Clyde

Hydrographic Office of the Admiralty (1852). Frith of Clyde between Little Cumbrae and Toward Point. 1846.

IAMMWG (2015). Management Units for cetaceans in UK waters (January 2015). JNCC Report No. 547, JNCC Peterborough.

Institute of Air Quality Management, 2014. Guidance on the assessment of dust from demolition and construction

Institute of Air Quality Management, 2015. Land Use Planning and Development Control: Planning for Air Quality 2015'

Institute of Environmental Management and Assessment (1993) -Guidelines for the Environmental Assessment of Road Traffic

JNCC Coasts and seas of the United Kingdom, Region 14 South-west Scotland: Ballantrae to Mull (1997);

Jones, E.L., Morris, C. D., Smout, S. & McConnell, B. J. (2016). Population scaling in 5 km x 5 km grey and harbour seal usage maps. Note commissioned by Marine Scotland under contract MMSS/002/15.

Joint Nature Conservation Committee (2000) seabird nesting counts 2000, Available at: http://www.magic.gov.uk

Joint Nature Conservation Committee (2010) Handbook for Phase 1 Habitat survey – A technique for environmental audit
Joint Nature Conservation Committee (2017) South-East Islay Skerries SAC: http://jncc.defra.gov.uk/ProtectedSites/SACselection/sac.asp?EUcode=UK0030067 [Accessed: February 2017].

Joint Nautical Archaeology Policy Committee, (2006). JNAPC Code of Practice for Seabed Development.

Landscape Institute, Photography and photomontage in landscape and visual impact assessment, Advice Note 01/11, 2011.

Landscape Institute, Photography and photomontage in landscape and visual impact assessment, Advice Note 01/11, 2011

MarineSpace Ltd, ABPmer Ltd, ERM Ltd, Fugro EMU Ltd and Marine Ecological Surveys Ltd (2013) Environmental Effect Pathways between Marine Aggregate Application Areas and Atlantic Herring Potential Spawning Habitat: Regional Cumulative Impact Assessments. Version 1.0.

Mitchell, P.I., Newton, S.F., Ratcliffe, N. & Dunn, T.E. (2004). Seabird Populations of Britain and Ireland. Results of the Seabird 2000 Census (1998-2002). T & AD Poyser, London. ,

National Biodiversity Network (2015). Available at: https://data.nbn.org.uk/

Nedwell, R., & Brooker, A,. (2008). Measurement and assessment of background underwater noise and its comparison with noise from pin pile drilling operations during installation of the SeaGen tidal turbine device, Strangford Lough. Subacoustech Report No. 724R0120 to COWRIE Ltd. ISBN: 978-0-9557501-9-9. Available at: http://www.offshorewindfarms.co.uk/Assets/Final%20report_26%2001%2009.pdf

North Ayrshire Council (2013) Millport Conservation Area Appraisal. Available at: http://www.ayrshirescotland.com/towns/cumbrae.html

North Ayrshire Council (2014) Local Biodiversity Action Plan (LBAP) for North Ayrshire 2014 – 2017. Available at: http://www.gov.scot/seag/seagDocs/SEA-00998/16001.pdf

North Ayrshire Council (2016) Flood Risk Management Plan Screening Report

North Ayrshire Council Local Development Plan (2014) Available at: http://www.north-ayrshire.gov.uk/resident/planning-and-building-standards/local-development-plan.aspx

Ordnance Survey (1869). 1st Edition. 25 inch to one mile 1st Edition Argyll and Bute Sheet CCXVI.14 (Great Cumbray).

Ordnance Survey Map Landranger 63

Parvin, S., Nedwell, J., & Workman, R. (2006) Underwater noise impact modelling in support of the London Array, Greater Gabbard and Thanet Offshore Wind Farms. Subacoustech report No. 710R0517

Paxton, C.G.M., Scott-Hayward, L., Mackenzie, M., Rexstad, E. and Thomas, L. (2016) Revised Phase III Data Analysis of Joint Cetacean Protocol Data Resource JNCC Report No.517.

Perpetuus Tidal Energy Centre Ltd (2014) Perpetuus Tidal Energy Centre Environmental Statement. Available at: https://www.iwight.com/planning/AppDetails3.aspx?frmId=29114

Popper, A,. & Hastings, M. (2009). The effects of anthropogenic sources of sound on fishes. Journal of Fish Biology 75, 455–489
Reid. J.B, Evans. P.G.H and Northridge.S.P (2003) Atlas of Cetacean distribution in north-west European waters. JNCC, Peterborough.

Royal HaskoningDHV (2007). North Ayrshire Coastal Study Farland Head to Skelmorlie.

Royal HaskoningDHV (2015) Millport Flood Risk Assessment Options Appraisal

Scotland River Basin District - Surface Water - map 3 of 22 (Drinking Water Protected Areas)

Scott, K.E., Anderson, C., Dunsford, H., Benson, J.F. and MacFarlane, R. (2005). An assessment of the sensitivity and capacity of the Scottish seascape in relation to offshore windfarms. Scottish Natural

Scottish Government (2008) Planning Advice Note (PAN) 60 (Planning for Natural Heritage)

Scottish Government, (2013) Planning Advice Note 1/2013: Environmental Impact Assessment

Scottish Government, 1999National Planning Policy Guidance (NPPG) 14 Natural Heritage

Scottish Natural Heritage (2002) A Handbook on Environmental Impact Assessment

Scottish Natural Heritage (2011) The siting and design of aquaculture in the landscape; visual and landscape considerations

Scottish Natural Heritage (2012) Offshore Renewables – guidance on assessing the impact on coastal landscape and seascape – Guidance for Scoping an Environmental Statement

Scottish Natural Heritage website: guidance on otter surveys (undated) http://www.snh.gov.uk/protecting-scotlands-nature/species-licensing/mammal-licensing/otters/surveys-research/

Scottish Natural Heritage website: guidance on protected species (http://www.snh.gov.uk/protecting-scotlands-nature/protected-species/protected-species-az/));

Scottish Natural Heritage (2017) Harbour porpoise candidate SAC: http://www.snh.gov.uk/protecting-scotlands-nature/protected-areas/2016-harbour-porpoise-consultation/ [Accessed: February 2017].

SCOS (2015). Scientific Advice on Matters Related to the Management of Seal Populations. Available at: http://www.smru.st-andrews.ac.uk/documents/scos/SCOS_2015.pdf

SEPA (2014). RBMP Water body information sheet for water body 200026 in Clyde

SEPA (2015) interactive flood map. Available at: http://map.sepa.org.uk/floodmap/map.htm

SEPA (2015) water quality data from Millport Bay bathing water during 2015. Available at: http://apps.sepa.org.uk/BathingWaters/ViewResults.aspx?id=124651

Transport Scotland (2014) Vessel Replacement and Deployment Plan Annual Report 2014. Available at http://www.transport.gov.scot/system/files/uploaded_content/documents/tsc_basic_pages/Water/VRDP%20Annual%20Report%202014%20-%20final%20-%202%20October%202015.pdf

University of Sheffield and Land Use Consultants, Landscape Character Assessment: Guidance for England and Scotland, Countryside Agency and Scottish Natural Heritage publication, produced 2002

URS (2014). Millport Pier, Cumbrae Ground Investigation/Options Report, ref 47070921/GIR, October 2014.

Wright, MD; Goodman, P; and Cameron, TC. (2010) Exploring behavioural responses of shorebirds to impulsive noise. Journal: Wildfowl (2010) 60:pp 150 -167. Wildfowl and Wetlands Trust.

Zetica, 2016. Regional unexploded bomb risk. North Scotland.

Appendix 1.1 Scotland's Planning Policy

Scottish National Planning Framework 3 (http://www.gov.scot/Publications/2014/06/3539)
The NPF states '*Flooding is a natural process which cannot be prevented entirely, but it can be managed to reduce its social and economic consequences and to safeguard the continued functioning of services and infrastructure. Some locations are already susceptible to intermittent flooding and climate change is expected to worsen the situation. Inadequate drainage infrastructure also increases the risk of flooding. Planning authorities must take the probability of flooding from all sources – (coastal, fluvial (water course), pluvial (surface water), groundwater, sewers and blocked culverts) and the risks involved into account when preparing development plans and determining planning applications*'.

Scottish Planning Policy (http://www.gov.scot/Publications/2014/06/5823)
The SPP states *'A development which requires additional flood alleviation or prevention measures to address flood risk from any source, is likely to be acceptable only outside or adjoining the boundary of 'medium to high' risk areas. Alleviation measures may include land raising and underbuilding. Elevating buildings on structures such as stilts is unlikely to be acceptable for watercourse or coastal flood risk. Flood prevention measures include walls, embankments, new channels and flood storage areas. New development should not lead to demands for flood prevention schemes. Exceptionally there may be circumstances where a pro-active approach to development opportunities may facilitate the provision of flood prevention measures.*

'The Flood Prevention (Scotland) Act 1961, as amended in 1997, puts limited duties of maintenance of watercourses on to local authorities in certain circumstances. These duties are likely to take precedence over the provisions of a planning permission or agreement and require Councils to assume the ultimate responsibility for maintenance measures approved as part of a planning application.'

Circulars
Circular 1/2015 (The relationship between statutory land use planning system and marine planning and licencing) states the following under 'Coastal defences and flood risk management':

'The marine environment, particularly in those areas close to shore, is a highly dynamic system, and there are relationships between physical works occurring in these areas and flood risk. There are also close links between climate change and flood risk in coastal areas, particularly in relation to sea level rise.

'The Flood Risk Management (Scotland) Act 2009 (FRMA) requires coastal areas at risk of flooding to be identified and objectives and measures to address flood risk to be coordinated across these areas. Ensuring close coordination between physical works occurring in coastal areas and actions to manage flood risk is essential.

'The Scottish Environment Protection Agency's (SEPA) flood maps[11] identify areas at risk of coastal flooding. Areas at significant risk of coastal erosion and flood risk will be identified in Flood Risk Management Strategies prepared by SEPA. Where relevant, specific actions relating to coastal flood risk will be included in the 14 Local Flood Risk Management Plans which are prepared by local authorities.

'The Town and Country Planning (Development Planning) (Scotland) Regulations 2008 (as amended) require that when preparing strategic development plans and local development plans, planning authorities must have regard to any approved flood risk management strategy or finalised local flood risk management plan relating to the strategic development plan and local development plan area.

[11] *SEPA's flood risk map identifies Millport to be at high risk of coastal flooding*

'Under Section 60 of the FRMA flood protection schemes do not require separate planning permission. Section 57 of the Town and Country Planning (Scotland) Act 1997 (as amended by Section 65 of the FRMA) allows for deemed planning permission to be granted by Scottish Ministers on confirmation of a scheme.

'Under the provisions of the Coast Protection Act 1949, local authorities have discretionary powers to carry out such coast protection work as may appear to them to be necessary or expedient for the protection of any land in their area against erosion and encroachment by the sea.

Local Plan
North Ayrshire Council adopted its first Local Development Plan (LDP) on 20 May 2014. It encompasses mainland North Ayrshire, the Cumbraes and the Isle of Arran.

The LDP is an important, land-use document that indicates where certain types of development should and should not happen, providing certainty to investors and communities.

The LDP characterises Millport as a rural area with:

- Town Centre/Retailing
- Housing
- Open Space
- Conservation Area
- Core path

Strategy 5: Environment states '*Development which retains and attracts people to Arran and (the) Cumbrae(s), or builds on their rural economy whilst recognising their outstanding environment, will be encouraged.'*

Appendix 1.2 Formal Screening and Scoping Opinion request letters

HASKONINGDHV UK LTD.
74/2 Commercial Quay
Commercial Street
Leith
Edinburgh
EH6 6LX

+44 131 5550506 **T**
info.edinburgh@uk.rhdhv.com **E**
royalhaskoningdhv.com **W**

MARINE SCOTLAND
Marine Planning & Policy - Licensing Operations Team- Major Projects
Scottish Government
Marine Laboratory
375 Victoria Road
Aberdeen
AB11 9DB

Date:	06 April 2017	Contact name:	Wendy A Johnston
Your reference:		Telephone:	01733 336189
Our reference:	I&BL001	Email:	Wendy.johnston@rhdhv.com

Classification: Open

CC North Ayrshire Planning and Building Standards Department

Enclosures Millport Coastal Flood Prevention Scheme Scoping Report

Request for Scoping Opinion for Millport Coastal Flood Prevention Scheme

Dear Sirs

I am writing on behalf of our client, North Ayrshire Council, to request an EIA Scoping Opinion for the above proposed project.

Further to your letter dated 6th April 2017 advising that a formal screening opinion from Marine Scotland states that an EIA under Annex II 10(k) for the above mentioned proposal is required, we are now seeking a Scoping Opinion under Part 2 of the Marine Works (EIA) Regulations 2007 (as amended) and under Regulation 5 of the Marine Licensing (Pre-application Consultation) Regulations 2013for works below Mean High Water Springs (MHWS) from Marine Scotland.

It is anticipated that North Ayrshire Council will seek to consent the elements of the scheme above Mean Low Water Springs (MLWS) under Section 60 of The Flood Risk Management (Scotland) Act 2009. North Ayrshire Council will seek deemed planning permission under Section 57 of the Town and Country Planning (Scotland) Act 1997 (as amended by Section 65 of the FRMA) to be granted by Scottish Ministers on confirmation of the scheme. North Ayrshire Council's Planning Department has previously advised that an EIA for these elements of the works are not required.

This letter accompanies an Environmental Scoping Report, which details the key environmental issues associated with the proposed scheme and summarises those identified for further investigation and assessment. In line with the EIA Regulations, a site location plan, a description of the

proposed development and possible effects on the environment that have been identified at this time are presented in the Environmental Scoping Report and summarised here.

Need for the Scheme

In 2015, Royal HaskoningDHV, on behalf of North Ayrshire Council completed an assessment of coastal flood risk and an appraisal of management options for Millport. These reports concluded that Millport is at risk from coastal flooding due to wave overtopping which occurs during storms originating to the south or south west within the Firth of Clyde. If nothing is done to provide improved protection to Millport's residential and commercial properties and infrastructure located within the flood risk zone, flooding and erosion would cause economic losses in excess of £44 million over the next 100 years.

Proposed Development

At this stage in the process, the preferred scheme design has not been finalised. A single flood protection scheme will comprise works on land, works on the foreshore and one of three options for works in the coastal waters at Millport Bay, any of which could be progressed alongside toe works on land and on the foreshore.

The onshore works include a 610m long flood wall along Glasgow Street, part of the main promenade at Millport. In addition, a 150m harbour breakwater extension would be constructed, using rock armour, plus additional shore-connected rock armour breakwaters on the foreshore to the west of the harbour. Reinforcements would be made to the existing sea walls at the rear of properties to Clyde Street, and a crest wall added to the coastal defences to West Bay Road, Millburn Street, and Crichton Street. The three off-shore options currently being considered include a rock armour breakwater extension at Millport Pier (Option1); and offshore rock armour structures in the vicinity of the rock islets within the Bay (with two possible arrangements which differentiate between Option 2 and Option 3). Full details of the project description are outlined in the Scoping Report.

EIA Assessment Criteria

The Environmental Scoping Report provides full details of the scoping process undertaken. The nature and scale of the proposed development has been assessed against the criteria set out within the Scottish EIA Regulations and related guidance, and it is our view that, when judged in this context and when following standard best practice and guidance for scheme design and construction activities, a statutory EIA would not be required, particularly having regard to the type of development, characteristics of development and the characteristics of the potential impact.

However, in order to comprehensively assess the potential environmental impacts of the proposed development, and identify any necessary mitigation measures during construction and/or operation, we propose to undertake a targeted Environmental Report in order to assess a targeted suite of relevant environmental issues to the same standard and robustness as an EIA. The Environmental Report would focus on the following:

- Tourism and recreation;
- Archaeology and cultural heritage;
- Landscape, seascape and visual setting;
- Traffic and transport; and
- Onshore noise;

In addition, the following topics scoped as having a potential significant effect will also be considered and assessed within the Environmental Report:

- Reduced flow of contaminants following flood events;
- Direct and indirect impacts on otters and breeding birds;
- Disturbance to seals;
- Noise and visual disturbance of fish;
- Physical disturbance of intertidal ecology;
- Spread of marine non-native species;
- Impacts to fishing resource;
- Disruption to existing services; and
- Air quality.

The Scoping Report included sets out our approach to each topic, our proposed approach to data gathering and our proposed approach to data analysis and impact assessment. North Ayrshire Council is committed to consulting on the proposed scheme with regulators, stakeholders and the public, and the proposed stakeholder engagement plan is appended to the Scoping Report.

Conclusion

An EIA is required for the off-shore elements of this proposal. We look forward to receiving a Scoping Opinion based on the information outlined above. If you require anything further at this stage please do not hesitate to contact me at the number/email above. Otherwise we look forward to hearing from you in relation to this Scoping Opinion request within the prescribed timescales.

Yours sincerely

[redacted]

Wendy A Johnston

Principal Environmental Consultant
Environment

HASKONINGDHV UK LTD.
74/2 Commercial Quay
Commercial Street
Leith
Edinburgh
EH6 6LX

+44 131 5550506 **T**
info.edinburgh@uk.rhdhv.com **E**
royalhaskoningdhv.com **W**

NORTH AYRSHIRE COUNCIL PLANNING AND BUILDING STANDARDS DEPARTMENT
North Ayrshire Council
Cunninghame House
Irvine, Scotland
KA12 8EE

Date:	06 April 2017	Contact name:	Wendy Johnston
Your reference:		Telephone:	01733 336189
Our reference:	I&BL001	Email:	Wendy.johnston@rhdhv.com
Classification:	Open		
CC	Marine Scotland Licencing Operations Team		
Enclosures	Millport Coastal Flood Prevention Scheme Scoping Report		

For the Attention of Ross Middleton

Request for Scoping Opinion for Millport Coastal Flood Prevention Scheme

Dear Ross

I am writing on behalf of our client, North Ayrshire Council, to request an EIA Scoping Opinion for the above proposed project.

As you are aware, it is anticipated that North Ayrshire Council will seek to consent the elements of the scheme above Mean Low Water Springs (MLWS) under Section 60 of The Flood Risk Management (Scotland) Act 2009. North Ayrshire Council will seek deemed planning permission under Section 57 of the Town and Country Planning (Scotland) Act 1997 (as amended by Section 65 of the FRMA) to be granted by Scottish Ministers on confirmation of the scheme.

While we consulted you previously and you advised that an EIA for the landward elements of this work would not be required, we also sought screening option under Part 2 of the Marine Works (EIA) Regulations 2007 (as amended) and under Regulation 5 of the Marine Licensing (Pre-application Consultation) Regulations 2013for works below Mean High Water Springs (MHWS) from Marine Scotland. We have been advised by Marine Scotland in a letter dated 6th April 2017 that an EIA under Annex ii 10(k) is required and therefore we are now undertaking seeking a scoping request from Marine Scotland and are consulting you at the same time.

This letter accompanies an Environmental Scoping Report, which details the key environmental issues associated with the proposed scheme and summarises those identified for further investigation and assessment. In line with the EIA Regulations, a site location plan, a description of the proposed development and possible effects on the environment that have been identified at this time are presented in the Environmental Scoping Report and summarised here.

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VAT registration number: 792428892

Need for the Scheme

In 2015, Royal HaskoningDHV, on behalf of North Ayrshire Council completed an assessment of coastal flood risk and an appraisal of management options for Millport. These reports concluded that Millport is at risk from coastal flooding due to wave overtopping which occurs during storms originating to the south or south west within the Firth of Clyde. If nothing is done to provide improved protection to Millport's residential and commercial properties and infrastructure located within the flood risk zone, flooding and erosion would cause economic losses in excess of £44 million over the next 100 years.

Proposed Development

At this stage in the process, the preferred scheme design has not been finalised. A single flood protection scheme will comprise works on land, works on the foreshore and one of three options for works in the coastal waters at Millport Bay, any of which could be progressed alongside toe works on land and on the foreshore.

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EIA Assessment Criteria

The Environmental Scoping Report provides full details of the scoping process undertaken. The nature and scale of the proposed development has been assessed against the criteria set out within the Scottish EIA Regulations and related guidance, and it is our view that, when judged in this context and when following standard best practice and guidance for scheme design and construction activities, a statutory EIA would not be required, particularly having regard to the type of development, characteristics of development and the characteristics of the potential impact.

However, in order to comprehensively assess the potential environmental impacts of the proposed development, and identify any necessary mitigation measures during construction and/or operation, we propose to undertake a targeted Environmental Report in order to assess a targeted suite of relevant environmental issues to the same standard and robustness as an EIA. The Environmental Report would focus on the following:

- Tourism and recreation;
- Archaeology and cultural heritage;
- Landscape, seascape and visual setting;
- Traffic and transport; and
- Onshore noise;

In addition, the following topics scoped as having a potential significant effect will also be considered and assessed within the Environmental Report:

- Reduced flow of contaminants following flood events;
- Direct and indirect impacts on otters and breeding birds;
- Disturbance to seals;
- Noise and visual disturbance of fish;
- Physical disturbance of intertidal ecology;
- Spread of marine non-native species;
- Impacts to fishing resource;
- Disruption to existing services; and
- Air quality.

The Scoping Report included sets out our approach to each topic, our proposed approach to data gathering and our proposed approach to data analysis and impact assessment. North Ayrshire Council is committed to consulting on the proposed scheme with regulators, stakeholders and the public, and the proposed stakeholder engagement plan is appended to the Scoping Report.

Conclusion

An EIA is required for the off-shore element of this proposal. We look forward to receiving a Scoping Opinion based on the information outlined above. If you require anything further at this stage please do not hesitate to contact me at the number/email above. Otherwise we look forward to hearing from you in relation to this Scoping Opinion request within the prescribed timescales.

Yours sincerely

[redacted]

Wendy Johnston

Principal Environmental Consultant
Environment

Appendix 2.1 Stakeholder Engagement Plan

REPORT

Stakeholder Engagement Plan

Millport Flood Protection Scheme

Client: North Ayrshire Council

Reference: WATPB4749R002D01

Revision: 01/Draft

Date: 21 June 2016

Royal HaskoningDHV

Enhancing Society Together

HASKONINGDHV UK LTD.

74/2 Commercial Quay
Commercial Street
Leith
Edinburgh
EH6 6LX
Water
VAT registration number: 792428892

+44 131 5550506 **T**
info.edinburgh@uk.rhdhv.com **E**
royalhaskoningdhv.com **W**

Document title:	Stakeholder Engagement Plan
Document short title:	Millport Stakeholder Engagement Plan
Reference:	WATPB4749R002D01
Revision:	01/Draft
Date:	21 June 2016
Project name:	Millport FPS
Project number:	PB4749
Author(s):	Daniel Smith, Jen McMillan
Drafted by:	Daniel Smith, Jen McMillan
Checked by:	Amy Savage
Date / initials:	21/06/2016
Approved by:	
Date / initials:	

Classification
Project related

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1 Introduction

1.1 General

This document outlines the planned approach to stakeholder engagement for the Millport Flood Protection Scheme (Millport FPS) as part of the design development process. It is intended for internal use by the project team and North Ayrshire Council. The document has three sections as follows:

- The first section outlines the project and consultation requirements;
- The second section outlines how statutory and non-statutory stakeholders will be engaged; and
- The third section outlines how the communities likely to be effected will be consulted and the wider public will be informed.

This stakeholder engagement plan draws upon Royal HaskoningDHV's previous experience of consultation for flood protection schemes, projects in remote or isolated areas, and previous experience of coastal management and harbour projects throughout Scotland. We will also draw on the experience of North Ayrshire Council.

Early engagement with statutory stakeholders to inform our Environmental Scoping report will ensure that their requirements will be included in designs that can then be discussed with non-statutory stakeholders and the community. The North Ayrshire Council's knowledge of Great Cumbrae will be used to identify non-statutory stakeholder groups.

During the community consultation there will be a strong focus on the following engagement tools:

- Newsletters;
- Questionnaires;
- Public Consultation Meetings (2 no. expected);
- One to one meetings with key user groups and landowners as applicable; and
- Promotion of the project and dissemination of information and Frequently Asked Questions (FAQs) through newsletters, social media, and North Ayrshire Council's website.

The aim of the community consultation is to:

- Engage with residents, business, and property owners.
- Provide details of the project, its aims, its benefits and its progress;
- Acquire knowledge of people's views about the area that can be used to develop an appropriate design of the scheme;
- Inform them of the proposed/on-going studies and survey works; and
- Provide a framework for expression of opinions, sharing of information and stakeholder feedback.

1.2 The project

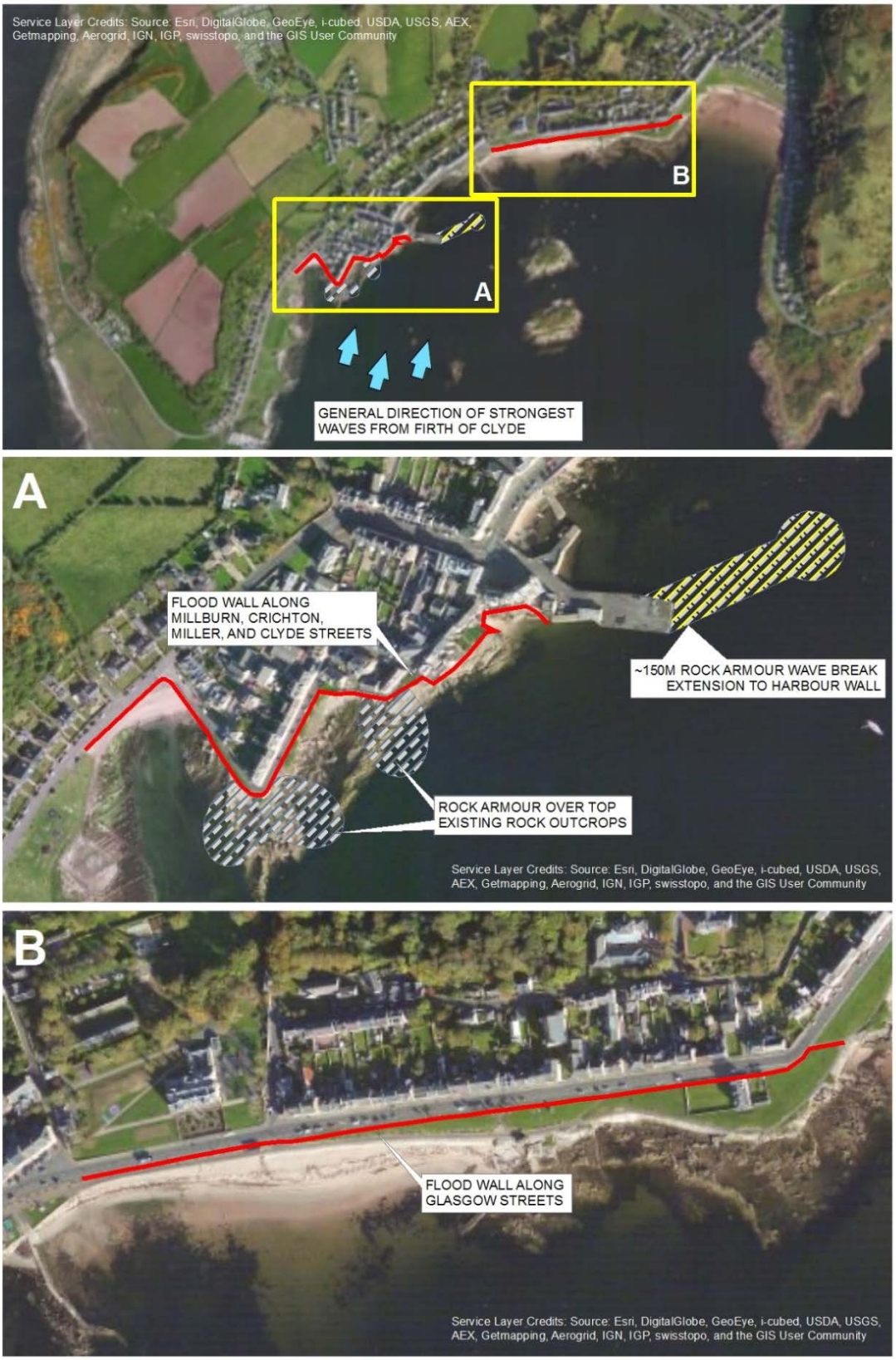

Figure 1: Location of Flood Protection Scheme elements

The purpose of the project is to reduce the risk of flooding to the town of Millport. Previous flood risk assessments and modelling has shown that wave overtopping poses the greatest risk to properties in Millport. Conceptual design and further modelling of various options has shown that reducing the energy of waves entering from the Firth of Clyde will reduce the risk of waves overtopping defences and flooding people's properties. This will be achieved by constructing rock armour at various points. Where this is not possible or does not provide sufficient protection further flood walls will be constructed.

The proposed flood protection scheme is shown in Figure 1 (above), it includes the following elements:

- To reduce wave energy reaching the shore (Figure 1, A):
  - An extension of the existing harbour wall, using rock armour, to a length of approximately 150m;
  - Construction of three rock armour sections to the west of the harbour;
- To protect against overtopping from waves that reach the shore;
  - Construction of a flood wall along Millburn, Crichton, Miller, and Clyde Street, west of the harbour (Figure 1, A); and
  - A flood wall along Glasgow street (Figure 1, B).

1.3 Relevant legislation

The Millport Flood Protection Scheme is subject to the following legislation;

- **The Flood Risk Management (Scotland) Act 2009** was enacted on June 16, 2009. It introduces a more sustainable and modern approach to flood risk management, suited to the needs of the 21st century and to the impact of climate change. It also creates a more joined up and coordinated process to manage flood risk at a national and local level.
- **Town and Country Planning (Scotland) Act 1997** is the principal piece of legislation governing the use and development of land within Scotland and sets out the process of statutory consultation followed in Section 2.
- **Marine (Scotland) Act 2010** provides a framework which helps balance competing demands on Scotland's seas. It introduces a duty to protect and enhance the marine environment and includes measures to help boost economic investment and growth in areas such as marine renewables.
- **The Harbours Act 1964** gives powers to Scottish Ministers to make various types of harbour order, for the purposes of introducing new harbour legislation or amending existing harbour legislation of local application to a specific harbour or group of harbours.

1.4 Requirement for consultation

1.4.1 Statutory Consultation

Under the Town and Country Planning (Scotland) Act 1997 “statutory consultees” are described as “key public sector organisations who must be consulted on all proposals that have a bearing on their particular area of operation.”

In addition to the planning authority of the North Ayrshire Council the organisations that are required to be consulted for the Millport Flood Protection Scheme are as follows:

- Community Councils of Great Cumbrae;
- Marine Scotland;
- Scottish Water;
- Scottish Environment Protection Agency (SEPA);
- Scottish Natural Heritage (SNH); and
- Historic Environment Scotland;

These consultees have been contacted as part of the pre-application process for the planning application. The methodology for this is detailed in Section 2.1.

1.4.2 Non-statutory Consultation

Although not designated by law, in our experience engaging with consultees who are likely to have an interest in a proposed development (non-statutory stakeholders) is beneficial to both the design process and the speed of the planning application. The Local Flood Risk Management Plan Scoping Report and Stakeholder List provided by North Ayrshire Council identifies key non-statutory consultees for engagement throughout the process. Details of the methodology for non-statutory consultation are provided in Section 2.2.

1.4.3 Community consultation and public engagement

The “community” is defined as anybody that is directly affected by the proposed development whereas the “public” is anybody else that may have an interest in the proposed development. The process of community consultation and public engagement is described in Section 3.

Community engagement is a requirement under the Public Participation Directive 2003. Article 3 of the Directive amends the EIA Directive (Directive 85/337/ EEC) and aligns the provisions for public participation with the Aarhus Convention on access to information, public participation in decision-making and access to justice in environmental matters.

Public participation is a statutory requirement of the application stage for a flood protection scheme (and associated consents). Based on our previous experience, open engagement with the public throughout the development of a flood protection scheme and the associated Environmental Impact Assessment (EIA) process, with the aim of increasing the understanding of the project and influencing design decisions, can improve the perception of the project and potentially reduce opposition at the application stage.

The Public Participation Directive requires that the Environmental Statement (ES) for a project be made available in public libraries and a public notice be advertised in the press. The public has 28 days to lodge any opposition/support for the project.

1.4.4 Information provided to the public

In accordance with the Flood Risk Management (Scotland) Act 2009 and the Flood Risk Management (Flood Protection Schemes, Potentially Vulnerable Areas and Local Plan Districts) (Scotland) Regulations 2010, North Ayrshire Council is responsible for promoting a flood protection scheme (FPS) for management of flood risk within its area. Flood protection schemes must be confirmed by the Scottish Ministers. Confirmation of a scheme allows the local authority to proceed with work for the scheme, although other statutory consents may be required.

A flood protection scheme must describe the flood protection operations which are proposed and the land which would be affected by them, by reference to maps and plans. The local authority must advertise the scheme in the locality, and any person may object in writing to Ministers within a three month period from the date of the advertisement. If an objection from any person whose land may be adversely affected by the scheme is not withdrawn, it will be considered at a Public Local Inquiry. After all objections have been withdrawn, or after any local inquiry has reported, the Scottish Government will consider the scheme for confirmation. Ministers may confirm a scheme, with or without modifications, or refuse to confirm a scheme.

1.5 Consultation to date

North Ayrshire Council representatives have held informal discussions within North Ayrshire Council and with members of the public regarding the scheme proposals. Consultation was not undertaken during preparation of the Flood Risk Assessment and Options Appraisal. Consultation with statutory stakeholders has begun as part of the Environmental Scoping process.

2 Stakeholder Engagement Plan

This section sets out the method of engaging statutory and non-statutory stakeholders.

2.1 Statutory consultation

The following statutory stakeholders have been consulted in preparation of the Environmental Scoping Report to inform the Environmental Impact Assessment:

- Scottish Environment Protection Agency (SEPA);
- Marine Scotland - Licensing Operations Team - Major Projects;
- Scottish Natural Heritage;
- Historic Environment Scotland; and
- North Ayrshire Council's Planning Authority.

Statutory stakeholders have been contacted via telephone and email to gauge broad opinion of the flood protection scheme. This will then inform the development of the Environmental Scoping Report which will be submitted to North Ayrshire Council's Planning department.

The Planning department will then issue the scoping report to the other statutory stakeholders and gather their opinion. This will then be provided to Royal HaskoningDHV as one report. Following this we will initiate meetings with the different statutory stakeholders. We will aim to conduct this follow up conversation as one workshop but this will depend on the response we receive to this invitation. The outcomes of these discussions will inform the Environmental Impact Assessment.

2.2 Non-statutory stakeholders

The Local Flood Risk Management Plan Scoping Report and Stakeholder List provided by North Ayrshire Council identifies key non-statutory consultees for engagement throughout the process. These consultees and other identified groups to be considered for the public engagement correspondence and meeting invites will be added to the stakeholder database, which will be maintained throughout the project.

Local councillors and key senior North Ayrshire Council staff will be briefed on the project to ensure public queries can be answered or directed appropriately. Royal HaskoningDHV will draft a briefing note and provide to North Ayrshire Council to review and circulate as appropriate.

A Statement of Community Involvement (SCI) will be produced to outline to the public how they can engage in the project, including how to find out more information and how to provide feedback. This will be distributed at the public consultation meetings (see Section 3.5) and made available on the project website (Section 3.9).

2.3 Stakeholder records

All stakeholder engagement will be recorded in a database which will include the following information:

- **Full list of consultees**, capturing the following data:
    - Stakeholder Group & Organisation;
    - Contact Name;
    - Contact details (telephone, email, address);
    - Interest and comments;

- Responses vs comments; and
- Date.

- **Consultation Undertaken**, capturing the following data:
  - EIA Topic;
  - Name of Consultee;
  - Organisation;
  - Content of Consultation;
  - Contacts; and
  - Date.

- **Scoping Responses**, capturing the following data:
  - Name;
  - Organisation;
  - Consultation type;
  - Date received;
  - Response;
  - EIA topic linked to comment;
  - Action;
  - Status; and
  - Notes.

2.4 Consultation Reporting

Following full consultation, feedback, opinions, and conclusions will be included in the Technical Report for the Millport Flood Protection Scheme (to be submitted to Scottish Government) as well as documents submitted to licensing authorities, and the council. Details of the consultation process and outcomes will also be made available as part of publicly available reports via the North Ayrshire Council website.

3 Community Engagement Plan

3.1 Approach to Community Engagement Planning

Gap analysis to inform community engagement strategy

A gap analysis will be undertaken early in the project by Royal HaskoningDHV with support from North Ayrshire Council. A review of public material will be used to gain an understanding of community groups and organisations, including their expected views and objectives in relation to the proposed scheme. This will then be supplemented with feedback and information gained throughout the consultation process. This will allow the project team, as much as is practicable, to align project objectives with public aspirations. To account for the location of the development the Consultation Zone will focus on the southern end of Great Cumbrae, but information will also be provided to the wider communities of Great Cumbrae and Largs.

Stakeholder analysis using a matrix of influence

This is a method for mapping the key connections, influences and drivers within the user, community and other groups with an interest in the project. A draft matrix format is provided below.

Stakeholder	Geographic proximity	Political influence	Economic role	Social role	Technical skills	Aspirations for the FPS	Concerns about the FPS

Stakeholder Database

Details of all statutory and community stakeholders and records of all engagement will be logged in a consultation database throughout the design development and environmental screening, scoping and assessment process. This will provide an audit trail for all engagement and will support the to allow it to be considered in the design process for the Flood Protection Scheme.

3.2 Consulting team

Royal HaskoningDHV will support North Ayrshire Council in delivery of the Community Engagement Plan. Project manager Amy Savage will lead the community engagement programme with support from the EIA coordinator Jen McMillan, Technical Director Alistair Davison and Project Director Nick Cooper.

Oobe landscape architects will support Royal HaskoningDHV to develop visualisations to inform the public of what Millport might look like once the scheme has been constructed.

North Ayrshire Council's Flood Risk Manager, Patricia Rowley, will provide guidance on key stakeholder groups, the process of disseminating information from the council, and suitable venues for engagement.

3.3 Branding

The primary branding for the communications material will be that of North Ayrshire Council. The Royal HaskoningDHV logo and contact details will also be included on all written communications.

3.4 Community engagement programme

The community engagement programme is shown within the overall project programme, included as Appendix A. The project programme is a live document and will change over the duration of the project. Key milestone dates for community engagement are currently as follows:

- Newsletter 1 – June / July 2016;
- Newsletter 2 and Questionnaire – July / August 2016;
- Public Consultation Meeting 1 – September / October 2016;
- Public Consultation Meeting 2 – February 2017.

3.5 Local events

The first level of public engagement will involve:

- Interviews with local media (Largs and Millport Weekly News, http://www.largsandmillportnews.com/ and regular updates on progress via North Ayrshire Council's website;
- Project briefings to key interest groups (e.g. relevant Council elected members, Millport Community Council and other community groups to be identified); and
- Public consultation meetings.

3.5.1 Newsletters and Questionnaire

The first of six newsletters will be issued in late June or early July 2016. The timing of subsequent newsletters will depend on project progress but it is currently expected that they will be issued every two or three months, as shown in the programme in Appendix A.

A public questionnaire will be developed and issued with the second newsletter (example provided as Appendix B). This questionnaire will be made available throughout the subsequent project development, both as a printed document and digitally, to enable ongoing feedback and public contributions to the design process.

3.5.2 Public Consultation Meetings

Public consultation meetings will be held in the Garrison House in Millport. Key members of the design team, EIA team, landscape architects, and the North Ayrshire Council shall attend. This will ensure the relevant expertise and knowledge is available to respond to all general and specific queries raised by the public.

The second newsletter will provide details of the first Public Consultation Meeting. The date of this meeting is to be confirmed, but is currently expected to be in late September or early October 2016.

Displays of poster boards and graphics will provide general project information and share information collated during the design development and EIA process to date. This will include information from the environmental scoping report (including the initial landscape assessment), outputs from numerical modelling and findings of any other investigations e.g. geotechnical.

An information leaflet, incorporating Frequently Asked Questions (FAQs), and the questionnaire will be made available. An attendance list will be compiled. The questionnaire will allow attendees to identify any information which they would have liked to see that was not available (to inform the second public consultation meeting), as well as details of their name, address, email address and whether they would

like to be included in future mailings. The consultation database will be updated with the responses to the questionnaire, which will feed into design development.

A summary of the work undertaken to date and to be completed for the EIA process will be provided to demonstrate the commitment to developing the Millport FPS with minimal impact on the environment and local community. Attendees will be informed that there will be a further consultation meeting upon completion of the design development and EIA and where to obtain further information in the interim.

A second Public Consultation Meeting will be held following completion of design development and EIA and in advance of the statutory consultation process for the flood protection scheme. This is currently expected to be in Q1 of 2017. This meeting will set out the flood protection scheme proposals and the findings of the associated EIA, and demonstrate how the views of stakeholders have been incorporated into the scheme. The second Public Consultation Meeting might incorporate a site visit, to describe the scheme proposals during a walkover of the project area. The Statement of Community Involvement will be reissued providing information on the statutory consultation process including timescales and how to provide feedback.

3.5.3 Community benefits commitments

Royal HaskoningDHV is pleased to work with North Ayrshire council to deliver additional community benefits as part of the Millport FPS. The community benefits plan for the project is to be finalised but we currently expect this to involve:

- Presentations to or workshops with schools alongside the public consultation events;
- Preparation of a package of material (based on the presentations/workshops) that can be used in the future with other schools; and
- Schools and/or community competition relating to the scheme, e.g. ideas or designs for public art.

3.6 Media management

A press release providing initial information about the project and the consultation plans will be prepared by Royal HaskoningDHV at the earliest opportunity to raise the profile of the project. Royal HaskoningDHV will aim to mirror any North Ayrshire Council press releases using our twitter and facebook pages to amplify the message.

Additional press releases will be prepared for key milestones within the project, including:

- Public consultation meetings;
- Council approval to progress flood protection scheme; and
- Publication of flood protection scheme and associated EIA.

The public consultation meetings will be advertised using local media. Local media representatives will be invited to attend the meetings. Social media may also be used to promote the consultation meetings.

A note for editors will be prepared by Royal HaskoningDHV with support from North Ayrshire Council which can be provided to the media in attendance to encourage correct reporting of the project information.

3.7 Responding to feedback

Feedback will be reviewed at monthly project progress meetings and an action plan will be devised for dealing with the feedback where appropriate, particularly where any queries or issues raised are

potentially controversial. Where a direct response is appropriate it will be discussed and agreed at the progress review meetings who would be best placed to respond. Options for responses include individual letters, minuted conference calls or minuted face to face meetings. North Ayrshire Council and Royal HaskoningDHV will flag any ad hoc feedback in the press, online or via letters and emails. The schedule of FAQs will be updated to reflect general queries which are received.

3.8 Record of consultation

Records of all meetings, telephone conversations, written communications and ad hoc feedback will be held by Royal HaskoningDHV in a database format and updated regularly. The database will be accessible to both North Ayrshire Council and Royal HaskoningDHV via a document sharing website.

The Environmental Assessment will include a chapter outlining all consultation undertaken throughout the EIA phases. A Statement of Community Consultation will also be produced.

3.9 Website

A webpage will be set up within the North Ayrshire Council website to provide an overview of the project and act as a central holding place for key documents which can be shared with the public. We recommend that a short online form is included for completion before documents are downloaded so that the name, organisation (if applicable), reason for interest, and a contact email address can be collated for those who are downloading documents.

Information on the website should complement the wider stakeholder engagement plan and Royal HaskoningDHV will provide advice and information to include on the website. It is assumed that North Ayrshire Council will be responsible for creation and maintenance of the website.

Appendix A

Project Programme

Royal HaskoningDHV

Appendix B

Example Questionnaire

Royal HaskoningDHV

Appendix 4.1 Contaminated Land Desk Study

Royal HaskoningDHV
Enhancing Society Together

Technical Note

HaskoningDHV UK Ltd.
Maritime & Aviation

To: Amy Savage
From: Barnaby Coulson and Paul Howlett
Date: Monday, 02 May 2016
Copy: D. Smith, N. Cooper, G. Shore
Our reference: PB3030-M&AN001D01
Classification: Project Related

Subject: **Millport Flood Protection Scheme, North Ayrshire: Geotechnical and Land Contamination Desk Study**

1.0 Introduction

Millport is the main settlement on the island of Great Cumbrae, which is located in the Firth of Clyde, approximately 2.5km to the west of Largs, on the mainland coast of North Ayrshire. Millport is located at the southern end of the island, within a bay approximately 1.4km in width. Millport town is largely built within a narrow coastal strip, with properties generally located to the landward side of the coastal road.

In July 2015 RHDHV carried out an appraisal of coastal flood risk management options for Millport for North Ayrshire Council (Reference 1). The location of the study area is shown in Figure 1-1 below:

Figure 1-1: Study area for flood risk assessment and options appraisal

The appraisal of coastal flood risk management options for Millport concluded that:

- Millport is at risk from flooding due to overtopping of the existing flood defences. Overtopping occurs due to wave action during storms originating to the south or south west within the Firth of Clyde.
- The relatively steep slope of the coastal frontage means that flood water does not propagate far inland, and water is able to drain away to sea.
- If nothing is done to provide improved protection to 845 residential and commercial properties in Millport, flooding and erosion would cause serious economic damage through the loss of the coastal roads and adjacent residential and commercial properties.
- In economic terms, the flood and erosion damage losses in Millport will exceed £44 million, at current prices, over the next 100 years.

The purpose of this technical note is to review available published information on the geology and ground conditions at the site, to review historical land use, to review the geotechnical and land contamination risks associated with the proposed works and to recommend a scope of ground investigation sufficient to enable design of the proposed works.

2.0 Proposed Works

The Options Appraisal considered eight alternative 'Do Something' options, all of which were assessed as being economically viable, with a positive net present value and a benefit cost ratio greater than 1.0. The preferred scheme on technical and economic grounds was determined to be Option 4b – Harbour Breakwater with Flood Walls and Shore-Connected Breakwaters. This option aims to minimise the wave energy and reduce wave overtopping volumes during a storm event. This option will also reduce wave loading during storms, increasing the residual life of the existing defences.

Table 2-1 below summarises the proposed works for the preferred Option 4b:

Location	Flood protection measures
Glasgow Street (College Street to Craig Street)	Set back flood wall behind public green space, with tie in to coastal defences at south-west end of Kames Bay
Glasgow Street (Guildford Street to College Street)	Set back flood wall along landward side of promenade
Stuart Street	Harbour breakwater, approx. 150m long
Rear of properties on Clyde Street	Improvements to existing flood walls along rear boundaries of properties.
West Bay Road, Millburn Street, Crichton Street	Wave return crest wall. Shore-connected rock breakwaters.

Table 2-1: Option 4b – Harbour breakwater, flood walls and shore-connected breakwaters

The proposed works involved with Option 4b are shown in Figure 2-1 below:

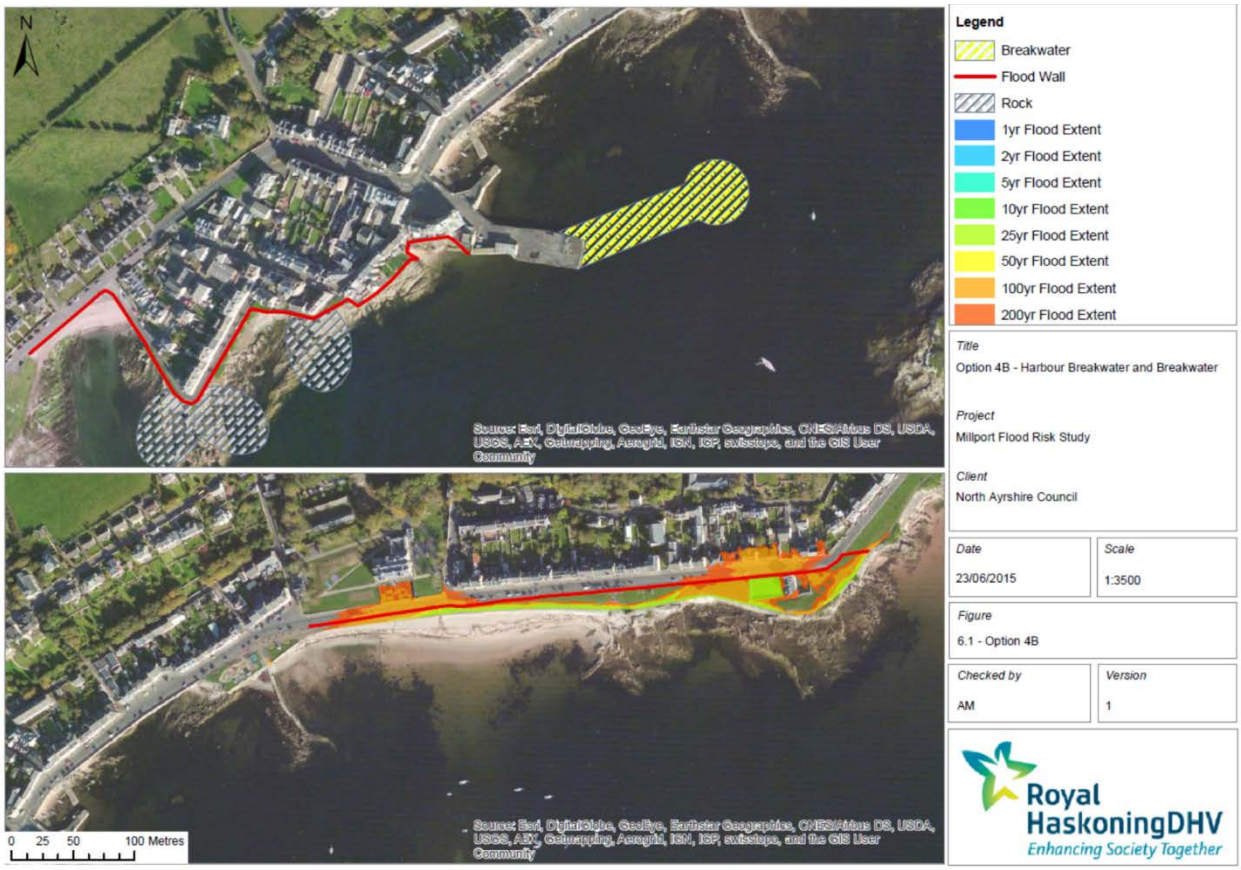

Figure 2-1: Millport Option 4b Harbour breakwater, flood walls and shore-connected breakwaters

3.0 Site Location and Site Description

Millport is the main settlement on the island of Great Cumbrae, which is located in the Firth of Clyde, approximately 2.5km to the west of the mainland coast of North Ayrshire. A ferry service, operated by Caledonian MacBrayne, runs between Largs on the mainland and a ferry terminal located to the north of the island.

Millport is located at the southern end of the island, within a bay approximately 1.4km in width as shown in Figure 3-1 below. Millport town is largely built within a narrow coastal strip, with properties generally located to the landward side of the coastal road (B896).

The western part of the study area comprises predominantly rocky foreshore known as Bessy's Port, but also includes Millport Pier and a small harbour. Millport Pier is a traditionally built timber and masonry pier approximately 100m in length, from where a paddle steamer, the Waverley, provides cruises to the Lochs and Isles of the west coast of Scotland.

The central part of the study area comprises a sandy beach, known as Newtown Bay. Further east there is another area of rocky foreshore known as Long Point, and the eastern end of the study area is a sandy embayment known as Kames Bay.

Approximately 400m offshore of Newtown Bay, there is a group of small uninhabited rocky islands known as "The Eileans". The approximate national grid reference for the centre of the site is NS 16509 54986.

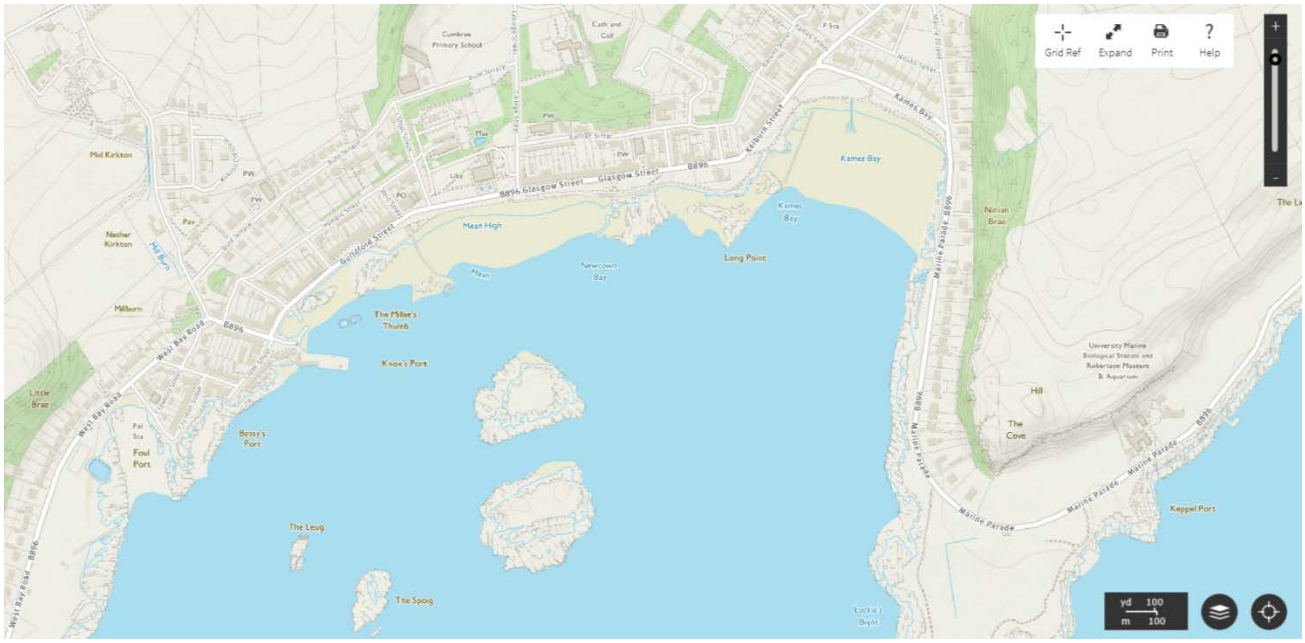

Figure 3-1: Extract from Ordnance Survey Map

4.0 Site History

Ainslie's Map of the Southern Part of Scotland dated 1821 (Reference 2) shows the settlement of Millport on the island of "Big Cambray". A ferry route is shown between Largs on the mainland and a ferry terminal on north east of the island. A road is shown running between the ferry terminal and Millport.

The Admiralty Chart entitled Firth of Clyde Sheet 1 between "Little Cumbrae" and Toward Point dated 1846 (Reference 3) shows Millport Pier and shows a number of buildings on the sea front. The chart shows a watercourse running in a north south direction and discharging into "Kaimes Bay". There is a "Mill" adjacent to the watercourse approximately 100 m to the north of high water at the bay.

The Ordnance Survey 1st Edition 25 inch to the mile map (Argyll and Bute Sheet CCXVI.14 Great Cumbray) surveyed in 1856 and published in 1869 (Reference 4) shows Millport Pier and the adjacent harbour. Further developments shown on the map include the construction of a Garrison on the landward side of Glasgow Street (B896). There is a small smithy recorded at the eastern end of Glasgow Street and a small building marked as "Female School of Industry" on what is now known as George Street. A number of wells are recorded between 50 m and 100 m inland of the high water mark:

- two are recorded adjacent to what is now known as College Street approximately 80 m and 100m north of Glasgow Street,
- four are recorded at the very rear of the gardens of properties on Stuart Street and Guildford Street, immediately next to what is now known as Howard Street; and
- four are recorded in the gardens of properties on Glasgow Street.

An extract from the 1869 map is shown in Figure 4-1 below:

Figure 4-1: Ordnance Survey 25 inch 1st Edition published 1869

The Ordnance Survey 2nd Edition 25 inch to the mile map (Buteshire 216.14) published in 1896 (Reference 5) shows the construction of a number of houses to the east of Kames Bay in an area marked as Newtown. The map also shows landing stages located to the east of Newtown Bay and to west of Kames Bay. Only three of the wells remain. There is a "weighing machine" marked on the seaward side of Stuart Street just to the east of the harbour. One building at the landward end of Millport Pier is identified as a hotel.

The Ordnance Survey 1:25,000 scale map dated 1960 (Reference 6) shows the construction of additional houses along the coastal frontage at the western end of the study area.

Current publicly available mapping and imagery records a small garage on Marine Parade, north of Kames Bay.

5.0 Geology

The British Geological Survey Geology of Britain viewer (Reference 7) indicates that superficial deposits of sand and gravel exist in the western portion of the site at Newtown Bay, and the eastern part of the site at Kames Bay. Some made ground is expected along roadsides and the waterfront. The superficial deposits overlie sedimentary rock strata of Carboniferous age with igneous intrusions of Carboniferous and Palaeogene age. A north-south trending fault is present at the eastern end of Kames Bay, where the headland is formed by outcropping rock strata of Devonian age.

Other significant rock outcrops at the site include Bessy's Port, Long Point and the island group known as "The Eileans". The anticipated stratigraphy at the site in order of superposition is summarised in Table 5-1 below:

The British Geological Survey Geology of Britain viewer (Reference 7) holds no borehole records in the vicinity of Millport.

Age	Name	Description
Pleistocene and Holocene (Quaternary)	Glacial Till	Moraines of till with outwash sand and gravel deposits. Superficial deposits formed up to 2 million years ago.
	Raised Marine Deposits	Sand and gravel. Superficial deposits formed up to 2 million years ago in the Quaternary Period.
	Marine Beach Deposits	Sand and gravel. Superficial deposits formed up to 3 million years ago in the Quaternary Period.
Palaeogene	Mull Dyke-swarm	Microgabbro. Igneous bedrock formed approximately 23 to 66 million years ago in the Palaeogene Period.
Carboniferous	Dinantian Dykes	Microgabbro. Igneous bedrock formed approximately 326 to 359 million years ago in the Carboniferous period, intruding previous Carboniferous and Devonian age deposits.
	Millport Cornstones Member	Sandstone, silty mudstone and cornstone (nodular limestone). Sedimentary bedrock formed approximately 343 to 352 million years ago in the Carboniferous period.
	Ballagan Formation	Mudstone, limestone and calcareous mudstone. Sedimentary bedrock formed approximately 343 to 359 million years ago in the Carboniferous period.
	West Bay Cornstone Member	Sandstone and nodular limestone (cornstone). Sedimentary bedrock formed approximately 352 to 359 million years ago in the Carboniferous period.
Devonian	Kelly Burn Sandstone Formation	Interbedded sandstone and conglomerate. Sedimentary bedrock formed approximately 359 to 385 million years ago in the Devonian period.

Table 5-1: Summary of published geology

6.0 Hydrogeology

It is assumed that groundwater flow in the vicinity of Millport is likely to be dominated by flow from the centre of the island radially towards the coast. Locally the flow is likely to be modified slightly by the presence of dykes and faults. Groundwater levels are likely to be tidally influenced.

Close to the route of the watercourse which emerges from its culvert onto Kames Bay, flow is likely to be into that watercourse. There are records of seepage of brackish water onto Kames Bay (Reference 8) and the presence of relatively fresh water is supported by the number of wells recorded within 100 m of the shore within Millport.

7.0 Mining

A search of the Coal Authority Interactive Map (Reference 9) showed that the site is not close to any zones defined as "*Development High Risk Areas*". However the interactive map showed two abandoned mines located in the north of the island (refer to Figure 7-1 below).

Figure 7-1: The Coal Authority Interactive Map "Abandoned Mines Catalogue"

The historical maps indicate that a quarry located to the east of Kames Bay existed in the mid-19th Century (coinciding with the construction of many of the buildings within Millport). The quarry is not shown on maps after 1869.

8.0 Discussion of Geotechnical Risks

8.1 New Flood walls

It is understood that the new flood walls will generally be low height walls designed to prevent flooding from waves overtopping the existing frontage. The walls will be of reinforced concrete construction and will be located on the landward side of the promenade.

Typically low height flood walls are founded on shallow foundations, but verification of the required geometry of the foundations for the new flood walls will require confirmation of the ground conditions.

Risks associated with the construction and performance of the flood walls at the site include sliding or overturning under wave forces, excessive settlement, excessive seepage / uplift, and difficulties excavating strong igneous or Carboniferous rocks. The geotechnical risks are summarised in Table 8.1 below:

8.2 Breakwater extension to Millport Pier

It is understood that the extension to Millport Pier will comprise a rock breakwater approximately 150m in length, and oriented in a north-westerly direction. The end of the breakwater will have a roundhead construction.

Risks associated with the construction and performance of breakwater extension include instability or excessive settlement of the breakwater. The geotechnical risks are summarised in Table 8.1 below:

8.3 Improvements to existing flood walls

It is understood that the existing flood walls located to the west of the site (Clyde Street, West Bay Road, Milburn Street and Crichton Street) comprise masonry and concrete walls. It is proposed to repair these walls by various methods such as structural encasement, construction of a concrete toe to prevent undermining, and patch repairs. In some areas it may be necessary to raise the crest level of the walls to prevent overtopping.

Risks associated with the repairs and raising of the existing flood walls include risk of instability due to increased imposed loads on the wall. The geotechnical risks are summarised in Table 8.1 below:

8.4 Shore-connected rock breakwaters

This part of the scheme will involve the construction of rock armour shore-connected breakwaters in the areas around West Bay Road, Milburn Street and Crichton Street. The breakwaters will be constructed in the rocky foreshore areas adjacent to the existing flood walls.

Risks associated with the construction of the shore-connected breakwaters include the risk of instability due to construction of the breakwaters directly on to inclined or discontinuous rock outcrops. The geotechnical risks are summarised in Table 8.1 below:

8.5 Geotechnical Risk Register

A geotechnical risk register for the proposed scheme is shown in Table 8-1 below:

	Element		Hazard	Cause	Magnitude of Risk			Mitigation Measures
					L	S	R	
A	New flood walls	1	Sliding or overturning of flood walls due to wave forces	Insufficient resistance due to possible presence of weak surficial soils	3	4	12	Carry out ground investigation to determine the ground conditions. Carry out appropriate design of flood walls.
		2	Excessive settlement of flood walls	Possible presence of weak compressible soils	3	3	9	Carry out ground investigation to determine the ground conditions. Carry out appropriate design of flood walls.
		3	Excessive seepage beneath flood wall or uplift pressures on landward side	Possible presence of highly permeable soils or highly permeable fractured rock.	3	3	9	Carry out ground investigation to determine the ground conditions. Carry out appropriate design of flood walls. Consider need for seepage cut-off.
		4	Inability to excavate foundations for flood walls	Possible presence of strong igneous rock intrusions near the ground surface	4	3	12	Carry out ground investigation to determine the ground conditions. Consider alternative foundation designs in areas of strong igneous rock.
		5	Difficulties excavating foundations for flood walls	High ground water level	3	3	9	Carry out ground investigation to determine the ground water conditions.
B	Breakwater extension to Millport Pier	1	Instability or excessive settlement of breakwater	Possible presence of weak compressible soils. Possible presence of inclined or discontinuous or weathered rock outcrops present at bed level	3	4	12	Carry out ground investigation to determine the ground conditions. Carry out appropriate design of breakwater.
C	Improvements to existing flood walls	1	Instability of existing walls	Additional loading on walls	4	3	12	Carry out ground/structural investigation to determine the ground conditions and wall/ foundation construction. Carry out appropriate design of modifications to existing flood walls.
D	Shore-connected breakwaters	1	Instability of shore-connected breakwaters	Difficulties “keying in” the breakwaters to the existing rock outcrops	3	3	9	Carry out inspection by geotechnical engineer at low tide, followed by ground investigation if necessary.

Risk matrix key							
Likelihood of Risk				Severity of Risk		Magnitude of Risk = Likelihood x Severity	
0	Very Unlikely		0	Negligible effect		0 to 4	No action required.
1	Unlikely		1	Very little effect		5 to 8	Consider reducing the risk
2	Possible		2	Little effect		9 to 11	Reduce the risk where possible. Where the risk cannot be reduced, identify contingency measures.
3	Likely		3	Large effect		12 to 19	Measures must be taken to reduce the risk. Construction should not proceed until the risk is reduced. Construction work should not proceed until the risk is reduced.
4	Very likely		4	Major effect		20 to 25	Measures must be taken to reduce the risk. If the risk is due to construction activities and cannot be reduced, the project should not proceed.
5	Extremely likely		5	Catastrophic effect			

Table 8-1: Geotechnical risk register

9.0 Discussion of Land Contamination Risks

For contamination within soil or water to pose a risk, a pollutant linkage must be established. A pollutant linkage consists of three parts:

- A source of contamination in or on the land;
- A pathway by which the contaminant is able to cause harm (or which presents a significant possibility of such harm being caused); and
- A receptor which is sensitive to impact from the contamination.

Where all three of these are present, a pollutant linkage exists. Current guidance recommends that a Conceptual Site Model (CSM) is formulated based on the information available. As more information becomes available the conceptual model may be updated. The CSM is limited at this stage to the identification and assessment of potential sources, potential receptors, and the anticipated pathways to those receptors identified from documentary evidence.

9.1 Sources

Following review of the publicly available historic mapping, no potentially contaminative land uses have been identified within the footprint of the proposed works. Only three potentially contaminative land uses have been identified in the vicinity of Millport:

- The 'Mill' adjacent to the watercourse approximately 100 m to the north of high water at the Kames Bay.
- The garage on Marine Parade, north of Kames Bay.
- Backfilling of the quarry to the east of Kames Bay.

These three potential contaminative land uses are distant from the proposed works.

Potential sources which may be present within the footprint of the development are fuel storage associated with the harbour facilities and asbestos from demolition material incorporated into made ground. There is also the potential for contamination of the marine sediment within the footprint of the breakwater.

9.2 Pathways

The following potential pathways have been considered:

- **Dermal Contact, Ingestion, Particulate Inhalation** – Some excavation for foundations may be required and this may expose hitherto deeper soils in an area of high public traffic.
- **Direct Contact with Structures and Services** - The proposed works may have shallow foundations which could suffer from sulphate attack if exposed to soil or groundwater with high concentrations of sulphate. The integrity of buried services such as water supply and sewerage may also be threatened by direct contact with organic or other contaminants.
- **Gas Migration** - Ground gases and vapours may migrate by direct diffusion through the permeable Marine Beach Deposits and underlying bedrock. However the proposed development is unlikely to include an impermeable surfacing which could restrict upward diffusion and the foundations for the works are unlikely to be deep enough to influence the gas migration. This pathway has not been considered further.

- **Groundwater Movement –** Dissolved phase contaminants could flow directly into the waters of the Firth of Clyde via advective groundwater transport through permeable made ground, Marine Beach Deposits or carboniferous strata. Free phase contaminants could also migrate though permeable ground. Groundwater movement is likely to be restricted within the dykes present.

9.3 Receptors

Based on the proposed works, it is considered that the likely receptors will be:

- Public using the amenity areas and residents of private dwellings;
- Construction workers involved in the works;
- Foundations of the works and services which cross the works; and
- The Firth of Clyde.

It is assumed that any remaining wells are no longer used for abstraction.

9.4 Qualitative Risk Assessment

In order to assess the risk posed by the various source, pathway and receptor linkages that may exist, a qualitative assessment of the Preliminary CSM has been undertaken in general accordance with the methodology set out in current guidance (CIRIA, 2001).

The process involves the classification of the following:

- Magnitude of the potential consequence which takes into account both the potential severity of the hazard and the sensitivity of the receptor; and
- The probability (likelihood) of the potential consequence occurring which takes into account both the presence of the hazard and the receptor and the integrity of the pathway.

Once the consequence (severity) and probability (likelihood) have been classified, these can then be compared to produce a risk category ranging from ‘very high risk’ to ‘very low risk’ (see Table 9-1, below).

		Consequence			
		Severe	Medium	Mild	Minor
Probability	High likelihood	**Very High Risk**	**High Risk**	**Moderate Risk**	Moderate / Low Risk
	Likely	**High Risk**	**Moderate Risk**	Moderate / Low Risk	Low Risk
	Low likelihood	**Moderate Risk**	Moderate / Low Risk	Low Risk	Very Low Risk
	Unlikely	Moderate / Low Risk	Low Risk	Very Low Risk	Very Low Risk

Table 9-1: Contamination Risk Categories

A description of these risk categories is presented in Table 9-2 below.

Risk rating	Description
Very High Risk	There is a high probability that severe harm could arise to a designated receptor from an identified hazard or there is evidence that severe harm to a designated receptor is currently happening. The risk, if realised is likely to result in a substantial liability. Urgent investigation (if not undertaken already) and remediation are likely to be required
High Risk	Harm is likely to arise to a designated receptor from an identified hazard. Realisation of the risk is likely to present a substantial liability. Urgent investigation (if not undertaken already) is required and remedial works may be necessary in the short term and are likely over the longer term
Moderate Risk	It is possible that, harm could arise to a designated receptor from an identified hazard. However it is either relatively unlikely that any such harm would be severe, or if any harm were to occur, it is more likely that the harm would be relatively mild. Investigation (if not already undertaken) is normally required to clarify the risk and to determine the potential liability. Some remedial works may be required in the longer term
Low Risk	It is possible that harm could arise to a designated receptor from an identified hazard but it is likely that at worst this harm if realised would at worst normally be mild
Very Low Risk	There is a low probability that harm could arise to a receptor, in the event of such being realised it is not likely to be severe

Table 9-2: Contamination Risk Rating Terminology

Using the information in the sections above, a preliminary pollution linkage assessment has been made. The assessment is presented in Table 9-3, below.

Source	Pathway	Receptor	Consequence of risk being realised (severity)	Probability of risk being realised (likelihood)	Description of Pollution Linkage	Risk
Contaminants within the shallow strata or made ground, contaminants within marine sediments	Dermal Contact, Ingestion, Particulate Inhalation	Human health (public and residents)	Medium	Unlikely	There is no evidence for the presence of contaminants, or known contaminative land use. However some asbestos or other contamination may be present in made ground.	Low Risk
		Human health (construction workers)	Medium	Unlikely	There is no evidence for the presence of contaminants, or known contaminative land use. Short term risks can be mitigated using appropriate Personal Protective Equipment (PPE) and adopting the approaches of Construction Design and Management (CDM), and Control of Substances Hazardous to Health (COSHH) guidance.	Low Risk
	Direct contact	Structures and services	Mild	Unlikely	There is no evidence for the presence of contaminants, or known contaminative land use.	Very Low Risk
Contaminants within the shallow strata or made ground, contaminants within marine sediments Contaminated groundwater within shallow strata	Dissolved phase and free phase lateral groundwater migration.	The Firth of Clyde	Mild	Unlikely	There is no evidence for the presence of contaminants, or known contaminative land use. Given the proximity and likely emergence of groundwater into the sea, the presence of free phase contaminant would be visually evident. Potential sources of contamination to the north of Kames Bay (garage, mill and infilled quarry) are unlikely to be upgradient of the proposed works	Very Low Risk

Table 9-3 – Preliminary pollution linkage assessment

The risk assessment has been carried out for the proposed development to determine plausible pollutant linkages that require further consideration. On the basis of the information detailed in the preceding section of this report it is concluded that:

- There is no evidence of potentially contaminative land use within the footprint of the development.
- Some contaminant may be present in made ground encountered on during the works.
- Some contaminant may be present in marine sediments within the footprint of the breakwater.
- There is very low risk to the water environment from the proposed works.
- There is low risk to construction workers from short term direct contact, ingestion or inhalation of contaminated soils/sediment (if present), which can be mitigated using appropriate PPE and CDM methodology.
- There is low risk to the health of residents and public who come into direct contact with contaminated soils/sediment (if present).

10.0 Scope of ground investigation

It is considered that a ground investigation is required to mitigate the geotechnical risks associated with the scheme as highlighted in Section 8 of this technical note. Additionally the same ground investigation may be used to confirm the land contamination risk assessment. The required scope of the ground investigation is discussed in Table 10-1 below:

Structure / Element	Discussion of outline scope of ground investigation	Comments
1. New flood walls	Mechanically excavated trial pits, spaced at approximately 50m intervals, should provide sufficient information (assuming low height flood walls founded on shallow foundations).	Analysis of a maximum of two samples from different depths in any made ground encountered for common soil contaminants* and leachability.
2. Breakwater extension to Millport Pier	Overwater boreholes, spaced at approximately 50m intervals would typically be carried out prior to construction of a breakwater. The boreholes, which could be carried out from a floating barge or a jack-up platform, would normally be carried out by cable percussion techniques and extended by rotary core drilling to prove “rockhead”. Analysis of a representative number of samples for common marine contaminants only if there is a requirement to move any marine sediment.	The cost of overwater boreholes is likely to be relatively high. Possible alternative techniques include marine bathymetric / geophysical surveying augmented by trial pits or jet probing carried out from a barge. However these alternative techniques may provide less reliable information on the ground conditions. It is likely that any removed sediment would need to be analysed for waste characterisation purposes before disposal in any case.
3. Improvements to existing flood walls	Trial pits should provide sufficient information on the ground conditions (assuming only minor raising of the walls). The trial pits should also aim to prove the dimensions of the foundations of the existing walls. Analysis of a maximum of two samples from different depths in any made ground encountered for common soil contaminants* and leachability.	Additional structural investigation such as coring of the walls may be required.

Structure / Element	Discussion of outline scope of ground investigation	Comments
4. Shore-connected breakwaters	Inspection of the locations of the shore-connected breakwaters should be carried out (at low tide) by a geotechnical engineer.	Possible investigation techniques (if required) may include trial pitting using land based excavation plant.

* Metals, TPH, PAH, cyanides, asbestos (presence/absence). Full waste characterisation if off-site disposal is required.

Table 10-1: Discussion of scope of ground investigation

11.0 Summary and Conclusions

This technical note provides a review of available published information on the geology, ground conditions and historical land use at the Millport Flood Protection Scheme site. The note also highlights geotechnical and land contamination risks potentially associated with the proposed works.

The geological maps indicate that superficial deposits of sand and gravel (where present) overlie sedimentary rock strata (sandstone, mudstone and limestone) of Carboniferous age with igneous intrusions (dykes) of Carboniferous and Palaeogene age (including microgabbro and dolerite).

The principal geotechnical risks associated with the proposed development include the risk of instability of the flood walls due to the possible presence of weak soils and the risk of instability of the breakwater extension due to the possible presence of weak soils or inclined or discontinuous rock outcrops at bed level. An additional geotechnical risk is the possibility that the near surface igneous rock strata are too competent to be excavated (where required) by normal mechanical methods.

The assessment of risk associated with land contamination is low, due to there being no evidence of potentially contaminative land uses.

It is recommended that a ground investigation is designed and executed in order to provide sufficient information on the ground conditions at the site to mitigate the geotechnical risks and enable the design of the structures. In addition the risk from land contamination may be confirmed during this ground investigation. The initial recommended scope of ground investigation is as follows:

i) trial pits located along the alignment of the proposed flood walls and existing flood walls (including structural investigation of the existing walls);

ii) environmental analysis of a maximum of two samples from different depths in any made ground encountered during trial pitting.

iii) over-water cable percussion boreholes at the location of the Millport Pier breakwater extension carried out from a floating barge or a jack-up platform;

iv) environmental analysis of a representative number of samples (should there be a requirement to move any marine sediments); and

v) inspection of the foreshore in the area of the proposed shore-connected breakwater at low tide by a geotechnical engineer.

Notes:

- The cost of carrying out over-water cable percussion boreholes is likely to be relatively high. Possible alternative techniques include marine bathymetric / geophysical surveying augmented by trial pits or jet probing carried out from a barge. However the alternative intrusive

investigation techniques may provide less reliable information on the ground conditions than boreholes, and are not generally recommended.

- The ground investigation will also involve in situ testing, sampling, laboratory testing and reporting.

References:

1. Royal HaskoningDHV (2015). Millport Flood Risk Assessment Options Appraisal. Final Report. July 2015.
2. Ainslie, J. (1821). Map of the environs of Glasgow, Paisley, Lanark, Sanquhar, Wigton, Kirkcudbright etc. Macredie, Shelly & Co. Edinburgh. 1821.
3. Hydrographic Office of the Admiralty (1852). Frith of Clyde between Little Cumbrae and Toward Point. 1846.
4. Ordnance Survey (1869). 1st Edition. 25 inch to one mile 1st Edition Argyll and Bute Sheet CCXVI.14 (Great Cumbray).
5. Ordnance Survey (1896). 2nd Edition. 25 inch to the mile map (Buteshire 216.14).
6. Ordnance Survey (1960). 1:25,000 scale map. NS15.
7. British Geological Survey (2016). Geology of Britain viewer. http://mapapps.bgs.ac.uk/geologyofbritain/home.html
8. Smith, R.I. (1955). Salinity Variation in Interstitial Water of Sand at Kames Bay, Millport, with Reference to the Distribution of *Nereis Diversicolor*, J. Mar. Biol. Ass. vol 34, pp 33-46. UK.
9. The Coal Authority (2016). Interactive Map Viewer. http://mapapps2.bgs.ac.uk/coalauthority/home.html