

Balliemeanoch Pumped Storage Hydro

Environmental Impact Assessment
Report

Volume 5: Appendices
Appendix 8.3 Marine Protected Area
Assessment

ILI (Borders PSH) Ltd

July 2024

Quality information

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1 Introduction

1.1 Overview

AECOM has been commissioned by Intelligent Land Investments (ILI) (Borders PSH) Ltd. (hereafter referred to as the 'Applicant') to prepare an Environmental Impact Assessment Report (EIAR) to accompany an application for consent to construct, operate, and decommission a pumped storage hydro (PSH) scheme to be known as the Balliemanoch Pumped Storage Hydro (referred to throughout as the 'Development') under Section 36 of the Electricity Act 1989 (the 'Act').

Additionally, for works in the marine environment, which comprises the construction of a jetty for the delivery of construction materials for the proposed Development, a marine license is required under the Marine (Scotland) Act 2010 and the Marine and Coastal Access Act (2009).

As part of these applications, specific consideration of the potential for impact on Scottish Marine Protected Areas (MPAs) is required for any marine license application in Scottish waters. The need for the consideration of MPAs is set out in Section 83 of the Marine (Scotland) Act 2010¹.

To support the marine licence application, an assessment has been carried out to consider the effects of the Development in respect of Section 83 of the Marine (Scotland) Act 2010.

This assessment should be read in conjunction with the following EIAR chapters in *Volume 2: Main Report*:

- *Chapter 1: Introduction;*
- *Chapter 2: Project and Site Description;*
- *Chapter 8: Marine Ecology; and*
- *Chapter 18: Marine Physical Environment and Coastal Processes.*

1.2 Report Scope

Specific consideration of the potential for effects to occur on MPAs is required as part of a marine license application in Scottish waters, as set out in Section 83 of the Marine (Scotland) Act 2010. The purpose of this report is to inform the MPA assessment process in determining whether the Development's activities are capable of affecting (other than insignificantly):

- A protected feature in a Nature Conservation MPA;
- A stated purpose for a Demonstration and Research MPA; or
- A marine historic asset in a Historic MPA.

This MPA assessment provides a description of the Development's activities, identifying potential impacts which could arise from the planned activities and screens into the assessment any MPAs that could be affected. A process for assessing MPAs during the licensing process has not been outlined by MD-LOT. In the absence of such guidance, the process outlined by the Marine Management Organisation (MMO) for Marine Conservation Zones (MCZ) in England will be followed, as provided in the guidance document 'Marine conservation zones and marine licensing' (MMO, 2013). Therefore, the screening assessment will follow this guidance and the information provided will be used to inform the consideration of MPAs by the MD-LOT.

The Development, in the context of relevant MPA locations, is presented in *Figure 2-1*, below.

1.3 Project Overview

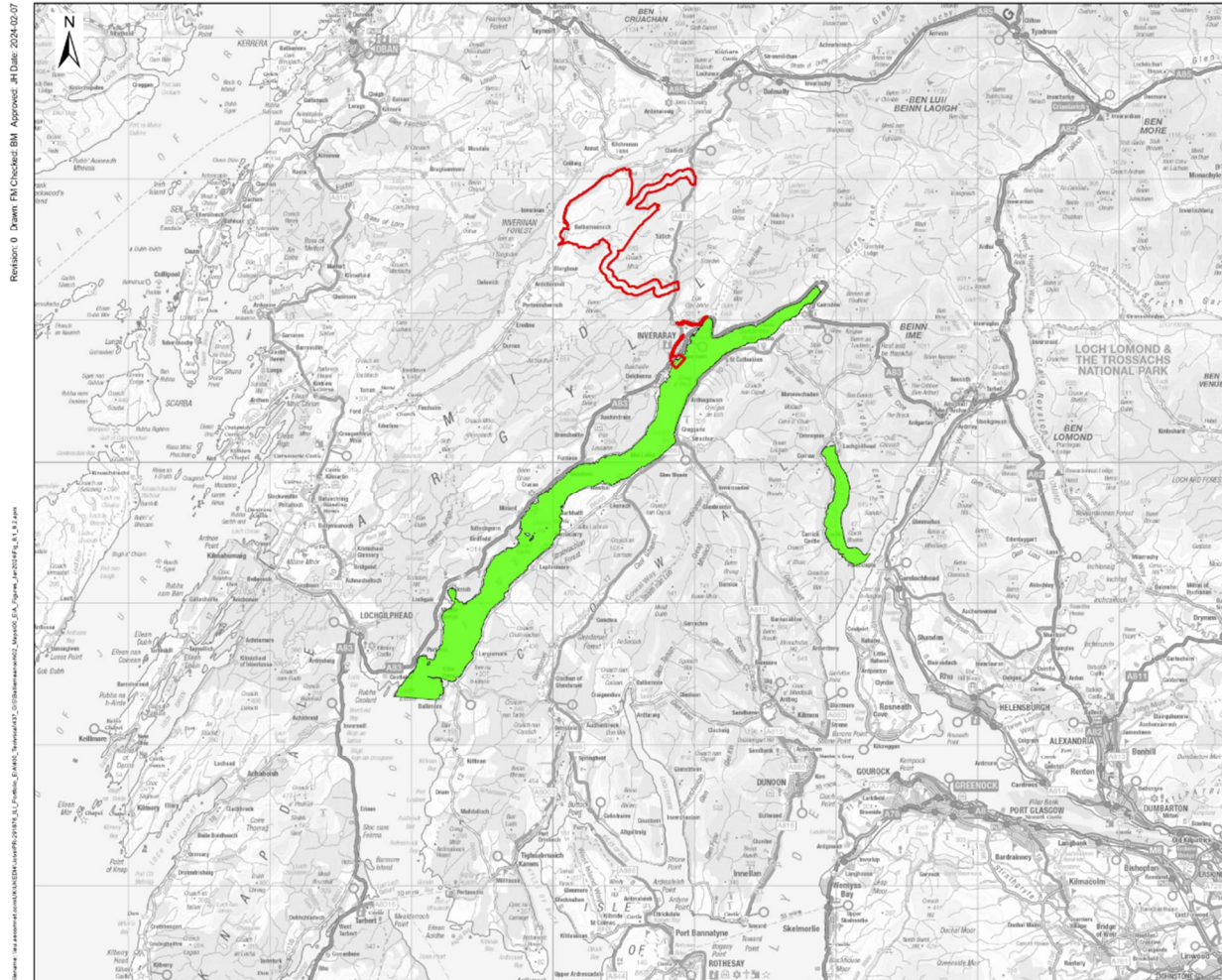
The main PSH Development is located at central national grid reference NN 03615 17578, approximately 4.4 km to the south of the village of Portsonachan and 9 km northwest of Inveraray in Argyll and Bute, Scotland. The Marine Facility is located

¹ <https://www.legislation.gov.uk/asp/2010/5/part/5/crossheading/general-duties-of-public-authorities>

some distance away, south of Inveraray into Loch Fyne, a sea loch extending from the Firth of Clyde. The Marine Facility is a jetty that will be constructed to facilitate the delivery of large, abnormal loads, reducing pressures to the local road network during the construction of the main PSH Development. The construction and operation of the Marine Facility has the potential to affect marine ecological receptors in Loch Fyne.

The construction of the jetty will involve the installation of 72 piles, which are expected to remain *in situ* permanently, even after demobilisation. The Marine Facility directly overlaps with the boundary of the Upper Loch Fyne and Loch Goil MPA (*Figure 1-1*), and as such, direct effects to this site are considered within this assessment.

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LEGEND

- Development Boundary
- Upper Loch Fyne and Loch Goll

NOTES

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PROJECT NUMBER
 60570241

FIGURE TITLE
 Study Area

FIGURE NUMBER
 Figure 8.1b

Figure 1-1: Location of the Development and relevant MPAs

2 Legislative Framework

MPAs are designated under the Marine (Scotland) Act to protect a range of important marine habitats, species and geological formations in Scottish waters and UK offshore waters. These sites contribute to an ecologically coherent network of Marine Protected Areas (MPAs) in the North East Atlantic.

The development of the Scottish MPA network has involved work between the Marine Directorate, Joint Nature Conservation Committee (JNCC), Natural England (NE), Historic Environment Scotland, the Scottish Environment Protection Agency (SEPA) and NatureScot (formerly Scottish Natural Heritage (SNH)). The approach for identifying MPAs followed a science-based process as set out in the Scottish MPA Selection Guidelines². To date 36 MPAs have been designated for nature conservation³.

Section 83 of the Marine (Scotland) Act 2010 places specific duties on the Marine Directorate relating to MPAs and marine licence decision making. Section 83 applies where:

- a. *A public authority has the function of determining an application (whenever made) for authorisation of the doing of any act, and*
- b. *The act is capable of affecting (other than insignificantly):*
 - i. a protected feature in a Nature Conservation MPA,
 - ii. a stated purpose for a Demonstration and Research MPA,
 - iii. a marine historic asset in a Historic MPA,

To ensure the Marine Directorate remains compliant with the Marine (Scotland) Act 2010, specific consideration must be given to MPAs during the licence decision making process. Hence, there is a requirement for specific information relating to potential interactions with MPAs within waters licenced by MD-LOT (i.e., Scottish waters) to be provided.

3 Assessment Methodology

In the absence of formal guidance from the Marine Directorate in relation to the assessment of Scottish MPAs during the licence decision making process, the MMO guidance (2013) for English MCZ assessments will be applied to Scottish MPAs but adapted for considerations set out in section 83 of the Marine (Scotland) Act 2010.

The guidance published by the MMO (2013) describes how MCZ Assessments should be undertaken during the process of marine licence decision making. These guidelines recommend a staged approach to assessment, involving three sequential stages (Figure 3-1: Summary of the MCZ assessment process used by the MMO in marine licence decision making):

- **Screening** – Determine whether the licensable activity is taking place within or near an area being put forward or already designated as an MCZ and whether the activity is capable of affecting (other than insignificantly) either (i) the protected features of an MCZ, or (ii) any ecological or geomorphological process on which the conservation of any protected feature of an MCZ is (wholly or in part) dependant. If the answer is yes, then proceed to Stage 1.
- **Stage 1 Assessment** – Is the authority satisfied that there is no significant risk of the activity hindering the conservation objectives stated for the MCZ, and can the authority exercise its functions to further the conservation objectives of the site? If the answer is no to either of these questions, then the authority must consider whether there are other means of proceeding with the activity which would create a substantially lower risk of hindering the achieving of the site conservation objectives. If the answer is still no, then proceed to Stage 2.
- **Stage 2 Assessment** – This stage looks at whether the benefit to the public clearly outweighs the risk of damage to the environment and seeks to satisfy the authority that the applicant can make arrangements to undertake measures of equivalent environmental benefit to the damage which the activity will have on the MCZ.

² <https://www.webarchive.org.uk/wayback/archive/3000/https://www.gov.scot/Resource/0051/00515466.pdf>

³ <https://www.nature.scot/professional-advice/protected-areas-and-species/protected-areas/marine-protected-areas/scotlands-marine-protected-area-network>

To determine whether Section 83 of the Marine (Scotland) Act 2010 applies, it is necessary to consider the geographical proximity of the Development to the MPAs and the potential for proposed activities to affect designated features or the ecological/geomorphological processes upon which designated features rely.

A risk-based approach is recommended by the MMO when determining the proximity of an activity to an MCZ. The application of appropriate buffer zones to the protected features under consideration, as well as consideration of the potential risk of impacts from activities at greater distances is necessary. If the screening stage determines that Section 83 applies, it is necessary for the Marine Directorate to assess which elements should apply to a marine license application.

In line with the precautionary approach encouraged by the MMO guidance, the screening process has considered any MPA located within 700 m of the Marine Facility. This is considered to be a sufficiently precautionary buffer around the Development that encompasses the maximum Zone of Influence (ZoI) of development activities that are likely to impact MPA designated features in this instance (see *Section 4: Potential Impacts Effects and Zones of Influence*). This distance is based on the mean spring tide tidal ellipse data (*Chapter 18: Marine Physical Environment and Coastal Processes (Volume 2: Main Report)*) for the Development area and represents the maximum theoretical distance for suspended sediments, particularly fine sediments, could be dispersed. However, additional consideration is given to MPAs designated for marine mammal or migratory fish features which may be further afield, as both are highly mobile and transient and individuals associated with other sites may migrate within the Development area. Advice from the Joint Nature Conservation Committee (JNCC) indicates that an effective deterrent range for underwater sound associated with monopile installation is 26 km for harbour porpoise. As such, any MPAs that fall within this range will also be considered for impacts from underwater sound to marine mammals and/or migratory fish.

Appraisals of potential effects from the Development on the marine ecological receptors are presented in the EIAR *Chapter 8: Marine Ecology*. The chapter includes definitions of impact, effect, and significance of effects on the identified receptors, drawn from the Chartered Institute of Ecology and Environmental Management (CIEEM) Guidelines for Ecological Impact Assessment in Britain and Ireland – Terrestrial, Freshwater, Coastal and Marine (CIEEM, 2018, and updated September 2019). These definitions have also been used within this assessment, with the term 'effect' to express the consequence of an impact. This is expressed as the 'significance of effect' and is determined by considering the magnitude of the effect alongside the importance, or sensitivity, of the receptor or resource, in accordance with defined significance criteria (*Chapter 4: Approach to EIA (Volume 2: Main Report)*).

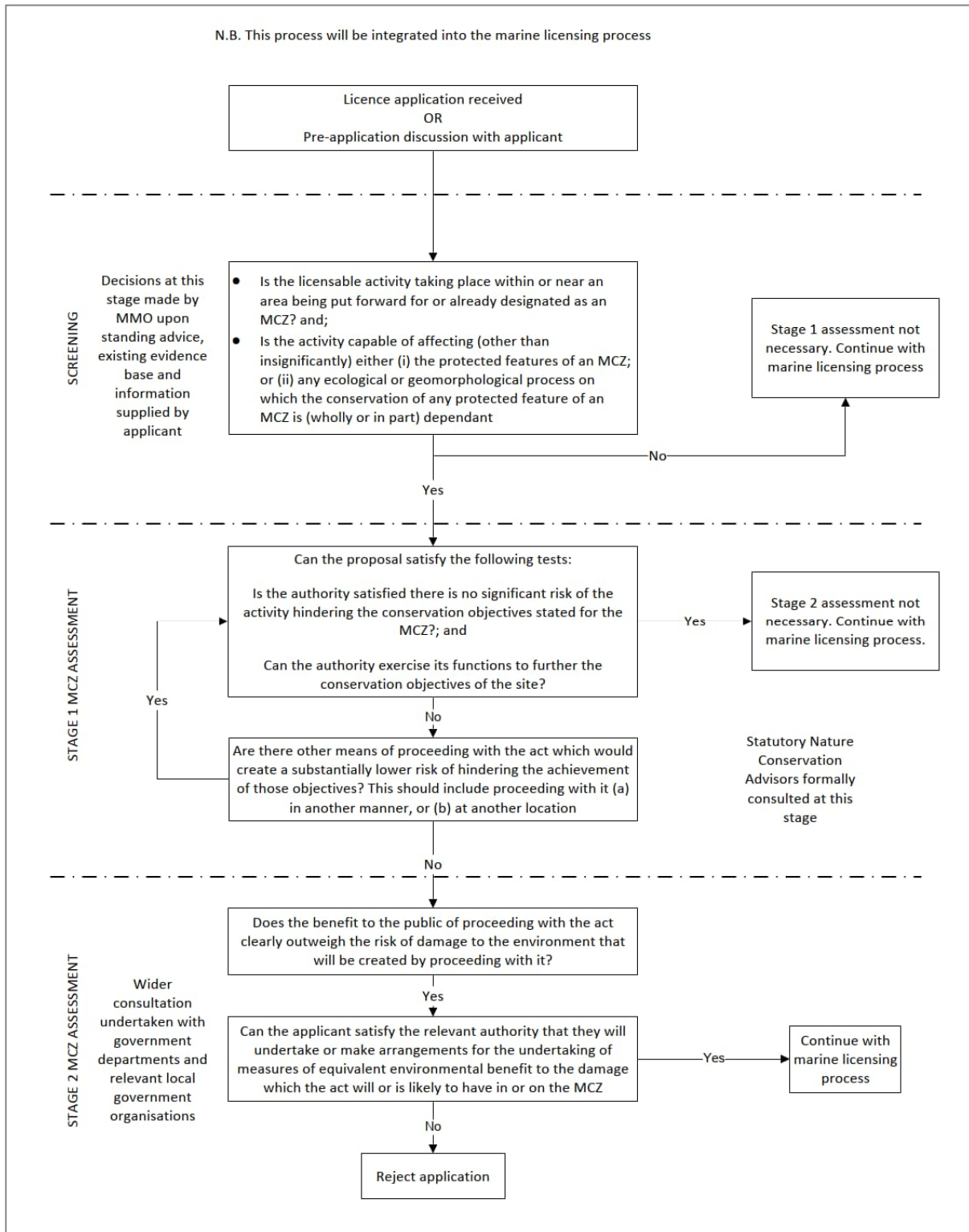


Figure 3-1: Summary of the MCZ assessment process used by the MMO in marine licence decision making

4 Potential Impacts, Effects and Zones of Influence

In Scotland, protected features of MPAs can include a broad range of habitats and species, including benthic habitats, fish and shellfish, and marine mammals. The nearest MPA is Upper Loch Fyne and Loch Goil MPA which overlaps with the Marine Facility and is designated the protection of burrowed mud habitats, flame shell beds, horse mussel beds, ocean quahog aggregations and sublittoral mud and mixed sediment communities. The impact pathways and associated Zols (the extent of the potential impact from the activity) considered within this assessment are those that specifically relate to the protected feature receptors of these sites. As the Development will involve the installation of a marine jetty within the boundaries of the MPA, direct impacts to the Upper Loch Fyne and Loch Goil MPA are likely to occur.

A summary of impact pathways and associated Zones of Influence (Zol) which have been established through the impact assessment process and reported within the EIAR are presented in *Table 4-1: Summary of impact pathways and associated Zols*. All Zols are based on a reasonable worst-case scenario, unless stated otherwise.

The OSPAR Intersessional Correspondence Group on Cumulative Effects pressure list (OSPAR 2011) and the Marine Life Information Network (MarLIN) marine evidence-based sensitivity assessments (MarESA) have been used to describe the potential impacts expected from the Development.

Table 4-1: Summary of impact pathways and associated Zols

Project phase	Potential impact	Zone of influence
Construction	Underwater sound	26 km
	Permanent loss of benthic habitat due to the installation of steel piles	Installation of 72 piles of 0.6 m diameter giving a total footprint of 20.4 m ²
	Temporary physical disturbance of benthic habitats	Footprint of jack up barge spud legs on the seabed estimated to be ~12 m ² (4 legs of 2 m diameter each).
	Temporary increase in suspended sediment concentrations (SSC) sediment deposition leading to contaminant mobilisation, turbidity and smothering effects	Fine particulates may disperse up to 700 m away from the Marine Facility
	Reduction in water quality due to discharges, unplanned releases, and accidental leaks and spills from vessels, and resuspension of contaminated sediments	700 m
	Introduction and spread of invasive non-native species (INNS) via the addition of man-made structures (i.e. jetty)	700 m
Operation	Disturbance to habitats and species due to scour from hydrodynamic change	Small region (<1 m) in the immediate vicinity of each pile
	Operation phase activities will primarily include vessel movements, as the Marine Facility has been designed to accommodate a deck cargo barge and vessel-based crane. As such, the potential pathways for impact to marine ecological receptors are expected to be the same as those identified for vessel use for the construction phase of the Development. No dredging will be required during operation.	As above
Decommissioning	Although the Marine Facility is expected to remain in place in its entirety for 12 months, the piles are expected to remain <i>in situ</i> permanently. Thus, as a worst-case scenario, impacts during decommissioning may be of a similar magnitude to construction phase activities.	As above

4.1 Underwater sound

Construction of the Marine Facility in Loch Fyne may require impact piling to install approximately 72 piles into the benthic substrate, which may produce high sound pressure levels that can be detected by many groups of marine fauna, including marine mammals and fish. JNCC recommends an effective deterrent range for underwater sound associated with monopile installation is 26 km for harbour porpoise, the most noise sensitive of the cetacean species. As such, this range is considered to encompass all likely effects to both fish and marine mammals.

4.2 Permanent loss of benthic habitat due to the installation of steel piles

The construction of the Marine Facility in Loch Fyne will require the placement of approximately 72 piles into the benthic substrate. These piles will be left *in situ* long-term following the completion of the construction phase, resulting in permanent habitat loss of benthic habitat. Each pile will be 600 mm in diameter (see *Chapter 2: Project and Site Description (Volume 2: Main Report)*), resulting in the permanent loss of benthic habitat of 20.4 m² within the Upper Loch Fyne and Loch Goil MPA.

4.3 Benthic Habitat Modification from the Introduction of Artificial Structures on the Seabed

The construction of the Marine Facility in Loch Fyne will be associated with the installation of approximately 72 piles into the seabed, which will be left *in situ* long-term following the completion of the construction phase, resulting in the permanent introduction of artificial structures. Each pile will be 600 mm in diameter (see *Chapter 2: Project and Site Description (Volume 2: Main Report)*), resulting in the replacement of 20.4 m² of benthic habitat by artificial structures. These structures provide new surface area for colonisation by a range of epifaunal species, including INNS (see below for assessment of '*Introduction and Spread of INNS*'), which could result in alteration of the local community composition.

4.4 Temporary physical disturbance to intertidal and subtidal benthic habitats and species

As piling works will require the use of a jack up barge (JUB), the placement of spud legs on the seabed will likely result in the temporary disturbance of benthic habitats. The Marine Facility is expected to require the installation of 72 piles. A worst-case scenario, that the barge will be repositioned for every pile, thus impacting new areas of the seabed with each placement, has been assumed. As vessel specifications are not available at this stage, the exact footprint associated with the barge placement is unknown, as barge legs can vary in size and number. However, a reasonable footprint has been estimated to be a total of 12 m², which reflects standard JUB measurements (see *Chapter 8: Marine Ecology (Volume 2: Main Report)*).

4.5 Temporary increase in SSC and sediment deposition leading to turbidity, smothering effects, and contaminant mobilisation

Whilst no dredging associated with the Development will occur, the installation of piles is likely to result in a temporary disturbance to the seabed. This has the potential to mobilise sediments into the water column that could increase local SSC concentration and hence turbidity, and create a plume of sediment that will travel some distance from the Marine Facility before settling onto the seabed. There are several potential effects to marine ecological receptors associated with increased SSC and sediment deposition, including:

- Reduced photosynthesis resulting in reduced primary production in marine seaweed and algae;
- Smothering of benthic invertebrate species;
- Decreased visibility in visual predators which results in decreased feeding success;
- Clogging of feeding and respiratory apparatus, of sessile species in particular;

- Potential barriers to movement and migration for mobile species;
- Egg and larvae mortality; and
- Indirect effects of remobilised sediment contaminants, such as heavy metals and hydrocarbons.

Increased SSC can affect filter feeding organisms, such as fish and shellfish, clogging and damaging feeding and breathing equipment. The largest sediment plumes and highest levels of SSC are associated with the disturbance of sediments that exhibit a high proportion of fine particulate material, such as muds and clays, which remain in suspension longest and settle to the seabed more slowly. Coarse material, such as sand and gravel settle to the seabed quickly.

The estimated travel distance for a particle carried in suspension can be related to the length of the major axis of the tidal excursion ellipse, where maximum tidal excursion on an ebb and flow tide reaches approximately 300 m around the Marine Facility in the nearshore and 700 m around the Marine Facility near the center of the loch (ABPmer, 2017; *Chapter 18 Marine Physical Environment and Coastal Processes (Volume 2: Main Report)*).

4.6 Reduction in water quality due to discharges, unplanned releases, accidental leaks and spills from vessels

The accidental release of pollutants (e.g., oil, fuels, lubricants, chemicals) and planned release of wastewater could occur from any of the vessels associated with the Development. Such releases, have the potential to reduce water quality, leading to consequences to marine fauna, including benthic invertebrates, fish and shellfish, and marine mammals. Sensitivity to physical disturbance varies between receptor; for mobile receptors, displacement, physiological or morphological damage may occur though many individuals will be able to avoid the area as construction slowly moves forward. For sedentary or less mobile receptors, the likely impacts are physiological or morphological damage and mortality.

Operation phase activities will primarily include vessel movement, as the Marine Facility has been designed to accommodate a deck cargo barge and vessel-based crane. As such, the potential pathways for impact to designated features of MPAs are expected to be the same as those identified for vessel use for the construction phase.

4.7 Introduction and spread of INNS

There are multiple pathways associated with Construction phase activities that have the potential to result in accidental introduction of INNS. International vessels may release ballast water into the water column, and / or the addition of hard substrata to the seabed (e.g., piles) may act as potential steppingstones for new species. Whilst most non-native species are unlikely to become invasive, those that do can out-compete native species which could result in significant changes to community composition and mortality. Thus, the introduction of INNS has the potential to cause detrimental changes to native benthic habitats and species.

Operation phase activities will primarily include vessel movement, as the Marine Facility has been designed to accommodate a deck cargo barge and vessel-based crane. As such, the potential pathways for impact to designated features of MPAs are expected to be the same as those identified for vessel use for the construction phase.

4.8 Disturbance to habitats and species due to scour from hydrodynamic change

The installation of piles for the Marine Facility may alter the local hydrodynamics of the marine environment, resulting in disturbance to habitats and species. However, hydrodynamic modelling conducted for the Marine Facility (*Chapter 18: Marine Physical Environment and Coastal Processes (Volume 2: Main Report)*) concluded that local hydrodynamics or sediment pathways would not be altered under normal conditions. Even with wind events that contribute to current speed magnification, the Marine Facility is considered to have minimal influence on both the flow regime and bed shear stress. Should any localised changes occur from the Marine Facility's

presence, they are expected to rapidly dissipate and thus are unlikely to affect marine ecological receptors beyond the immediate vicinity around each of the piles. As such, this pathway has scoped out of the assessment.

5 Screening

The assessment approach applied during the MPA screening has been based on the guidance document 'Marine conservation zones and marine licensing' (MMO, 2013) and is presented in *Figure 5-1: MPA screening process*.

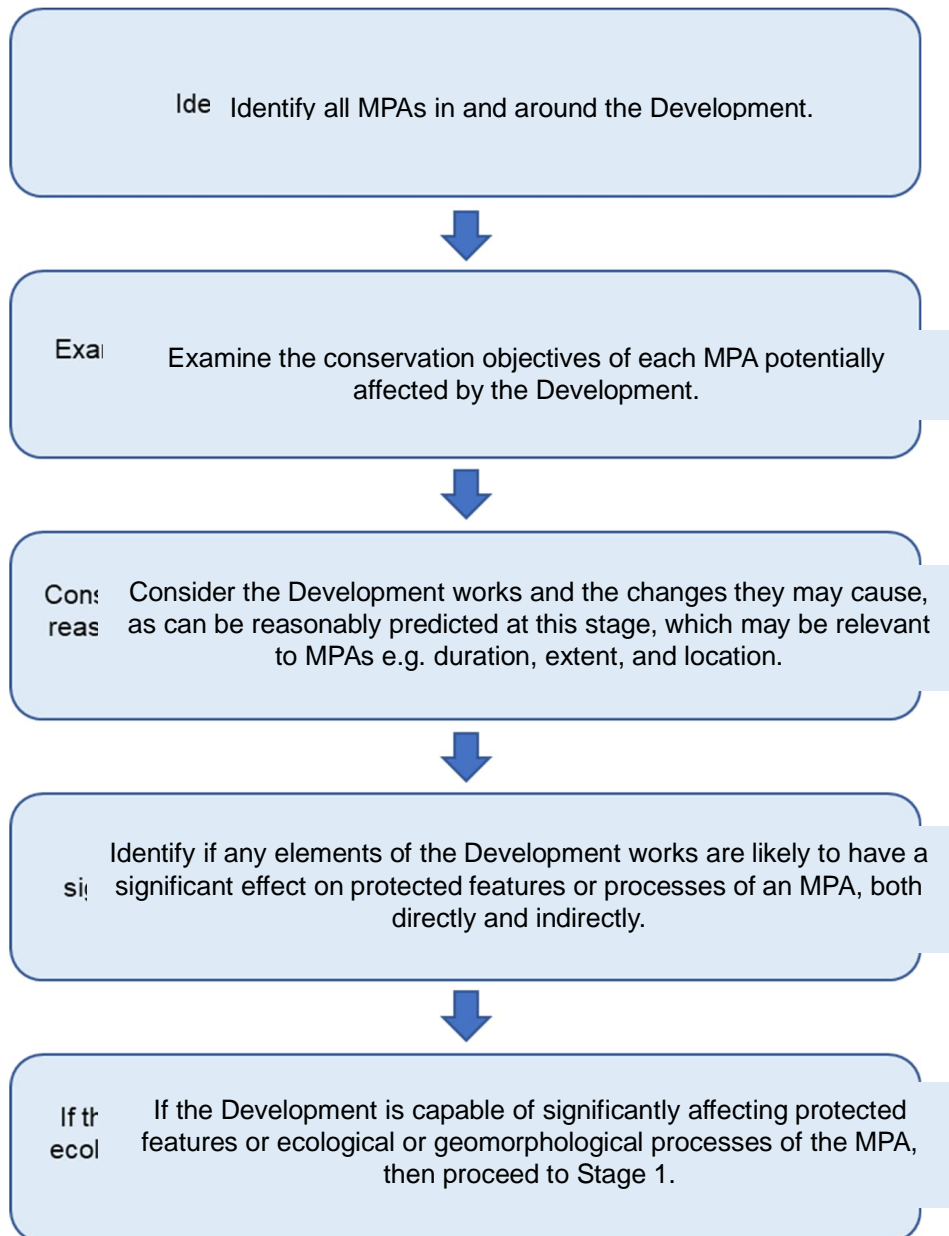


Figure 5-1: MPA screening process

A Geographic Information System (GIS) was used to map MPA boundaries in relation to the Marine Facility (*Figure 1-1*). To determine whether each receptor has the potential to interact with the Development, it was necessary to understand the nature of (and existing baseline for) the protected biodiversity features.

Information on the protected biodiversity features for the MPAs screened into this assessment are presented below. This information has been used to compare the activities of the Development against the sites' protected features to identify impact pathways.

Based on the application of the MMO (2013) MCZ Assessment Guidelines to Scottish MPAs, it is considered that section 83 of the Marine (Scotland) Act 2010 would apply if it is determined through the course of screening that:

“the activity is capable of affecting (other than insignificantly) either: (i) a protected feature in a Nature Conservation MPA; (ii) a stated purpose for a Demonstration and Research MPA; (iii) a marine historic asset in a Historic MPA; or (iv) any ecological or geomorphological process on which the conservation of any protected feature in a Nature Conservation MPA, or on which the stated purpose for a Demonstration and Research MPA, is (wholly or in part) dependent”.

The screening process has considered any MPAs within 700 m of the Marine Facility for benthic receptors, based on the estimated maximum tidal ellipse data and on professional judgement and consideration of worst-case for fine particulates (*Chapter 18: Marine Physical Environment and Coastal Processes (Volume 2: Main Report)*), and 26 km for marine mammals and migratory fish based on JNCC guidance for effects from piling. These are considered sufficiently precautionary to encompass the maximum Zol of project related activities that are likely to impact MPA designated features in this instance. The only MPA to occur within the Zol is the Upper Loch Fyne and Loch Goil MPA, which directly overlaps with the Development.

5.1 Loch Fyne and Loch Goil MPA

5.1.1 Overview

Upper Loch Fyne and Loch Goil MPA overlaps with the Marine Facility. It is designated for the protection of burrowed mud, flame shell beds (*Limaria hians*), horse mussel beds (*Modiolus modiolus*), ocean quahog aggregations (*Arctica islandica*), and sublittoral mud and specific mixed sediment communities.

The ‘Burrowed mud’ habitat is a Priority Marine Feature (PMF) in Scotland, as well as being listed on the OSPAR List of Threatened or Declining Species and Habitats. Where undisturbed, it is often burrowed extensively by several species, including *Nephtys norvegicus* (nephrops), and other important species such as the fireworks anemone (*Pachycerianthus multiplicatus*) and the tall sea pen (*Funiculina quadrangularis*) (Scottish Government, 2018). This habitat type is common in Scottish waters, hosting 95% of the UK records within sea lochs and the northern North Sea (Scottish Government, 2018).

Flame shell beds are a PMF in Scottish seas, a UK BAP habitat, and an OSPAR threatened or declining habitat as they provide essential habitat and support biodiversity. In Loch Fyne, the primary occurrence of a flame shell bed is known to occur at the southern end of the loch near Otter Spit (ca. 31 km; Allen, 2017). Benthic surveys have observed records at an additional five sites, however, they occurred entirely near Otter Spit and the existing flame shell bed (Allen, 2017). Flame shells beds support high diversity, with a study suggesting that they can support up to 19 algal and 265 invertebrate species (NatureScot, 2023). They can be particularly vulnerable to any seabed disturbances like bottom trawls and dredging. As a filter feeder, flame shells are also incredibly sensitive to changes in water quality and siltation (NatureScot, 2023).

Horse mussels similarly aggregate in bed structures, providing habitat for other organisms. They are often found partially buried in sediment but can also be attached to rocks in the lower shore. In sheltered regions, they are more well known for establishing extensive beds or reefs. These beds support a range of organisms, including soft corals, worms, ophiuroids, crustaceans, molluscs, algae, and commercially important shellfish like scallops and whelks. Horse mussels are a long-lived species, many capable of surviving over 25 years. They are particularly vulnerable to bottom trawling and dredging, which can cause lasting damage to an aggregation (Allen, 2017).

The ocean quahog is listed on the OSPAR List of Threatened and/or Declining Species and Habitats. It is a slow growing and incredibly long-lived filter feeding bivalve that lives buried in soft sediments (OSPAR Commission, 2009). Individuals can live for hundreds of years. Slow growing/long-lived species are typically slow to recover following disturbance, and as a bottom-dwelling species, ocean quahogs are subject to similar threats as the flame shell and horse mussel.

Sublittoral mud also supports a variety of organisms and local biodiversity with species composition in these habitats often dominated by polychaetes, echinoderms, sea pens, and nephrops (EUNIS, 2012). Mixed sediment communities are comprised of a few different sediment types which can also support high diversity. These communities are encompassed within Annex I of the EU Habitats Directive as ‘sandbanks which are slightly covered by sea water all the time,’ and are known to support a variety of organisms, contribute to essential nutrient and biogeochemical cycling, and serve as nursery grounds for important commercial fish species.

5.1.2 Conservation Objectives

The conservation objectives of the Upper Loch Fyne and Loch Goil MPA are that the protected features:

- a) So far as already in favourable condition, remain in such condition; and
- b) So far as not already in favourable condition, be brought into such condition, and remain in such condition.

The specific aim for Upper Loch Fyne and Loch Goil MPA is to recover the flame shell bed and conserve all other features.

5.1.3 Screening

The Upper Loch Fyne and Loch Goil MPA directly overlaps with the Development. As the MPA is designated for the protection of benthic habitats and species which may be subject to impact from Development activities, it has been **screened in for a Stage 1 Assessment**. No other sites were identified within the Zol.

6 Stage 1 Assessment

This section assesses the potential for the identified Development to have significant effects which would risk hindering the site conservation objectives of the MPA. For any impact pathways for which a significant effect is identified, a further Stage 2 Assessment will be required. Following the initial screening in Section 5, potential effects to one MPA were identified and are therefore considered further in this Stage 1 assessment: the Upper Loch Fyne and Loch Goil MPA.

The Loch Fyne and Loch Goil MPA has been designated to protect the following features and thus impact pathways effects to these features are considered:

- Burrowed mud;
- Sublittoral mixed sediment;
- Flame shell beds;
- Horse mussel beds; and
- Ocean quahog aggregations.

6.1 Permanent loss of benthic habitat due to the installation of steel piles

The construction of the Marine Facility in Loch Fyne will be associated with the placement of approximately 72 piles into the benthic substrate, which will be left *in situ* long-term following the completion of the construction phase, resulting in permanent habitat loss of benthic habitat.

Each pile will be 600 mm in diameter (see *Chapter 2: Project and Site Description (Volume 2: Main Report)*), resulting in the permanent loss of 20.4 m² of benthic habitat. Within the study area, there were two primary habitats observed during benthic surveys that are known PMFs: 'kelp and seaweed communities on sublittoral sediment' and 'burrowed mud'. Of these, only burrowed mud is a designated feature of the Upper Loch Fyne and Loch Goil MPA.

However, the construction of the Marine Facility is considered to sit entirely within the 'kelp and seaweed communities on sublittoral sediment' habitat. Burrowed mud was observed in deeper water further offshore (see *Appendix 8.2: Subtidal Benthic Ecology Survey Report*), outside the direct footprint of the Marine Facility. Thus, no habitat type that is a designating feature of the MPA will be lost. When considering this in conjunction with the relatively small area of impact and the fact that the overall footprint will be divided into smaller segments by each pile, it is highly unlikely that there will be any direct effect on the integrity of the site.

As such, the impact of permanent loss of benthic habitat due to the installation of steel piles will not significantly affect the stated conservation objectives of the Upper Loch Fyne and Loch Goil MPA. Section 83 of the Marine

(Scotland) Act 2010 is therefore discharged on the basis that there is no significant risk of the Development hindering the achievement of the conservation objectives stated for this MPA.

6.2 Benthic Habitat Modification from the Introduction of Artificial Structures on the Seabed

The installation of piles on the seabed provides new surface area for colonisation by a range of epifaunal species, including INNS (considered in *Section 6.6*), which may result in alteration of the local community composition.

Studies assessing the colonisation of offshore wind infrastructure shows marked zonation of epifaunal communities, with the upper reaches dominated by mussels, macroalgae, and barnacles, which are replaced by filter-feeding arthropods and then anemones at greater depths (Galparsoro et al., 2022). Similar colonisation may occur in on the steel piles of the Marine Facility. However, many of these epifaunal species are likely to be naturally present on the surrounding reef habitat and whilst diversity may be lower, and abundance of some species may be higher on the plies, the overall impact to local diversity is expected to be minor.

Within the study area, two benthic habitats were observed, the PMFs 'kelp and seaweed communities on sublittoral sediment' and 'burrowed mud'. Of these, the Marine Facility is considered to only overlap with the 'kelp and seaweed communities on sublittoral sediment' as the burrowed mud was observed only in deeper water further offshore (see *Appendix 8.2: Subtidal Benthic Ecology Survey Report (Volume 5: Appendices)*), outside the direct footprint of the Marine Facility. When considering that the piles will not overlap with designated features of the MPA and that the overall footprint will be relatively small and divided into smaller segments by each pile, it is likely that the integrity of the site will remain intact.

As such, the impact of benthic habitat modification from the introduction of artificial structures on the seabed will not significantly affect the stated conservation objectives of the Upper Loch Fyne and Loch Goil MPA. Section 83 of the Marine (Scotland) Act 2010 is therefore discharged on the basis that there is no significant risk of the Development hindering the achievement of the conservation objectives stated for this MPA.

6.3 Temporary physical disturbance to intertidal and subtidal benthic habitats and species

As piling works will require the use of a jack up barge (JUB), the placement of spud legs on the seabed will likely result in temporary disturbance to benthic habitats. The Marine Facility is expected to require the placement of 72 piles. A worst-case scenario has been assumed that the barge will be repositioned for every pile, thus impacting new areas of the seabed with each placement.

As vessel specifications are not available at this stage, the exact footprint associated with the barge placement is unknown. As barge legs can vary in size and number, for the purpose of this assessment, the total estimated area of disturbance has taken a reasonable worst-case estimate of 12 m². Project-specific surveys have indicated that the proposed location of the Marine Facility overlaps primarily with the benthic habitat 'kelp and seaweed communities on sublittoral sediment', which is not a feature of the MPA. The only designated habitat observed was burrowed mud, the occurrence of which did not directly overlap with the footprint of the Marine Facility. Furthermore, the JUB spud legs are likely to be placed on the seabed, at each location, for a very short time period and so whilst there is likely to be some damage, it will be small in scale and the benthos is expected to recover.

When considering that JUB placement is unlikely to overlap with designated features of the MPA in conjunction with the small spatial scale of any effect and the temporary nature of the disturbance, it is unlikely that the integrity of the site will be affected. As such, the impact of temporary physical disturbance from the JUB spud legs on the designated features of the Upper Loch Fyne and Loch Goil MPA will not significantly affect its stated conservation objectives. Section 83 of the Marine (Scotland) Act 2010 is therefore discharged on the basis that there is no significant risk of the Development hindering the achievement of the conservation objectives stated for this MPA.

6.4 Temporary increase in SSC and sediment deposition leading to turbidity, smothering effects, and contaminant mobilisation

The installation of piles is likely to result in a temporary increase in SSC concentrations. The largest sediment plumes and highest levels of SSC are associated with the disturbance of sediments that exhibit a high proportion of fine particulate material, such as muds and clays, which remain in suspension longest and settle to the seabed more slowly. Coarse material, such as sand and gravel settle to the seabed quickly, typically within a few hours of disturbance, with sediment likely transported a distance of metres to tens of metres from the source. As sediment disperses, prevailing tides and currents contribute to dilution over a broad area and a reduction in SSC levels, returning water column turbidity to baseline conditions within hundreds to a few thousand metres from the point of release, depending on particle size.

Sediment dispersion distances were estimated using tidal excursion ellipse data (see *Chapter 18: Marine Physical Environment and Coastal Processes (Volume 2: Main Report)*). The estimated travel distance for a particle carried in suspension can be related to the length of the major axis of the tidal excursion ellipse, where maximum tidal excursion on an ebb and flow tide reaches approximately 300 m around the Marine Facility in the nearshore and 700 m around the Marine Facility near the center of the loch (ABPmer, 2017). Mean particle size distribution at study sites sampled within the Development area ranged from 38.1-73.6% for sand, 17.8-61.6% for mud, and 0.3-14.0% for gravel (*Appendix 8.2: Subtidal Benthic Ecology Survey Report (Volume 5: Appendices)*). This indicates that sediment particles are likely to gradually settle out of suspension, with coarse particles settling quickly whilst finer particles have the potential to extend to the maximum reaches of the spring tidal excursion.

As a fjordic loch⁴, Loch Fyne is a sheltered environment where the sills contribute to stable conditions within each of the loch's basins (Brown, 2020). As a result, tidal currents within the loch are weak (Brown, 2020), which is reflected by the relatively low maximum tidal excursion distances. Despite the high percentage of fine particulates in some sediment samples, much of the sediment will remain localised to the Marine Facility, particularly as the volume of sediment disturbed by the installation of piles, is not expected to be extensive. Whilst this lessens the overall footprint of impact, it may result in increased levels of sediment deposition within a very local area.

With regard to sediment-bound contaminants, a recent assessment of contaminants present in sediment and marine biota concluded that contaminant concentrations were highest in the Irish Sea, including the Clyde Marine Region (Marine Scotland, 2020). Contaminants of concern in this region noted in sediments which may lead to adverse effects included mercury, lead, and polychlorinated biphenyls (PCBs). Additionally, heavy metal input into the Clyde Marine Region has historically been high, with elevated water concentrations of chromium noted in the inner estuary. However, concentrations within sediments and inputs into the Clyde were considered stable or declining for all substances measured. Within Loch Fyne, sediment cores have previously reported increased concentrations of trace metals, such as lead, copper, and zinc (Krom et al., 2009).

Contaminants will be associated with finer material such as silts and clays, which comprise low-moderate proportions of the sediment within the study area. Where finer sediments do occur, dilution of suspended particulate matter is anticipated to occur rapidly with distance from the Marine Facility. In addition, natural disturbance to the sediment such as during storm events and periods of strong wave action will mobilise contaminants and subject benthic habitats and species to temporary and localised changes in water quality. As a result, these habitats and species will have a tolerance to moderate changes in the surrounding water quality.

Within the study area, the only designated feature of the MPA observed during project-specific surveys was 'burrowed mud'. As burrowed mud is already composed of fine particulate sediments, increased sediment deposition, particularly considering the restricted level of sediment disturbance likely to occur over this feature is unlikely to affect its conservation objectives. As such, the impact of increased SSC on the designated features of the Loch Fyne and Loch Goil MPA will not significantly affect its stated conservation objectives. Section 83 of the Marine (Scotland) Act 2010 is therefore discharged on the basis that there is no significant risk of the Development hindering the achievement of the conservation objectives stated for this MPA.

⁴ Fjordic lochs are carved by glacial movements.

6.5 Reduction in water quality due to discharges, unplanned releases, and accidental leaks and spills from vessels

The accidental release of pollutants (e.g., oil, fuels, lubricants, chemicals) and planned release of wastewater could occur from any of the vessels associated with the Development. Such releases, as well as mobilisation of any sediment-bound contaminants, have the potential to reduce water quality, leading to consequences to marine fauna, including benthic invertebrates, fish and shellfish, and marine mammals.

To ensure the risk of accidental spills is as low as reasonably practicable (ALARP), the Development will adhere to relevant guidance (e.g., Pollution Prevention Guidance) and comply with all relevant health, safety, and environmental legislation. This includes compliance with regulations relating to International Convention for the Prevention of Pollution from Ships (the MARPOL Convention 73 / 78) with the aim of preventing and minimising pollution from ships. Preparedness and swift responses are essential for effective spill management and as such, response plans will be in place should an incident occur. Control measures and shipboard oil pollution emergency plans (SOPEP) will be in place and adhered to under MARPOL Annex I requirements for all vessels. Any planned effluent dischargers will also be compliant with MARPOL Annex IV 'Prevention of Pollution from Ships' standards.

Moreover, an Emergency Spill Response Plan and Waste Management Plan will be implemented during the Construction phase of the Development to minimise releases (*Chapter 02: Project and Site Description (Volume 2: Main Report)*). Appropriate Health, Safety, and Environment (HS&E) procedures will also be implemented, with strict weather and personnel limits to reduce any risk of accidental spillage. With consideration of this good practice mitigation, the likelihood of an accidental spillage occurring from any of the vessels is considered very low. Should a spill occur, the impact would be of very small magnitude, short-term and localised to the Development. Any releases will be rapidly dispersed and diluted by currents and tidal movements.

When considering the low likelihood of accidental releases from vessels and rapid dilution of any mobilised sediment-bound contaminants, the integrity of the site is unlikely to be affected. As such, the impact of adverse water quality on the designated features of the Loch Fyne and Loch Goil MPA will not significantly affect its stated conservation objectives. Section 83 of the Marine (Scotland) Act 2010 is therefore discharged on the basis that there is no significant risk of the Development hindering the achievement of the conservation objectives stated for this MPA.

6.6 Introduction and spread of INNS

There are multiple pathways associated with Construction phase activities that have the potential to result in the accidental introduction of INNS, the presence of which can result in detrimental changes to native benthic habitats and species. INNS considered to be of concern to Loch Fyne include wireweed (*Sargassum muticum*), Japanese skeleton shrimp, and the parasite *Gyrodactylus salaris* which poses a threat to Atlantic salmon populations (Argyll and Bute Council, 2009).

During project-specific surveys no INNS were observed, however, previous surveys of the loch have observed several INNS: the modest barnacle, carpet sea squirt, erect bryozoans *B. simplex* and *T. inopinata*, the orange-tipped sea squirt, Japanese skeleton shrimp, leathery sea squirt, and the alga *C. fragile* (Marine Scotland, 2020). Of these, only the modest barnacle and carpet sea squirt have been observed within the upper loch, which contains the Development. The modest barnacle is well established around the UK and out-competes some native barnacle species on the shore. In comparison, the carpet sea squirt is capable of covering extensive areas of the substratum. It is known to colonise artificial structures, rocks, boulders and even tide pools and is usually found in low energy environments where water motion is limited (Gibson-Hall & Bilewitch, 2018). A marine biosecurity plan for Loch Fyne has indicated that industrial activities within the loch pose a high risk of spreading carpet sea squirt through the use of vessels (Brown, 2020).

For this reason, all project vessels will adhere to the International Convention for the Control and Management of Ships' Ballast Water and Sediments with the aim of preventing the spread of INNS (IMO, 2022). Vessels will also be required to adhere to the IMO guidelines for the control and management of ships' biofouling to minimise the transfer of invasive aquatic species (Biofouling Guidelines) (resolution MEPC.207(62)). Additionally, the Development will adhere to best practice measures outlined in the Loch Fyne Marine Biosecurity Plan for preventing the spread of INNS. These measures lower the probability of INNS transmission from vessels to benthic habitat.

The GB Invasive Non-Native Species Strategy also provides guidance for the prevention, detection, eradication and management of INNS, including marine species. Best practice measures will be adopted in compliance with the relevant IMO guidance regarding ballast water, should it be present, and biofouling. These measures will reduce the overall risk of introduction of INNS, resulting in a low magnitude of change.

When considering these embedded mitigation measures, the spread of any existing non-native species is considered unlikely, and the integrity of the site is unlikely to be affected. As such, the impact of permanent loss of benthic habitat due to the installation of steel piles on the designated features of the Loch Fyne and Loch Goil MPA will not significantly affect its stated conservation objectives. Section 83 of the Marine (Scotland) Act 2010 is therefore discharged on the basis that there is no significant risk of the Development hindering the achievement of the conservation objectives stated for this MPA.

7 Conclusion

This report has been produced to provide the necessary information to allow the Marine Directorate to meet their specific duty for MPAs as outlined in section 83 of the Marine (Scotland) Act. The first stage of the assessment process was screening to identify if MPAs within the Zol of development activities that were taken through the full assessment in the Stage 1 Assessment process.

The screening concluded that a possible risk of the Development affecting the designated features and/or conservation objectives of the Upper Loch Fyne and Loch Goil MPA was present. This MPA was screened in for further assessment, as it directly overlaps with the Development.

A Stage 1 Assessment was completed for the Upper Loch Fyne and Loch Goil MPA, due to the site falling within the Zols of the following impact pathways:

- Permanent loss of subtidal benthic habitats and species due to the installation of steel piles;
- Temporary physical disturbance to intertidal and subtidal benthic habitats and species;
- Temporary increase in suspended sediment concentrations (SSC) and deposition leading to physical disturbance and/or loss of benthic habitats and species;
- Changes to marine water quality from the use of drilling fluids and the release of sediment bound contaminants and bacteria leading to indirect effects on benthic habitats and species; and,
- Introduction and spread of INNS.

The Stage 1 Assessment found that when the Development adheres to the following best practice measures, these impact pathways are not considered to have a significant effect on the designated features or conservation objectives of the MPA:

- Adherence to relevant guidance (e.g. Pollution Prevention Guidance, Loch Fyne Biosecurity Plan);
- Compliance with regulations relating to International Convention for the Prevention of Pollution from Ships; and,
- Preparation of shipboard oil pollution emergency plan, emergency response plan, and waste management plan.

It has therefore been concluded that the conditions of section 83 of the Marine (Scotland) Act, as determined under Stage 1 of the MPA assessment process, can be met and that there is no significant risk to any of the identified designated features or conservation objectives of the sites as a result of Development activities.

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