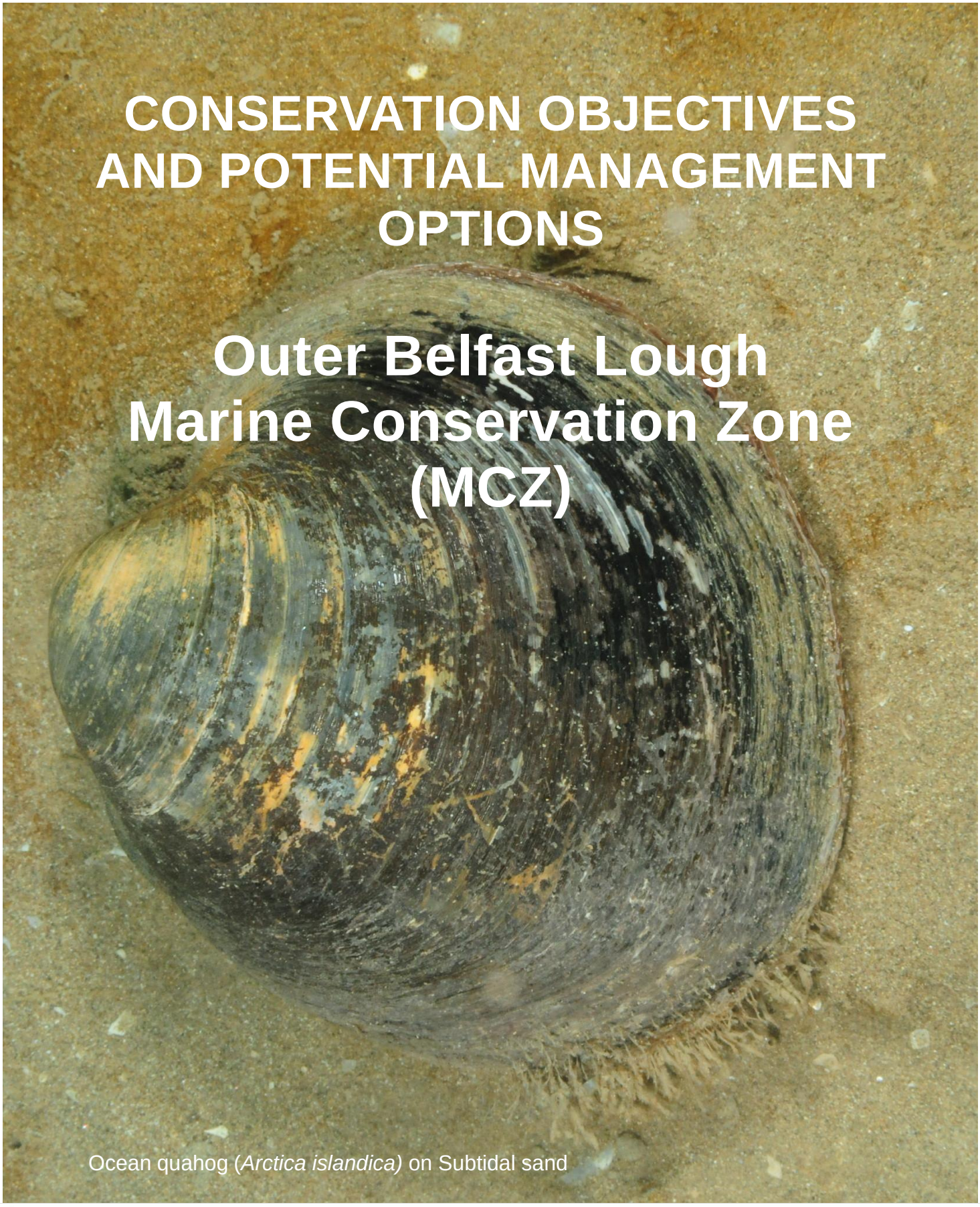
CONSERVATION OBJECTIVES AND POTENTIAL MANAGEMENT OPTIONS

Outer Belfast Lough Marine Conservation Zone (MCZ)



Ocean quahog (*Arctica islandica)* on Subtidal sand

Department of Agriculture, Environment and Rural Affairs
www.daera-ni.gov.uk

INVESTORS IN PEOPLE

Document version control			
Version	**Date**	**Author**	**Comments**
Version 0.1	16/12/2014	Clara Alvarez Alonso	Site based draft
Version 0.2	19/01/2015	Clara Alvarez Alonso	Outer Belfast Lough CO&MO
Version 0.3	02/03/2015	Colin Armstrong	Amendments
Version 0.4	02/03/2015	Joe Breen	Amendments
Version 0.5	02/03/2015	Stephanie Bennett	Amendments
Version 1.0	05/03/2015	Clara Alvarez Alonso	Publication
Version 1.1	21/7/2015	Liz Pothanikat	Amendments
Version 1.2	19/10/2015	Liz Pothanikat, Clara Alvarez Alonso, Stephanie Bennett, Nuala McQuaid, Joe Breen	Amendments
Version 2.0	28/10/2015	DOE Marine Division	Internal Consultation
Version 2.1	16/11/2015	Stephanie Bennett	Amendments
Version 3.0	14/12/2015	DOE Marine Division	Public Consultation
Version 3.1	31/8/2016	Liz Pothanikat and Clara Alvarez Alonso	Rebranding, updates & amendments
Version 3.2	07/12/2016	Joe Breen, Clara Alvarez Alonso, Liz Pothanikat, Stephanie Bennett Nuala McQuaid, Colin Armstrong and Carol O'Boyle	Amendments
Version 4.0	13/12/2016	DAERA Marine and Fisheries Division	Designation

Distribution List		
Version	**Issue date**	**Issued to**
Version 1.0	09/03/2015	DOE Website
Version 2.0	28/10/2015	Internal distribution
Version 3.0	14/12/2015	DOE/DAERA Website
Version 4.0	13/12/2016	DAERA Website

Contents

Tables

Figures

Summary

This document provides information on the various uses and activities occurring within Outer Belfast Lough Marine Conservation Zone (MCZ) and surrounding area. The document has been produced to advise stakeholders about the activities that may pose a threat to the designated features, the possible management options for these activities and their compatibility with conservation objectives of the protected features.

The information is organised by the type of activity, and briefly describes potential impacts on the features and potential management options. The grouping of activities was based on the standardised UK pressures-activity matrix[1], as developed by JNCC (2013), which classed similar activities that exerted similar pressures together, for example, anchoring by commercial and recreational vessels. Since the public consultation, a new Pressures-Activities Database (PAD) has been developed by Cefas and APBmer (2015). This database and the list of activities are currently under review by JNCC in conjunction with each country agency. The Department has used this database and the improved activities list along with a revised methodology (Marine Evidence based Sensitivity Assessment, MarESA, developed by JNCC and Natural England) to review the vulnerability assessments for the MCZs (where applicable). Detailed management plans will be developed post designation based on this document along with the features vulnerability assessment and the conservation objectives of the MCZ feature. The management options will only consider those activities assessed as capable of affecting the features of the MCZ, based on the risk of damage assessment.

This document has been based on data, evidence from peer-reviewed scientific journals and stakeholder engagement. Due to the high degree of variability within some habitats, the variety of activities under consideration and local variation, it is inevitable that the document is somewhat generalised. Where possible, the paper will give comprehensive evidence-based guidance as a starting point for discussions about the development of management options to achieve the conservation objectives for the MCZ.

This document should be read alongside the document Guidance on the development of Conservation Objectives and potential Management Options.

Additional information on Outer Belfast Lough MCZ and the MCZ process includes:

- Guidance on selection and designation of Marine Conservation Zones

[1] Refer to Paper for HBDSEG Meeting 9-10 October 2013 – Progress towards the development of a standardised UK pressure-activities matrix http://jncc.defra.gov.uk/pdf/Final_HBDSEG_P-A_Matrix_Paper_28b_Website_edit%5B1%5D.pdf

(MCZs) in the Northern Ireland Inshore Region

- Justification report for selection of proposed Marine Conservation Zones (pMCZ) features
- Assessment against the Selection Guidelines for Outer Belfast Lough Marine Conservation Zone (MCZ)
- Data Confidence Assessment for Outer Belfast Lough Marine Conservation Zone (MCZ)
- Site Summary Document for Outer Belfast Lough Marine Conservation Zone (MCZ)

Glossary of Terms and Acronyms

AFBI – Agri-food and Biosciences Institute

ASSI – Area of Special Scientific Interest are notified under The Environment (Northern Ireland) Order 2002

Biotope – The region of habitat associated with a particular ecological community

Circalittoral – The subzone of the rocky sublittoral dominated by animals. No lower limit is defined but species composition changes below about 40m to 80m depth

Conservation objective – A statement of the desired ecological/geological state (quality) of a feature (habitat, species or geological) for which the MCZ is designated

DAERA – Department of Agriculture, Environment and Rural Affairs (also referred to as the Department in the text)

DfC – Department for Communities

DfE – Department for the Economy

DfI – Department for Infrastructure

DOE – Department of the Environment (now lies within DAERA)

EUNIS – European Nature Information System, is a habitat classification system used throughout Europe and covers all types of natural and artificial habitats, both aquatic and terrestrial

IMO – The International Maritime Organization

Infralittoral – Describes the zone from mean low water down to a depth where 1% of light can reach the seabed (JNCC). This zone is dominated by erect algae, typically Kelp species.

JNCC – Joint Nature Conservation Committee, the statutory nature conservation adviser to the Department and the UK Government in the marine environment

MCAA – Marine and Coastal Access Act 2009

MCA – The Maritime and Coastguard Agency

MCZ – Marine Conservation Zone designated under section 13 of the Marine Act (Northern Ireland) 2013 in the Northern Ireland inshore region and in section 116 of the Marine and Coastal Access Act 2009 in the Northern Ireland offshore region

MCZ Feature – Marine Conservation Zone feature(s) that underpins the MCZ designation

MPA – As a generic term Marine Protected Areas are a clearly defined geographical space, recognised, dedicated and managed through legal or other means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values. As a specific term it refers to a national designation in Scotland (equivalent to an MCZ)

NIEA –Northern Ireland Environment Agency

NIW – Northern Ireland Water

OSPAR – OSPAR is the mechanism by which fifteen Governments of the western coasts and catchments of Europe, together with the European Union, cooperate to protect the marine environment of the North-East Atlantic

OSPAR T&D – OSPAR List of Threatened and/or Declining Species and Habitats

PMF – Priority Marine Feature - collective term for those features (habitats, species and geological/geomorphological features) which are considered to be of conservation importance in the NI inshore region

PSA – Particle size analysis

RNLI – Royal National Lifeboat Institution

SPA – Special Protection Area, designated under the Birds Directive

Spyball – Underwater drop camera operated by crew aboard a vessel used to study submerged habitats and species.

SSNI – Sublittoral Survey Northern Ireland

Subtidal (sublittoral) – the zone exposed to air only at its upper limit by the lowest spring tides. The sublittoral extends from the upper limit of the large kelps and includes for practical purposes in nearshore areas, all depths below the littoral

UKHO – United Kingdom Hydrographic Office

VMS – Vessel Monitoring System

WFD – Water Framework Directive

Introduction

Belfast Lough is a large sea inlet situated at the mouths of the Lagan, Farset and Blackstaff Rivers on the eastern coast of Northern Ireland. Outer Belfast Lough is an exposed area as it opens into the North Channel and connects Belfast to the Irish Sea. Home to a variety of species, the Outer Lough encompasses a wide range of habitats including subtidal mixed sediment types, sediment dominated bays and rocky shores.

The MCZ is located at the mouth of the Lough and is a small area (2.51km^2) positioned close to the southern shore of Belfast Lough (north of Groomsport) (Figure 1). The MCZ has been designated due to the presence of a well established population of Ocean quahog that lives buried in the sediment. Although distributed throughout Northern Ireland, Ocean quahog is present in a dense aggregation in Outer Belfast Lough; it is thought that the species is well conserved here due to continuous recruitment and high population numbers.

Outer Belfast Lough is impacted by human activity with a rapidly growing commercial sector and booming leisure activities. Belfast Harbour is Northern Ireland's largest port with significant passenger and freight traffic. Fisheries in the area include bottom culture of mussels, scallop dredging, whelk creels and crab/lobster potting. Popular for sailing, the Outer Lough has several yacht clubs, marinas and mooring areas, in addition to unrestricted anchoring of commercial shipping close to the MCZ. The Lough also hosts national and international sailing events. The Belfast Maritime and Coastguard Agency (MCA) are located in the Bangor marina alongside Bangor Royal National Lifeboat Institution (RNLI) Lifeboat Station. Clochan Jetty, on the north shore, is a large deepwater oil reception area and is close to the Irish Salt Mining and Exploration discharge jetty. Carrickfergus Harbour has in recent years declined in commercial activities, replaced generally by the leisure market. Both sporting and nature enthusiasts use the wider Belfast Lough area for cruising, recreational fishing, SCUBA diving, kayaking, windsurfing, wildfowling and bird watching activities.

Nearby, areas of Outer Belfast Lough are designated as an Area of Special Scientific Interest (ASSI), Special Protection Area (SPA) and RAMSAR site.

Further information on the MCZ can be found in the Site Summary Document.

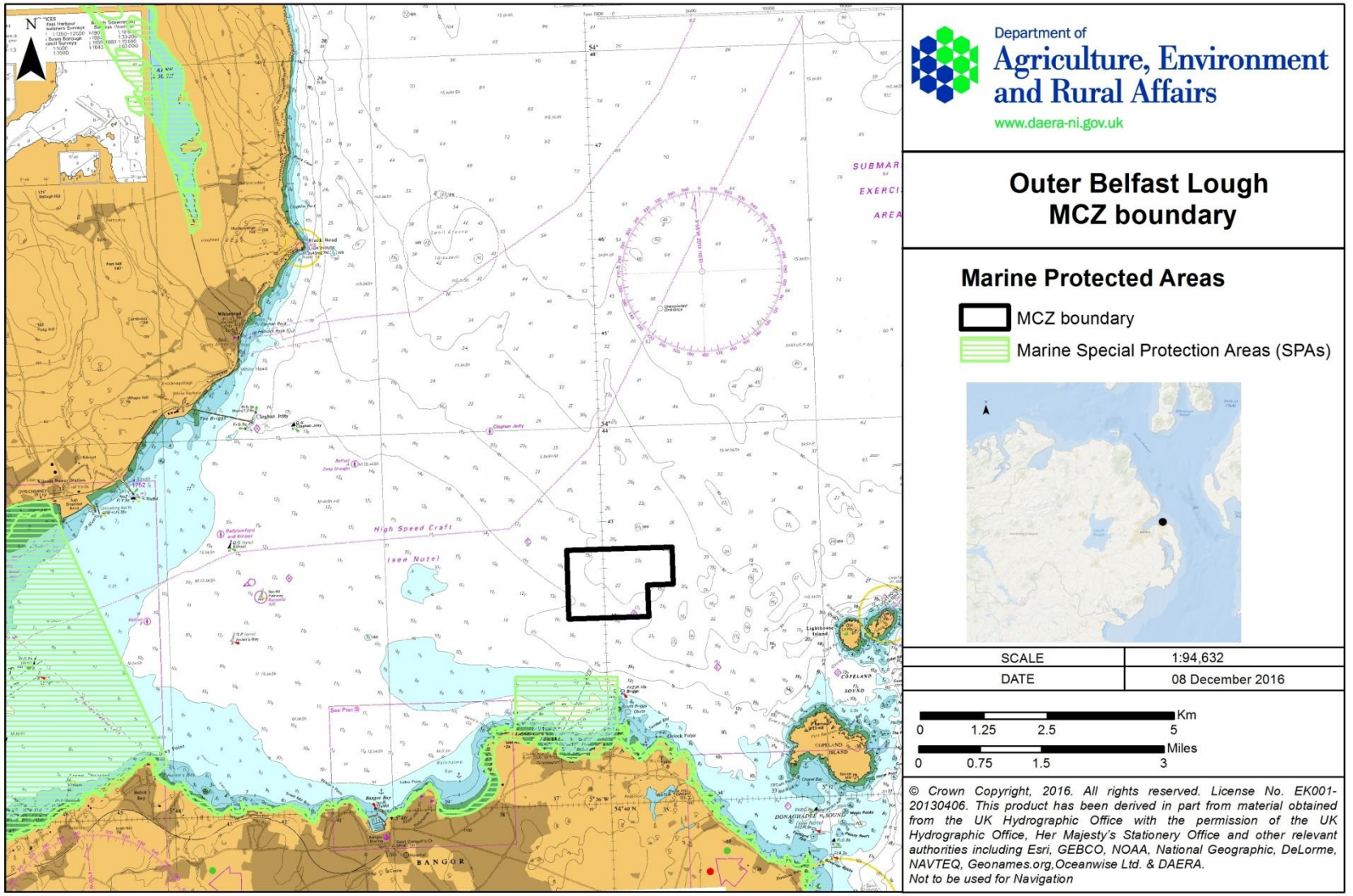


Figure 1 Location of boundary of Outer Belfast Lough MCZ

Conservation Objectives, Vulnerability Assessment and MCZ Features

A conservation objective is a statement of the desired ecological quality of a feature (habitat, species or geological) for which an MCZ is designated. The conservation objective establishes whether the feature condition meets the desired state and should be maintained, or falls below the desired state and should be recovered to favourable condition.

The conservation objectives are the first step towards developing management options and monitoring programmes. The procedure used to establish conservation objectives is described in the document Guidance on the Development of Conservation Objectives and potential Management Options.

Vulnerability Assessment

The level of vulnerability is based on a feature's sensitivity and current exposure to pressures associated with human activities. It aids in the development of potential management options.

MCZ Features

Outer Belfast Lough has been designated as a MCZ as it supports a well established population of **Ocean quahog (*Arctica islandica*)** (4.5 individuals/m^2) and their associated habitat **Subtidal (sublittoral) sand**.

There are also Priority Marine Features (PMFs) present within the MCZ boundary. While the PMFs identified within the MCZ boundary did not meet the criteria for consideration as a feature in their own right, they are afforded a level of protection based on vulnerability and risk assessment. A full list of these features is provided in Annex II.

Habitats

The MCZ habitat feature, **Subtidal (sublittoral) sand**, is a broad and complex habitat. This is sand dominated with occasional small patches of gravelly muddy sand (confirmed by particle size analysis, PSA). The biotopes A5.354 (*Virgularia mirabilis* and *Ophiura* spp with *Pecten maximus* on circalittoral sandy or shelly mud) and A5.262 (*Amphiura brachiata* with *Astropecten irregularis* and other echinoderms in circalittoral muddy sand) are present. In addition, other biotopes have been recorded within the MCZ (A5.444: *Flustra foliacea* and *Hydrallmania falcata* on tide-swept circalittoral mixed sediment, and A5.361: Seapens and burrowing megafauna in circalittoral fine mud) indicating the existence of both muddy sand and sandy mud. The Ocean quahog, *Arctica islandica,* is the primary selection reason for the MCZ.

The location and extent of the habitat within the MCZ boundary is shown in Figure 2. This map shows the predictive habitat model for the area (JNCC, EUNIS code Level 2) as well as the location of grab sample sites from many spatial and temporal

surveys: Department of the Environment (DOE) North Channel Disposal Grounds - Monitoring Programme 2008-2013; Marine and Coastal Access Act (MCAA) survey (grab survey) 2012; Agri-food and Biosciences Institute (AFBI) video tows and grab cruise reference CO0715, 2015). Survey work (DOE Outer Belfast Lough pMCZ spyball and diving survey) carried out in 2015 confirmed the sediment types enabling a boundary to be drawn. The area has also been the subject of research studies by Bangor University, Wales with data published in peer reviewed scientific papers.

As Subtidal (sublittoral) sand in Outer Belfast Lough MCZ is currently in unfavourable condition, the Department recommends that the **conservation objective is set to *recover* this feature to favourable condition**.

Low mobility species

The MCZ species feature, the **Ocean quahog**, is a large, slow-growing bivalve mollusc, which lives buried in muddy and sandy sediments. The oldest recorded Ocean quahog from Belfast Lough was approximately 220 years old.

Outer Belfast Lough was surveyed by Bangor University during several research cruises (2005, 2008 and 2010); Ocean quahog was only located in the area subsequently selected as a proposed MCZ. Survey work carried out in 2015 confirmed the presence of Ocean quahog (DOE Outer Belfast Lough pMCZ spyball and diving survey 2015 and AFBI cruise CO0715 – video tows and grab survey 2015). The location and extent of the MCZ is shown in Figure 2. This map shows individual records of the Ocean quahog collected from different surveys (Sublittoral Survey Northern Ireland; DOE North Channel Disposal Grounds Monitoring Programme 2008-2013; DOE Belfast grab survey 1990-2004 and Bangor University Ocean quahog survey 2008).

Ocean quahog is currently listed on the OSPAR List of Threatened and/or Declining Species and Habitats but is not considered Threatened and/or Declining in the region in which the MCZ is located, OSPAR Region III, (OSPAR agreement 2008-6; OSPAR, 2009). It is also a Nationally Important Marine Feature (NIMF).

Their conservation status has been determined on the basis that damaged individuals show a slow population recovery which may be due to slow growth rates and irregular recruitment.

As the Ocean quahog in Outer Belfast Lough MCZ is currently in unfavourable condition, the Department recommends that the **conservation objective is set to *recover* this feature to favourable condition.**

Figures 3-10 have been produced using the MCZ feature data (points and polylines) shown in Figure 2 to illustrate the location of various activities in relation to Outer Belfast Lough MCZ. The Subtidal (sublittoral) sand habitat is thought to be present across the entirety of the MCZ, and so for simplicity, this habitat has not been included in Figures 3-10

Historic and Archaeological Interest

The Department's mechanism to protect underwater cultural heritage is principally the Protection of Wrecks Act 1973 and the Historic Monuments and Archaeological Objects Order 1995 and these will be utilised when and where appropriate. However, the Department will have regard to any historic assets that lie within the MCZ boundary and these may be afforded incidental protection. It is recognised that management measures to protect MCZ features could protect historic assets.

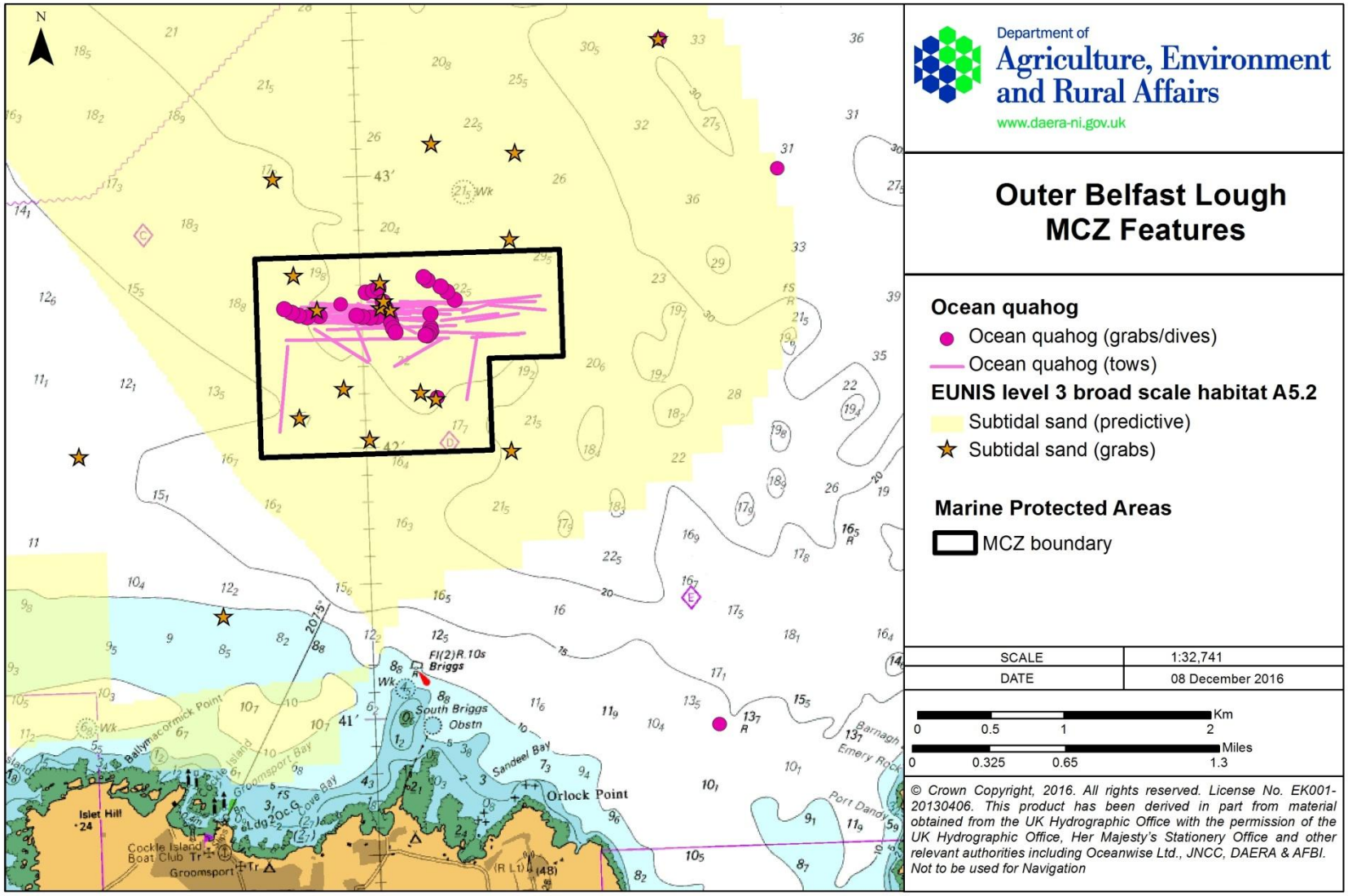


Figure 2 Distribution of the MCZ features in Outer Belfast Lough

Activities and Potential Management Options in Outer Belfast Lough

Table 1 lists the activities that have the potential to affect Outer Belfast Lough MCZ. This list has been generated based on activities that are current, historical or already identified as potential future activities. Any activities that have not yet been considered, e.g. new emerging technologies or new fishing techniques will need to be considered as they are developed. This document discusses the various activities and their potential impacts on the MCZ features and has been developed from a range of data, scientific literature including peer-reviewed publications and reports, and stakeholder comments. Details of the literature used have been provided in a reference section at the end of this document.

Table 1 Activities that have the potential to affect Outer Belfast Lough MCZ features

Type of activity	Activities
Extraction of living resources	*Fishing – dredging (scallops and potential clam dredging)* *Fishing – demersal trawling (fish & mussels)* *Fishing – traps (potting/creeling)*
Energy generation (potential)	*Renewable energy – Tidal Resource Zone*
Coastal infrastructure	*Coastal docks, ports & marinas* *Coastal defence & land claim*
Waste management activities	*Sewage disposal (Waste water treatment Works & outfalls)* *Dredge disposal*
Transport	*Shipping – general at sea (Moorings, Anchorage & Vessel movements* *Shipping – port operations within Harbour Authority limits (mooring, beaching, launching, ferry route, etc.)*
Recreation and leisure	*Recreational activities (SCUBA Diving, Sailing, Windsurfing, Kayaking/canoeing, Bird watching Recreational fishing)*
Marine research	*Scientific and Archaeological activities*
Other man-made structures	*Submarine cable & pipeline operations*

All the activities are assessed against the level of impact or risk of damage to the MCZ features based on the latter's vulnerability to each activity. Only those activities considered capable of affecting the designated features (or likely to impact the feature) will be detailed in the management options. The management options considered for each activity include no management required, reduce or limit pressures, or to remove or avoid pressures altogether. Where management is required the options recommended will be implemented as management measures with reporting structures. The full vulnerability and risk of damage assessments are provided in Annex III.

The Guidance on the development of Conservation Objectives and potential Management Options document fully details the procedure used to develop potential management options.

Advice on management implications

In order to meet the conservation objectives listed above, all public authorities are required to manage activities within their remit to avoid significant loss, damage or change to the qualifying features of the site. Within Outer Belfast Lough the features are vulnerable to the following pressures – activities should be managed so that they do not result in:

- Temperature changes
- Salinity changes
- Water flow (tidal current) changes
- Wave exposure changes
- De-oxygenation
- Organic enrichment
- Physical loss (to land or freshwater habitat)
- Physical change (to another seabed or sediment type)
- Habitat structure changes - removal of substratum (extraction)
- Overall abrasion/disturbance of the surface/subsurface of the substratum or the seabed
- Siltation rate changes (including smothering)
- Removal of non-target species

Extraction of living resources: *Fishing – dredging (scallops), demersal trawling (mussels) and traps (potting/creeling)*

Outer Belfast Lough is fished by pots/creels for lobsters (*Homarus gammarus*), crabs (*Cancer pagurus* and *Necora puber*) and buckie or common whelk (*Buccinus undatus*). There is also scallop dredging (*Pecten maximus*) and demersal trawling (ground fish & *Mytilus edulis*). Outer Belfast Lough is considered to be a productive area for crabs while the scallop fishery operating out of Bangor is gaining importance in Northern Ireland with increasing landings in the past few years. Within Inner Belfast Lough there is a significant bottom culture of mussels industry. Although a cockle fishery (using dredges) operated in 2009, landing 66 tonnes, due to a lack of recruitment in Inner Belfast Lough no further fisheries have taken place (AFBI, 2013).

At present there is no Ocean quahog exploitation in UK waters; however this fishery/industry may be considered in the future. The Ocean quahog is harvested commercially as a food source using a hydraulic clam dredge in United States, Canada, Norway and Iceland. There is also a small market for Ocean quahog as a bait species in these countries.

Figure 3 shows the overlap between commercial fishing in the area and the MCZ. This map shows fishing interest zones and fishing density in Outer Belfast Lough (Vessel Monitoring System, 2011). A quantitative analysis of data from Vessel Monitoring Systems (VMS) from 2006-2014 shows that average fishing effort within the MCZ is 0.11% of the total effort within ICES rectangle 38E4. The annual average fishing effort in the Outer Belfast Lough MCZ is 7.49hours per annum, which equates to 2.99hours/km^2. The Department acknowledges that this is only an indicative value as VMS is limited to vessels larger than 12m. It is believed that local vessels smaller than 12m also prosecute a fishery within Belfast Lough although locational and catch data is not available.

The **Subtidal (sublittoral) sand** habitat is moderately vulnerable to fishing pressures and is likely to sustain damage as a result fishing activities. It is not currently known what the true fishing effort on the site is. However, evidence from side-scan sonar shows that dredging has occurred on this site at high intensity within the MCZ boundary (refer to Assessment against the MCZ Selection Guidelines for Outer Belfast Lough MCZ, guideline 2d). Dredging and demersal trawling impact the habitat by **de-oxygenation, overall abrasion** (surface and subsurface)**, siltation rate changes** (including smothering) and **removal of non-target species** resulting in a degraded benthic community. In addition, impacts of fishing tend to be greater in areas of muddy sands and sand in deeper water, both of which are considered to have a high sensitivity to some mobile bottom gear. Subtidal sand has been reported to be highly vulnerable to dredging through **changes in seabed type** or **habitat structure changes**. This habitat is also vulnerable to the **removal of non-target species** associated with creeling and potting.

The main threats to **Ocean quahog** associated with commercial fisheries are disturbances to its habitat. Moreover, this species has moderate to high vulnerability to **physical change** (to another seabed type**), habitat structure changes, overall abrasion** (surface and subsurface) and **siltation rate changes** (including smothering) and **removal of non-target species**. The species has a low vulnerability to **surface abrasion** associated with deploying and recovering traps (creels and pots) from the seabed**.**

The physical effects of dredging on seabed sediments are detrimental. Although Ocean quahog burrows into the sediment, certain types of fishing have the potential to displace or damage individuals. Dredging in the area will likely remove a large proportion of the population and/or cause damage to the shells and body.

It is considered that dredging and demersal trawling should be avoided within the MCZ boundary where they are likely to impact the MCZ feature to aid the achievement of the conservation objectives.

It is considered that fishing with traps should be reduced or limited as there is a moderate risk of not achieving the conservation objective due to the pressures associated with this activity (creels and pots)

Hydraulic gears penetrate sediments more deeply than other gears and so could be expected to cause a greater mortality, particularly where Ocean quahog is the target species (although there is no known direct exploitation of the species in this country). **Currently hydraulic dredging is prohibited throughout Northern Ireland** (The Inshore Fishing (Prohibition of Fishing and Fishing Methods) (Amendment) Regulations (Northern Ireland) 2008).

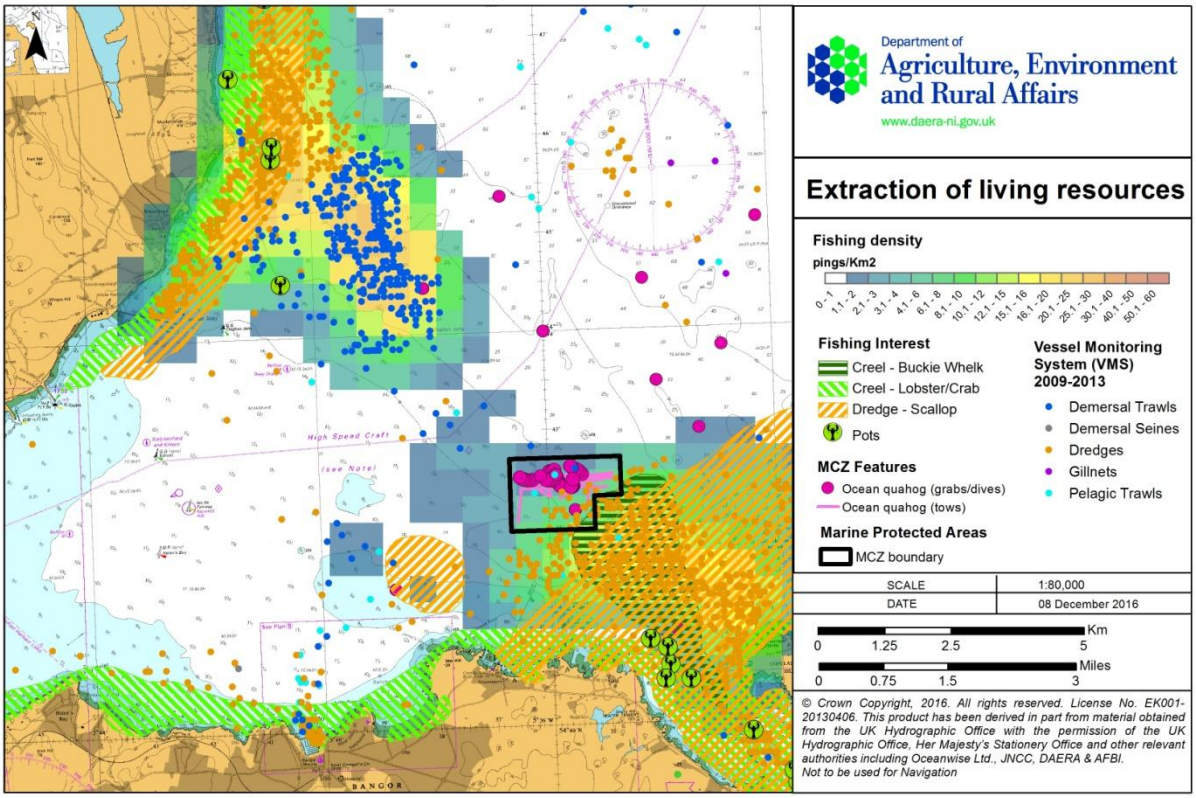


Figure 3 Location of commercial fisheries in relation to Outer Belfast Lough MCZ

Table 2 Potential Management Options for extraction of living resources

Potential Management Options	**Management measures are recommended to remove or avoid pressures associated with dredging and demersal trawling where they are likely to impact the MCZ features.** Management measures may include the use of VMS on vessels using demersal trawls to monitor compliance. **Management measures are recommended to reduce or limit pressures associated with traps (pot/creel) where they are likely to impact the MCZ features.** Management measures may include the use of VMS on vessels to monitor compliance.
Proposed way forward	The Department is responsible, through regulations, for the development of fisheries management measures to protect the MCZ features. The MCZ features will be monitored within a 6 yearly rolling cycle to assess biotope distributions and species abundances. This will determine whether the conservation objectives are being achieved.

Relationship with existing Management Options	The Department is responsible for fisheries regulations in Outer Belfast Lough. Sea fishing is governed largely by the Reformed Common Fisheries Policy (CFP) 2013.

Energy generation (potential): *Renewable energy – Tidal resource zone*

The Strategic Environmental Assessment (SEA) of Offshore Wind and Marine Renewable Energy by the Department of Energy, Trade and Investment (DETI, 2009) assessed the potential for commercial and test/demonstration tidal stream sites in NI waters. This assessment identified potential impacts of such developments and related mitigating actions to be considered at project development stages.

A possible small scale Test and Demonstration Tidal Resource Zone was identified around the Copeland Islands. There are currently no tidal development plans in this area.

Figure 4 shows the spatial extension of the Copeland Island tidal resource zone and the MCZ. Currently there is no overlap with the MCZ, however the future development of a tidal infrastructure in the proximity of the MCZ and the pressures associated with the tidal turbine activity, installation and operations, may pose a risk on the achievement of conservation objectives for the site.

The MCZ features **Subtidal (sublittoral) sand** habitat and the **Ocean quahog** are sensitive[2] to the following pressures that could happen in the area associated with tidal energy generation: **temperature changes**, **water flow** (tidal current) **changes** (including sediment transport)**, wave exposure changes, physical change** (to another seabed type)**, habitat structure changes, overall abrasion** (surface and subsurface) and **siltation rate changes** (including smothering)**.**

The SEA report (DETI, 2009) shows that activities associated with energy production may result in the removal or disturbance of the sediment and these could have significant adverse effects on sensitive benthic habitats and species. Additionally, Ocean quahog juveniles and larvae, as well as the food supply within the water column, could be affected by flow changes and increased wave action. However, with mitigating measures taken at the EIA/Projects stage these impacts could be reduced or eliminated.

There are no tidal energy developments in this area at the moment and the Department is engaging with the developers and will consider any marine licence applications. There are no tidal energy developments in this area at the moment and the Department is engaging with the developers and will consider any marine licence applications. The potential tidal development sites being investigated lie outside the MCZ boundary.

[2] Currently there are no energy generation licences in Belfast Lough so the features are not exposed to the pressures normally associated with this activity. As such, vulnerability assessments cannot be carried out. Instead, the sensitivity of the features to pressures is referred to here.

It is considered that the risk of not meeting the conservation objectives for any of the features is low as the potential tidal developments are unlikely to affect these features. However, the pressures and sensitivities of Outer Belfast Lough MCZ will need to be considered if future applications are submitted. At present no additional management is required.

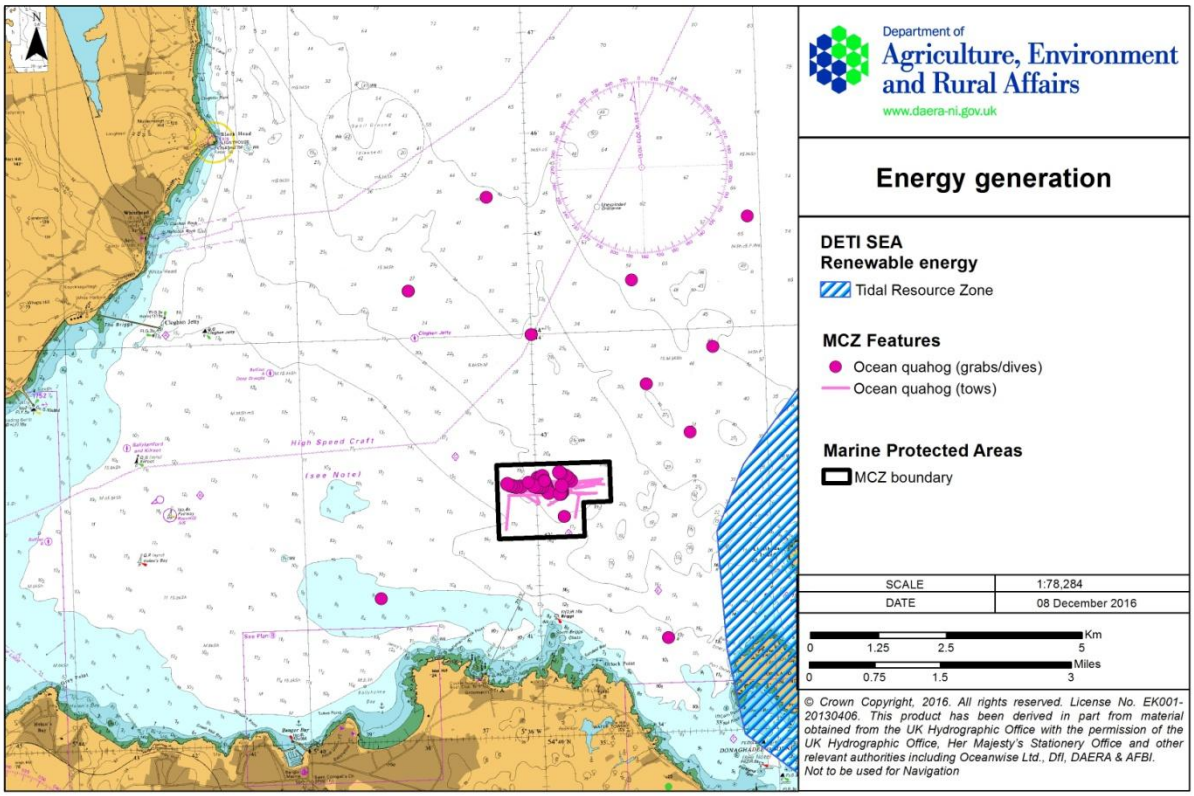


Figure 4 Location of potential energy generation areas in relation to Outer Belfast Lough MCZ

Table 3 Potential Management Options for energy generation

Potential Management Options	**No additional management is required.**
Proposed way forward	Any new development for renewable energy production will require a licence from the Department who will consider any potential impacts on the MCZ.

Relationship with existing Management Options	The Department is the marine licensing authority for the NI inshore region. The Department for the Economy is the consenting authority for the construction and operation of electricity generation installations. The Crown Estate has an interest as the seabed and subsurface owner and leasing authority.

Coastal infrastructure: *Coastal docks, ports & marinas and coastal defence & land claim*

Belfast Harbour is a major commercial port in Northern Ireland with a growing industry (ship maintenance and a Wind Energy supply facility) and increased shipping movements. The port is also Northern Ireland's leading logistics and distribution hub and is home to many businesses. The port has a large capacity with important infrastructure and consideration has been given to an extension. Additionally, in recent years there has been an increase in cruise ship visits and more regular visits by MoD vessels. Events such as the Tall Ships and other maritime tourism events are also likely to increase into the future.

There are also three marinas in the Lough close to the MCZ: Groomsport Marina (which is a small harbour), Ballyholme Yacht Club and Bangor Marina. Due to the distance from the Belfast Harbour and the marinas any development of these is unlikely to affect the MCZ.

Coastal defences and land reclaim are localised management practices used to reduce the impact of coastal erosion. In Outer Belfast Lough there is natural and hard coastal reinforcement on both shores along the mouth of Belfast Lough. The MCZ is over 3km offshore and unlikely to be impacted by the development of new coastal defences. Infrastructure within or adjacent to the MCZ is shown in Figure 5.

The main pressures linked to infrastructure operations in the area to which **Ocean quahog** and **Subtidal (sublittoral) sand** have low to moderate vulnerability are: **water flow** (tidal current), **wave exposure changes**, **physical loss** (to land or freshwater habitat), **physical change** (to another seabed type), **habitat structure changes**, **overall abrasion** (surface and subsurface), and **siltation rate changes** (including smothering).

The main identified risks which can occur as a result of the existing infrastructure operation, are habitat changes and loss, and direct damage to the individuals. In addition, the construction of new infrastructure may affect the local hydrodynamic and sediment transport regimes altering the sandy sediment and leading to a loss of characteristic species.

In the past it may have been common practice to conduct post refit commissioning trials of drill rigs within the sheltered confines of the Lough. Such activity is now regulated through the Department and should be directed away from the MCZ.

It is considered that the risk of not achieving the conservation objectives for the MCZ features is low unless the location or intensity of infrastructure or the associated operations were to change in the future. At present no additional management is required.

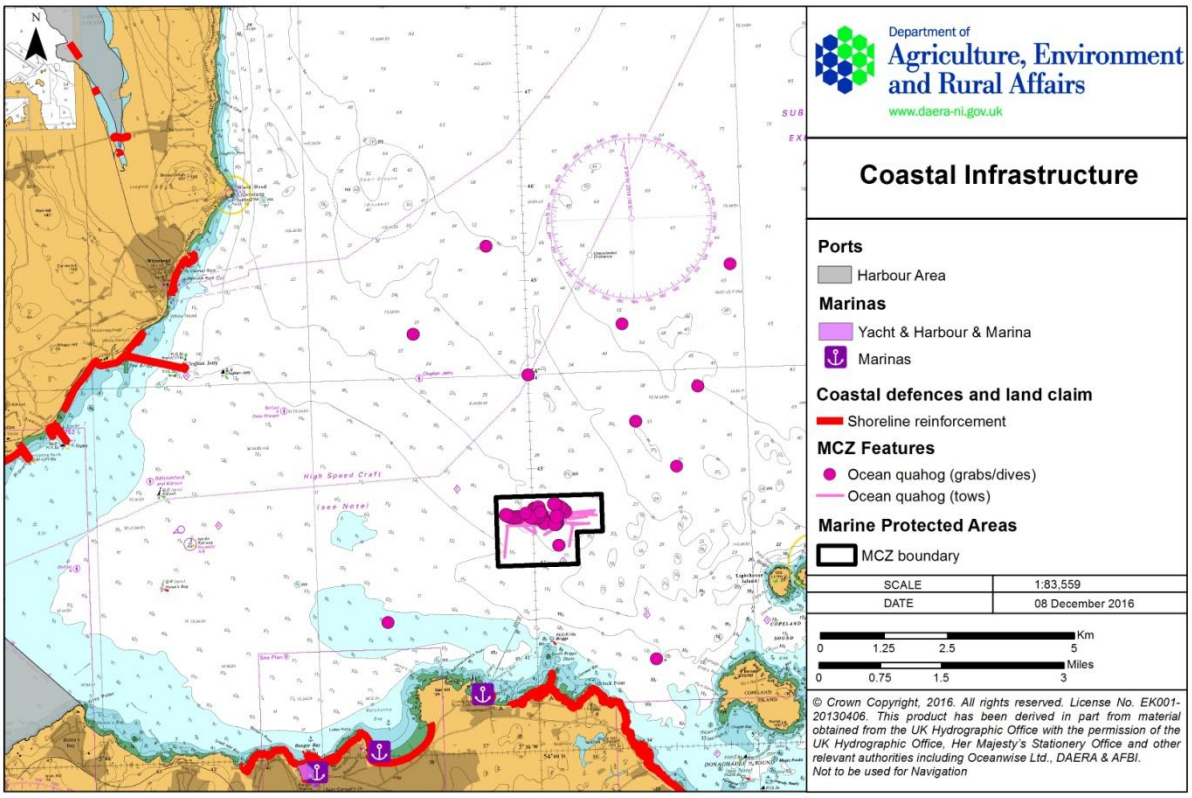


Figure 5 Location of coastal infrastructure in relation to Outer Belfast Lough MCZ

Table 4 Potential Management Options for coastal infrastructure

Potential Management Options	**No additional management is required.**
Proposed way forward	The Department will continue discussions with those involved with infrastructure activities and operations within or adjacent to the MCZ to help us to understand more about the interactions with the MCZ features.

Relationship with existing Management Options	Port developments are covered by the Department for Infrastructure (DfI) and though marine planning and licensing. Belfast Harbour Authority has responsibility for the management of ports and marinas under The Harbours (Northern Ireland) Order 2002. The Department for Infrastructure (DfI) is responsible for sea defences designated under the Drainage (Northern Ireland) Order 1973.

Waste management: *Sewage disposal and Dredge disposal*

Treated sewage effluent is discharged from four waste water treatment works (pipelines outfalls) along the Outer Lough. The closest outfall pipe/discharge to the MCZ discharges 600m offshore, to the north east of Groomsport (Brigg's Rocks) and is one of the major discharges to Belfast Lough. A new waste water treatment works for the area was completed during 2009. It provides secondary treatment with UV disinfection during the bathing season. The discharge location of the outfall was selected to ensure protection of all of the bathing waters in the area. Although the inner part of the Lough is subject to nutrient enrichment, the mouth of the Lough allows the effluent to disperse and is considered a less sensitive area.

The disposal of waste generated from vessels is regulated by Belfast Harbour Commissioners and they have produced a Port Waste Management Plan which details available facilities, legal duties, responsibilities and obligations. Other secondary pressures are land-based and marine industrial or commercial sources.

There is a licensed area for the disposal of dredged material just outside Belfast Lough. It is important for the continued commercial success of the harbour to have sites licensed and available for dredge disposal. The location and suitability of disposal sites is regulated by the Department through a fully consultative licensing process.

Although there is no spatial overlap with the MCZ, the Briggs Rocks discharge site and disposal grounds are close to the area (see Figure 6).

The **Ocean quahog** and its associated habitat, **Subtidal (sublittoral) sand**, are vulnerable to **siltation changes** (including smothering) and **temperature changes** as a result of sewage effluent. The habitat has also low vulnerability to **salinity changes**, **de-oxygenation** and **organic enrichment** associated with sewage disposal.

Dredging disposal has a direct impact on the sediment and on sedimentation patterns at the disposal sites. It can also alter circulation, tidal patterns and water chemistry in the surrounding area. The Subtidal (sublittoral) sand is vulnerable to **de-oxygenation**, **organic enrichment**, **habitat structure changes**, **overall abrasion** (surface and subsurface), **siltation rate changes** (including smothering) and **removal of non-target species**.

Ocean quahog has a low to moderately vulnerable to **physical loss** (to land or freshwater habitat), **habitat structure changes**, **overall abrasion** (surface and subsurface), **siltation rate changes** (including smothering) and **removal of non-target species** associated with dredged disposal. Although on a smaller scale, industrial and agricultural contamination is another source of pressure.

It is considered that the risk of not achieving the conservation objectives for

the MCZ features is low, unless the location or intensity of the disposal activity was to change in the future. At present no additional management is required.

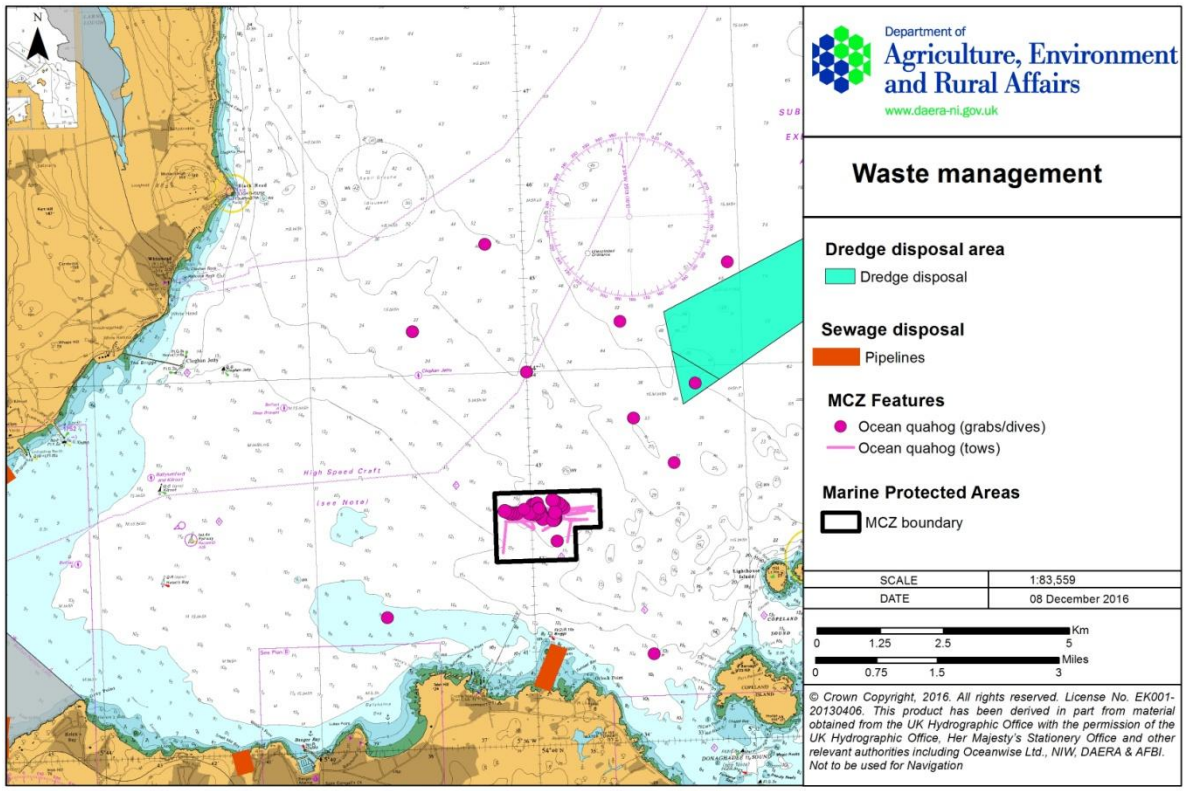


Figure 6 Location of waste management activities (disposal and dredge disposal sites) in relation to Outer Belfast Lough MCZ

Table 5 Potential Management Options for waste management

Potential Management Options	**No additional management is required.**
Proposed way forward	New applications for sewage or dredge disposal will be subject to the marine licensing and Water Order discharge consent processes which will take the MCZ features into consideration. Any changes to the current discharge/waste disposal sites will be carried out by Northern Ireland Water (NIW) in consultation with the Department to determine any impacts to the MCZ.

Relationship with existing Management Options	NIW is responsible for wastewater treatment works. Water discharges are governed by requirements in European legislation (The Urban Waste Water Treatment Directive (91/271/EEC) and Nitrates Directive (91/676/EEC), Water (Northern Ireland) Order 1999. The disposal of ship generated waste (including sewage and bilge water) must comply with the EU Directive 2000/59/EC of the European Parliament and Council on Port Waste Reception Facilities for Ship Generated Waste and Cargo Residues, the Merchant Shipping (Port Waste Reception Facilities) Regulations 1997, the Merchant Shipping and Fishing Vessels (Port Waste Reception Facilities) Regulations 2003. The Department is responsible for licensing dredging and disposal activities in the Northern Ireland inshore region. Disposal of dredged materials at sea is regulated internationally under the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter 1972 (London Convention) and the Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR Convention 1992). DfI, through the Harbour Works (Environmental Impact Assessment) Regulations (Northern Ireland) 2003 (as amended) can require Harbour Authorities to conduct an Environmental Impact Assessment for certain types of harbour works. Ports and harbours with a Harbour Order or Local Act in place may be exempt from the requirement to obtain a marine licence to carry out dredging and/or disposal within the harbour limits.

Transport: ***Shipping – general at sea (Moorings, anchorage & vessel movements) and Shipping – port operations within Harbour Authority limits (mooring, beaching, launching, ferry route etc)***

In the outer part of the Lough there is one mooring point at Bangor Bay and ten boat anchoring points.

There are also several ferry routes crossing the Lough to Heysham (24 crossings weekly), Liverpool (26 crossings weekly), Stranraer (14 crossings daily) and Douglas (2 crossings weekly).

Shipping and navigation in the area, shown in Figure 7, include service crafts, military vessels, passenger vessels, cargo vessels, tankers, fishing vessels, recreational vessels (sailing & motorboats) and vessels associated with dredging or underwater activities (including diving). Belfast Harbour handles almost 70% of trade for the entire island of Ireland and it is an important gateway for materials and goods. Furthermore, Belfast is only one of two ports on the island of Ireland to handle a full range of cargos, from freight vehicles to containers, dry, break and liquid bulk. In the order of 12,000 ship movements take place in the Port per annum, which accounts for up to 60% of Northern Ireland's seaborne trade.

It is common practice for cargo vessels entering Belfast Port to anchor in Outer Belfast Lough until a berth is free. Other vessels also anchor in the area awaiting sailing orders or simply to shelter from storms. While the ship's master determines suitable boat anchoring based on depth, seabed holding and weather conditions, identification of the MCZ location will inform the selection of a suitable anchoring. Anchors and cables from ocean going vessels have the potential to cause significant damage to the features. Evidence from the side scan sonar surveys indicates abrasion caused by both the anchors and the chain. Monitoring of AIS has also shown that large ships do currently anchor within or near to the MCZ.

The main pressures for the features (**Ocean quahog** and **Subtidal (sublittoral) sand**) associated with transport are **overall abrasion** (surface and subsurface) and **siltation rate changes** (including smothering), most likely through anchoring. Although Ocean quahog burrows into the sands, the siphon used for feeding and respiration sits on the surface. Despite having a solid shell their large body size makes them more vulnerable to physical damage than smaller species.

There is a significant amount of shipping activity, both commercial and recreational, which pass through the MCZ in addition to the cross channel ferry operators. Although there is overlap of navigation with the MCZ it is considered that the risk of damage to the MCZ features from transiting vessels is low.

No additional management is required for the shipping – port operations within the Harbour Authority limits (mooring, beaching, launching, ferry route etc.).

However, shipping – general at sea (anchoring and mooring) should be avoided within the MCZ boundary to aid the achievement of the conservation objectives.

Anchoring in emergency situations will not be restricted.

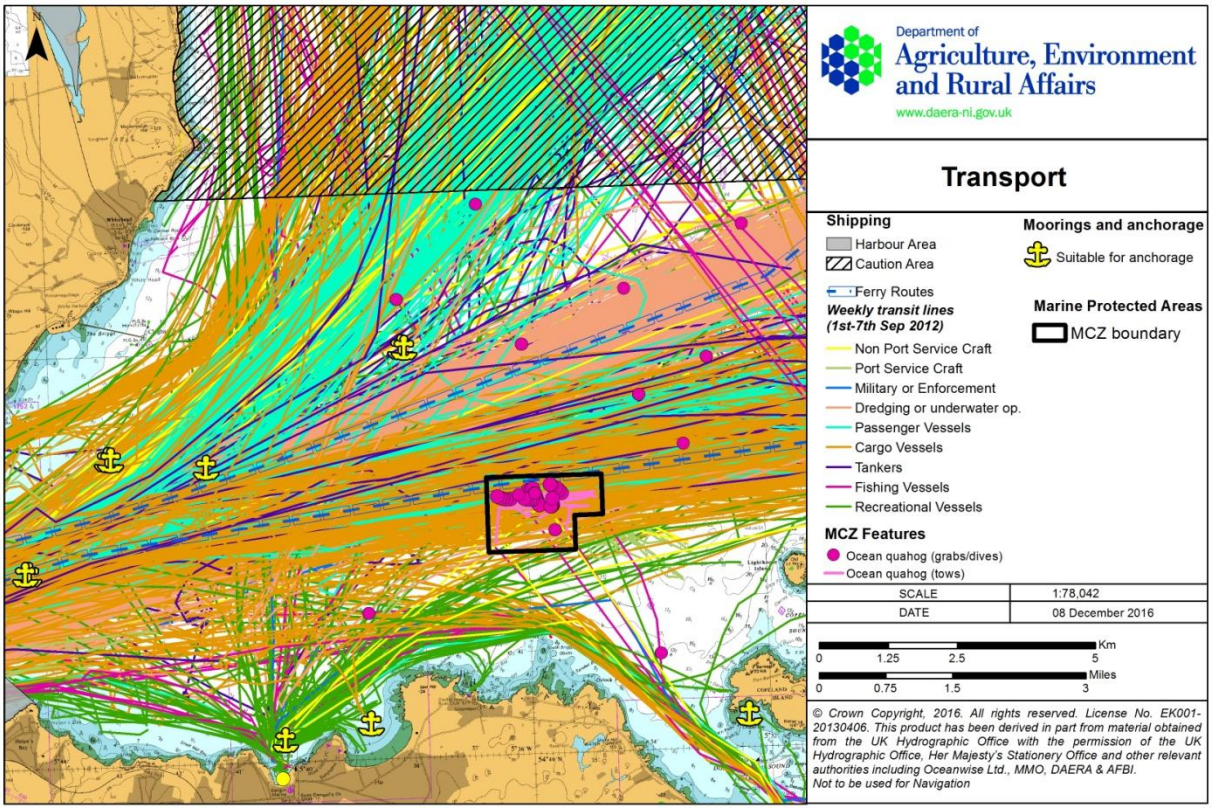


Figure 7 Location of transport in relation to Outer Belfast Lough MCZ

Table 6 Potential Management Options for transport

Potential Management Options	**Management measures are recommended to remove or avoid pressures associated with shipping - general at sea (anchoring and mooring) where they are likely to impact the MCZ features.** **Anchoring in emergency situations will not be restricted.** **No additional management is required for shipping – port operations within the Harbour Authority limits**.

Proposed way forward	The Department will continue discussions with those involved with marine traffic in Outer Belfast Lough to develop appropriate management measures. It is proposed that the UKHO mark the MCZ on Admiralty Charts advising masters not to anchor within the boundary.
Relationship with existing Management Options	The Shipping industry is primarily regulated by the International Maritime Organization (IMO). The Maritime and Coastguard Agency (MCA) works closely with national and international partners in the shipping industry to promote the safe construction, operation and navigation of ships. Permanent moorings are licensed by the Crown Estate as owners of the seabed. Any new moorings will require a marine licence from the Department except those within the harbour limits which are the responsibility of the Harbour Authority.

Recreation and leisure: ***Recreational activities –SCUBA diving, sailing, windsurfing, kayaking/canoeing, bird watching, recreational sea angling, recreational fishing.***

There are numerous recreation and tourist activities taking place along the shores and waters of Outer Belfast Lough, i.e. walking, bathing, yachting, water sports, sea angling and bird watching.

Walking and cycling are leisure activities that have increased in popularity in recent years, especially via the North Down Coastal Path that extends from Holywood along Helen's Bay and Bangor shore. There are also important bathing water beaches in Outer Belfast Lough - Helen's Bay Beach, Crawfordsburn, Ballyholme and Groomsport.

Water sports in the area are quite significant due to the proximity to Belfast and the immediacy to the Irish Sea cruising routes. The East Coastal Canoe Trail runs along both the north and south coasts of the Lough and the Copelands with access points from Whitehead, Carrickfergus, Helen's Bay, Bangor, Groomsport and Lighthouse Island. Bangor Marina is the second largest in Ireland and hosts international yachting events as well as many other attractions, such as the Pickie Fun Park. Bangor Marina is home to Ballyholme and Royal Ulster Yacht Clubs who provide dinghy and keelboat sailing as well as being the location of the HM Coastguard's Maritime Rescue Co-ordination Centre. Windsurfing occurs all along the north Down coast, especially in Ballyholme. SCUBA diving is popular in the area due to the presence of shipwrecks. Figure 8 shows recreational activities and tourism in the Outer Belfast Lough area.

North Down (Holywood, Bangor and Groomsport) is considered an important spot for bird watching for the variety of native birds and seasonal migrants. Lighthouse Island is also an important bird observatory. There are bird watching tours and boat charters in the area.

Shore fishing and deep sea angling occur along North Down all-year-round. Charter boats and wildlife watching cruises are available on a daily basis from the Eisenhower Pier, Bangor.

The main pressures associated with recreation and leisure, to which the MCZ features have low to moderate vulnerability, are **overall abrasion** (surface and subsurface)**, siltation rate changes** (including smothering) and **removal of non-target species**.

It is considered that the risk of not achieving the conservation objectives for Ocean quahog and associated habitat is moderate without management in place to reduce adverse effects from recreational activities. Anchoring or mooring activity associated with recreation and leisure should be removed or avoided where they are likely to impact the MCZ features.

Anchoring in emergency situations will not be restricted.

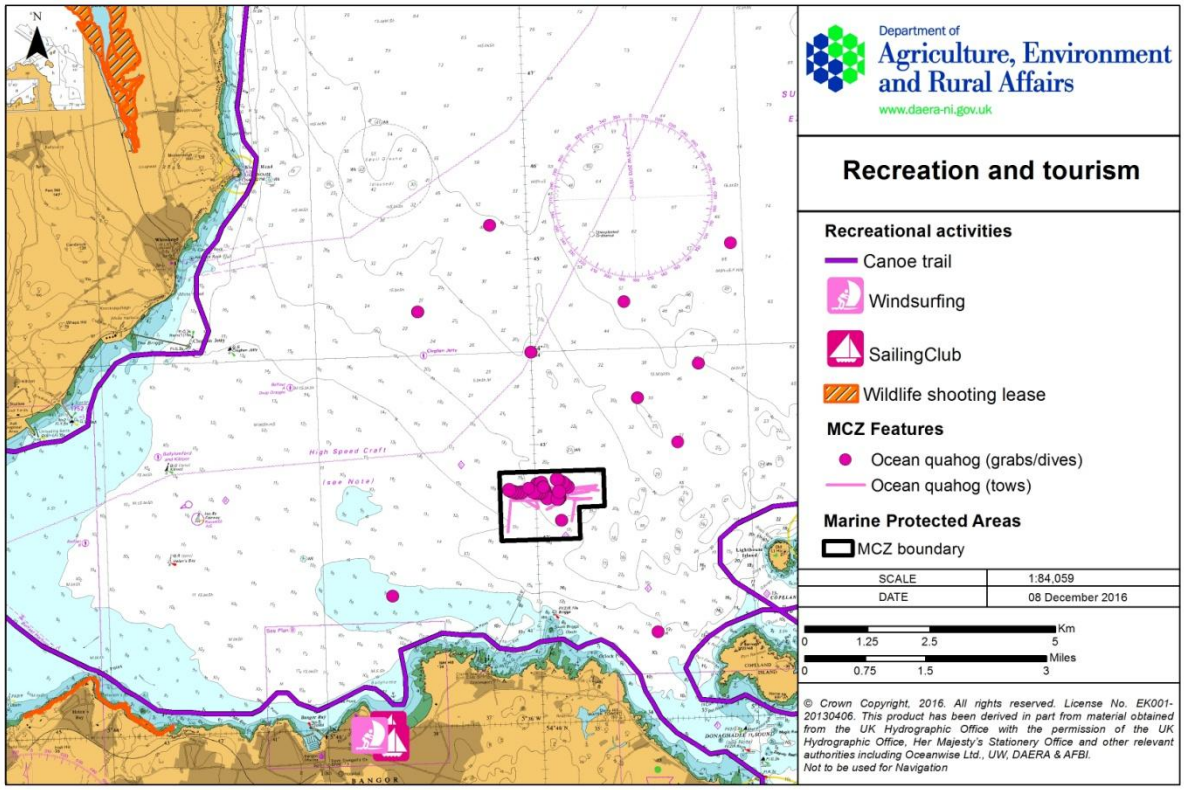


Figure 8 Location of recreation and leisure in relation to Outer Belfast Lough MCZ

Table 7 Potential Management Options for recreation and leisure

Potential Management Options	**Management measures are recommended to remove or avoid pressures associated with recreation and leisure activities (anchoring and mooring) where they are likely to impact the MCZ features.** **Anchoring in emergency situations will not be restricted.**
Proposed way forward	The Department will continue discussions with those involved with recreation and tourism in Outer Belfast Lough to develop appropriate management measures.

Relationship with existing Management Options	DfE is responsible for tourism policy while District Councils have a role in promoting local tourism and recreation. DfC has responsibility for arts, culture and sport, while DAERA is responsible for inland fisheries and DfI is responsible for inland waterways. Licences for angling (salmon and sea trout) are also issued by the Department. The Crown Estate and The Department are responsible for the licensing of any proposed moorings within the MCZ.

Marine research: *Scientific and Archaeological*

Outer Belfast Lough is subject to a variety of environmental monitoring programmes.

The Joint Agency Monitoring Programme (the Department; Agri-food and Biosciences institute (AFBI); Loughs Agency) delivers spatial water quality monitoring throughout Northern Ireland coastal waters. There is a largely automated environmental monitoring system using moored monitoring stations/points (eight in Outer Belfast Lough, see Figure 9).

Additionally, AFBI (on behalf of the Department) carries out fish stock assessment surveys. These scientific surveys determine the amount of resource allowed to be fished each year. Donaghadee Sound is a harvest area for seed mussel and is subject to regular stock assessment surveys (Boyd & Clements, 2014). AFBI also has a station close to the MCZ where the RV Corystes deploys gears as part of different surveys for fish stock assessment, larvae and other research.

AFBI undertakes shore sanitary surveys (Service, 2008) for microbiological and pollution control for shellfish harvesting areas.

The Department, together with National Museums of Northern Ireland (NMNI), completed Sublittoral Dive Surveys (SSNI) to collect data on the distribution and condition of Northern Ireland Conservation Priority Species. This included a site within the MCZ. Side Scan sonar surveys, drop camera and grab surveys were also carried out by the Department within the MCZ area to assess the condition of the MCZ features.

The Department's megafauna monitoring sites are located throughout the wider Belfast Lough area and data is collected on a regular basis as part of the Seal and Cetacean Monitoring programme. In addition, ongoing bird surveys are carried out by British Trust for Ornithology (BTO).

The Department is responsible for periodic grab surveys of historic and current disposal sites surveys as part of the Marine Pollution Monitoring Programme under the Water Framework Directive (WFD).

There is one recorded wreck falling within the Outer Belfast Lough MCZ boundary, a 49 ton schooner (the *Mary Young*), sunk in 1982, but its location is approximate. Recent archaeological analysis of the United Kingdom Hydrographic Office (UKHO) East Antrim/Belfast Lough multibeam data (Henry, 2015) has identified two potential anthropogenic anomalies falling inside the MCZ boundary. One of these is low potential (a 3.5m x 3.5m circular depression) but the other is a 46m x 36m low mound (c. 0.7m in height) which might represent the remains of a sunken, and now buried, shipwreck.

Marine research activities may have the potential to cause the deterioration of the

designated habitat and species through **habitat structure changes**, **overall abrasion** (surface and subsurface) and **siltation rate changes** (including smothering).

Strict guidelines and practices developed by JNCC for survey work seek to ensure that any impact on features is minimised to the lowest possible levels and that the conservation objectives can be achieved.

It is considered that the risk of not achieving the conservation objectives of the protected features is low since marine research activities under the above mentioned surveys are performed by trained, qualified staff using non-invasive techniques (where possible) such as acoustic and video methodologies. In addition, the Department must be notified before any activities within the MCZ take place and will require the provision of detailed methodologies for all marine research to assess if any impacts to the MCZ feature are likely to occur.

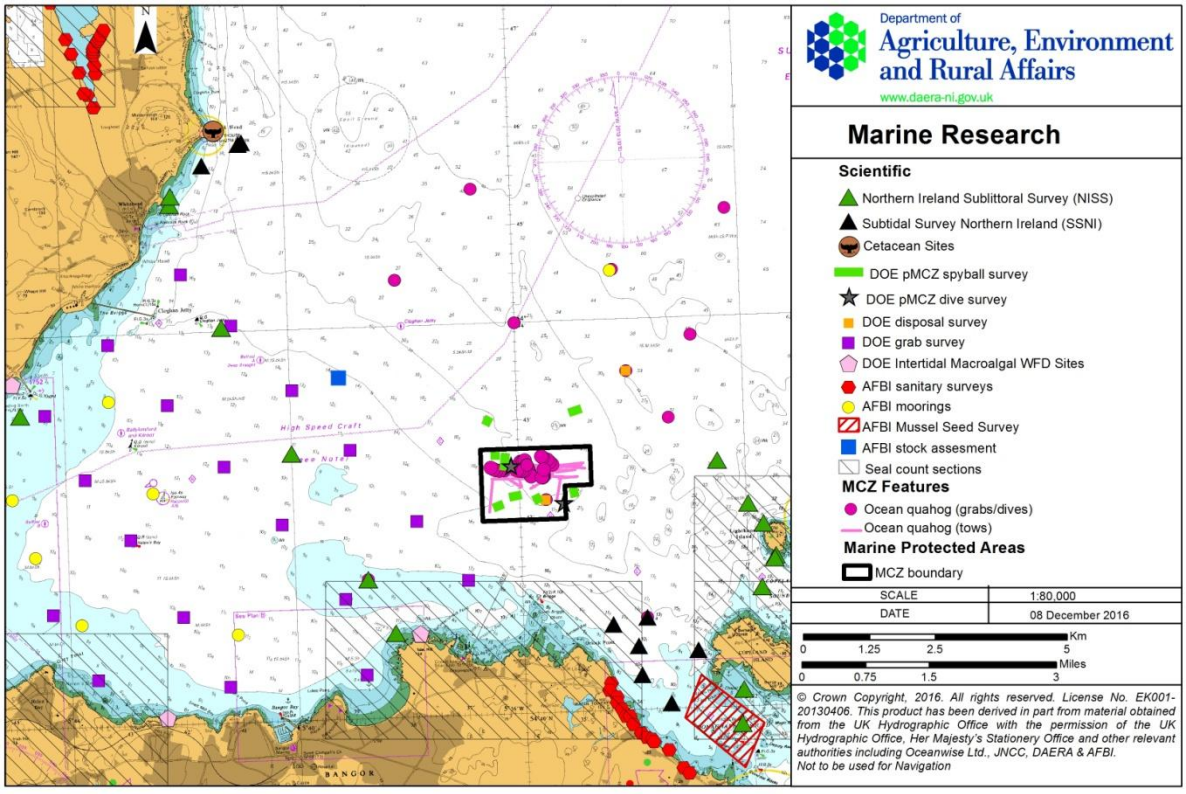


Figure 9 Location of marine research in relation to Outer Belfast Lough MCZ

Table 8 Potential Management Options for marine research

Potential Management Options	**No additional management is required** **Anchoring in emergency situations will not be restricted.**
Proposed way forward	The MCZ features will be monitored within a 6 yearly rolling cycle to assess biotope distributions and species abundances. This will determine whether the conservation objectives are being achieved. The Department will require the provision of detailed methodologies for all marine research prior to these being carried out to assess if any impacts to the MCZ features are likely to occur.
Relationship with existing Management Options	Delivered by the Department and AFBI under international, European and national legislation with marine component (Marine Strategy Framework Directive, Marine and Coastal Access Act 2009 and The Marine Act (Northern Ireland) 2013, OSPAR).

Other man-made structures: *Submarine cable & pipeline operations*

There are four submarine communication cables present within the wider area, two of which cross Outer Belfast Lough. This cables lie to the north west of the MCZ and there is no spatial conflict between these and the MCZ features (Figure 10). However, the construction, operations and maintenance of structures close to the area have the potential to cause damage to the MCZ features. Specifically, the operations related with submarine cables (Ardrossan to Carrickfergus telecommunications cable, around 600m distance to the MCZ) or new installations, could affect the designated features due to the proximity to the boundary.

There is one outfall pipe close to the MCZ; this is a discharge pipe for the sewage treatment works. The pressures associated with waste disposal have already been covered in the Waste management section.

Construction or maintenance activities of the submarine cable and pipeline have the potential to impact **Ocean quahog** and **Subtidal (sublittoral) sand** through the following pressures in the area: **temperature changes**, **physical change** (to another seabed type), **habitat structure changes**, **overall abrasion** (surface and subsurface) and **siltation rate changes** (including smothering).

It is considered that the risk of not achieving the conservation objectives of the designated features is low since all current activities have been licensed. Any future construction or maintenance activities associated with the submarine cable or pipeline may require a new marine licence. At present no additional management is required. Emergency operations will not be restricted.

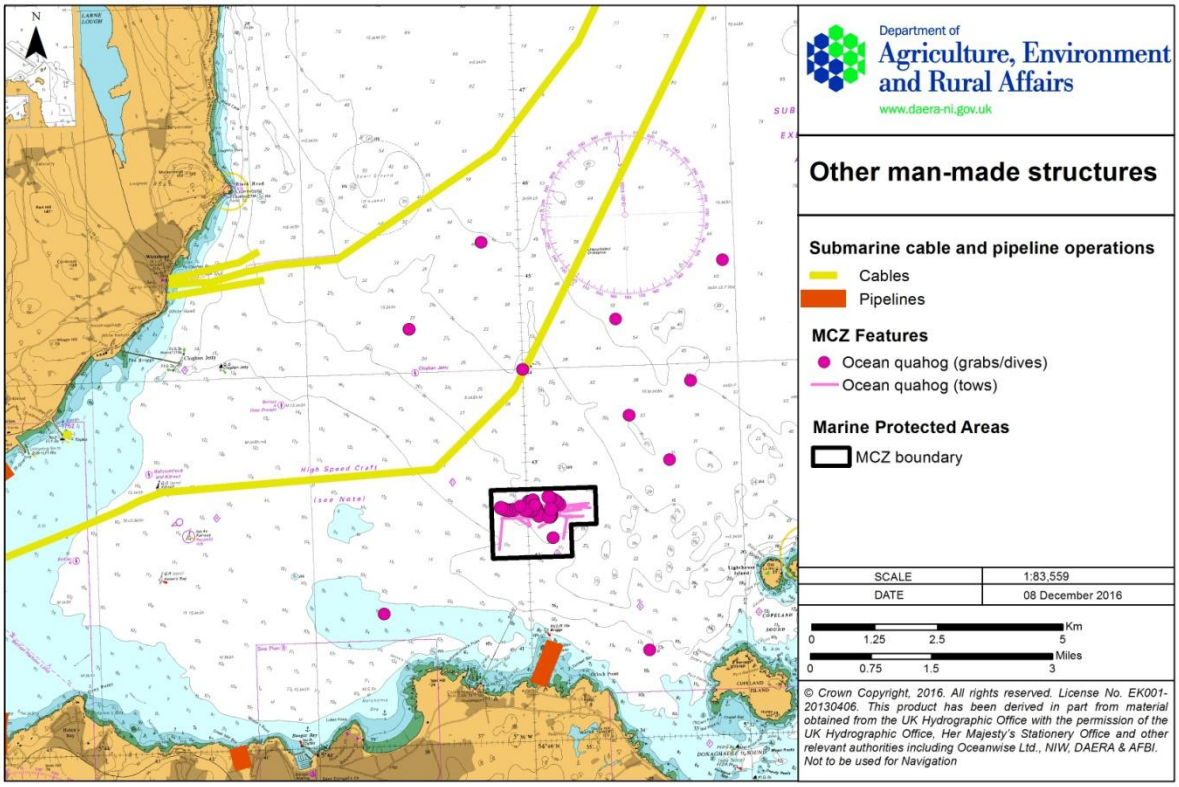


Figure 10 Location of other man-made structures in relation to Outer Belfast Lough MCZ

Table 9 Potential Management Options for other man-made

Potential Management Options	**No additional management is required.** **Emergency operations will not be restricted.**
Proposed way forward	Any proposed maintenance works (including construction) to the submarine cable or pipeline may require a marine licence from the Department. The potential impact to the MCZ features will be considered during the assessment process.
Relationship with existing Management Options	NIW is responsible for waste water treatment and the construction, operation and maintenance of sewage outfalls. Water discharges are governed by requirements in European legislation (The Urban Waste Water Treatment Directive (91/271/EEC), Water Framework Directive (WFD) and Nitrates Directive and Water (Northern Ireland) Order 1999. Responsibility for subsea telecommunications is a reserved matter.

Summary of Potential Management Options

Table 10 Potential Management Options for Outer Belfast Lough MCZ

Extraction of living resources: *Fishing – dredging and demersal trawling*	**Management measures are recommended to remove or avoid pressures associated with dredging and demersal trawling where they are likely to impact the MCZ features.**
Fishing – traps	**Management measures are recommended to reduce or limit pressures associated with traps (pot/creel) where they are likely to impact the MCZ features.**
Energy generation: *Renewable energy*	**No additional management is required.**
Coastal infrastructure: *Coastal docks, ports & marinas and Coastal defence & land claim*	**No additional management is required.**
Waste management: *Sewage disposal and Dredge disposal*	**No additional management is required**
Transport: *Shipping – general at sea (mooring, anchorage & vessel movements)*	**Management measures are recommended to remove or avoid** pressures associated with **shipping - general at sea (anchoring and mooring) where they are likely to impact the MCZ features.** **Anchoring in emergency situations will not be restricted.**
Shipping – port operations within the Harbour Authority limits (mooring, beaching, launching etc)	**No additional management is required.**
Recreation and leisure: *Recreational activities – SCUBA Diving, sailing, windsurfing, kayaking/canoeing, bird watching, recreational fishing*	**Management measures are recommended to remove or avoid** pressures associated with **recreation and leisure activities (anchoring and mooring) where they are likely to impact the MCZ features.** **Anchoring in emergency situations will not be restricted.**

Marine research: *Scientific and Archaeological Activities*	**No additional management is required.**
Other man-made structures: *Submarine cable & pipeline operations*	**No additional management is required.** **Emergency operations will not be restricted.**

Data Sources and Bibliography

Agri-Food and Bioscience Institute (AFBI). 2015. Dredge fisheries in Northern Ireland. https://www.afbini.gov.uk/publications/dredge-fisheries-northern-ireland.

Aisha, A., Johnson, C. and Turnbull, C. 2008. Identifying OSPAR Threatened and/or Declining Species and Habitats for which area based protection may be appropriate in the UK and the contribution that Natura sites make to their protection. MASH 05/5/Info.2-E. Agenda item 5.

Anon. 1992. An experimental study on the impact of clam dredging on soft sediment macroinvertebrates. (Contractor: Southern Science, Hampshire Laboratory, Otterbourne, Hants.). Unpublished report to English Nature. (English Nature Research Report, No. 13), Peterborough.

Bell, E., Brennan, R., Nickell, T., Potts, T., Valcic, B. and Wilson, H. 2011. Making the case for the sound management of Marine Protected Areas by Scottish Association for Marine Science. Published by Scottish Environment LINK.

Bergmann, M.J.N. and Van Santbrink, J.W. 2000. Fishing mortality and populations of megafauna in sandy sediments. In: Kaiser M.J. & de Groot S.J. (eds.). Effects of fishing on non-target species and habitats. Blackwell, Oxford.

Boyd, A and Clements, A. 2014. Outer Ards Seed Mussel Stock Assessment. AFBI Fisheries and Aquatic Ecosystem Branch for the Department of Agriculture and Rural Development.

Boyd, A. and Service, M. 2014. Cumulative impact assessment: Aquaculture activities within and adjacent to Natura 2000 designated sites in Belfast Lough. Agri-food and Biosciences institute (AFBI), Fisheries and Aquatic Ecosystems Branch for DARD Fisheries and Environment Division.

Cronin, M., McGovern, E., McMahon, T. and Boelens, R. Guidelines for the assessment of dredge material for disposal in Irish waters. 2006. Marine Environment and Health Series, No. 24, 2006. ISSN NO: 1649-0053

Department of Enterprise, Trade and Investment (DETI). 2009. Offshore wind and marine renewable energy in Northern Ireland. Strategic Environmental Assessment (SEA).

Department of Enterprise, Trade and Investment (DETI). 2012. NI Offshore Renewable Energy Strategic Action Plan 2012-2020.

Department of the Environment. Consultation on draft Northern Ireland Marine Position Paper.

Department for Environment, Food and Rural Affairs. 2002. Sewage treatment in the UK. UK implementation of the EC Urban Waste Water Treatment Directive.

Edwards, E. 1997. Molluscan fisheries in Britain. In The History, Present Condition, and Future of the Molluscan Fisheries of North and Central American and Europe, vol. 3, Europe, (ed. C.L. MacKenzie, Jr., V.G. Burrell, Jr., Rosenfield, A. & W.L. Hobart). National Oceanic and Atmospheric Administration, NOAA Technical Report NMFS 129.

FEAST website (Feature Activity Sensitivity Tool) http://www.marine.scotland.gov.uk/FEAST/Index.aspx

Henry, S. 2015. Archaeological Analysis of the UKHO East Antrim/Belfast Lough Multibeam Data. Unpublished report prepared by the Centre for Maritime Archaeology, Ulster University, Coleraine for the Northern Ireland Environment Agency: Historic Environment Division, pp 27.

Joint Nature Conservation Committee (JNCC). 2015. Pressures-Activities Database (PAD) developed by Cefas and APBmer. http://jncc.defra.gov.uk/default.aspx?page=7136

Joint Nature Conservation Committee (JNCC). 2015. A Standard UK list of marine activities and their definitions. (Collated by JNCC and formally agreed by the Marine Assessment and Reporting Group (MARG), the Healthy and Biologically Diverse Seas Evidence Group (HBDSEG) and the UK Marine Monitoring and Assessment Strategy (UKMMAS) sub-group on spatial data collation on human activities and pressures). http://jncc.defra.gov.uk/PDF/Standard_Activity_Definitions.pdf

Joint Nature Conservation Committee (JNCC). 2015. A list of marine pressures and their definitions formally agreed by the OSPAR Intercessional Correspondence Group on Cumulative Effects (ICG-C). http://jncc.defra.gov.uk/PDF/20110328_ICG-C_Pressures_list_v4.pdf

Kaiser M.J., Clarke, K.R., Hinz, H., Austen, M.C.V., Somerfield P.J. and Karakassis, I. 2006. Global analysis of response and recovery of benthic biota to fishing. Marine Ecology Progress Series, 311: 1–14.

Lancaster, J. (Ed.), McCallum, S., Lowe A.C., Taylor, E., Chapman A. and Pomfret, J. 2014. Development of detailed ecological guidance to support the application of the Scottish MPA selection guidelines in Scotland's seas. Scottish Natural Heritage Commissioned Report No.491. Ocean quahog Aggregations – supplementary document.

Marine Evidence based Sensitivity Assessment (MarESA) http://www.marlin.ac.uk/species/sensitivity_rationale

Minchin, D.M and Nunn, J.D. 2013. Rapid assessment of marinas for invasive alien species in Northern. Northern Ireland Environment Agency Research and Development Series No.13/06

Northern Ireland Environment Agency (NIEA) and Agri-food and Biosciences institute (AFBI). 2011. State of the Seas report. https://www.daera-ni.gov.uk/publications/state-seas-report

Northern Ireland Environment Agency (NIEA). 2014. Bathing Water Profile. Groomsport. https://www.daera-ni.gov.uk/publications/2016-bathing-water-profiles

OSPAR Commission. 2009. Background document for Ocean quahog *Arctica islandica*. Biodiversity series. ISBN 978-1906840-47-1 Publication Number: 407/2009.

Piet, G. J., Rijnsdorp, A. D., Bergman, M. J. N., van Santbrink, J. W., Craeymeersch, J., and Buijs, J. 2000. A quantitative evaluation of the impact of beam trawling on benthic fauna in the southern North Sea. – ICES Journal of Marine Science, 57:1332–1339.

Ridgway, I.D., Richardson, C.A., Scourse, J.D., Butler, P.G. and Reynolds, D.J. 2011. The population structure and biology of the Ocean quahog, *Arctica islandica*, in Belfast Lough, Northern Ireland. Journal of the Marine Biological Association of the United Kingdom, 2012, 92(3), 539–546.

Service, M. 2008. Sanitary Survey Report. Belfast Lough. AFBI.

Sewell, J. and Hiscock, K. 2005. Effects of fishing within UK European Marine Sites: guidance for nature conservation agencies. Report to the Countryside Council for Wales, English Nature and Scottish Natural Heritage from the Marine Biological Association. CCW Contract FC 73-03-214A. 195 pp.

Taylor, A.C. 1976. Burrowing behaviour and anaerobiosis in the bivalve *Arctica islandica* (L.). Journal of the Marine Biological Association of the United Kingdom 95-109.

Tillin, H. M., Houghton, A. J., Saunders, J. E. and Hull, S. C. 2011. Direct and Indirect Impacts of Marine Aggregate Dredging. Marine ALSF Science Monograph Series No. 1. MEPF 10/P144. (Edited by R. C. Newell & J. Measures). 41pp. ISBN: 978 0 907545 43 9.

Weinberg, J. 2001. Ocean quahog. NOAA [National Oceanic and Atmospheric Administration] Tech. Memo. NMFS-NE-115. .149p.

ANNEX I

Conservation Objectives for Outer Belfast Lough MCZ

In general the conservation objectives for Outer Belfast Lough MCZ are that the protected features:

- where they are already in *favourable condition*, remain so, and
- where they are not in *favourable condition*, are brought into such condition and remain so.

'Favourable Condition' is defined as 'the target condition for an interest feature in terms of the abundance, distribution and/or quality of that feature within the site'. With respect to a marine habitat, *favourable condition* means that the habitat's extent is stable or increasing and its structures, functions, quality and the composition of its characteristic biological communities (including diversity and abundance) are such that it remains in a healthy condition, which is not deteriorating. Any temporary deterioration in condition is to be disregarded if the marine habitat is sufficiently healthy and resilient to enable its recovery from such deterioration.

'Favourable condition' in relation to marine species, means that the quality and quantity of the species habitat and the composition of its population in terms of number, age and sex ratio ensures that the population is maintained in numbers that enable it to thrive.

The conservation objectives have been drafted for the MCZ features of Subtidal (sublittoral) sand and Ocean quahog (*Arctica islandica*) but reference is also given to associated community features to which the conservation objective also applies. The purpose of this is to provide some reference points, against which the success of the conservation objectives and the management plan can be measured.

By monitoring attributes of these features and sub-features, which have been identified to provide an indication of the condition of the feature, it should be possible to identify trends or changes in these habitats and whether or not these changes are natural or caused by human activities. This monitoring is essential in order to ensure that these habitats are being kept in (or restored to) favourable condition, the condition in which the habitat or species is capable of sustaining itself on a long-term basis.

Conservation Objective 1

To *recover*[1] the Subtidal (sublittoral) sand in *favourable condition*, taking account of natural change such that:

- The natural environmental quality[2] is maintained
- The natural environmental processes[3] are maintained
- The extent[4], diversity[5], community structure[6] and typical species[7] representative of the habitat are maintained.

Conservation Objective 2

To *recover*[1] the populations of Ocean quahog to *favourable condition*, taking account of natural change such that:

- The distribution of the species within the site are maintained
- The distribution, extent[4], structure[6], function and supporting processes[3] of the habitats supporting the species are maintained.

Explanation of terms used in the Conservation Objectives

1. Maintain or Recover/restore

Maintain implies that the feature is in favourable condition and will, subject to natural change, remain at its condition at designation. Any existing activities are deemed to be sustainable and will not adversely affect the condition of the feature *if current practices are continued at current levels.*

Recover/restore implies that the feature is degraded to some degree and that activities will have to be managed to reduce or eliminate negative impact(s). Restoration in the marine environment can refers to natural recovery through the removal of unsustainable physical, chemical and biological pressures, as well as intervention.

2. Natural environmental quality

e.g. chemical quality parameters of water, suspended sediment levels, radionuclide levels etc. should not deviate from baseline at designation (if available) or reference conditions.

3. Natural environmental processes

e.g. circulation, sediment deposition and erosion etc. should not deviate from baseline at designation (if available) or reference conditions.

4. Extent

The area covered by the habitat and communities

5. Diversity

The number of different biological species and communities

6. Community structure

e.g. age classes, sex ratios, distribution of species, abundance, biomass, reproductive capacity, recruitment, range and mobility.

7. Typical species

See Annex II

Monitoring Priorities

Monitoring will add to the existing baseline of information and where appropriate, existing survey work will be repeated in order to ensure that it conforms to the agreed monitoring methods.

The following table (Table 1) outlines the various types of monitoring that the Department considers necessary in order to be able to assess the condition of the MCZ's interest features (habitats and species). By monitoring various aspects or attributes of these features, it is possible to build up a picture of what is happening to the site and whether or not there need to be changes made to the way in which it is managed. The aim is to ensure that the interest features remain in (or are restored to) a favourable condition which can be said to occur when the target for each attribute is reached.

Table 1 Favourable condition table for Outer Belfast Lough MCZ

Feature	Sub-Feature	Attribute	Measure	Target	Comments
Ocean quahog (*Arctica islandica*)		Presence of Ocean quahog	Presence of Ocean quahog measured once during the reporting cycle.	Ocean quahog should be present in those areas of the Lough where they currently occur.	Measured against known baseline. Changes in presence may indicate long term changes in the physical conditions at the site.
		Extent and distribution of Ocean quahog	Extent and distribution of Ocean quahog measured once during the reporting cycle.	No decrease in extent or distribution from established baseline, subject to natural change.	Baseline survey required. Changes in extent and distribution may indicate long-term changes in the physical conditions at the site.
Subtidal (sublittoral) sand		Extent	Area (ha) measured periodically (frequency to be determined).	No decrease in extent from an established baseline subject to natural change.	Extent of feature provides a long- term integrated measure of environmental conditions. Reduction in extent may indicate long term changes in the physical conditions influencing the feature.

		Sediment character	Particle size analysis (PSA). Parameters include percentage sand/silt/gravel, mean and median grain size, and sorting coefficient used to characterise sediment type. Sediment character to be measured once during the reporting cycle.	Average PSA parameters should not deviate significantly from an established baseline, subject to natural change.	Sediment character, defined by particle size analysis, is key to the structure of the feature and reflects all of the physical processes acting on it. Particle size composition varies across the feature and can be used to indicate spatial distribution of sediment types thus reflecting the stability of the feature and the processes supporting it.
	Subtidal (sublittoral) sand and gravel communities Mixed sediment communities	Characteristic biotopes at sites chosen so as to provide some indication of the distribution and extent of the sub-feature.	Presence of selected biotopes at selected sites measured once during the reporting cycle.	Presence of selected biotopes should not deviate significantly from an established baseline, subject to natural change.	Species composition is an important contributor to the structure of the biotopes within the sub-feature. The presence and relative abundance of characterising species gives an indication of the quality of the biotopes and change in composition may indicate cyclic change/trend or long-term changes in the physical conditions at the site.

		Species composition of characteristic biotopes at monitoring sites.	Presence and abundance of composite species, measured once during the reporting cycle.	Presence and abundance of composite species should not deviate significantly from an established baseline, subject to natural change.	Species composition is an important contributor to the structure of the biotopes within the sub-feature. The presence and relative abundance of characterising species gives an indication of the quality of the biotopes and change in composition may indicate cyclic change/trend or long-term changes in the physical conditions at the site.

ANNEX II

Priority Marine Features (PMFs)

Table 1 List of Priority Marine Features recorded within the MCZ

Habitats	
Sea-pen and burrowing megafauna	
Subtidal (sublittoral) sand	
Subtidal (sublittoral) mixed sediments	
Subtidal chalk	
Low mobility species	
Common name	**Latin name**
Ocean quahog	*Arctica islandica*
Red seaweed	*Stenogramma interruptum*
Hydroid	*Tamarisca tamarisca*
Nudibranch	*Embletonia pulchra*
Sea cucumber	*Leptosynapta bergensis*
Queen scallop	*Aequipecten opercularis*
King scallop	*Pecten maximus*
Highly mobile species	
Common name	**Latin name**
Harbour porpoise	*Phocoena phocoena*
Eider duck	*Somateria mollissima*
European shag	*Phalacrocorax aristotelis*

ANNEX III

Sensitivity, exposure and vulnerability Matrix for Outer Belfast Lough MCZ

Sensitivity and Exposure Key: ●●● High ●● Moderate ● Low ○ Not Sensitive ? No information

Vulnerability Key: High vulnerability Moderate vulnerability Low vulnerability No vulnerability Unknown

Table 1 Ocean quahog (*Arctica islandica*) Vulnerability Assessment

The vulnerability to each pressure is derived from the sensitivity of the feature to the activity combined with its current exposure to that activity (i.e. to what degree the activity is occurring). The vulnerability rating/score provides a 'snapshot' of what is occurring at the time of the assessment – when considering new activities the exposure will be reassessed to give a new vulnerability rating.

Pressure category	Pressures	Activities associated in the area	OQ		
			Sensitivity	Exposure	Vulnerability
Hydrological pressures	**Temperature changes - local**	Waste management: *Sewage disposal*	●●●	●	**Moderate**
		Other man-made structures: *Submarine cable & pipeline operations*		●	**Moderate**
	Salinity changes - local		○		**No**
	Water flow (tidal current) changes (including sediment transport considerations)	Coastal infrastructure: *Coastal docks, ports & marinas. Coastal defence & land claim*	●	●	**Low**

	Emergence regime changes (includes tidal level change considerations)			○	**No**
	Wave exposure changes	*Coastal infrastructure: Coastal docks, ports & marinas. Coastal defence & land claim*	●●	●	**Low**
		Transport: Shipping – port operations (mooring, beaching, launching, ferry route etc.)		●	**Low**
Pollution and other Chemical pressures	**Non-synthetic compound contamination - Transition elements & organo-metals**		○		**No**
	Non-synthetic compound contamination - Hydrocarbon & PAH Contamination		○		**No**
	Synthetic compound contamination		○		**No**
	Radionuclide contamination		○		**No**
	Introduction of other substances (solid, liquid or gas)		?		**Unknown**
	De-oxygenation		○		**No**
	Nutrient enrichment		○		**No**
	Organic enrichment		○		**No**

Physical loss	**Physical loss (to land or freshwater habitat)**	Coastal infrastructure: *Coastal docks, ports & marinas. Coastal defence & land claim*	●●●	●	**Moderate**
		Waste management: *Dredge disposal*		●	**Moderate**
	Physical change (to another seabed type)	Extraction of living resources: *Fishing – dredging*	●●●	●●	**High**
		Extraction of living resources: *Fishing – demersal trawling*		●	**Moderate**
		Coastal infrastructure: *Coastal docks, ports & marinas. Coastal defence & land claim*		●	**Moderate**
		Other man-made structures: *Submarine cable & pipeline operations*		●	**Moderate**
Physical damage	**Habitat structure changes**	Extraction of living resources: *Fishing – dredging*	●●●	●●	**High**
		Extraction of living resources: *Fishing – demersal trawling*		●	**Moderate**
		Coastal infrastructure: *Coastal docks, ports & marinas. Coastal defence & land claim*		●	**Moderate**
		Waste management: *Dredge disposal*		●	**Moderate**
		Marine research: *Scientific and Archeological*		●●	**High**

		Other man-made structures: *Submarine cable & pipeline operations*		●	**Moderate**
	Penetration and/or disturbance of the substrate below the surface of the seabed - (Overall abrasion)	Extraction of living resources: *Fishing – dredging*	●●●	●●	**High**
		Extraction of living resources: *Fishing – demersal trawling*		●	**Moderate**
		Coastal infrastructure: *Coastal docks, ports & marinas. Coastal defence & land claim*		●	**Moderate**
		Waste management: *Dredge disposal*		●	**Moderate**
		Transport: *Shipping – general at sea (moorings, anchorage & vessel movements)*		●●	**High**
		Transport: *Shipping – port operations (mooring, beaching, launching, ferry route etc.)*		●	**Moderate**
		Recreation and leisure: *Recreational activities*		●	**Moderate**
		Marine research: *Scientific and Archeological*		●●	**High**
		Other man-made structures: *Submarine cable & pipeline operations*		●	**Moderate**

	Abrasion/disturbance of the surface of the substratum or seabed	Extraction of living resources: *Fishing – dredging*		●●	**Low**
		Extraction of living resources: *Fishing – demersal trawling*		●	**Low**
		Coastal infrastructure: *Coastal docks, ports & marinas. Coastal defence & land claim*		●	**Low**
		Waste management: *Dredge disposal*		●	**Low**
		Transport: *Shipping – general at sea (moorings, anchorage & vessel movements)*	●	●●	**Low**
		Transport: *Shipping – port operations (mooring, beaching, launching, ferry route etc.)*		●	**Low**
		Recreation and leisure: *Recreational activities*		●	**Low**
		Marine research: *Scientific and Archeological*		●●	**Low**
		Other man-made structures: *Submarine cable & pipeline operations*		●	**Low**
	Changes in suspended solids (water clarity)			○	**No**
	Siltation rate changes,	Extraction of living resources: *Fishing – dredging*	●●●	●●	**High**

	including smothering	Extraction of living resources: *Fishing – demersal trawling*		●	**Moderate**
		Coastal infrastructure: *Coastal docks, ports & marinas. Coastal defence & land claim*		●	**Moderate**
		Waste management: *Sewage disposal*		●	**Moderate**
		Waste management: *Dredge disposal*		●	**Moderate**
		Transport: *Shipping – general at sea (moorings, anchorage & vessel movements)*		●●	**High**
		Transport: *Shipping – port operations (mooring, beaching, launching, ferry route etc.)*		●	**Moderate**
		Recreation and leisure: *Recreational activities*		●	**Moderate**
		Marine research: *Scientific and Archeological*		●●	**High**
		Other man-made structures: *Submarine cable & pipeline operations*		●	**Moderate**
Other physical pressures	**Litter**		?		**Unknown**
	Electromagnetic changes		?		**Unknown**
	Underwater noise changes		○		**No**
	Introduction of light		?		**Unknown**

	Barrier to species movement		○		**Unknown**
	Death or injury by		○		**Unknown**
	Visual disturbance (behaviour)		?		**Unknown**
Biological pressures	**Genetic modification & translocation of indigenous species**			○	**No**
	Introduction or spread of non- indigenous species		○		**No**
	Introduction of microbial pathogens		○		**No**
	Removal of target species		○		**No**
	Removal of non- target species	Extraction of living resources: *Fishing – dredging*	●●	●●	**Moderate**
		Extraction of living resources: *Fishing – demersal trawling*		●	**Low**
		Extraction of living resources: *Fishing – traps (potting/creeling)*		●	**Low**
		Waste management: *Dredge disposal*		●	**Low**
		Recreation and leisure: *Recreational activities*		●	**Low**

Table 2 Subtidal (sublittoral) sand (SS) Vulnerability Assessment

The vulnerability to each pressure is derived from the sensitivity of the feature to the activity combined with its current exposure to that activity (i.e. to what degree the activity is occurring). The vulnerability rating/score provides a 'snapshot' of what is occurring at the time of the assessment – when considering new activities the exposure will be reassessed to give a new vulnerability rating.

Pressure category	Pressures	Activities associated in the area	SS		
			Sensitivity	Exposure	Vulnerability
Hydrological pressures	**Temperature changes - local**	Waste management: *Sewage disposal*	●	●	**Low**
		Other man-made structures: *Submarine cable & pipeline operations*		●	**Low**
	Salinity changes - local	Waste management: *Sewage disposal*	●●	●	**Low**
	Water flow (tidal current) changes (including sediment transport considerations)	Coastal infrastructure: *Coastal docks, ports & marinas. Coastal defence & land claim*	●	●	**Low**
	Emergence regime changes (includes tidal level change considerations)		○		**No**
	Wave exposure changes		○		**No**
Pollution and other Chemical	**Non-synthetic compound contamination - Transition elements & organo-metals**		○		**No**

pressures	**Non-synthetic compound contamination - Hydrocarbon & PAH Contamination**		○		**No**
	Synthetic compound contamination		○		**No**
	Radionuclide contamination		?		**Unknown**
	Introduction of other substances (solid, liquid or gas)		○		**No**
	De-oxygenation	Extraction of living resources: *Fishing – dredging*	●●	●●	**Moderate**
		Coastal infrastructure: *Coastal docks, ports & marinas. Coastal defence & land claim*		●	**Low**
		Waste management: *Sewage disposal*		●	**Low**
		Waste management: *Dredge disposal*		●	**Low**
	Nutrient enrichment		○		**No**
	Organic enrichment	Coastal infrastructure: *Coastal docks, ports & marinas. Coastal defence & land claim*	●●	●	**Low**
		Waste management: *Sewage disposal*		●	**Low**
		Waste management: *Dredge disposal*		●	**Low**

Physical loss	**Physical loss (to land or freshwater habitat)**	Coastal infrastructure: *Coastal docks, ports & marinas. Coastal defence & land claim*	●●●	●	**Moderate**
		Waste management: *Dredge disposal*		●	**Moderate**
	Physical change (to another seabed type)	Extraction of living resources: *Fishing – dredging*	●●●	●●	**High**
		Extraction of living resources: *Fishing – demersal trawling*		●	**Moderate**
		Coastal infrastructure: *Coastal docks, ports & marinas. Coastal defence & land claim*		●	**Moderate**
		Other man-made structures: *Submarine cable & pipeline operations*		●	**Moderate**
Physical damage	**Habitat structure changes**	Extraction of living resources: *Fishing – dredging*	●●●	●●	**High**
		Extraction of living resources: *Fishing – demersal trawling*		●	**Moderate**
		Coastal infrastructure: *Coastal docks, ports & marinas. Coastal defence & land claim*		●	**Moderate**
		Waste management: *Dredge disposal*		●	**Moderate**
		Marine research: *Scientific and Archeological*		●●	**High**

		Other man-made structures: *Submarine cable & pipeline operations*		●	**Moderate**
	Penetration and/or disturbance of the substrate below the surface of the seabed - (Overall abrasion)	Extraction of living resources: *Fishing – dredging*	●●	●●	**Moderate**
		Extraction of living resources: *Fishing – demersal trawling*		●	**Low**
		Coastal infrastructure: *Coastal docks, ports & marinas. Coastal defence & land claim*		●	**Low**
		Waste management: *Dredge disposal*		●	**Low**
		Transport: *Shipping – general at sea (moorings, anchorage & vessel movements)*		●●	**Moderate**
		Transport: *Shipping – port operations (mooring, beaching, launching, ferry route etc.)*		●	**Low**
		Recreation and leisure: *Recreational activities*		●	**Low**
		Marine research: *Scientific and Archeological*		●●	**Moderate**
		Other man-made structures: *Submarine cable & pipeline operations*		●	**Low**

	Abrasion/disturbance of the surface of the substratum or seabed	Extraction of living resources: *Fishing – dredging*		●●	**Moderate**
		Extraction of living resources: *Fishing – demersal trawling*		●	**Low**
		Coastal infrastructure: *Coastal docks, ports & marinas. Coastal defence & land claim*		●	**Low**
		Waste management: *Dredge disposal*		●	**Low**
		Transport: *Shipping – general at sea (moorings, anchorage & vessel movements)*	●●	●●	**Moderate**
		Transport: *Shipping – port operations (mooring, beaching, launching, ferry route etc.)*		●	**Low**
		Recreation and leisure: *Recreational activities*		●	**Low**
		Marine research: *Scientific and Archeological*		●●	**Moderate**
		Other man-made structures: *Submarine cable & pipeline operations*		●	**Low**
	Changes in suspended solids (water clarity)		○		**No**
	Siltation rate changes,	Extraction of living resources: *Fishing – dredging*	●	●●	**Low**

	including smothering	Extraction of living resources: *Fishing – demersal trawling*		●	**Low**
		Coastal infrastructure: *Coastal docks, ports & marinas. Coastal defence & land claim*		●	**Low**
		Waste management: *Sewage disposal*		●	**Low**
		Waste management: *Dredge disposal*		●	**Low**
		Transport: *Shipping – general at sea (moorings, anchorage & vessel movements)*		●●	**Low**
		Transport: *Shipping – port operations (mooring, beaching, launching, ferry route etc.)*		●	**Low**
		Recreation and leisure: *Recreational activities*		●	**Low**
		Marine research: *Scientific and Archeological*		●●	**Low**
		Other man-made structures: *Submarine cable & pipeline operations*		●	**Low**
Other physical pressures	**Litter**		?		**Unknown**
	Electromagnetic changes		?		**Unknown**
	Underwater noise changes		○		**No**
	Introduction of light		○		**No**

	Barrier to species movement		○		**No**
	Death or injury by collision		○		**No**
	Visual disturbance (behaviour)		○		**No**
Biological pressures	**Genetic modification & translocation of indigenous species**		?		**Unknown**
	Introduction or spread of non- indigenous species		?		**Unknown**
	Introduction of microbial pathogens		?		**Unknown**
	Removal of target species		○		**No**
	Removal of non- target species	Extraction of living resources: *Fishing – dredging*	●●	●●	**Moderate**
		Extraction of living resources: *Fishing – demersal trawling*		●	**Low**
		Extraction of living resources: *Fishing – traps (potting/creeling)*		●	**Low**
		Waste management: *Dredge disposal*		●	**Low**
		Recreation and leisure: *Recreational activities*		●	**Low**

Risk of Damage Assessment for Outer Belfast Lough MCZ

Level of risk Key: High risk Medium risk Low risk

Table 3 Ocean quahog (*Arctica islandica)* (OQ) Risk of Damage Matrix

This is based on the feature Vulnerability identified in Table 1 and takes into consideration any current management measures in place which may reduce the risk of damage being incurred. This table does not cover new activities as these will not have been taken into account in the Vulnerability assessment.

OQ						
Activity	**Pressures associated with activity**	**Vulnerability**	**Is the current management adequate?‡**	**Comments**	**Level of Risk**	**Action Advised**
Extraction of living resources: *Fishing – Dredging (scallops)*	**Physical change (to another seabed type)**	**High**	No	No site specific management of this activity in place.	**High**	- Remove or avoid pressures associated with dredging within the MCZ
	Habitat structure changes	**High**			**High**	
	Penetration and/or disturbance of the substrate below the surface of the seabed - (Overall abrasion)	**High**			**High**	

‡ This does not refer to any future activities or situations where active management is not required.

	Abrasion/disturbance of the surface of the substratum or seabed	**Low**			**Moderate**	
	Siltation rate changes, including smothering	**High**			**High**	
	Removal of non-target species	**Moderate**			**Moderate**	
Extraction of living resources: *Fishing – Demersal trawling (mussels)*	**Physical change (to another seabed**	**Moderate**	No	No site specific management of this activity in place.	**Moderate**	- Remove or avoid pressures associated with demersal trawling within the MCZ
	Habitat structure changes	**Moderate**			**Moderate**	
	Penetration and/or disturbance of the substrate below the surface of the seabed - (Overall abrasion)	**Moderate**			**Moderate**	
	Abrasion/disturbance of the surface of the substratum or	**Low**			**Moderate**	
	Siltation rate changes, including smothering	**Moderate**			**Moderate**	
	Removal of non-target species	**Low**			**Moderate**	

Extraction of living resources: *Fishing – traps (creeling/ potting)*	**Removal of non-target species**	**Low**	No	No site specific management of this activity in place.	**Moderate**	- Reduce or limit creeling and potting activities within the MCZ
Coastal infrastructure: *Coastal docks, ports & marinas*	**Water flow (tidal current) changes (including sediment transport considerations)**	**Low**	Yes	New developments require future management action (licensing/permits).	**Low**	- No additional management is required
	Wave exposure changes	**Low**			**Low**	
	Physical loss (to land or freshwater habitat)	**Moderate**			**Low**	
	Physical change (to another seabed type)	**Moderate**			**Low**	
	Habitat structure changes	**Moderate**			**Low**	
	Penetration and/or disturbance of the substrate below the surface of the seabed - (Overall abrasion)	**Moderate**			**Low**	

	Abrasion/disturbance of the surface of the substratum or seabed	**Low**			**Low**	
	Siltation rate changes, including smothering	**Moderate**			**Low**	
Coastal infrastructure: *Coastal defence & land claim*	**Water flow (tidal current) changes (including sediment transport considerations)**	**Low**	Yes	New developments require future management action (licensing/permits).	**Low**	- No additional management is required
	Wave exposure changes	**Low**			**Low**	
	Physical loss (to land or freshwater habitat)	**Moderate**			**Low**	
	Physical change (to another seabed type)	**Moderate**			**Low**	
	Habitat structure changes	**Moderate**			**Low**	
	Penetration and/or disturbance of the substrate below the surface of the seabed - (Overall abrasion)	**Moderate**			**Low**	

	Abrasion/disturbance of the surface of the substratum or seabed	**Low**			**Low**	
	Siltation rate changes, including smothering	**Moderate**			**Low**	
Waste management: *Sewage disposal*	**Temperature changes - local**	**Moderate**	Yes	New developments require future management action (licensing/permits).	**Low**	- No additional management is required
	Siltation rate changes, including smothering	**Moderate**			**Low**	
Waste management: *Dredge disposal*	**Physical loss (to land or freshwater habitat)**	**Moderate**	Yes	New applications require future management action (licensing/permits).	**Low**	- No additional management is required
	Habitat structure changes	**Moderate**			**Low**	
	Penetration and/or disturbance of the substrate below the surface of the seabed - (Overall abrasion)	**Moderate**			**Low**	
	Abrasion/disturbance of the surface of the substratum or seabed	**Low**			**Low**	

	Siltation rate changes, including smothering	**Moderate**			**Low**	
	Removal of non-target species	**Low**			**Low**	
Transport: *Shipping – general at sea (moorings, anchorage & vessel movements)*	**Penetration and/or disturbance of the substrate below the surface of the seabed - (Overall abrasion)**	**High**	No	No management of this activity in place.	**High**	- Remove or avoid anchoring and moorings within the MCZ Anchoring in emergency situations will not be restricted
	Abrasion/disturbance of the surface of the substratum or seabed	**Low**			**Moderate**	
	Siltation rate changes, including smothering	**High**			**High**	
Transport: *Shipping – port operations (mooring, beaching, launching, ferry route etc.)*	**Wave exposure changes**	**Low**	Yes	New activities inside the MCZ require future management action (licensing/permits).	**Low**	- No additional management is required Anchoring in emergency situations will not be restricted
	Penetration and/or disturbance of the substrate below the surface of the seabed - (Overall abrasion)	**Moderate**			**Low**	

	Abrasion/disturbance of the surface of the substratum or seabed	**Low**			**Low**	
	Siltation rate changes, including smothering	**Moderate**			**Low**	
Recreation and leisure: ***Recreational activities***	**Penetration and/or disturbance of the substrate below the surface of the seabed - (Overall abrasion)**	**Moderate**	No	No management of this activity in place.	**Moderate**	- Remove or avoid anchoring, moorings, recreation and leisure pressures within the MCZ Anchoring in emergency situations will not be restricted
	Abrasion/disturbance of the surface of the substratum or seabed	**Low**			**Moderate**	
	Siltation rate changes, including smothering	**Moderate**			**Moderate**	
	Removal of non-target species	**Low**			**Moderate**	
Marine research:	**Habitat structure changes**	**High**	Yes	New activities inside the MCZ require	**Low**	- No additional management is

Scientific and Archeological	**Penetration and/or disturbance of the substrate below the surface of the seabed - (Overall abrasion)**	**High**		future management action (licensing/permits).	**Low**	required
	Abrasion/disturbance of the surface of the substratum or seabed	**Low**			**Low**	
	Siltation rate changes, including smothering	**High**			**Low**	
Other man-made structures: *Submarine cables & pipelines operations*	**Temperature changes - local**	**Moderate**	Yes	New developments require future management action (licensing/permits).	**Low**	- No additional management is required
	Physical change (to another seabed type)	**Moderate**			**Low**	
	Habitat structure changes	**Moderate**			**Low**	
	Penetration and/or disturbance of the substrate below the surface of the seabed - (Overall abrasion)	**Moderate**			**Low**	
	Abrasion/disturbance of the surface of the substratum or seabed	**Low**			**Low**	

	Siltation rate changes, including smothering	**Moderate**			**Low**	

Table 4 Subtidal sand (SS) Risk of Damage Matrix

This is based on the feature Vulnerability identified in Table 2 and takes into consideration any current management measures in place which may reduce the risk of damage being incurred. This table does not cover new activities as these will not have been taken into account in the Vulnerability assessment.

SS						
Activity	**Pressures associated with activity**	**Vulnerability**	**Is the current management adequate?[§]**	**Comments**	**Level of Risk**	**Action Advised**
Extraction of living resources: *Fishing – Dredging (scallops)*	**De-oxygenation type)**	**Moderate**	No	No site specific management of this activity in place.	**Moderate**	- Remove or avoid pressures associated with dredging within the MCZ
	Physical change (to another seabed type)	**High**			**High**	
	Habitat structure changes	**High**			**High**	
	Penetration and/or disturbance of the substrate below the surface of the seabed - (Overall abrasion)	**Moderate**			**Moderate**	
	Abrasion/disturbance of the surface of the substratum or seabed	**Moderate**			**Moderate**	

[§] This does not refer to any future activities or situations where active management is not required.

	Siltation rate changes, including smothering	**Low**			**Moderate**	
	Removal of non-target species	**Moderate**			**Moderate**	
Extraction of living resources: *Fishing – Demersal trawling (mussels)*	**Physical change (to another seabed**	**Moderate**	No	No site specific management of this activity in place.	**Moderate**	- Remove or avoid pressures associated with demersal trawling within the MCZ
	Habitat structure changes	**Moderate**			**Moderate**	
	Penetration and/or disturbance of the substrate below the surface of the seabed - (Overall abrasion)	**Low**			**Moderate**	
	Abrasion/disturbance of the surface of the substratum or seabed	**Low**			**Moderate**	
	Siltation rate changes, including smothering	**Low**			**Moderate**	
	Removal of non-target species	**Low**			**Moderate**	
Extraction of living resources: *Fishing – traps (creeling/ potting)*	**Removal of non-target species**	**Low**	No	No site specific management of this activity in place.	**Moderate**	- Reduce or limit creeling and potting activities within the MCZ

Coastal infrastructure -*Coastal docks, ports & marinas*	**Water flow (tidal current) changes (including sediment transport considerations)**	**Low**	Yes	New developments require future management action (licensing/permits).	**Low**	- No additional management is required
	De-oxygenation	**Low**			**Low**	
	Organic enrichment	**Low**			**Low**	
	Physical loss (to land or freshwater habitat)	**Moderate**			**Low**	
	Physical change (to another seabed type)	**Moderate**			**Low**	
	Habitat structure changes	**Moderate**			**Low**	
	Penetration and/or disturbance of the substrate below the surface of the seabed - (Overall abrasion)	**Low**			**Low**	
	Abrasion/disturbance of the surface of the substratum or seabed	**Low**			**Low**	
	Siltation rate changes, including smothering	**Low**			**Low**	

Coastal infrastructure - *Coastal defence & land claim*	**Water flow (tidal current) changes (including sediment transport considerations)**	**Low**	Yes	New developments require future management action (licensing/permits).	**Low**	- No additional management is required
	De-oxygenation	**Low**			**Low**	
	Organic enrichment	**Low**			**Low**	
	Physical loss (to land or freshwater habitat)	**Moderate**			**Low**	
	Physical change (to another seabed type)	**Moderate**			**Low**	
	Habitat structure changes	**Moderate**			**Low**	
	Penetration and/or disturbance of the substrate below the surface of the seabed - (Overall abrasion)	**Low**			**Low**	
	Abrasion/disturbance of the surface of the substratum or seabed	**Low**			**Low**	
	Siltation rate changes, including smothering	**Low**			**Low**	
Waste management:	**Temperature changes - local**	**Low**	Yes	New developments require future	**Low**	- No additional management is

Sewage disposal	**Salinity changes - local**	**Low**		management action (licensing/permits).	**Low**	required
	De-oxygenation	**Low**			**Low**	
	Organic enrichment	**Low**			**Low**	
	Siltation rate changes, including smothering	**Low**			**Low**	
Waste management: *Dredge disposal*	**De-oxygenation**	**Low**	Yes	New applications require future management action (licensing/permits).		- No additional management is required
	Organic enrichment	**Moderate**			**Low**	
	Habitat structure changes	**Moderate**			**Low**	
	Penetration and/or disturbance of the substrate below the surface of the seabed - (Overall abrasion)	**Low**			**Low**	
	Abrasion/disturbance of the surface of the substratum or seabed	**Low**			**Low**	
	Siltation rate changes, including smothering	**Low**			**Low**	
	Removal of non-target species	**Low**			**Low**	

Transport: *Shipping – general at sea (moorings, anchorage & vessel movements)*	**Penetration and/or disturbance of the substrate below the surface of the seabed - (Overall abrasion)**	**Moderate**	No	No management of this activity in place.	**High**	- Remove or avoid anchoring and moorings within the MCZ Anchoring in emergency situations will not be restricted
	Abrasion/disturbance of the surface of the substratum or seabed	**Moderate**			**Moderate**	
	Siltation rate changes, including smothering	**Low**			**High**	
Transport: *Shipping – port operations (mooring, beaching, launching, ferry route etc.)*	**Penetration and/or disturbance of the substrate below the surface of the seabed - (Overall abrasion)**	**Low**	Yes	New activities inside the MCZ require future management action (licensing/permits).	**Low**	- No additional management is required Anchoring in emergency situations will not be restricted
	Abrasion/disturbance of the surface of the substratum or seabed	**Low**			**Low**	
	Siltation rate changes, including smothering	**Low**			**Low**	
Recreation and leisure: *Recreational activities*	**Penetration and/or disturbance of the substrate below the surface of the seabed - (Overall abrasion)**	**Low**	No	No management of this activity in place.	**Moderate**	- Remove or avoid anchoring, moorings, recreation and leisure pressures within the

	Abrasion/disturbance of the surface of the substratum or seabed	**Low**			**Moderate**	MCZ Anchoring in emergency situations will not be restricted
	Siltation rate changes, including smothering	**Low**			**Moderate**	
	Removal of non-target species	**Low**			**Moderate**	
Marine research: ***Scientific and Archaeological***	**Habitat structure changes**	**High**	Yes	New activities inside the MCZ require future management action (licensing/permits).	**Low**	- No additional management is required
	Penetration and/or disturbance of the substrate below the surface of the seabed - (Overall abrasion)	**Low**			**Low**	
	Abrasion/disturbance of the surface of the substratum or seabed	**Moderate**			**Low**	
	Siltation rate changes, including smothering	**Low**			**Low**	
Other man-made structures: ***Submarine cables & pipelines***	**Temperature changes - local**	**Moderate**	Yes	New developments require future management action (licensing/permits).	**Low**	- No additional management is required
	Physical change (to another seabed type)	**Moderate**			**Low**	
	Habitat structure changes	**Moderate**			**Low**	

operations	**Penetration and/or disturbance of the substrate below the surface of the seabed - (Overall abrasion)**	**Moderate**			**Low**	
	Abrasion/disturbance of the surface of the substratum or seabed	**Low**			**Low**	
	Siltation rate changes, including smothering	**Moderate**			**Low**	

DAERA Marine and Fisheries Division

2nd Floor,

Klondyke Building

Cromac Avenue

Malone Lower

Belfast

BT7 2AJ

Telephone: 028 90569262

Email: Marine.InfoRequests@daera-ni.gov.uk

Web: www.daera-ni.gov.uk/topics/marine

Photos represent Priority Marine Features found throughout the Northern Ireland Inshore Region

ISBN 978-1-84807-697-6

Department of Agriculture, Environment and Rural Affairs

www.daera-ni.gov.uk

INVESTORS IN PEOPLE