Habitats Regulations Appraisal of National Planning Framework 4 – HRA Record

November 2022

Scottish Government
Riaghaltas na h-Alba

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1 National Planning Framework 4 (NPF4) will be a long-term spatial plan to 2045 that sets out where development and infrastructure will be needed to support sustainable and inclusive growth. It will guide spatial development, set out Scotland's national planning policies, and highlight regional spatial priorities. NPF4 will incorporate Scottish Planning Policy, so that spatial and thematic planning policies will be addressed in one place. It will have the status of development plan for planning purposes. This is a change to the current position and will mean that its policies should inform day to day decision making as decisions in the planning system are made on the basis of the development plan.

2 To support the Spatial Strategy, NPF4 designates as 'National Developments' certain developments or classes of development for which Scottish Ministers have established the need in principle. The National Developments as set out in the revised Draft NPF4 are as follows:

1. Energy Innovation Development on the Islands[1]
2. Pumped Hydro Storage
3. Strategic Renewable Electricity Generation and Transmission Infrastructure
4. Circular Economy Materials Management Facilities
5. Urban Sustainable, Blue and Green Surface Water Management Solutions[2]
6. Urban Mass/Rapid Transit Network
7. Central Scotland Green Network
8. National Walking, Cycling and Wheeling Network
9. Edinburgh Waterfront
10. Dundee Waterfront
11. Stranraer Gateway

[1] This National Development was previously known as 'Islands Hub for Net Zero' in Draft NPF4, therefore any reference to Islands Hub for Net Zero in the HRA Screening Report should be taken to mean Energy Innovation Development on the Islands.

[2] This National Development was previously known as 'Urban Sustainable, Blue and Green Drainage Solutions in Draft NPF4, therefore any reference to Urban Sustainable, Blue and Green Drainage Solutions in the HRA Screening Report should be taken to mean Urban Sustainable, Blue and Green Surface Water Management Solutions.

12. Digital Fibre Network
13. Clyde Mission
14. Aberdeen Harbour
15. Industrial Green Transition Zones
16. Hunterston Strategic Asset
17. Chapelcross Power Station Redevelopment
18. High Speed Rail

3 In compliance with the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended), more commonly known as the 'Habitats Regulations', the draft NPF4 was the subject of a Habitats Regulations Appraisal (HRA). The aim of the HRA was to establish whether the adoption of NPF4, including its spatial and thematic policies and National Developments, could result in adverse effects on the integrity of any 'European sites', either alone or in-combination with other plans and projects.

4 Prior to publication of this HRA Record, the following HRA work was completed:

- the methodology to be adopted during the HRA of NPF4 was set out in the Habitats Regulations Appraisal of National Planning Framework 4 – HRA Methodology (AECOM, 2020)
- a baseline data gathering exercise was completed and is reported in the Habitats Regulations Appraisal of National Planning Framework 4 – Baseline Information Report (AECOM, 2021a), and
- the potential for likely significant effects to arise on the qualifying habitats and/or species of European sites from the national planning policies and National Developments of NPF4 was investigated during the 'HRA screening' stage. This is reported in the Habitats Regulations Appraisal of National Planning Framework 4 – Initial HRA Screening Record (AECOM, 2021b).

5 The purpose of HRA screening is to determine, in view of best available scientific knowledge, whether a plan (or project), either alone or in-combination with other plans or projects, could have likely significant effects on the qualifying features of a European site. In relation to NPF4, the objective was therefore to 'screen out' those elements of the plan – including policies and National Developments – for which it could be stated, without more detailed appraisal, that significant effects are not likely on any European site (either alone or in combination). Where likely significant effects were identified, or if there was reasonable scientific doubt, then a policy or National Development would be 'screened in' to the next stage known as appropriate assessment.

6 Although NPF4 contains numerous policies which promote or support types of development that have the potential to result in likely significant effects, the policies themselves do not make specific allocations or commitments to a specific quantum or location of such development. NatureScot guidance (SNH, 2015) states that where effects on a given European site cannot be identified because a policy is too general, for example where it lacks any spatial definition, likely significant effects can be

screened out. Therefore, following this guidance, the draft Spatial Strategy and National Planning Policy elements of NPF4 were screened out of further assessment.

7 No likely significant effects were identified for 7 of the 18 National Developments, and these were screened out of further assessment. These were:

- Strategic Renewable Electricity Generation and Transmission Infrastructure
- Circular Economy Materials Management Facilities
- Urban Sustainable, Blue and Green Surface Water Management Solutions
- Urban Mass/Rapid Transit Networks
- Central Scotland Green Network
- National Walking, Cycling and Wheeling Network, and
- Digital Fibre Network.

8 No likely significant effects were identified from these National Developments on any European sites, either alone or in-combination with other plans or projects. In accordance SNH (2015), this is because:

a) they are intended to protect the natural environment;

b) they will not themselves lead to development or other change;

c) they make provision for change but could have no conceivable effect on a European site;

d) they make provision for change but could have no significant effect on a European site; or

e) effects on any particular European site cannot be identified, because they are too general or lack any spatial definition.

9 These National Developments were therefore not be taken forward to the appropriate assessment.

10 Likely significant effects could not be ruled out for the remaining National Developments. These were therefore screened in and were subject to further appraisal as part of the appropriate assessment stage of the HRA. At this stage, consideration is given to the requirement for mitigation to ensure that the projects brought forward under these National Developments do not adversely affect the integrity of any European sites.

11 An initial appropriate assessment of the Draft NPF4[3], completed in March 2022, concluded that, subject to detailed design and the implementation of avoidance and mitigation measures, including further study and assessment where necessary, projects brought forward under each National Development could be delivered without adverse effect on the integrity of any European site, either alone or in-combination with other currently known plans or projects, with the exception of:

[3] The Draft Fourth National Planning Framework was laid in Parliament on 10 November 2021 and is available to view at Scotland 2045 - fourth National Planning Framework - draft: consultation - gov.scot (www.gov.scot)

- Quay and handling facilities for ultra large container ships in Scapa Flow, proposed under Energy Innovation Development on the Islands, and
- Land reclamation for port expansion at Dundee Waterfront.

12 For these two classes of development under Energy Innovation Development on the Islands and Dundee Waterfront it was not possible, on the basis of information available at this stage in the planning process, for the initial appropriate assessment to conclude that relevant projects could be progressed without adversely affecting several European sites situated around Orkney and in the Firth of Tay, respectively. As a consequence, the following changes were made to the revised Draft NPF4:

- The class of development including quay handling facilities for ultra large container ships in Scapa Flow was removed from Energy Innovation Development on the Islands, and
- The class of development 'land reclamation for port expansion' was removed from Dundee Waterfront.

In addition, subsequent to the initial appropriate assessment of the Draft NPF4, other minor changes were made to several of the National Developments. These changes were reviewed and appraised for their potential to result in adverse effects on European sites not previously identified by the initial appropriate assessment. No such effects were identified. Therefore, with the changes described above made to the Energy Innovation Development on the Islands and Dundee Waterfront, it was concluded that all of the National Developments of NPF4 could be delivered without adverse effects on the integrity of European sites, either alone or in-combination with other plans or projects, so long as mitigation measures are adopted where necessary.

13 The conclusions of the Habitats Regulations Appraisal of NPF4 must be subject to HRA at future stages of the planning process, including at development plan and project level, when more information should be available to inform the assessment since it is conceivable that the detailed design of a particular proposal may identify issues that cannot be identified or assessed based on the level of detail provided in NPF4. As such, the conclusion of the HRA for NPF4 does not mean consent for any National Development will be granted, nor does it replace the more detailed project-level HRA that will be required in order to determine any planning applications.

14 Recommendations are given in this HRA Record for specific mitigation measures in relation to individual National Developments. These provide an initial starting point for incorporation into development plans or projects when taking forward proposals for National Developments. However, these will almost certainly need to be refined once more detail on relevant proposals is known further through the planning process. Moreover, a requirement for additional mitigation measures not suggested at this stage may also be identified based on the precise nature of relevant proposals and/or the occurrence / distribution of qualifying features in relation to the development.

1. Introduction

Overview of National Planning Framework 4

1.1 National Planning Framework 4 (NPF4) will be a long-term spatial plan to 2045 that sets out where development and infrastructure will be needed to support sustainable and inclusive growth. It will guide spatial development, set out Scotland's national planning policies, and highlight regional spatial priorities. NPF4 will incorporate Scottish Planning Policy, so that spatial and thematic planning policies will be addressed in one place. It will have the status of development plan for planning purposes. This is a change to the previous position and will mean that its policies should inform day to day decision making as decisions in the planning system are made on the basis of the development plan for the area.

1.2 NPF4 will be very different to the previous National Planning Framework 3 (NPF3), with a longer time horizon to 2045, fuller regional coverage and improved alignment with wider programmes and strategies, including on infrastructure, climate change and economic investment. NPF4 also takes into account indicative regional spatial strategies prepared by local authorities.

1.3 NPF4 will address the following high-level outcomes:

- meeting the housing needs of people living in Scotland including, in particular, the housing needs of older people and disabled people;
- improving the health and well-being of people living in Scotland;
- increasing the population of rural areas of Scotland;
- improving equality and eliminating discrimination;
- meeting any targets relating to the reduction of emission of greenhouse gases; and
- securing positive effects for biodiversity.

1.4 In addition, NPF4 will designate as 'National Developments' certain developments or classes of development for which Scottish Ministers have established the need in principle. The National Developments are as follows

1. Energy Innovation Development on the Islands[4]

2. Pumped Hydro Storage

3. Strategic Renewable Electricity Generation and Transmission Infrastructure

4. Circular Economy Materials Management Facilities

[4] This National Development was previously known as 'Islands Hub for Net Zero' in Draft NPF4, therefore any reference to Islands Hub for Net Zero in the HRA Screening Report should be taken to mean Energy Innovation Development on the Islands.

5. Urban Sustainable, Blue and Green Surface Water Management Solutions[5]
6. Urban Mass/Rapid Transit Network
7. Central Scotland Green Network
8. National Walking, Cycling and Wheeling Network
9. Edinburgh Waterfront
10. Dundee Waterfront
11. Stranraer Gateway
12. Digital Fibre Network
13. Clyde Mission
14. Aberdeen Harbour
15. Industrial Green Transition Zones
16. Hunterston Strategic Asset
17. Chapelcross Power Station Redevelopment
18. High Speed Rail

1.5 Under the Habitats Regulations[6], a network of sites has been designated across Scotland and its marine environment for the purposes of nature conservation. This network comprises sites known as Special Areas of Conservation (SAC) and Special Protection Areas (SPA). SACs are designated for the protection of habitats, plants and non-avian animal species of conservation concern. SPAs are designated to protect rare or vulnerable species of bird, as well as certain regularly occurring migratory bird species.

1.6 Prior to the UK's exit from the European Union (EU), Scotland's SACs and SPAs were part of a wider European network of such sites known as the 'Natura 2000 network'. They were consequently referred to as 'European sites'. Now that the UK has left the EU, Scotland's SACs and SPAs are no longer part of the Natura 2000 network but form a part of a UK-wide network of designated sites referred to as the 'UK site network'. However, it is current Scottish Government policy to

[5] This National Development was previously known as 'Urban Sustainable, Blue and Green Drainage Solutions in Draft NPF4, therefore any reference to Urban Sustainable, Blue and Green Drainage Solutions in the HRA Screening Report should be taken to mean Urban Sustainable, Blue and Green Surface Water Management Solutions.

[6] The Conservation (Natural Habitats, &c.) Regulations 1994 (as amended), more commonly referred to as the 'Habitats Regulations'.

retain the term ‘European site’ to refer collectively to SACs and SPAs (including any which are designated following the UK’s exit from the EU).

1.7 The Habitats Regulations or, for reserved matters, the Conservation of Habitats and Species Regulations 2017 (as amended), require that any development plan or proposal which is not directly connected with or necessary to the conservation of a European site, and which is likely to have a significant effect on such as site, must be subject to an ‘appropriate assessment’ of the implications for the Conservation Objectives of that site. Generally, such plans or proposals may only be approved if the ‘competent authority’ has ascertained, by means of an appropriate assessment, that there will be no adverse effect on the integrity of the European site(s).

1.8 The procedure to be applied is known as ‘Habitats Regulations Appraisal’ (HRA)[7].

1.9 In addition to fully designated European sites, the Habitats Regulations also apply to those sites in the earlier stages of the designation process and which are referred to as ‘candidate’ or ‘proposed’ European sites.

1.10 For the purposes of the HRA of NPF4, consideration has also been given to Wetlands of International Importance (more commonly known as ‘Ramsar sites’). For the remainder of this document, the term ‘European site’ is therefore used to refer to fully designated SACs, SPAs and Ramsar sites, as well as candidate or proposed European sites.

1.11 Since NPF4 constitutes a ‘plan’ within the meaning of the Habitats Regulations, it was necessary for a HRA to be completed. The aim of the HRA has been to demonstrate that the adoption of NPF4, including its spatial and thematic policies, will not result in adverse effects on the integrity of any of Scotland’s European sites.

Background to this Appraisal

1.12 AECOM was appointed by Scottish Government to conduct the HRA of NPF4. Prior to the preparation of this HRA Record, the following work was carried out as part of the HRA process:

- the methodology to be adopted during the HRA of NPF4 was set out in the Habitats Regulations Appraisal of National Planning Framework 4 – HRA Methodology (AECOM, 2020). The methods were submitted to the NPF4 HRA Steering Group, comprising representatives from Scottish Government and NatureScot (formerly Scottish Natural Heritage (SNH)), and were agreed by all parties, and
- a baseline data gathering exercise was completed and is reported in the Habitats Regulations Appraisal of National Planning Framework 4 – Baseline Information

7 In the past, the term ‘appropriate assessment’ has been used to describe both the overall process and a particular stage of that process. The term ‘Habitat Regulations Appraisal’ has come into use in order to refer to the process that leads to an appropriate assessment, thus avoiding confusion. Throughout this document, HRA is used to refer to the overall procedure required by the Habitats Regulations.

Report (AECOM, 2021a). As part of this exercise, the following information was collected:

- all European sites designated and proposed since the publication of NPF3
- any changes to European sites included in the HRA of NPF3 which have been made since its publication (e.g. changes to their Conservation Objectives, changes to qualifying features etc.)
- details of all plans and strategies which were considered as part of the in-combination assessment of effects on European sites relevant to NPF4
- new and potentially relevant research conducted since the publication of NPF3 which informed the HRA of NPF4, and
- a review of the buffer areas which were applied as part of the 'ecological screening' element of the HRA, based on available information from contemporary research.

1.13 The information collected during the baseline data gathering exercise was used to inform all of the subsequent stages of the HRA of NPF4.

1.14 In addition, an 'HRA screening' exercise was carried out. The purpose of this stage of the HRA was to determine, in view of best available scientific knowledge, whether NPF4, either alone or in-combination with other plans or projects, could have likely significant effects on the qualifying features of any European sites. The objective was to 'screen out' those elements of the plan – including policies and National Developments – for which it could be stated, without any detailed appraisal, that significant effects are unlikely on any European site. Where likely significant effects were identified, or if there was reasonable scientific doubt, then a policy or National Development would be 'screened in' to the next stage of detailed appropriate assessment. Full details can be found in the Habitats Regulations Appraisal of National Planning Framework 4 – Initial HRA Screening Record (AECOM, 2021b).

1.15 Subsequent to the publication of the HRA Screening Record, changes were made to the draft Spatial Strategy and National Planning Policies. All changes were reviewed to determine whether they could result in likely significant effects on European sites. However, no likely significant effects were identified from the changes and the conclusions of the HRA Screening Report remained the same, with the final Spatial Strategy and National Planning Polices continuing to be screened out of appropriate assessment.

Quality Assurance

1.16 This document has been prepared in accordance with the AECOM Integrated Management System (IMS). Our IMS places emphasis on professionalism, technical excellence, quality, as well as covering health, safety, environment and sustainability management. All AECOM staff members are committed to maintaining our accreditation to those parts of BS EN ISO 9001:2015 and 14001:2015, as well as BS OHSAS 18001:2007 that are relevant to a consultancy service.

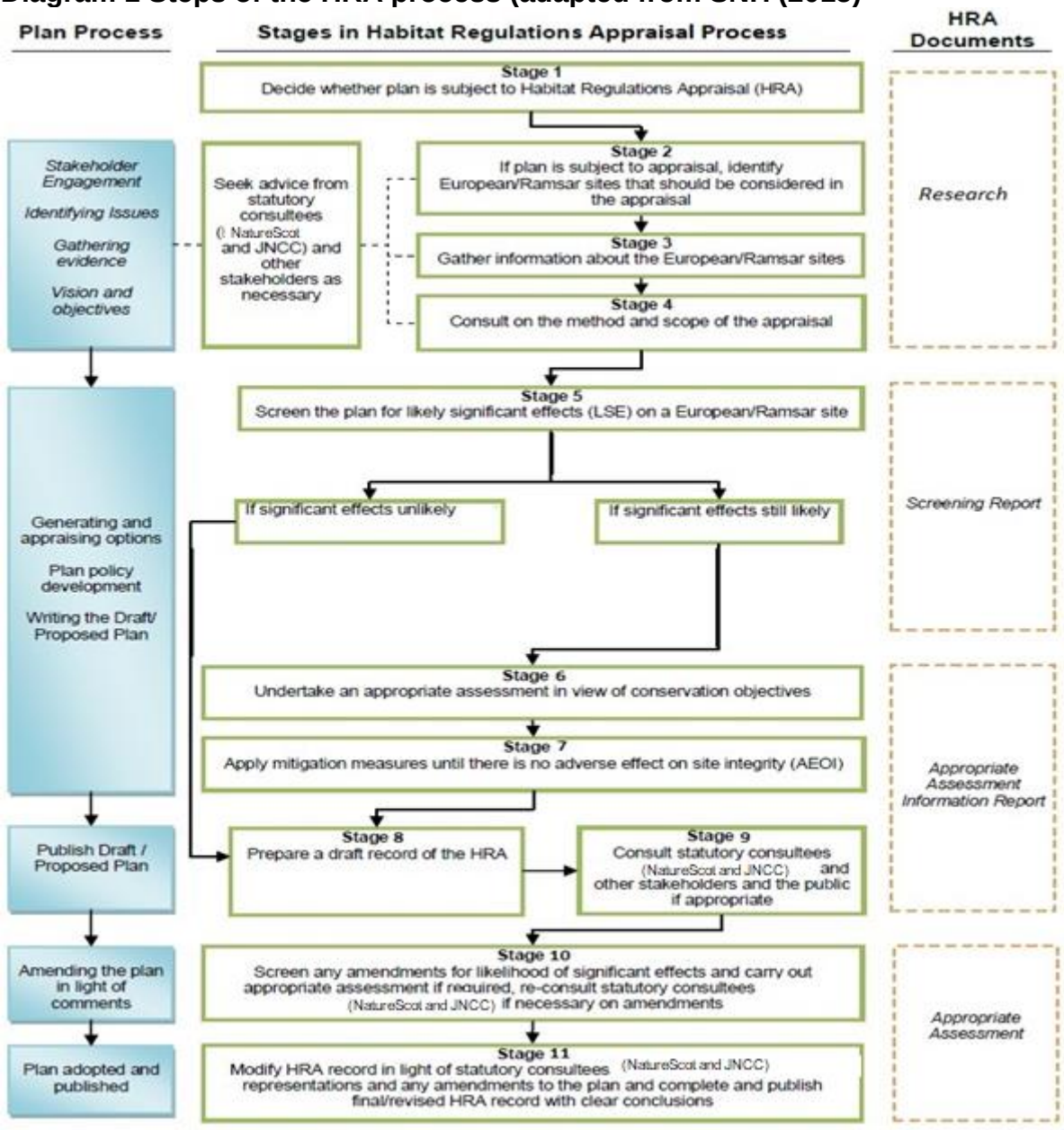
1.17 All ecologists involved in the HRA of NPF4 are members, at the appropriate level, of the Chartered Institute of Ecology and Environmental Management (CIEEM) and adhere to their strict Code of Professional Conduct.

2. The HRA Process

Overview

2.1 The Habitats Regulations do not prescribe a particular methodology for carrying out an appraisal of plans. NatureScot recommend an approach, as described in SNH (2015), which is outlined as a series of thirteen steps. However, with cognisance of recent case law, for the HRA of NPF4 this was revised to constitute eleven stages (see Diagram 1). Further guidance published by NatureScot on HRA (SNH, 2014a) also sets out the methods for assessing whether plans will affect a European site.

Diagram 1 Steps of the HRA process (adapted from SNH (2015)



Consultation

2.2 An HRA Steering Group was established at the commencement of the HRA of NPF4. This comprised representatives from AECOM, Scottish Government and NatureScot.

2.3 All deliverables prepared during the HRA process (as described in Section 1) were submitted to NatureScot for review and comment, with feedback and recommendations addressed and/or incorporated as necessary.

2.4 NatureScot were also consulted in relation to the appropriate assessment of all of those National Developments screened into appropriate assessment. General feedback was incorporated into this version of the HRA Record.

2.5 In discussion with NatureScot and Marine Scotland the initial appropriate assessment of the Energy Innovation Development on the Islands, in particular on the potential inclusion of quay and handling facilities for ultra large container ships in Scapa Flow under this National Development concluded that it was not possible to conclude that development of this type would not result in adverse effects on the integrity of several European sites, including Orkney Mainland Moors SPA, Scapa Flow SPA and Hoy SPA. For this reason, the class of development 'Quay and handling facilities for ultra large container ships in Scapa flow' was removed from the Energy Innovation Development on the Islands National Development in the revised Draft NPF4.

2.6 NatureScot advised that, due to the presence of the Firth of Tay and Eden Estuary SAC immediately adjacent to the entire coastal area encompassed by Dundee Waterfront, land reclamation progressed under this National Development would in their view have adverse effects on the integrity of this European site (and potentially others including Firth of Tay and Eden Estuary SPA). The conclusion of the initial appropriate assessment of March 2022 was therefore that, with land reclamation for port expansion included as a development class, a conclusion of no adverse effect on site integrity could not be reached for this aspect of the Dundee Waterfront proposal. As a consequence, the class of development 'Land reclamation for port expansion' was deleted from the Dundee Waterfront National Development in the revised Draft NPF4.

The Habitats Regulations

2.7 As a consequence of the UK's exit from the EU, it was necessary for various amendments to be made to the Habitats Regulations. These changes were required to ensure that Scotland continues to maintain the same standard of protection afforded to European sites. The Habitats Regulations remain in force, including the general provisions for the protection of European sites and the procedural requirements to undertake HRA.

2.8 Scottish Government published guidance on the changes to the Habitats Regulations in December 2020 (Scottish Government, 2020). This guidance was considered when preparing this document. However, as made clear by Scottish Government, the procedural requirements for HRA remain unchanged.

2.9 Although the UK is no longer part of the EU, a series of prior rulings of the Court of Justice of the European Union (CJEU) were considered when carrying out the HRA of NPF4:

- People Over Wind and Sweetman v Coillte Teoranta (C-323/17)
- Sweetman v An Bord Pleanála (C-258/11)
- Waddenzee (C-127/02)
- Commission of the European Communities v UK (C-6/04)
- Holohan and Others v An Bord Pleanála (C-461/17), and
- T.C. Briels and Others v Minister van Infrastructuur en Milieu (C-521/12).

2.10 The implications of this case law for HRA in Scotland are discussed in NatureScot guidance (SNH, 2014a; SNH 2015; SNH, 2019).

HRA Activities

2.11 In accordance with the process recommended by NatureScot shown in Diagram 1, the relevant case law listed above, and following the agreed HRA methodology for NPF4 set out in AECOM (2020), the HRA of NPF4 adopted a methodology comprising four broad activities:

- **HRA Activity 1 – scoping and data gathering** (the HRA Methodology (AECOM, 2020) and Baseline Information Report (AECOM, 2021a) describe the work done in relation to scoping and data gathering)
- **HRA Stage 2 – HRA screening** (the test of likely significant effects, reported in the Initial HRA Screening Record (AECOM, 2021b))
- **HRA Activity 3 – appropriate assessment**, and
- **HRA Activity 4 – avoidance and mitigation**.

2.12 This HRA Record is primarily concerned with HRA Activities 3 and 4. However, a summary of the appraisal required during each of the four activities is provided under the following sub-headings.

HRA Activity 1 – Scoping and Data Gathering

2.13 The HRA Methodology (AECOM, 2020) was prepared to provide a written record of the methods to be adopted and deliverables to be provided throughout the HRA of NPF4. It was reviewed and agreed by the HRA Steering Group and was designed to ensure that a scientifically-robust, legally-compliant HRA of NPF4 was carried out.

2.14 Having established the HRA method, a data gathering exercise was conducted and is reported in the Baseline Information Report (AECOM, 2021a). This built on work done for the HRA of National Planning Framework 3 (NPF3) and did not seek to replicate information provided in relevant associated documents produced at that time, other than to update that information, where necessary.

2.15 One of the main aims at this stage was to establish which European sites may be relevant to the HRA. All European sites designated and proposed in Scotland since the publication of NPF3 in 2014 were therefore identified. In addition, as the impacts of NPF4 could extend beyond Scotland, European sites designated and proposed in northern England and Northern Ireland since the publication of NPF3 were also identified.

2.16 In addition, the following information was also presented in the Baseline Information Report:

- any changes to European sites included in the HRA of NPF3 which have been made since its publication (e.g. changes to their Conservation Objectives, changes to qualifying features etc.)
- a list and details of all plans and strategies which have been considered as part of the in-combination assessment of effects on European sites relevant to NPF4
- a review of all new and potentially relevant research conducted since the publication of NPF3, and
- a review of the species-specific buffer areas which were subsequently applied during the HRA screening, based on available information from contemporary research.

HRA Activity 2 – HRA Screening

2.17 Following baseline data gathering the next stage is to determine whether there may be likely significant effects from the plan on European sites. This is shown as Stage 5 on the NatureScot process illustrated on Diagram 1 and is often referred to as 'HRA screening' or the 'test of likely significant effects'.

2.18 The purpose of HRA screening is to determine, in view of best available scientific knowledge, whether a plan (or project), either alone or in-combination with other plans or projects, could have likely significant effects on the qualifying features of a European site. For this purpose 'likely' is taken to mean 'possible'. Moreover, a 'significant' effect is one which could undermine the Conservation Objectives of a European site (SNH, 2015).

2.19 In relation to NPF4, the objective was therefore to 'screen out' those elements of the plan – including policies and National Developments – for which it could be stated, without any detailed appraisal, that significant effects are unlikely on any European site.

2.20 Where it was identified that there were likely significant effects, or if there was reasonable scientific doubt, then a policy or National Development would be 'screened in' and the next stage in the process initiated and a detailed appropriate assessment undertaken.

HRA Activity 3 – Appropriate Assessment

2.21 Where it is determined that a conclusion of 'no likely significant effect' cannot be drawn, the analysis must proceed to the next stage of HRA, known as 'appropriate assessment'. Case law has clarified that 'appropriate assessment' is not a technical term. Whilst there are no particular analyses, or level of technical analysis, that are classified by law as belonging to appropriate assessment rather than determination of likely significant effects, the assessment is undertaken to the extent possible on the basis of the precision of the plan and the statutory framework within which it sits.

2.22 By virtue of the fact that it follows the screening process, there is a clear implication that the analysis will be more detailed than completed at the previous stage. One of the key considerations during appropriate assessment is whether there is available mitigation that would entirely address the potential effect(s). In practice, the appropriate assessment would take any policies or National Developments that could not be dismissed following the HRA screening stage and assess the potential for an effect in more detail, with a view to concluding whether there would actually be an adverse effect on site integrity (in other words, disruption of the coherent structure and function of the European site, in the view of its Conservation Objectives).

HRA Activity 4 – Avoidance and Mitigation

2.23 Where necessary, measures are recommended for incorporation into NPF4 in order to avoid or mitigate adverse effects on European sites. There is considerable precedent concerning the level of detail that a national planning document needs to contain regarding mitigation. The implication of this precedent is that it is not necessary for all measures that will be deployed to be

fully developed prior to adoption of the plan, rather that the plan must provide an adequate framework within which these measures can be delivered.

A Proportionate Assessment

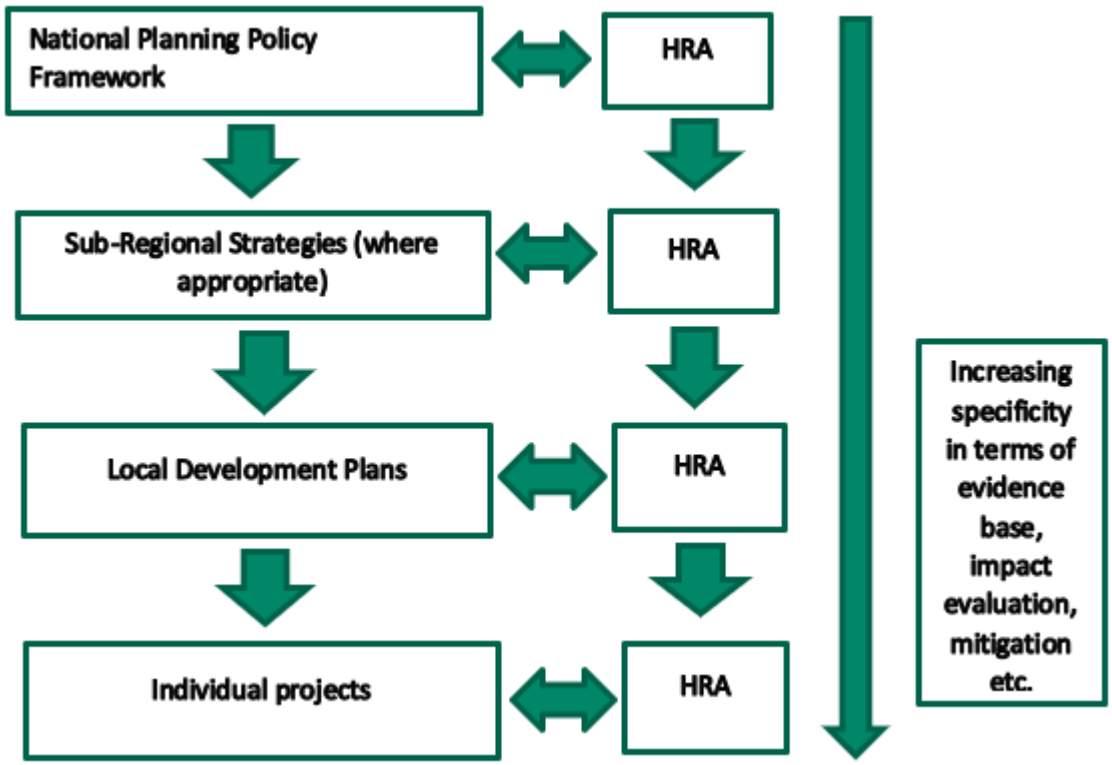
2.24 HRA of projects (as opposed to plans) often requires bespoke survey work and novel data generation in order to accurately determine the significance of effects. At project-level, it is necessary to look beyond the risk of an effect to a justified prediction of the actual likely effect and to the development of avoidance or mitigation measures.

2.25 Advocate General Kokott[8] has commented regarding HRA in a multi-tiered planning system that "it would…hardly be proper to require a greater level of detail in preceding plans [rather than planning applications] or the abolition of multi-stage planning and approval procedures so that assessment of implications can be concentrated on one point in the procedure. Rather, adverse effects on areas of conservation must be assessed at every relevant stage of the procedure to the extent possible on the basis of the precision of the plan. This assessment is to be updated with increasing specificity in subsequent stages of the procedure" [emphasis added].

2.26 There is, therefore, a tacit acceptance that HRA can be tiered and that all impacts are not necessarily appropriate for consideration to the same degree of detail at all tiers, as illustrated in Diagram 2. The fullest level of detail would be necessary for planning applications as that is the last level at which impacts on European sites can be investigated. In contrast, detailed surveys would be disproportionate at national plan level, given that European sites can be protected in the absence of such surveys by having a strong policy dictating the need for further investigation and prohibiting development until such surveys are completed.

[8] Opinion of Advocate General Kokott, 9th June 2005, Case C-604. Commission of the European Communities v United Kingdom of Great Britain and Northern Ireland, paragraph 94. https://curia.europa.eu/juris/document/document.jsf?docid=58359&doclang=EN.

Diagram 2 Tiering of HRA Through the Planning System



In-combination Assessment

2.27 In-combination (i.e. cumulative) effects can result from individually insignificant but collectively significant actions taking place over a period of time or concentrated in a location (CIEEM, 2019).

2.28 It is a requirement of the Habitats Regulations that the impacts of any plan are not considered in isolation but in-combination with other plans and projects that may also affect the European site(s) in question.

2.29 When undertaking this part of the assessment it is essential to bear in mind the principal intention behind the legislation – to ensure that those projects or plans, which in themselves may have minor impacts, are not simply dismissed on that basis but are evaluated for any cumulative contribution they may make to an overall significant effect.

2.30 Consideration was therefore given to the potential for the plans, programmes and strategies in Scotland, Northern Ireland and the north of England listed in the Baseline Information Report (AECOM, 2021a) to act in-combination with any policies or National Developments of NPF4 to result in significant effects.

2.31 In addition, the in-combination assessment considered the potential for different elements of NPF4 that were screened out individually to act cumulatively with each other to result in significant effects. Those elements of NPF4 which were screened out individually because of the absence of any linking impact pathway, or because that element of the plan is too general in nature, were not included in the in-combination assessment, since they will clearly have no cumulative

effects, or at least any effects cannot be identified until a lower tier of the planning system.

3. HRA Screening Results

3.1 A summary of the HRA screening of NPF4 is provided in this section. Further details can be found in the Initial HRA Screening Record (AECOM, 2021b).

3.2 Part 1 of NPF4 sets out Scottish Government's Spatial Strategy to 2045. It sets out a vision for how planning will deliver a net zero Scotland and how all parties will work together to build:

- Sustainable places
- Liveable places, and
- Productive places

3.3 Recognising that each part of Scotland can make a unique contribution to achieving this vision, NPF4 identifies regional spatial priorities to be taken forward.

3.4 Although it refers to projects, both existing, and those which may be brought forward in future, the purpose of the Spatial Strategy is to set out the overall vision of NPF4, in order to inform other plans and strategies such as regional spatial strategies, local development plans and local place plans. At the local level, it is for individual planning authorities to determine how the Spatial Strategy of NPF4 should best be achieved through their own plans and strategies. Consequently, and in accordance with SNH (2015) guidance in relation to elements of development plans which are general and do not include a specific location, the Spatial Strategy was screened out of further assessment.

3.5 Subsequent to the publication of the HRA Screening Report, changes were made to the Spatial Strategy. No likely significant effects were identified from these changes, and the conclusion of the Spatial Strategy remained the same, and it was screened out of appropriate assessment.

3.6 No likely significant effects were identified from any draft policy, either alone or in-combination with other national or local plans, programmes or strategies. Subsequent to the publication of the HRA Screening Report, a number of changes were made to National Planning Policies. Although there are numerous policies which promote or support certain types of development that have the potential to result in likely significant effects, the policies themselves do not make specific allocations or commitments to a specific quantum or location of such development. All of the policies of NPF4 were therefore screened out of further assessment. This remains the case for the revised Draft NPF4.

3.7 A summary of the HRA screening of the National Developments of NPF4 is provided in Table 1.

Table 1 Summary of the HRA screening of NPF4 National Developments

National Development	Summary of test of likely significant effects	HRA screening outcome
Energy Innovation Development on the Islands	There are several proposals associated with the Energy Innovation Development on the Islands National Development on Shetland, Orkney and the Outer Hebrides. Those which involve the creation of new ports, or the extension of existing port facilities (including any land reclamation), have the potential to significantly affect foraging seabirds from several nearby SPAs during the breeding season. Impacts which could arise include pollution of the marine environment, changes to coastal processes, and disturbance and/or displacement of birds due to construction activities or increased ship movements. The Arnish Renewables Base and Deep Water Port near Stornoway is also in very close proximity to the Inner Hebrides and the Minches SAC, designated for harbour porpoise *Phocoena phocoena*. This species could be impacted in the same way as seabirds above, but could also be subject to collision with moving vessels. The onshore proposals for Shetland have the potential to significantly affect several European sites depending on the precise route of, for example, new pipelines.	Screened in
Pumped Hydro Storage	Generally applies to the whole of Scotland but includes a specific proposal for Cruachan 2, at Loch Awe. This project would either be within or directly adjacent to the Glen Etive and Glen Fyne SPA (designated for golden eagle *Aquila chrysaetos*) and the Loch Etive Woods SAC (designated for woodland habitats and otter *Lutra lutra*). It could therefore result in the direct loss of qualifying habitat and/or loss of habitat supporting these qualifying species. There is also the potential for pollution impacts on qualifying and supporting habitats, and for disturbance to the qualifying species both within and outside of the boundaries of the European sites. Although locations are unknown, additional projects brought forward under this National Development could be linked to other European sites across Scotland, especially as impacts to the freshwater environment can occur over relatively large distances.	Screened in
Strategic Renewable Electricity Generation and	This National Development supports renewable energy development, repowering and the expansion of the electricity grid. All of these proposals have a substantial likelihood of causing likely significant	Screened out

Transmission Infrastructure	effects on European sites, depending on where they take place. However, there is no spatial definition associated with these proposals and, following NatureScot guidance, this National Development is screened out as effects on any particular European site cannot be identified.	
Circular Economy Materials Management Facilities	This proposed National Development applies nationwide and establishes the need for sites and facilities to retain the resource value of waste materials in order to maximise the use of materials in the economy and minimise the use of virgin materials in order to reduce greenhouse gas emissions. This proposed National Development has insufficient spatial definition to identify possible links to European sites across Scotland.	Screened out
Urban Sustainable, Blue and Green Surface Water Management Solutions	Applies to the Glasgow and Edinburgh catchment areas and seeks to build on the benefits of the Metropolitan Glasgow Strategic Drainage Partnership. This proposal is only very broadly spatially defined but could potentially be connected to European sites within the Clyde and Forth estuaries. However, this National Development is essentially environmentally positive (seeking to manage urban water run-off, including a prioritisation of catchment scale nature-based solutions which include blue and green infrastructure) and would not have likely significant effects of an adverse nature on this, or any other, European site, either alone or in-combination with other plans or projects.	Screened out
Urban Mass/Rapid Transit Networks	This National Development covers Edinburgh, Glasgow and Aberdeen, and associated regions. It is therefore only broadly spatially defined. However, projects brought forward under this National Development will be urban in nature. The only European sites in the vicinity of these three cities are marine or estuarine and are unlikely to be significantly affected.	Screened out
Central Scotland Green Network	The Central Scotland Green Network seeks an expansion of green infrastructure and supports a greener approach to development. At this stage, the proposals under this National Development are too broad and generally promote environmental benefits / enhancements. For these two reasons, this National Development can be screened out of further assessment.	Screened out
National Walking, Cycling and	This National Development facilitates the shift from vehicles to walking, cycling and wheeling for everyday	Screened out

Wheeling Network	journeys contributing to reducing greenhouse gas emissions from transport. The upgrading and provision of additional active travel infrastructure will be fundamental to the development of a sustainable travel network providing access to settlements, key services and amenities, employment and multimodal hubs. It has very little spatial definition, and the precise route of connections is unknown at this stage. This National Development has therefore been screened out of further assessment as, in the absence of information on active travel routes, effects on particular European sites cannot be identified.	
Edinburgh Waterfront	This National Development supports the regeneration of strategic sites along the Forth Waterfront in Edinburgh, between Leith and Granton. Projects progressed under this National Development could be immediately adjacent to, or otherwise in close proximity to the Firth of Forth SPA, Imperial Dock, Leith SPA, and the Outer Firth of Forth and St Andrews Bay Complex SPA. Birds associated with the Forth Islands SPA may also occur along the coast in the vicinity of this National Development. Projects involving works within the marine environment could impact upon grey seal *Halichoerus grypus*, harbour seal *Phoca vitulina* and/or bottlenose dolphin *Tursiops truncatus* from the Isle of May SAC, Berwickshire and North Northumberland Coast SAC, Firth of Tay and Eden Estuary SAC, and/or the Moray Firth SAC.	Screened in
Dundee Waterfront	The Dundee Waterfront National Development and associated proposals may include projects within the Firth of Tay and Eden Estuary SAC and Firth of Tay and Eden Estuary SPA. Terrestrial habitat around Dundee Waterfront is potentially suitable for several qualifying species of the Firth of Tay and Eden Estuary SPA and the Outer Firth of Forth and St Andrews Bay Complex SPA. There is the possibility of impacts to these sites including changes to coastal processes, loss of functionally-linked habitat, disturbance of qualifying species, mortality or injury of qualifying species, and the spread of invasive non-native species. In addition to the aforementioned sites, there are pathways for these impacts to affect the following European sites: River Tay SAC, Isle of May SAC, and Berwickshire and North Northumberland Coast SAC.	Screened in
Stranraer Gateway	Onshore developments within the towns of Stranraer or Cairnryan are unlikely to affect any European site. Developments in the surrounding area could be connected to the Glen App and Galloway Moors SPA, or the Loch of Inch and Torrs Warren SPA (for example resulting in the loss of functionally-linked	Screened in

	habitat used by qualifying Greenland white-fronted geese *Anser albifrons flavirostris* and/or hen harrier *Circus cyaneus*). Projects which involve works in the marine environment, particularly piling, or which increase the number of ship or other vessel movements, could impact on marine mammals through noise disturbance and/or injury or mortality. From Northern Ireland, grey seals from The Maidens SAC could be affected. Likewise, qualifying seabird species from the Ailsa Craig SPA (or more distant SPAs designated for seabirds) foraging outside of the boundary of the site could also be impacted by disturbance from the same sources. The precise nature of transport infrastructure projects associated with Stranraer Gateway is unknown. However, it will be supported by strategic transport interventions including road and rail that emerge from the second Strategic Transport Projects Review (STPR2). Such projects could impact on the following sites due to direct habitat loss, waterborne pollution, airborne pollution and/or disturbance of qualifying species: Lendalfoot Hills Complex SAC, Flow of Dergoals SAC, River Bladnoch SAC, Solway Firth SPA, and Loch Ken and River Dee Marshes SPA. Other transport infrastructure projects not defined at this stage could affect additional sites.	
DigitalFibre Network	This National Development applies to the whole of Scotland and has no spatial definition and cannot be linked to any European sites.	Screened out
Clyde Mission	The Clyde Mission is focussed on the River Clyde and riverside from South Lanarkshire in the east to Inverclyde and Argyll and Bute in the west, plus an area of up to around 500 m from the river edge. This footprint includes the parts of the Clyde Gateway, River Clyde Waterfront, North Clyde River Bank and River Clyde Corridor frameworks, and Glasgow Riverside Innovation District, and aims to repurpose brownfield land. A range of development types are possible. Impact sources will depend on the nature of projects brought forward, but could include: the spread of invasive non-native species, waterborne and airborne pollution, the loss of functionally-linked habitat, disturbance of species using functionally-linked habitat, and increased recreational pressure. There are three European sites which could be linked to projects under this National Development: the Inner Clyde SPA, Black Cart SPA and Clyde Valley Woods SAC. Other European sites are too distant for there to be realistic pathways for effects (e.g. they are beyond the distance	Screened in

	at which air quality changes could cause significant effects, or they are remote upland sites which are unlikely to experience a significant increase in recreational pressure).	
Aberdeen Harbour	Projects brought forward under this National Development are likely to be immediately adjacent to (or even within) the River Dee SAC and in close proximity to the Ythan Estuary, Sands of Forvie and Meikle Loch SPA. Further afield, Aberdeen Harbour is within the foraging range of qualifying seabirds of Fowlsheugh SPA and several of the SPAs covering the Firth of Forth, in addition to grey seal and bottlenose dolphins associated with the following: Berwickshire and North Northumberland Coast SAC, Isle of May SAC and Moray Firth SAC. Depending on the nature of projects brought forward, there is the potential for a range of impacts to result in likely significant effects on the qualifying features of these European sites.	Screened in
Industrial Green Transition Zones	This National Development applies to locations at St Fergus, Peterhead and Grangemouth, but also includes for offshore infrastructure. Projects in these locations have the potential to result in several impacts such as loss of functionally-linked habitat and disturbance of qualifying species. Offshore works, including for example in the Firth of Forth, also have the potential to effectively act as a barrier (due to disturbance) to migratory Atlantic salmon *Salmo salar* and/or lamprey species of the upstream River Teith SAC.	Screened in
Hunterston Strategic Asset	The location of this proposed National Development covers Hunterston port as well as the adjacent former nuclear power station sites and marketable business land of the Hunterston Estate. The clearly defined spatial nature of the National Development allows for straightforward screening. The nearest SPA for wide ranging seabird species is Ailsa Craig SPA, approximately 50km distant. This is within the foraging range adopted by the HRA screening when considering the distance at which seabirds may travel beyond SPA boundaries. Any increase in marine vessel movements to and from Hunterston could impact on foraging by the qualifying seabirds of Ailsa Craig SPA (and potentially on other SPAs further afield), depending on the routes taken and the numbers involved. The only terrestrial SPAs within 20km are Renfrewshire Heights SPA and Arran Moors SPA. These are both designated for breeding hen harrier,	Screened in

	and are both situated beyond the core foraging range of this species from the Hunterston Strategic Asset National Development. The nearest SACs are Bankhead Moss, Beith SAC, Cockinhead Moss SAC, and Dykeneuk Moss SAC. All are approximately 15km distant and designated for raised bog habitat. This is well beyond the distance at which any impacts (e.g. air quality changes) could reach these sites to have any effect. Therefore, likely significant effects from this proposed National Development cannot be excluded for SPAs designated for breeding seabirds. However, it is very unlikely to have any significant effects on terrestrial SPAs or SACs.	
Chapelcross Power Station Redevelopment	Chapelcross Power Station is within 5km of the Solway Firth SPA and the Upper Solway Flats and Marshes Ramsar site, designated for a range of wintering waterbirds which could occur in grassland within and surrounding the site. It is also within core foraging range (20km) of pink-footed geese *Anser brachyrhynchus* belonging to the Castle Loch, Lochmaben SPA. There is the potential for loss of functionally-linked habitat (either directly or due to disturbance displacement). The site also appears to be hydrologically linked via the Gullielands Burn to the River Annan, and downstream to the Solway Firth SAC. Development activities could therefore impact upon qualifying lamprey species, for example through waterborne pollution or hydrological changes to the watercourse. Although no detail of specific proposals is provided, any industrial development which involves emissions to air from stacks (e.g. for hydrogen generation) could have impacts on European sites up to 15km distant. Raeburn Flow SAC and Solway Mosses North SAC are both approximately within this distance of Chapelcross. They are both designated for raised bog habitats which are sensitive to air quality impacts and may therefore be significantly affected.	Screened in
High Speed Rail	The proposed national development is to support the implementation of new infrastructure to improve rail capacity and connectivity on the main cross-border routes, the East and West Coast Mainlines. There is very little spatial information available. However, development in proximity to the Firth of Forth could have likely significant effects, for example through disturbance of qualifying species using functionally-	Screened in

	linked habitat, or through the direct loss of such habitat.

3.8 Of the 18 National Developments, 7 were screened out of further assessment, as described in Table 1. These were:

- Strategic Renewable Electricity Generation and Transmission Infrastructure
- Circular Economy Materials Management Facilities
- Urban Sustainable, Blue and Green Surface Water Management Solutions
- Urban Mass/Rapid Transit Networks
- Central Scotland Green Network
- National Walking, Cycling and Wheeling Network, and
- Digital Fibre Network.

3.9 Likely significant effects from these National Developments on European sites, both alone and in-combination with other plans, programmes and/or strategies, were excluded, in accordance with SNH (2015), either because:

a) they are intended to protect the natural environment

b) they will not themselves lead to development or other change

c) they make provision for change but could have no conceivable effect on a European site

d) they make provision for change but could have no significant effect on a European site, or

e) effects on any particular European site cannot be identified, because they are too general or lack any spatial definition.

3.10 These 7 National Developments were therefore not taken forward to the next HRA stage of appropriate assessment. However, although screened out at the level of NPF4, further HRA of these National Developments will be necessary at lower tiers in the planning process including, where relevant, at the local development plan level, and for individual projects. At these levels, additional detail is likely to be available, including the location of infrastructure. On the basis of available information at that time, it may not be possible to exclude the possibility of likely significant effects on the qualifying features of European sites from the proposals, either alone or in-combination with other plans or projects, and in the absence of mitigation. In this case, it would be necessary to progress to the appropriate assessment stage, irrespective of the conclusion drawn in this HRA of NPF4.

3.11 Likely significant effects were identified for the remaining 11 National Developments:

- Energy Innovation Development on the Islands
- Pumped Hydro Storage
- Edinburgh Waterfront
- Dundee Waterfront
- Stranraer Gateway
- Clyde Mission
- Aberdeen Harbour

- Industrial Green Transition Zones
- Hunterston Strategic Asset
- Chapelcross Power Station Redevelopment, and
- High Speed Rail.

4. Appropriate Assessment

Overview

4.1 As summarised in Section 3, the possibility of likely significant effects arising from 11 of the National Developments contained within NPF4 could not be excluded at the HRA screening stage.

4.2 These National Developments were therefore 'screened in' for further appraisal at this appropriate assessment stage of the HRA process. The aim of the appropriate assessment is to determine, through more detailed investigation, whether any of the 11 screened in National Developments could have an adverse effect on the integrity of any European site and in particular to consider whether any potential for adverse effects could be mitigated, or whether any of the National Developments could not be delivered without an adverse effect on integrity. In this context, an adverse effect on integrity is one which undermines the achievement of the Conservation Objectives of a particular European site.

4.3 However, at the level of NPF4 there is a limit to the degree of assessment that is possible. This is because either:

- the National Development in question, as expressed in NPF4, contains limited specifics as to what will be delivered or where because, those elements are to be determined later, so it literally cannot be assessed in detail at the plan level. In these cases, the appropriate assessment focusses on precautionary mitigation that can be included in the plan to ensure that whatever proposals come forward will not result in adverse effects on integrity, or
- the nature of the potential impacts (including for example air quality, noise and visual disturbance during construction, or loss of functionally-linked land) are very closely related to exactly how the development will be designed and constructed, or on the distribution of relevant qualifying features (which will be determined by planning application surveys), and therefore cannot be assessed in detail at the plan level. In these instances, the assessment focusses on the availability of suitable mitigation measures, the extent to which such measures would be achievable, and effective, and whether an adequate protective framework exists to ensure that further assessment at a lower tier (including consideration of mitigation measures where necessary) is undertaken such that in practice delivery of the National Development would be possible without an adverse effect on the integrity of any European sites.

4.4 As set out in Section 2, and in accordance with relevant case law (People Over Wind and Sweetman v Coillte Teoranta (C-323/17)), it is only once the appropriate assessment stage is reached that mitigation measures to avoid adverse effects on integrity is considered. Therefore, where necessary, mitigation measures are recommended to ensure that relevant National Developments do not result in adverse effects on European site integrity.

4.5 Information on the qualifying habitats / species of relevant European sites, including their latest assessed condition and any identified threats or pressures, and the associated Conservation Objectives for these features, are summarised and described only as far as necessary for this assessment. Further details can be found in relevant citation documents and/or Conservation Advice Packages

(CAPs) which are available from the NatureScot SiteLink website (https://sitelink.nature.scot/home).

4.6 A brief description of each National Development is provided to aid in understanding the appraisal. However, further information on all of the National Developments of NPF4 can be found in the NPF4 itself.

Mitigation

4.7 Protection for European sites is through the Habitats Regulations and is also built in to NPF4 through Policy 4: Natural Places. Part b) of policy 4 states that "*Development proposals that are likely to have a significant effect on an existing or proposed European site (Special Area of Conservation or Special Protection Areas) and are not directly connected with or necessary to their conservation management are required to be subject to an 'appropriate assessment' of the implications for the conservation objectives.* "

4.8 Therefore, while the HRA of NPF4 has sought to determine that National Developments will not adversely affect the integrity of European sites, there ultimately already exists a regulatory and planning policy framework which ensures that, regardless of the conclusions of the appraisal at this strategic level, development proposals which could adversely affect the integrity of any European site, and which could not be adequately mitigated, cannot be progressed (without there being imperative reasons of over-riding public interest, no suitable alternative, and without providing adequate compensation, all of which would need to be assessed and authorised by Scottish Ministers).

4.9 As described above, it will therefore be necessary to undertake HRA of proposals relevant to the National Developments of NPF4 at subsequent tiers in the planning process, including at local development plan and project levels. This is in line with advice to the European Court of Justice concerning the approach to HRA in a tiered planning system.

4.10 Recommendations are given in this document for specific mitigation measures which may be needed to ensure that National Developments do not adversely affect the integrity of European sites, either alone or in-combination with other currently known plans or projects. These provide an initial starting point for incorporation into development plans or projects when taking forward proposals under National Developments. However, these will almost certainly need to be refined once more detail on relevant proposals is known further through the planning process. Moreover, a requirement for additional mitigation measures not suggested at this stage may also be identified based on the precise nature of relevant proposals and/or the occurrence / distribution of qualifying features in relation to the development. This is because it is conceivable that detailed design of a particular proposal may identify issues that cannot be identified or assessed based on the level of detail provided in NPF4. As such, the conclusion of the HRA for NPF4 does not mean consent for any National Development will be granted, nor does it replace the more detailed project-level HRA that will be required in order to determine any planning consents.

4.11 This accords with guidance published by NatureScot (SNH, 2015) which states that concluding no adverse effect on site integrity at this stage but requiring further appraisal and development of mitigation at future planning stages is not a way of deferring or delaying the appraisal process, but a way of securing

mitigation measures in a lower tier plan where they cannot be secured in detail at this higher tier plan level.

4.12 In addition, the following statement has been added to the Revised Draft NPF4: *"The potential for National Developments to affect European sites, depending on the precise design, location and construction of individual projects, has been identified by the Habitats Regulations Appraisal (HRA) of NPF4. Any such development would need to be considered carefully at project level and all relevant statutory tests met"*.

Summary of the Appropriate Assessment

4.13 A summary of the appropriate assessment of each of the 11 screened in National Developments is given in Table 2. A more detailed description of the assessment for each National Development in turn is provided in Annex A. For each National Development, potential avoidance and mitigation measures which may be necessary to avoid adverse effects on European site integrity are given in Annex A.

4.14 An initial appropriate assessment of the draft NPF4, completed in March 2022, concluded that, subject to detailed design and the implementation of avoidance and mitigation measures, including further study and assessment where necessary, projects brought forward under each National Development could be delivered without adverse effect on the integrity of any European site, either alone or in-combination with other currently known plans or projects, with the exception of:

- development of a deep water port in Scapa Flow, proposed under Energy Innovation Development on the Islands, and
- any project brought forward under Dundee Waterfront which involves land reclamation.

4.15 For these two classes of development under Energy Innovation Development on the Islands and Dundee Waterfront, on the basis of information available at this stage of the planning process, it was not possible for the appropriate assessment to conclude that relevant projects could be progressed without adversely affecting several European sites situated around Orkney and in the Firth of Tay, respectively.

4.16 These classes of development were therefore removed from the respective National Developments in the Revised Draft NPF4.

4.17 In addition, subsequent to the initial appropriate assessment of the draft NPF4, other changes were made to several of the National Developments. These changes were appraised for their potential to result in adverse effects on European site and no such effects were identified. The inclusion of Scatsta and Dales Voe[9], both on Shetland, as specific locations referred to under the Energy Innovation Development on the Islands National Development was specifically

[9] There are several locations on Shetland known as 'Dales Voe' or similarly named. The location referred to in this National Development is the Dales Voe north of Lerwick where an existing quay facility already exists.

considered. Scatsta lies adjacent to Sullom Voe SAC, while Dales Voe is covered by the East Mainland Coast, Shetland SPA. However, for the reasons set out in Table 2 and in the appropriate assessment (see Annex A), namely that there already exists port / harbour facilities at these locations and that qualifying bird species are therefore expected to be habituated to shipping activities, it was concluded that development at Scatston and Dales Voe could potentially be progressed without adverse effects on the integrity of these or other European sites.

4.18 Therefore, with the changes described above made to Energy Innovation Development on the Islands and Dundee Waterfront, it was concluded that all of the National Developments of NPF4 could be delivered without adverse effects on the integrity of European sites, either alone or in-combination with other plans or projects, so long as mitigation measures are adopted where necessary.

4.19 The conclusions of the Habitats Regulations Appraisal of NPF4 must be re-examined at future stages of the planning process, including at local development plan and project level, when more information should be available to inform the assessment. The in-combination element of the assessment should consider all relevant plans and projects in place at this time and which may interact with individual proposals brought forward under a National Development. For example, this HRA of NPF4 has identified that projects progressed under Industrial Green Transition Zones, Aberdeen Harbour, Dundee Waterfront and Edinburgh Waterfront have the potential to generate in-combination impacts with one another, and this will need to be considered further at future stages in the planning process (e.g. at the level of local development plan or for individual projects). Similarly, the development of offshore wind energy schemes around the north and east coasts of Scotland may also have substantial in-combination impacts with these (and potentially other) National Developments. However, other plans or projects may be relevant in future and must be subject to assessment. As stated, in-combination assessment at future stages in the planning process must therefore consider these possibilities and identify all relevant plans or projects at that time.

Table 2 Summary of the appropriate assessment of NPF4 National Developments

National Development	Summary of appropriate assessment	Conclusion of the assessment of effects on site integrity
Energy Innovation Development on the Islands	Energy Innovation Development on the Islands supports proposed developments in the Outer Hebrides, Shetland and Orkney for renewable energy generation, renewable hydrogen production, infrastructure and shipping, and associated opportunities in the supply chain for fabrication, research and development. The use of low and zero emission fuels will play a crucial role in decarbonising island and mainland energy use, shipping, strengthening energy security overall and creating a low carbon energy economy for the islands and islanders. With the exception of several port locations (for which see further below), there are no onshore elements of this National Development which are spatially defined. With no spatial definition, it is not possible to assess the potential for adverse effects on European site integrity from onshore developments under the Energy Innovation Development on the Islands. However, several of the classes of onshore development included under this National Development (for example renewable energy generation) could have impacts on European site, depending on where they are proposed. Industrial and manufacturing processes, including the manufacture of ammonia and/or hydrogen, can result in the emission of pollutants to the atmosphere. The main airborne pollutants associated with the ammonia / hydrogen manufacturing processes are oxides of nitrogen (NOx) and ammonia gas (NH_3), both of which can affect European sites, potentially up to distances of 15km from the source. At this stage, there is no information available on the potential location of offshore renewables projects which could come under the scope of NPF4	With the implementation of mitigation measures, it is considered that projects progressed under all classes of development included in the Energy Innovation Development on the Islands National Development, could potentially be delivered with no adverse effect on the integrity of any European site. This conclusion would need to be re-examined for planning applications when a much greater level of detail regarding the design and delivery of the scheme will be available. This conclusion is based on the fact that certain classes of development under Energy Innovation Development on the Islands are likely to be deliverable without any loss of habitat from within the boundary of Sullom Voe SAC and East Mainland Coast, Shetland SPA. However, it is possible that port infrastructure upgrades or expansion at the ports of Sullom Voe or Scatsta could result in the loss of qualifying habitat from within the boundary of the Sullom Voe SAC, and similarly port

	and which could have impacts on the qualifying species of European sites. However, such developments have the potential to significantly affect seabirds and marine mammals (e.g. through collision mortality, disturbance / displacement, and changes to predator-prey dynamics), and detailed assessment will be required by HRA at future stages of the planning process for any such proposals. Energy Innovation Development on the Islands includes for port developments at Arnish (near Stornoway), Hatston, Lerwick, Dales Voe, Sullom Voe and Scatsta. In the draft NPF4 it also included a new deep water port for ultra large container ships at Scapa Flow. Scapa Flow is currently largely undisturbed, which contributes to its importance to a number of bird species. The initial appropriate assessment concluded that, with specific reference to a new deep water port for ultra large container ships in Scapa Flow, at this stage in the planning process and on the basis of information available currently it is not possible to conclude that there would not be adverse effects on the integrity of several European sites, including Scapa flow SPA, Orkney Mainland Moors SPA, and Hoy SPA. In response, the class of development 'Quay and handling facilities for ultra large container ships in Scapa flow' was deleted from this National Development in the Revised DraftNPF4. There are numerous potential impacts from the construction and operation of new or expanded ports. These could affect numerous European sites designated for birds which forage in the marine environment (during both the breeding and non-breeding season) and marine mammals. However, at Arnish, Hatston, Dales Voe, Sullom Voe and Scatsta, it is considered likely that birds using these areas would be habituated to these impacts from ports / quays which already exist at these locations, and consequently that measures could be included in the detailed design and delivery to adequately mitigate such effects.	development at Dales Voe could result in loss of habitat from East Mainland Coast, Shetland SPA. The loss of habitat from within the boundary of any European site has a high probability of causing an adverse effect on site integrity. As stated, HRA will be required to assess individual proposals. The conclusion of this assessment has been reached following the removal of 'Quay and handling facilities for ultra large container ships in Scapa Flow' from this National Development in the revised Draft NPF4.

Pumped Hydro Storage	The appropriate assessment focussed on the only scheme under this National Development for which a location is identified – the expansion of Cruachan in Argyll. Infrastructure associated with the expansion of Cruachan may lie within the boundary of two European sites: Loch Etive Woods SAC and Glen Etive and Glen Fyne SPA. A number of possible impacts on the qualifying woodland habitats and qualifying species of these sites (otter and golden eagle) were identified. In particular, the potential for losses of qualifying habitat from the SAC or the loss of habitat from within (or outside) the SPA which supports golden eagle was considered. At this high-tier level of assessment, it is considered that such losses can be avoided through project design or, in the case of the SPA, even if they can't be completely avoided can be minimised such that they are so small as to have no significant effect on the golden eagle population (including in-combination with other possible losses from currently unknown plans or projects). In addition, the potential for disturbance of breeding otter and golden eagle during the construction phase (and, although less likely, during the operation of the scheme) was considered. Mitigation which may be needed to avoid this from occurring could include timing works to take place outside the golden eagle breeding season (February to August, inclusive) and/or implementing suitable works exclusion zones around any identified otter or golden eagle breeding sites. This will require detailed field survey to be carried out to identify such sites and monitor breeding status.	With the implementation of mitigation measures, it is considered that, based on the level of detail available at this stage, it would be possible to deliver the expansion of Cruachan pumped hydro storage facility with no adverse effects on the integrity of any European site, either alone or in-combination with other currently known plans or projects. However, this conclusion is based on the assumption that the scheme can be delivered with no losses of qualifying woodland habitat of the Loch Etive Woods SAC. The loss of even a small area of such habitat may be considered significant.
Edinburgh Waterfront	This National Development supports the regeneration of strategic sites along the Forth waterfront in Edinburgh, between Leith and Granton. Potential development will include mixed use proposals that optimise use of the strategic assets for residential, community, commercial and industrial purposes, including support for offshore energy generation developments	With the implementation of mitigation measures, it is considered that, based on the level of detail available at this stage, it would be possible to deliver projects under the Edinburgh Waterfront

	It has been assumed when conducting this assessment that no projects will be brought forward which will result in the actual loss of habitat from within the boundary of any European site. However, should any proposals for development within the boundary of a European site be progressed, it will be necessary to conduct detailed survey to establish the distribution of qualifying and supporting habitats / species in the affected area(s). This must support a project-level HRA to ensure there are no adverse effects on the integrity of any European site. The potential for losses of functionally-linked habitat will need to be determined through field survey once more detailed proposals exist for where works are intended to take place. Wherever possible, land which is found to be functionally-linked to the Firth of Forth European sites should be retained. However, it is considered at this stage that it is unlikely that the loss of such areas would jeopardise the integrity of any European site as the species which may be impacted are habitat generalists, the total area which would be lost is small, and there is abundant alternative habitat elsewhere along the Firth of Forth. Similarly, although there is the potential for disturbance of qualifying waterbirds belonging to the Firth of Forth European sites, this is unlikely following implementation of mitigation, including timing of works to avoid the most sensitive periods. New housing has the potential to increase visitor numbers to the Firth of Forth coast, with associated recreational pressure on the European sites here, in particular from disturbance of qualifying waterbirds. However, this area is already subject to high numbers of visitors, and it is considered very unlikely that any additional visitors generated by new housing would significantly change the existing situation or lead to adverse effects on European site integrity.	National Development with no adverse effects on the integrity of any European site, either alone or in-combination with other currently known plans or projects. This conclusion, and the requirement for mitigation (in particular to manage recreational pressure and associated impacts on qualifying waterbirds) will need to be determined at future stages of the planning process, including at the project level, and should be informed, where necessary, by detailed further study including field survey.

Dundee Waterfront	This National Development supports the redevelopment of the Dundee Waterfront, including the Central Waterfront, Seabraes, City Quay, Dundee Port, Riverside Business Area and Nature Park, and the Michelin Scotland Innovation Parc. The initial appropriate assessment of this National Development in the draft NPF4 concluded that adverse effects on the Firth of Tay and Eden Estuary SAC (and potentially other sites) could not be ruled out, due to the inclusion of the class of development 'Land reclamation for port expansion'. As a consequence, this class of development was deleted from this National Development in the Revised Draft NPF4. The loss of habitat from within the boundary of European sites within the Firth of Tay should therefore be avoided. Terrestrial habitat around Dundee Waterfront is potentially suitable for several qualifying species of the Firth of Tay and Eden Estuary SPA and the Outer Firth of Forth and St Andrews Bay Complex SPA. Developments here could result in the loss of habitat used by these species outside of the boundary of these sites and which is therefore considered to be functionally-linked to it. Construction and operational activities could also cause disturbance of the qualifying animal species of European sites, both within and outside of the boundaries of European sites. Impacts could occur from activities in the marine environment, or anywhere within the Firth of Tay. This could include dredging and the increased passage of ships. Such impacts could have effects on seabirds, marine mammals, and migratory fish belonging to the River Tay SAC.	The entirety of Dundee Waterfront lies immediately adjacent to the Firth of Tay and Eden Estuary SAC, with large areas also adjacent to the SPA and Ramsar site of the same name. The loss of any habitat from within these sites should be avoided and is not included in any class of development in the Dundee Waterfront National Development. It has therefore been assumed when conducting the assessment for Dundee Waterfront that no projects will be brought forward which will result in the actual loss of habitat from within the boundary of any European site. Should any proposals for development within the boundary of a European site be brought forward for consideration, it will be necessary to conduct detailed survey to establish the distribution of qualifying and supporting habitats / species in the affected area(s) in order to determine no adverse effect on European site integrity. With the implementation of mitigation measures, it is considered that development of the type included in the Dundee Waterfront National Development could be delivered with no adverse effects on the integrity of any European site, either alone or in-

		combination with other currently known plans or projects. This conclusion would need to be re-examined for planning applications when a much greater level of detail regarding the design and delivery of the scheme will be available. This will also require a thorough assessment of the potential for in-combination effects to arise with other plans or projects, including offshore wind energy developments.
Stranraer Gateway	This National Development supports the regeneration of Stranraer, covering the town and associated transport routes, including road and rail. It was determined at the HRA screening stage that onshore developments within the towns of Stranraer or Cairnryan would be unlikely to significantly affect any European site. The appropriate assessment therefore primarily considered transport infrastructure projects in the wider south-west of Scotland, and developments in the marine environment. Transport infrastructure projects have the potential to result in the direct loss of habitat from European sites, or the loss of functionally-linked habitat, depending on the precise location of any such proposals. Furthermore, such projects could also lead to disturbance of qualifying species, with Greenland white-fronted geese belonging to Loch of Inch and Torrs Warren SPA being identified as possibly occurring in the vicinity of the A75. Traffic is a major contributor of airborne pollutants of relevance to habitats (although this is likely to reduce post-2030 after the UK government bans the sale of new petrol and diesel cars and vans) and there is the potential for effects on European sites within 200m of any road infrastructure projects.	With the implementation of mitigation measures, it is considered that, based on the level of detail available at this stage, it would be possible to deliver projects under the Stranraer Gateway National Development with no adverse effects on the integrity of any European site, either alone or in-combination with other currently known plans or projects. This conclusion would need to be re-examined for planning applications when a much greater level of detail regarding the design and delivery of particular projects will be available. In particular, measures to manage the disturbance of seabirds and marine mammals in Loch Ryan which may arise from an increase in boats due to

	Construction works associated with the expansion of Stranraer marina and/or redevelopment of the east pier are likely to be relatively minor (when compared to major port developments). It is therefore unlikely that they would significantly disturb or displace breeding seabirds or marine mammals. An increase in boat traffic in Loch Ryan could lead to disturbance of seabirds and marine mammals, alongside other impacts including injury or mortality. This may require bespoke mitigation to be implemented including speed restrictions, zoning of areas where boats are not permitted, and awareness raising. However, at this stage, the increase in the number of vessels generated through marina expansion is not expected to reach such a level that the effects on qualifying species become significant.	expansion of the marina in Stranraer may be required.
Clyde Mission	The Clyde Mission National Development covers the corridor of the River Clyde, up to a distance of 500m from the river's edge, along its length from South Lanarkshire in the east, to Inverclyde and Argyll and Bute in the west. It includes for a wide range of development class within this area. Due to the broad nature of development types which could be progressed under Clyde Mission, there are numerous impacts which could arise on European sites. However, those European sites considered to be most relevant are: Inner Clyde SPA and Ramsar site, Black Cart SPA and Clyde Valley Woods SAC. The most important impacts which could affect these sites are likely to be loss of habitat (including functionally-linked habitat) from the Inner Clyde SPA / Ramsar site and Black Cart SPA, construction-related disturbance of the qualifying birds of these sites, and the varied effects of increased recreational pressure on these sites and the Clyde Valley Woods SAC. Standard mitigation exists to avoid or minimise habitat loss and construction-related disturbance. However, strategic mitigation is likely to be necessary to	Standard and strategic mitigation is likely to be required to ensure that Clyde Mission does not significantly affect the qualifying features of any European site, either alone or in-combination with other plans or projects in the wider area outside of the National Development. However, with the implementation of mitigation measures, it is predicted that Clyde Mission can be delivered without an adverse effect on the integrity of any European site, either alone or in-combination with other currently known plans or projects. This conclusion must be re-examined by HRA at future stages of the planning

	ensure no adverse effects from the potential increase in visitor numbers of European sites which could occur due to projects progressed under Clyde Mission. This is particularly the case as Clyde Mission applies to land in seven local planning authority areas. There is the potential for developments elsewhere in these council areas, but outside of the Clyde Mission area, to result in impacts which act in-combination with developments brought forward under the National Development. The creation of a strategic approach to mitigation will ensure any such impacts do not result in adverse effects on European site integrity.	process, including at the local development plan and project level. This is likely to require more detailed study, potentially including field survey, and the development of bespoke, strategic mitigation to avoid in-combination recreational pressure impacts.
Aberdeen Harbour	This National Development applies to the Port of Aberdeen North and South Harbours. It supports the continued use and repurposing of Aberdeen Harbour. There is the potential for the loss of functionally-linked terrestrial habitat due to development of the South Harbour, which could impact bird species belonging to the Ythan Estuary, Sands of Forvie and Meikle Loch SPA / Ramsar site. However, larger impacts are likely to occur from development activities taking place in the marine environment as these could affect qualifying seabirds, marine mammals and Atlantic salmon belonging to several European sites, including the River Dee SAC. Impacts could be generated through construction activities or during the operational phase (for example through maintenance dredging or the increased passage of ships). As the most severe impacts are likely to be associated with activities in the marine environment, there is the potential for in-combination effects to arise due to projects associated with other National Developments on the east coast of Scotland (including Industrial Green Transition Zones, Dundee Waterfront and Edinburgh Waterfront). In addition, the development of	With the implementation of available mitigation measures, it is considered that development of the type included in the Aberdeen Harbour National Development could be delivered with no adverse effects on the integrity of any European site, either alone or in-combination with other currently known plans or projects. This conclusion would need to be re-examined for planning applications when a much greater level of detail regarding the design and delivery of the scheme will be available. This will also require a thorough assessment of the potential for in-combination effects to arise with other plans or projects, including offshore wind energy developments.

	offshore wind energy schemes could lead to in-combination effects, particularly if Aberdeen Harbour is to be used as a key gateway to these sites in the North Sea.	
Industrial Green Transition Zones	This National Development applies to locations at St Fergus, Peterhead and Grangemouth, but could also include offshore infrastructure. It also includes a wide variety of class of development, focussed on capturing, transporting and storing carbon emissions and including associated infrastructure such as port facilities. However, it also includes for the regeneration of the town of Grangemouth and a flood protection scheme in Grangemouth. As a very broad National Development, the potential impacts which could arise from projects brought forward under Industrial Green Transition Zones are wide ranging. At this stage, therefore, it is impossible to describe in detail all of those which could potentially occur. A summary is instead given in Annex A, with high-level recommendations for avoidance and mitigation of such impacts.	Based on the type of impact which could arise, and the availability of general mitigation, it is considered that this National Development could be implemented in such a way that no adverse effects on the integrity of any European site would occur as a result of projects brought forward under Industrial Green Transition Zones, either alone or in-combination with other known plans or projects. This conclusion must be re-examined by HRA at future stages of the planning process, including at the project level. This is very likely to require detailed further study, including field survey, in order to establish the presence and distribution of qualifying features in relation to development proposals.
Hunterston Strategic Asset	This National Development was screened into appropriate assessment on the basis that likely significant effects on SPAs designated for breeding seabirds from port development at Hunterston could not be ruled out. As the nearest such site, the assessment focussed primarily on Ailsa Craig SPA. However, the identified impacts which could arise could affect seabirds belonging to SPAs several hundred kilometres distant from the National Development as many seabirds are known to forage a long way from their nesting colonies.	With the implementation of mitigation measures it would be possible to deliver Hunterston Strategic Asset with no adverse effects on the integrity of any European site, either alone or in-combination with other currently known plans or projects.

	The primary sources for impacts are likely to be an increase in ship movements in the Firth of Clyde and, should they be required, dredging activities, including the disposal of dredge waste. However, given the relative tolerance of the qualifying species of Ailsa Craig SPA to ship movements, the distance between the European site and the National Development, and the availability of large areas of sea for foraging beyond the shipping lanes, no adverse effect on the integrity of the site is predicted from increased numbers of vessels in the Firth of Clyde. As the precise location for dredging, including waste disposal, or indeed any need for it, is unknown at this stage, it will be necessary to assess in more detail the potential for the impacts associated with these activities to significantly affect the qualifying features of Ailsa Craig SPA, and other European sites, at future stages in the planning process, including at the project level. However, again due to the distance between Hunterston Strategic Asset and the nearest European sites for which the qualifying species rely on marine environment, it is considered very likely that through careful design, timing and siting of dredging activities, adverse effects on European site integrity can be avoided. In-combination effects can be avoided by ensuring that, wherever possible, shipping routes to different ports in the Firth of Clyde are well defined and consistent across locations, and by making use of existing dredge disposal sites.	
Chapelcross Power Station	This National Development supports the redevelopment of the brownfield site of the former Chapelcross nuclear power station, in Dumfries and Galloway. A range of classes of development are part of the National Development, including commercial, industrial and manufacturing, renewable energy generation, and the production, transmission and transport of low carbon and renewable hydrogen.	A range of mitigation measures are available to avoid or minimise the potential impacts which could arise on European sites. There is also likely to be a requirement for detailed air quality modelling and accompanying ecological assessment in order to confirm any air

	Chapelcross Power Station lies within 5km of the Solway Firth and is potentially connected to European sites covering the estuary through surface water flows and due to the potential presence of habitat suitable for non-breeding geese and other waterbirds which may be functionally-linked to several European sites. Industrial facilities may also generate airborne emissions which in accordance with national guidelines require assessment of impacts on European sites up to 15km away (including those in the Solway Firth, and Raeburn Flow SAC and Solway Mosses North SAC, both designated for bogs). There is also the potential for direct hydrological impacts on watercourses which may support lamprey species which are qualifying features of the Solway Firth SAC. There are currently no known plans or projects which could act in-combination with the Chapelcross Power Station Redevelopment to result in adverse effects on the integrity of any European site.	quality impacts on European sites. This is not possible at the NPF stage as it requires detailed design and process information which will not be available until a given scheme is designed in detail for a planning application. In addition, emissions to air, water abstraction or discharges to the surface water environment would be subject to other environmental legislation and/or specific relevant permitting / licensing processes by SEPA or other regulators. This would ensure no significant effects on potentially impacted qualifying habitats and species, including lamprey. It is therefore concluded that, with the implementation of mitigation measures and down-the-line assessments, this National Development could be implemented in such a way that no adverse effects on the integrity of any European site would occur as a result of projects brought forward under Chapelcross Power Station Redevelopment, either alone or in-combination with other known plans or projects.
High Speed Rail	This National Development supports the development of infrastructure to improve rail capacity and connectivity of the main cross-border routes – the East and West Coast Mainlines. However, High Speed Rail was screened	In the absence of an identified location for a new station in East Lothian, and without detailed survey information that

	into appropriate assessment due to reference in the East Lothian Local Development Plan to the potential for new stations at East Linton and Blindwells. All other aspects of this National Development currently have no spatial definition and were therefore screened out during the test of likely significant effects as there is no reason to assume that they cannot be conceived and designed in such a way that they would not impact European sites. The potential impacts of a new station in East Lothian will largely be determined by its location. However, there are possible pathways for impacts on the European sites covering the Firth of Forth. In particular, should the location be close to the coast, there is the potential for construction of a new station to result in the loss of functionally-linked habitat used by qualifying species of the Firth of Forth SPA and Ramsar Site and/or the Outer Firth of Forth and St Andrews Bay Complex SPA for foraging or roosting outside of the boundary of these sites. In addition to the direct loss of functionally-linked habitat, disturbance of birds using such habitat could result in them being displaced, causing the effective loss of this area to these birds. If the new station were to be built very close to the coast (i.e. within 300m), there would be the possibility that construction and/or operation of the new station could disturb and/or displace qualifying bird species within the boundary of the Firth of Forth SPA or the Outer Firth of Forth and St Andrews Bay Complex SPA.	will need to be gathered for any planning application once a precise development location is identified, it is not possible at this stage to fully assess the potential effects of the National Development on the Firth of Forth European sites. Further assessment will therefore be required at further stages in the planning process, including at the project level. However, with the implementation of available standard mitigation, and by designing any station to avoid areas used by qualifying birds of the Firth of Forth European sites, the loss of functionally-linked habitat and/or disturbance and displacement impacts should be avoidable or able to be adequately mitigated. If any residual impact does remain, it is very likely that, given the relatively small area which would be affected, and due to the availability of large areas of alternative habitat across the Forth Estuary, there would be no adverse effect on the integrity of any European site, either alone or in-combination with other currently known plans or projects.

5. Conclusion

5.1 No likely significant effects were identified from the Spatial Strategy or National Planning Policies. Although NPF4 contains numerous policies which promote or support types of development that have the potential to result in likely significant effects, the policies themselves do not make specific allocations or commitments to a specific quantum or location of such development. As such, the policies are unable to result in any likely significant effects on European sites. The Spatial Strategy and National Planning Policy elements of NPF4 were therefore screened out of further assessment.

5.2 Of the 18 National Developments, 7 were screened out of further assessment. No likely significant effects were identified from these National Developments on any European sites, either alone or in-combination with other plans or projects. In accordance SNH (2015), this is because:

a) they are intended to protect the natural environment

b) they will not themselves lead to development or other change

c) they make provision for change but could have no conceivable effect on a European site

d) they make provision for change but could have no significant effect on a European site, or

e) effects on any particular European site cannot be identified, because they are too general or lack any spatial definition.

5.3 These National Developments were therefore not taken forward to the appropriate assessment.

5.4 Likely significant effects could not be ruled out for the remaining National Developments. These were therefore screened in and were subject to further appraisal as part of the appropriate assessment stage of the HRA. At this stage, consideration was given to the requirement for mitigation to ensure that the projects brought forward under these National Developments do not adversely affect the integrity of any European sites. The 11 National Developments screened in and subject to appropriate assessment were:

- Energy Innovation Development on the Islands
- Pumped Hydro Storage
- Edinburgh Waterfront
- Dundee Waterfront
- Stranraer Gateway
- Clyde Mission
- Aberdeen Harbour
- Industrial Green Transition Zones
- Hunterston Strategic Asset
- Chapelcross Power Station Redevelopment, and

- High Speed Rail.

The appropriate assessment concluded that, subject to detailed design and the implementation of avoidance and mitigation measures, including further study and assessment where necessary, projects brought forward under each National Development could be delivered without adverse effect on the integrity of any European site, either alone or in-combination with other currently known plans or projects.

5.5 The HRA conclusion reached must be considered again at future stages of the planning process, including at development plan and project level, when more detailed information should be available to inform the assessment.

5.6 The recommendations given in this document for specific mitigation measures provide an initial starting point for incorporation into development plans or projects when taking forward proposals under National Developments. However, these can almost certainly be refined further once more detail on relevant proposals is known through the planning process. Moreover, a requirement for additional mitigation measures not suggested at this stage may also be identified based on the precise nature of relevant proposals and/or the occurrence / distribution of qualifying features in relation to the development.

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Annex A Appropriate Assessment of National Developments

Energy Innovation Development on the Islands

Summary Description of the National Development

Energy Innovation Development on the Islands supports proposed developments in the Outer Hebrides, Shetland and Orkney for renewable energy generation, renewable hydrogen production, infrastructure and shipping, and associated opportunities in the supply chain for fabrication, research and development . Any strategy for deployment of these technologies must enable decarbonisation at pace and cannot be used to justify unsustainable levels of fossil fuel extraction or impede Scotland's just transition to net zero.

The use of low and zero emission fuels will play a crucial role in decarbonising island and mainland energy use, shipping, strengthening energy security overall and creating a low carbon energy economy for the islands and islanders.

The following classes of development are included in the Energy Innovation Development on the Islands National Development.

Outer Hebrides - Supporting Arnish Renewables Base and Outer Hebrides Energy Hub. The classes below apply to development that is for delivery of the Arnish Renewables Base and Outer Hebrides Energy Hub:

a) New or updated on- and/or offshore infrastructure for energy generation from renewables exceeding 50 megawatts capacity
b) Electricity transmission cables and converter stations on- and/or offshore of 132kv and above;
c) Infrastructure for the production, storage and transportation of low and zero-carbon fuels (that are not electricity or heat) including renewable hydrogen; and hydrogen production related chemicals including ammonia with appropriate carbon capture linked to transport and storage infrastructure;
d) Improved oil storage infrastructure for Stornoway, with appropriate emissions abatement, and
e) Quay to service renewable energy, energy transportation, energy decommissioning, fabrication or freight handling, including new or enhance associated laydown or operational area at Arnish.

Shetland Islands – Supporting the ORION Clean Energy Project. The classes below apply to development that is for the delivery of renewable and low carbon aspects of the ORION project:

a) New or updated on- and/or offshore infrastructure for energy generation from renewables exceeding 50 megawatts capacity
b) Electricity transmission cables and converter stations on- and/or offshore of 132kv and above
c) Infrastructure for the production, storage and transportation of low and zero-carbon fuels (that are not electricity or heat) including renewable hydrogen; and hydrogen production related chemicals including ammonia with appropriate carbon capture linked to transport, storage, and utilisation infrastructure at Sullom Voe
d) Quay to service renewable energy, energy transportation, energy decommissioning, fabrication or freight handling, including new or enhanced

associated laydown or operational area at Sullom Voe, Scatsta, Lerwick, and Dales Voe
e) oil terminal modifications at Sullom Voe to maintain asset use moving towards net zero emissions, and
f) new infrastructure and/or upgraded buildings and facilities to support the transportation and storage of captured carbon.

Orkney Islands – Supporting Scapa Flow Future Fuels Hub and Orkney Harbours. The classes apply to development that is for the delivery of the Future Fuels Hub, new quay in Scapa Flow and the Orkney Logistics Base at Hatston, which support services for the renewable and marine energy and shipping sectors:

a) New or updated on and/or off shore infrastructure for energy generation from renewables exceeding 50 megawatts capacity;
b) Electricity transmission cables and converter stations on and/or off shore of 132kv and above;
c) Infrastructure for the production, storage and transportation of low and zero-carbon fuels (that are not electricity or heat) including renewable hydrogen; and hydrogen production related chemicals including ammonia with appropriate carbon capture linked to transport and storage infrastructure;
d) Quay to service renewable energy, energy transportation, energy decommissioning, fabrication or freight handling, including new or enhanced associated laydown or operational area at, Scapa Flow, and Hatston (Kirkwall); and
e) Oil terminal modifications at Scapa Flow to maintain asset use moving towards net zero emissions.

Potential Impacts on European Sites

With the exception of several port locations (for which see further below), there are no specific onshore locations referred to in this National Development. However, classes of development included under the National Development could have impacts on European sites, depending on where they are delivered For example, the construction of new renewable energy developments, new electricity transmission cables, or new pipelines for the transportation of fuels could, depending on their location, involve works within the boundary of European sites located across the islands groups covered by this National Development.

Industrial and manufacturing processes, including the manufacture of ammonia and/or hydrogen, can result in the emission of pollutants to the atmosphere. The main airborne pollutants associated with the ammonia / hydrogen manufacturing processes are oxides of nitrogen (NOx) and ammonia gas (NH_3). Ammonia gas can have a directly toxic effect upon vegetation and research suggests that this may also be true for NOx at very high concentrations (http://www.apis.ac.uk/). More significantly, greater NOx or ammonia concentrations within the atmosphere will lead to greater rates of nitrogen deposition to vegetation and soils. An increase in the deposition of nitrogen from the atmosphere is generally regarded to lead to an increase in soil fertility, which can have a serious deleterious effect on the quality of semi-natural, nitrogen-limited terrestrial habitats. The effects of pollution are likely to be of greater magnitude where the existing pollutant concentrations and deposition rates are low, as they are in the Western Isles, Orkney and Shetland. that would need careful consideration during detailed design and subsequent management of the port.

Arnish, Sullom Voe, Scatsta, Dales Voe, Scapa Flow, and Hatston (Kirkwall) are all in close proximity to numerous SPAs designated for breeding and non-breeding seabirds, which can forage over large areas of the marine environment. Port development, with an anticipated increase in number of ship movements, could have impacts on the qualifying species of these SPAs (and on other SPAs located at considerable distance due to the foraging ranges of many seabird species), in a number of ways. This may include through collisions, disturbance and associated displacement from foraging areas, and increased energetic expenditure due to flight or other evasion responses.

In a study by Fliessbach *et al* (2019), the distance at which different seabirds were found to elicit an 'escape' response from ships was found to vary between species. Those which were found to be most tolerant included gulls, gannet *Morus bassanus* and common guillemot *Uria aalge*, with the distance at which these species were disturbed being generally less than 150m from vessels. The most sensitive species to disturbance were found to include red-breasted merganser *Mergus serrator*, red-throated diver and black-throated diver *Gavia arctica*. For these species, disturbance was caused by vessels passing at distances of approximately 750m up to more than 1km. Image 1 below, which has been reproduced from Fliessbach *et al* (2019) sets out the distance at which different species were found to elicit an escape response from moving ships. Note that 'loon' is another name to refer to diver species, and Arctic loon is an alternative name for black-throated diver. Likewise, common murre is another name for common guillemot. All distances given in Image 1 are in metres.

Image 1 Escape distances of selected seabirds (reproduced from Fliessbach *et al* (2019))

	Individual				Flock		
Species	**Mean ± SD**	***N***	**Min**	**Max**	**Mean ± SD**	**Median**	***N***
Common scoter	1,600 ± 777	9,417	40	3,200	1,015 ± 727	800	591
Unidentified loon	1,374 ± 416	64	340	2,000	1,281 ± 424	1,200	40
Red-breasted merganser	1,178 ± 617	193	120	2,000	681 ± 485	500	41
Red-throated loon	750 ± 437	31	250	1,700	702 ± 348	600	21
Unidentified auk	750 ± 379	4	200	1,000	667 ± 416	800	3
Arctic loon	721 ± 616	31	80	2,000	562 ± 450	450	18
Velvet scoter	474 ± 304	1,062	30	2,000	444 ± 307	350	241
Black guillemot	417 ± 186	6	180	700	417 ± 186	410	6
Razorbill	395 ± 216	53	30	900	330 ± 219	280	23
Long-tailed duck	389 ± 227	8,274	10	1,500	325 ± 235	250	604
Horned grebe	343 ± 255	33	30	1,100	325 ± 268	265	24
Great-crested grebe	308 ± 248	58	50	900	288 ± 245	165	36
Common eider	277 ± 218	1,496	20	1,600	255 ± 195	200	290
Great cormorant	258 ± 215	187	30	1,500	287 ± 241	225	124
Red-necked grebe	221 ± 171	7	80	600	230 ± 186	175	6
Lesser black-backed gull	157 ± 105	51	30	500	159 ± 106	130	50
Herring gull	133 ± 83	115	15	300	110 ± 85	65	60
Northern gannet	127 ± 82	7	20	250	127 ± 82	120	7
Common murre	127 ± 110	86	15	500	137 ± 123	100	48
Mew gull	118 ± 113	12	20	400	118 ± 113	70	12
Black-headed gull	84 ± 70	9	20	250	86 ± 75	60	8
Great black-backed gull	79 ± 81	7	25	250	79 ± 81	40	7

The most sensitive species to disturbance listed in Image 1 above generally breed inland, or they are very rare breeding species in Scotland. There is consequently no potential for them to be disturbed at the nest by the operation of ports, and it is also unlikely that this would occur during the construction phase (although this may need to be confirmed through targeted field survey if there is the potential for nest sites to be situated within approximately 1km any works areas). Those species which nest in coastal habitats, including on cliffs, are generally more tolerant to human activities (e.g. gulls, gannet, common guillemot and others), such that disturbance would not be likely

at distances of less than 500m. It is therefore unlikely, given that very large ships in particular would need to travel in deeper water away from the coast, that disturbance of these birds at the nest would occur.

Waterborne pollution could occur during both the construction and operational phases of marine developments under Energy Innovation Development on the Islands. During both phases there is the potential for spills of fuels, oils or other contaminants. However, of likely greater impact would be any requirement for dredging activities, and the disposal of waste thereby generated.

The intrusive nature of dredging activities means that they can result in the release of seabed sediment into the water column. In addition, toxic contaminants such as organic material and heavy metals may also be released. The result of this is an increase in suspended sediment composition and the deposition of sediment many kilometres away from the source. As a general rule, impacts from sediment disturbance and sediment transport at any designated site that lies more than the distance of one tidal ellipse[10] away are unlikely to arise in practice. This is based on evidence from plume studies that even fine particles mobilised from the seabed settle out again to a large extent within the distance of one tidal excursion. The average distance over which there could be potential direct and indirect effects, as defined by an average tidal ellipse, is around 10-15km.

Dredging can also result in the loss of habitat which supports the prey species of breeding seabirds. For example, reef habitat is typically associated with high fish populations and is therefore excellent foraging grounds for species such as, terns, shearwaters and kittiwakes *Rissa tridactyla*. For birds, this habitat may reduce in quality due to its physical loss (i.e. smothering) from dredging or due to foraging displacement.

Fish hear sound and use this information to perceive their environment. Changes in noise levels are likely to affect a fish's behaviour, physiology, anatomy, and development. Increased noise levels can displace fish from a given area. Dredging activities which generate substantial noise therefore have the potential to indirectly affect seabirds by reducing the availability of fish prey.

Increased turbidity arising from suspended sediment can also occur as a result of dredging activities (including waste disposal) and could negatively impact the foraging efficiency of seabirds. Species that are most at risk include visual hunters which dive to capture their prey under the water such as cormorants, terns and gannets that are generally considered to reply heavily upon visual cue for hunting fish (Garthe *et al*, 2000).

Industrial activities such as dredging can attract seabirds, particularly gulls, due to increased shipping activity and construction works (Garthe and Hüppop, 1999). This could increase the collision risk of these birds leading to mortality. The collision risk is not just associated with birds on the surface but also with those below the surface in the case of plunge-diving seabirds. Research has indicated that an increase in vessels at night, particularly in poor visibility, can correlate with an increase in seabird collisions

[10] Elliptical packages of water will move to and fro over one tidal cycle, typically along a dominant axis, returning to almost the same position. These are 'tidal ellipses' (Thompson *et al*, 2005).

particularly when the birds are attracted to, or disoriented by, artificial lighting on the vessels (Merkel, 2010).

In summary, there are multiple impacts that may arise due to dredging activities:

- loss of supporting habitat
- disturbance and displacement of species
- suspended material could be transported by water currents and any contaminants within the sediment
- reduced seabird foraging efficiency
- changes to predator-prey interactions, and
- risk of injury and mortality.

Marine mammals are vulnerable to the impacts of noise generated by construction and other activities associated with ports, including dredging and the movement of vessels. Marine mammals have well-adapted auditory organs and use sound extensively for social communication, navigation and the detection of prey. Most anthropogenic sound is low frequency in nature and is within the audible range of many marine mammals. Increases in background noise and specific sound sources can impact marine mammals in a number of ways, including masking of important sounds such as vocalisations and hearing loss (both temporary and permanent). Disturbance caused by human-induced noise can displace marine mammals from areas which would otherwise be used for activities such as foraging.

Marine mammals are extremely powerful and agile swimmers with quick reflexes and good sensory capabilities. This equips individuals with the abilities to avoid anthropogenic structures when they are in good environmental conditions (i.e. reduced / low levels of turbidity). However, there are multiple published reports of marine mammal mortality attributed to collision with ships (e.g. Kraus, 1990; Wiley *et al*, 1994). Vanderlaan and Taggart (2007) also reported that with increasing vessel speed, the probability of lethal injury to whales increased. The greatest rate of change was observed between vessel speeds of 8.6-15 knots, when the probability of a lethal injury (as opposed to a ‘minor’ non-lethal injury) increased from 21% to 79%. At speeds above 15 knots, the probability of a collision being fatal approached 100%.

Ships are a major vector for the spread of invasive non-native species. These species can lead to the extinction of native plants and animals, destroy biodiversity, and permanently alter habitats. They can be introduced to an area by ship ballast water, accidental release, and most often, by people. However, since September 2017, ships have been required to manage their ballast water to remove, render harmless or avoid the uptake or discharge of aquatic organisms under the International Maritime Organization's Ballast Water Convention (https://www.imo.org/en/MediaCentre/HotTopics/Pages/Implementing-the-BWM-Convention.aspx). Under the Convention, all ships in international traffic are required to manage their ballast water and sediments to a certain standard, according to a ship-specific ballast water management plan. All ships also have to carry a ballast water record book and an international ballast water management certificate.

Relevant European Sites

Due to the nature of the National Development, which includes for port development in locations in the Outer Hebrides, Orkney and Shetland, coupled with the distances travelled by breeding seabirds and marine mammals, there are a very large number of

European sites which could be connected to Energy Innovation Development on the Islands.

Those which are most likely to be relevant are listed below:

- Inner Hebrides and the Minches SAC
- Scapa Flow SPA
- Orkney Mainland Moors SPA
- Hoy SPA
- East Mainland Coast, Shetland SPA, and
- Sullom Voe SAC.

Further details on these sites are given below.

However, as stated, there are many more European sites which will need to be considered by HRA at future stages of the planning process, both nearby and located much further afield. For example, at the screening stage in the HRA of NPF4, a minimum distance of 100km was used when considering connectivity to SPAs designated for breeding seabirds (this being extended for certain species, up to 2,365km for Manx shearwater *Puffinus puffinus*), while a distance of 50km was used for SACs designated for harbour porpoise and harbour seal, and up to 135km for SACs for which grey seal are a qualifying feature.

Inner Hebrides and the Minches SAC

The sole qualifying species of the Inner Hebrides and the Minches SAC is harbour porpoise, with the latest assessed condition of this feature being Favourable Maintained.

The Conservation and Management Advice document for this site, published by NatureScot (available from https://sitelink.nature.scot/site/10508) states that harbour porpoise present in shallower waters are exposed to a wide range of pressures that are both ubiquitous (e.g. pollution) and patchy (e.g. entanglement in nets). The species is considered to be sensitive to:

- removal of non-target and target species (i.e. entanglement in fishing gear and removal of their prey species)
- contaminants (e.g. through effects on water quality and bioaccumulation of contaminants that in turn affect survival and productivity rates)
- underwater noise, and
- death or injury by collision (predominantly in relation to collision with various types of fast moving vessels from commercial shipping to personal leisure craft).

The Conservation Objectives of the Inner Hebrides and the Minches SAC are:

1. To ensure that the Inner Hebrides and the Minches SAC continues to make an appropriate contribution to harbour porpoise remaining at favourable conservation status.
2. To ensure for harbour porpoise within the context of environmental changes, that the integrity of the Inner Hebrides and the Minches SAC is maintained through 2a, 2b and 2c.
    a) Harbour porpoise within the Inner Hebrides and the Minches SAC are not at significant risk from injury or killing.

b) The distribution of harbour porpoise through the site is maintained by avoiding significant disturbance.
c) The condition of supporting habitats and the availability of prey for harbour porpoise are maintained.

Scapa Flow SPA

Scapa Flow SPA lies within the enclosed waters of Scapa Flow, sheltered by Orkney Mainland to the north, Hoy, South Walls and Flotta to the west and south, and Burray and South Ronaldsay to the east. It is linked to the Pentland Firth on the south through the Sound of Hoxa, and to the Atlantic on the west through Hoy Sound. Much of Scapa Flow is between 20-30m deep, but there is a deeper trench at Brings Deeps, reaching just over 60m depth.

A diverse range of seabed habitats, including muddy sands, tide swept sands and gravels, kelp forests and maerl beds, support a diversity of marine life. These rich sheltered waters support large numbers of waterfowl, particularly in the winter months when frequent storms affect the surrounding North Sea and eastern Atlantic. The site is also used by breeding red-throated divers which feed almost exclusively at sea close to their freshwater breeding sites in the moorlands of Orkney Mainland and Hoy.

The qualifying species of Scapa Flow SPA are (all are non-breeding with the exception of red-throated diver):

- black-throated diver
- eider *Somateria mollissima*
- great northern diver *Gavia immer*
- long-tailed duck *Clangula hyemalis*
- red-breasted merganser
- red-throated diver
- shag *Phalacrocorax aristotelis*, and
- Slavonian grebe *Podiceps auritus*.

The Conservation Objectives for Scapa Flow SPA are:

- To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, subject to natural change, thus ensuring that the integrity of the site is maintained in the long-term and it continues to make an appropriate contribution to achieving the aim of the Birds Directive for each of the qualifying species.
- This contribution will be achieved through delivering the following objectives for each of the site's qualifying features:
  - avoid significant mortality, injury and disturbance of the qualifying features, so that the distribution of the species and ability to use the site are maintained in the long-term, and
  - to maintain the habitats and food resources of the qualifying features in favourable condition.

The Advice to Support Management document for Scapa Flow SPA (available from https://www.nature.scot/doc/scapa-flow-proposed-marine-spa-supporting-documents) identifies both navigational and maintenance dredging, and new port and harbour development in Scapa Flow as activities which are considered likely to affect the qualifying features of the site.

Orkney Mainland Moors SPA

The Orkney Mainland Moors SPA is designated for breeding and non-breeding hen harrier and breeding short-eared owl *Asio flammeus*. However, neither of these species is considered to be relevant to the offshore elements of Energy Innovation Development on the Islands (they may, however, be relevant to onshore projects, depending on their location). However, the site is also designated for breeding red-throated diver, which forage in the marine environment in Scapa Flow. There is consequently the potential for activities within Scapa Flow to affect the red-throated divers breeding in freshwater habitats within the Orkney Mainland Moors SPA.

According to the SPA citation, the site supports on average 18 breeding pairs of red-throated diver, representing approximately 2% of the British population. The latest assessed condition for red-throated diver within the SPA was Favourable Maintained.

The Conservation Objectives for Orkney Mainland Moors SPA are:

- To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained.
- To ensure for the qualifying species that the following are maintained in the long term:
  - population of the species as a viable component of the site
  - distribution of the species within the site
  - distribution and extent of habitats supporting the species
  - structure, function and supporting processes of habitats supporting the species, and
  - no significant disturbance of the species.

Hoy SPA

Hoy SPA encompasses a diverse mix of habitats, including high sea cliffs, which between them support an important assemblage of moorland breeding birds and breeding seabirds. The qualifying species of Hoy SPA are the following breeding birds [and their latest assessed condition]:

- Arctic skua *Stercorarius parasiticus* [Unfavourable Declining]
- fulmar *Fulmaris glacialis* [Unfavourable No change]
- great black-backed gull *Larus marinus* [Unfavourable Declining]
- great skua *Stercorarius skua* [Unfavourable Declining]
- guillemot [Unfavourable No change]
- kittiwake [Unfavourable Declining]
- peregrine *Falco peregrinus* [Favourable Maintained]
- puffin *Fratercula arctica* [Unfavourable Declining]
- red-throated diver [Favourable Maintained], and
- the breeding seabird assemblage, which regularly exceeds 20,000 individuals [Unfavourable Declining].

The Conservation Objectives for Hoy SPA are:

- To avoid deterioration of the habitats and of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained.
- To ensure for the qualifying species that the following are maintained in the long term:
  - population of the species as a viable component of the site
  - distribution of the species within the site
  - distribution and extent of habitats supporting the species
  - structure, function and supporting processes of habitats supporting the species, and
  - no significant disturbance of the species.

East Mainland Coast, Shetland SPA

This SPA stretches from Fish JHolm and Lunna Ness in the north, southwards to the coast of Bressay. The diversity of fish, polychaete worms, gasteropod and bivalve molluscs dependent upon the sediments and seaweeds present form potential prey for waterbirds frequenting the area. The qualifying species of East Mainland Coast, Shetland SPA are the following bird species [and their latest assessed condition]:

- non-breeding great northern diver [Favourable Maintained]
- breeding red-throated diver [condition not assessed], and
- non-breeding Slavonian grebe [Favourable Maintained].

The Conservation Objectives for East Mainland Coast, Shetland SPA are:

1. To ensure that the qualifying features of East Coast Mainland, Shetland SPA are in favourable condition and make an appropriate contribution to achieving Favourable Conservation Status
2. To ensure that the integrity of East Mainland Coast, Shetland SPA is maintained in the context of environmental changes by meeting objectives 2a, 2b and 2c for each qualifying feature:

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

Sullom Voe SAC

Sullom Voe SAC is designated for the following habitats [and their latest assessed condition]:

- lagoons [Favourable Maintained]
- reefs [Favourable Maintained], and
- shallow inlets and bays [Favourable Maintained].

The Conservation Objectives of Sullom Voe SAC are:

1. To ensure that the qualifying features of Sullom Voe SAC are in favourable condition and make an appropriate contribution to achieving favourable conservation status.
2. To ensure that the integrity of Sullom Voe SAC is maintained in the context of environmental change by meeting objectives 2a, 2b and 2c for each qualifying feature.
    a) Extent and distribution of the habitat within the site.
    b) Structure and function of the habitat and the supporting environment on which it relies.
    c) Distribution and viability of typical species of the habitat.

Assessment of Effects on Site Integrity

At this stage, the location of onshore projects which could be brought forward under the National Development are largely unknown, but could include renewable energy generating schemes and other infrastructure required for manufacture, storage or transport of traditional and new fuels and electricity. Where any such schemes are proposed in proximity to European sites, avoidance of habitat loss from within their boundaries will need to be achieved through project design, unless it can be demonstrated through project-level HRA that it would not adversely affect the integrity of any impacted European site and its Conservation Objectives (these circumstances will be very limited). The loss of either qualifying habitat or habitat which supports qualifying or ‘typical’ species has the potential to be considered significant as it may undermine the Conservation Objectives for a given site. NatureScot in SNH (2014a) gives several examples of cases from across the UK in which development proposals would have resulted in the direct loss of qualifying habitats. In some, the loss of small areas, representing less than 1% of the total resource within the relevant European site, were considered to represent a significant adverse effect. At this stage, however, it is considered that through scheme design, losses of habitat from within the boundary of European sites will be avoided.

A detailed assessment of air quality impacts on European sites will be required for any development brought forward which involves emissions to the atmosphere. This should be based on the screening buffers advised by the Department for Environment, Food and Rural Affairs (Defra) and the Environment Agency (EA), namely 10km for most emitters, extended up to 15km for major emitters (https://www.gov.uk/guidance/air-

emissions-risk-assessment-for-your-environmental-permit#screen-out-pecs-from-detailed-modelling). This will require the input of air quality specialists and ecologists to determine whether any identified impacts from air pollution could significantly affect any European sites. As the specific projects which may be brought forward are not known at this stage, it is only possible to state that projects which are predicted to result in pollutant rates at European sites which exceed 1% of the relevant critical load[11] or critical level[12] for the applicable habitats could result in an adverse effect on the integrity of that site. However, there is considerable precedent for emitters to be delivered within 10-15km of European sites without adverse effects on the integrity of European sites (for example through the use of technology to reduce NOx and ammonia emissions). Therefore, with a requirement for detailed air quality modelling and accompanying ecological assessment, and any associated process improvements, it will be possible to avoid developments being progressed which could adversely affect the integrity of any European site.

Although the ports of Sullom Voe and (potentially) Scatsta lie within Sullom Voe SAC, the type of development which may be progressed at these locations is not currently known. There are a number of classes of development under Energy Innovation Development on the Islands which could potentially be delivered at these locations without any associated loss of habitat from within the SAC. However, and as set out above in relation to onshore projects, any port development which would involve the loss of habitat, especially reef and shallow inlets and bays habitat, from within the SAC has a high likelihood of adversely affecting the integrity of the site. The loss of any such habitat should therefore be avoided through project design. However, as stated above, the distribution of rocky reef habitat includes areas immediately adjacent to the existing port infrastructure, according to NatureScot.

Marine mammals are vulnerable to the impacts of underwater noise. There is the possibility of construction activities associated with port development having adverse impacts on the qualifying species of several European sites. In particular, the Inner Hebrides and the Minches SAC is located in very close proximity to Arnish, and works here could impact the qualifying harbour porpoise population (when occurring both within and outside the boundary of the site). Ship movements to and from all port locations could also have adverse impacts on marine mammals through disturbance, pollution, collision mortality etc. However, there are several avoidance and mitigation measures (described below) which can be implemented to minimise the risk of these impacts occurring, or to reduce the severity of the impacts, and it is consequently expected that such activities could take place without adverse effects on European site integrity.

Published research indicates that birds which forage in the marine environment are susceptible to impacts from ship movements, but that this varies between species. As there are existing port facilities at Arnish, Sullom Voe, Dales Voe and Kirkwall, it is probable that birds using habitats in these areas are habituated to some degree to the

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[11] Critical load is defined as “a quantitative estimate of exposure to one or more pollutants below which significant harmful effects on specified sensitive elements of the environment do not occur according to present knowledge” (http://www.apis.ac.uk/).

[12] Critical level is defined as “concentrations of pollutants in the atmosphere above which direct adverse effects on receptors, such as…plants [or] ecosystems, may occur according to present knowledge” http://www.apis.ac.uk/).

passage of ships. The potential for significant effects as a result of disturbance is therefore likely to be reduced.

However, the construction and operation of a deep water port for ultra large ships in Scapa Flow is likely to substantially change the conditions within this area, which is currently not known to be frequently used by ships, and especially not those of the size which could be expected to use a new deep water port. Birds in Scapa Flow are therefore much less likely to be habituated to the disturbance caused by ship movements. Furthermore, Scapa Flow SPA is designated for several species of bird which are considered to be most sensitive to ship movements, including red-throated diver during the breeding season, and, during the non-breeding season, red-breasted merganser and black-throated diver.

As the precise location for dredging, including waste disposal, is unknown at this stage, it will be necessary to assess in more detail at future stages in the planning process any potential for the impacts associated with these activities to affect the qualifying features of Scapa Flow SPA, Orkney Mainland Moors SPA, Hoy SPA, and other European sites.

Related to this, and as set out above under 'Potential Impacts on European Sites', NatureScot advise in the Advice to Support Management document for Scapa Flow SPA that all of the qualifying features of the site are sensitive to the impacts of dredging and dredge waste disposal activities. NatureScot state that the following impacts are of relevance:

- disturbance from vessel movement – red-throated divers are considered to have high sensitivity to visual disturbance during the breeding season. Great northern diver, black-throated diver, Slavonian grebe and red-breasted merganser are considered to have medium sensitivity to visual disturbance caused by vessel movements. Long-tailed duck, shag, eider and goldeneye *Buccephala clangula* are considered to have low sensitivity to such visual disturbance, with some level of habituation occurring. For eider, however, during periods of flightless moults, their ability to avoid vessel movement will be reduced
- changes in water clarity – all qualifying features rely on underwater visibility to capture prey and/or forage on the seabed
- removal of prey species, and
- abrasion and smother of supporting habitat for prey species – all qualifying species could be affected by a reduction in availability of prey species due to damage of habitat which supports those species.

Therefore, it is concluded that, due to likely habituation of birds using marine environment around Arnish, Kirkwall and Sullom Voe, subject to the implementation of avoidance and mitigation measures (described below), it is possible that port developments could be progressed at these locations without adverse effects on the integrity of any European site. However, for the following reasons, the same conclusion cannot be drawn for development of a new deep water port in Scapa Flow:

- the currently largely undisturbed nature of Scapa Flow means it is unlikely that birds using this area of sea are habituated to ship movements, and especially not to those of ultra large ships, and
- the qualifying species of Scapa Flow SPA are considered to be sensitive to disturbance by ship movements and therefore at further risk of adverse effects.

In response to this conclusion, the development class ‘quay handling facilities for ultra large container ships in Scapa Flow’ was removed from the draft NPF4 for the Energy Innovation Development on the Islands National Development.

In-combination Assessment

It is possible that port developments around Orkney, including in Scapa Flow and at Kirkwall, as well as at other locations identified in the Orkney Harbours Masterplan, could generate impacts which act cumulatively to have significant adverse effects on European sites. This could include impacts of disturbance / displacement of birds caused by construction and/or operational activities, such as vessel movements and dredging activities. These activities could similarly impact marine mammals belonging to several SACs.

Other National Developments which support port developments along the east coast of Scotland have the potential to generate in-combination impacts with projects brought forward under Energy Innovation Development on the Islands. These may include Aberdeen Harbour, Industrial Green Transition Zones, Dundee Waterfront and Edinburgh Waterfront. This will need to be assessed fully at future stages of the planning process, including at project level. However, given the distance between these National Developments, and the highly mobile nature of qualifying species which could be impacted (particularly seabirds and marine mammals), it is unlikely, with suitable avoidance and/or mitigation measures being implemented, that there would be any significant in-combination effects on a European site.

A search of the Marine Scotland maps website (https://marinescotland.atkinsgeospatial.com/nmpi/default.aspx?layers=712) indicates that there are two existing open dredge disposal sites just outside of Scapa Flow, one to the south, and just south of the Sound of Hoxa, and one to the west, which appears to be located in Bring Deeps (a channel between Hoy and the mainland). There are similarly open dredge disposal sites near to Arnish and Sullom Voe. There does not, however, appear to be any such site on the north side of the Orkney mainland, close to Kirkwall. Should any new site(s) be used for the disposal of any dredge waste generated by development associated with Energy Innovation Development on the Islands, there is the potential for the impacts this may cause to act in-combination with any such impacts generated through the use of these existing sites. To avoid the potential for this, it is recommended that, where possible, dredge waste from the National Development be disposed of in one of the existing disposal sites.

The construction and operation of offshore wind energy developments off the north and east coasts of Scotland has the potential to impact on seabirds and marine mammals in a variety of ways (for example, disturbance during construction, and collision mortality and displacement during construction and/or operation). The significance of effect generated by these impacts can only be determined at the project level, using robust data collected specifically to inform the assessment for each development. Any impacts generated by the developments have the potential to act in-combination with impacts caused by proposals brought forward under the Energy Innovation Development on the Islands National Development. Furthermore, the construction and operation of wind energy developments in these areas may also likely to be directly relevant to Energy Innovation Development on the Islands as port development brought forward under the National Development may be directly related to construction and/or maintenance of offshore wind developments. At this stage, it can only be concluded that measures are available (listed below)) to avoid or reduce the potential impacts which occur at existing ports across the Western Isles, Orkney and Shetland (with the exception of Scapa

Flow) and that, if these are implemented where necessary, it should be possible to avoid adverse effects on European site integrity. However, and as already stated, this will need to be assessed for each wind energy development and for other possible wind energy developments off the north and east coasts of Scotland cumulatively.

Other offshore renewable energy projects, for example those existing and proposed at the European Marine Energy Centre (EMEC), but also in other locations across the Western Isles, Orkney and Shetland, could similarly generate impacts which act cumulatively with projects progressed under Energy Innovation Development on the Islands to result in adverse effects on European site integrity.

Avoidance and Mitigation

The following mitigation measures are recommended to avoid or minimise the identified impacts which could arise from projects brought forward under the Energy Innovation Development on the Islands National Development:

- all proposed developments must undergo project-level HRA to ensure there are no adverse effects on the integrity of any European site
- further study to determine whether any habitat surrounding onshore projects brought forward under Energy Innovation Development on the Islands is functionally-linked to a European site. This could include targeted field survey, potentially to be carried out over multiple years. Where land is found to be used as functionally-linked habitat, its loss should be avoided as far as possible through project design
- where construction works are proposed in proximity to a European site or habitat which is functionally-linked to a terrestrial European site designated for animal species, measures to avoid disturbance of the qualifying species will be required. This may include
  - the use of temporary or permanent screening to reduce noise and/or visual impacts. For example, noise reducing barriers may be used as a temporary solution during construction. Planting of hedgerows and/or trees may provide a more permanent, longer-term measure to screen operational activities
  - using technology and best available techniques which minimise the generation of noise during construction and operation
  - a ‘soft-start’ may be adopted for all potentially disturbing activities to minimise the risk of impacts on waterbirds within at least 300m. This involves gradually increasing the intensity of an activity (for example the noise it generates) over a period of time to allow birds to habituate to the source
- pollution prevention measures will be required during the construction and operation of any project. These should follow the Pollution Prevention Guidelines (PPGs) / Guidance on Pollution Prevention (GPP) published by SEPA, and may include (but not necessarily be limited to):
  - controls and contingency measures to manage run-off from construction areas and to manage sediment
  - all oils lubricants or other chemicals should be stored in an appropriate secure container in a suitable storage area, with spill kits provided across the development site
  - in order to avoid pollution of soils, vegetation and/or watercourses, all refuelling and servicing of vehicles and plant should be carried out in a designated area which is bunded and has an impermeable base. This should be at least 50m from any watercourse / waterbody
- air quality modelling for any development which involves emissions to air. Guidance on the assessment of air quality impacts on European sites (for

example CIEEM, 2021; Holman *et al*, 2019) must be followed to determine that emissions will not adversely affect the integrity of any European site, either alone or in-combination with other sources of air pollution
- the design of a project should seek to maintain existing surface water conditions
- further study, including targeted survey if necessary, is likely to be required to determine the distribution of seabirds in the vicinity of any new routes for ships to and from port developments or offshore energy developments progressed under this National Development. The results of this study will help to identify any particularly important areas for seabirds
- based on the findings of the aforementioned study, a well-defined route for the movement of ships should be created, avoiding any area(s) identified as being important for seabirds. This will help to minimise the effects of displacement from foraging areas, will reduce the area over which disturbance may occur and may also help to reduce the risk of injury or mortality
- a maximum speed limit may be required for ships to minimise the risks of disturbance or mortality of seabirds and/or marine mammals
- where dredging is required to enable a proposed project, this should be fully assessed and carefully designed, sited and/or timed to avoid or minimise impacts on qualifying species including seabirds and marine mammals
- dredging must make use of Best Available Techniques/Technology (BAT) most appropriate to the seabed type to avoid excessive sediment mobilisation
- the location of any dredge waste disposal site(s) would also need to be informed by detailed study and should avoid sensitive locations of importance to breeding seabirds or marine mammals. Ideally, existing open dredge disposal sites would be used
- it may be necessary to impose seasonal restrictions on construction and/or operational activities, including dredging, to avoid sensitive periods for relevant species (for example to avoid the red-throated diver breeding season). However, in some locations, including Scapa Flow and Dales Voe, European sites are designated for breeding and non-breeding species and thus seasonal restrictions may not be effective, and
- survey for the presence of invasive non-native plant species on land which will be impacted by development. Suitable biosecurity measures will need to be devised based on the species present and their distribution, and the nature of works to take place. Such measures will need to be set out in a Biosecurity Management Plan or similar but must be designed to prevent the spread of such species from the site. Wherever possible, the possibility of eradication from the site should also be investigated.

Conclusion

With the implementation of mitigation measures, it is considered that projects progressed under all classes of development included in the Energy Innovation Development on the Islands National Development could be delivered with no adverse effect on the integrity of any European site. This conclusion would need to be re-examined for planning applications when a much greater level of detail regarding the design and delivery of the scheme will be available. This conclusion has only been reached after the class of development ‘quay handling for ultra large container ships in Scapa Flow’ was removed from the draft NPF4.

This conclusion is based on the fact that certain classes of development under Energy Innovation Development on the Islands are likely to be deliverable without any loss of habitat from within the boundary of Sullom Voe SAC or East Mainland Coast, Shetland SPA. However, it is possible that port infrastructure upgrades or expansion at the ports

of Sullom Voe and Scatsta could result in the loss of qualifying habitat from within the boundary of the Sullom Voe SAC. Similarly, port development at Dales Voe could result in the loss of habitat from within the East Mainland Coast, Shetland SPA. The loss of habitat from within the boundary of any European site has a high probability of causing an adverse effect on site integrity. As stated, HRA will be required to assess individual proposals.

A thorough assessment of the potential for in-combination effects to arise with other plans or projects will also be required for individual proposals brought forward under the National Development. In particular, the potential impacts of offshore wind energy developments must be carefully considered at the project level as these schemes could promote additional development under Islands Hubs for Fuels and/or act in-combination with other projects under the National Development.

Pumped Hydro Storage

Summary Description of the National Development

Some or all of the possible impact types arising from the expansion of Cruachan may be relevant to other schemes brought forward elsewhere in Scotland. However, any other proposals for pumped hydro storage facilities will require their own HRA to be carried out.

The following classes of development are included in the Pumped Hydro Storage National Development:

a) New and/or expanded and/or upgraded water holding reservoir and dam;
b) New and/or upgraded electricity generating plant structures or buildings;
c) New and/or upgraded pump plant structures or buildings;
d) New and/or expanded and/or upgraded water inlet and outlet pipework;
e) New and/or upgraded substations and/or transformers; and
f) New and/or replacement transmission cables.

Potential Impacts on European Sites

The currently proposed layout of the Cruachan expansion (https://www.cruachanexpansion.com/wp-content/uploads/2021/10/Cruachan-Expansion-EIA-Scoping-Report.pdf, accessed 06 January 2022) includes infrastructure within the boundary of two European sites: Loch Etive Woods SAC, and Glen Etive and Glen Fyne SPA. Further information on both sites can be found below. However, due to the potential requirement for construction within these sites, there is the possibility for the direct loss of both qualifying habitat and/or habitat which supports qualifying species. Construction in areas outside of the boundaries of these sites may also result in the loss of functionally-linked habitat used by the qualifying species, namely golden eagle and otter.

Construction and/or operation of the scheme could result in waterborne pollution, for example through spillages of fuel, oils, chemicals or other pollutants. This could impact the qualifying otter population directly (for example through injury or mortality), or indirectly should it lead to a reduction in prey availability (for example by causing fish mortality).

Any changes to existing hydrological conditions could impact the qualifying features of the Loch Etive Woods SAC. This could occur should there be changes to groundwater or surface water flows or volumes, where these support qualifying woodland habitat. Similarly, there could be impacts on otter should changes to hydrology reduce prey availability (primarily fish) or prevent this species from commuting to locations currently used for foraging.

Construction and operation could cause disturbance of the qualifying species of the Loch Etive Woods SAC and Glen Etive and Glen Fyne SPA. Standing advice provided by NatureScot recommends that a works exclusion zone of 200m should be established around any otter breeding site, though this can be reduced to 100m depending on the nature of the works, topography and natural screening. For otter resting sites which are not used for breeding, NatureScot suggests that the buffer can be reduced to 30m (https://www.nature.scot/doc/standing-advice-planning-consultations-otters). It can

therefore be taken that, beyond 30-200m, disturbance of otter from construction and/or operational activities would be unlikely to occur. Ruddock and Whitfield (2007) concluded following a literature review and expert opinion survey that the upper distance at which active disturbance of breeding golden eagles was likely to occur was between 750m and 1,000m. However, they note that some expert responses suggested that disturbance could occur at distances of 1.5km, and that previous recommendations had been that disturbance could occur at this range (e.g. Currie and Elliot, 1997). Forestry and Land Scotland (FLS) also recommends establishing works exclusion zones of between 750-1,500m between active golden eagle nests and forest operations (FCS, 2006). While the potential for disturbance depends to some extent on the location of any golden eagle nests in relation to works activities, it is possible that any nest within 1.5km may be subject to disturbance during the construction and/or operational phase.

Linked to disturbance and habitat loss is the potential for qualifying species to be displaced from an area, both within and outside the boundaries of the European sites, which they use for activities including breeding, foraging and commuting. The magnitude of such an impact would depend on the scale of disturbance and the importance of the particular area(s) to the qualifying species. The latter could only be determined reliably through further detailed study, including field survey.

Injury or mortality of golden eagles during construction and/or operation is highly unlikely. However, there is the potential for the accidental injury or death of otter during construction, for example through collision with vehicles or plant, or by becoming trapped in excavations.

It is understood that the proposed operation of the Cruachan expansion will not involve the transfer of water from any additional catchments which do not already feed into the existing scheme. Assuming that this remains the case, and no water is transferred between new catchments not currently connected to the scheme, there is no potential for the spread of aquatic invasive non-native species.

However, the presence of invasive non-native species including *Rhododendron ponticum* is identified in the Conservation Advice Package for Loch Etive Woods SAC as an existing pressure on the condition of the qualifying habitats. Construction works, if undertaken without suitable control measures in place, have the potential to cause the spread of such species, potentially exacerbating their negative effects. However, the spread of terrestrial invasive non-native plants can be readily avoided through the implementation of standard biosecurity measures. This will require a suitable survey of the project site to be carried out to search for the presence of invasive non-native plants. This should seek to identify potential infestation pathways and the precise methods for control and, where possible, eradication. With the adoption of such measures, there will be no adverse effect on the integrity of any Loch Etive Woods SAC.

Relevant European Sites

Based on the location of the scheme and the potential impacts which could arise from the expansion of Cruachan pumped hydro storage facility, the following European sites are considered to be relevant:

- Loch Etive Woods SAC; and
- Glen Etive and Glen Fyne SPA.

The National Development includes new and/or replacement transmission cables directly linked to a pumped hydro storage scheme. While the route for connection to the grid from Cruachan expansion is unknown, it is possible that this could involve new or upgraded lines through European sites, for example Ben Lui SAC to the east.

Loch Etive Woods SAC

Loch Etive Woods SAC is a multi-part site containing native woodland types and associated flora and fauna. The qualifying features [and latest assessed condition] of Loch Etive Woods SAC are:

- mixed woodland on base-rich soils associated with rocky slopes [Favourable Declining]
- western acidic oak woodland [Unfavourable Recovering]
- alder woodland on floodplains [Unfavourable Recovering], and
- otter [Favourable Maintained].

Both mixed woodland on base-rich soils associated with rocky slopes and alder woodland on floodplains are 'priority' habitat types of the Habitats Directive[13]. Habitats identified as being priorities under the Habitats Directive are those considered to be at risk of disappearance and whose natural range mainly occurs in Europe.

Identified negative pressures on the qualifying habitats of the SAC are over-grazing and the presence of invasive non-native species.

The overarching Conservation Objectives for the qualifying woodland habitats of Loch Etive Woods SAC are:

1. To ensure that the qualifying features of Loch Etive Woods SAC are in favourable condition and make an appropriate contribution to achieving favourable conservation status.
2. To ensure that the integrity of Loch Etive Woods SAC is restored by meeting objectives 2a, 2b and 2c for each qualifying feature. These are set out in Table A1.

[13] Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora, more commonly known as the 'Habitats Directive'.

Table A1 Conservation Objectives 2a, 2b and 2c for the qualifying habitats of Loch Etive Woods SAC

Qualifying habitat	Conservation Objective 2a	Conservation Objective 2b	Conservation Objective 2c
Mixed woodland on base-rich soils associated with rocky slopes	Maintain the extent and distribution of the habitat within the site	Maintain the structure, function and supporting processes of the habitat	Maintain the distribution and viability of typical species of the habitat
Western acidic oak woods	Maintain the extent and distribution of the habitat within the site	Restore the structure, function and supporting processes of the habitat	Maintain the distribution and viability of typical species of the habitat
Alder woodland on floodplains	Maintain the extent and distribution of the habitat within the site	Restore the structure, function and supporting processes of the habitat	Maintain the distribution and viability of typical species of the habitat

Further information on the Conservation Objectives 2a, 2b and 2c for the qualifying woodland habitats can be found in the Conservation Advice Package for Loch Etive Woods SAC.

The Conservation Objectives for otter are:

1. To ensure that the qualifying features of Loch Etive Woods SAC are in favourable condition and make an appropriate contribution to achieving favourable conservation status.
2. To ensure that the integrity of Loch Etive Woods SAC is restored by meeting objectives 2a, 2b and 2c for each qualifying feature.
    a) Maintain the population of the species as a viable component of the site.
    b) Maintain the distribution of the species throughout the site.
    c) Maintain the habitats supporting the species within the site and availability of food.

Glen Etive and Glen Fyne SPA

Glen Etive and Glen Fyne SPA is a large, predominantly upland site. It rises from sea level to over 1,100m and encompasses a diverse range of habitats including moorland, rough grassland, blanket bog, native woodland, montane heaths and exposed rock and scree. There are also numerous freshwater lochs and river systems.

The sole qualifying feature of the SPA is golden eagle, with the site supporting 19 active territories in 2003, which represented more than 4.2% of the British population. The species was last assessed as being in Favourable Maintained condition within the SPA, and the sole identified negative pressure was recreation / disturbance.

The conservation objectives of Glen Etive and Glen Fyne SPA are:

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

- To ensure for the qualifying species that the following are maintained in the long term:
  - population of the species as a viable component of the site
  - distribution of the species within the site
  - distribution and extent of habitats supporting the species
  - structure, function and supporting processes of habitats supporting the species, and
  - no significant disturbance of the species.

Assessment of Effects on Site Integrity

The total area of the Loch Etive Woods SAC is approximately 2,642.59ha, with the extent of each the qualifying woodlands being as follows:

- mixed woodland on base-rich soils – 103.06ha
- western acidic oak woods – 1,005.24ha, and
- alder woodland on floodplains – 38.05ha.

The loss of any area of qualifying habitat has the potential to be considered significant, in that it may undermine Conservation Objective 2a for all three woodland types, to maintain their extent and distribution within the SAC. NatureScot in SNH (2014a) gives several examples of cases from across the UK in which development proposals would have resulted in the direct loss of qualifying habitats. In some, the loss of small areas, representing less than 1% of the total resource within the relevant European site, were considered to represent a significant adverse effect. The most relevant example describes the planned upgrading of the Fort William to Mallaig A830 trunk road through Glen Beasdale SAC. In this case, the road improvements resulted in the loss of approximately 7.9ha of qualifying western acidic oak wood, equal to around 2.5% of the total area of this habitat, and under 1.6% of the total SAC area. In the absence of compensatory measures, this loss was considered to result in an adverse effect on the integrity of the SAC.

It will therefore be necessary to avoid any loss of habitat from within the boundary of Loch Etive Woods SAC through project design. At this stage it is considered that this is likely to be feasible, especially as much of the infrastructure associated with pumped hydro storage facilities is underground and there is already built infrastructure, including access tracks, associated with the existing Cruachan facility. Where losses of qualifying habitat cannot be avoided, the extent to which these are significant or not will depend on their implications for the Conservation Objectives, which will need to be determined by project-level HRA. However, as set out above, even a very small loss may be considered to result in an adverse effect on site integrity. If, following detailed project design, losses of qualifying habitat cannot be avoided, consultation with NatureScot will be essential to inform the HRA for the planning application(s). However, at the NPF4 level it has been assumed that the scheme can be delivered without loss of qualifying habitats for the SAC.

Similarly, when considering the Glen Etive and Glen Fyne SPA, it will be necessary for targeted field survey to be completed to determine whether losses of habitat (either from outside or within the boundary of the site) would result in the loss of any area of relative importance to any golden eagles belonging to the SPA population. The potential for adverse effects on the integrity of Glen Etive and Glen Fyne SPA from any such habitat losses would need to be determined through project-level HRA.

Waterborne pollution is a risk whenever construction takes place near a European site. However, with the implementation of standard pollution prevention measures, which are widely adopted and reliable, there is unlikely to be any effect from waterborne pollution on the qualifying features of Loch Etive Woods SAC or Glen Etive and Glen Fyne SPA. Relevant pollution prevention guidance and high-level measures which may be needed are given below.

SEPA guidance on groundwater dependent terrestrial ecosystems (GWDTE) indicates that mixed woodland on base-rich soils and western acidic oak woods are unlikely to be groundwater-dependent (SEPA, 2017). Although alder woodland on floodplains is considered to be highly groundwater-dependent (at least in some situations), it is unlikely that this qualifying habitat is present in the vicinity of the infrastructure associated with Cruachan expansion as there is no floodplain in this area. Consequently, impacts on groundwater are unlikely to significantly affect the qualifying habitats of Loch Etive Woods SAC. Although there may be groundwater-dependent habitats within the boundary of Glen Etive and Glen Fyne SPA which could be impacted by the project, such impacts are very unlikely to reduce prey availability for golden eagles. It is therefore very unlikely that any changes to groundwater hydrology caused by the expansion of Cruachan would adversely affect golden eagles.

Measures to maintain surface water hydrology will be required, including culverts which allow the continuation of existing water flows. In particular, all watercourses must remain passable to otter to ensure that there are no new barriers to the movement of this species. Good practice guidance on the design of watercourse crossings which allow mammal passage has been published by SEPA and should be followed (SEPA, 2010).

Disturbance of breeding otter or golden eagle could occur during the construction or operational phases. While otters may breed at any time of year, golden eagle breeding generally takes place between February and August, inclusive (SNH, 2014b). An understanding of the distribution of these species will be needed to assess the potential for disturbance to occur and to inform mitigation requirements. Existing data on the known distribution of these species may also be available (for example, in the case of golden eagle, from the Argyll Raptor Study Group). However, targeted field survey is likely to be required for both species, and this may need to be conducted over more than one year (in particular for golden eagle). As described above, disturbance of otter could occur up to distances of 200m from the most intensive of activities. Breeding golden eagle may be disturbed at distances of up to 1.5km. The disturbance of either species while breeding may affect the success of that breeding attempt and, in a worst-case scenario, could lead to the failure to rear young in that year. This impact is most likely to occur during the construction phase, when works activities will be most intensive and have the highest chance of causing disturbance. During the operational phase, activities are expected to be relatively minor and the probability of disturbance being caused will be much reduced. Depending on the location of identified nest sites, it may therefore be necessary to restrict works activities during the golden eagle breeding season and/or to implement works exclusion zones around active golden eagle nests or otter breeding sites. It should be noted that not only would this be required to avoid adverse effects on the European sites, but both otter and golden eagle are protected from disturbance by other wildlife legislation meaning that there is a legal obligation to avoid any such impact. With the implementation of mitigation, as required, it will be possible to avoid disturbance impacts on otter and golden eagle, and no adverse effect on the integrity of any European site is predicted.

The risk of accidental injury or mortality of otter during construction is low and reduces further during the operational phase when the level of human activity will be minor. Standard good practice construction techniques and mitigation, described below, can reduce the risk of otter injury or mortality during construction. It is therefore very unlikely that this impact would affect the conservation status of the species within the Loch Etive Woods SAC.

In-combination Assessment

With the adoption of specific mitigation measures, it is considered at this stage that the only possible impact from Cruachan expansion which could arise from other plans or projects to have adverse effects on European site integrity is the loss of habitat from within Loch Etive Woods SAC or Glen Etive and Glen Fyne SPA.

Any other project or plan which leads to the loss of qualifying woodland habitat from Loch Etive Woods SAC or an extensive area of habitat which supports golden eagles of the Glen Etive and Glen Fyne SPA could combine with any losses from the expansion of Cruachan. In this way, even if unavoidable losses from the expansion of Cruachan were deemed to be insignificant on their own, when combined with additional losses from other developments, the effect could become significant. However, at this stage, no such projects or plans have been identified. It is also assumed that it will be possible to avoid the loss of qualifying habitat of Loch Etive Woods SAC from the expansion of Cruachan through project design. In relation to Glen Etive and Glen Fyne SPA, it is assumed that loss of habitat will either be avoided or be will be so small as to be of no consequence, even if added to losses caused by other plans or projects. The potential for in-combination effects is therefore currently ruled out. This must be verified at the project-level when carrying out the HRA of Cruachan expansion.

Avoidance and Mitigation

The following mitigation measures are recommended to avoid or minimise the identified impacts which could arise from the expansion of Cruachan on Loch Etive Woods SAC and/or Glen Etive and Glen Fyne SPA:

- all proposed developments must undergo project-level HRA to ensure there are no adverse effects on the integrity of any European site
- construction works near or at any retained trees within the boundary of Loch Etive Woods SAC should follow guidance in British Standard 5837:2012 *Trees in relation to design, demolition and construction – Recommendations* (British Standards Institution, 2012)
- pollution prevention measures will be required during the construction and operation of the scheme. These should follow good practice PPGs / GPP published by SEPA, and may include (but not necessarily be limited to):
  - controls and contingency measures to manage run-off from construction areas and to manage sediment
  - all oils lubricants or other chemicals should be stored in an appropriate secure container in a suitable storage area, with spill kits provided across the development site
  - in order to avoid pollution of soils, vegetation and/or watercourses, all refuelling and servicing of vehicles and plant should be carried out in a designated area which is bunded and has an impermeable base. This should be at least 50m from any watercourse / waterbody
- the design of the scheme should seek to maintain existing surface water conditions

- targeted field surveys will be required to establish the distribution of qualifying species, namely otter and golden eagle, in relation to the scheme. The precise scope of such survey should be agreed with NatureScot but is likely to involve multi-year survey programmes, especially to determine use of habitat by golden eagles. Should otter or golden eagle breeding sites be identified, exclusion zones will be required around these areas while being actively used for breeding, and construction / operational activities within these zones would be restricted during this period
- furthermore, it may be necessary to avoid any construction (and potentially operational) activities during the golden eagle breeding season (generally taken to be February to August, inclusive) in certain locations to avoid disturbance of nesting birds
- pre-construction checks for the presence of otter will be required to avoid accidental injury, mortality or disturbance. A range of standard mitigation measures should also be implemented during the construction phase to minimise the risk of accidental injury or death:
  - any excavations should be left with a method of escape for any otters that may enter overnight, and should be checked at the start of each working day to ensure that no otters are trapped within them
  - any pipes should be capped or otherwise blocked at the end of each working day, or if left for extended periods of time, to ensure no otters become trapped
  - as far as possible, works should be carried out in daylight to minimise the risk of injury or mortality to otter, which is generally a nocturnal species away from the coast, and
- pre- and during-construction surveys / monitoring of golden eagle may be required to determine the breeding locations and/or status of birds within the potential disturbance distance of the scheme (up to 1.5km). This will allow for suitable works exclusion zone(s) to be implemented, as required. Such monitoring may be required during the operational phase, depending on the type of activities expected to be required and whether these can reasonably be expected to risk disturbance being caused, and
- survey for the presence of invasive non-native plant species will be required on land which will be impacted by development. Suitable biosecurity measures will need to be devised based on the species present and their distribution, and the nature of works to take place. Such measures will need to be set out in a Biosecurity Management Plan or similar but must be designed to prevent the spread of such species from the site. Wherever possible, the possibility of eradication from the site should also be investigated.

Conclusion

With the implementation of mitigation measures, it is considered that, based on the level of detail available at this stage, it would be possible to deliver the expansion of Cruachan pumped hydro storage facility without adverse effects on the integrity of any European site, either alone or in-combination with other currently known plans or projects. This conclusion would need to be re-examined for planning applications when a much greater level of detail regarding the design and delivery of the scheme will be available.

However, this conclusion is based on the assumption that the scheme can be delivered with no losses of qualifying woodland habitat of the Loch Etive Woods SAC. The loss of even a small area of such habitat may be considered significant depending on context,

and this would depend on the total area involved and would be subject to the opinion of NatureScot.

Edinburgh Waterfront

Summary Description of the National Development

This National Development supports the regeneration of strategic sites along the Forth waterfront in Edinburgh, between Leith and Granton. Development will include mixed use proposals that optimise use of the strategic asset for residential, community, commercial and industrial purposes, including support for off-shore energy relating to port uses. Further cruise activity should take into account the need to manage impacts on transport infrastructure.

The following class of development is included in the National Development:

a) New and/or upgraded buildings for mixed use and/or residential development;
b) New and/or upgraded buildings for commercial, industrial, business use;
c) New and/or upgraded utilities;
d) New and/or upgraded green and blue infrastructure;
e) New and/or upgraded active and sustainable travel routes; and
f) New and/or upgraded port facilities for vessel berthing and related landside activities including for lay-down and marine sector services.

Potential Impacts on European Sites

No qualifying habitat could be lost because there are no SACs within or adjacent to the Edinburgh Waterfront area. However, upgrading of port facilities may result in loss of intertidal and/or marine habitat within the boundaries of adjacent SPAs.

Loss of potentially functionally-linked habitat outside European sites concerns land within the existing Edinburgh Waterfront area (although this National Development might result in some seaward expansion, all adjacent intertidal / marine areas are within European sites). Relevant qualifying species that might use such land comprise qualifying birds of adjacent coastal SPAs or other sufficiently nearby European sites, such as waders and geese. Some of these species commonly utilise shorter grasslands or arable fields, but these are generally lacking within the Edinburgh Waterfront area – theoretically suitable grassland within an existing park in the Granton section of Edinburgh Waterfront is rendered unsuitable by its small width and high frequency of people, often with dogs. However, qualifying bird species may also roost or rest on various marine edge structures or (particularly in the case of gulls) on any open space including brownfield land within the existing Edinburgh Waterfront area, and loss of such roosting / resting habitat is therefore possible.

Any construction activity in the Edinburgh Waterfront area has potential to contaminate adjacent European sites through polluted run-off. Operation of the development could also cause such pollution if surface waters are not adequately managed.

Standard guidance provides recommendations on the distances at which European sites need to be considered when assessing air quality impacts from development (e.g. Holman *et al*, 2019; Holman *et al*, 2014; Highways England *et al*, 2019; CIEEM, 2021). Since Edinburgh Waterfront does not include developments potentially capable of causing major air pollutant emissions (such as power stations and waste incinerators), air pollution during construction (including vehicle emissions and dust) or operation

(vehicle emissions) would only be relevant over short distances of up to 200m. Adjacent intertidal and marine habitat within SPAs is not vulnerable to such emissions, however breeding common terns *Sterna hirundo* at Imperial Dock Lock, Leith SPA (which is within the Edinburgh Waterfront area) could be adversely affected by construction dust if this falls on the breeding terns (when they are present).

There is no possibility of hydrological changes to European sites. Adjacent European sites are all intertidal or marine (with islands), or comprise dock infrastructure, which are not affected by water levels on adjacent land. Terrestrial European sites are beyond the City of Edinburgh and cannot be affected hydrologically by Edinburgh Waterfront.

Edinburgh Waterfront would not be likely to affect coastal processes except if construction into the existing intertidal / marine area took place. This could cause increased deposition of coastal sediment, where impeded by new infrastructure in the marine environment, and decreased deposition in other places where such sediment would have been naturally carried and deposited.

Disturbance of qualifying species could occur during construction through disturbance of: a) habitat in adjacent SPAs used by foraging or roosting qualifying waterbirds, b) the common tern breeding colony in Imperial Dock Lock, Leith SPA (when present in the breeding season), and/or c) adjacent or nearby functionally-linked terrestrial habitat used by qualifying waterbirds (for which the main potential appears to be the large open space grassland beside the shore immediately west of Granton, which could be used by qualifying waders such as curlew *Numenius arquata*).

Disturbance during operation on qualifying birds could occur through recreational visitor pressure at the same above-mentioned locations, or at coastal locations and adjacent open grassland / arable land further afield where there is a likelihood that residents of proposed residential sectors at Edinburgh Waterfront may travel there for recreational purposes. More detailed information on the potential impacts and effects of recreational pressure on European sites is given in the assessment for Clyde Mission, above.

It is improbable that disturbance of qualifying grey seals from Isle of May SAC or Berwickshire and North Northumberland Coast SAC, or qualifying harbour seals from Firth of Tay and Eden Estuary SAC, would be of sufficient magnitude to compromise the integrity of these European sites. Whilst increased ship movements to and from the developed Edinburgh Waterfront (if port upgrades take place and proposed offshore energy services materialise) would pass through water used by at least the Isle of May grey seals, such shipping would have no need to closely approach seal breeding and resting grounds on islands and sand banks, and there is already a high frequency of ship movements in the Firth of the Forth. Seals would therefore be accustomed to high levels of shipping movement, and would not be likely to be significantly disturbed by additional ships largely using existing shipping lanes.

It is also improbable that there would be any significant disturbance of qualifying lampreys from River Teith SAC. The mouth of the River Teith is approximately 38km from Edinburgh Waterfront, following the most direct line along the meanders of the River Forth. Brook lamprey *Lampetra planeri* is an entirely freshwater species and would not therefore occur in the Firth of the Forth. River lamprey *Lampetra fluviatilis* uses estuarine habitat as an adult and would therefore use parts of the Firth of the Forth, and sea lamprey *Petromyzon marinus* fully migrates to sea and will certainly occur in the Firth of the Forth (Maitland, 2003). The coastal habitat adjacent to Edinburgh Waterfront is more or less marine rather estuarine, thus presence of river lamprey nearby is perhaps unlikely, and there is no aspect of the marine area adjacent

to Edinburgh Waterfront that imbues it with particular value to lampreys. Moreover, any works at Edinburgh Waterfront on the coastal edge, such as for port upgrades, would affect an extremely small part of the Firth of the Forth, with the vast majority unaffected and available lampreys. Therefore any disturbance caused by Edinburgh Waterfront to lampreys is expected to be imperceptible in effect.

Edinburgh Waterfront does not propose any terrestrial infrastructure that could impede or displace qualifying species (excepting the possible displacement of qualifying birds by disturbance which is discussed in the previous section). Whilst port upgrades could result in additional structures in the marine environment, these would be highly localised and, considering the very great size of the Firth of the Forth at this location, essentially comprising open sea, would not be expected to impede migration of qualifying fish. Similarly, theoretical unmitigated pollution from this National Development would be very highly diluted and it is also reasonable to expect no effect on migratory fish by this means.

Marine mammals are extremely powerful and agile swimmers with quick reflexes and good sensory capabilities. This equips individuals with the abilities to avoid anthropogenic structures when they are in good environmental conditions (i.e. reduced / low levels of turbidity). However, there are multiple published reports of marine mammal mortality attributed to collision with ships (e.g. Kraus, 1990; Wiley *et al*, 1994). Vanderlaan and Taggart (2007) also reported that with increasing vessel speed, the probability of lethal injury to whales increased. The greatest rate of change was observed between vessel speeds of 8.6-15 knots, when the probability of a lethal injury (as opposed to a 'minor' non-lethal injury) increased from 21% to 79%. At speeds above 15 knots, the probability of a collision being fatal approached 100%.

The spread of invasive non-native species could arise during construction of Edinburgh Waterfront through inadvertent transfer of terrestrial invasive species (such as Japanese knotweed, which is known to have been recorded in the Granton part of the site). However, spread of terrestrial invasive species is not likely to occur to islands in the Firth of the Forth, where shipping associated with this National Development has no need to travel, and are not relevant to the intertidal and marine habitats of the adjacent SPAs. Terrestrial European sites are distant and thus it is improbable that activities at Edinburgh Waterfront would carry terrestrial invasive species to terrestrial European sites. Therefore, terrestrial invasive species are not considered an issue for European sites for this National Development. Marine invasive species could be inadvertently spread by shipping associated with Edinburgh Waterfront, which may have minor adverse effects on the habitat used by qualifying species within the adjacent European sites, or possibly on more distant European sites at other ports if shipping carries marine invasive species from the Firth of the Forth to other ports.

Relevant European Sites

Based on the location of the Edinburgh Waterfront, and the type of project which may be brought forward under the National Development, the following European sites are considered to be most relevant:

- Firth of Forth SPA
- Firth of Forth Ramsar site
- Outer Firth of Forth and St Andrews Bay Complex SPA
- Imperial Dock Lock, Leith SPA, and
- Forth Islands SPA.

Firth of Forth SPA and Ramsar Site

Details of these coincident European sites can be found in the assessment for High Speed Rail.

Outer Firth of Forth and St Andrews Bay Complex SPA

Details of this site can be found in the assessment for Dundee Waterfront, above.

Imperial Dock Lock, Leith SPA

This is a man-made structure at the mouth of the Imperial Dock in the heart of the Port of Leith and lies within the City of Edinburgh Local Authority area. The boundary of the SPA is coincidental with that of the Imperial Dock Lock. The sole qualifying feature of this site is a population of breeding common tern, which was last assessed as being in Favourable Maintained condition.

The Conservation Objectives of the Imperial Dock Lock, Leith SPA are:

- To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained.
- To ensure for the qualifying species that the following are maintained in the long term:
  - population of the species as a viable component of the site
  - distribution of the species within the site
  - distribution and extent of habitat supporting the species
  - structure, function and supporting processes of habitats supporting the species, and
  - no significant disturbance of species.

Forth Islands SPA

Details of this site can be found in the assessment for Dundee Waterfront, above.

Assessment of Effects on Site Integrity

It has been assumed when conducting this assessment that no projects will be brought forward which will result in the loss of habitat from within the boundary of any European site. However, should any proposals for development within the boundary of a European site be progressed, it will be necessary to conduct detailed survey to establish the distribution of qualifying species and/or and supporting habitats in the affected area(s). The loss of any habitat from within a European site from development associated with Edinburgh Waterfront would be applicable to the qualifying bird species of the relevant Firth of Forth SPA(s) and Ramsar site listed above. The potential for adverse effects on site integrity would therefore be dependent on whether the impacted habitat is used by qualifying bird species. This could only be determined through targeted field survey. In certain locations, it is theoretically possible that an area of habitat within the boundary of a Firth of Forth European site may not be used by or be of importance to the qualifying bird population(s), and its loss would not necessarily have adverse effects on site integrity. This could occur because the boundary of the European site has been drawn in part to reflect administrative or geographic boundaries, and the habitat may not actually be suitable for the qualifying bird species.

It is for this reason that it has been concluded that it could be possible to deliver all classes of development included under Edinburgh Waterfront without adverse effects on European site integrity.

Regardless of this, the loss of habitat from within the boundary of any European site should be avoided through project design. Where this cannot be achieved, it will be necessary to demonstrate through project-level HRA, informed by targeted field survey, that this will not adversely affect the integrity of the site and its Conservation Objectives (however, these circumstances will be very limited).

Based on current understanding of the extent of the area over which Edinburgh Waterfront will apply, informed by the City of Council Local Development Plan 2016, the National Development does not appear (from a review of aerial images) to cover any greenfield habitat which is suitable for waterbirds. It is therefore assumed, at this stage, that there will be no loss of functionally-linked greenfield habitat from the National Development. However, this must be confirmed at the project level through further study, including a field-based assessment of the suitability of habitat for foraging or roosting waterbirds. Should habitat have the potential to be functionally-linked to European sites by supporting waterbirds, it may be necessary to conduct further field survey to determine use of the area by these species.

However, there are areas of brownfield land within the area encompassed by Edinburgh Waterfront which could be used by roosting waterbirds, in particular gulls. There is therefore the potential for a loss of some functionally-linked habitat. The importance of such habitat would need to be determined through further study, likely involving some level of field survey. However, at this stage, it is considered unlikely that the loss of brownfield sites would jeopardise the integrity of any European site as the species which may be impacted are habitat generalists, the total area which would be lost is small, and there is abundant alternative habitat elsewhere along the Firth of Forth.

At its western extent, Edinburgh Waterfront appears to meet designated greenbelt, with habitat which may be used by qualifying waterbird species. In addition, the seawalls and other habitats along the seafront may be used by foraging and/or roosting waterbirds. There is the potential for construction-related disturbance of these birds. The Waterbird Disturbance Mitigation Toolkit (Cutts *et al*, 2013) provides species-specific information for several of the qualifying features of these sites. However, it suggests that, in general, disturbance of waterbirds can occur up to distances of around 300m from construction activities.

Several options for mitigating the potential impacts of construction disturbance exist, including the use of visual and noise screening and adopting working methods and technologies which minimise the generation of noise. Should these measures be considered insufficient, timing of works to take place to take place outside of the period of time when most birds are present – which is likely to be during the non-breeding season – may also help to avoid or reduce impacts.

While it will be necessary to determine the level of use of suitable habitat within at least 300m of the National Development by waterbirds through further study, likely to include targeted field survey, it is very unlikely that there would be any adverse effects on the integrity of any European site because:

- given the urban nature of the area, there is already a high degree of anthropogenic disturbance and birds using impacted habitats can be expected to be tolerant to a degree of disturbance, and may be habitat generalists

- the distance up to which disturbance is likely to occur is relatively small and would therefore only affect a relatively small area, outside of the boundary of any European site
- there is abundant alternative habitat for foraging in the surrounding should any disturbance occur
- there are reliable mitigation measures which could be implemented to avoid or minimise disturbance, and
- even if disturbance is considered to be a possibility following the adoption of mitigation measures, works could be timed to avoid the non-breeding season, at which time most (but not all) qualifying species are not present, reducing the risk of significant effects.

New housing has the potential to increase visitor numbers to the Firth of Forth coast, with associated recreational pressure on the European sites here, in particular from disturbance of qualifying waterbirds. However, this area is already subject to high numbers of visitors, and it is considered very unlikely that any additional visitors generated by new housing would significantly change the existing situation or lead to adverse effects on European site integrity. For example, there is high quality infrastructure already in place to promote access, including cycle paths and walkways, and it is likely that these locations would continue to be used. However, to ensure this is the case, management measures may be required to encourage use of formalised paths, including through signage, fencing and/or provision or removal of parking locations. Furthermore, efforts to prevent off-leash dog walking on the shore may also be needed as this is the predominant source of human-induced disturbance of waterbirds in these habitats. This may require signage or other education awareness raising. If considered absolutely necessary, other measures such as byelaws to prevent this activity at certain times of year, or the creation of designated dog walking areas (which can incorporate areas for dog swimming) are also available.

The impacts of port-related development have been considered above and are not expected to result in significant effects on the qualifying features of European sites alone. However, as set out below, the potential for in-combination effects due to multiple port developments and from offshore wind energy developments should be considered at the project level.

In-combination Assessment

Other National Developments which support port developments along the east coast of Scotland have the potential to generate in-combination impacts with projects brought forward under Edinburgh Waterfront. These may include Industrial Green Transition Zones, Dundee Waterfront and Aberdeen Harbour. This will need to be assessed fully at future stages of the planning process, including at project level. However, given the distance between these National Developments, and the highly mobile nature of qualifying species which could be impacted (particularly seabirds and marine mammals), it is unlikely, with suitable avoidance and/or mitigation measures being implemented, that there would be any significant in-combination effects on a European site.

Edinburgh Waterfront appears already to be incorporated into the City of Edinburgh Council Local Development Plan, so there is unlikely to be potential for in-combination effects between the National Development and the local plan.

The construction and operation of offshore wind energy developments in off the north and east coasts of Scotland has the potential to impact on seabirds, marine mammals

and fish in a variety of ways (for example, disturbance during construction, and collision mortality and displacement during construction and/or operation). The significance of effect generated by these impacts can only be determined at the project level, using robust data collected specifically to inform the assessment for each development. Any impacts generated by the developments have the potential to act in-combination with impacts caused by proposals brought forward under the Edinburgh Waterfront National Development. Furthermore, the construction and operation of wind energy developments in these areas may also be directly relevant to Edinburgh Waterfront, as the Port of Leith may be used as a key port used for servicing the developments at all stages. As already stated, the potential impacts will need to be assessed for each wind energy development and for other possible wind energy developments off the north and east coasts of Scotland cumulatively.

There are no other known plans or projects which could act in-combination to give rise to adverse effects on European sites.

Avoidance and Mitigation

The following mitigation measures are recommended to avoid or minimise the identified impacts which could arise from projects brought forward under the Edinburgh Waterfront National Development:

- all proposed developments must undergo project-level HRA to ensure there are no adverse effects on the integrity of any European site further study may be required to determine whether any terrestrial habitat within the Edinburgh Waterfront area may be used by qualifying bird species of any European site, and which may thus be functionally-linked. This could require targeted field survey, potentially to be carried out over multiple years. Where land is found to be used as functionally-linked habitat, its loss should be avoided as far as possible through project design
- where construction works are proposed within at least 300m of habitat which is found to be functionally-linked to any SPA, measures to avoid the disturbance of the qualifying species will be required. This may include:
  - the use of temporary or permanent screening to reduce noise and/or visual impacts. For example, noise reducing barriers may be used as a temporary solution during construction. Planting of hedgerows and/or trees may provide a more permanent, longer-term measure to screen operational activities
  - using technology and best available techniques which minimise the generation of noise during construction and operation
  - a ‘soft-start’ may be adopted for all potentially disturbing activities to minimise the risk of impacts on waterbirds within at least 300m. This involves gradually increasing the intensity of an activity (for example the noise it generates) over a period of time to allow birds to habituate to the source
- if it cannot be concluded that significant disturbance effects on the qualifying species can be avoided, it may be necessary to time works to avoid the time of year when relevant species are found to be present (however, this may be difficult as relevant SPAs are designated for both breeding and non-breeding species)
- measures to limit the impacts of recreational pressure caused by new housing developments may be required. This could include:
  - encouraging people to use existing (or new, where necessary) formalised paths and access routes

    - preventing people from accessing areas where they could adversely impact on qualifying habitats, species or habitats supporting qualifying species (for example through fencing or planting)
    - providing signage to educate people on required behaviours at the sites. In particular, this could relate to advice in relation to dog walking
    - providing education through other means, including, for example, providing leaflets with all new homes and on-site information boards
    - where necessary, implementing byelaws to restrict dog walking off-leash, and
    - creating designated dog walking areas to attract people to use these rather than areas where disturbance of qualifying species could occur
- pollution prevention measures will be required during the construction and operation of the scheme. These should follow SEPA PPGs / GPP, and may include (but not necessarily be limited to):
    - controls and contingency measures to manage run-off from construction areas and to manage sediment
    - all oils lubricants or other chemicals should be stored in an appropriate secure container in a suitable storage area, with spill kits provided across the development site
    - in order to avoid pollution of soils, vegetation and/or watercourses, all refuelling and servicing of vehicles and plant should be carried out in a designated area which is bunded and has an impermeable base. This should be at least 50m from any watercourse / waterbody, and
- survey for the presence of invasive non-native plant species will be required on land which will be impacted by development. Suitable biosecurity measures will need to be devised based on the species present and their distribution, and the nature of works to take place. Such measures will need to be set out in a Biosecurity Management Plan or similar, but must be designed to prevent the spread of such species from the site. Wherever possible, the possibility of eradication from the site should also be investigated.

Conclusion

With the implementation of mitigation measures, it is considered that, based on the level of detail available at this stage, it should be possible to deliver projects under the Edinburgh Waterfront National Development without adverse effects on the integrity of any European site.

This conclusion, and the requirement for mitigation will need to be determined at future stages of the planning process, including at the project level and should be informed, where necessary, by detailed further study, likely including field survey, and project-level HRA.

As set out above, the reason that this conclusion has been reached is because there will be no loss of habitat from within an SAC or a Ramsar site designated for habitats. It is theoretically possible, therefore, that habitat could be lost from within an SPA / Ramsar site boundary which does not support qualifying bird populations. Its loss could therefore not have adverse effects on site integrity.

Recommendations are given to mitigate the potential impacts of recreational pressure on qualifying waterbird species, although these are not expected to give rise to adverse effects on the integrity of any European site. However, the mitigation measures described may need to be refined or expanded to ensure that this conclusion is realised. A strategic approach to providing this mitigation is recommended for all

projects brought forward under Edinburgh Waterfront National Development, or other plans or projects in the area.

Dundee Waterfront

Summary Description of the National Development

This National Development supports the redevelopment of the Dundee Waterfront Zones, including the Central Waterfront, Seabraes, City Quay, Dundee Port, Riverside Business Area and Riverside Nature Park, and the Michelin Scotland Innovation Parc.

Projects associated with the National Development include: the Michelin Scotland Innovation Parc, which will become an innovation hub for net zero emission mobility; the Eden Project; and an improvement of facilities at Dundee Port. The National Development includes reusing land on and around the Dundee Waterfront to support the lifelong health and wellbeing of communities, deliver innovation and attract investment. As the development progresses it will be important to support sustainable and active transport options and to build in adaptation to future climate risks.

The following classes of development are included in the Dundee Waterfront National Development:

a) New and/or upgraded buildings for mixed use and/or residential development;
b) New and/or upgraded buildings for commercial, industrial, business, storage, distribution, research, educational, and/or tourism use;
c) New and/or upgraded utilities;
d) New and/or upgraded active and sustainable travel routes;
e) New and/or upgraded port facilities for vessel berthing and related landside activities including for lay-down, freight handling and marine sector services; and
f) New and/or upgraded green and blue infrastructure.

Potential Impacts on European Sites

The entrance to Dundee Harbour requires vessels to pass through the Firth of Tay and Eden Estuary SAC and Outer Firth of Forth and St Andrews Bay Complex SPA, and in close proximity to areas within Firth of Tay and Eden Estuary SPA / Ramsar site. The entirety of Dundee Waterfront also lies immediately adjacent to the Firth of Tay and Eden Estuary SAC, with large areas also adjacent to the SPA and Ramsar site of the same name. The loss of habitat from within the boundary of these European sites, which may be a qualifying feature or may otherwise support qualifying species, should be avoided.

The construction and maintenance of ports poses a number of environmental risks. Of particular importance is the dredging necessary to permit large vessels to enter ports, or to maintain inland channels. In natural estuaries and harbours, there is a balance between sediment transported out to sea and that which flows in with rivers and run-off, which tends to maintain an equilibrium depth. Often this is not deep enough to allow vessels safe passage, so navigational channels and harbours are dredged to deepen them. As natural forces will tend to build up sediment until the channels and port return to their equilibrium, dredging to maintain safe depth is an on-going maintenance activity. The need for such dredging is likely to increase in the future as ships become larger and require deeper ports.

Dredging poses direct threats to habitats and species in the areas in which it occurs. It introduces sediment into the adjacent water column, which is then redeposited on the bottom. This has a variety of usually short-term effects on pelagic fish and the benthic community. The suspended sediment increases turbidity, decreasing light penetration and photosynthetic activity. Dredging can also have longer term effects on water circulation patterns, particularly in estuarine areas where water circulation determines the distribution of fresh and salt water, patterns of dissolved oxygen, and other water quality parameters. Changes in salinity can affect the viability of freshwater wetlands and tidal marshes, with consequent impacts on the distribution of marine life. Changes in water circulation patterns can also alter sediment accumulation, thus affecting all ecosystems in the immediate area (National Research Council, 1985).

Dredging can also result in the loss of habitat which supports the prey species of breeding seabirds. This can occur where waste generated by dredging activities is disposed of in an area which is important for such species. For example, reef habitat is typically associated with high fish populations and is therefore excellent foraging grounds for species such as, terns and kittiwakes. This habitat can be lost through smothering as a result of the disposal of dredge waste.

Terrestrial habitat around Dundee Waterfront National Development is potentially suitable for several qualifying species of the Firth of Tay and Eden Estuary SPA and the Outer Firth of Forth and St Andrews Bay Complex SPA. Developments here could result in the loss of habitat used by these species outside of the boundary of these sites and which is therefore considered to be functionally-linked to it.

Construction and operation of Dundee Waterfront National Development could cause disturbance of the qualifying species of European sites. Disturbance of animals can have a range of adverse effects, including reduced feeding success, range use, reproductive success, survival and abundance.

Atlantic salmon on passage to the River Tay SAC could be impacted by noise disturbance during the construction and/or operational phase of developments at Dundee Waterfront. Substantial noise levels could be generated through activities such as piling, dredging and the passage of vessels. Fish hear sound and use this information to perceive their environment. Changes in noise levels are likely to affect a fish's behaviour, physiology, anatomy, and development. For instance, noise may impact on fish orientation and predator avoidance. Increased noise levels can also displace fish from a given area.

Marine mammals are highly mobile and can travel large distances in search of suitable foraging grounds. For example, based on consultation feedback provided by the JNCC and other stakeholders in the MMO marine plans HRA, it was considered that grey seal could travel up to 135km from the boundary of SACs for which they are designated. Bottlenose dolphins belonging to the Moray Firth SAC are known to regularly forage down the east coast of Scotland. There is therefore the potential for these species to travel from distant sites and be impacted by the Dundee Waterfront National Development. In particular, and as for fish (described above), marine mammals are vulnerable to the impacts of noise generated by construction and other activities associated with ports, including dredging and the movement of vessels.

Marine mammals have well-adapted auditory organs and use sound extensively for social communication, navigation and the detection of prey. Most anthropogenic sound is low frequency in nature and is within the audible range of many marine mammals. Increases in background noise and specific sound sources can impact marine

mammals in a number of ways, including masking of important sounds such as vocalisations and hearing loss (both temporary and permanent). Disturbance caused by human-induced noise can displace marine mammals from areas which would otherwise be used for activities such as foraging.

As described above, there are multiple possible impacts on fish and marine mammals from human-induced noise. However, where noise levels are sufficiently high, they can have anatomical impacts on fish, including hearing loss or injury to vital organs. This can result in strandings, disorientation and death. Damage to fish hearing may also result in them being unable to detect threats and therefore being more vulnerable to predation. Studies have shown that fish are sensitive to ear damage at noise levels ranging from 142-300 Hz pure tone at 180 dB re 1µPa (Scholik and Yan, 2001).

Disturbance of birds can have a significant effect on their survival and productivity, largely due to inefficiencies in foraging. This is often exacerbated during extreme climatic conditions. Disturbance can also cause some species to desert feeding and roosting sites, to abandon nests and can elicit behavioural changes resulting in higher energy costs. An example of the latter is evident in a study on the Dee estuary (north Wales) by Mitchell *et al* (1988), who found that, when suffering frequent disturbance at a high tide roost, knot *Calidris canutus* and dunlin *Calidris alpina* declined by 79% and 81%, respectively. They continued to use the traditional feeding area but incurred an additional 40 km flight during each tidal cycle.

Birds depend on sound to avoid dangers and will differentiate between meaningful sounds and background noise. They will also habituate to certain stimuli that carry no reinforcing consequences and birds build up a higher tolerance to disturbance when this is regular in habit and pattern and when there is close access to cover. There are few studies into the tolerance of wading species and waterfowl to noise disturbance. However, where there are studies it is evident that both noise and visual stimuli are assessed in conjunction with one another, since response to noise alone is difficult to assess as may be confounded by responses to visual stimulus.

Birds are sensitive to different types of disturbance at different times of the day or year. Multiple stimuli create earlier behavioural responses than a single disturbance event and the degree of disturbance depends upon a number of variables (Cutts *et al*, 2009), including:

- type of disturbance stimuli
- the bird community present
- the birds' activity
- spatial topography of the site
- time of year
- weather conditions, and
- degree of previous exposure.

The potential for ship movements to disturb and displace foraging seabirds is discussed in detail in the assessment for Energy Innovation Development on the Islands. The magnitude of such impacts on qualifying species would depend on the scale of disturbance and the importance of the particular area(s) to the qualifying species. The latter could only be determined reliably through further detailed study, including field survey.

Waterborne pollution is a possibility during the construction and/or operation of any new infrastructure. During both phases there is the potential for spills of fuels, oils or other

contaminants. Although the Michelin Scotland Innovation Parc lies inland, it is hydrologically connected via the Dighty Water to the Firth of Tay and Eden Estuary SAC / SPA / Ramsar site, and to the Outer Firth of Forth and St Andrews Bay Complex SPA, some 4.8km away. Standard pollution prevention and control measures can be implemented during the construction and operational phases of developments brought forward under Dundee Waterfront. With the implementation of such measures, there is unlikely to be an adverse effect on the integrity of any European site.

The risk of accidental injury or mortality of otters belonging to the River Tay SAC as a result of construction and operation of the Dundee Waterfront National Development is considered very low, if not negligible, given the distance between Dundee Waterfront and the boundary of the European site (which is more than 20km). Standing advice provided by NatureScot recommends that a works exclusion zone of 200m should be established around any otter breeding site, though this can be reduced to 100m depending on the nature of the works, topography and natural screening. For otter resting sites which are not used for breeding, NatureScot suggests that the buffer can be reduced to 30m (https://www.nature.scot/doc/standing-advice-planning-consultations-otters). It can therefore be taken that, beyond 30-200m, disturbance of otter from construction and/or operational activities would be unlikely to occur.

Expanding the port has the potential to result in an increase in the volume of freight vessels entering Dundee which in turn could lead to the introduction of invasive species. These species can lead to the extinction of native plants and animals, destroy biodiversity, and permanently alter habitats. They can be introduced to an area by ship ballast water, accidental release, and most often, by people. Invasive non-native species can. However, since September 2017, ships have been required to manage their ballast water to remove, render harmless or avoid the uptake or discharge of aquatic organisms under the International Maritime Organization's Ballast Water Convention (https://www.imo.org/en/MediaCentre/HotTopics/Pages/Implementing-the-BWM-Convention.aspx). Under the Convention, all ships in international traffic are required to manage their ballast water and sediments to a certain standard, according to a ship-specific ballast water management plan. All ships also have to carry a ballast water record book and an international ballast water management certificate.

An increase in the number of vessels also presents an increased collision risk for animal species. The potential for marine mammals and fish to be injured or killed by human activities in the marine environment is discussed in detail under the section of this document on Aberdeen Harbour. The potential for seabirds to be injured or killed by human activities in the marine environment is discussed in detail under the section of this document on Energy Innovation Development on the Islands.

Relevant European Sites

Based on the location of Dundee Waterfront, and the type of project which may be brought forward under the National Development, the following European sites are considered to be most relevant:

- Firth of Tay and Eden Estuary SAC
- Firth of Tay and Eden Estuary SPA
- Firth of Tay and Eden Estuary Ramsar site
- Outer Firth of Forth and St Andrews Bay Complex SPA
- River Tay SAC
- Isle of May SAC
- Forth Islands SPA, and

- Moray Firth SAC.

In addition, due to their highly mobile and wide-ranging nature, bottlenose dolphins belonging to the Moray Firth SAC may also be connected to the National Development.

Firth of Tay and Eden Estuary SAC

The Firth of Tay and the Eden Estuary are two high-quality estuarine areas. The two estuaries have been proposed within a single site because they are integral components of a large, geomorphologically complex area that incorporates a mosaic of estuarine and coastal habitats.

The Firth of Tay and Eden Estuary SAC is designated for the following qualifying habitats and species [with their latest assessed condition]:

- Estuaries [condition not assessed]
- intertidal mudflats and sandflats [Favourable Maintained]
- subtidal sandbanks [Favourable Maintained], and
- common seal [Unfavourable Declining].

The Conservation Objectives of the SAC are:

- To avoid deterioration of the qualifying habitats thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to achieving favourable conservation status for each of the qualifying features.
- To ensure for the qualifying habitats that the following are maintained in the long term:
  - extent of the habitat on site
  - distribution of the habitat within the site
  - structure and function of the habitat
  - processes supporting the habitat
  - distribution of typical species of the habitat
  - viability of typical species as components of the habitat, and
  - no significant disturbance of typical species of the habitat.

There are a range of existing negative pressures identified as acting on the SAC including invasive non-native species, marine water pollution, disturbance, shipping, and industrial activities.

Firth of Tay and Eden Estuary SPA

The Firth of Tay and Eden Estuary SPA lies within, but does not share the same boundary as, the SAC of the same name (described above).

The site contains a complex of estuarine and coastal habitats from the mouth of the River Earn in the inner Firth of Tay, east to Barry Sands on the Angus coast and St Andrews on the Fife coast. For much of its length the main channel of the estuary lies close to the southern shore and the most extensive intertidal flats are on the north side, west of Dundee. In Monifieth Bay, to the east of Dundee, the substrate becomes sandier and there are also mussel beds. The south shore consists of fairly steeply shelving mud and shingle. There are notable continuous, dense stands of common reed Phragmites australis in the inner part of the estuary, along its northern shore. These reedbeds, which are inundated during high tides, are amongst the largest in Britain.

Towards the mouth of the estuary, where conditions become more saline, there are areas of saltmarsh, which is a relatively scarce habitat in eastern Scotland.

The following non-breeding species are qualifying features [including their latest assessed condition]:

- bar-tailed godwit *Limosa lapponica* [Favourable Declining]
- common scoter *Melanitta nigra* [Unfavourable Declining]
- cormorant *Phalacrocorax carbo* [Favourable Maintained]
- dunlin [Favourable Declining]
- eider [Favourable Recovered]
- goldeneye [Unfavourable Declining]
- goosander *Mergus merganser* [Favourable Maintained]
- grey plover *Pluvialis squatarola* [Favourable Maintained]
- greylag goose *Anser anser* [Unfavourable Declining]
- black-tailed godwit *Limosa limosa* [Favourable Maintained]
- long-tailed duck [Unfavourable Declining]
- oystercatcher *Haematopus ostralegus* [Favourable Maintained]
- pink-footed goose [Favourable Maintained]
- red-breasted merganser [Unfavourable Declining]
- redshank *Tringa totanus* [Favourable Declining]
- sanderling *Calidris alba* [Favourable Maintained]
- shelduck *Tadorna tadorna* [Unfavourable Declining]
- velvet scoter *Melanitta fuscua* [Unfavourable Declining], and
- the assemblage of non-breeding waterfowl, which regularly exceeds 20,000 individuals [Favourable Maintained].

In addition, little tern *Sterna albifrons* [Unfavourable No change] and marsh harrier *Circus aeruginosus* [Favourable Maintained] are qualifying features as breeding species within the SPA.

The Conservation Objectives of the SPA are:

- To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained.
- To ensure for the qualifying species that the following are maintained in the long term:
  - population of the species as a viable component of the site
  - distribution of the species within the site
  - distribution and extent of habitats supporting the species
  - structure, function and supporting processes of habitats supporting the species, and
  - no significant disturbance of the species.

A range of existing negative pressures are identified as acting on the SPA including invasive non-native species, marine water and other surface water pollution, and changes in biotic and hydraulic conditions.

Firth of Tay and Eden Estuary Ramsar Site

The Firth of Tay and Eden Estuary Ramsar site is coincident with the SPA of the same name (described above). As for the SPA, it therefore lies within, but does not have the same boundary as, the Firth of Tay and Eden Estuary SAC.

The qualifying features of the Ramsar site are identical to those of the SPA.

Outer Firth of Forth and St Andrews Bay Complex SPA

The Outer Firth of Forth and St Andrews Bay Complex is an extensive SPA stretching from Arbroath in the north to St Abb's Head in the south. It encompasses the Firth of Forth, the outer Firth of Tay and St Andrews Bay. The waters in this SPA attract one of the largest and most diverse marine bird concentrations in Scotland and the site is classified for the protection of 21 seabird and waterbird species.

The following species are non-breeding qualifying features:

- black-headed gull *Croicocephalus ridibundus*
- common gull *Larus canus*
- common scoter
- eider
- goldeneye
- guillemot
- herring gull *Larus argentatus*
- kittiwake
- little gull *Hydrocoloeus minutus*
- long-tailed duck
- razorbill *Alca torda*
- red-breasted merganser
- red-throated diver
- Slavonian grebe
- velvet scoter
- the non-breeding seabird assemblage, which regularly exceeds 20,000 individuals, and
- the non-breeding waterfowl assemblage, which regularly exceeds 20,000 individuals.

In addition, the following species are designated as breeding qualifying features:

- Arctic tern *Sterna paradisaea*
- common tern
- gannet
- guillemot
- herring gull
- kittiwake
- Manx shearwater
- puffin
- shag, and
- the breeding seabird assemblage, which regularly exceeds 20,000 individuals.

NatureScot is currently preparing Conservation and Management Advice for all Scottish inshore marine protected areas, including the Outer Firth of Forth and St Andrews Bay Complex SPA. The Conservation and Management Advice documents will include the full Conservation Objective for the site. Whilst the site-specific information is developed, the high-level Conservation Objectives will remain as draft but are unlikely to change. At the time of undertaking this HRA, the draft Conservation Objectives of the Outer Firth of Forth and St Andrews Bay Complex SPA are:

1. To ensure that the qualifying features of the Outer Firth of Forth and St Andrews Bay Complex SPA are in favourable condition and make an appropriate contribution to achieving favourable conservation status.
2. To ensure that the integrity of the Outer Firth of Forth and St Andrews Bay Complex SPA is restored in the context of environmental changes by meeting objectives 2a, 2b and 2c for each qualifying feature.
    a) The populations of the qualifying features are viable components of the site.
    b) The distributions of the qualifying features throughout the site are maintained by avoiding significant disturbance of the species.
    c) The supporting habitats and processes relevant to the qualifying features and their prey/food resources are maintained, or where appropriate, restored.

Shag, kittiwake, common tern and herring gull are considered to be in unfavourable condition within the SPA, and therefore an overarching 'restore' objective is set for the site.

According to the JNCC website (https://jncc.gov.uk/our-work/outer-firth-of-forth-and-st-andrews-bay-complex-spa/#conservation-advice), ports and harbour activities, and navigational and maintenance dredging are existing threats to the SPA.

River Tay SAC

The River Tay originates on the slopes of Ben Lui and flows eastwards across the Highlands, through Loch Dochart, Loch Lubhair and Loch Tay, then through Strathtay tothrough Perth, where it becomes tidal, to its mouth at the Firth of Tay, south of Dundee. Its catchment is approximately 5,200 km^2.

The River Tay SAC is designated for the following qualifying habitats and species [including latest assessed condition]:

- clear-water lakes or lochs with aquatic vegetation and poor to moderate nutrient levels [Favourable Maintained]
- river lamprey [Favourable Maintained]
- brook lamprey [Favourable Maintained]
- sea lamprey [Favourable Maintained]
- Atlantic salmon [Favourable Maintained], and
- otter [Favourable Maintained].

The overarching Conservation Objectives for the qualifying habitats and species of the SAC are:

1. To ensure that the qualifying features of the River Tay SAC are in favourable condition and make an appropriate contribution to achieving favourable conservation status.
2. To ensure that the integrity of the River Tay is maintained by meeting objectives 2a, 2b and 2c for the qualifying feature. These are set out in Table A2.

Table A2 Conservation Objectives for the qualifying features of the River Tay SAC

Qualifying feature(s)	Conservation Objective 2a	Conservation Objective 2b	Conservation Objective 2c
Clear-water lakes or lochs with aquatic vegetation and poor to moderate nutrient levels	Maintain the extent and distribution of the habitat within the site	Maintain the structure, function and supporting processes of the habitat	Maintain the distribution and viability of typical species of the habitat
River lamprey, brook lamprey and sea lamprey	Maintain the population of the lamprey species as viable components of the site	Maintain the distribution of the lamprey species throughout the site	Maintain the habitats supporting the lamprey species within the site, and availability of food
Atlantic salmon	Maintain the population of the species, including range of genetic types, as a viable component of the site	Maintain the distribution of the species throughout the site	Maintain the habitats supporting the species within the site, and availability of food
Otter	Maintain the population as a viable component of the site	Maintain the distribution of the species throughout the site	Maintain the habitats supporting the species within the site, and availability of food

Further information on the Conservation Objectives 2a, 2b and 2c for the qualifying features can be found in the Conservation Advice Package for River Tay SAC.

The Conservation Advice Package for River Tay SAC identifies a range of factors which are known to currently affect the qualifying features, including changes to hydrology, invasive non-native species, and surface water and air pollution.

Isle of May SAC

The Isle of May sits in the mouth of the Firth of Forth, approximately 9km south-east of Anstruther and 17km north-west of North Berwick. It is approximately 1.8km long but less than 500m wide. Composed of basaltic rock, there are vertical cliffs up to 60m high on the west coast from where the island slopes down towards sea level in the east. The island supports internationally important numbers of breeding seabirds and grey seals.

The Isle of May SAC is designated for the following qualifying habitats and species [including latest assessed condition]:

- reefs [Favourable Maintained], and
- grey seal [Favourable Maintained].

The Conservation Objectives of the SAC are:

- To avoid deterioration of the qualifying habitat thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to achieving favourable conservation status for each of the qualifying features.
- To ensure for the qualifying habitat that the following are maintained in the long term:
  - extent of the habitat on site
  - distribution of the habitat within site
  - structure and function of the habitat
  - processes supporting the habitat
  - distribution of typical species of the habitat
  - viability of typical species as components of the habitat, and
  - no significant disturbance of typical species of the habitat.

Marine water pollution and human disturbance are identified as existing negative pressures on the site.

Forth Islands SPA

Forth Islands SPA consists of a series of islands supporting the main seabird colonies in the Firth of Forth. The islands of Inchmickery, Isle of May, Fidra, The Lamb, Craigleith and Bass Rock were classified in April 1990. The extension to the site, classified in February 2004 consists of the island of Long Craig, which, at the time of classification supported the largest colony of roseate tern *Sterna dougallii* in Scotland. It is the most northerly of only six regular British colonies. The seaward extension extends approximately 2km into the marine environment to include the seabed, water column and surface.

The SPA qualifies by regularly supporting populations of the following breeding species [including latest assessed condition]:

- Arctic tern [Favourable Declining]
- common tern [Unfavourable Declining]
- cormorant [Unfavourable Declining]
- gannet [Favourable Maintained]
- guillemot [Favourable Maintained]
- herring gull [Favourable Maintained]
- kittiwake [Unfavourable Declining]
- lesser black-backed gull [Favourable Maintained]
- puffin [Favourable Declining]
- razorbill [Favourable Maintained]
- roseate tern [Unfavourable Declining]
- sandwich tern [Unfavourable Declining]
- shag [Unfavourable Declining], and
- the assemblage of breeding seabirds, which regularly exceeds 20,000 individuals [Favourable Declining].

The Conservation Objectives of the SPA are:

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

- To ensure for the qualifying species that the following are maintained in the long term:
  - population of the species as a viable component of the site
  - distribution of the species within the site
  - distribution and extent of habitats supporting the species
  - structure, function and supporting processes of habitats supporting the species, and
  - no significant disturbance of the species.

A range of existing negative pressures act on the qualifying species including marine water pollution, invasive non-native species, and changes in biotic and abiotic conditions.

Moray Firth SAC

The Moray Firth SAC is one of the largest marine SACs in the UK. It comprises the 'triangular' area of water west of a line between Helmsdale on the Sutherland coast and Lossiemouth on the Moray coast, including the Beauly / Inverness Firths, and the outer reaches of the Dornoch and Cromarty Firths. The marine boundary extends seaward from the tidal level of mean low water mark of spring tides unless otherwise specified. Much of the coastline is characterised by sweeping sandy beaches and dunes that lie within a fertile lowland strip although cliffs and rocky shores occur where high ground extends to the coast.

The Moray Firth SAC is designated for the following qualifying habitats and species [including latest assessed condition]:

- subtidal sandbanks [Favourable Maintained], and
- bottlenose dolphin [Favourable Maintained].

The overarching Conservation Objectives for the qualifying habitats and species of the SAC are:

1. To ensure that the qualifying features of the Moray Firth SAC are in favourable condition and make an appropriate contribution to achieving favourable conservation status.
2. To ensure that the integrity of the Moray Firth SAC is maintained by meeting objectives 2a, 2b and 2c for the qualifying features. These are set out in Table A3.

Table A3 Conservation Objectives for the qualifying features of the Moray Firth SAC

Qualifying feature	Conservation Objective 2a	Conservation Objective 2b	Conservation Objective 2c
Subtidal sandbanks	Maintain the extent and distribution of the habitat within the site	Maintain the structure, function of the habitat and the supporting environment on which it relies	Maintain the distribution and viability of typical species of the habitat
Bottlenose dolphin	Maintain the population of the species as a viable component of the site	Maintain the distribution of species throughout the site by avoiding significant disturbance of the species	Maintain the habitats and processes relevant to the qualifying species, and their prey/food resources

Further information on the Conservation Objectives 2a, 2b and 2c for the qualifying features can be found in the Conservation Advice Package for Moray Firth SAC.

The Conservation Advice Package for Moray Firth SAC identifies a range of factors which are known to currently affect the qualifying features, including ports and shipping, marine water pollution and invasive non-native species.

Assessment of Effects on Site Integrity

The loss of either qualifying habitat or habitat which supports qualifying or 'typical' species has the potential to be considered significant as it may undermine the Conservation Objectives for a given site. NatureScot in SNH (2014a) gives several examples of cases from across the UK in which development proposals would have resulted in the direct loss of qualifying habitats. In some, the loss of small areas, representing less than 1% of the total resource within the relevant European site, were considered to represent a significant adverse effect. The class of development 'Land reclamation for port expansion' was removed from the draft NPF4 and there is no inclusion in other classes of development for the loss of habitat from within European sites. Such losses should be avoided through project design as they would have a high probability of resulting in adverse effects on the integrity of European sites.

It has therefore been assumed when conducting this assessment that no projects will be brought forward which will result in the loss of habitat from within the boundary of any European site. However, should any proposals for development within the boundary of a European site be progressed, it will be necessary to conduct detailed survey to establish the distribution of qualifying and supporting habitats / species in the affected area(s). As set out above, even a small loss of habitat (which does not need to be a qualifying habitat) can have an adverse effect on European site integrity. The loss of habitat from within the boundary of any European site should be avoided unless it can be demonstrated that it would not adversely affect the European site and its Conservation Objectives (these circumstances will be very limited).

Terrestrial habitat around Dundee Waterfront National Development is potentially suitable for several qualifying species of the Firth of Tay and Eden Estuary SPA, Outer Firth of Forth and St Andrews Bay Complex SPA and Forth Islands SPA. Developments

here could result in the loss of habitat used by these species outside of the boundary of these sites and which is therefore considered to be functionally-linked to it. However the majority of the area is already urbanised so losses, where unavoidable, are likely to be minimal. Regardless, the loss of functionally-linked habitat should be avoided as far as possible through project design.

The Waterbird Disturbance Mitigation Toolkit (Cutts *et al*, 2013) suggests that, in general, disturbance of waterbirds from construction activities may occur up to a distance of around 300m. Any birds associated with European sites which use habitat in the vicinity of Dundee Waterfront may be disturbed by construction (or operational) activities. However, as set out above, given the distance between the Firth of Tay and Eden Estuary SPA / Ramsar site (1.9km west) and the Outer Firth of Forth and St Andrews Bay Complex SPA (1km east) and the National Development, and the availability of alternative habitat in the intervening landscape, any disturbance which was caused would be very unlikely to have a significant effect on the species. Moreover, mitigation measures, described below, are available to help avoid or reduce potential disturbance impacts.

There does not appear to be any potential for disturbance of qualifying bird species from construction works when individuals are located within the boundary of any European site.

As the precise location for dredging, including waste disposal, is unknown at this stage, it will be necessary to assess in more detail the potential for the impacts associated with these activities to significantly affect the qualifying features of the River Tay SAC, and other European sites, at future stages in the planning process. Avoidance and mitigation measures are also available to ensure there are no adverse effects on qualifying species, including careful design, timing and siting of dredging activities. In terms of timing of dredging activities, this may need to especially consider the time of year when Atlantic salmon and lamprey return to the River Tay to spawn, with dredging works not being permitted during this period.

Other standard pollution prevention and control measures can be implemented during the construction and operational phases of developments brought forward under Dundee Waterfront. With the implementation of such measures, there is unlikely to be an adverse effect on the integrity of any European site

As described above, noise may impact Atlantic salmon due to the temporary or permanent loss of hearing. This may, for example, reduce perception and therefore increase predation risk. Alternatively, noise may deter fish away from the source, increasing energetic outputs and/or reduce their ability to find the mouth of spawning rivers. Marine mammals can also be adversely affected in multiple ways by underwater noise. Any proposals which will result in the generation of underwater noise (for example through piling or dredging) must therefore aim to avoid, minimise or mitigate sound levels to ensure there are significant effects on these species. This may involve timing of works to avoid the period(s) when these species are known to occur in the vicinity of the National Development (for example the time when Atlantic salmon return to the River Tay SAC to spawn). Other measures to mitigate underwater noise may also need to be investigated and adopted, including the use of best available technology / techniques (e.g. using bubble curtains around piling works to absorb sound) or reducing ship speeds. It is likely to be necessary to undertake detailed underwater noise modelling at the project level to determine that, with the implementation of such measures, there will be no significant effects on any qualifying species. This is most likely to be relevant to Atlantic salmon, as marine mammals are highly mobile and

range over extremely wide areas, allowing them to move away from noise sources. Therefore, at this stage, with mitigation options available, and subject to the results of further study and assessment, it is concluded that adverse effects on European sites from noise impacts can be avoided.

Published research indicates that seabirds are susceptible to impacts from ship movements, but that this varies between species (see under the assessment for Energy Innovation Development on the Islands). Most of the qualifying seabird species of the Firth of Tay and Eden Estuary SPA / Ramsar, Outer Firth of Forth and St Andrews Bay Complex SPA and Forth Islands SPA are relatively tolerant of ships. However, according to Fliessbach *et al* (2019) common scoter, red-throated diver and red-breasted merganser are all relatively sensitive to disturbance from ship movements. Escape responses in these species were elicited on average at distances of 1,600m, 1,374m and 1,178m, respectively. Therefore, while the European sites are very large and cover a wide area of sea, it will be necessary to determine the distribution of these and other waterbird species, should projects relevant to the National Development increase vessel movements in and out of Dundee port. Any areas found to be of relative importance to these species will need to be avoided to ensure no significant disturbance from ship activities.

In-combination Assessment

Other National Developments which support port developments along the east coast of Scotland have the potential to generate in-combination impacts with projects brought forward under Dundee Waterfront. These may include Industrial Green Transition Zones, Edinburgh Waterfront and Aberdeen Harbour. This will need to be assessed fully at future stages of the planning process, including at project level. However, given the distance between these National Developments, and the highly mobile nature of qualifying species which could be impacted (particularly seabirds and marine mammals), it is unlikely, with suitable avoidance and/or mitigation measures being implemented, that there would be any significant in-combination effects on a European site.

The construction and operation of offshore wind energy developments off the north and east coasts of Scotland has the potential to impact on seabirds, marine mammals and fish, in a variety of ways (for example, disturbance during construction, and collision mortality and displacement during construction and/or operation). The significance of effect generated by these impacts can only be determined at the project level, using robust data collected specifically to inform the assessment for each development. Any impacts generated by the developments have the potential to act in-combination with impacts caused by proposals brought forward under the Dundee Waterfront National Development. Furthermore, the construction and operation of wind energy developments in these areas is also likely to be directly relevant to Dundee Waterfront as this may be a key port used for servicing the developments at all stages. There may consequently be an increase in ship movements and/or developments on terrestrial habitats which impact on functionally-linked habitat, for example. At this stage, it can only be concluded that measures are available to avoid or reduce the potential impacts which occur at Dundee Waterfront (listed below) and that, if these are implemented where necessary, adverse effects on European site integrity should not occur. However, and as already stated, this will need to be assessed for each wind energy development and for other possible wind energy developments off the north and east coasts of Scotland cumulatively.

Avoidance and Mitigation

The following mitigation measures are recommended to avoid or minimise the identified impacts which could arise from projects brought forward under the Dundee Waterfront National Development:

- all proposed developments must undergo project-level HRA to ensure there are no adverse effects on the integrity of any European site
- further study may be required to determine whether any terrestrial habitat around Dundee Waterfront may be used by qualifying bird species of any SPA, and which may thus be functionally-linked. This could require targeted field survey, potentially to be carried out over multiple years. Where land is found to be used as functionally-linked habitat, its loss should be avoided as far as possible through project design
- where construction works are proposed within at least 300m of habitat which is found to be functionally-linked to any SPA, measures to avoid the disturbance of the qualifying species will be required. This may include:
  - the use of temporary or permanent screening to reduce noise and/or visual impacts. For example, noise reducing barriers may be used as a temporary solution during construction. Planting of hedgerows and/or trees may provide a more permanent, longer-term measure to screen operational activities
  - using technology and best available techniques which minimise the generation of noise during construction and operation
  - a 'soft-start' may be adopted for all potentially disturbing activities to minimise the risk of impacts on waterbirds within at least 300m. This involves gradually increasing the intensity of an activity (for example the noise it generates) over a period of time to allow birds to habituate to the source
- if it cannot be concluded that significant disturbance effects on the qualifying species can be avoided, it may be necessary to time works to avoid the time of year when relevant species are found to be present (however, this may be difficult as relevant SPAs are designated for both breeding and non-breeding species)
- further study, including targeted survey if necessary, may be required to determine the distribution of seabirds in the vicinity of any new routes for ships to and from Dundee Harbour (including to any new offshore wind energy developments). The results of this study will help to identify any particularly important areas for seabirds
- based on the findings of the aforementioned study, a well-defined route for the movement of ships should be created, avoiding any area(s) identified as being important for seabirds. This will help to minimise the effects of displacement from foraging areas, will reduce the area over which disturbance may occur and may also help to reduce the risk of injury or mortality
- a maximum speed limit may be required for ships to minimise the risks of disturbance or mortality of seabirds and/or marine mammals
- if any capital dredging or increase in the extent or frequency of maintenance dredging is required, it may be necessary following detailed HRA for any planning application to undertake such dredging activities outside of the period when Atlantic salmon and lamprey species return to the River Tay. However, this may be conflict with a similar objective to avoid impacts on breeding seabirds, and careful assessment will therefore be required to determine the optimal time to undertake dredging

- dredging must make use of Best Available Techniques/Technology (BAT) most appropriate to the seabed type to avoid excessive sediment mobilisation
- the location of any dredge waste disposal site(s) would also need to be informed by detailed study and should avoid sensitive locations of importance to breeding seabirds or marine mammals. Ideally, existing open dredge disposal sites would be used, and
- pollution prevention measures will be required during the construction and operational phases to protect the marine environment.

Conclusion

With the implementation of mitigation measures, it is considered that projects progressed under Dundee Waterfront could be delivered with no adverse effect on the integrity of any European site. This conclusion would need to be re-examined for planning applications when a much greater level of detail regarding the design and delivery of the scheme will be available.

A thorough assessment of the potential for in-combination effects to arise with other plans or projects will also be required for individual proposals brought forward under the National Development. In particular, the potential impacts of developments progressed under other National Developments on the east coast of Scotland (Industrial Green Transition Zones, Aberdeen Harbour and Edinburgh Waterfront, in particular) and from offshore wind energy developments must be carefully considered at the project level.

Stranraer Gateway

Summary Description of the National Development

This National Development supports the regeneration of Stranraer. Stranraer is a gateway town. It is located close to Cairnryan, a key port connecting Scotland to Northern Ireland, Ireland and beyond to wider markets.

It envisages place-based regeneration to help address socio-economic inequalities in Stranraer and to support the wider population of south-west Scotland by acting as a hub and providing a platform for future investment. This will be supported by any strategic transport interventions including road and rail that emerge from the second Strategic Transport Projects Review (STPR2) which embeds the National Transport Strategy's sustainable travel and investment hierarchies.

The following classes of development are included in the Stranraer Gateway National Development:

a) Development contributing to Stranraer Waterfront regeneration;
b) Marina expansion;
c) Redevelopment of Stranraer harbour east pier;
d) Sustainable road, rail and freight infrastructure for access to Stranraer and/or Cairnryan;
e) New and/or upgraded infrastructure for the transportation and use of low carbon fuels; and
f) Reuse of vacant and derelict buildings and brownfield land, including regeneration of Blackparks industrial estate.

It was determined at the HRA screening stage that onshore developments within the towns of Stranraer or Cairnryan would be unlikely to significantly affect any European site. The assessment below is therefore concerned primarily with transport infrastructure projects in the wider south-west of Scotland, and developments in the marine environment.

Potential Impacts on European Sites

There are no details at this stage of transport infrastructure upgrades which may be brought forward under the Stranraer Gateway National Development. However, the main trunk roads to the town, and to Cairnryan, are the A75 (from the east) and A77 (from the north). Flow of Dergoals SAC and River Bladnoch SAC both lie immediately adjacent to or are crossed by the A75. Lendalfoot Hills Complex SAC and Glen App and Galloway Moors SPA are also both located immediately adjacent to the A77. Upgrades to either road in these areas could involve the loss of habitat from within the boundaries of these sites. All proposed developments must undergo project-level HRA to ensure there are no adverse effects on the integrity of any European site. Details of the qualifying habitats, or species supported by the habitats, of these sites are provided below.

Transport infrastructure developments also have the potential to result in the loss of functionally-linked habitat outside of the boundaries of European sites. This may be particularly relevant to the Loch of Inch and Torrs Warren SPA and Ramsar site, which

is located approximately 2.4km east of Stranraer and 340m from the A77 at its closest point. This site is designated for non-breeding Greenland white-fronted goose and non-breeding hen harrier. Greenland white-fronted goose in the south-west of Scotland forages on open farmland, especially unimproved permanent pasture, but also including intensively managed re-seeded grassland. In autumn the species also feeds in stubble fields and in winter on root crops (Forrester *et al*, 2007). During the non-breeding season, hen harriers also forage in the lowlands, hunting over open habitat including rough grassland, cultivated farmland and marsh (Forrester *et al*, 2007). The loss of any such habitat, where it may be functionally-linked to the SPA / Ramsar site, should be avoided as far as possible.

Waterborne pollution is a possibility during the construction and/or operation of any new infrastructure. Road upgrades to the A75 within the catchment of the River Bladnoch SAC are of particular concern in relation to this impact. This site is designated for Atlantic salmon and the release of sediment or the spillage of fuels or oils, or other pollutants during construction or operation could impact on the qualifying species, for example by degrading spawning habitat.

Classes of development under Stranraer Gateway include the expansion of the existing marina and the redevelopment of the east pier in the town. Projects associated with these elements of the National Development are unlikely to result in an increase in large ships (for example container vessels) using Loch Ryan and would most likely lead to an increase in smaller private vessels such as yachts. There is consequently no expectation for dredging to be required in Loch Ryan to enable access by larger ships, beyond any which already takes place for the ferries between Cairnryan and Northern Ireland. One of the benefits of relocating the ferries from Stranraer to Cairnryan is reported to have been a reduced requirement to dredge the shallow shores in the south of Loch Ryan (Solway Firth Partnership, 2014), and the National Development is not expected to change this situation. Similarly, unlike larger vessels which can cause sediment movements and/or erosion, smaller boats are unlikely to have this impact.

However, the Loch Ryan Management Plan (Solway Firth Partnership, 2014) identifies that the main issue with development around the edge of Loch Ryan is the potential for disturbance of contaminated land. It reports that there are a number of sites around the loch, including World War II bases and industrial sites, which would need to be investigated for contaminants before development took place. The release of pollutants into the marine environment could have impacts on the habitats within Loch Ryan and the species they support. This could include seabirds and marine mammals from European sites beyond the loch, such as Ailsa Craig SPA and, from Northern Ireland, The Maidens SAC and North Channel SAC.

Road traffic is a major contributor of airborne pollutants. The most important of these for European sites are oxides of nitrogen. At close distances to the source, for example near road verges, NOx can have a directly toxic effect on vegetation at very high concentrations. However, likely to be of greater concern is the contribution NOx makes to the deposition of nitrogen to soils. Increases in nitrogen deposition from the atmosphere can, if sufficiently great, enhance soil fertility and lead to eutrophication. This often has adverse effects on the community composition and quality of semi-natural, nitrogen-limited terrestrial and aquatic habitats (e.g. Wolseley *et al*, 2006; Dijk, 2011; http://www.apis.ac.uk/search-pollutant-impacts).

A critical level (as defined in the assessment for Chapelcross Power Station Redevelopment) of NOx for all vegetation types has been set to 30 ug/m^3. In relation to nitrogen deposition, assessment of the potential impacts is based on the concept of

critical load, also defined in the assessment for Chapelcross Power Station Redevelopment. The critical load for nitrogen deposition is dependent on the habitat type in question and its sensitivity to increased nitrogen inputs. Habitats which are particularly sensitive to nitrogen deposition, because they are otherwise naturally nitrogen-limited, includes raised and blanket bogs.

According to the Transport Analysis Guidance (TAG) published by the Department of Transport (DfT), beyond 200m, the contribution of vehicle emissions from roads to local pollution levels is insignificant (Image 1) and https://www.gov.uk/guidance/transport-analysis-guidance-tag#013). The Design Manual for Roads and Bridges (DMRB) therefore advises that consideration should be given for the potential impacts of airborne pollution on designated sites within 200m of roads (Highways England *et al*, 2019).

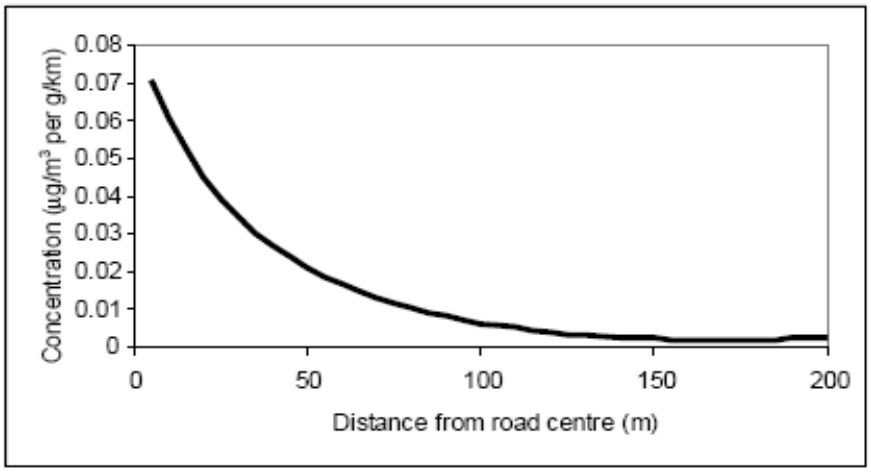

Image 1 Traffic contributions to concentrations of pollutants at increasing distance from road

It should be noted that road transport emissions impacting designated sites are often the result of many plans or projects located some distance from the site. Therefore, projects brought forward under Stranraer Gateway which increase road traffic could impact on European sites at some distance from the National Development.

Construction activities can also lead to air quality impacts on designated sites, though these are typically less severe, and occur over a shorter period of time, than those associated with road traffic or other operational sources of pollutants. In particular, construction works can generate dust which can directly impact vegetation or aquatic environments, and can directly impact on animal species (for example where these habitats are used by them for foraging). During periods of extended dry weather, dust can cover plant foliage and adversely affect photosynthesis or other biological functions. Rainfall can then remove deposited dust and rapidly leach chemicals into the soil (Holman *et al*, 2014). As stated, the significance of these effects will partly depend on the duration over which the impacts occur. Where they arise over a relatively short period of time, the impacts are unlikely to be significant.

Guidance published by the Institute of Air Quality Management advises that consideration should be given to construction-related air quality impacts on nature conservation sites within 50m of works, including any access routes, extending to 500m from the entrance to the construction site (Holman *et al*, 2014).

Human-induced disturbance of animals can have a range of adverse effects, including reduced feeding success, range use, reproductive success, survival and abundance. The construction of transport infrastructure under Stranraer Gateway has the potential

to disturb qualifying species. This will depend on the precise location of such developments, but may be most relevant to the Loch of Inch and Torrs Warren SPA / Ramsar site (though any project which requires new crossing over the River Bladnoch also has the potential to impact on qualifying Atlantic salmon of that SAC). There is little information on the sensitivity of Greenland white-fronted geese to disturbance, except in relation to shooting. However, advice provided in the Waterbird Disturbance Mitigation Toolkit suggests that for Brent geese, which are considered to be very sensitive to human activities, disturbance from construction works can occur at distances of up to 400m (Cutts *et al*, 2013). This is therefore assumed to be a reasonably conservative estimate for the distance at which Greenland white-fronted geese may also be subject to disturbance. Ruddock and Whitfield (2007) present a review of disturbance distances for selected bird species, including hen harrier. Based on a review of literature and the results of an expert opinion survey, they suggest that disturbance of breeding hen harriers could occur at distances of 500-750m, although Currie and Elliott (1997) recommend a safe working distance of 500-1,000m. While the distance at which disturbance may be caused is likely to be less during the non-breeding season, when birds are generally less sensitive to disturbance, construction works have the potential to disturb hen harriers at roost sites or when foraging, potentially leading to displacement from suitable hunting habitat. These impacts could occur should construction works take place near to the boundary of the Loch of Inch and Torrs Warren SPA / Ramsar site, or on or near functionally-linked land outside of the boundary of these designations. The use of upgraded transport infrastructure by traffic is not expected to substantially alter existing conditions with respect of disturbance of qualifying species, unless this involves the construction of new infrastructure located in areas where currently none exists.

The potential impacts of disturbance on seabirds and marine mammals which can be caused by construction activities in the marine environment (and which could arise during the expansion of Stranraer marina) and from the increased frequency of movements by large ships are discussed in detail in the assessment of Energy Innovation Development on the Islands. However, as set out above, Stranraer Gateway is not expected to lead to an increase in the numbers of large vessels in Loch Ryan. Expansion of the marina may lead to an increase in the number of smaller vessels in the loch, which could include yachts, power boats and jet-skis. Such vessels have the potential to disturb birds and marine mammals, especially when travelling at high speed. For example Miller *et al* (2008) studied the effect of high-speed boats on bottlenose dolphins in the USA. They found that dolphins increased travelling behaviour and decreased feeding behaviour following the passage of a boat. As described in the assessment for Energy Innovation Development on the Islands, the impacts of vessel movements can be exacerbated when they occur over a wide area and do not follow regular routes. Recreational boating has the potential to occur widely over Loch Ryan, rather than down a defined channel, meaning that this impact could occur widely across the marine environment. The impacts of disturbance on seabirds and marine mammals could affect individuals associated with European sites in the wider area, including Ailsa Craig SPA, The Maidens SAC and North Channel SAC.

There are no European sites along the A75 or A77 corridors designated for animal species which are considered to be vulnerable to collisions with vehicles, and which could be impacted by increased traffic. An increase in small vessels in Loch Ryan due to expansion of the marina or redevelopment of the east pier is also unlikely to substantially increase the risk of injury or mortality being caused to seabirds or marine mammals. The exception to this may be associated with an increase in the use of high-speed powerboats or jet-skis which present a higher risk of collision with birds and mammals (e.g. RSPB, 2015; JNCC, 2010).

Increased numbers of boats in Loch Ryan increases the risk of invasive non-native species being introduced. However, based on current knowledge, any such species are unlikely to have major consequences for the qualifying seabirds or marine mammals from European sites elsewhere which may use the loch for foraging.

Relevant European Sites

Based on the location of the Stranraer Gateway and the type of project which may be brought forward under the National Development, the following European sites are considered to be most relevant:

- Loch of Inch and Torrs Warren SPA
- Loch of Inch and Torrs Warren Ramsar site
- Flow of Dergoals SAC
- River Bladnoch SAC, and
- Lendalfoot hills Complex SAC.

Depending on the nature of any strategic transport developments which are brought forward in response to the outcomes of STPR2, and which would be included under the Stranraer Gateway National Development (e.g. upgrades to the A75 or A77 trunk roads), there is the potential for impacts on European sites across south-west Scotland. Such sites could include the Solway Firth SPA and Loch Ken and River Dee Marshes SPA / Ramsar site. Other transport infrastructure projects not identified at this stage could impact on additional sites.

In addition, European sites located distantly to Loch Ryan may also be impacted where they have qualifying features which can travel widely beyond the boundary of the designations. In particular, Ailsa Craig SPA (designated for breeding seabirds, see assessment of Hunterston Strategic Asset for more details), The Maidens SAC (designated for grey seal) and the North Channel SAC (designated for harbour porpoise) may all be impacted by development brought forward under Stranraer Gateway.

Loch of Inch and Torrs Warren SPA

The Loch of Inch and Torrs Warren SPA comprises a large eutrophic freshwater loch (Loch of Inch or White Loch) and a nearby area of foreshore and dunes (Torrs Warren).

The qualifying features of the SPA [and latest assessed condition] are:

- non-breeding Greenland white-fronted goose [Favourable Declining] – according to the SPA citation the site supported a winter peak mean of 534 individuals between 1991/92 and 1995/96, representing approximately 2% of the world population. However, more recent count data for this site presented in Fox *et al* (2019) suggest that in 2018/19, the population within the SPA numbered 180 birds, and
- non-breeding hen harrier [Favourable Maintained] – according to the SPA citation the site supported a winter peak mean of eight individuals between 1991/92 and 1995/96, representing approximately 1% of the British wintering population.

The Conservation Objectives for the SPA are:

- To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained.
- To ensure for the qualifying species that the following are maintained in the long term:
  - population of the species as a viable component of the site
  - distribution of the species within the site
  - distribution and extent of habitats supporting the species
  - structure, function and supporting processes of habitats supporting the species, and
  - no significant disturbance of the species.

Loch of Inch and Torrs Warren Ramsar Site

The Loch of Inch and Torrs Warren Ramsar site is coincident with the SPA of the same name. While also sharing Greenland white-fronted goose as a qualifying species, the Ramsar site is also designated for sand dune habitat. Non-breeding hen harrier is not a qualifying species of the Loch of Inch and Torrs Warren Ramsar site.

Flow of Dergoals SAC

Flow of Dergoals SAC contains one of the few remaining extensive areas of un-afforested blanket bog in Wigtownshire.

The qualifying habitats of the SAC [and latest assessed condition] are:

- blanket bog [Favourable Maintained], and
- depressions on peat substrates [Favourable Maintained].

Blanket bog is identified as a priority habitat under the Habitats Directive. This means it is considered to be at risk of disappearance and has a distribution largely restricted to Europe.

The overarching Conservation Objectives for the qualifying habitats of Flow of Dergoals SAC are:

1. To ensure that the qualifying features of Flow of Dergoals SAC are in favourable condition and make an appropriate contribution to achieving favourable conservation status.
2. To ensure that the integrity of Flow of Dergoals SAC is maintained by meeting objectives 2a, 2b and 2c for each qualifying feature.
   a) Maintain the extent and distribution of habitat within the site.
   b) Maintain the structure, function and supporting processes of the habitat.
   c) Maintain the distribution and viability of typical species of the habitat.

Further information on the Conservation Objectives 2a, 2b and 2c for the qualifying habitats can be found in the Conservation Advice Package for Flow of Dergoals SAC.

River Bladnoch SAC

The sole qualifying feature of the River Bladnoch SAC is Atlantic salmon. The species has been assessed as being in Unfavourable Recovering condition within the site, primarily as a result of improvements to freshwater habitats which support the species, rather than an increase in the population size (although catch and release conservation

measures for rod catches are also in place to improve spawning rates and, longer term, the number of adult fish returning to the catchment).

The Conservation Objectives of River Bladnoch SAC are:

1. To ensure that the qualifying feature of the River Bladnoch SAC is in favourable condition and makes an appropriate contribution to achieving favourable conservation status.
2. To ensure that the integrity of the River Bladnoch SAC is restored by meeting objectives 2a, 2b and 2c for the qualifying feature.
    a) Restore the population of the species, including range of genetic types, as a viable component of the site.
    b) Restore the distribution of the species throughout the site.
    c) Restore the habitats supporting the species within the site and availability of food.

Further information on the Conservation Objectives 2a, 2b and 2c for Atlantic salmon can be found in the Conservation Advice Package for River Bladnoch SAC.

Lendalfoot Hills Complex SAC

This a multi-part site in South Ayrshire which lies adjacent to and east of the A77 trunk road.

The qualifying feature habitat types of the SAC [and latest assessed condition] are:

- base-rich fens [Unfavourable Recovering]
- dry heaths [Unfavourable Declining]
- grasslands on soils rich in heavy metals [Unfavourable Declining]
- species-rich grassland with mat grass in upland areas [Unfavourable No change]
- very wet mires often identified by an unstable ‘quaking’ surface [Unfavourable Declining], and
- wet heathland with cross-leaved heath [Unfavourable No change].

Burning, over-grazing and the presence of invasive species are identified as existing negative pressures on the condition of several of the qualifying habitats. Management measures are currently in place which aim to restore the dry heath, grassland on soils rich in heavy metals, and wet heath habitats.

The Conservation Objectives of the SAC are:

- To avoid deterioration of the qualifying habitats thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to achieving favourable conservation status for each of the qualifying features.
- To ensure for the qualifying habitats that the following are maintained in the long term:
    - extent of the habitat on site
    - distribution of the habitat within the site
    - structure and function of the habitat
    - processes supporting the habitat
    - distribution of typical species of the habitat
    - viability of typical species as components of the habitat, and
    - no significant disturbance of typical species of the habitat.

Assessment of Effects on Site Integrity

At this stage, possible transport infrastructure projects which could be brought forward under the National Development are unknown. However, where such schemes are proposed in proximity to European sites, for example those identified which lie immediately adjacent to existing trunk roads, avoidance of habitat loss from within their boundaries will need to be achieved through project design, unless it can be demonstrated it would not adversely affect the integrity of any impacted European site and its Conservation Objectives (these circumstances will be very limited). The loss of either qualifying habitat or habitat which supports qualifying or 'typical' species has the potential to be considered significant as it may undermine the Conservation Objectives for a given site. NatureScot in SNH (2014a) gives several examples of cases from across the UK in which development proposals would have resulted in the direct loss of qualifying habitats. In some, the loss of small areas, representing less than 1% of the total resource within the relevant European site, were considered to represent a significant adverse effect. At this stage, however, it is considered that through scheme design, losses of habitat from within the boundary of European sites will be avoided.

SNH (2016) states that Greenland white-fronted geese have a core foraging range which extends to between 5-8km from the boundary of SPAs for which they are designated. Although the guidance does not consider non-breeding hen harrier, SNH (2016) also states that this species has a core foraging range of 2km during the breeding season, but that this can extend up to a maximum of 10km. It is likely that during the non-breeding season, when not associated with a nest location, hen harrier foraging will be over a wider area. The main feeding grounds of the Greenland white-fronted goose population associated with the Loch of Inch and Torrs Warren SPA consist of intensively managed agricultural fields on Stair Estates (which is close to the A75), around Genoch Mains, Culmore, Mye, in the fields surround West Freugh airfield to Galdenoch Bridge, around Droughduil and at Cults Loch, immediately south-east of Lochinch. Areas around Stoneykirk are used to a lesser extent. The core foraging area is considered to be around the West Freugh airfield, which is approximately 2km south of the A75 (https://greenlandwhitefront.org/gb-site-inventory/south-west-scotland/72-stranraer-dumfries-and-galloway-region-2/). Suitable foraging habitat within at least 5km of the SPA / Ramsar site could be used as functionally-linked land by Greenland white-fronted geese and/or hen harrier. Although the precise location of new infrastructure is unknown, it is likely to be in proximity to existing transport routes. Habitat in these areas will already be subject to a degree of disturbance, and is unlikely to be important as functionally-linked habitat. Therefore the potential for losses of functionally-linked habitat is considered to be low. Regardless, where proposals will result in the loss of such habitat within 5-8km of the Loch of Inch and Torrs Warren SPA / Ramsar site, it will be necessary to determine the potential use of this land by Greenland white-fronted geese and/or hen harrier. This will require further detailed study and may involve field survey. Given the distribution of these species, the likelihood of infrastructure being close to existing transport networks, and with a requirement for further study to determine use of suitable habitat, there is not expected to be any effect on the integrity of these designations due to the loss of functionally-linked habitat

Waterborne pollution generated during construction and operation of development projects can be controlled through the implementation of standard pollution prevention measures, which are widely adopted and reliable. These should include SuDS as part of the operational drainage system to manage run-off, especially where there is a hydrological link to a European site (e.g. the River Bladnoch SAC). Where there is considered to be a risk of contaminated land, detailed investigation will be required and bespoke mitigation may be needed before development can proceed. However, this is

again likely to be feasible. There is consequently no expectation of adverse effects on the integrity of any European from waterborne pollution.

The potential for air quality impacts generated by increased road traffic to adversely affect European sites will require detailed air quality modelling. This can be done at the plan or project level but requires an understanding of the nature of development likely to be progressed, which is not known at this stage. Any European site within 200m of the relevant road network will need to be included in the modelling, and the results will need to be carefully assessed by an ecologist, with reference to critical level / critical load for relevant habitats and existing background pollutant rates. It may be necessary to undertake surveys of sites subject to impacts in order to establish the distribution of qualifying or supporting habitats or species. Through detailed modelling and ecological assessment, any adverse effects on European sites can be identified and avoided, for example through project design or other mitigation such as physical screening. Therefore no adverse effect on the integrity of any European site is expected from this impact.

Similarly, the negative impacts on air quality which can arise during the construction phase of a development are also readily mitigated and are very unlikely to adversely affect the integrity of any European site.

The primary roost location used by the Greenland white-fronted goose population of the Loch of Inch and Torrs Warren SPA is understood to be White Loch. This is the nearest part of the SPA / Ramsar site to the A75 and is, at closest, approximately 340m north of the trunk road. This is within the distance within which disturbance may be caused from construction works. However, there is mature forestry across the entire distance between the road and the loch, and it is very likely that this would screen birds using the waterbody from any disturbance. In a study by Thomson and Harding (1994) (reported on https://greenlandwhitefront.org/gb-site-inventory/south-west-scotland/72-stranraer-dumfries-and-galloway-region-2/), White Loch was found to be used regularly in December, but in January it was suspected the birds were also roosting on fields behind Lochinch Castle, as had been reported in previous years. By February, much of the flock had switched to roosting on the sea at Clayshant Beach, round 5km south of the A75. Therefore, alternative roosting locations are also available, and there is apparently temporal variation in use through the winter period. Details of the location of hen harrier roosting are not presented here due to the risk of illegal interference. However, it is understood that this is distant from the A75 and unlikely to be subject to disturbance from construction associated with transport infrastructure projects.

Construction works associated with the expansion of Stranraer marina and/or redevelopment of the east pier are likely to be relatively minor (when compared to major port developments). It is therefore unlikely that they would significantly disturb or displace breeding seabirds or marine mammals occurring in Loch Ryan but associated with European sites such as Ailsa Craig SPA, The Maidens SAC or the North Channel SAC. Any impacts from construction would be expected to extend over a relatively small area and, given the availability of extensive areas of marine environment between Stranraer and these sites, would be very unlikely to have a significant effect on the relevant qualifying species.

An increase in boat traffic in Loch Ryan could lead to disturbance of seabirds and marine mammals, alongside other impacts including injury or mortality. This may require bespoke mitigation to be implemented including speed restrictions, zoning of areas where boats are not permitted, and awareness raising. However, at this stage, the increase in the number of vessels expected through marina expansion is not

expected to reach such a level that the effects on qualifying species become significant. This is especially the case given the distance to the nearest relevant European sites (approximately 35km to Ailsa Craig and approximately 55km to The Maidens SAC), the availability of alternative habitat in the intervening sea, and the fact that Loch Ryan already experiences the regular movement of ferries to and from Northern Ireland, and other vessels including fishing boats using the existing marina in Stranraer.

None of the other impacts discussed above are considered to have the potential to adversely affect the integrity of any European site.

In-combination Assessment

As stated above, transport interventions brought forward under Stranraer Gateway will be aligned with the outputs of STPR2. It is therefore not the case that the National Development and STPR2 will propose different projects which may otherwise act in-combination to cause significant effects on European sites.

Loch Ryan Management Plan seeks to regenerate Stranraer and the surrounding area and to position it as a "*successful marine leisure destination*". This aligns with the aims of the Stranraer Gateway National Development, and consideration has been given above to the potential for increased numbers of boats on the loch to adversely impact on seabirds and marine mammals. Mitigation recommended below would be applicable to, and is described in, the Loch Ryan Management Plan. Therefore adverse effects arising due to in-combination impacts from the National Development and the Loch Ryan Management Plan are very unlikely.

The National Renewables Infrastructure Plan identifies a spatial framework of port and harbour sites, based on best-fit locations for the needs of the offshore renewable industry. On this basis, N-RIP also identifies the potential to use Loch Ryan as a location from which to support the renewable energy industry. This could lead to an increase in larger ships using Loch Ryan. This is not expected to act in-combination with Stranraer Gateway, as the National Development is only likely to increase the number of smaller vessels. Moreover, large ferries already operate out of Cairnryan, meaning animal species using Loch Ryan are habituated to a degree of disturbance from the movement of large ships.

There are no other known plans or projects which, at this stage, are predicted to act in-combination with Stranraer Gateway to cause adverse effects on the integrity of any European site.

Avoidance and Mitigation

The following mitigation measures are recommended to avoid or minimise the identified impacts which could arise from the Stranraer Gateway National Development:

- all proposed developments must undergo project-level HRA to ensure there are no adverse effects on the integrity of any European site
- the loss of functionally-linked habitat used by qualifying species outside of the boundary of European sites should be avoided. This can be done through scheme design (e.g. avoiding areas of potentially suitable habitat) but may need to be informed through further study, including targeted field survey
- pollution prevention measures will be required during the construction and operation of the scheme. These should follow the PPGs and GPP published by SEPA, and may include (but not necessarily be limited to):

    - controls and contingency measures to manage run-off from construction areas and to manage sediment
    - all oils lubricants or other chemicals should be stored in an appropriate secure container in a suitable storage area, with spill kits provided across the development site
    - in order to avoid pollution of soils, vegetation and/or watercourses, all refuelling and servicing of vehicles and plant should be carried out in a designated area which is bunded and has an impermeable base. This should be at least 50m from any watercourse / waterbody
- the design of the scheme should seek to maintain existing surface water conditions
- the impacts of air pollution from road traffic on European sites must be investigated at the plan or project level once sufficient detail on likely developments is known. This will require air quality modelling and assessment by an ecologist with reference to relevant critical levels / critical loads, existing background pollutant rates and the distribution of qualifying and/or supporting / typical habitats and species. Where adverse effects are predicted, additional mitigation measures will be required, including scheme design or the provision of physical barriers to pollution such as screening planting
- mitigation measures may be required to avoid disturbance of qualifying species either within or outside of the boundaries of European sites. In relation to non-breeding Greenland white-fronted geese and hen harrier, this may require avoiding areas of functionally-linked habitat, implementing works exclusion zones, or timing works to avoid the season in which they are present (for example, Fox *et al* (2019) found that Greenland white-fronted geese arrived in the Loch of Inch and Torrs Warren SPA / Ramsar site in October and departed in March)
- impacts on seabirds and marine mammals in Loch Ryan, including disturbance, displacement, and injury / mortality, may require targeted mitigation to be adopted. This will need to be assessed in more detail at further stages of the planning process, depending on the expected increase in vessel numbers, and the type of vessel likely to be involved. However, such measures may include:
    - implementing speed restrictions in the loch
    - designating zones in which vessels are not permitted to enter. These zones would be those considered to be of most important to relevant species, and would need to be identified through detailed study, potentially including field survey
    - education and awareness raising, including provision of signage, and
    - effective management of vessels in the loch, for example through appointment of a harbour master.

Depending on the type and nature of project brought forward under Stranraer Gateway, additional mitigation measures not described above may be required and should be determined through detailed study and assessment.

Conclusion

With the implementation of mitigation measures, it is considered that, based on the level of detail available at this stage, it will be possible to deliver projects under the Stranraer Gateway National Development without adverse effects on the integrity of any European site. This conclusion would need to be re-examined for planning applications when a much greater level of detail regarding the design and delivery of particular projects will be available.

In particular, measures to manage the disturbance of seabirds and marine mammals in Loch Ryan which may arise from an increase in boats due to expansion of the marina in Stranraer may be required.

Clyde Mission

Summary Description of the National Development

The Clyde Mission National Development covers the corridor of the River Clyde, up to a distance of 500m from the river's edge, along its length from South Lanarkshire in the east, to Inverclyde and Argyll and Bute in the west. This area includes parts of the Clyde Gateway, River Clyde Waterfront, North Clyde River Bank and River Clyde Corridor frameworks, and Glasgow Riverside Innovation District.

This National Development aims to encourage the repurposing and redevelopment of brownfield land and to support local living and adaptation to the impacts of climate change, in which regard nature-based solutions would be particularly supported.

The following classes of development are included in the Clyde Mission National Development:

a) Mixed use, which may include residential, redevelopment of brownfield land;
b) New, reused and/or upgraded buildings and facilities for residential; commercial, business and industrial uses on brownfield land;
c) Upgrade of existing port and harbour assets for servicing marine functions including freight and cruise uses and associated landside commercial and/or industrial land for supporting services;
d) New and/or upgraded active and sustainable travel and recreation routes and infrastructure; and
e) New and/or upgraded infrastructure for climate adaptation, including nature-based, green and blue solutions.

Potential Impacts on European Sites

The only European sites which lie within 500m of the River Clyde are the Inner Clyde SPA and Ramsar site. These designations are coincident and both have the same sole qualifying feature – non-breeding redshank. The SPA and Ramsar site cover extensive intertidal mudflats between Newshot Island and Craigendoran Pier on the north of the estuary, and Newark Castle on the south. Development of the type included in Clyde Mission is unlikely to take place on the intertidal habitat which supports the qualifying redshank population, except potentially infrastructure designed to manage climate change impacts. This could include blue or green infrastructure which may make use of nature-based solutions to provide climate change adaptations, and which could deliver benefits for the SPA and Ramsar site. However, as set out in more detail in the assessment for the Pumped Hydro Storage National Development, the loss of any habitat from within the boundary of a European site can have an adverse effect on the integrity of that site.

The feeding range of wintering redshank extends higher up the shore than most waders, and some birds will feed in pastures at high tide (Forrester *et al*, 2007). Proposals for development in suitable foraging habitat within the area encompassed by Clyde Mission near to the Inner Clyde SPA and Ramsar site have the potential to result in the loss of functionally-linked habitat used by redshank outside of the boundary of these sites.

Given the proximity of the National Development to the River Clyde, there is the potential for waterborne pollution of the watercourse. This could occur during the construction phase of developments, for example through spills of fuels or other contaminants, or as a result of the uncontrolled release of sediment. There could also be impacts on water quality during the operational phase of developments, including discharge of effluent. There is direct hydrological connectivity for waterborne pollution entering the River Clyde to reach the Inner Clyde SPA and Ramsar site. However, the only other European sites which are hydrologically connected to the River Clyde are the Black Cart SPA and the Clyde Valley Woods SAC. These sites, although encompassing watercourses which flow into the River Clyde, are generally upstream of the River Clyde. In the case of Clyde Valley Woods SAC, pollution of watercourses encompassed by this designation is unlikely to impact on the qualifying woodland habitat.

Clyde Mission includes for new, reused and/or upgraded buildings and facilities for industrial use. As set out in more detailed in the assessment for the Chapelcross Power Station Redevelopment, development of this type can lead to emissions of airborne pollutants which can adversely affect European sites in a number of ways (see Table A6). Guidance published by Defra and the Environment Agency recommends that for larger industrial facilities, air quality impacts on European sites up to 10km distant should be assessed. For larger emitters (greater than 50 megawatts), this distance may need to be increased to 15km (https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit#screen-out-pecs-from-detailed-modelling). There are numerous European sites within this distance of Clyde Mission, but the one which is closest and most likely to be impacted is the Clyde Valley Woods SAC.

Construction traffic and plant, and traffic associated with the operational phase of a development (including residents at new housing developments) can also lead to air quality impacts. For example, within a 'typical' housing development, by far the largest contribution to NOx will be made by the associated road traffic. Other sources are of minor importance in comparison. The Design Manual for Roads and Bridges (DMRB) advises that impacts on European sites can occur at distances of up to 200m from roads (Highways England *et al*, 2019), but that air pollution levels fall sharply within the first few tens of metres from a road.

Construction activities can also lead to air quality impacts on designated sites, though these are typically less severe, and occur over a shorter period of time, than those associated with road traffic or other operational sources of pollutants. In particular, construction works can generate dust which can directly impact vegetation or aquatic environments and can indirectly impact on animal species (for example where these habitats support them for foraging). During periods of extended dry weather, dust can cover plant foliage and adversely affect photosynthesis or other biological functions. Rainfall can then remove deposited dust and rapidly leach chemicals into the soil (Holman *et al*, 2014). As stated, the significance of these effects will partly depend on the duration over which the impacts occur. Where they arise over a relatively short period of time, the impacts are unlikely to be significant. Guidance published by the Institute of Air Quality Management (IAQM) advises that consideration should be given to construction-related air quality impacts on nature conservation sites within 50m of works, including any access routes, extending to 500m from the entrance to the construction site (Holman *et al*, 2014).

The only European sites with animals as qualifying features which are located in proximity to the Clyde Mission National Development are the Inner Clyde SPA and Ramsar site, and the Black Cart SPA. All other European sites are located further than the distance to which their qualifying animal species would be expected to travel

beyond the site boundary. According to the Waterbird Disturbance Mitigation Toolkit (Cutts *et al*, 2013), redshank (the qualifying species of Inner Clyde SPA / Ramsar site) are relatively tolerant to human activities and habituate rapidly to works. The Toolkit suggests that disturbance from construction may occur at distances of 75-100m from the source. It also states that the species can be very tolerant of people, allowing approach to between 70-115m before flushing from a lone walker on the mudflat. No information is given in the Waterbird Disturbance Mitigation Toolkit in relation to whooper swan *Cygnus cygnus*, the sole qualifying species of the Black Cart SPA. However, it states that disturbance of waterbirds in general may occur at distances of up to 300m from construction activities, although this can be greater for particularly sensitive species.

Recreational pressure, caused by visitors to nature conservation sites, can have significant impacts on the qualifying habitats and species. Research by Weitowitz *et al* (2019) found that more housing consistently leads to more visitors to protected sites, across most habitats. This was found to be particularly the case for visitors on-foot originating from housing developments within 1.5km of a designated site. For visitor numbers at protected sites with car parking locations, levels of housing within 15km were found to be a significant predictor of recreational pressure, but this depended on habitat type. For both visitors accessing on foot and by car, the strongest positive correlations between visitor numbers and housing development were found at sites containing inland water features, estuaries and wetlands.

Time that birds spend responding to disturbance is time not spent feeding and results in unnecessary energy expenditure, and thus risks increasing energetic output while reducing energetic input. This can adversely affect condition and ultimately survival of birds. Displacement from one feeding site to others also increases pressure on available resources. Several empirical studies have demonstrated that disturbance from recreational activities can be significant:

- Linaker (2012) found during a survey of recreational activity at Teesmouth and Cleveland Coast SPA that 28% of activities caused a disturbance event, and that dog walking generally accounted for the majority of events and caused the greatest mean disturbance
- Webb (2002) found that dog-walking had the greatest negative cumulative effect on turnstones in Thanet and Sandwich Bay SPA, and disturbance was greatest at high tide except during maximum disturbance events (dogs actively chasing turnstones)
- Liley and Fearnley (2011) found during an extensive survey of disturbance on intertidal habitats in Kent that major disturbance flights were more likely with dogs present and at high tide, and dog-walking caused 55% of all major flights
- Thomas *et al* (2003) found that recreational disturbance especially by dogs reduced foraging time of sanderlings, and recommended enforcement of dog-leash laws
- Tuite *et al* (1983) found that high recreational activity caused bird numbers at Llangorse Lake to decrease by 30%, matching the increase in recreational activity, and caused birds to spend less time in ‘preferred zones’
- Underhill *et al* (1993) correlated disturbance with a decrease in waterfowl numbers at smaller sites and with movement from disturbed to less disturbed areas at larger sites, at 54 water bodies in the South West London Water Bodies SPA
- Evans and Warrington (1997) found that on Sundays, waterbird numbers were 19% higher on Stocker’s Lake Local Nature Reserve (LNR), and attributed this to

observed greater recreational activity on surrounding water bodies at weekends relative to weekdays, and
- Burger *et al* (2004) found that human disturbance of shorebirds at Delaware Bay in the USA declined sharply after management actions, including dog-leash encouragement, installation of signs with information on the shorebirds, and spatial access restrictions.

Furthermore, visitor pressure can also be exerted on terrestrial habitats. This can happen through trampling, which causes soil compaction and erosion, and can change vegetation composition. Walkers with dogs can contribute additional pressure on vegetation through nutrient enrichment as a result of dog fouling. Empirical studies have illustrated these damaging effects on vegetation, including:

- Cole (1995) conducted experimental off-track trampling in various habitats in the USA. Low mat-forming grasses recovered best, while tall non-woody non-grass species were least resistant. Plants with buds below the soil surface were most resilient, and those with buds above the soil surface least resilient
- Hirst *et al* (2005) found in a study on Salisbury Plain that neutral grasslands typically took 30-40 years to re-establish following disturbance, but calcareous grasslands took at least 50 years, and even after long time periods there were significant differences between disturbed and undisturbed swards, with perennial herbs, particularly hemicryptophytes, persisting at higher frequencies in swards disturbed 50 years ago.
- Vujnovic *et al* (2002) confirmed in Canada that both lack of and heavy disturbance led to lower plant diversity, and non-native plant diversity was higher with more disturbance
- Atkinson *et al* (2004) found that increased disturbance and trampling were amongst the factors (primarily fertilising, grazing and mowing) that reduced herb diversity and quantity in UK improved grasslands, negatively affecting invertebrates and birds, and
- Taylor *et al* (2006) noted that dog faeces encouraged decreased plant diversity and increases species of improved habitats and lush growth; it was also noted that dogs typically defecate within 400m of a walk starting, but urinate at regular intervals.

Brownfield sites can often be infested by invasive non-native plant species. Development activities have the potential to cause the uncontrolled spread of these species. As described in relation to waterborne pollution, the only sites which are hydrologically connected to, and downstream of, the National Development are the Inner Clyde SPA and Ramsar site. Much of the area encompassed by these designations is unsuitable for the growth of invasive non-native plant species. However, above the tidal limit, there is the potential for species such as Japanese knotweed, which can be spread through plant fragments, to establish.

Relevant European Sites

Considering the impacts described above, the following European sites are likely to be most relevant to the Clyde Mission National Development.

- Inner Clyde SPA
- Inner Clyde Ramsar site
- Black Cart SPA, and
- Clyde Valley Woods SAC.

In addition, considering the potential for large-scale industrial emitters to have air quality impacts up to distances of 10-15km, the following additional European sites may also need to be considered depending on the proposals brought forward under the National Development:

- Cranley Moss SAC
- North Shotts Moss SAC
- Coalburn Moss SAC
- Waukenwae Moss SAC
- Red Moss SAC
- River Tweed SAC
- Upper Nithsdale Woods SAC
- Moffat Hills SAC
- Renfrewshire Heights SPA, and
- Muirkirk and North Lowther Uplands SPA.

However, these sites are likely to be subject to air quality impacts from multiple existing sources including road traffic and operational industrial facilities. No further information is given on these sites in this assessment, but they should be considered when carrying out HRA screening at future stages of the planning process, including at the project level

Inner Clyde SPA and Ramsar site

The designations are coincident and for both the sole qualifying feature is non-breeding redshank. According to the SPA / Ramsar site citation documents, between 1992/93-1996/97, the site supported 2,107 individual redshank. This is one of the highest density wintering populations in the UK. The latest assessed condition of the redshank population in the SPA was Favourable Maintained.

The Conservation Objectives of the SPA are:

- To avoid the deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained.
- To ensure for the qualifying species that the following are maintained in the long term:
  - population of the species as a viable component of the site
  - distribution of the species within the site
  - distribution and extent of habitats supporting the species
  - structure, function and supporting processes of habitats supporting the species, and
  - no significant disturbance of the species.

Black Cart SPA

Black Cart SPA comprises a 3km tidal stretch of the Black Cart Water and its associated floodplain. This stretch of the watercourse supports abundant submerged vegetation typical of brackish conditions. The floodplain is mostly semi-improved pasture but includes small creeks, stands of common reed *Phragmites australis* and areas of rush-dominated grassland.

The sole qualifying feature of the SPA is non-breeding whooper swan. The population forages over the entire Black Cart SPA, roosts on the open water and uses the area as a severe winter refuge. The latest assessed condition of the whooper swan population was Favourable Declining.

The Conservation Objectives of the SPA are:

- To avoid the deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained.
- To ensure for the qualifying species that the following are maintained in the long term:
  - population of the species as a viable component of the site
  - distribution of the species within the site
  - distribution and extent of habitats supporting the species
  - structure, function and supporting processes of habitats supporting the species, and
  - no significant disturbance of the species.

Clyde Valley Woods SAC

Clyde Valley Woods SAC comprises 11 separate parts and the sole qualifying feature is the habitat ‘mixed woodland on base-rich soils associated with rocky slopes’. This habitat typically occurs in association with base-rich rocks in steep-sided immature river valleys and is found on nutrient-rich soils that often accumulate in the shady micro-climates towards the bases of slopes and ravines. Such forests are not extensive but localised, topographically constrained stands that then grade into other woodland types on level valley floors or slopes above. The feature is considered to be in Favourable Maintained condition, but the presence of invasive non-native plant species is identified as a pressure on the conservation status.

The Conservation Objectives of the SAC are:

1. To ensure that the qualifying feature of Clyde Valley Woods SAC is in favourable condition and makes an appropriate contribution to achieving favourable conservation status.
2. To ensure that the integrity of Clyde Valley Woods SAC is maintained by meeting objectives 2a, 2b and 2c.
   a) Maintain the extent and distribution of the habitat within the site.
   b) Maintain the structure, function and supporting processes of the habitat.
   c) Maintain the distribution and viability of typical species of the habitat.

Further information on the Conservation Objectives 2a, 2b and 2c for the qualifying woodland habitat can be found in the Conservation Advice Package for Clyde Valley Woods SAC.

The latest assessed condition of the qualifying habitat was Favourable Maintained. However, the presence of numerous invasive non-native plant species is identified as an existing pressure on the woodland.

Assessment of Effects on Site Integrity

All proposed developments must undergo project-level HRA to ensure there are no adverse effects on the integrity of any European site. Given that the habitats used by this species are mainly intertidal, it is considered, however, that proposals involving the loss of such habitat are unlikely to be brought forward. Even where this was the case, it is likely that losses of habitat from within the boundary of the European site could be avoided through project design. Any proposals which involve blue or green infrastructure / nature-based solutions to manage climate change impacts, and which would benefit non-breeding redshank, would likely be supported.

In addition to intertidal habitat within the Inner Clyde SPA and Ramsar site, wintering redshank may also use inland pasture (grazed grassland) for foraging. Wintering whooper swan – the sole qualifying feature of the Black Cart SPA – will also use agricultural grassland habitats for foraging, as well as cereal stubbles and root crops (Forrester *et al*, 2007). SNH (2016) suggests that this species may use such habitats at distances of up to 5km from the boundary of SPAs for which they are designated. Development of grassland habitat which may be functionally-linked to the Inner Clyde SPA / Ramsar site and/or Black Cart SPA should therefore be avoided. Where development will lead to a loss of potentially suitable habitat within 5km of the Black Cart SPA, and within at least 1km of Inner Clyde SPA / Ramsar site, it will be necessary to carry out targeted study, including field survey, to determine use of the affected area by whooper swan or redshank, respectively. Through project design and siting and based on the results of further study where necessary, it is very likely that the direct loss of habitat which supports the qualifying species of Inner Clyde SPA / Ramsar site and Black Cart Water SPA, including functionally-linked habitat outside of the boundaries of these sites, can be avoided. There is therefore no expectation of an effect on site integrity from these impacts.

As described above, the only sites for which an impact pathway exists for waterborne pollution caused by developments brought forward under the Clyde Mission National Development are the Inner Clyde SPA and Ramsar site. Standard pollution prevention measures, as described in SEPA PPGs / GPP, which are widely adopted and reliable, can be implemented to avoid pollution risks during the construction phase of developments. Any projects brought forward which involve operational discharges to watercourses will need to be suitably permitted and through this process, adverse effects on water quality, and thus the integrity of these European sites, will be avoided.

A detailed assessment of air quality impacts on European sites will be required for any development brought forward which involves emissions to the atmosphere. This should be based on the screening buffers advised by Defra / the EA, namely 10km for most emitters, extended up to 15km for major emitters. This will require the input of air quality specialists and ecologists to determine whether any identified impacts from air pollution could significantly affect any European sites. As the specific projects which may be brought forward are not known at this stage, it is only possible to state that projects which are predicted to result in pollutant rates at European sites which exceed 1% of the relevant critical load or critical level for the applicable habitats could result in an adverse effect on the integrity of that site. However, there is considerable precedent for emitters to be delivered within 10-15km of European sites without adverse effects on the integrity of European sites (for example through the use of technology to reduce NOx and ammonia emissions). Therefore, with a requirement for detailed air quality modelling and accompanying ecological assessment, and any associated process improvements, it will be possible to avoid developments being progressed which could adversely affect the integrity of any European site.

Construction-phase disturbance of redshank and whooper swan is possible at distances of between 100-300m, depending on the nature of the works. Construction works associated with Clyde Mission which take place adjacent to the Inner Clyde SPA / Ramsar site or the Black Cart SPA have the potential to disturb the qualifying species when present within the boundaries of these sites. Additionally, construction works within 5km of Black Cart SPA have the potential to disturb whooper swan foraging in functionally-linked habitat. This could also occur in relation to redshank, although this species is likely to forage inland only relatively short distances from the coast during the non-breeding season. To minimise potential disturbance impacts, several mitigation measures are available, including the use of visual and noise screening, and adopting working methods and technologies which minimise the generation of noise. However, should these measures be considered insufficient, timing of works to take place outside of the non-breeding season would ensure that any possible impacts on redshank and/or whooper swan could be avoided. For whooper swan, this is generally between September and March, inclusive. However, according to Forrester *et al* (2007), redshank move to the coast following breeding from July onwards, and can reach a peak in these locations in October. Birds return to breeding grounds from March.

Research shows that recreational pressure from new residential development is likely to be greatest on European sites located within 1.5km. However, at sites where car parking is provided, an increase in recreational pressure from new housing can occur at sites up to 15km distant. These impacts are shown to occur most significantly at estuaries, wetlands and inland sites with water features. Any new housing brought forward under Clyde Mission therefore has the potential to impact on sites up to 15km away through increased recreational pressure. However, with the exception of Inner Clyde SPA / Ramsar site, Black Cart SPA and Clyde Valley Woods SAC, all European sites within 15km are either: a) located in the uplands b) are very large, and/or c) they contain bog habitats which are unlikely to be attractive to significant numbers of visitors. As a consequence, none of these sites is expected to experience a significant increase in visitor numbers from any new housing brought forward under the National Development.

The HRA of the Clydeplan Forestry and Woodland Strategy (LUC, 2015) states that the majority of the Cylde Valley Woods SAC is inaccessible due to steep topography. Where access is possible, it is carefully managed through the Management Plan for the Clyde Valley Woodlands National Nature Reserve (NNR) which overlaps some, but not all, of the SAC. However, the Conservation Advice Package for the SAC does identify that recreational issues, including mountain biking, represent a key management issue for the site. The CAP provides current and recommended management to avoid adverse effects on the qualifying woodland habitat of the site, including community liaison, educational initiatives and on-site interpretation. Through careful management, it is likely that adverse effects on the integrity of Clyde Valley Woods SAC from residential development brought forward under the Clyde Mission National Development can be avoided.

The Site Management Statement for the Black Cart Site of Special Scientific Interest (SSSI) (which is coincident with the Black Cart SPA) states that recreational use of the site is generally restricted to shooting and angling and that some of this may be unauthorised. Although this is a possible pressure on the qualifying whooper swan population, it is not indicated as being a current threat to the conservation status of the species as a qualifying feature of the SPA. Moreover, new housing development is unlikely to significantly increase the occurrence of unauthorised shooting, and no adverse effect on the integrity of this site is predicted from new residential development brought forward under Clyde Mission.

The conservation status of redshank in the Inner Clyde SPA was last assessed in 2007 as being Favourable Maintained. The Site Management Statement for the Inner Clyde SSSI, which is coincident with the SPA, identifies that several areas adjacent to the site are used for recreation, specifically including Brucehill playing fields and Levengrove Park at Dumbarton (on the north shore), and Kelburn Park at Port Glasgow (on the south shore). Public access to the foreshore is facilitated over much of the site by the existence of relatively formalised footpaths, notably including the coastal path running along the southern shore from Newark Castle to Parklea. With a favourable conservation status, it is clear that existing levels of recreational are not significantly affecting wintering redshank in the SPA. As existing opportunities for access exist, it is likely that these locations would continue to be used. To ensure this is the case, management measures may be required to encourage use of formalised paths, including through signage, fencing and/or provision or removal of parking locations. However, by directing access to existing recreational locations, and given that use of these areas currently is not adversely affecting the SPA, it is considered unlikely that Clyde Mission would adversely affect the integrity of the Inner Clyde SPA or Ramsar site through recreational pressure.

The spread of invasive non-native plant species to the Inner Clyde SPA / Ramsar site can readily be avoided through the implementation of biosecurity measures, described below. It will be necessary for a suitable survey of development sites to be carried out to search for the presence of invasive non-native plants. This should seek to identify potential infestation pathways and methods for control and, where possible, eradication. With the adoption of such measures, there will be no adverse effect on the integrity of any European site.

In-combination Assessment

Clyde Mission applies to land in seven local planning authority areas: South Lanarkshire, North Lanarkshire, Glasgow City, Renfrewshire, West Dunbartonshire, Argyll and Bute, and Inverclyde. Development brought forward under the National Development must also be consistent with the policies and priorities of the local development plans for these areas. The National Development also includes parts of the areas covered by Clyde Gateway, River Clyde Waterfront, North Clyde River Bank and River Clyde Corridor frameworks, all of which include various types of development aimed at regenerating the urban environment.

There is the potential for developments elsewhere in the council areas or associated with these other frameworks, but outside of the Clyde Mission area, to result in impacts which act in-combination with developments brought forward under the National Development. The most important are likely to include:

- recreational pressure, which may include disturbance / displacement of redshank and/or whooper swan in the Inner Clyde SPA / Ramsar site and Black Cart SPA, respectively
- loss of functionally-linked habitat, and
- airborne pollution and the impacts of reduced air quality on qualifying and supporting habitats.

In addition, the Black Cart SSSI Site Management Statement identifies that requirements to maintain air safety at Glasgow Airport may involve scaring of whooper swans away from certain areas. Depending on frequency of such activities, this additional pressure could also act in-combination with impacts arising from the National Development.

However, it should be possible to avoid or mitigate these impacts using the measures described above and listed below, and it is not expected at this stage that there would be an adverse effect on the integrity of any European site.

Given the urbanised nature of much of the area covered by Clyde Mission, there may be other projects which could act in-combination with the National Development to result in adverse effects. This will need to be carefully assessed for each proposal at the project-level. However, as concluded above, sufficient opportunity for avoidance and/or mitigation exists such that adverse effects on the integrity of European sites are not expected.

Avoidance and Mitigation

The following mitigation measures are recommended to avoid or minimise the identified impacts which could arise from Clyde Mission on European Sites:

- all proposed developments must undergo project-level HRA to ensure there are no adverse effects on the integrity of any European site
- development which results in the loss of habitat which could be used by the qualifying species of Inner Clyde SPA / Ramsar site and/or Black Cart SPA outside of the boundaries of these designations should be avoided. This primarily includes pasture and other agricultural land. Where development may result in the loss of such habitat within 5km of Black Cart SPA, or within at least 1km of Inner Clyde SPA / Ramsar site, detailed study, potentially including field survey, will be required to determine whether this is functionally-linked to these designations. The precise scope of such survey will need to be determined based on the nature of the relevant proposal(s) but may require data collection over more than one non-breeding season
- pollution prevention measures will be required during the construction and operation of the scheme. These should follow SEPA PPGs / GPP, and may include (but not necessarily be limited to):
  - controls and contingency measures to manage run-off from construction areas and to manage sediment
  - all oils lubricants or other chemicals should be stored in an appropriate secure container in a suitable storage area, with spill kits provided across the development site
  - in order to avoid pollution of soils, vegetation and/or watercourses, all refuelling and servicing of vehicles and plant should be carried out in a designated area which is bunded and has an impermeable base. This should be at least 50m from any watercourse / waterbody
- residential development within 1.5km of a European site requires consideration to be given to increased visitor numbers arriving on foot or by car. It may be necessary to manage recreational pressure on qualifying habitats or species as a result of increased visitor numbers. Potential management measures may include:
  - encouraging people to use existing (or new, where necessary) formalised paths and access routes
  - preventing people from accessing areas where they could adversely impact on qualifying habitats, species or habitats supporting qualifying species (for example through fencing or planting)
  - providing signage to educate people on required behaviours at the sites. In particular, this could relate to advice in relation to dog walking
  - where necessary, implementing byelaws to restrict dog walking off-leash, or other activities such as mountain biking or shooting

    - providing dog waste bins, and
    - providing education through other means, including, for example, providing leaflets with all new homes and on-site information boards
- where construction works are proposed within at least 300m of the Inner Clyde SPA / Ramsar site and/or the Black Cart SPA, or within at least 300m of habitat which is functionally-linked to these sites, measures to avoid the disturbance of the qualifying species will be required. This may include:
    - the use of temporary or permanent screening to reduce noise and/or visual impacts. For example, noise reducing barriers may be used as a temporary solution during construction. Planting of hedgerows and/or trees may provide a more permanent, longer-term measure to screen operational activities
    - using technology and best available techniques which minimise the generation of noise during construction and operation
    - a ‘soft-start’ may be adopted for all potentially disturbing activities to minimise the risk of impacts on redshank and whooper swan within at least 300m. This involves gradually increasing the intensity of an activity (for example the noise it generates) over a period of time to allow birds to habituate to the source
- if it cannot be concluded that significant disturbance effects on the qualifying species can be avoided, it may be necessary to time works to avoid the non-breeding season. The precise dates may need to be determined based on the species present, but the non-breeding season is generally taken to be extend between September and February, inclusive, for whooper swan. For redshank this can extend between July and March, inclusive, and
- survey for the presence of invasive non-native plant species will be required on land which will be impacted by development. Suitable biosecurity measures will need to be devised based on the species present and their distribution, and the nature of works to take place. Such measures will need to be set out in a Biosecurity Management Plan or similar but must be designed to prevent the spread of such species from the site. Wherever possible, the possibility of eradication from the site should also be investigated.

Conclusion

With the implementation of mitigation measures, it is considered that development of the type included in the Clyde Mission National Development can be delivered without adverse effects on the integrity of any European site. This conclusion must be re-examined by HRA at future stages in the planning process, including for local development plans and individual projects, at which time a much greater level of detail will be available.

A thorough assessment of the potential for in-combination effects to arise with other plans or projects will also be required for individual proposals brought forward under the National Development. However, there is no expectation that any such effects could not be sufficiently avoided or mitigated.

Aberdeen Harbour

Summary Description of the National Development

This National Development applies to port of Aberdeen North and South Harbours. It supports the continued use and repurposing of Aberdeen Harbour.

At the South Harbour, the focus should be on regenerating existing industrial land and reorganising land use around the harbour in line with the spatial strategy of the Local Development Plan. By focusing future port activity here, parts of the existing harbour in the city centre will become available for mixed use development, opening up development land to help reinvigorate Aberdeen city centre.

The following classes of development are included in the Aberdeen Harbour National Development:

a) Mixed use development reusing the land at the existing (north) Aberdeen Harbour;
b) Upgraded port facilities at Aberdeen Harbour and completion of South Harbour;
c) New and/or upgraded green infrastructure;
d) Buildings and facilities for commercial, manufacturing and industrial uses;
e) Infrastructure for the production, storage and transportation of low carbon and renewable hydrogen and related chemicals including ammonia, with carbon capture as necessary; and
f) Transport infrastructure, including for sustainable and active travel, for the South Harbour, as supported by the Aberdeen City Region Deal.

Additional business and industrial development outwith the existing Aberdeen Harbour and South Harbour is a matter to be determined in the relevant local development plan and is not included in the scope of this National Development.

Potential Impacts on European Sites

The entrance to the existing (north) Aberdeen Harbour requires vessels to pass through the River Dee SAC. Any development which involves upgrading of the existing port facilities at Aberdeen Harbour may require dredging, for example to permit the passage of larger ships. The qualifying features of the SAC are all animal species (Atlantic salmon, otter and freshwater pearl mussel *Margaritifera margaritifera*), so there will be no direct loss of qualifying habitat. Moreover, none of the qualifying species are likely to rely on the habitat at this location, thus any dredging at the entrance to Aberdeen Harbour is unlikely to result in the loss of habitat which supports the qualifying species.

Terrestrial habitat around South Harbour is potentially suitable for several qualifying species of the Ythan Estuary, Sands of Forvie and Meikle Loch SPA, including non-breeding lapwing and redshank. Developments here could result in the loss of habitat used by these species outside of the boundary of this site and which is therefore considered to be functionally-linked to it.

Dredging can also result in the loss of habitat which supports the prey species of breeding seabirds. This can occur where waste generated by dredging activities is disposed of in an area which is important for such species. For example, reef habitat is typically associated with high fish populations and is therefore excellent foraging

grounds for species such as, terns and kittiwakes. This habitat can be lost through smothering as a result of the disposal of dredge waste.

Waterborne pollution could occur during both the construction and operational phases of terrestrial and marine development at Aberdeen Harbour. During both phases there is the potential for spills of fuels, oils or other contaminants. However, of greater impact would be any requirement for dredging activities, and the disposal of waste thereby generated. Details on the potential water quality impacts of dredging activities on breeding seabirds can be found under the assessment for Energy Innovation Development on the Islands. Atlantic salmon are expected to avoid areas of high turbidity. However, while the threats of turbidity are reduced through avoidance, there is the risk of poor visibility acting as a barrier to migratory movement. Otter are highly mobile and can avoid areas of poor water quality to forage in either the freshwater or marine environment, as well as in terrestrial wetland habitats.

Structures placed within sites designated for migratory fish or along migratory routes may displace fish from these areas. Structures may change the hydrodynamic and/or sediment transport regime or be a significant barrier to movement. Migrating fish can be displaced by the presence of structures at the mouth of their spawning river. Fish use several cues at the river mouth to identify the correct spawning river. For example, according to Perrier *et al* (2011), Atlantic salmon can detect spawning rivers using the following environmental cues:

- specific chemical identity of the river
- geological substrate (i.e. sand or gravel)
- geographical differences (i.e. pH of the river and gravel size)
- temperature differences, and
- upstream difficultly (i.e. the physical difficulty migrating upstream).

If migrating fish are not able to detect these cues, reproductive success of that population could be jeopardised. Furthermore, any impacts which prevent Atlantic salmon entering the River Dee SAC, or reduce the numbers entering the European site, could affect freshwater pearl mussels upstream (because this species relies on Atlantic salmon as a host for part of its lifecycle). Similarly, otter could also be affected by reduced numbers of Atlantic salmon as this species likely forms an important part of the diet of otter on the River Dee at certain times of year.

Atlantic salmon could be impacted by noise disturbance during the construction and/or operational phase of developments at Aberdeen Harbour. Substantial noise levels could be generated through activities such as piling, dredging and the passage of vessels. Fish hear sound and use this information to perceive their environment. Changes in noise levels are likely to affect a fish's behaviour, physiology, anatomy, and development. For instance, noise may impact on fish orientation and predator avoidance. Increased noise levels can also displace fish from a given area.

Marine mammals are highly mobile and can travel large distances in search of suitable foraging grounds. For example, based on consultation feedback provided by the Joint Nature Conservation Committee (JNCC) and other stakeholders in the MMO marine plans HRA, it was considered that grey seal could travel up to 135km from the boundary of SACs for which they are designated. Bottlenose dolphins belonging to the Moray Firth SAC are known to regularly forage down the north-east coast and to reach as far as Aberdeen (Quick *et al*, 2014). There is therefore the potential for these species to travel from distant sites and be impacted by the Aberdeen Harbour National Development. In particular, and as for fish (described above), marine mammals are

vulnerable to the impacts of noise generated by construction and other activities associated with ports, including dredging and the movement of vessels.

Marine mammals have well-adapted auditory organs and use sound extensively for social communication, navigation and the detection of prey. Most anthropogenic sound is low frequency in nature and is within the audible range of many marine mammals. Increases in background noise and specific sound sources can impact marine mammals in a number of ways, including masking of important sounds such as vocalisations and hearing loss (both temporary and permanent). Disturbance caused by human-induced noise can displace marine mammals from areas which would otherwise be used for activities such as foraging.

As described above, there are multiple possible impacts on fish and marine mammals from human-induced noise. However, where noise levels are sufficiently high, they can have anatomical impacts on fish, including hearing loss or injury to vital organs. This can result in strandings, disorientation and death. Damage to fish hearing may also result in them being unable to detect threats and therefore being more vulnerable to predation. Studies have shown that fish are sensitive to ear damage at noise levels ranging from 142-300 Hz pure tone at 180 dB re 1µPa (Scholik and Yan, 2001).

The potential for ship movements to disturb and displace foraging seabirds is discussed in detail in the assessment for Energy Innovation Development on the Islands.

Physical structures at the entrance to a watercourse, in addition to having impacts on hydrological conditions, can also cause physical harm to fish. For example, when water flows past a structure, velocity gradients are created otherwise known as vortices. Depending on hydrodynamic conditions, fish can be attracted to or repelled by the turbulence (Liao, 2007). Extremely high levels of shear stress can harm fish (Odeh *et al*, 2002) and turbulence can increase the energetic costs of swimming (Enders *et al*, 2003).

The main collision risk to Atlantic salmon is posed by construction works and increased vessel movements. The ability of fish to avoid a potential collision with an object is dependent on sensory capabilities (i.e. vision and hearing), perception levels and swimming speeds of the species. In high latitude coastal areas (such as at Aberdeen Harbour), and in areas where turbidity may be increased by human activities (including dredging or the movement of vessels), visibility for Atlantic salmon may be poor and the risk of collision is increased.

Marine mammals are extremely powerful and agile swimmers with quick reflexes and good sensory capabilities. This equips individuals with the abilities to avoid anthropogenic structures when they are in good environmental conditions (i.e. reduced / low levels of turbidity). However, there are multiple published reports of marine mammal mortality attributed to collision with ships (e.g. Kraus, 1990; Wiley *et al*, 1994). Vanderlaan and Taggart (2007) also reported that with increasing vessel speed, the probability of lethal injury to whales increased. The greatest rate of change was observed between vessel speeds of 8.6-15 knots, when the probability of a lethal injury (as opposed to a ‘minor’ non-lethal injury) increased from 21% to 79%. At speeds above 15 knots, the probability of a collision being fatal approached 100%.

There is limited available information with regards to otters and collision risks, however, similarly to marine mammals, otters are agile swimmers and are therefore expected to avoid collisions with slow moving vessels.

The potential for seabirds to be injured or killed by human activities in the marine environment is discussed in detail under the section of this document on Energy Innovation Development on the Islands.

Ships are a major vector for the spread of invasive non-native species. These species can lead to the extinction of native plants and animals, destroy biodiversity, and permanently alter habitats. They can be introduced to an area by ship ballast water, accidental release, and most often, by people. However, since September 2017, ships have been required to manage their ballast water to remove, render harmless or avoid the uptake or discharge of aquatic organisms under the International Maritime Organization's Ballast Water Convention (https://www.imo.org/en/MediaCentre/HotTopics/Pages/Implementing-the-BWM-Convention.aspx). Under the Convention, all ships in international traffic are required to manage their ballast water and sediments to a certain standard, according to a ship-specific ballast water management plan. All ships also have to carry a ballast water record book and an international ballast water management certificate.

Relevant European Sites

The European sites most likely to be relevant to Aberdeen Harbour National Development are as follows:

- River Dee SAC
- Ythan Estuary, Sands of Forvie and Meikle Loch SPA
- Ythan Estuary and Meikle Loch Ramsar site
- Buchan Ness to Collieston Coast SPA, and
- Fowlsheugh SPA.

Further details on these sites are given below. However, other sites located more distantly may also be connected to the National Development as they are designated for animals which may travel large distances beyond the boundaries such sites. This may include grey seal associated with Berwickshire and North Northumberland Coast SAC or Isle of May SAC, bottlenose dolphin from the Moray Firth SAC, and seabirds for numerous SPAs located many hundreds of kilometres away.

River Dee SAC

The qualifying features of the River Dee SAC [and latest assessed condition] are:

- freshwater pearl mussel [Unfavourable No change]
- Atlantic salmon [Favourable Maintained], and
- Otter [Favourable Declining].

No existing negative pressures on the otter population of the SAC are identified. However, numerous pressures are identified for freshwater pearl mussel and Atlantic salmon, including agricultural activities, invasive species, water management and water quality.

The overarching Conservation Objectives for all of the qualifying species are:

1. To ensure that the qualifying features of the River Dee SAC are in favourable condition and make an appropriate contribution to achieving favourable conservation status.

2. To ensure that the integrity of the River Dee SAC is restored by meeting objectives 2a, 2b, 2c for each qualifying feature (and 2d for freshwater pearl mussel). Objectives 2a, 2b and 2c are set out in Table A4.

Table A4 Conservation Objectives for the qualifying features of the River Dee SAC

Qualifying habitat	Conservation Objective 2a	Conservation Objective 2b	Conservation Objective 2c
Freshwater pearl mussel	Restore the population of freshwater pearl mussel as a viable component of the site	Restore the distribution of freshwater pearl mussel throughout the site	Restore the habitats supporting the freshwater pearl mussel within the site and availability of food
Atlantic salmon	Maintain the population of Atlantic salmon, including range of genetic types, as a viable component of the site	Maintain the distribution of Atlantic salmon throughout the site	Maintain the habitats supporting Atlantic salmon within the site and availability of food
Otter	Maintain the population of otter, as a viable component of the site	Maintain the distribution of otter throughout the site	Maintain the habitats supporting otter within the site and availability of food

Conservation 2d in in relation to freshwater pearl mussel is to maintain the distribution and viability of freshwater pearl mussel host species (i.e. Atlantic salmon and other salmonid fish) and their supporting habitats.

Further information on the Conservation Objectives 2a, 2b, 2c and 2d for the qualifying species can be found in the Conservation Advice Package for River Dee SAC.

Ythan Estuary, Sands of Forvie and Meikle Loch SPA

Ythan Estuary, Sands of Forvie and Meikle Loch SPA covers a complex area that contains the long, narrow estuary of the River Ythan, the Sands of Forvie on the east bank of the estuary, the eutrophic Meikle Loch and a marine component covering the area between Aberdeen and Cruden Bay to the north.

The qualifying species of the SPA [and latest assessed condition] are listed below:

- breeding sandwich tern [Favourable Maintained]
- breeding common tern [Unfavourable No change]
- breeding little tern [Favourable Maintained]
- non-breeding pink-footed goose [Favourable Maintained]
- non-breeding lapwing [Favourable Maintained]
- non-breeding eider [Favourable Declining]
- non-breeding redshank [Favourable Maintained]
- the assemblage of non-breeding waterfowl, which regularly exceeds 20,000 individuals [Favourable Maintained].

For the qualifying breeding species, the most recent SPA population estimate is available from Lewis *et al* (2012). For non-breeding species, population data are available from Stroud *et al* (2016). Both sources are more recent than the SPA citation document.

Agricultural activities and recreation / disturbance are identified as existing negative pressures on some of the qualifying species.

The draft Conservation Objectives of the SPA are:

1. To ensure that the qualifying features of Ythan Estuary, Sands of Forvie and Meikle Loch SPA are in favourable condition and make an appropriate contribution to achieving favourable conservation status.
2. To ensure that the integrity of Ythan Estuary, Sands of Forvie and Meikle Loch SPA is restored in the context of environmental changes by meeting objectives 2a, 2b and 2c for each qualifying feature.
    a) The populations of the qualifying features are viable components of the site.
    b) The distributions of the qualifying features throughout the site are maintained by avoiding significant disturbance of the species.
    c) The supporting habitats and processes relevant to the qualifying features and their prey/food resources are maintained, or where appropriate, restored.

Common tern is considered to be in an unfavourable condition at Ythan Estuary, Sands of Forvie and Meikle Loch SPA and therefore an overarching 'restore' objective is set for the site.

Ythan Estuary and Meikle Loch Ramsar site

The Ythan Estuary and Meikle Loch Ramsar site lies within, but does not have an identical boundary to, the Ythan Estuary, Sands of Forvie and Meikle Loch SPA. The Ramsar site covers only the intertidal area of the estuary of the River Ythan, plus the southernmost tip of the Sands of Forvie, and the freshwater Meikle Loch. It does not include the wider Sands of Forvie or the marine area encompassed by the SPA.

However, the qualifying features of the Ramsar site are identical to those of the SPA.

Buchan Ness to Collieston Coast SPA

Buchan Ness to Collieston Coast SPA encompasses 15km of south-east facing cliffs. The qualifying features are the following breeding seabirds [with their latest assessed condition]:

- fulmar [Unfavourable Declining]
- guillemot [Favourable Maintained]
- herring gull [Unfavourable No change]
- kittiwake [Unfavourable No change]
- shag [Unfavourable No change], and
- the assemblage of breeding seabirds, which regularly exceeds 20,000 individuals [Favourable Recovered].

Population estimates for the qualifying species available from Lewis *et al* (2012) are more recent than those given in the SPA citation document.

No negative pressures are identified on the NatureScot SiteLink website for the SPA. However, the Site Management Statement for the underlying Bullers of Buchan Coast SSSI states that the availability of sandeels *Ammodytes* spp. affects the seabird populations.

The Conservation Objectives of the SPA are:

- To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained.
- To ensure for the qualifying species that the following are maintained in the long term:
  - population of the species as a viable component of the site
  - distribution of the species within the site
  - distribution and extent of habitats supporting the species
  - structure, function and supporting processes of habitats supporting the species, and
  - no significant disturbance of the species.

Fowlsheugh SPA

Fowlsheugh SPA covers a 10.15ha stretch of cliffs, between 30-60m high. It extends seawards for 2km into the marine environment and includes the seabed, water column and surface.

The qualifying features of Fowlsheugh SPA [and their latest assessed condition] are the following breeding seabirds:

- Fulmar [Favourable Maintained]
- Guillemot [Favourable Maintained]
- herring gull [Unfavourable Declining]
- kittiwake [Favourable Maintained]
- razorbill [Favourable Maintained], and
- the assemblage of breeding seabirds, which regularly exceeds 20,000 individuals [Favourable Maintained].

Population estimates for the qualifying species available from Lewis *et al* (2012) are more recent than those given in the SPA citation document.

Fulmar, herring gull and razorbill are qualifying species as part of the seabird assemblage only.

The Conservation Objectives of the SPA are:

- To avoid the deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained.
- To ensure for the qualifying species that the following are maintained in the long term:
  - population of the species as a viable component of the site
  - distribution of the species within the site
  - distribution and extent of habitats supporting the species

- structure, function and supporting processes of habitats supporting the species, and
- no significant disturbance of the species.

Assessment of Effects on Site Integrity

The entrance to the north Aberdeen Harbour requires vessels to pass through the River Dee SAC. This is likely to be the only area within which the National Development may lie inside the boundary of a European site. Dredging activities already take place within this area, but this may be increased depending on nature of projects brought forward under the National Development. Where an increase in dredging, or dredging in a new location is proposed, this will require detailed survey and assessment to determine the potential impacts on qualifying species of the SAC (and other European sites).

Several of the non-breeding bird species which are qualifying features of the Ythan Estuary, Sands of Forvie and Meikle Loch SPA / Ramsar site may use terrestrial habitats outside of the boundary of these designations for foraging and/or roosting. It is possible that this may include habitats around the southern Aberdeen Harbour, and developments at this location may result in the loss of habitat which could be functionally-linked to this designation. This can only be determined through further detailed study, likely including field survey (which may need to be conducted over multiple non-breeding seasons). This area is approximately 1.3km from the nearest boundary of the SPA / Ramsar site, but almost 20km from the Ythan Estuary itself. In the intervening landscape there are abundant alternative areas which are likely to be suitable for foraging and/or roosting, and the loss of habitat from the National Development is unlikely to significantly affect any of the qualifying species. However, as stated, this will need to be determined based on the results of targeted further study to ensure that the area is not found to be of relative importance to any species.

The Waterbird Disturbance Mitigation Toolkit (Cutts *et al*, 2013) suggests that, in general, disturbance of waterbirds from construction activities may occur up to a distance of around 300m. As none of the qualifying non-breeding species of the Ythan Estuary, Sands of Forvie and Meikle Loch SPA / Ramsar site are considered to be highly sensitive to disturbance, this is considered to be a sufficiently conservative distance in this case. Any birds associated with the European site which use habitat in the vicinity of the south Aberdeen Harbour may be disturbed by construction (or operational) activities. However, as set out above, given the distance between the site and the National Development, and the availability of alternative habitat in the intervening landscape, any disturbance which was caused would be very unlikely to have a significant effect on the species. Moreover, mitigation measures, described below, are available to help avoid or reduce potential disturbance impacts.

There does not appear to be any potential for disturbance of qualifying bird species from construction works when individuals are located within the boundary of any European site.

As the precise location for dredging, including waste disposal, is unknown at this stage, it will be necessary to assess in more detail the potential for the impacts associated with these activities to significantly affect the qualifying features of the River Dee SAC, and other European sites, at future stages in the planning process. However, it is likely that dredging activities already take place for the existing Aberdeen Harbour, and qualifying species are therefore expected to be exposed to the impacts of this activity at certain times already. Avoidance and mitigation measures are also available to ensure there are no significant adverse effects on qualifying species, including careful design, timing

and siting of dredging activities. In particular, existing dredge waste disposal sites should continue to be used, as opposed to opening up new sites, wherever possible. In terms of timing of dredging activities, this may need to especially consider the time of year when Atlantic salmon return to the River Dee to spawn, with dredging works not being permitted during this period.

Other standard pollution prevention and control measures can be implemented during the construction and operational phases of developments brought forward under Aberdeen Harbour. With the implementation of such measures, there is unlikely to be an adverse effect on the integrity of any European site.

Salmonids have well developed eyes that allow them to see a variety of colour, pattern and behavioural displays indicating that they are a visually orientated group (Cheung and Flamarique, 2004). They can therefore detect and avoid structures within the marine environment. The risk of collision with any new marine structures is consequently low. However, the hydrological impacts of any new structures must be carefully assessed to ensure that significant adverse effects on Atlantic salmon are avoided. The placement of structures near to the mouth of the River Dee should generally be avoided to ensure no barrier to the movement of Atlantic salmon into the SAC.

As described above, noise may impact Atlantic salmon due to the temporary or permanent loss of hearing. This may, for example, reduce perception and therefore increase predation risk. Alternatively, noise may deter fish away from the source, increasing energetic outputs and/or reducing their ability to find the mouth of spawning rivers. Marine mammals can also be adversely affected in multiple ways by underwater noise. Any proposals which will result in the generation of underwater noise (for example through piling or dredging) must therefore aim to avoid, minimise or mitigate sound levels to ensure there are significant effects on these species. This may involve timing of works to avoid the period(s) when these species are known to occur in the vicinity of the National Development (for example the time when Atlantic salmon return to the River Dee to spawn). Other measures to mitigate underwater noise may also need to be investigated and adopted, including the use of best available technology/techniques (e.g. using bubble curtains around piling works to absorb sound) or reducing ship speeds. It is likely to be necessary to undertake detailed underwater noise modelling at the project level to determine that, with the implementation of such measures, there will be no significant effects on any qualifying species. This is most likely to be relevant to Atlantic salmon, as marine mammals are highly mobile and range over extremely wide areas, allowing them to move away from noise sources. Therefore, at this stage, with mitigation options available, and subject to the results of further study and assessment, it is concluded that adverse effects on European sites from noise impacts can be avoided.

Published research indicates that seabirds are susceptible to impacts from ship movements, but that this varies between species (see under the assessment for Energy Innovation Development on the Islands). The qualifying seabird species of Buchan Ness to Collieston Coast SPA, Fowlsheugh SPA, and the Ythan Estuary, Sands of Forvie and Meikle Estuary SPA are relatively tolerant of ships. According to Fliessbach *et al* (2019) the species most sensitive to such an impact would be razorbill, and this species was found to elicit escape distances of around 400m from a ship. For other qualifying species of these sites, the escape response was elicited at distances of less than 300m. Moreover, although there may be an increase in vessels using Aberdeen Harbour, there is a very large area of sea off the north-east coast which will remain available for foraging by these very wide-ranging species. This is also applicable, to an

even greater extent, to any birds belonging to more distant SPAs which could also occur in proximity to Aberdeen Harbour. Given therefore the behavioural responses of the qualifying seabird species and the availability of large areas of sea for foraging, it is very unlikely that any impacts from ship movements will affect either breeding success or survival. As a result, there is unlikely to be any significant adverse effect on the integrity of any SPA designated for breeding seabirds.

In-combination Assessment

Other National Developments which support port developments along the east coast of Scotland have the potential to generate in-combination impacts with projects brought forward under Aberdeen Harbour. These may include Industrial Green Transition Zones, Edinburgh Waterfront and Dundee Waterfront. This will need to be assessed fully at future stages of the planning process, including at project level. However, given the distance between these National Developments, and the highly mobile nature of qualifying species which could be impacted (particularly seabirds and marine mammals), it is unlikely, with suitable avoidance and/or mitigation measures being implemented, that there would be any significant in-combination effects on a European site.

The HRA of the MMO's North East, North West, South East and South West Marine Plans scoped out of appropriate assessment SACs in north-east Scotland designated for migratory fish (including Atlantic salmon) on the basis that, according to Malcolm *et al* (2010), the main migration routes are from the north and would thus not pass through any of the marine plan areas.

A search of the Marine Scotland maps website (https://marinescotland.atkinsgeospatial.com/nmpi/default.aspx?layers=712) indicates that there is an existing open dredge disposal site off the coast south-east of Aberdeen. There are additional open disposal sites east of Stonehaven and Peterhead. Should a new site be used for the disposal of any dredge waste generated by development associated with Aberdeen Harbour, there is the potential for the impacts this may cause to act in-combination with any such impacts generated through the use of these sites. To avoid the potential for this, it is recommended that, where possible, dredge waste from the National Development be disposed of in one of the existing disposal sites.

The construction and operation of offshore wind energy developments off the north and east coasts of Scotland has the potential to impact on seabirds, marine mammals and fish in a variety of ways (for example, disturbance during construction, and collision mortality and displacement during construction and/or operation). The significance of effect generated by these impacts can only be determined at the project level, using robust data collected specifically to inform the assessment for each development. Any impacts generated by the developments have the potential to act in-combination with impacts caused by proposals brought forward under the Aberdeen Harbour National Development. Furthermore, the construction and operation of wind energy developments in these areas is also likely to be directly relevant to Aberdeen Harbour as this is expected to be a key port used for servicing the developments at all stages. There may consequently be an increase in ship movements and/or developments on terrestrial habitats which impact on functionally-linked habitat, for example. At this stage, it can only be concluded that measures are available to avoid or reduce the potential impacts which occur at Aberdeen Harbour (listed below) and that, if these are implemented where necessary, adverse effects on European site integrity should not occur. However, and as already stated, this will need to be assessed for each wind

energy development and for other possible wind energy developments off the north and east coasts of Scotland cumulatively.

Avoidance and Mitigation

The following mitigation measures are recommended to avoid or minimise the identified impacts which could arise from projects brought forward under the Aberdeen Harbour National Development:

- further study may be required to determine whether any terrestrial habitat around the south Aberdeen Harbour may be used by qualifying bird species of any SPA, and which may thus be functionally-linked. This could require targeted field survey, potentially to be carried out over multiple years. Where land is found to be used as functionally-linked habitat, its loss should be avoided as far as possible through project design.
- where construction works are proposed within at least 300m of habitat which is found to be functionally-linked to any SPA, measures to avoid the disturbance of the qualifying species will be required. This may include:
  - the use of temporary or permanent screening to reduce noise and/or visual impacts. For example, noise reducing barriers may be used as a temporary solution during construction. Planting of hedgerows and/or trees may provide a more permanent, longer-term measure to screen operational activities
  - using technology and best available techniques which minimise the generation of noise during construction and operation
  - a 'soft-start' may be adopted for all potentially disturbing activities to minimise the risk of impacts on waterbirds within at least 300m. This involves gradually increasing the intensity of an activity (for example the noise it generates) over a period of time to allow birds to habituate to the source
- if it cannot be concluded that significant disturbance effects on the qualifying species can be avoided, it may be necessary to time works to avoid the non-breeding season
- further study, including targeted survey if necessary, may be required to determine the distribution of seabirds in the vicinity of any new routes for ships to and from Aberdeen Harbour (including to any new offshore wind energy developments). The results of this study will help to identify any particularly important areas for seabirds
- based on the findings of the aforementioned study, a well-defined route for the movement of ships should be created, avoiding any area(s) identified as being important for seabirds. This will help to minimise the effects of displacement from foraging areas, will reduce the area over which disturbance may occur and may also help to reduce the risk of injury or mortality
- a maximum speed limit may be required for ships to minimise the risks of disturbance or mortality of seabirds and/or marine mammals
- no new structures should be built in the marine environment near to the mouth of the River Dee where these may impede access to the SAC for Atlantic salmon. Any proposed new structures must be subject to detailed hydrological modelling to allow detailed assessment of the potential impacts on migratory Atlantic salmon
- if any capital dredging or increase in the extent or frequency of maintenance dredging is required, it may be necessary following detailed HRA for any planning application to undertake such dredging activities outside of the period when Atlantic salmon return to the River Dee. However, this may be conflict with a similar objective to avoid impacts on breeding seabirds, and careful assessment will therefore be required to determine the optimal time to undertake dredging
- the location of any dredge waste disposal site(s) would also need to be informed by detailed study and should avoid sensitive locations of importance to breeding

seabirds or marine mammals. Ideally, existing open dredge disposal sites would be used

- it may be necessary to undertake dredging activities outside of the breeding season, to avoid the potential associated impacts on breeding seabirds. The location of any disposal site(s) must be informed by detailed study and should avoid sensitive locations of importance to breeding seabirds
- dredging must make use of Best Available Techniques/Technology (BAT) most appropriate to the seabed type to avoid excessive sediment mobilisation, and
- pollution prevention measures will be required during the construction and operational phases to protect the marine environment.

Conclusion

With the implementation of mitigation measures, it is considered that development of the type included in the Aberdeen Harbour National Development could be delivered with no adverse effect on the integrity of any European site. This conclusion would need to be re-examined for planning applications when a much greater level of detail regarding the design and delivery of the scheme will be available.

A thorough assessment of the potential for in-combination effects to arise with other plans or projects will also be required for individual proposals brought forward under the National Development. In particular, the potential impacts of offshore wind energy developments must be carefully considered at the project level as these schemes could promote additional development at Aberdeen Harbour and/or act in-combination with other projects under the National Development.

Industrial Green Transition Zones

Summary Description of the National Development

Industrial Green Transition Zones (IGTZ) will support the generation of significant economic opportunities while minisiming carbon emissions. This national development applies to locations at St Fergus, Peterhead, and Grangemouth. Technologies that will help Scotland transition to net zero will be supported at these locations, with a particular focus on low carbon and zero emissions technologies, including renewables and the generation, storage and distribution of low carbon hydrogen.

The deployment of hydrogen and carbon capture utilisation and storage (CCUS) at these locations must demonstrate decarbonisation at pace and cannot be used to justify unsustainable levels of fossil fuel extraction or impede Scotland's just transition to Net Zero. Hydrogen and CCUS are emerging industries, both government and industry in Scotland wish to accelerate and maximise the deployment of green hydrogen. For projects that utilise carbon capture and storage, we want to ensure the highest possible carbon capture rates in the deployment of these technologies. While there are examples internationally where CCUS projects have been associated with offshore Enhanced Oil Recovery, we understand there to be no plans for offshore Enhanced Oil Recovery as part of the Scottish Cluster. However, if any IGTZ is found to be incompatible with Scotland's transition to net zero, Scottish Government policy, along with designations of and classes of development, will change accordingly.

Industrial Green Transition Zones are:

- **The Scottish Cluster** which encompasses a CCUS) projects network and is a key strategic vehicle for industrial decarbonisation, energy generation, and the transportation and storage of captured carbon. The designation relates to projects that form a Scottish Cluster, in the first instance specifically Peterhead, St Fergus and Grangemouth. Further industrial transition sites are expected to emerge in the longer term and benefit from the experience gained within the Scottish Cluster but do not form part of this national development. This national development will support the generation of significant economic opportunities for low carbon industry as well as minimising carbon emissions at scale, and will play a vital part in maintaining the security and operability of Scotland's electricity supply and network. The creation of hydrogen and deployment of negative emissions technologies, utilising CCUS, at commercial scale, will establish the opportunities to decarbonise industry, transport and heat, as well as other sectors, and pave the way for the transportation and storage infrastructure to support the growing hydrogen economy in Scotland.

- **Grangemouth Investment Zone** currently hosts strategic and critical infrastructure, high value employment and manufacturing of materials that are currently vital for every-day life. This role will continue in the long-term but must seek to decarbonise given the significant contribution of the industrial activities to Scotland's emissions. It is a key location in the Scottish Cluster for carbon capture and storage, and hydrogen deployment. The Grangemouth Investment Zone will be a focus for transitioning the petro-chemicals industry and associated activities into a leading exemplar of industrial decarbonisation, significantly helped through the coordination activities of the Scottish Government's Grangemouth Future Industry Board. Decarbonisation could include opportunities for: renewable energy innovation; bioenergy; hydrogen production

with carbon capture and storage; and repurposing of existing strategic and critical infrastructure such as pipelines.

The following classes of development are included in the IGTZ National Development:

a) Carbon capture with high capture rates and negative emission technologies, transportation and storage of captured carbon forming part of or helping to create an expandable national network;
b) Pipeline for transportation and storage of captured carbon and/or hydrogen;
c) Onshore infrastructure including compression equipment, supporting pipeline transportation and shipping transportation of captured carbon and/or hydrogen;
d) Offshore storage of captured carbon;
e) New and/or upgraded buildings and facilities for the utilisation of captured carbon;
f) Infrastructure for the production of hydrogen on shore or off shore where co-located with off shore wind farms within 0-12 nautical miles;
g) Infrastructure for the storage of hydrogen on shore or off shore, including on or near-shore geological storage;
h) Port facilities for the transport and handling of hydrogen and carbon dioxide;
i) The application of carbon capture and storage technology to existing or replacement thermal power generation capacity;
j) Production, storage and transportation with appropriate emissions abatement of bioenergy; hydrogen production related chemicals including ammonia;
k) New and/or upgraded buildings for industrial, manufacturing, business, and educational or research uses related to the industrial transition;
l) Town centre regeneration at Grangemouth;
m) Grangemouth flood protection scheme;
n) New and/or upgraded green and blue infrastructure;
o) New and/or upgraded utilities and/or local energy network; and
p) New and/or upgraded facilities at the port for inter-modal freight handling at Grangemouth.

Potential Impacts on European Sites

The IGTZ National Development includes a wide variety of development types, which may be delivered at locations across Scotland (although focused on hubs at St Fergus, Peterhead and Grangemouth). At this stage, therefore, it is impossible to describe in detail the potential impacts which could arise from delivery of projects under the National Development. A high-level summary of the broad impact types which could arise due to development in the areas at or around St Fergus, Peterhead and Grangemouth in particular is therefore provided in Table A5. Further HRA will be required at future stages of the planning process, including at development plan and project level, to further investigate and quantify these impacts.

Table A5 High-level description of impacts which could arise from projects brought forward under Industrial Green Transition Zones

Impact	Brief description	European sites which may be connected to impact
Direct loss of habitat	Proposed projects which lie within the boundary of a European site will result in the loss of habitat from that site. This may include qualifying habitat or habitat which supports qualifying species. Any loss of habitat, even if very small, has the potential to adversely affect the integrity of a European site. Therefore, construction within the boundary of any European site should be avoided unless it can be demonstrated it would not adversely affect the integrity of any European site and its Conservation Objectives (these circumstances will be very limited).	Impossible to determine at this stage. This impact is most likely to occur due to construction of pipelines which could cross large distances.
Loss of functionally-linked habitat	Similarly to loss of habitat from within a European site boundary, construction of infrastructure could result in the loss of habitat outside of such a site but which nonetheless supports the qualifying mobile species of an SAC / SPA. Identifying habitat which is functionally-linked to European sites will require targeted study, likely including field survey. The loss of functionally-linked habitat from construction of new infrastructure should be avoided as far as possible through project design.	Again, very difficult to determine due to potential for development over large parts of eastern Scotland. However, European sites close to St Fergus, Peterhead and Grangemouth which have qualifying species which may use terrestrial habitat outside of the site boundaries include: Loch of Strathbeg SPA / Ramsar site, Firth of Forth SPA / Ramsar site, and the Outer Firth of Forth and St Andrews Bay Complex SPA.
Waterborne pollution	Any construction works have the potential to generate waterborne pollution, for example from spillages of oils, fuels, chemicals or other pollutants, or from the uncontrolled run-off of sediment. Dredging in the marine environment, which could be associated with several types of development included in IGTZ depending on detailed design, also has impacts on water quality (see	Any European site hydrologically connected to projects progressed under IGTZ could be impacted by waterborne pollution. However, reliable mitigation measures exist which, when implemented, would ensure no waterborne pollution effects on European sites. In relation to dredging, water quality impacts can affect mobile animal species belonging to distant European sites, particular seabirds,

	the assessment of Energy Innovation Development on the Islands for more information).	marine mammals and migratory fish. European sites which may be connected are therefore those designated for these species.
Airborne pollution	Air quality impacts can occur during the construction and operation of developments, including many of the type included under IGTZ. This can be caused by construction dust, emissions from vehicles (during construction and operation), and emissions from operational facilities (e.g. industrial plants). Further details on the impacts of airborne pollution on European sites is provided in the assessments of Chapelcross Power Station Redevelopment and Stranraer Gateway.	Various guidance documents provide recommendations on the distances at which European sites need to be considered when assessing air quality impacts from development (e.g. Holman *et al*, 2019; Holman *et al*, 2014; Highways England *et al*, 2019; CIEEM, 2021). Sites up to 10-15km may be affected by the largest industrial emitters, and any European site within this distance of St Fergus, Peterhead and/or Grangemouth could be connected to the National Development (see below under 'Relevant European Sites').
Hydrological changes	Changes to hydrological conditions could arise through the IGTZ in a number of ways, including through the abstraction of water, or due to construction of a flood protection scheme in Grangemouth.	At this stage, there is no European site which would obviously be affected by hydrological changes. However, this must be determined at the project level, depending on the nature and location of the proposal.
Changes to coastal processes	Changes in coastal processes can arise from works on the coast or in the intertidal or marine environments. Changes which may occur include modified long-shore sediment transport and coastal erosion.	At this stage, there is no European site which would obviously be affected by changes to coastal processes. However, this must be determined at the project level, depending on the nature and location of the proposal.
Disturbance of qualifying species	Disturbance of qualifying species can be caused by construction or operational activities taking place near to a European site or near to habitat which is functionally-linked to a European site. Disturbance can have multiple effects on species including increased energy expenditure, reduced feeding time, behavioural changes, and displacement (see below).	This depends on the precise location of development, but most likely to be relevant to European sites close to St Fergus, Peterhead and Grangemouth. Perhaps the most relevant will be those in the Firth of Forth (for example due to construction of Grangemouth Flood Protection Scheme), and the River Teith SAC, designated for migratory fish which will pass through the Forth Estuary.
Barriers and/or displacement	Development activities can displace species from areas they use for foraging or resting as a result of disturbance. Physical or chemical changes can also displace species, or act as a barrier to their movement (for	This depends on the precise location of development, but most likely to be relevant to European sites close to St Fergus, Peterhead and Grangemouth. Perhaps the most relevant will be those in the Firth of Forth, and the River Teith SAC,

	example, water pollution may prevent the migration of fish species). Understanding whether barrier or displacement impacts are likely to occur will require on a detailed understanding of the distribution of relevant qualifying features in relation to development activities. This is likely to need targeted study, potentially including field survey.	designated for migratory fish which will pass through the Forth Estuary.
Injury or mortality	Injury or mortality could be caused by works in the terrestrial, freshwater or marine environments. For example, dredging and the movement of vessels, both of which could be expected due to developments of the type included in IGTZ, can cause injury or mortality of seabirds, marine mammals and fish.	This impact is most likely to impact on European sites designated for species which live and/or forage in the marine environment. Relevant sites may include Moray Firth SAC, Buchan Ness to Collieston Coast SPA, Firth of Tay and Eden Estuary SAC, Berwickshire and North Northumberland Coast SAC, and any of the designations covering the Firth of Forth.
Spread of invasive non-native species	Invasive non-native species could be spread through terrestrial, freshwater and marine environments as a result of construction and operational activities. This could include the spread of terrestrial plants through construction works, or the spread of marine species through the movement of ships.	Impossible to say at this stage, however mitigation measures can be implemented to minimise the risk of spreading invasive non-native species. Establishing the distribution of invasive non-native species at a site through targeted field survey is likely to be required to enable a suitable mitigation strategy to be developed.

Relevant European Sites

As outlined above, based on the wide range of development types included under the IGTZ National Development, and the limited information available at this stage with regards to where projects may be brought forward (especially those which are likely to cover large areas, including pipelines), it is difficult to identify all European sites which may be relevant. However, those which are closest to St Fergus, Peterhead and Grangemouth have the highest potential to be impacted by the National Development. These include, but may not to be limited to:

- Loch of Strathbeg SPA – designated for several non-breeding waterbirds and breeding sandwich tern *Sterna sandvicensis*
- Loch of Strathbeg Ramsar site – also designated for non-breeding waterbirds and breeding sandwich tern, plus eutrophic loch habitat
- Moray Firth SAC – of relevance to the National Development is the qualifying population of bottlenose dolphin

- Buchan Ness to Collieston Coast SPA – encompasses a 15km stretch of cliffs and is designated for five breeding seabirds and the assemblage of breeding seabirds
- Buchan Ness to Collieston SAC – the sole qualifying feature of this site is vegetated sea cliffs
- Firth of Forth SPA – designated for a large number of non-breeding waterbirds, and for sandwich tern as a passage species
- Firth of Forth Ramsar site – has an identical list of qualifying species as the Firth of Forth SPA
- Forth Islands SPA – multi-part site covering islands used for breeding by multiple qualifying seabird species
- Outer Firth of Forth and St Andrews Bay Complex SPA – designated for 21 species of waterbird, and for the assemblage of non-breeding waterfowl and seabirds
- Imperial Dock Lock, Leith SPA – the sole qualifying feature of this site is a population of breeding common tern
- River Teith SAC – designated for Atlantic salmon, brook lamprey, river lamprey and sea lamprey
- Isle of May SAC – designated for grey seal and reef habitat
- Firth of Tay and Eden Estuary SAC – designated for harbour seal and three marine / intertidal habitat types, and
- Berwickshire and North Northumberland Coast SAC – designated for grey seal, reefs and sea caves.

For other National Developments screened into appropriate assessment, details of the relevant European sites have been provided in this document under the relevant section of the appraisal. However, for brevity, this has not been done for IGTZ, given the number of European sites which may or may not be connected to the National Development. Instead, a broad overview of the relevant qualifying features of the potentially relevant sites has been provided in the list above. Full details on each site can be obtained from the NatureScot SiteLink website (https://sitelink.nature.scot/home).

Assessment of Effects on Site Integrity

Development at St Fergus and Peterhead is very unlikely to involve the loss of any habitat from within the boundary of a European site, as there are no European sites at or immediately adjacent to these locations. Development at Grangemouth, which lies immediately adjacent to the Firth of Forth, could result in the loss of habitat from the Firth of Forth SPA / Ramsar site. However, at this stage there are no specific proposals which are known to involve such an impact. Moreover, it is assumed that projects would be designed to avoid the loss of any habitat from within the boundary of a European site. No adverse effect on European site integrity is therefore expected.

As set out in Table A5, the presence of functionally-linked habitat in the vicinity of proposals brought forward under the National Development can only be identified through further targeted study, most likely involving field survey, at the time specific locations for development are identified. However, the loss of functionally-linked habitat should be avoided, as far as possible, through project design. In this way, it is expected that there will be no adverse effects on the integrity of any European site.

Waterborne pollution generated during construction and operation of development projects can be controlled through the implementation of standard pollution prevention measures, which are widely adopted and reliable. These include sustainable drainage

systems (SuDS) as part of the operational drainage system to manage run-off, especially where there is a hydrological link to a European site. Any proposals for new dredging activities, including the disposal of dredge waste, must be assessed in detail at the plan or project level, whenever sufficient information is available. Through careful design, timing and siting of dredging activities, the potential adverse impacts on qualifying species can be avoided or sufficiently mitigated. It is recommended that, where possible, existing dredge waste disposal sites are used, rather than opening new sites.

A detailed assessment of air quality impacts on European sites will be required for any development brought forward which involves emissions to the atmosphere. This should be based on widely adopted screening buffers and may need to consider European sites up to 10km from most emitters, but potentially to 15km for the largest facilities. This will require the input of air quality specialists and ecologists to determine whether any identified impacts from air pollution could significantly affect any European sites. It is not currently certain there will be such developments but there is considerable precedent for emitters to be delivered within 10-15km of European sites without adverse effects on the integrity of European sites (for example through the use of technology to reduce emissions of oxides of nitrogen and ammonia). Therefore, with a requirement for detailed air quality modelling and accompanying ecological assessment and any associated process improvements, it will be possible to avoid developments being progressed which could adversely affect the integrity of any European site.

The potential for disturbance, displacement and barrier impacts on qualifying species will depend on the location and nature of construction and/or operational activities, the distribution of the species, and the sensitivity of the species to noise and visual disturbance from human activities. It will therefore be necessary to undertake detailed study to establish the distribution of species in relation to development projects once project-specific details are known. Areas used by qualifying species should be avoided or works timed to avoid the period when they are likely to be present, where possible. Where projects involve works in the marine environment, this will require consideration of the migratory fish species which are qualifying features of the River Teith SAC, and which pass through the Firth of Forth. Other mitigation measures can also be implemented to avoid or minimise these impacts on species. As such, it is expected that projects progressed under IGTZ could be delivered without significant effects on the qualifying species of any European site. This must be confirmed at the project level HRA.

The spread of invasive non-native plant species to European sites can readily be avoided through the implementation of standard biosecurity measures. It will be necessary for a suitable survey of the development sites to be carried out to search for the presence of invasive non-native plants. This should seek to identify potential infestation pathways and the precise methods for control and, where possible, eradication. With the adoption of such measures, there will be no adverse effect on the integrity of any European site.

In-combination Assessment

Other National Developments which support port developments along the east coast of Scotland have the potential to generate in-combination impacts with offshore projects brought forward under IGTZ. These may include Edinburgh Waterfront, Dundee Waterfront and Aberdeen Harbour. This will need to be assessed fully at future stages of the planning process, including at project level. However, given the distance between these National Developments, and the highly mobile nature of qualifying species which

could be impacted (particularly seabirds and marine mammals), it is unlikely, with suitable avoidance and/or mitigation measures being implemented, that there would be any significant in-combination effects on a European site.

Other plans and projects off the east coast of Scotland which could similarly generate impacts which could act in-combination with those of Industrial Green Transition Zones include offshore wind energy developments or other port developments identified in the National Renewables Infrastructure Plan as having potential to support offshore renewables, including Montrose. However, as above, given the area over which these plans / projects could occur, at this stage it is considered that would not be significant in-combination effects on European sites.

A detailed assessment of in-combination effects will be required by HRA at future stages of the planning process. However, based on the above, at this stage it is concluded that there will be no adverse effects on European site integrity from in-combination impacts arising from other known plans or projects.

Avoidance and Mitigation

It is only possible at this stage to suggest high-level mitigation measures which may help to avoid or minimise the potential impacts which could arise from projects brought forward under Industrial Green Transition Zones. These will need to be investigated in more detail, and refined and/or expanded upon, based on the results of further study and assessment at future stages in the planning process. However, the following are recommended for consideration:

- all proposed developments must undergo project-level HRA to ensure there are no adverse effects on the integrity of any European site
- further study to determine whether any habitat surrounding projects brought forward under IGTZ is functionally-linked to a European site. This could include targeted field survey, potentially to be carried out over multiple years. Where land is found to be used as functionally-linked habitat, its loss should be avoided as far as possible through project design
- pollution prevention measures will be required during the construction and operation of any project. These should follow the PPGs / GPP published by SEPA, and may include (but not necessarily be limited to):
  - controls and contingency measures to manage run-off from construction areas and to manage sediment
  - all oils lubricants or other chemicals should be stored in an appropriate secure container in a suitable storage area, with spill kits provided across the development site
  - in order to avoid pollution of soils, vegetation and/or watercourses, all refuelling and servicing of vehicles and plant should be carried out in a designated area which is bunded and has an impermeable base. This should be at least 50m from any watercourse / waterbody
- air quality modelling for any development which involves emissions to air. Guidance on the assessment of air quality impacts on European sites (for example CIEEM, 2021; Holman *et al*, 2019) must be followed to determine that emissions will not adversely affect the integrity of any European site, either alone or in-combination with other sources of air pollution
- the design of a project should seek to maintain existing surface water conditions
- where dredging is required to enable a proposed project, this should be fully assessed and carefully designed, sited and/or timed to avoid or minimise

impacts on qualifying species including seabirds, marine mammals and migratory fish
- dredging must make use of Best Available Techniques/Technology (BAT) most appropriate to the seabed type to avoid excessive sediment mobilisation
- the location of any dredge waste disposal site(s) should be informed by detailed study and should avoid sensitive locations of importance to breeding seabirds, marine mammals or migratory fish. Ideally, existing open dredge disposal sites would be used
- where a proposed project is expected to result in an increase in ship movements, detailed study will determine whether this could result in disturbance, displacement and/or injury or mortality impacts on qualifying species. It may be necessary, based on the results of further study, to define routes which must be followed by ships (and which avoid areas of importance to qualifying species) or to set maximum speeds at which ships can travel
- where construction works are proposed in proximity to a European site or habitat which is functionally-linked to a terrestrial European site designated for animal species, measures to avoid disturbance of the qualifying species will be required. This may include
    - the use of temporary or permanent screening to reduce noise and/or visual impacts. For example, noise reducing barriers may be used as a temporary solution during construction. Planting of hedgerows and/or trees may provide a more permanent, longer-term measure to screen operational activities
    - using technology and best available techniques which minimise the generation of noise during construction and operation
    - a ‘soft-start’ may be adopted for all potentially disturbing activities to minimise the risk of impacts on waterbirds within at least 300m. This involves gradually increasing the intensity of an activity (for example the noise it generates) over a period of time to allow birds to habituate to the source
    - timing of works to avoid sensitive times of day and/or of year, and
- survey for the presence of invasive non-native plant species on land which will be impacted by development. Suitable biosecurity measures will need to be devised based on the species present and their distribution, and the nature of works to take place. Such measures will need to be set out in a Biosecurity Management Plan or similar but must be designed to prevent the spread of such species from the site. Wherever possible, the possibility of eradication from the site should also be investigated.

Conclusion

There is limited information at this stage on the precise nature of development which may be brought forward under Industrial Green Transition Zones. However, the National Development includes a wide variety of development classes and projects may be progressed in the terrestrial, freshwater, and marine environments.

However, there are available mitigation measures (if required) for all identified impact pathways. It is therefore concluded that, with the implementation of mitigation, projects brought forward under this National Development could be delivered in such a way that there are no adverse effects on the integrity of any European site, either alone or in-combination with other currently known plans or projects.

This conclusion must be re-examined by HRA at future stages of the planning process, including at the project level. This is very likely to require detailed further study, including field survey, in order to establish the presence and distribution of qualifying features in relation to development proposals.

Hunterston Strategic Asset

Summary Description of the National Development

This national development supports the repurposing of Hunterston port as well as the adjacent former nuclear power station sites and marketable business land of the Hunterston Estate. The location and existing infrastructure offers potential for electricity generation from renewables, and a variety of commercial uses including port, research and development, aquaculture, and circular economy facilities.

The following classes of development are included in the Hunterston Strategic Asset National Development:

a) Infrastructure to support a multi-modal deep water harbour;
b) Land and buildings for bulk handling, storage, processing and distribution;
c) Facilities for marine energy generation technology fabrication and decommissioning;
d) Facilities for marine energy servicing;
e) Land and buildings for industrial, commercial, research and development, and training uses;
f) Infrastructure for the capture, transportation and long-term storage of greenhouse gas emissions, where transportation may be by pipe or vehicular means;
g) Infrastructure for the production, storage, and transportation of low carbon and renewable hydrogen; and hydrogen production related chemicals including ammonia;
h) Infrastructure for the generation and storage of electricity from renewables exceeding 50 megawatts; and
i) Electricity transmission infrastructure of 132kv or more.

Hunterston Strategic Asset was screened into appropriate assessment on the basis that likely significant effects on SPAs designated for breeding seabirds from port development could not be ruled out. The assessment below therefore considers only the potential impacts and effects which could occur from the construction and operation of new port infrastructure at Hunterston.

Potential Impacts on European Sites

As stated above, the potential for likely significant effects from this National Development could not be excluded at the screening stage. However, this was due primarily to the potential for impacts on seabird species which are qualifying features of SPAs. The possibility for significant effects on other marine species, or on terrestrial habitats and/or species, was considered to be very low and was screened out of further assessment.

The nearest European site to Hunterston Strategic Asset which is designated for breeding seabirds is Ailsa Craig SPA, approximately 50km to the south-west. Further information on this site can be found below. However, the qualifying species are:

- gannet
- lesser black-backed gull *Larus fuscus*
- guillemot

- herring gull
- kittiwake, and
- the breeding seabird assemblage.

Published research suggests that lesser black-backed gulls may forage up to 236km from breeding sites and gannets up to distances of 509km (Woodward *et al*, 2019). The same research suggests that the foraging ranges for other species can be similar or even greater, including:

- fulmar – 1,200km
- Manx shearwater – 2,365km
- storm petrel *Hydrobates pelagicus* – 336km, and
- puffin – 265km.

For other general breeding seabirds, the Marine Management Organisation (MMO) HRA of the North East, North West, South East and South West Marine Plans adopted a 100km buffer around marine plan areas (AECOM, 2019). This was because a 100km distance was deemed to be a quantifiable and objective area that is likely to encompass the foraging range of most seabirds from their breeding sites.

There is therefore the possibility for seabirds associated with SPAs located at substantial distance from Hunterston Strategic Asset to be connected to the National Development. However, as the closest such site, consideration is given primarily to the potential impacts on Ailsa Craig SPA.

It is assumed that the type of ship which would use a deep water harbour at Hunterston port would not pass sufficiently close to Ailsa Craig to cause any disturbance of seabirds while at the nest. The potential impacts from port development at Hunterston will therefore be restricted to locations outside of the boundary of Ailsa Craig SPA. Furthermore, although impacts could occur during the construction phase, these are likely to be relatively minor as they would be restricted to the area around the National Development (with the possible exception of waterborne pollution). The main impacts will therefore be those which arise as a result of an increase in the number of ships travelling in the Firth of Clyde to and from Hunterston port, and those caused by any dredging activities, including the disposal of dredge waste.

Ships can impact seabirds in several ways, including through collisions, disturbance and associated displacement from foraging areas, and increased energetic expenditure due to flight or other evasion responses. In addition, pollution of the marine environment can also indirectly affect these species (BirdLife International, 2012).

In a study by Fliessbach *et al* (2019), the distance at which different seabirds were found to elicit an ‘escape’ response from ships was found to be shortest for gulls, at 157m (±105m) for lesser black-backed gull and 133m (±83m) for herring gull. Gannets were found to elicit the same response at similar distances of 127m (± 82m) and guillemots at distances of 127m (± 110m). Thus, the qualifying species of Ailsa Craig SPA are likely to be relatively tolerant to ship movements and disturbance is only likely to occur up to a short distance from passing vessels. However, should such movements be frequent, and especially if they were spread over a wide area, there would be the potential for larger areas of the marine environment to be subject to disturbance, with greater levels of impact on seabirds.

Waterborne pollution could occur during both the construction and operational phases of a port development at Hunterston. During both phases there is the potential for spills

of fuels, oils or other contaminants. However, of greater impact would be any requirement for dredging activities, and the disposal of waste thereby generated. Details on the potential impacts of dredging on seabirds can be found under the assessment for Energy Innovation Development on the Islands.

Ships are a major vector for the spread of invasive non-native species. These species can lead to the extinction of native plants and animals, destroy biodiversity, and permanently alter habitats. They can be introduced to an area by ship ballast water, accidental release, and most often, by people. However, since September 2017, ships have been required to manage their ballast water to remove, render harmless or avoid the uptake or discharge of aquatic organisms under the International Maritime Organization's Ballast Water Convention (https://www.imo.org/en/MediaCentre/HotTopics/Pages/Implementing-the-BWM-Convention.aspx). Under the Convention, all ships in international traffic are required to manage their ballast water and sediments to a certain standard, according to a ship-specific ballast water management plan. All ships also have to carry a ballast water record book and an international ballast water management certificate.

Relevant European Sites

Based on the location of the National Development and the potential impacts which could arise from port development at Hunterston, the most relevant European site is Ailsa Craig SPA. Further details on this site are provided below.

The next closest SPA designated for breeding seabirds after Ailsa Craig is Rathlin Island SPA, in Northern Ireland. This site is approximately 95km in a straight line from Hunterston but is on the opposite side of Kintyre. Accounting for travel around this peninsula, the distance between Rathlin Island SPA and Hunterston is approximately 110km. The next nearest site designated for breeding seabirds in Scotland is the Treshnish Isles SPA (for which storm petrel is a qualifying species). Foraging birds associated with this European site would need to travel approximately 235km past Islay and around Kintyre to reach Hunterston.

However, SPAs designated for seabirds located several hundred kilometres from Hunterston could be connected to the National Development and may need to be considered during further development plan or project level HRA.

Ailsa Craig SPA

Ailsa Craig SPA is an island rising to 338m, situated in the outer part of the Firth of Clyde. Cliffs up to 100m encircle the island and provide nesting sites for a variety of seabirds, including one of the largest colonies of gannet in the world.

The seaward boundary of the site extends approximately 2km into the marine environment to include the seabed, water column and surface.

The qualifying features [and latest assessed condition] of Ailsa Craig SPA are listed as follows. Population estimates for the qualifying species are available from Lewis *et al* (2012), which provides more recent data than the SPA citation document:

- gannet [Favourable Maintained]
- lesser black-backed gull [Unfavourable No change]
- guillemot [Favourable Maintained]

- herring gull [Unfavourable No change]
- kittiwake [Unfavourable Declining], and
- the breeding seabird assemblage, which regularly exceeds 20,000 individuals [Favourable Maintained].

The conservation objectives of Ailsa Craig SPA are:

- To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained.
- To ensure for the qualifying species that the following are maintained in the long term:
  - population of the species as a viable component of the site
  - distribution of the species within the site
  - distribution and extent of habitats supporting the species
  - structure, function and supporting processes of habitats supporting the species, and
  - no significant disturbance of the species.

Assessment of Effects on Site Integrity

Published research indicates that seabirds are susceptible to impacts from ship movements, but that this varies between species. The qualifying species of Ailsa Craig SPA are amongst the most tolerant of ships, with escape responses being shown to occur at distances of generally less than 200m from passing vessels. Hunterston Strategic Asset is located approximately 50km from Ailsa Craig SPA. Although ships associated with proposals brought forward under the National Development may pass closer than this to the SPA, there is a very large area of sea which will remain available for foraging by these birds. This is also applicable, to an even greater extent, to birds belonging to more distant SPAs, the closest of which is around 110km from Hunterston. Given therefore the behavioural responses of the qualifying species of Ailsa Craig SPA, the distances involved, and the availability of large areas of sea for foraging, it is very unlikely that any impacts from ship movements will affect either breeding success or survival of the qualifying seabirds. As a result, there is unlikely to be any adverse effect on the integrity of Ailsa Craig SPA or any other European site.

As the precise location for dredging, including waste disposal, is unknown at this stage, it will be necessary to assess in more detail at future stages in the planning process any potential for the impacts associated with these activities to affect the qualifying features of Ailsa Craig SPA, and other European sites. However, due to the distance between Hunterston Strategic Asset and the nearest European sites for which the qualifying species rely on marine environment, it is considered very likely that through careful design, timing and siting of dredging activities, adverse effects on European site integrity can be avoided.

In-combination Assessment

The National Renewables Infrastructure Plan (N-RIP) identifies a spatial framework of port and harbour sites, based on best-fit locations for the needs of the offshore renewable industry. On this basis, in addition to Hunterston, N-RIP also identifies ports at Ayr and Troon as possible sites for supporting the offshore renewable energy industry. An increase in ship movements to and from either or both of these locations could act in-combination with the movement of ships using Hunterston to increase the effects on seabirds in the Firth of Clyde.

However, adopting the mitigation set out below, and in particular ensuring that ship movements are restricted to defined areas which are as narrow as possible, and that wherever possible the same routes are used by ships visiting different ports, will help to avoid significant adverse effects on European sites.

The construction and operation of offshore wind or other renewable energy developments has the potential to impact on seabirds and marine mammals in a variety of ways (for example, disturbance during construction, and collision mortality and displacement during construction and/or operation). The significance of effect generated by these impacts can only be determined at the project level, using robust data collected specifically to inform the assessment for each development. Any impacts generated by the developments have the potential to act in-combination with impacts caused by proposals brought forward under the Hunterston Strategic Asset National Development.

A search of the Marine Scotland maps website (https://marinescotland.atkinsgeospatial.com/nmpi/default.aspx?layers=712) indicates that there are four existing dredge disposal sites within the Firth of Clyde, all of which are currently open. These are located off the east coast of Arran, west of Ayr, and near Girvan. There are further disposal sites, which are again currently open, near Campbeltown and in the North Channel. Should a new site be used for the disposal of any dredge waste generated by development associated with Hunterston Strategic Asset, there is the potential for the impacts this generates to act in-combination with any such impacts already occurring from the use of these sites, particularly those in the Firth of Clyde. To avoid the potential for this, it is recommended that, where possible, dredge waste from the National Development be disposed of in one of the existing disposal sites.

Considering the above, it is therefore unlikely that there will be any significant adverse effects arising in-combination with other projects, plans or programmes.

Avoidance and Mitigation

The following mitigation measures are recommended to avoid or minimise the identified impacts which could arise from port development at Hunterston:

- further study, including targeted survey if necessary, should be carried out to determine the distribution of seabirds in the vicinity of possible shipping routes to and from Hunterston Strategic Asset. The results of this study will help to identify any particularly important areas for seabirds and to develop a detailed disturbance model, if required
- based on the findings of the aforementioned study, a well-defined route for the movement of ships should be created, avoiding any area(s) identified as being important for seabirds. This will help to minimise the effects of displacement from foraging areas, will reduce the area over which disturbance may occur and may also help to reduce the risk of injury or mortality
- if any capital dredging or increase in the extent or frequency of maintenance dredging is required, it may be necessary following detailed HRA for any planning application to undertake such dredging activities outside of the breeding season, to avoid the potential associated impacts on breeding seabirds. The location of any disposal site(s) would also need to be informed by detailed study and should avoid sensitive locations of importance to breeding seabirds
- dredging must make use of Best Available Techniques/Technology (BAT) most appropriate to the seabed type to avoid excessive sediment mobilisation, and

- pollution prevention measures will be required during the construction and operational phases to protect the marine environment.

Conclusion

With the implementation of mitigation measures, it is considered that this National Development could be delivered without adverse effects on the integrity of any European site, either alone or in-combination with other known plans or projects.

Chapelcross Power Station Redevelopment

Summary Description of the National Development

This national development supports the redevelopment of Chapelcross, a former nuclear power station of significant scale regionally and nationally, and the national development supports the reuse of the site to deliver on net zero and provide opportunities for communities in the south of Scotland.

Final uses for the site remain to be agreed, but the site has locational advantage to act as an energy hub with opportunities including: business development with a particular focus on energy and energy supply chain; energy generation from solar; electricity storage; generation of heat; production and storage of low carbon and renewable hydrogen.The following classes of development are included in the Chapelcross Power Station Redevelopment National Development:

a) Commercial, industrial, manufacturing, and office related development occurring on the Chapelcross development site;
b) Generation of electricity from renewables exceeding 50 megawatts capacity;
c) Infrastructure for the production, storage and transportation of low carbon and renewable hydrogen and related chemicals including ammonia, with carbon capture as necessary; and
d) Active and sustainable travel connection to the site.

Potential Impacts on European Sites

Chapelcross does not lie within the boundary of any European site. Furthermore, the brownfield site is unlikely to contain suitable habitat for the qualifying species of any European site within 20km (but this should be confirmed through targeted field survey at future stages in the planning process). There will consequently be no direct loss of qualifying habitat or of functionally-linked habitat used by qualifying species outside of the boundary of a European site.

However, agricultural fields immediately beyond the boundary of the site appear to have suitability for foraging by non-breeding geese. This is consistent with Mitchell (2012) which shows the known distribution of foraging pink-footed geese and greylag geese in the area and indicates that habitat surrounding the National Development is used by these species. Guidance published by NatureScot (SNH, 2016) suggests that, during the non-breeding season, pink-footed geese and greylag geese can forage up to 20km from the boundary of SPAs for which they are designated. According to the same guidance, barnacle geese *Branta leucopsis* may forage up to 25km from SPA boundaries. The Solway Firth SPA, Castle Loch, Lochmaben SPA and Ramsar site, and the Upper Solway Flats and Marshes Ramsar site, which all have non-breeding geese as qualifying features, all lie within these distances of the National Development, and there is the potential for birds belonging to the populations supported by these sites to occur in fields surrounding it. Furthermore, in addition to non-breeding geese, the agricultural fields surrounding the National Development are also likely to be suitable for use by foraging curlew, oystercatcher, lapwing *Vanellus vanellus* and whooper swan which are all qualifying species of the Solway Firth SPA. Therefore, while the loss of qualifying habitat is not expected, there is the potential for construction and/or

operational works to disturb qualifying waterbird species using functionally-linked habitat for foraging.

The Chapelcross site appears from Ordnance Survey (OS) mapping to be hydrologically linked via the Gullielands Burn to the River Annan, which flows into the SAC, SPA and Ramsar designations covering the Solway Firth. There is consequently a pathway for pollution of habitats and/or species of the Solway Firth European sites, within the boundary of these designations. In addition, both river lamprey and sea lamprey are qualifying species of the Solway Firth SAC and there is the potential for pollution in the River Annan to impact these species when on migration up the watercourse, outside of the boundary of the European site. For example, Maitland (2003) states that occasional mortalities of river lamprey have been reported that have been ascribed to pollution, including one such event when a number of dead adults were found near the mouth of the River Annan. The same report states that significant water pollution can eliminate whole populations of lamprey (including river lamprey and sea lamprey) and in such cases it is usually severe pollution in the lower reaches of a watercourse that prevents upstream migration and kills downstream migrants. Furthermore, beyond the direct toxic effects, pollution can have a major impact on lamprey by smothering both spawning gravels and nursery silts.

In the absence of information on the aquatic habitats it contains, it is possible that the Gullielands Burn, which appears from OS mapping to emanate from Chapelcross, could be suitable for spawning by river lamprey and/or sea lamprey. Any direct impacts on the watercourse could result in the loss of degradation of such habitat. This may include any requirement for water abstraction. For example, according to Maitland (2003), some river lampreys are taken by power station intake pipes, although there is no evidence in the UK that the numbers involved are detrimental to the conservation status of the species.

Industrial and manufacturing processes can result in the emission of pollutants to the atmosphere. The main airborne pollutants of concern for European sites are oxides of nitrogen (NOx), ammonia (NH_3) and sulphur dioxide (SO_2). Ammonia can have a directly toxic effect upon vegetation and research suggests that this may also be true for NOx at very high concentrations (http://www.apis.ac.uk/). More significantly, greater NOx or ammonia concentrations within the atmosphere will lead to greater rates of nitrogen deposition to vegetation and soils. An increase in the deposition of nitrogen from the atmosphere is generally regarded to lead to an increase in soil fertility, which can have a serious deleterious effect on the quality of semi-natural, nitrogen-limited terrestrial habitats. Table A6 presents the main sources and effects of air pollutants on habitats and species.

Table A6 Main sources and effects of air pollutants on habitats and species

Pollutant	Source	Effects on habitats and species
Acid deposition	SO_2, NOx and ammonia all contribute to acid deposition. Although future trends in sulphur emissions and subsequent deposition to terrestrial and aquatic ecosystems will continue to decline, it is likely that increased nitrogen emissions may cancel out any gains produced by reduced sulphur levels.	Can affect habitats and species through both wet (acid rain) and dry deposition. Some sites will be more at risk than others depending on soil type, bed rock geology, weathering rate and buffering capacity.
Ammonia	Ammonia is released following decomposition and volatilisation of animal wastes. It is a naturally occurring trace gas, but levels have increased considerably with expansion in numbers of agricultural livestock. Ammonia reacts with acid pollutants such as the products of SO_2 and NOx emissions to produce fine ammonium (NH_4+) - containing aerosol which may be transferred much longer distances (can therefore be a significant trans-boundary issue).	Adverse effects are as a result of nitrogen deposition leading to eutrophication. As emissions mostly occur at ground level in the rural environment and NH_3 is rapidly deposited, some of the most acute problems of NH_3 deposition are for small relict nature reserves located in intensive agricultural landscapes.
NOx	Nitrogen oxides are mostly produced in combustion processes. About one quarter of the UK's emissions are from power stations, one-half from motor vehicles, and the rest from other industrial and domestic combustion processes.	Deposition of nitrogen compounds (nitrates (NO3), nitrogen dioxide (NO2) and nitric acid (HNO3)) can lead to both soil and freshwater acidification. In addition, NOx can cause eutrophication of soils and water. This alters the species composition of plant communities and can eliminate sensitive species.
Nitrogen deposition	The pollutants that contribute to nitrogen deposition derive mainly from NOx and NH_3 emissions. These pollutants cause acidification (see also acid deposition) as well as eutrophication.	Species-rich plant communities with relatively high proportions of slow-growing perennial species and bryophytes are most at risk from nitrogen eutrophication, due to its promotion of competitive and invasive species which can respond readily to elevated levels of nitrogen. Deposition of nitrogen can also increase the risk of damage

		from abiotic factors (for example drought and frost).
Ozone (O_3)	A secondary pollutant generated by photochemical reactions from NOx and volatile organic compounds (VOCs). These are mainly released by the combustion of fossil fuels. The increase in combustion of fossil fuels in the UK has led to a large increase in background ozone concentration, leading to an increased number of days when levels across the region are above 40 parts per billion (ppb). Reducing ozone pollution is believed to require action at international level to reduce levels of the precursors that form ozone.	Concentrations of O_3 above 40ppb can be toxic to wildlife. Increased ozone concentrations may lead to a reduction in growth of agricultural crops, decreased forest production and altered species composition in semi-natural plant communities.
Sulphur Dioxide (SO_2)	Main sources of SO_2 emissions are electricity generation, industry and domestic fuel combustion. May also arise from shipping and increased atmospheric concentrations in busy ports. Total SO_2 emissions have decreased substantially in the UK since the 1980s.	Wet and dry deposition of SO_2 acidifies soils and freshwater, and alters the species composition of plant and associated animal communities. The significance of impacts depends on levels of deposition and the buffering capacity of soils.

Defra and the EA recommend that, when considering air quality impacts, European sites within at least 10km of a point source emitter should be considered and be subject to assessment, where necessary. This distance can be extended to 15km for larger emitters (above 50 megawatts). The type of development which could be progressed at Chapelcross is not yet precisely defined but could include industrial and manufacturing facilities. While it is unlikely that these would be 'major' emitters (under the Defra / EA guidance), at this stage this possibility cannot be excluded. Therefore, all European sites within 15km of the National Development may need to be considered in relation to air quality impacts. In addition to those covering the Solway Firth, this would also include Raeburn Moss SAC and Solway Mosses North SAC. These sites are both designated for raised bog habitat. Bogs are particularly sensitive to atmospheric pollution (CIEEM, 2021). For example, when the rate of nitrogen deposition exceeds the critical load for this habitat, effects can include the loss of heather *Calluna vulgaris* and bog mosses *Spagnum* spp. Similarly, when the critical load for acid deposition is exceeded, the functioning of peat peatland ecosystems can be affected, including reduced decomposition, sulphate reduction, nitrate uptake, organic acid production, together with a decline in peat pH and drainage waters. There can be changes to vegetation composition, including a decline in *Sphagnum* mosses and plant species diversity (http://www.apis.ac.uk/overview/ecosystems/overview_bogs.htm).

Brownfield sites can often be infested by invasive non-native plant species. Development activities have the potential to cause the uncontrolled spread of these species. As described above, Chapelcross appears to by hydrologically linked to the Solway Firth SAC and SPA and the Upper Solway Flats and Marshes Ramsar site. Much of these sites is unsuitable for the growth of invasive non-native plant species. However, above the tidal limit there is the potential for species such as Japanese knotweed *Reynoutria japonica*, which can spread through plant fragments, to establish.

Relevant European Sites

Based on the location of the National Development and the potential impacts which could arise from the redevelopment of Chapelcross, the following European sites are considered to be most relevant:

- Solway Firth SPA
- Solway Firth SAC
- Upper Solway Flats and Marshes Ramsar site
- Castle Loch, Lochmaben SPA
- Castle Loch, Lochmaben Ramsar site
- Raeburn Flow SAC, and
- Solway Mosses North SAC.

Solway Firth SPA

The Solway Firth SPA is a large site which encompasses extensive areas of intertidal mudflats, fringing saltmarshes and grazing marshes and the marine environment. The offshore sediments are substantially sand, associated with mud and gravel towards the edges of the firth, especially in the smaller tributary estuaries. The series of sandbanks north-east of the Isle of Man is the result of strong currents and an abundant supply of sand. The inner firth is shallow, as is Wigtown Bay, but further west towards the north-eastern Irish Sea the water deepens to over 40m.

The following non-breeding waterbird species are qualifying features of Solway Firth SPA:

- bar-tailed godwit
- barnacle goose
- black-headed gull
- common gull
- common scoter
- cormorant
- curlew
- dunlin
- golden plover *Pluvialis apricaria*
- goldeneye
- goosander
- grey plover
- herring gull
- knot
- lapwing
- oystercatcher
- pink-footed goose
- pintail *Anas acuta*
- red-throated diver

- redshank
- sanderling
- scaup *Aythya marila*
- shelduck
- shoveler *Anas clypeata*
- teal *Anas crecca*
- turnstone *Arenaria interpres*
- whooper swan, and
- the assemblage of non-breeding waterfowl, which regularly exceeds 20,000 individuals.

No condition assessment for the qualifying species of the Solway Firth SPA is given by NatureScot on the SiteLink website.

In addition to the non-breeding species listed above, ringed plover *Charadrius hiaticula* is also included as a qualifying feature as a passage species.

NatureScot is currently preparing Conservation and Management Advice for all Scottish inshore marine protected areas, including the cross-border Solway Firth SPA. The Conservation and Management Advice documents will include the full Conservation Objective for the site. Whilst the site-specific information is developed, the high-level Conservation Objectives will remain as draft but are unlikely to change. At the time of undertaking this HRA, the draft Conservation Objectives of the Solway Firth SPA are:

1. To ensure that the qualifying features of Solway Firth SPA are in favourable condition and make an appropriate contribution to achieving Favourable Conservation Status.
2. To ensure that the integrity of Solway Firth SPA is maintained or restored as appropriate, in the context of environmental changes by meeting objects 2a, 2b and 2c for each qualifying feature.
    a) The populations of the qualifying features are viable components of the site.
    b) The distributions of the qualifying features throughout the site are maintained, or where appropriate, restored by avoiding significant disturbance of the species.
    c) The supporting habitats and processes relevant to the qualifying features and their prey / food resources are maintained or where appropriate, restored.

Solway Firth SAC

The Solway Firth SAC lies within the Solway Firth SPA but does not share the same marine extension. It encompasses extensive areas of intertidal mudflats, fringing saltmarshes and grazing marshes.

The qualifying features of the Solway Firth SAC [and latest assessed condition] are:

- Atlantic salt meadows [Favourable Maintained]
- coastal shingle vegetation outside the reach of waves [Unfavourable Declining]
- dune grassland [Unfavourable No change]
- estuaries [condition not assessed]
- glasswort and other annuals colonising mud and sand [Favourable Maintained]
- intertidal mudflats and sandflats [condition not assessed]
- reefs [condition not assessed]

- subtidal sandbanks [Favourable Maintained],
- river lamprey [condition not assessed], and
- sea lamprey [condition not assessed].

Dune grassland is a priority habitat of the Habitats Directive, which indicates that this habitat type is in danger of disappearance and has a distribution largely restricted to Europe.

The Conservation Objectives for the qualifying habitats of Solway Firth SAC are:

- To avoid deterioration of the qualifying habitats thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to achieving favourable conservation status for each of the qualifying features.
- To ensure for the qualifying habitats that the following are maintained in the long term:
  - extent of the habitat on site
  - distribution of the habitat
  - structure and function of the habitat
  - processes supporting the habitat
  - distribution of typical species of the habitat
  - viability of typical species as components of the habitat, and
  - no significant disturbance of typical species of the habitat.

The Conservation Objectives for the qualifying lamprey species of the Solway Firth SAC are:

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

Upper Solway Flats and Marshes Ramsar site

The extensive flats and marshes of the Upper Solway form one of the largest and most important continuous areas of intertidal habitat in Britain. The site exhibits vegetational transition from seaward edge communities through grassy saltmarsh to mature marsh. The estuary is internationally important for numerous species of wintering waterbirds and includes the entire Svalbard breeding population of barnacle goose.

The Upper Solway Flats and Marshes Ramsar site is coincident with the Solway Firth SAC. The list of qualifying bird species for the Ramsar site is almost identical to the qualifying species of the Solway Firth SPA but does not include common scoter, goosander or red-throated diver.

In addition, natterjack toad *Bufo calamita* is a qualifying feature of the Ramsar site. The site supports up to 23% of the British population of this species, dispersed between several colonies. This population is at the northern limit of its range in Britain. The toads breed in pools on the landward edge of the saltmarsh habitat.

Castle Loch, Lochmaben SPA and Ramsar site

Castle Loch is a shallow eutrophic waterbody with stands of emergent vegetation. The margins support a wide range of vegetation from marshy grassland to mature woodland.

The sole qualifying species of the SPA and Ramsar site is non-breeding pink-footed goose. The latest assessed condition of the feature is Unfavourable No change, with agricultural operations identified as an existing threat to the population.

The Conservation Objectives for the Castle Loch, Lochmaben SPA are:

- To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained.
- To ensure for the qualifying species that the following are maintained in the long term:
  - population of the species as a viable component of the site
  - distribution of the species within the site
  - distribution and extent of habitats supporting the species
  - structure, function and supporting processes of habitats supporting the species, and
  - no significant disturbance of the species.

Raeburn Flow SAC

Raeburn Flow is one of the best examples of raised bog in Annandale and Eskdale. The site contains good examples of typical bog plant communities and supports locally uncommon plants such as cranberry *Vaccinium oxycoccos*, crowberry *Empetrum nigrum*, bog asphodel *Narthecium ossifragum* and bog rosemary *Andromeda polifolia*.

The qualifying features of Raeburn Flow SAC [and latest assessed condition] are:

- active raised bog [Favourable Declining], and
- degraded raised bog [Unfavourable No change].

Active raised bog is a priority habitat of the Habitats Directive, which indicates that this habitat type is in danger of disappearance and has a distribution largely restricted to Europe.

The primary identified reason for the declining condition of the active raised bog is the continued establishment of scrub.

The Conservation Objectives for both of the qualifying habitats are:

1. To ensure that the qualifying features of Raeburn Flow SAC are in favourable condition and make an appropriate contribution to achieving favourable conservation status.

2. To ensure that the integrity of Raeburn Flow SAC is restored then maintained by meeting objectives 2a, 2b and 2c.
    a) Restore the extent and distribution of the habitat within the site.
    b) Maintain and where necessary restore, the structure, function and supporting processes of the habitat.
    c) Restore the distribution and viability of typical species of the habitat.

Further information on the Conservation Objectives 2a, 2b and 2c for the qualifying habitats can be found in the Conservation Advice Package for Raeburn Flow SAC.

Solway Mosses North SAC

Solway Mosses North SAC encompasses two areas of raised bog which are remnants of the once extensive Lochar Moss, a complex of raised bog sites that remains un-afforested and is especially notable for its extensive surface patterning of hummocks and hollows.

The qualifying features of Solway Mosses North SAC [and latest assessed condition] are:

- active raised bog [Unfavourable Recovering], and
- degraded raised bog [Unfavourable Recovering].

Active raised bog is a priority habitat of the Habitats Directive, which indicates that this habitat type is in danger of disappearance and has a distribution largely restricted to Europe.

The qualifying habitats have been assessed as being in unfavourable condition because past management activities (planting of commercial conifers and ditch creation) are still having a negative impact. However, positive management is taking place, including the removal of conifer blocks, scrub removal, grazing, and ditch blocking to improve the condition of the site.

The Conservation Objectives for both of the qualifying habitats are:

1. To ensure that the qualifying features of Solway Mosses North SAC are in favourable condition and make an appropriate contribution to achieving favourable conservation status.
2. To ensure that the integrity of Raeburn Flow SAC is restored by meeting objectives 2a, 2b and 2c.
    a) Maintain the extent and distribution of the habitat within the site.
    b) Restore the structure, function and supporting processes of the habitat.
    c) Maintain the distribution and viability of typical species of the habitat.

Further information on the Conservation Objectives 2a, 2b and 2c for the qualifying habitats can be found in the Conservation Advice Package for Solway Mosses North SAC.

Assessment of Effects on Site Integrity

Pink-footed geese are vulnerable to disturbance when foraging, with Mitchell and Hearn (2004) reporting that this species has been found to avoid fields within 100m of the nearest road (median distance 400m), for example. While the Waterbird Disturbance Mitigation Toolkit (Cutts *et al*, 2013) does not consider pink-footed, greylag or barnacle

geese specifically, it assesses the susceptibility of Brent goose *Branta bernicla* to construction disturbance. It concludes that this species is very sensitive to noise and visual disturbance and may be impacted by works taking place within 400m. Given the stated sensitivity of this species, it is likely to be suitably precautionary to assume that disturbance of the qualifying geese species of the Solway Firth and Castle Loch, Lochmaben European sites may occur at distances of up to 400m from the source.

Although the feeding distribution of pink-footed and greylag geese does appear to include fields in proximity to the National Development, according to Mitchell (2012) the birds from these European sites forage at locations across the Annan Valley, as well as the greater part of the coastal area between Dumfries and Annan. There is consequently likely to be a large area of the surrounding landscape which will remain available to these birds even if disturbance from the area around Chapelcross did occur.

The above is also applicable to other waterbirds from the Solway Firth SPA and Upper Solway Flats and Marshes Ramsar site which may use agriculture fields around Chapelcross as functionally-linked habitat. For some of these species, individual accounts of their sensitivity to construction disturbance are given in the Waterbird Disturbance Mitigation Toolkit. However, in general, a distance of around 300m is considered to be the approximate upper limit at which construction works would be likely to cause disturbance of these species.

Several options for mitigating the potential impacts of construction (and operational) disturbance also exist, including the use of visual and noise screening and adopting working methods and technologies which minimise the generation of noise. Should these measures be considered insufficient, timing of works to take place outside of the non-breeding season would ensure that any possible impacts on qualifying birds were avoided.

Therefore, while it will be necessary to determine the level of use of habitat within at least 400m of the National Development by non-breeding waterbirds through further study, likely to include targeted field survey, it is very unlikely that there would be any adverse effects on the integrity of any European site because:

- the distance up to which disturbance is likely to occur is relatively small and would therefore only affect a relatively small area, outside of the boundary of any European site
- there is abundant alternative habitat for foraging in the surrounding should any disturbance occur
- there are reliable mitigation measures which could be implemented to avoid or minimise disturbance, and
- even if disturbance is considered to be a possibility following the adoption of mitigation measures, works could be timed to avoid the non-breeding season, at which time qualifying bird species will not be present, removing the risk of any impact entirely.

Following the course of the Gullielands Burn and River Annan, it is approximately 5km from the National Development to the point where the River Annan enters the Solway Firth European sites. At this distance, even in the absence of mitigation, waterborne pollution is likely to have been subject to sufficient dilution that the impacts on habitats and/or species within the estuary will be negligible. This is especially so given the estuarine / marine nature of the European sites and the massive dilution effect of the sea. However, should development brought forward at Chapelcross involve major

discharges of effluent, there is the potential for impacts on habitats and species within the boundaries of these sites, and on lamprey in the watercourses outside of the sites. Despite this, a range of control and mitigation measures exist to manage waterborne pollution during the construction and operational phases of development. In particular, any operational discharges may need to be subject to a PPC permit[14], and concentrations of pollutants would need to remain within set limits which would be designed to avoid adverse effects on the aquatic environment. There is consequently unlikely to be any adverse effect on the integrity of any European site from waterborne pollution.

Similarly, any proposals which involve hydrological changes to the Gullielands Burn or River Annan would need to be fully assessed on the basis of the more detailed information available at that time. This would include any proposals to abstract water or to modify the physical characteristics of the watercourses. Again, development which involved such activities would be subject to PPC permit, or a CAR licence[15]. To fully understand the potential impacts of such proposals it would be necessary to assess the suitability of habitat within affected parts of the watercourses to be used by lamprey for breeding. Should suitable habitat be identified, targeted surveys to determine the presence of these species would be needed.

A detailed assessment of air quality impacts on European sites will be required for any development brought forward which involves emissions to the atmosphere. This should be based on the screening buffers advised by Defra / the EA, namely 10km for most emitters, extended up to 15km for major emitters. This will require the input of air quality specialists and ecologists to determine whether any identified impacts from air pollution could significantly affect any European sites. As the specific projects which may be brought forward are not known at this stage, it is only possible to state that projects which are predicted to result in pollutant rates at European sites which exceed 1% of the relevant critical load or critical level[16] for the applicable habitats could result in an adverse effect on the integrity of that site. However, there is considerable precedent for emitters to be delivered within 10-15km of European sites without adverse effects on the integrity of European sites (for example through the use of technology to reduce NOx and ammonia emissions). Therefore, with a requirement for detailed air quality modelling and accompanying ecological assessment, and any associated process improvements, it will be possible to avoid developments being progressed which could adversely affect the integrity of any European site.

The spread of invasive non-native plant species to the Solway Firth European sites can readily be avoided through the implementation of standard biosecurity measures. It will be necessary for a suitable survey of the Chapelcross site to be carried out to search for the presence of invasive non-native plants. This should seek to identify potential infestation pathways and the precise methods for control and, where possible,

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[14] A permit issued by SEPA under the Pollution Prevention and Control (Scotland) Regulations 2012.

[15] Issued by SEPA under the Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended).

[16] Critical level is defined as “concentrations of pollutants in the atmosphere above which direct adverse effects on receptors, such as…plants [or] ecosystems, may occur according to present knowledge” http://www.apis.ac.uk/).

eradication. With the adoption of such measures, there will be no adverse effect on the integrity of any European site.

In-combination Assessment

There are no known plans or projects which could act in-combination with the Chapelcross Power Station Redevelopment to result in adverse effects on the integrity of any European site.

However, this must be re-examined at further stages in the planning process, including at the project level. In particular, the potential for cumulative disturbance of foraging geese or other waterbirds from other developments must be considered. In addition, air quality modelling must also account for existing and planned sources of airborne pollution when assessing the potential ecological effects on the qualifying habitats of European sites.

Avoidance and Mitigation

The following mitigation measures are recommended to avoid or minimise the identified impacts which could arise from the Chapelcross Power Station Redevelopment on European sites:

- targeted survey of the land within and surrounding the National Development will be required to inform the requirement for mitigation to avoid impacts on foraging geese and other waterbirds. The precise scope of such survey will need to be determined based on the nature of the relevant proposal(s) but may require data collection over more than one non-breeding season
- should the fields surrounding the National Development be used by the qualifying waterbirds of European site(s), measures to avoid their disturbance / displacement will be required, which may include:
  - the use of temporary or permanent screening to reduce noise and/or visual impacts. For example, noise reducing barriers may be used as a temporary solution during construction. Planting of hedgerows and/or trees may provide a more permanent, longer-term measure to screen operational activities
  - using technology and best available techniques which minimise the generation of noise during construction and operation
  - a ‘soft-start’ may be adopted for all potentially disturbing activities to minimise the risk of impacts on waterbirds within at least 400m. This involves gradually increasing the intensity of an activity (for example the noise it generates) over a period of time to allow birds to habituate to the source
- if it cannot be concluded that significant disturbance effects on qualifying waterbirds can be avoided, it may be necessary to time works to avoid the non-breeding season. The precise dates may need to be determined based on the species present, but the non-breeding season is generally taken to be extend between September and February, inclusive
- pollution prevention measures will be required during the construction and operation of the scheme. These should follow SEPA PPGs / GPP, and may include (but not necessarily be limited to):
  - controls and contingency measures to manage run-off from construction areas and to manage sediment
  - all oils lubricants or other chemicals should be stored in an appropriate secure container in a suitable storage area, with spill kits provided across the development site

    - in order to avoid pollution of soils, vegetation and/or watercourses, all refuelling and servicing of vehicles and plant should be carried out in a designated area which is bunded and has an impermeable base. This should be at least 50m from any watercourse / waterbody
- if proposals brought forward under the National Development could impact water quality or the physical hydrology of any watercourse, survey for river lamprey and sea lamprey is likely to be required
- air quality modelling will be required for any development which involves emissions to air. Guidance on the assessment of air quality impacts on European sites (for example CIEEM, 2021; Holman *et al*, 2019) must be followed to determine that emissions will not adversely affect the integrity of any European site, either alone or in-combination with other sources of air pollution, and
- survey for the presence of invasive non-native plant species will be required on land which will be impacted by development. Suitable biosecurity measures will need to be devised based on the species present and their distribution, and the nature of works to take place. Such measures will need to be set out in a Biosecurity Management Plan or similar but must be designed to prevent the spread of such species from the site. Wherever possible, the possibility of eradication from the site should also be investigated.

Conclusion

With the implementation of mitigation measures, and subject to the results of further study and modelling (where necessary), no adverse effects on the integrity of any European site are predicted from Chapelcross Power Station Redevelopment, either alone or in-combination with other known plans or projects.

High Speed Rail

Summary Description of the National Development

This national development supports the implementation of increased infrastructure to improve rail capacity and connectivity on the main cross-border routes, the east and west coast mainlines. Enhancement would be in addition to and in conjunction with High Speed 2 (HS2) and other enhancements identified by the UK Government. The Strategic Transport Projects Review 2 is appraising through recommendation 45 and will provide the strategic case for investment in the rail network in Scotland, over and above the commitments within HS2.

The following classes of development are included in the High Speed Rail National Development:

a) New and/or upgraded railway track and electrification solution (overhead cabling and pylons or on track);
b) New and/or upgraded multi-modal railway stations to service high-speed lines; and
c) Depot facilities for high speed trains and/or related to the construction and onward maintenance of the UK high-speed rail infrastructure.

High Speed Rail was screened into appropriate assessment due to reference in the East Lothian Local Development Plan to the potential for new stations at East Linton and Blindwells. All other aspects of this National Development currently have no spatial definition and were therefore screened out during the test of likely significant effects. The assessment below is therefore limited to the potential impacts and effects from the construction and operation of a new rail station in East Lothian. Consideration has not been given to any possible impacts from increased frequency of trains using the existing line, as it is not known at this stage whether this will occur as a result of the development of a new station.

Potential Impacts on European Sites

The potential impacts of a new station in East Lothian will largely be determined by its location. However, there are possible pathways for impacts on the European sites covering the Firth of Forth.

In particular, should the location be close to the coast, there is the potential for construction of a new station to result in the loss of functionally-linked habitat used by qualifying species of the Firth of Forth SPA and Ramsar Site and/or the Outer Firth of Forth and St Andrews Bay Complex SPA for foraging or roosting outside of the boundary of these sites. In particular, species such as curlew, lapwing, oystercatcher and others may use agricultural grassland during the non-breeding season. It will be necessary to undertake further study once the proposed location for a new station is known in order to determine use of the area by qualifying bird species. This is likely to require targeted field survey, which may need to be conducted over more than one year.

In addition to the direct loss of functionally-linked habitat, disturbance of birds using such habitat could result in them being displaced, causing the effective loss of this area to these birds. The Waterbird Disturbance Mitigation Toolkit (Cutts *et al*, 2013) provides species-specific information for several of the qualifying features of these sites.

However, it suggests that, in general, disturbance of waterbirds can occur up to distances of around 300m from construction activities. Disturbance during the operational phase is likely to occur over a smaller area as the impact sources are likely to primarily be increased vehicular traffic or the passage of trains, both of which birds can become habituated to. For example, Godinho *et al* (2017) found no exclusion effects from an active railway on wetland birds, with no variation in the abundance of species in locations deemed to be 'near' (up to 500m) and 'far' (beyond 500m) from the railway line.

If the new station were to be built very close to the coast (i.e. within 300m), there would be the possibility that construction and/or operation of the new station could disturb and/or displace qualifying bird species within the boundary of the Firth of Forth SPA or the Outer Firth of Forth and St Andrews Bay Complex SPA.

Although the site of a new station could be hydrologically linked to the Firth of Forth, it is unlikely that, even in the absence of mitigation, there would be an adverse effect on the integrity of any European site for the following reasons:

- the construction and operation of a new rail station is unlikely to generate substantial quantities of waterborne pollution, even in a worst-case scenario, and
- there would be a very large dilution effect on any pollutants entering the Firth of Forth.

Regardless, pollution prevention measures are readily available to control and manage waterborne pollution, and it is highly unlikely that this impact could realistically affect the qualifying features of the Firth of Forth European sites.

Relevant European Sites

The European sites likely to be relevant to the construction and operation of a new High Speed Rail station in East Lothian will be determined by its location but are likely to include the Firth of Forth SPA and Ramsar site, and Outer Firth of Forth and St Andrews Bay Complex SPA. As waterborne pollution is unlikely to have a significant effect on the marine environment, sites designated for marine mammals (for example Isle of May SAC and Berwickshire and North Northumberland Coast SAC) are not considered at this stage to be relevant.

Firth of Forth SPA and Ramsar Site

The Firth of Forth SPA and Ramsar site are coincident and share the same qualifying features. The designations encompass a complex of estuarine and coastal habitats stretching from Alloa to the coasts of Fife and East Lothian. The site includes extensive invertebrate-rich intertidal flats and rocky shores, areas of saltmarsh, lagoons and sand dune.

The qualifying features of the Firth of Forth SPA [and their latest assessed condition] and Ramsar site are the following non-breeding waterbirds:

- bar-tailed godwit [Favourable Maintained]
- common scoter [Unfavourable Declining]
- cormorant [Favourable Maintained]
- curlew [Favourable Maintained]
- dunlin [Favourable Declining]
- eider [Favourable Declining]

- golden plover [Unfavourable Declining]
- goldeneye [Unfavourable Declining]
- great crested grebe *Podiceps cristatus* [Unfavourable Declining]
- grey plover [Favourable Declining]
- knot [Unfavourable Declining]
- lapwing [Favourable Declining]
- long-tailed duck [Unfavourable Declining]
- mallard *Anas platyrhynchos* [Favourable Declining]
- oystercatcher [Favourable Maintained]
- pink-footed goose [Favourable Maintained]
- red-breasted merganser [Unfavourable Declining]
- red-throated diver [Favourable Maintained]
- redshank [Favourable Maintained]
- ringed plover [Favourable Maintained]
- scaup [Unfavourable Declining]
- shelduck [Favourable Maintained]
- Slavonian grebe [Unfavourable Declining]
- turnstone [Favourable Maintained]
- velvet scoter [Favourable Maintained]
- wigeon *Anas penelope* [Favourable Maintained], and
- the assemblage of non-breeding waterfowl, which regularly exceeds 20,000 individuals [Favourable Maintained].

In addition to the non-breeding species listed above, sandwich tern is also included as a qualifying feature as a passage species and is assessed as being in Favourable Maintained condition.

The main reasons for the unfavourable and/or declining condition of several of the qualifying species are recreation and disturbance, including dog walking, and climate change. Other negative pressures have been identified for certain species, but the aforementioned are likely to be having the greatest impact on a number of the qualifying features.

The Conservation Objectives of the Firth of Forth SPA are:

- To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained.
- To ensure for the qualifying species that the following are maintained in the long term:
  - population of the species as a viable component of the site
  - distribution of the species within the site
  - distribution and extent of habitat supporting the species
  - structure, function and supporting processes of habitats supporting the species, and
  - no significant disturbance of species.

Outer Firth of Forth and St Andrews Bay Complex SPA

The Outer Firth of Forth and St Andrews Bay Complex SPA encompasses the two closely adjacent Firths of Forth and Tay. In the mid Firth of Forth a belt of mud-rich sediments lies between areas of sandy gravels and shell material on either side along the shore. As the estuary widens towards the outer firth, there are extensive areas of sandy and gravelly muds and fine sediments. In contrast, St Andrews Bay contains

clean sands and gravel with only small areas of muddy sediments. The area supports a wide variety of both pelagic and demersal fish, crustaceans, molluscs and marine worms, all of which comprise the prey of the qualifying waterbird species.

The Outer Firth of Forth and St Andrews Bay Complex SPA is designated for 21 species of waterbird, and for the assemblage of non-breeding waterfowl and seabirds it supports. However, the species which are most likely to be relevant to the High Speed Rail National Development are those which could make use of inland habitat outside of the boundary of the designation. These non-breeding qualifying features are:

- black-headed gull
- common gull, and
- herring gull.

NatureScot is currently preparing Conservation and Management Advice for all Scottish inshore marine protected areas, including the Outer Firth of Forth and St Andrews Bay Complex SPA. The Conservation and Management Advice documents will include the full Conservation Objective for the site. Whilst the site-specific information is developed, the high-level Conservation Objectives will remain as draft but are unlikely to change. At the time of undertaking this HRA, the draft Conservation Objectives of the Outer Firth of Forth and St Andrews Bay Complex SPA are:

1. To ensure that the qualifying features of the Outer Firth of Forth and St Andrews Bay Complex SPA are in favourable condition and make an appropriate contribution to achieving Favourable Conservation Status.
2. To ensure that the integrity of the Outer Firth of Forth and St Andrews Bay Complex SPA is restored in the context of environmental changes by meeting objects 2a, 2b and 2c for each qualifying feature.
    a) The populations of the qualifying features are viable components of the site.
    b) The distributions of the qualifying features throughout the site are maintained by avoiding significant disturbance of the species.
    c) The supporting habitats and processes relevant to the qualifying features and their prey / food resources are maintained or where appropriate restored, at the Outer Firth of Forth and St Andrews Bay Complex SPA.

Assessment of Effects on Site Integrity

In the absence of an identified location for a new station in East Lothian, and without detailed survey information, it is not possible at this stage to fully assess the potential effects of the National Development on the Firth of Forth European sites. Further assessment will therefore be required at further stages in the planning process, including at the project level.

However, given the extent of available mitigation solutions for conceivable impact pathways, there is no reason to conclude that with the implementation of mitigation, and by designing the station to avoid areas used by qualifying birds of the Firth of Forth European sites, the loss of functionally-linked habitat and/or disturbance and displacement impacts can be largely avoided or minimised. If any residual impact remains, it is very likely that, given the relatively small area which would be affected, and due to the availability of large areas of alternative habitat across the Forth Estuary, there would be no adverse effect on European site integrity.

In-combination Assessment

At this stage, without knowing where a new station may be located, a detailed assessment of the potential for in-combination effects cannot be carried out. However, East Lothian Council is promoting the redevelopment of the former Cockenzie Power Station, and there is on-going development in the nearby Blindwells area. Given the scale of these developments, they may be relevant when considering the potential for in-combination effects with the High Speed Rail National Development.

The East Lothian Local Development Plan 2018 (https://www.eastlothian.gov.uk/downloads/download/13023/local_development_plan_2018) also identifies priorities for residential and other mixed used development in towns across the region, including Musselburgh, Prestonpans, Tranent, Haddington, Dunbar and North Berwick. A full in-combination assessment will be required at future stages in the planning process.

However, with the implementation of the mitigation described above, it is likely that impacts on the qualifying birds of the Firth of Forth European sites can be avoided or minimised, and adverse effects on the integrity of these or other European sites is unlikely.

Avoidance and Mitigation

As already stated, the potential impacts of a new station in East Lothian will depend on its precise location. The avoidance and/or mitigation measures which may be required cannot therefore be set out with certainty at this time. However, the following may be necessary to avoid adverse effects on the Firth of Forth SPA and Ramsar site, and the Outer Firth of Forth and St Andrews Bay Complex SPA:

- to inform the requirements for mitigation, targeted survey of the location of any new station, and any surrounding habitat suitable for qualifying bird species, will be required
- should the fields surrounding the proposed location for the new station be found to be used by the qualifying waterbirds of European site(s), measures to avoid their disturbance / displacement will be required, which may include:
  - the use of temporary or permanent screening to reduce noise and/or visual impacts. For example, noise reducing barriers may be used as a temporary solution during construction. Planting of hedgerows and/or trees may provide a more permanent, longer-term measure to screen operational activities
  - using technology and best available techniques which minimise the generation of noise during construction and operation
  - a ‘soft-start’ may be adopted for all potentially disturbing activities to minimise the risk of impacts on waterbirds within approximately 300m. This involves gradually increasing the intensity of an activity (for example the noise it generates) over a period of time to allow birds to habituate to the source
- if it cannot be concluded that significant disturbance effects on qualifying waterbirds can be avoided, it may be necessary to time works to avoid the non-breeding season. The precise dates may need to be determined based on the species present, but the non-breeding season is generally taken to be extend between September and February, inclusive, and
- although not considered at this stage to be necessary to avoid adverse effects on any European site, standard pollution prevention measures will be required to comply with other relevant environmental protection legislation.

Conclusion

Although the precise location of a possible new rail station in East Lothian is unknown at this stage, there are available mitigation measures to address all identified potential impact pathways. It is therefore concluded that with the implementation of mitigation measures, no adverse effects on the integrity of any European site are predicted from the High Speed Rail National Development, either alone or in-combination with other known plans or projects.

This conclusion, and the requirement for mitigation will need to be determined at future stages of the planning process, including at the project level and will be informed by detailed further study, likely including field survey.

This publication is available at **www.gov.scot**

Any enquiries regarding this publication should be sent to us at

The Scottish Government
St Andrew's House
Edinburgh
EH1 3DG

ISBN: 978-1-80525-133-0 (web only)

Published by The Scottish Government, November 2022

Produced for The Scottish Government by APS Group Scotland, 21 Tennant Street, Edinburgh EH6 5NA
PPDAS1182003 (11/22)