

Marine Scotland

Scottish Marine Protected Areas (MPA) Monitoring Strategy

June 2017

March 2024

Scottish Marine Protected Areas (MPA) Monitoring Strategy

1. Foreword

The Scottish Marine Protected Area (MPA) Monitoring Strategy develops an approach to MPA-related survey and monitoring. This is to ensure that sufficient information is collected to underpin assessment and reporting obligations. It will also enable provision of management advice at the individual site and wider network scale.

The Strategy has been developed by Marine Scotland (MS) and Marine Scotland Science (MSS), in partnership with Scottish Natural Heritage (SNH) and the Joint Nature Conservation Committee (JNCC). It covers all Scottish Waters, from the coast to the extent of the UK Continental Shelf Claim Limits (UKCS)¹, and all types of protected areas. More information on the scope of the Strategy can be found in Section 3.

The Strategy provides:

- direction for monitoring, assessment and reporting on the MPA network;
- guidance on standardisation of monitoring objectives, sampling design, and methodologies;
- principles for prioritising MPA-related monitoring;
- consideration of using proxy methods (e.g. pressure information) to meet requirements; and,
- recognition of the importance of collaborative and citizen-led science programmes.

The Strategy is intended to be a working document which will be reviewed on a regular basis in collaboration with partner organisations.

¹ The Strategy does not cover the marine areas adjacent to England, Wales or Northern Ireland or areas outside UK jurisdiction adjacent to Scotland.

2. Introduction

2.1 The need for a Scottish MPA Monitoring Strategy

There are a number of legislative and policy drivers for MPA monitoring, assessment and reporting. The principal ones for which information should be gathered on MPAs are:

- Convention on Biological Diversity (CBD)
- Convention on the Protection of the Marine Environment of the North East Atlantic (OSPAR Convention)
- Marine (Scotland) Act 2010 and Marine and Coastal Access Act 2009 (MCAA)
- EU Directives (Habitats, Birds, Water Framework, and Marine Strategy Framework)

More information on these drivers can be found in Table 1. See also JNCC (2016).

To meet these reporting and assessment obligations, there is a need to gather appropriate evidence to assess the condition of sites, and determine whether any implemented management measures are proving effective. The Strategy provides a basis for gathering relevant information, and using it for assessment and reporting purposes.

The Strategy provides the direction for a new approach to site-based monitoring in the Scottish marine environment. Some work has already been undertaken to monitor feature condition at a site level, particularly in relation to European Marine Sites. However, the addition of Nature Conservation MPAs to the network and ongoing implementation of fisheries management measures has stimulated the development of this Strategy to ensure that future work is targeted accordingly. The Strategy provides the direction for future MPA-related monitoring in Scottish waters. The detailed monitoring programme for all marine biodiversity will be incorporated into future iterations of the annexes.

2.2 The Strategy's purpose

The purpose of this Strategy is to develop a long-term approach to MPA-related survey and monitoring effort. It does so by:

- Setting out a Scottish policy position and direction in relation to future MPA monitoring.
- Identifying principles to prioritise future MPA monitoring.
- Determining respective roles and responsibilities of Government and Public Bodies to optimise MPA-related monitoring, assessment and reporting delivery.
- Promoting collaborations with industry, academia, local coastal communities and other marine stakeholders to deliver better co-ordination of monitoring activities.
- Developing links to other relevant strategies and work streams.
- Highlighting the need for monitoring and reporting of relevant human activities.

- Promoting the application of the most appropriate monitoring and assessment methods including the testing of novel techniques to gather the required evidence.
- Ensuring that appropriate data standards and management systems are in place, and that data are accessible for other users.

Table 1. The main MPA-related policy drivers, including reporting and assessment requirements and reporting cycle frequency. Adapted from the “*Review of marine biodiversity assessment obligations in the UK*” (Hinchen, 2014).

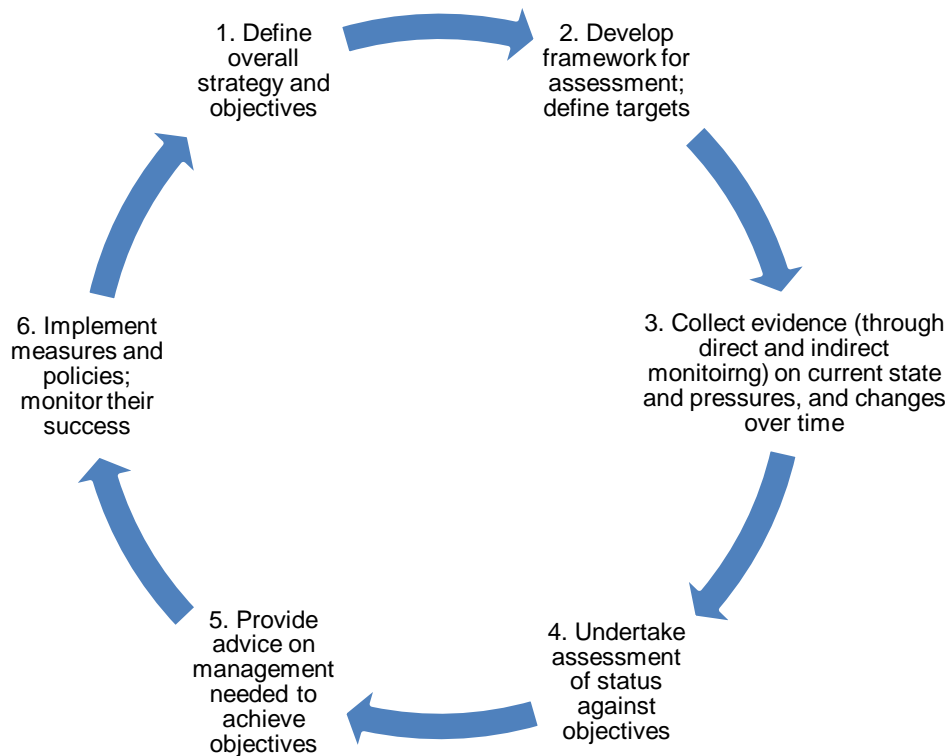
	International Conventions		UK Legislation		European Legislation			
	OSPAR Convention	Convention on Biological Diversity	Marine Scotland Act	Marine and Coastal Access Act	Habitats Directive	Birds Directive	Water Framework Directive	Marine Strategy Framework Directive
High level aspirations	Take the necessary measures to protect the maritime area against the adverse effects of human activities so as to safeguard human health and to conserve marine ecosystems, and where practical, restore marine areas that have been adversely affected.	Conserve biological diversity, ensure sustainable use of its components and the fair and equitable sharing of the benefits arising from the utilisation of genetic resources.....”	Help ensure clean, healthy, safe, productive and biologically diverse marine and coastal environments that meet the long term needs of people and nature. Puts in place a system for improved management and protection.	Define objectives for marine conservation. Designate MCZs to contribute to an ecologically coherent network of MPAs.	Maintain or restore natural habitats and species of Community interest to FCS. Establish Natura 2000 network of SACs.	Conservation of all species of naturally occurring birds in the wild state. Provisions for protection, management and control of these species and rules for their exploitation, including establishing SPAs.	Establish a framework for the protection of inland surface waters (rivers and lakes), transitional waters (estuaries), coastal waters and groundwater. To ensure that all aquatic ecosystems meet 'good status' by 2015.	Achieve Good Environmental Status (GES) in marine waters by 2020.

Assessment and reporting requirements	Article 6 - "CPs [Contracting Parties] shall... a) undertake and publish at regular intervals joint assessments of the status of the marine environment and of its development, for the maritime area, or for the regions thereof."	Article 26 - "Each CP shall...present reports on the measures taken for the implementation of the provisions of this Convention and their effectiveness in meeting the objectives."	Section 103 - "Before the end of each relevant period...., Scottish Ministers must lay before Parliament a report..."	Section 124 - "Before the end of every relevant period...., the appropriate authority must lay before the appropriate legislature (Parliament, Scottish Parliament, Welsh Assembly) a report..."	Article 17 - "Every six years....MSs [Member States] shall draw up a report on the implementation of the measures taken under this Directive....."	Article 12(1) - "MSs shall....report on the implementation of national provisions taken under this Directive."	Article 15 - "MSs shall submit ... summary reports of the monitoring programmes designed under Article 8.... a report describing progress in the implementation of the planned programme of measures."	Article 8 - "In respect of each marine region or subregion, MSs shall make an initial assessment of their marine waters..." Article 17 - "MSs shall review...their marine strategies every six years ..."
Reporting cycle frequency	Regular intervals.	Intervals determined by the COPs.	Every 6 years - next reporting in Dec 2018.	Every 6 years - next reporting in Dec 2018.	Every 6 years - next reporting 2019.	Every 6 years - next reporting in 2019.	Every 6 years - next reporting in July 2018.	Every 6 years - next reporting in July 2018.

The Strategy provides a framework for gathering the necessary evidence to meet all current reporting and assessment obligations. Figure 1 outlines the roles of monitoring and assessment within the MPA management cycle. This information will allow managers to take an adaptive approach to the management of Scottish MPA's in response to human activities. It will also provide evidence to monitor progress towards achieving the Scottish Government's vision of having "*clean, healthy, safe, productive and biologically diverse marine and coastal environments that meet the long term needs of people and nature*" (Marine Scotland, 2011).

It is essential that the Strategy considers all opportunities for gathering and accessing evidence beyond direct survey and monitoring, making best possible use of existing evidence sources. This will enable available economic resources to be targeted appropriately.

Figure 1. The adaptive management cycle².



² Noting that not all monitoring types lend themselves well to adaptive management.

2.3 Links to other strategies and work streams

The Strategy needs to consider a number of ongoing work streams including:

- UK Marine Monitoring and Assessment Strategy (UKMMAS)
 - UK Marine Biodiversity Monitoring Strategy;
 - Advice on monitoring options for habitats and species³;
 - Work by JNCC to collate and disseminate monitoring standards and guidelines via the [Marine Method Finder web portal](#).
- Scottish Marine Science Strategy
- CAMERAS Environmental Monitoring Strategy and the development of a Marine Monitoring Action Plan (Marine MAP)
- Scottish Biodiversity Strategy (and associate route map and evidence plan)
- Scottish Climate Change Adaptation Programme ([SCCAP](#))⁴ - gathering data to help assess the impact climate change is having on our seas (Objective N1/N1-6)

The Strategy complements these existing strategies and work streams, by promoting better co-ordination to deliver a more robust process.

2.4 Implementation of the Strategy

Marine Scotland will drive forward delivery of the Strategy, supported principally by SNH and JNCC. There is also a key role for the wider marine community and stakeholders to help provide the evidence base needed to fulfil the Strategy.

3. Scope

This Strategy covers the full extent of Scottish Waters. This extends from the coast (at mean high water spring) out to the extent of the UK Continental Shelf Claim Limits (Figure 2).

The Strategy encompasses Nature Conservation Marine Protected Areas (NC MPAs), Special Areas of Conservation (SACs), Special Protection Areas (SPAs), Ramsar sites, Sites of Special Scientific Interest (SSSIs) and other area based measures⁵. These existing sites are displayed on Figure 2.

Information on the MPA network in Scotland's seas can be viewed on the [National Marine Plan interactive \(NMPi\)](#) portal. Further details on individual sites and their protected features are available online at [JNCC's Site Information Centres](#) and the [SNH SiteLink](#) portal.

³ For - cetaceans, seals, marine birds, fish and cephalopods, plankton, benthic habitats and deep sea habitats.

⁴ [SCAAP](#) sets out Ministers' objectives, policies and proposals to tackle the climate change impacts identified for Scotland

⁵ A number of existing MPAs (SACs, SPAs, NC MPAs and Ramsar sites) have been submitted to OSPAR and have been adopted as OSPAR MPAs.

In some instances, monitoring of features outside of protected areas will be relevant. For example:

- Mobile species subject to protection within and outwith sites.
- Benthic features for comparative purposes under some types of monitoring.
- Opportunistic monitoring of the response of features to changes in management measures elsewhere (e.g. re-opening of fishery closures) to better understand the pressure-state relationships relevant to MPAs.
- Monitoring of areas potentially at risk because of increased pressure caused by displacement through MPA management measures.

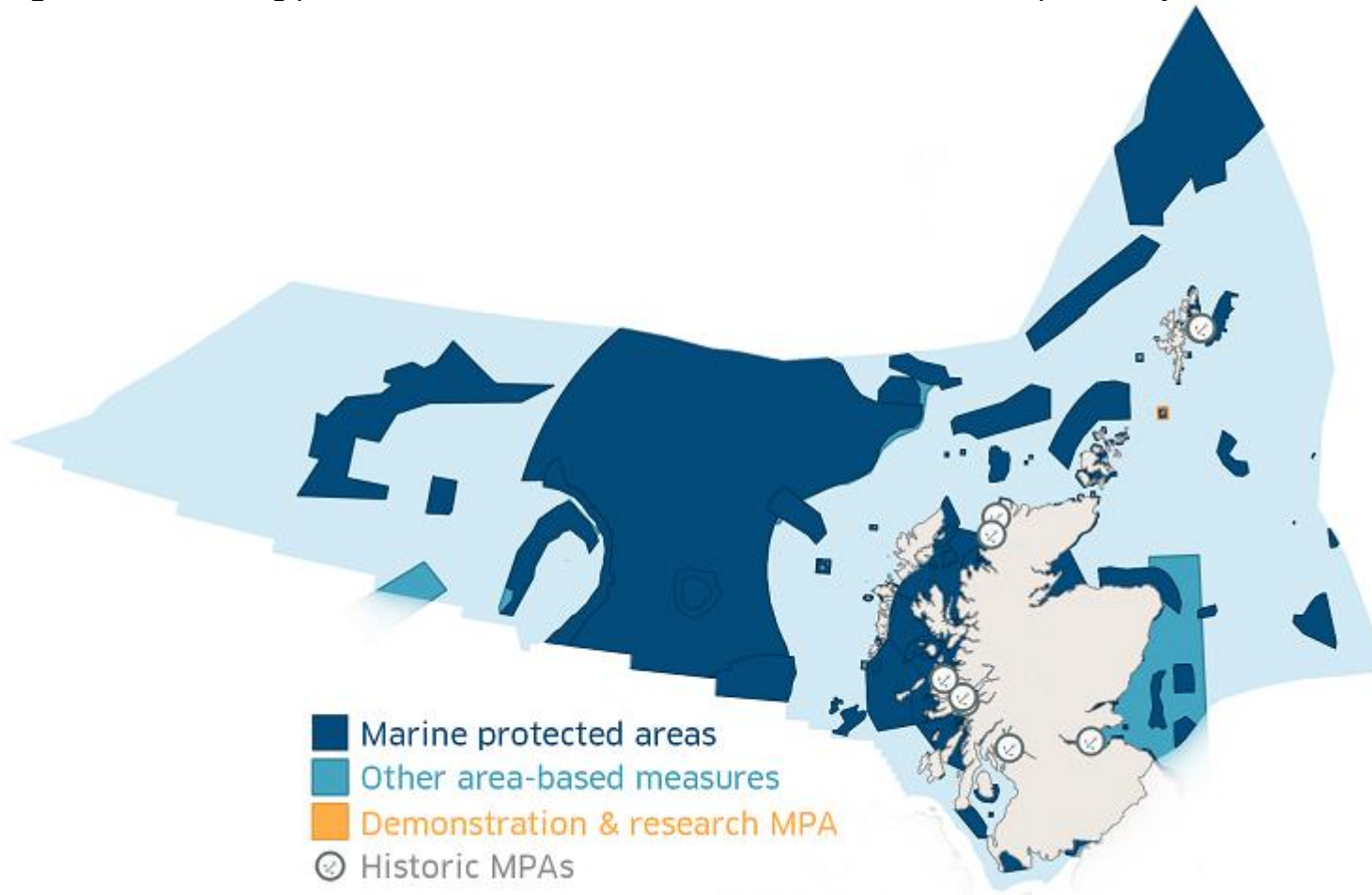
3.1 Exclusions to scope

The Strategy does not extend beyond Scottish Waters. It also excludes geodiversity interests, Historic MPAs and Demonstration and Research MPAs (D&R MPAs)⁶. It does not cover the terrestrial environment.

The Strategy does not consider compliance and socio-economic aspects. An assessment of emerging evidence on the socio-economic impacts of Scotland's MPAs and new fisheries management measures is [available online](#).

⁶ Monitoring of historic MPAs is led by Historic Environment Scotland and Demonstration and Research MPAs by local stakeholder groups. There may be opportunities to join up monitoring with work under this strategy where these interests coincide.

Figure 2. Existing protected areas and other area-based measures encompassed by the Scottish MPA Monitoring Strategy⁷.



⁷ Correct as of November 2023. For more information on the Scottish MPA network please refer to [Marine Scotland Information](#).

4. Scottish MPA Monitoring Strategy - Guiding principles

In developing our approach to monitoring and assessment, we will apply the following series of guiding principles:

- The MPA Monitoring Strategy will be implemented in partnership with stakeholders and will be reviewed regularly and updated to reflect changing priorities, new knowledge, and available resources.
- Spend on MPA-related monitoring should be balanced against other activities that can help improve the conservation status of MPA features, and survey work outside the network that may improve our understanding of wider feature distribution and status.
- Our MPA monitoring approach should be integrated as far as possible with other current activities to minimise resource requirements. We will work to achieve better co-ordination, share costs and avoid duplication.
- The existing valuable contribution from stakeholders in establishing the Scottish marine biodiversity knowledge-base is recognised. We will continue to develop opportunities for future collaborative delivery of marine environmental monitoring.
- We will apply the most appropriate monitoring methods and test novel techniques.
- Other marine biodiversity monitoring commitments will continue to be pursued and evidence collected under this Strategy will be used for those purposes.
- Sampling of habitats which occur within Scottish MPAs as part of routine MPA monitoring may represent a cost-effective mechanism for helping to meet wider assessment needs.
- The order in which monitoring surveys take place will be constrained by logistics (e.g. availability of suitable vessels; effects of weather down time etc.).
- Appropriate standards and management systems will be used. This will include Quality Assurance (QA) and ensuring discoverability and accessibility of data.

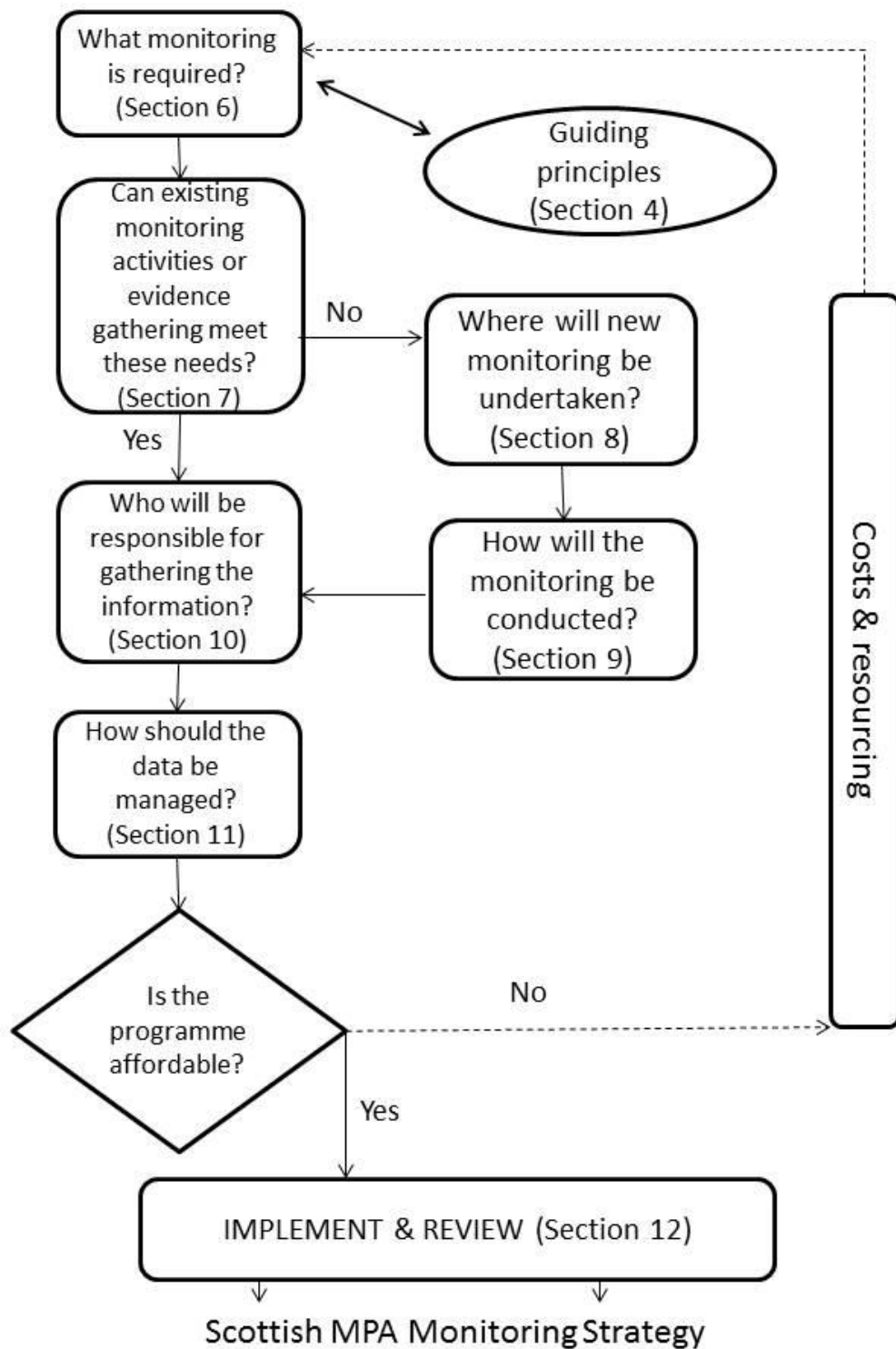
5. Components of the Strategy

The Strategy will consider each of the following in turn:

- What monitoring or evidence gathering is required? [*Section 6*]
- Whether existing monitoring activities or evidence gathering can meet these requirements? [*Section 7*]
- Where monitoring will be undertaken [*Section 8*]
- How the monitoring will be conducted [*Section 9*]
- Who will be responsible for gathering the data? [*Section 10*]
- How the data should be managed [*Section 11*]
- Ensuring the Strategy is effective [*Section 12*]

Each of these aspects is considered in more detail. A diagram illustrating the components of the Strategy is provided overleaf.

Figure 3. The key components of the Scottish MPA Monitoring Strategy.



6. What monitoring or evidence gathering is required?

To meet our monitoring and reporting obligations, clear quantifiable objectives should be established. In most cases, monitoring will be undertaken to meet one or more of the following objectives:

- To determine the condition of the protected features;
- To identify any changes in the features over time;
- To assess whether implemented management measures are effective in meeting their objectives.

Meeting these objectives requires information on human activities (and their associated pressures) taking place within and adjacent to MPAs, as well as information on the protected features. The results of monitoring will inform an adaptive approach to MPA management.

6.1 Pressure(s) monitoring

Where possible, monitoring should cover the pressures exerted on MPA features and the biological impact of these pressures to determine whether current management is effective. A summary of the key pressures for the different MPA feature groups is provided in Table 2 with additional information in Annex 1.

A risk-based approach to management of Scottish MPAs is used to ensure that activities are sustainable. An assessment of MPA feature sensitivity to pressure is provided in the [FEAST portal](#) (FEature, Activity, Sensitivity Tool). FEAST also details the links between human activities and pressures for Scottish waters. Sensitivity assessments for seabed habitats have recently been completed and are available on the [MarLIN website](#). A working group is progressing updates to FEAST to ensure coverage of all MPA network features in the future.

Many pressures and related activities are difficult to monitor systematically. Relevant information needs to be gleaned through marine planning and licensing on a case by case basis (e.g. in relation to pollution, organic enrichment, siltation, habitat loss, etc.).

Monitoring programmes do exist for some specific pressures. For example, the Scottish Marine Animal Strandings Scheme (SMASS) and the UK Cetacean Strandings Investigative Programme (CSIP) monitor pressures associated with disease, entanglement, deliberate killing and trauma in marine animal populations, while the UK Bycatch Monitoring Programme monitors fisheries with a risk of bycatch of marine species.

Where possible, relevant activities and their spatial and temporal distribution will be monitored remotely. For example, seabed abrasion can be inferred by analysing Vessel Monitoring System (VMS) data from fishing vessels. VMS data are currently lacking for <12 m vessels and it is also difficult to infer abrasion pressure from VMS data for vessels operating static gear. Such vessels routinely operate in Scottish inshore waters and there is a need to improve monitoring of pressures arising from

these sectors. An ongoing European Maritime and Fisheries Fund (EMFF) project is investigating potential cost effective solutions for monitoring smaller inshore vessels.

Table 2. List of the most significant pressures for each MPA biodiversity feature group (more detailed information is provided in Annex 1)⁸.

Receptors	Pressure
Marine birds	<ul style="list-style-type: none"> • Bycatch / entanglement • Collisions • Disease/parasitism • Disturbance (including noise and lighting) • Non-native species (on land/at colonies) • Pollution • Reduced prey availability • Physical barriers to movement • Physical damage or loss to habitats (on land/at colonies)
Seals (harbour and grey)	<ul style="list-style-type: none"> • Bycatch / entanglement • Collisions • Disease • Physical barriers to movement • Physical damage or loss due to habitats • Pollution • Reduced prey availability • Visual disturbance
Cetaceans	<ul style="list-style-type: none"> • Bycatch / entanglement • Collisions • Noise disturbance • Physical barriers to movement Physical damage or loss to habitats • Pollution (esp. PCBs) • Reduced prey availability
Fish	<ul style="list-style-type: none"> • Bycatch / entanglement • Collisions • Disease • Physical barriers to movement • Physical damage or loss to habitats Pollution Reduced prey availability
Seabed habitats	<ul style="list-style-type: none"> • Hydrological changes • Organic enrichment • Physical damage or loss to habitats • Removal of target / non-target species

⁸ Climate change has not been pulled out as a specific pressure but is expected to become an increasingly important factor.

Receptors	Pressure
	<ul style="list-style-type: none"> • Smothering

6.2 Feature monitoring

The Scottish MPA network encompasses a wide range of biodiversity features. These include broad physiographic units including coastal lagoons and estuaries, discrete seabed habitats such as maerl and horse mussel beds, through to highly mobile species of fish, birds and mammals. Despite this variation the need for information to inform assessment and reporting is broadly comparable (Table 1).

For seabed habitats, information is required on habitat range and extent and its structure and function; and, also on the status of the various species the habitat typically supports. It is also essential to know the geographic range of the protected species of Scottish MPAs as well as being beneficial to have an understanding of their population dynamics and the role and status of supporting habitats (for breeding, feeding etc.). Information on physical setting (bathymetry and hydrography) and water quality is needed, for example in relation to habitat function.

Four types of MPA-related feature monitoring have been identified (see Box 1). Applied examples of these different monitoring types are provided in Annex 3. Their descriptions relate to the purpose of the work in a Scottish MPA Programme context and the data collected. Types 1 to 3 are equivalent to the monitoring categories established in the UK Marine Biodiversity Monitoring Strategy (JNCC, 2016).

7. Can existing monitoring meet these requirements?

Where possible, existing monitoring programmes (adapted as appropriate) or those currently in development, will be used to meet our aims and objectives.

7.1 Current pressure monitoring

For many MPAs subject to very limited pressures with features at low risk, monitoring pressures alone may be adequate. Key here is information on fishing activity (and any other anthropogenic factors) and derived pressure data. These are important for evaluating the cause of any change in protected feature state. Data layers using VMS for different métiers and ScotMap⁹ have already been produced to support marine planning.

Other ongoing work programmes also provide an opportunity to collate and maintain information on potential pressures of relevance. For example, the Scottish Marine Animal Strandings Scheme (SMASS) and the UK Cetacean Strandings Investigative Programme (CSIP) monitor pressures associated with disease, entanglement, deliberate killing and trauma in marine animal populations through necropsies and associated sample analyses.

⁹ [ScotMap](#) provides spatial information on the fishing activity of Scottish registered commercial fishing vessels under 15 m in overall length. Information is provided on areas in which they fish, and to provide associated information on their fishing vessel

Similarly, targeted monitoring through the UK Bycatch Monitoring Programme allows identification of fisheries, gear types and areas with known bycatch, or risk of bycatch to marine species (e.g., sharks, cetaceans and seals). Furthermore, monitoring requirements associated with infrastructure development can be developed in conjunction with industry to provide information to inform assessment and reporting requirements for MPAs in Scotland.

Box 1 - The four monitoring types

Type 0 Monitoring to determine the continued presence of a feature in a site

Objective: To determine feature presence / absence.

Description: The data from this type of monitoring do not need to be quantitative and can take the form of presence or presence / absence observations. Type 0 work may trigger more detailed monitoring (Types 1 - 3 below). Type 0 monitoring may take the form of a rapid 'health check' and may be appropriate for completion by non-specialists. Such monitoring is likely to be restricted to coastal and accessible nearshore features. Type 0 monitoring may not necessarily have a defined frequency e.g. could occur on a randomised feature selection basis or be triggered if there were concerns about status.

Type 1 Monitoring designed to assess the condition of a protected feature at a site

Objective: To measure rate and direction of long-term change.

Description: Type 1 monitoring data are quantitative (for example, density data or data that allow assessment of the status of populations of mobile species e.g. photo-ID) and statistically robust, allowing the rate and direction of change in the feature of interest over time to be quantified. The design of Type 1 monitoring should include consideration of known activities / pressures. The use of reference areas outside of MPAs may be considered to provide context for any changes observed. This monitoring provides data that are appropriate for the assessment of status against MPA feature conservation objectives - recovery (trajectory) and / or maintenance - informing management action and reporting obligations.

Type 2 Monitoring or analyses undertaken to explore pressure-state relationships

Objective: To measure state and relate observed change to possible causes.

Description: This monitoring is best suited to exploring the likely impacts of anthropogenic pressures on habitats and species and identifying emerging problems. It allows testing of hypotheses about observed patterns, and is generally best applied in areas where a gradient of pressure is present (e.g. no pressure increasing gradually to 'high' pressure). It relies on finding relationships between observed changes in biodiversity and observed variability in pressures and environmental factors. It provides inference but it is not proof of cause and effect. The spatial and temporal scale for this type of monitoring will require careful consideration of the reality on the ground to ensure inference will be reliable; for example, inference will be poor in situations where the presence of a pressure is consistently correlated to the presence of an environmental driver (e.g. depth stratum).

Type 3 Monitoring or analyses undertaken to explore the effectiveness of MPA management measures

Objective: To investigate the cause of change.

Description: Monitoring that provides evidence of causality within a robust statistical framework, examining changes in the feature of interest against the onset of the putative impact (for example, the establishment of management measures that exclude fishing activity). The “beyond BACI” statistical methodology associated with this monitoring is rigorous, requiring multiple baseline surveys across multiple control and impact sites to be undertaken prior to the onset of the putative impact and thereafter. Conclusions from this monitoring may be applicable to other MPAs with similar habitats that exhibit similar trends (inferred from Type 1 monitoring). The frequency of Type 3 monitoring is likely to be higher than the other monitoring categories due to its requirement for multiple surveys to be undertaken before and after the implementation of management measures.

Type 2 and 3 monitoring studies are generally expected to be time limited.

Information on activities taking place within Scottish waters and the overlaps with existing and proposed MPAs can be explored through the [NMPi portal](#). A number of the datasets are available on the [Marine Scotland Information web pages](#). The ongoing collection and interpretation of such information will inform future MPA assessment and reporting in Scotland.

7.2 Current biodiversity feature monitoring

Annex 4 provides an overview of current monitoring activities for each MPA feature group. These existing monitoring programmes will be reviewed regularly in order to identify areas that require an adaption to existing monitoring or additional monitoring to meet our aims and objectives. A list of MPA monitoring studies undertaken in the previous year is provided in Annex 7 by way of illustrating what an annual schedule currently comprises. In summary:

- **Seals** - Harbour and grey seal populations around the Scottish coastline are monitored by the Sea Mammal Research Unit (SMRU). Harbour seal monitoring work is undertaken as part of a three-year rolling programme, while grey seal pup production surveys are undertaken biennially. The results of the monitoring inform the development of annual seal conservation advice to the Scottish Government.

- **Cetaceans** - Bottlenose dolphins and harbour porpoise are the two cetacean species currently protected by Scottish MPAs. A robust, well-established monitoring programme is in place for the bottlenose dolphins in the Moray Firth SAC. The Inner Hebrides and the Minches candidate SAC for harbour porpoise was submitted to the EC in late 2016. An array of passive acoustic monitoring devices will be installed across the site in 2017 with data collection proposed over an initial period of 3-4 years. A number of NGOs have traditionally operated in the area of the SAC collecting effort corrected sightings data.
- **Fish** - Common skate is a protected feature of the Loch Sunart and the Sound of Jura MPA. A joint Marine Scotland and SNH study is improving understanding of skate residency and movement within the site. Through continued collaboration with relevant anglers associations it should be possible to estimate the effects of fisheries measures implemented in 2016 (Marine Scotland, 2016) on common skate mortality and develop a pragmatic, long-term monitoring programme for this species. Sandeels are a protected feature of 3 MPAs. Marine Scotland undertakes annual monitoring of sandeels at the Turbot Bank MPA as part of the EU-funded Data Collection Framework (DCF).
- **Marine birds** - A suite of existing SPAs for marine birds are considered to contribute to the Scottish MPA network (encompassing both seabirds and waterbirds). Regular monitoring of the key marine bird species and terrestrial colonies is undertaken through well-established partnerships between the JNCC, other UK SNCBs, and assorted academic and NGO conservation groups. The main partnership monitoring programmes collect information on wider population status.
- **Seabed habitats** - SNH started a MPA-related seabed habitat monitoring programme in Scottish territorial waters in 2002. The initial monitoring studies (primarily Type 1) were undertaken alongside coarser resolution habitat mapping that informed the designation of marine SACs in 2005¹⁰. Phased MPA designation in the Scottish offshore area started in 2008, underpinned by a comparable range of broadscale habitat surveys.

Since 2014, the primary focus of the inshore seabed habitats monitoring work has been on implementing more detailed studies (Types 2 & 3) in a small number of sites to explore the effectiveness of new or proposed fisheries management measures. In offshore waters, monitoring programme have focussed on establishing the first point in monitoring time series (Type 1) and exploring the effectiveness of new or proposed fisheries management measures (Types 2 & 3).
- **Other area-based measures** - Survey work undertaken within areas that have restrictions in place to support fisheries management and that are considered to make a contribution to the MPA network is summarised in Annex 3.

8. Where will the monitoring be undertaken?

A risk-based approach will be used to provide a logical framework for planning and prioritising monitoring activities. This will ensure that an appropriate selection of features, across their broad geographic range, is included to inform key assessment

¹⁰ Further details are available in a JNCC UK-wide review (McBreen *et al.*, 2016).

and reporting requirements. Habitats and species considered most at risk from identified pressures, or most likely to show positive effects of management measures will be prioritised.

It is important to note that routine monitoring will not be planned in every MPA. Long-term monitoring will encompass specified features / sites only. Monitoring may be triggered in any site (e.g. on the basis of activities and / or management compliance monitoring).

Whilst monitoring effort may be targeted at a subset of features only, additional contextual information on pressures will inform assessment and reporting. The selection of features does not confer any additional nature conservation value over other features.

The Strategy recognises the need to balance monitoring work with ongoing wider survey work, as well as undertaking aspects of more detailed scientific research where appropriate.

8.1 Prioritisation of MPA monitoring effort

The following principles will be applied to prioritise monitoring effort. First the target features are identified, then where they should be monitored. The prioritisation process should also determine what type of monitoring is required (from the 4 types outlined in Box 1)., Once this has been done, additional features may be added to the site-specific monitoring programmes where this helps to deliver assessment and reporting in a cost-effective way (e.g., multiple features being monitored in the same locations).

8.1.1 General principles

Flexibility to modify the programme - there should be provision to modify the MPA-related monitoring programme to include any new protected areas, sites where pressure levels have changed significantly, or where there is any new evidence or concern.

8.1.2 Feature prioritisation - Principles for prioritising / ranking different features for MPA-related monitoring

- a) **Species / habitats at high risk of negative impact** - at a feature level these include those with known decline or threat of decline in Scottish waters on the basis of existing pressures [this principle is also relevant at the site level - see Section 8.1.3 below].
- b) **A feature for which Scotland has a special responsibility** - applies to some habitats and species where Scottish waters encompass a high proportion of the UK or European resource. Relevant MPA features include grey and harbour seals, common skate, saline lagoons, serpulid reefs, maerl beds, horse mussel beds, flame shell beds and burrowed mud.

- c) **Ecosystem services - functional importance - biological / ecological value** - allows for monitoring of features that have a demonstrable functional role e.g. climate change amelioration ('blue carbon'); habitats supporting commercial fisheries; habitats important for nutrient cycling; sediment stabilisation etc. The scale of any services will also be considered. Primarily but not solely applicable to seabed habitat features.

8.1.3 Location prioritisation - Design principles for selecting areas where features should be monitored

- d) **Species / habitats at high risk of negative impact** - at a site level, the decline or threat of decline may be reflected in feature Conservation Objectives set at the time of designation or current feature condition - this status may also be indicative of concerns at a broader feature level [see also Section 8.1.2 above]. Any existing management measures will also inform the site level risk assessment.
- e) **Site management characteristics** - this includes prioritising monitoring effort towards locations where protected features are expected to respond most markedly to management measures (e.g. to facilitate more detailed Type 3 BACI-style monitoring studies). The suitability and availability of information on anthropogenic activities will also be considered.
- f) **Capturing the geographic range and ecological variation of features** - where appropriate this may also include monitoring examples of MPA features outside the MPA network or at the edge of their range.
- g) **Linkages** - the proximity of other examples of features may have a bearing on where monitoring takes place. For some features with a restricted distribution (e.g. flame shell beds within sea lochs) it may be appropriate to monitor 'adjacent' examples of features at the open coast if these are believed to serve as 'sources' of larvae. Such monitoring would provide context for any observed changes in MPA feature condition.
- h) **Qualities of existing data** - the qualities of existing site-level data are likely to influence the selection of monitoring locations. Locations subject to previous or ongoing sampling / academic research may provide valuable insights into baseline conditions.
- i) **Level of local community / stakeholder interest in management or monitoring** - prioritisation of locations that present opportunities for collaboration. For nearshore waters this principle is linked to community empowerment.
- j) **Logistics - ease of access / costs** - these factors influence the affordability of future monitoring.

A number of the principles listed above will also have a bearing on the detailed design of any MPA-related monitoring e.g. an increased risk of decline is likely to require a higher frequency of sampling.

9. How will the data be gathered and by what methods?

MPA monitoring activity design and the selection of appropriate sampling methodologies depends on the specific question(s) that the monitoring is seeking to address (the hypothesis to be tested) and the statistical approach required to analyse the data.

Annex 4 provides a brief summary of methods applied within existing monitoring programmes. Links are provided to existing guidance materials where available.

The frequency of MPA monitoring will depend on the ecology of the species and habitats, and management measures in place. The frequency of monitoring of different parameters should be appropriate to their sensitivity to change. The spatial intensity of monitoring will be determined by the feature extent and variation, and by issues that affect statistical power such as the likely effect size and the level of unexplained variation within the data.

10. Who will be responsible for gathering the data?

While Marine Scotland, SNH and JNCC require information for MPA reporting and assessment purposes, future data collection will be financially constrained. It therefore is essential that the work is well coordinated, makes best possible use of existing information sources, and that collaborative delivery partnerships are developed. Increasingly, elements of monitoring are being undertaken by Non-Governmental Organisations (NGOs) in coastal environments, while information collected by marine industries and regulators can also be relevant in some instances. Improved coordination and data collation across these various sources is key to progress. Supporting current and future citizen science programmes will be essential to maximise the information available for assessment and reporting.

10.1 Enhanced coordination of marine survey and monitoring activities in Scottish waters - identifying efficiencies & maximising returns

The complex and extensive nature of the marine environment around Scotland means that marine monitoring tends to be very expensive while resources and expertise are limited. On a national level it is anticipated that a developing Scottish Marine Monitoring Coordination Group (SMMCG) will improve the cost effectiveness of future monitoring activities through better co-ordination of vessel and staff time.

Priority areas / features and the roles and responsibilities of participating organisations will be identified early. The case studies presented here and within Annex 5 provide evidence of collaborative initiatives that are currently underway. The monitoring activity outlined in the Moray Firth case study is well coordinated across a range of partner organisations and collectively provides far greater returns than the sum of the individual studies if conducted in isolation.

Case study 1 - Integrated marine mammal research and monitoring to support conservation and development in the Moray Firth

In May 2014, the Marine Mammal Monitoring Programme (MMMP) was set up in the Moray Firth to provide a strategic framework for integrating and sustaining marine mammal research and monitoring in the Moray Firth. With a principle aim of addressing both project-specific and strategic research and monitoring questions relating to the potential impacts of offshore wind farms upon key protected marine mammal populations, the programme also provides the opportunity to collect long-term data on trends in these protected populations which is beneficial to other marine stakeholders.

Funded by a consortium that includes developers (BOWL and MORL), Marine Scotland, The Crown Estate, and Highlands and Islands Enterprise, the Programme provides a good example of how multiple organisations can co-ordinate survey and monitoring effort in the long-term, minimising or eliminating duplication of effort and maximising the scientific returns.

Other examples of best practice can be found in Annex 5.

10.2 Working with others - industry, academia and other stakeholders

Engaging stakeholders and local communities in the delivery of marine survey and monitoring (see Case studies 1 and 2) is essential to ensure the success of marine conservation action. Collaborative projects offer opportunities to build strong relationships between regulators, marine users, conservation interests and scientists. It can provide transparency as well as building trust and stakeholder confidence in marine nature conservation processes. In its simplest form this could involve:

10.2.1 Promotion of existing and development of new ‘citizen science’ projects to support the delivery of Scottish MPA monitoring requirements

A number of well-established citizen science programmes already make a significant contribution to the delivery of MPA requirements. These existing citizen initiatives should be supported where these meet the principles set out in this Strategy. New collaborations and citizen science projects should be considered to help fill gaps. Case study 2 presents a new project idea currently under development to explore the potential contribution of volunteer observers on vessels of opportunity on the west coast of Scotland which may lead to wider application in future.

Case study 2 - Collaborative, citizen science monitoring of mobile marine species on the west coast: Caledonian MacBrayne ferries as Vessels of Opportunity (VoO)

A new citizen science project is currently under development based around west of Scotland ferry routes that pass through the recently designated Inner Hebrides and the Minches SAC for harbour porpoises, an area used by a wide range of other species.

The project is being established as a partnership involving Caledonian MacBrayne, SNH, JNCC, Marine Scotland and NGOs such as BTO, RSPB, Argyll Bird Club, Hebridean Whale & Dolphin Trust, ORCA and WDC. The ferries, which follow regular routes will serve as *Vessels of Opportunity* (VoO) from which volunteer

observers will undertake surveys. The volunteers will generate quantitative data on relative densities of the species as well as information on seasonal distribution patterns.

Other examples of best practice can be found in Annex 5.

Other opportunities to promote citizen science projects to support the delivery of Scottish MPA monitoring requirements will be continually explored.

10.2.2 Incorporation of stakeholder generated data into the condition assessment process to increase survey effort efficiencies

Stakeholder generated data can make a significant contribution to the delivery of MPA requirements and efforts should be made to continue to promote the use of this data. Annex 3 presents an applied example of the role of the Seasearch volunteer diver observation scheme and includes a web link to a host of other marine sightings recording schemes.

Furthermore, the principal means by which seabirds are monitored is through a partnership between the SNCBs and a range of NGOs. In Scotland the Wetland Bird Survey (WeBS) monitoring programme encompasses marine waterbird qualifying features in a number of estuarine protected areas such as the Solway Firth. For further details see Annex 3.

Data collected by industry can also play a key role. One of the case studies in Annex 6 illustrates the origins of the Noss Head MPA from an industry commissioned survey.

These opportunities will continue to be explored to support the delivery of Scottish MPA monitoring requirements.

10.2.3 Engaging fishermen in marine survey and monitoring

Fishermen are increasingly playing a role in monitoring and evidence gathering programmes, such as Fishing for Data. Practical operational considerations make the use of fishermen and fishing vessels a logical choice; fishing vessels are by nature well suited to survey work having sufficient deck space and lifting equipment, and fishing crew have the necessary skills and experience in dealing with technical and operational challenges of deploying and recovery of gear. They also have in-depth knowledge of fishing grounds built up over many years' experience.

A new EMFF project which is being led by Marine Scotland will develop this capacity further by engaging fishermen in marine survey and monitoring work.

11. Data management systems and standards

There remain inherent difficulties in identifying, accessing and using marine data; therefore we need to foster a culture of data sharing and good management, including common protocols for data collection and quality assurance of the data obtained. Developing appropriate data management procedures will ensure that data

are easily available on a cross-Scotland perspective for reporting and assessment purposes.

To facilitate multi-partner working and provide transparency in the work it will be essential that all data are captured in appropriate formats and with sufficient supporting information to facilitate easy use and reuse. To this end, we envisage adoption of best practice guidelines generated by UKDMOS (United Kingdom Directory of Marine Observing Systems), MEDIN (Marine Environmental Data & Information Network), the North East Atlantic Marine Biological Analytical Quality Control Scheme (NMBAQC) and the use of appropriate UK Data Archiving Centres (DACs) for the long-term storage and onward dissemination of both raw data and derived products. More detail is available in Annex 6.

12. Review the effectiveness of the strategy in meeting its objectives

The Strategy, including its objectives and delivery, will be reviewed on a regular basis to assess its effectiveness. This will be done by assessing progress against the stated purpose of the Strategy in Section 2.2.

Furthermore, the Annexes to this Strategy will be updated annually to ensure the monitoring work plans reflect changing resource availability and any changes in prioritisation.

13. References

Hinchen. 2014. *Review of marine biodiversity assessment obligations in the UK*. <https://hub.jncc.gov.uk/assets/891430c1-a073-4ec8-83d2-7468dce00fdf>.

JNCC. 2016. *The UK Marine Biodiversity Monitoring Strategy. Version 4.1*. <https://hub.jncc.gov.uk/assets/b15a8f81-40df-4a23-93d4-662c44d55598#:~:text=JNCC%2C%20in%20co%2Doperation%20with,cost%2Defficient%20and%20integrative%20way>.

Marine Scotland. 2011. *Marine Nature Conservation Strategy*. <https://webarchive.nrscotland.gov.uk/3000/https://www.gov.scot/Resource/Doc/295194/0115590.pdf>

Marine Scotland. 2016. *Simple guide to fisheries management measures in Marine Protected Areas (MPAs)*. https://webarchive.nrscotland.gov.uk/20180106115054mp_/http://www.gov.scot/Resource/0049/00498320.pdf

McBreen, F., Jesus, A., Camplin, M., Clark, L., Edwards, H., James, B., Pirie, C., Steel, L., Young, M., Johnston, C. & Hawkrigde J. 2016. A review of monitoring and assessment of seabed habitats in UK inshore Marine Protected Areas, 1999 - 2013. *JNCC Report No: 540*. <https://hub.jncc.gov.uk/assets/9c5a3dab-6839-435e-a4ad-904276e3b17d>



© Crown copyright 2024



This publication is licensed under the terms of the Open Government Licence v3.0 except where otherwise stated. To view this licence, visit nationalarchives.gov.uk/doc/open-government-licence/version/3 or write to the Information Policy Team, The National Archives, Kew, London TW9 4DU, or email: psi@nationalarchives.gsi.gov.uk.

Where we have identified any third party copyright information you will need to obtain permission from the copyright holders concerned.

This publication is available at www.gov.scot

Any enquiries regarding this publication should be sent to us at

The Scottish Government
St Andrew's House
Edinburgh
EH1 3DG

ISBN: 978-1-83601-006-7 (web only)

Published by The Scottish Government, March 2024

Produced for The Scottish Government by APS Group Scotland, 21 Tennant Street, Edinburgh EH6 5NA
PPDAS1423314 (03/24)

W W W . g o v . s c o t