# Immingham Green Energy Terminal

## Additional Documentation Requested By Examining Authority in Written Questions 2 Gen 2.1

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# Appendix 1: NELC Local Plan Review

# North East Lincolnshire Local Plan Review Draft Plan with options

20 December 2023

Local Plan Review
North East Lincolnshire

Working in partnership

**Proposed changes to the adopted 2018 Local Plan policies**



**Introducing the draft local plan**



**North East Lincolnshire, the place and people**



**Planning for our future**

**Policies**

# Proposed revisions to the adopted 2018 Local Plan policies

Table 1.1 Overview of proposed revisions provides a quick reference guide to the draft policies set out in this Draft Plan. It details of the proposed revisions to the current adopted 2018 Local Plan policies in order for them to remain in conformity with national policy at the time of the publication of the Draft Plan. Both the adopted 2018 plan policy number and title and the Draft Plan policy number and title have been included, where they exist, in order to enable cross-referencing between the documents.

Please note:

The policy numbers set out in this document may change in future iterations as the Local Plan Review is progressed, and policies are amended, removed or added as a result of future consultations.

| 2018 Local Plan policy number and title | Local plan review 'Draft Plan' policy number and title | Proposed revisions |
|---|---|---|
| Policy 1 Employment land supply | No policy has been set out in this Draft Plan. | This Draft Plan sets out options on the employment growth to be planned for. |
| Policy 2 The housing requirement | No policy has been set out in this Draft Plan. | This Draft Plan sets out options relating to the setting of future housing requirement for the Borough. |
| Policy 3 Settlement hierarchy | Draft Strategic Policy 1 Settlement hierarchy | Revisions are proposed to the existing policy to strengthen the approach to prevent coalescence of the 'Arc' settlements and therefore maintain their individual identities. |
| Policy 4 Distribution of housing growth | No policy has been set out in this Draft Plan. | This Draft Plan presents options on the distribution of housing across the Borough, which will affect the proportion of development to be delivered in each of the spatial zones. Emphasising delivery from brownfield sites where this is achievable. |
| Policy 5 Development boundaries | Draft Strategic Policy 2 Development boundaries | Revisions to the policy are proposed to provide clarity on the type of development allowed outside the development boundaries. Revisions to the Policies Maps will be made to take account of the housing allocations once they have been confirmed. |

| 2018 Local Plan policy number and title | Local plan review 'Draft Plan' policy number and title | Proposed revisions |
|---|---|---|
| Policy 6 Infrastructure | Draft Strategic Policy 4 Infrastructure | The infrastructure policy has been revised to include contributions towards Special Education Needs (SEN) provision and to take account of the mandatory introduction of Biodiversity Net Gain (BNG).<br>Further revisions have been made to incorporate telecommunications within this policy rather than as a separated stand alone policy. |
| Policy 7 Employment allocations | No policy has been set out in this Draft Plan. | This Draft Plan presents options on the land requirements for future employment allocations. |
| Policy 8 Existing employment areas | Draft Policy 5 Existing employment sites | A revision is proposed to include Laceby Business Park as an existing employment area. |
| Policy 9 Habitat Mitigation - South Humber Bank | Draft Strategic Policy 12 Habitat Mitigation - South Humber Bank | An adjustment to the scale of the contribution is proposed as costs associated with the implementation, management and monitoring of the sites has proven to be higher than was anticipated when the policy was first implemented. |
| Policy 10 Office development | Draft Policy 11 Town centre uses | Significant changes are proposed to the retail hierarchy and town centre policies to address changes to national planning policy, including merging existing policies to provide clarity on town centre uses and development in local centres. |
| Policy 11 Skills and training | Draft Policy 6 Skills and training | Revisions are proposed to include support for local supply chains and seek local labour agreements as part of larger developments. |
| Policy 12 Tourism and visitor economy | Draft Strategic Policy 16 Tourism and visitor economy | A minor change is proposed to clarify support for further visitor accommodation. |
| Policy 13 Housing allocations | No policy has been set out in this Draft Plan. | This Draft Plan presents options on the sites to meet the requirements for future housing. |

| 2018 Local Plan policy number and title | Local plan review 'Draft Plan' policy number and title | Proposed revisions |
|---|---|---|
| Policy 14 Development of strategic housing sites | Draft Strategic Policy 17 Development of strategic housing sites | A policy has been included settling out a framework for the development of potential strategic housing sites. This may need to be expanded to include the provision of infrastructure linked to specific sites once they are identified. |
| Policy 15 Housing mix<br>Policy 16 Provision for elderly person's housing needs<br>Policy 17 Housing density | Draft Policy 8 Housing mix | Changes are proposed to merge the policies relating to housing mix, housing density, and provision for elderly person's housing to form a single comprehensive policy. |
| Policy 18 Affordable housing | Draft Strategic Policy 18 Affordable housing | Revisions to the policy are proposed, including to the affordable housing split, to address the policy parameters and guidelines set by the Government. |
| Policy 19 Rural exceptions | Draft Policy 7 Rural exceptions | No change is proposed to the rural exceptions policy. |
| Policy 20 Self-build and custom build homes | Draft Policy 9 Self-build and custom build homes | Revisions to the policy are proposed requiring sites of 500 or more dwellings to make provision for self-builders or custom build options.<br>Also to reflect any change to strategic sites and include other sites acknowledged to be delivering self-build and custom build. |
| Policy 21 Provision for gypsies and travellers | Draft Policy 10 Provision for gypsies and travellers | Revisions to the policy are proposed to reflect the Council's adopted approach to unauthorised encampments. |
| Policy 22 Good design in new developments | Draft Strategic Policy 13 Good design in new developments | No change is proposed to the design quality policy. |
| Policy 23 Retail hierarchy and town centre development<br>Policy 24 Grimsby town centre opportunity sites<br>Policy 25 Cleethorpes town centre opportunity sites | Draft Strategic Policy 19 Retail hierarchy | Significant changes are proposed to the retail hierarch and town centre policies to address changes to national planning policy, including merging existing policies, to provide clarity on town centre uses and development in local centres. |

| 2018 Local Plan policy number and title | Local plan review 'Draft Plan' policy number and title | Proposed revisions |
|---|---|---|
| Policy 26 Primary shopping centres<br>Policy 27 Freeman Street district centre<br>Policy 28 Local Centres | Draft Policy 11 Town centre uses | Significant changes are proposed to the retail hierarchy and town centre policies, including merging existing policies to provide clarity on town centre uses and development in local centres. |
| Policy 29 Social and cultural places | Draft Strategic Policy 20 Social and cultural places | Revisions are proposed to the policy to recognise cultural activities that help to 'animate' the public realm. |
| Policy 30 Grimsby Town Football Club | No policy | This policy is removed due to changes in the Football Club now seeking to carry out improvements to the existing ground rather than moving to a new stadium. |
| Policy 31 Renewable and low carbon infrastructure | Draft Strategic Policy 7 Renewable and low carbon infrastructure | A revision to the policy is proposed to recognise that this policy supports the Council's drive to achieve net zero by 2030 and for the Borough as a whole by 2050. |
| Policy 32 Energy and low carbon living | Draft Strategic Policy 8 Energy and low carbon living | A revision has been proposed to require the incorporation of energy efficiency and low carbon technology as a specific consideration of the design stage. |
| Policy 33 Flood risk | Draft Strategic Policy 5 Flood risk | A revision to the flood risk policy has been proposed to safeguard land to ensure that future development along the estuary does not compromise the ability to maintain and possibly improve existing flood defence structures. |
| Policy 34 Water management | Draft Strategic Policy 6 Water management | No change is proposed to the water management policy. |
| Policy 35 Telecommunications | Draft Strategic Policy 4 Infrastructure | Revisions to the infrastructure policy are proposed to incorporate telecommunications rather than as a separate stand alone policy. |
| Policy 36 Promoting sustainable transport | Draft Strategic Policy 15 Promoting sustainable transport | Minor changes are proposed to refer to active travel choices. |

| 2018 Local Plan policy number and title | Local plan review 'Draft Plan' policy number and title | Proposed revisions |
|---|---|---|
| Policy 37 Safeguarding transport infrastructure | No policy | This policy has been removed as the transport schemes have either been completed, revised in their proposed delivery or addressed in another policy. |
| Policy 38 Parking | Draft Policy 4 Parking | Revisions are proposed to reflect the current requirement for parking for those people with mobility impairments and to address the requirement for street trees.<br>In addition it is proposed to remove reference to the provision of charging points as this is now a mandatory requirement of building regulations. |
| Policy 39 Conserving and enhancing the historic environment | Draft Strategic Policy 14 Conserving and enhancing the historic environment | A revision to the policy has been proposed to address the new legal protections. |
| Policy 40 Developing a green infrastructure network | Draft Strategic Policy 9 Developing a green infrastructure network | Revisions are proposed to the policy to emphasise the development and enhancement of a network of green space, building on existing assets and enhancing the overall quality of the environment.<br>Revisions include strengthening safeguarding of strategic gaps and addressing the introduction of biodiversity net gain. |
| Policy 41 Biodiversity and Geodiversity | Draft Strategic Policy 11 Biodiversity and Geodiversity | A revision to the policy has been proposed to recognised the desire to enhance biodiversity and geodiversity. |
| Policy 42 Landscape | Draft Strategic Policy 10 Landscape | A proposed revision has been included to refer to the requirement for street trees. |
| Policy 43 Green space and recreation | Draft Policy 2 Green space and recreation | No change is proposed to the green space and recreation policy except to acknowledge local green space designations, and to consider the adoption of revised Natural England standards. |

| 2018 Local Plan policy number and title | Local plan review 'Draft Plan' policy number and title | Proposed revisions |
|---|---|---|
| Policy 44 Safeguarding minerals and related infrastructure | Draft Strategic Policy 21 Safeguarding minerals and related infrastructure | No changes are proposed to the minerals policies. |
| Policy 45 Future mineral extraction and Secondary Aggregates | Draft Policy 12 Future mineral extraction and Secondary Aggregates | No changes are proposed to the minerals policies. |
| Policy 46 Restoration and aftercare (minerals) | Draft Policy 13 Restoration and aftercare (minerals) | No changes are proposed to the minerals policies. |
| Policy 47 Future requirements for waste facilities | Draft Strategic Policy 22 Future requirements for waste facilities | No changes are proposed to the waste policies. |
| Policy 48 Safeguarding waste facilities and related infrastructure | Draft Strategic Policy 23 Safeguarding waste facilities and related infrastructure | No changes are proposed to the waste policies. |
| Policy 49 Restoration and aftercare (waste) | Draft Policy 14 Restoration and aftercare (waste) | No changes are proposed to the waste policies. |
| No policy | Draft Strategic Policy 3 Green wedges | A new green wedges policy is being considered to provide greater protection to the open and undeveloped areas within the identified areas. |
| No policy | Draft Policy 1 Health and wellbeing | A new policy on health and wellbeing is being considered, reflecting the vital role planning can have in creating and supporting vibrant, strong and healthy communities. |
| No policy | Draft Policy 3 Biodiversity net gain | A new policy is proposed to reflect this new requirement setting out the principles to guide how this will be delivered in the Borough. |

**Table 1.1 Overview of proposed revisions**

# Section 1 Introduction

**1.0.1** The Local Plan is a key document that will guide the changing use of land in the Borough and define the purpose to which it is put in the future. This Draft Plan sets out revisions to the existing local plan to address changes in national planning policy and changing priorities in North East Lincolnshire. To reflect these changing priorities the structure of the document has been revised to give greater prominence to aspects of climate change and the natural environment as well as setting out proposals to revise specific policies. The Plan sets out the Council's long term vision and strategy for development and will ultimately determine why, where and how the Borough will grow. The Plan remains a plan for growth recognising the current plans and opportunities for investment that will ensure North East Lincolnshire prospers and establishes as a place where its people can live, work and appreciate the natural environment around them both now and in the future.

**1.0.2** The existing Local Plan was developed at at time of great optimism, but the years since its adoption have seen many key events that have impacted on the local people, the local economy and the local housing market. These have included the decision to exit the European market and subsequent Brexit processes, the Covid pandemic and the cost of living impacts linked to the crisis in Ukraine. This Draft Plan reflects on these events but looks forward to capture the opportunities for growth that can improve the lives of local residents.

**How to provide feedback on this Draft plan**

**1.0.3** The easiest way for you to comment is via our web-based Consultation Portal (https://nelincs-consult.objective.co.uk/kse/) which allows you to add your comments directly alongside the relevant sections of the online document. This ensures no responses are lost in the post or missed during the manual transfer process associated with email or paper submissions.

**1.0.4** You will need to create an account in order to submit comments via our consultation portal. This is a one time registration and you can request to be removed from the database at anytime, however any comments you have made will remain in the public domain along with your name and organisation. Once registered you will automatically receive notifications about future planning policy consultations.

**1.0.5** North East Lincolnshire Council is registered under the General Data Protection Regulation (GDPR) for the purpose of processing personal data in the performance of its legitimate business.

**1.0.6** Any information held by the company will be processed in compliance with the principles set out under the GDPR.

**1.0.7** Due to the statutory nature of planning policy consultations the Council can not treat comments/representation received as confidential. Nor can we accept anonymous responses, **we will require as a minimum your Name and full Address in order to register your comments**.

**1.0.8** Any comments received will be published on the consultation portal along with your name and organisation. We will not publish you personal contact details or use them for any other purpose than to contact you regarding the preparation of planning policy documents, including future stages of the Local Plan Review. This includes postal addresses, telephone number(s) and email addresses.

**1.0.9** Further information about the Council's approach to data protection and the GDPR is available on the Councils website (https://www.nelincs.gov.uk/your-council/information-governance/).

**1.0.10** You can download a copy of the response form from the Consultation Portal (https://nelincs-consult.objective.co.uk/kse/) or Council's website (https://www.nelincs.gov.uk/), complete the form and then send it to us via email to: Spatialplanning@nelincs.gov.uk.

**1.0.11** Paper copies of the response forms are available on request from the Planning Department at:

Local PlanEquansMunicipal OfficesTown Hall SquareGrimsbyDN31 1HU

**1.0.12** These should be returned to the above address and received no later than the closing date shown below.

**Statement 1**

Consultation period

The consultation starts on Monday 15th January and ends of Friday 8th March 2024. All responses should be received by 5pm on Friday 5th March 2024. Responses received after this date will not be accepted.

**Alternative formats**

**1.0.13** Paper copies of this Draft Plan are available to view at the following locations, during their normal opening hours (Please check opening hours with the venue before travelling.):

- North East Lincolnshire Council, Municipal Office reception
- Gingerbread House, Humberston
- Scartho community hub
- Grimsby library
- Waltham library
- Immingham library
- Cleethorpes library

**1.0.14** Paper copies of the Draft Plan are available on request from the Planning Department at:

Local PlanEquansMunicipal OfficesTown Hall SquareGrimsbyDN31 1HU

**1.0.15** A charge of £15.76 will be made to cover the cost of printing.

**Drop in events**

**1.0.16** A series of drop in sessions will be arranged during the consultation period, to enable people to ask questions and find out more information about how they can respond to the consultation.

**1.0.17** Details of when and where these will take place will be published on the Council's website (https://www.nelincs.gov.uk/) and social media platforms, local plan consultation portal (https://nelincs-consult.objective.co.uk/kse/) and press releases.

## 1.1 Timeframe

**1.1.1** The existing Local Plan worked to an end date of 2032 setting out a framework of policies for a 15 year period from its date of adoption to meet the requirements of the National Planning Policy Framework (NPPF). This Draft Plan looks forward to 2042 and beyond, reflecting that local plans should look forward over a minimum of 15 years from adoption. It also recognises that a change to the NPPF has stipulated that where significant extensions to existing villages or towns form part of the strategy for the area that policies should be set within a vision that looks further ahead (at least 30 years) to take account of the likely timescale of delivery.

## 1.2 Defining options and policy revisions

**1.2.1** This Draft Plan sets out alternative options which relate to the scale and distribution of development, and options for revising different policies to address issues identified through the scoping and issues stage. The Plan's status is as a **Pre-Publication document**.

**1.2.2** At this stage we are seeking your views on the alternative options and revisions to policies. The document is set out to:

- Highlight what the key evidence says;
- Identify realistic options, and following sustainability appraisal outline the approach the Council is minded to support; and,
- Provide sufficient detail to inform people what the different options mean.

**1.2.3** Where the evidence is clear in the direction the Plan should take this is made clear. An interim appraisal of the sustainability of the different options has been undertaken which has informed the preparation of this document and should be read in conjunction with it.

**1.2.4** Your comments, together with the continued process of sustainability appraisal, will inform the development of the local plan.

## 1.3 Local Plan Review stages

**1.3.1** This Draft Plan represents the first formal stage in the development of the local plan following the informal scoping and issues engagement. The formal stages in the progression of the Local Plan review are set out below:

- Draft plan (Regulation 18 - Preparation of a local plan document) **This stage.** - This is a formal statutory stage of consultation and will be your opportunity to consider our first draft of the updated local plan document and suggest any changes to the draft policies it contains.
- Submission draft (Regulation 19 - Publication of a local plan document). - This formal statutory stage of consultation is your final opportunity to comment on what the Council considers to be the version of the local plan it would adopt.
- Submission to the Secretary of State (Regulation 22). - This is the stage at which an independent Planning Inspector is appointed to examine the local plan.
    - During the examination the local planning authority has the power to request recommendations for modifications from the Inspector that would make the document suitable for adoption in a scenario where they might otherwise find it not 'sound'. If modifications are proposed these would be subject to a further period of consultation.
    - The Inspector publishes their recommendations in a report. Whilst the Council does not have to implement an Inspector's recommendations, the Council is only able to adopt the local plan if the Inspector has recommended it for adoption.

# Section 2 North East Lincolnshire in context

**2.0.1** North East Lincolnshire is relatively self contained, and is considered to be a single Housing Market Area (HEDNA 2023). There are no unmet housing or employment needs from adjoining districts as established through the work with adjoining local authorities.

**2.0.2** The population overall has seen a reduction from 159,616 (2011) to 156,907 (2021) and households have remain static 69,907 (2011) to 69,800 (2021). More significantly the population has seen a reduction in young and working age residents and a significant increase in older residents.

**2.0.3** Economically the current unemployment rate stands at 3.7% with a resident-based income of £29,241 in 2022 (ONS 2023). Growth in business formation since 2012 has been considerably lower than across the Yorkshire and Humber Region (ONS 2023 UK Business Counts). There are however, opportunities looking forward rather than backward, that point to economic growth. The Experian Economic Model predicts net workforce growth of 2,600 for the Borough over the period to 2042, in line with the Experian baseline December 2022 projections. Furthermore additional growth linked to the Freeport proposals and growth associated with renewables, hydrogen generation and carbon capture is likely to deliver more aligned to the formal designation of the Humber Freeport and the delivery of the Council's Investment and Regeneration Programmes.

## 2.1 Portrait

**2.1.1** This section of the Draft Plan defines what North East Lincolnshire is like as a place. Geographically, the Borough is a relatively small area, covering 74 square miles (192sq km), on the east coast of England, at the mouth of the Humber Estuary. Although quite a small Borough, this is a complex place.

**2.1.2** It is a meeting place: the Humber Estuary meets the Lincolnshire coast; the Lincolnshire Wolds meet the coastal plain; ports and industry meet farmland and seaside; town meets country; Lincolnshire meets the Humber and Yorkshire; the Midlands meet the North; England meets the North Sea and its continental neighbours. These factors have defined the place and influenced the lives of the people who live here, and they continue to do so. They combine to make North East Lincolnshire a place of contrasts, a place of challenges and a place of opportunities.

**2.1.3** In broad terms, North East Lincolnshire can be sub-divided into four 'Spatial Zones' - areas with similar characteristics, which display close physical and functional relationships. Those zones are outlined verbally below, and graphically on Figure 2.1 Spatial zones. Each zone includes the corresponding settlements as they are today together with adjoining land that may accommodate future growth.

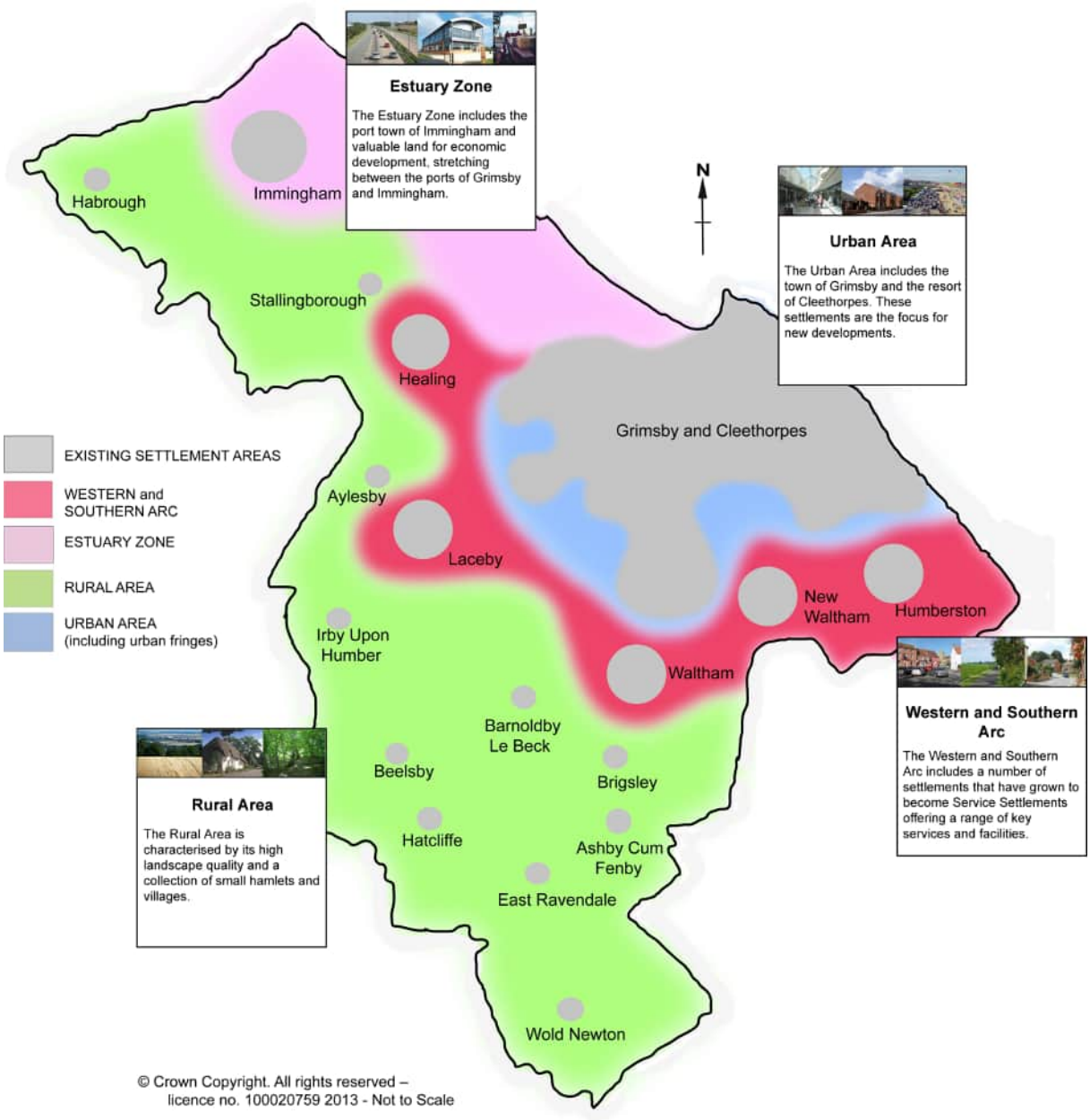


**Figure 2.1 Spatial zones**

## Estuary Zone

**2.1.4** Consisting of mainly low-lying land, bordering and including the South Humber Bank, the Estuary Zone is an area of both ecological and industrial importance, giving rise to some particularly complex environmental planning issues and challenges, particularly associated with the Humber Estuary's international designations. It includes the nationally important port, and town of Immingham and accommodates a major concentration of port-related and energy-related industry and commerce. These and the estuary itself are the main influences on the character, appearance and form of this part of the Borough. Just over five percent (5.3%) of the Borough's households live within this zone.

### Urban Area

**2.1.5** The Urban Area includes the port and town of Grimsby and the resort of Cleethorpes, two distinct and distinctive towns forming a continuous built-up area that extends along the estuary and coast for approximately 12kms, and about 4kms (average) inland. 74.3% of the Borough's households live in the Urban Area. The townscape is varied, including Grimsby's docks and town centre, the sea front and seaside town at Cleethorpes all of which include buildings and places of significant heritage value together with large residential suburbs (some built by private enterprise, some by the Council and other social housing providers) which have developed successively since the Victorian era and continue to grow. Grimsby has some diverse inner urban areas including places where housing, commerce and industry are mixed; areas of older, terraced houses; including areas of social and private housing; and larger houses and villas from the Victorian and Edwardian periods.

### Western & Southern Arc

**2.1.6** Wrapping around the western and southern edges of the Urban Area, and only slightly detached from it is an 'arc' of smaller settlements that have expanded to accommodate, at present, 16% of the Borough's households. Some of these settlements are villages that have grown significantly in recent years but still retain their older village cores (Waltham and Laceby); others are more recent suburban settlements with little remnant of an older village core (Humberston, New Waltham and Healing).

### Rural Area

**2.1.7** The largest of the Spatial Zones by area, the Rural area contains 4.4% of the Borough's households. It is characterised by an attractive rural landscape of open fields, farms and woodlands, rising and rolling into the Lincolnshire Wolds (a designated Area of Outstanding Natural Beauty) in the south of the Borough. There are several small villages and hamlets within this Zone, together providing homes for about two percent of North East Lincolnshire's population.

Planning for the Spatial Zones

Recognising the varied geography of the Borough, the concept of 'Spatial Zones' has been developed and was adopted in the existing local plan.

It provides an effective mechanism for considering and illustrating how 'planning for growth' will be delivered in different geographical areas in ways that recognise their different characteristics and reflect local distinctiveness.

The Spatial Zones are identified diagrammatically on Figure 2.1 Spatial zones. The area boundaries are deliberately not distinct as the issues pertinent to different areas in some cases overlap.

The Vision (Section 4 A vision for North East Lincolnshire) on which this Draft Plan is based describes a desired future for the whole Borough and for each Spatial Zone.

## 2.2 Strengths and weaknesses

**2.2.1** Preparing a local plan requires a sound understanding of the relationships between people and places considering the characteristics of place and how people live their lives. In so doing we can establish the strengths, weaknesses, opportunities and threats that will shape the policies and proposals set out in the Plan.

**2.2.2** The tables below draw together information presented in a wide range of evidence, strategies and plans. Together they present a 'SWOT analysis' detailing the strengths and weaknesses, opportunities and threats, that exist within North East Lincolnshire.

| Strengths | Weaknesses |
|---|---|
| 1. Economy: Strong and established industrial base, built on natural comparative advantage of Humber Estuary, bolstered by Freeport designation and transition to low carbon economy.<br>2. Economy: National significance of five key sectors.<br>3. Infrastructure: Including dock infrastructure, pipelines, road and rail freight infrastructure, and good standard of flood defences.<br>4. Green Infrastructure: Internationally significant wildlife sites, AONB and open space and recreational facilities.<br>5. Minerals: Resources include aggregates (sand and gravel), silica sand, and chalk(but no current extraction).<br>6. Waste: Good record of sustainable waste management.<br>7. Heritage: The heritage assets of the Borough contribute to the quality of places in which people want to live, work and invest. | 1. Demographics: An ageing population has implications for accommodation, healthcare and access to services for older people.<br>2. Demographics: Areas of concentrated deprivation.<br>3. Economy: low wage economy and weak levels of entrepreneurship.<br>4. Economy: Lack of readily available and good quality sites and premises in suitable locations to match business needs.<br>5. Economy: Large number of land hungry operations e.g. energy, storage and processing plants.<br>6. Economy: Limited employment opportunities within the rural areas.<br>7. Education: Low skills base a consequence of poor educational attainment.<br>8. Housing: Lack of affordable housing delivery.<br>9. Housing: Quality of the housing offer.<br>10. Health and well-being: Home to some of the most deprived communities in England.<br>11. Town centres: High vacancy levels, and lacking key facilities.<br>12. Environment: Significant proportion of the urban area at high risk of flooding.<br>13. Environment: Pockets of poor Air Quality. |

| Strengths | Weaknesses |
|---|---|
| | 14. Environment: Below average tree canopy coverage.<br>15. Transport: Car dependency and road congestion hotspots.<br>16. Transport: Accessibility to employment for people with no car.<br>17. Heritage: Number of buildings on the Heritage at Risk Register. |

**Table 2.1 SWOT analysis (strengths and weaknesses)**

| Opportunities | Threats |
|---|---|
| 1. Economy: Build on international significance of the ports and recent renewable energy related investments in the Humber.<br>2. Economy: Niche development of the O&M market - builds on investment by Dong, Siemens, RWE etc.<br>3. Economy: Ongoing role of the Ports within the UK import/export market. Capture the benefits of Freeport Zone.<br>4. Economy: Links to the wider Lincolnshire agricultural economy to promote further innovation in food processing/food science and technology.<br>5. Economy: SHIIP/Enterprise Zone designation provides opportunities to attract significant levels of business investment.<br>6. Economy: Significant Levelling Up Funding supporting regeneration in Grimsby and Cleethorpes.<br>7. Environment: Introduction of mandatory biodiversity net gain.<br>8. Heritage: Assets provide opportunities for heritage led regeneration. particularly building on work at Grimsby Docks.<br>9. Heritage: The historic environment can play a key role in helping to | 1. Demographics: Increasingly aged population and loss of economically active population presents a challenge for achieving suitable labour supply to meet growth aspirations.<br>2. Education: Lack of higher education facilities and deficit of talented young people who leave to study elsewhere.<br>3. Economy: Low value rents and land prices combine to impact upon commercial viability.<br>4. Economy: Many key sectors facing significant rises in costs.<br>5. Economy: Public sector finance cuts threaten public sector jobs and targeted public sector investment in areas of weakness.<br>6. Economy: International competition for investment, especially in chemicals/ processing and food processing sectors.<br>7. Economy: Legislative change, especially at the European level placing restrictions on process industries and ports.<br>8. Economy: Uncertainty of government policy with general election.<br>9. Economy: Cost of Living squeeze reduces household expenditure Climate Change: Potential for stresses on habitats and species to increase.<br>10. Climate Change: Increase in flood risk and severity of flood events. |

| Opportunities | Threats |
|---|---|
| reinforce the distinct identity of the various parts of the Borough.<br>10. Housing: Supply increased since local plan adoption. | 11. Housing: Low demand for housing in areas where there is greatest potential for employment related development.<br>12. Housing: Weak viability limits opportunities on brownfield sites and inhibit affordable housing delivery.<br>13. Housing: Development within strategic gaps eroding independence of village settlements.<br>14. Heritage: Impact of new development upon the character of the Borough's historic assets and loss of assets through neglect and lack of investment. |

**Table 2.2 SWOT analysis (opportunities and threats)**

## 2.3 Working together (Duty to cooperate)

**2.3.1** North East Lincolnshire has close ties with neighbouring authorities, and others further afield. The Borough is separated by the Humber Estuary from the East Riding of Yorkshire and Kingston upon Hull on the north bank, but shares several environmental and economic influences and issues. North Lincolnshire lies to the west and the districts of East Lindsey and West Lindsey, within the County of Lincolnshire directly adjoin the Borough to the south.

**2.3.2** Joint working with neighbouring authorities has been an ongoing process, which has developed a mutual understanding of the wider implications of potential policy approaches across the authorities. This has included joint working on key strategies and evidence. The Council is committed to continuing this process of joint working with specific relationships relating to aspects of flood risk, housing and infrastructure, economic development, biodiversity net gain and landscape.

**2.3.3** A separate Duty to Cooperate statement will be prepared which will detail the work that has been undertaken with neighbouring authorities and other prescribed bodies during the development of this Local Plan.

## 2.4 Devolution

**2.4.1** The three upper tier councils across Lincolnshire are developing a Greater Lincolnshire devolution deal with Government. Devolution will mean decisions are made closer to the people, communities and businesses which will benefit.

**2.4.2** Decisions will be better aligned to local priorities, they will be made faster, and they will deliver better outcomes.

**2.4.3** A team of officers and elected members from North Lincolnshire, North East Lincolnshire and Lincolnshire County Councils are creating the deal with Government. While primarily this is with ministers and officials from the Department

for Levelling-Up, Housing and Communities (DLUCH), the scale of the deal is such that many other government departments are involved too. This includes HM Treasury, Department for Business & Trade, Department for Energy Security & Net Zero, Department for Science, Innovation & Technology, Department for Transport, Department for Culture, Media & Sport and the Department for Education.

**2.4.4** The focus of this initial deal is to create better outcomes for residents, communities and businesses across the whole of Greater Lincolnshire through the securing of more money, more power and greater responsibility for delivery. Using local knowledge, understanding and expertise, the impact will be greater, and decision will improve local transport, enhance investment in infrastructure, the environment and net zero, support the delivery of good quality housing and creation of new, high paid, high skilled jobs.

**2.4.5** An announcement that Greater Lincolnshire's proposal to form a combined authority has been given the green light was made in the Government's Autumn Statement, on 22 November 2023. Work is now taking place in order to establish the Greater Lincolnshire Combined Authority before the Mayoral elections in May 2025.

# Section 3 Requirements

**3.0.1** Key evidence has been prepared to assess the key development requirements over the plan period. This assessment has been undertaken in the context of the national policy framework set out in the NPPF. This section of the Draft Plan seeks to answer the question: **What are our future development needs?**

**3.0.2** The Local Plan sets out to plan pro-actively to meet the development needs, and enable growth, capturing the opportunities which the Borough presents. It seeks through the policies and allocations to address the potential barriers to future investment.

**3.0.3** The development requirements set out in this section consider the future need and potential opportunity relating to: the provision of future jobs and, the provision of new homes.

## 3.1 Employment

**3.1.1** Economic forecasts have been generated to assess the future growth that can be anticipated. this comprises:

- the Experian Baseline December 2022 projections which considers a net workforce jobs growth of 2,600 over the plan period 2022-2042; and,
- an alternative job-based projection based upon an assessment of additional job estimates generated by forthcoming Freeports proposals, carbon capture and renewables related developments, these proposals assuming the infrastructure projects and investment schemes would it is calculated potentially generate a net additional 1,960 jobs on top of the baseline Experian projection. This would result in a net increase of 4,560 jobs over the plan period.

**3.1.2** The Experian Projection is produced by looking at past economic activity and combining this with predictions about future economic conditions, trends in the relevant sector and other internal and external factors.

**3.1.3** The alternative jobs based projection is derived from an assessment of local future projects and investments aligned to national and local strategies, policies and investment proposals. This is sometimes referred to as a 'Policy-On' position. The following infrastructure projects and investment proposals have been identified aligned to key strategies and plans:

- Plans and strategies
  - Humber Freeport Zone (including infrastructure provision)
  - Grimsby Town Deal
  - South Humber Industrial Investment Programme (SHIIP)
- Key Projects
  - Humber Zero (Part of the zero carbon Humber vision involving hydrogen production) **+200 jobs** (excluding 2,500 temporary construction jobs);
  - Humber H2ub (Part of the zero carbon Humber vision involving hydrogen production **+150 jobs**;

- Gigastack (Part of the zero carbon Humber vision involving wind energy/ hydrogen production **+180 jobs**;
- Immingham Green energy terminal (Hydrogen production) **+1,000 jobs**;
- RWE Grimsby Wind Farm Hub (operations and maintenance) **+60 jobs**;
- Orsted Wind Energy **+250 jobs**; and,
- Hornsea Wind Energy **+120 jobs**.

### Option 1

The Employment Requirement - Experian baseline 2022

Set the employment requirement aligned to the Experian Baseline 2022 Projection (net workforce jobs growth of 2,600 over the plan period 2022-2042).

### Option 2

The Employment Requirement - 'Policy-On'

Set the employment requirement aligned to the 'Policy-On' position (net workforce jobs growth of 4,560 over the plan period 2022 to 2042).

### Question 1

Employment requirement

To support the economic opportunities in the Borough, the Council is minded to support Option 2 The Employment Requirement - 'Policy-On' aligned to maximising the opportunities for economic growth, the "Policy-On" position.

Do you have any comments?

## 3.2 Housing

**3.2.1** The National Planning Policy Framework (NPPF), paragraph 61, states that:

*"To determine the minimum number of homes needed, strategic policies should be informed by a local housing need assessment, conducted using the standard method in national planning guidance - unless exceptional circumstances justify an alternative approach which also reflects current and future demographic trends and market signals. In addition to the local housing need figure, any needs that cannot be met within neighbouring areas should be taken into account in establishing the amount of housing to be planned for".*

**3.2.2** The starting point is therefore to determine the local housing need using the standard method. (In August 2020 the Government consulted on changes to the standard method which looked at incorporating 2018-based projections and

removing the cap that limits the level of local housing needs. The Government's response published in December 2020 confirmed that it would not be proceeding with the changes. As a consequence the 2014-based projections are used to inform the demographic starting point for the assessment of Local Housing Need). At present the standard methodology would result in a local need figure of 203. This is considered to be the minimum level of local housing need. According to the 2014-based SNPP, this would equate to a net change of 4,276 residents, 4,060 households but significantly a loss of 109 jobs over the 20 years 2022-2042. This is considered to be the baseline projection represented as Scenario A, in the Housing and Economic Development Needs Assessment (HEDNA 2023).

**3.2.3** Based on the trends identified through the demographic and economic assessment of the Borough, a number of further scenarios have been considered to test whether any adjustment is required which deviates from the locally assessed need identified by the standard method.

**3.2.4** The scenarios demonstrate the extent to which the population of the Borough could change over the Plan period and how this change would be translated into households, dwellings, numbers of economically active residents and the number of jobs that might be supported by the local population.

**3.2.5** The number of households is translated into dwelling needs through the application of an assumption about the proportion of vacant properties/second homes that are currently recorded in the Borough.

**3.2.6** The consultants, (Lichfields) preparing the Housing and Economic Development Needs Assessment (2023), modelled each of these scenarios using industry standard PopGroup demographic modelling software. Table 3.1 Future Housing Scenarios (Total Growth 2022 to 2042 (Annual)) below summaries the scenarios set out in the Assessment.

| Scenario | Population Change | Households | Dwellings (annual in bold) | Jobs |
|---|---|---|---|---|
| Scenario A **Standard Method** | 4,276 | 3,870 | 4,060 (**203**) | **- 109** |
| Scenario B **2014-Based SNPP** | 2,887 | 3,295 | 3,449 (**172**) | **- 610** |
| Scenario C **2014-based SNPP 2021 Census adjust** | 2,309 | 3,533 | 3,698 (**185**) | **- 1,900** |
| Scenario D **2018-based SNPP** | - 1,238 | 3,009 | 3,150 (**158**) | **- 2,377** |
| Scenario E **2018-based SNPP 2021 Census adjust** | - 578 | 3,067 | 3,210 (**161**) | **- 3,137** |
| Scenario F **Experian Baseline December 2022** | 11,114 | 7,920 | 8,292 (**415**) | **+ 2,600** |

| Scenario | Population Change | Households | Dwellings (annual in bold) | Jobs |
|---|---|---|---|---|
| Scenario G **Experian 'Policy-On'** | 15,231 | 9,695 | 10,150 (**507**) | + **4,560** |
| Scenario H **Local Plan Housing Target** | 15,514 | 9,781 | 10,240 (**512**) | **+ 4,755** |
| Scenario I **Past Housing Delivery** | 6,388 | 5,980 | 6,260 (**313**) | **+274** |

**Table 3.1 Future Housing Scenarios (Total Growth 2022 to 2042 (Annual))**

**3.2.7** Scenarios D and E are based on the 2018 population projections, however, the Government has chosen not to adopt these projections as the basis of determining the minimum level of housing need for the assessment of Local Housing Need. Scenarios B, C, D and E all produce figures which are below that calculated by the standard method, and significantly below that represented by past housing delivery. As the standard method figure represents the minimum level of housing need these scenarios are not presented as options. Scenario H which represents the previous local plan target is similarly not represented as an option as the evidence upon which this scenario was based has now been superseded, and is included as the basis of comparison only.

**3.2.8** This leaves four scenarios to be taken forward as options. It should be noted however, that the standard method calculation of Local Housing Need (LHN) is based on a projection of a decline of the working population. The HEDNA (2023) highlights that if unchecked this could have a serious negative impact on the local economy due to a declining labour force unless measures are implemented to increase the employment rate. It goes on to conclude; "given the strong regeneration and economic growth objectives being pursued by the Council this would suggest that the LHN generated by the Government's standard methodology is not appropriate for North East Lincolnshire moving forward".

**3.2.9** It should also be noted that the past housing delivery scenario is based on the net delivery over the period 2013/14 to 2021/22. This includes a period before the local plan was adopted in 2018, and the period from 2018/19 to 2021/22 when the net figures recorded included an additional annual reduction of 45 to take account of the demolition of the Freeman Street flats. As the demolition of the flats formed part of a wider rationalisation of Lincolnshire Housing Partnership property portfolio to reduce vacancy levels it is considered that the allowance made may not be a true reflection of the need generated. As a consequence the 45 reduction may have been a greater allowance than was appropriate.

### Option 3

Housing requirement - Scenario A standard method

This option would use the standard method to calculate a requirement for 203 dwellings per year and a loss of 109 jobs over the plan period.

### Option 4

Housing requirement - Scenario I past housing delivery

This option is based on the past housing delivery figures for the Borough which would result in a requirement for 313 dwellings per year and a jobs growth of 274 over the plan period.

### Option 5

Housing requirement - Scenario F Experian Baseline December 2022

This option would use the Experian Baseline (December 2022) which calculates a requirement for 415 dwellings per year and a jobs growth of 2,600 over the plan period.

### Option 6

Housing requirement - Scenario G Experian 'Policy On'

This option would use the Experian 'policy on' scenario which calculates a requirement for 507 dwellings per year and a jobs growth of 4,560 over the plan period.

### Question 2

Housing requirement

To support economic growth, the Council is minded to support Option 5 Housing requirement - Scenario F Experian Baseline December 2022 which would mean a requirement of 415 dwellings per annum and jobs growth of 2,600 over the plan period. (This option may require some flexibility to accommodate further growth).

Do you have any comments?

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# Section 4 A vision for North East Lincolnshire

**4.0.1** Section 2 North East Lincolnshire in context sets out the range of issues that the Borough faces. They demonstrate a clear need for change, which serves as a strong indication that a 'business as usual approach to planning for the Borough's future is not one that should be considered appropriate.

**4.0.2** Despite the challenges, the Borough is well positioned to maximise the potential of economic activity in key sectors. This economic growth is, essentially, a vehicle for change which, if planned for correctly, will improve the well-being of the community and revitalise towns and neighbourhoods. To achieve this, North East Lincolnshire must work alongside its neighbours to facilitate the real opportunities for change and growth that exists and maintain the Borough's distinctive role within the wider Humber Bank so that the growth is complementary to that in surrounding areas. Together with driving the economic priorities, the area's most valued assets must be protected and enhanced.

**4.0.3** **The Plan's vision remains, subject to some minor revisions, largely consistent with the vision in the existing local plan.**

## 4.1 The overall spatial vision

Spatial vision

By 2042 North East Lincolnshire will have built on its national and international recognition as a centre for offshore renewables, focusing on operations and maintenance and contributing significantly to the Humber's 'Energy Estuary' status. Growth in key sectors, food, energy, chemicals, ports and logistics, will be matched by a strong tourism and leisure offer. Evident through increased jobs and diversity of skills, the barriers to accessing jobs will have been broken down. This will be facilitated through the establishment of facilities to improve education and skills, and measures implemented to address housing need and affordability, and health and service needs, including countering deprivation issues in specific wards. A platform for sustained sustainable economic growth will have been created, with conditions to capture and sustain more and better jobs in the area well established. Town centres will be successful, having widened their offer to the communities they serve.

Environmental quality will be an established source of pride, aspiration and confidence. The special character, biodiversity and distinctiveness of the Borough will continue to be protected and enhanced. The Borough's ecological and green infrastructure networks will have been improved, providing improved habitats and access to nature for local communities. A commitment will have been demonstrated, to address the causes and consequences of climate change, including bringing about an overall reduction in the proportion of properties at risk from flooding.

Good progress will have been made to make North East Lincolnshire a forward looking Borough where aspirations have been raised, and gaps narrowed in terms of social inequality; whether caused by health, education, age, disability, ethnicity, location or other aspects. Housing initiatives will have successfully revitalised areas of low housing demand, and steps taken to lift housing delivery to support economic growth, recognising

the need to provide housing to address demographic change, and meet the prospects for economic growth over the plan period and beyond; whilst providing choice within the housing market, and being sensitive to the scale and character of settlements.

### Question 3

Spatial vision

Do you agree that the vision, as set out above, is appropriate to be taken forward in the Local Plan?

## 4.2 Place statements

4.2.1 The following 'Place statements' complement the overall spatial vision clarifying the role of different settlements in meeting the overall vision, and remain unaltered from the existing Local Plan.

**Urban Area (Grimsby and Cleethorpes)**

4.2.2 By 2042 the urban area will have witnessed a step change in the image and desirability of the urban environment. New sustainable communities will have been created, providing good quality housing, meeting people's needs and aspirations within attractive and easily accessible environments. Communities will have good access to quality jobs, healthcare and education, open space and retail facilities.

4.2.3 Grimsby will have strengthened and broadened its role as the sub-regional centre, accommodating new retail and leisure development, including environmental enhancement of the townscape. The buildings and structures associated with Grimsby's fishing heritage will have been appreciated and managed, and the potential they offer for heritage-led regeneration realised. Cleethorpes will have built-upon its role as a regional tourist destination, reinforcing its character as a historic seaside resort, and enhancing the quality and diversity of its offer to visitors, including those on business and those looking for an enjoyable day out.

**Estuary Zone (Land adjacent to the Estuary including the port town of Immingham)**

4.2.4 The land adjacent to the Estuary in and around the ports, and adjacent to the deep water channel is a valuable economic resource. By 2042 opportunities will have been taken to strengthen key economic sectors, capturing local economic benefits and realising the full potential of offshore renewable operations and transitioning to a low carbon economy. Development will have been secured, strengthening the offer of the wider Humber sub area, whilst recognising the environmental and biodiversity qualities of the Humber Estuary, maintaining the integrity of designated sites, addressing the causes and consequences of climate change, and providing infrastructure improvements. Areas of land will have been identified and secured, and a long term management plan will be in place, to safeguard sites for roosting, loafing and foraging birds as part of a sub-regional delivery plan.

**4.2.5** Immingham will have strengthened its role as an independent town. The town centre will provide retail and service facilities and a community focus. Highway improvements will have helped to alleviate localised air quality issues. Other environmental improvements and enhancements to service facilities will have revitalised the town and sustained its role supporting the needs of surrounding villages.

**Western and Southern Arc (Healing, Laceby, Waltham, New Waltham and Humberston)**

**4.2.6** The arc of larger villages outside the urban area, have seen historic patterns of growth. By 2042, these settlements will have grown but their character will have been protected through good design and sensitive planning. They will have been sustained by improving local community facilities e.g. shops, children's playgrounds, and sports pitch improvements. Accessible employment opportunities will have been established, particularly Hewitt's Circus Business Park. The open countryside that separates settlements will have been protected to maintain the sense of separation; recognising the value and importance of environment corridors stretching into the urban area. Growth will, however, have been sensitive to the scale and character of settlements, and sought to build upon the network of green infrastructure.

**Rural Area (Open countryside including rural settlements)**

**4.2.7** The special character and distinctiveness of the rural area will have been protected. The countryside is recognised as being of particular value to be enjoyed by local communities through a network of footpath and bridleway routes. Designated landscape, nature conservation habitat sites and heritage assets will continue to be offered high levels of protection. Opportunities will have been created and taken up to address local housing needs; and provision made for a diversity of rural employment opportunities that support the vitality and respect the local character of rural settlements.

## 4.3 Strategic objectives

**4.3.1** The objectives set out below relate directly to the spatial vision. They provide a framework for the local plan policies to facilitate the form and pattern of development necessary to ensure that the vision is fully realised by 2042. The objectives are mutually supportive and are not listed in order of priority. The objectives remain unaltered from the existing local plan.

**4.3.2** Appendix A Strategic objectives and policy relationship demonstrates which objective(s) each policy in the Plan is working towards.

| |
|---|
| SO1 Population<br><br>Meet development needs and facilitate economic development by supporting population growth, retaining working age population and providing for a generally ageing population. |
| SO2 Climate change |

Address the causes and effects of climate change by promoting development that minimises natural resource and energy use; reduces waste and encourages recycling; reduces pollution; brings about opportunities for sustainable transport use; responds to increasing flood risk; and, incorporates sustainable construction practices. Promote appropriate distribution of development and the role of green infrastructure in mitigating aspects of flood risk. Recognise the increased stress on habitats and species that climate change causes.

SO3 Economy

Support environmentally responsive local economic growth by promoting conditions that sustain an increase in the number of better paid jobs; and, raising skills. Promote rural regeneration and diversification, including a strengthened tourism offer.

SO4 Housing

Significantly boost housing supply to meet the existing and future housing needs of the whole community. High quality market and affordable housing, specific provision for the elderly, special needs housing and gypsy ad travellers accommodation will be supported. A balanced supply of deliverable sites will be identified to achieve as a minimum, the objectively assessed needs of the Borough.

SO5 Social and health inequality

Narrow the gap in terms of social and health inequality by addressing issues of housing choice, providing accessible employment and training opportunities, promoting healthier lifestyles, providing healthcare and community facilities, improving educational attainment and cultural facilities; and establishing protecting and maintaining a network of accessible good quality open space, sport and recreation facilities.

SO6 Built, historic and natural environment

Ensure that the development needs of the Borough are met in a way that safeguards and enhances the quality of the built, historic and natural environment and ensures that the development needs are met in a way that minimises harm to them. Direct development to locations of least environmental value and proactively manage development to deliver net gains in biodiversity overall. Encourage the use of brownfield land.

SO7 Transport

Improve accessibility to jobs and services by sustainable transport modes, including cycling and walking; reduce the overall need to travel with employment and housing growth spatially balanced; and, provide the necessary infrastructure to support sustainable growth.

SO8 Town centres and local facilities

Strengthen the vitality and viability of town centres, meeting the needs for retail, commercial and leisure uses, focusing appropriate uses on town centre sites, promote regeneration where appropriate and support the retention of local community and service facilities.

SO9 Design

Raise the quality of developments by applying the principles of goo sustainable and inclusive design; promote safe, secure and accessible streets and places; and, recognised the importance of supporting and strengthening local character and distinctiveness.

SO10 Minerals and Waste

Safeguard important mineral resources and support minerals infrastructure for the future. Promote the application waste hierarchy in the management of waste and deliver sustainable facilities to manage waste.

### Question 4

Strategic objectives

Do you agree that the objectives are appropriate to be taken forward in the local plan?

## 4.4 Monitoring

**4.4.1** The objectives are linked to particular indicators and targets that the Council will monitor. Monitoring is an integral part of the cyclical planning process of Plan-Monitor-Manage. It provides the basis for assessing the ongoing performance of the Plan, which brings about opportunity for intervention if policies are shown to be failing or circumstances change during the course of the plan period.

**4.4.2** The monitoring framework indicators have been revised and simplified to align more closely with the Council's monitoring of the Council Plan, which in turn recognises the priorities of the Borough.

**4.4.3** The revised monitoring framework has formed the basis of the Council's 2023 Authority's Monitoring Report (AMR) and is supplemented by data published on the North East Lincolnshire Data Observatory (https://www.nelincsdata.net/).

# Section 5 Spatial strategy

**5.0.1** The Local Plan as a whole sets out the development strategy for the Borough, providing the basis for future planning decisions. it promotes sustainable development which seeks to improve the quality of life, meeting the identified future needs whilst protecting and enhancing the natural, built and historic environment.

**5.0.2** The spatial strategy is expressed in the following policies relating to the settlement hierarchy, distribution of housing growth, development boundaries and green wedges; these policies together with the employment and housing allocations and supporting infrastructure define the areas for growth and restraint.

## 5.1 Hierarchy

**5.1.1** The settlement hierarchy is one of the key factors which influences and underpins the spatial distribution of future development. Broadly speaking, it is a factor which should be taken into account when assessing the amount of development appropriate in different settlements and areas of the Borough. A settlement that sits higher in the hierarchy would, in principle, be expected to accommodate a higher level of growth.

**5.1.2** Draft Strategic Policy 1 Settlement hierarchy is informed by the spatial portrait set out in 2.1 Portrait, and the more detailed *Settlement Accessibility Assessment* (2023). The detailed assessment is founded on an objective approach which uses a number of key indicators to assign points to settlements. The settlements which accumulate the highest number of points are deemed to be those which provide the greatest level of accessibility for residents to a wide range of key services and amenities, including education, healthcare and recreation.

**5.1.3** The defined settlement hierarchy in Draft Strategic Policy 1 Settlement hierarchy establishes four levels of settlement. This hierarchy should be considered alongside key development needs and constraints, infrastructure capacity and the availability of land for development. **The Council is considering revising the existing policy to strengthen the approach to prevent coalescence of the 'Arc settlements' and therefore maintain their individual identities.**

### Draft Strategic Policy 1

Settlement hierarchy

1. The following settlement hierarchy will provide the framework for the Council's decisions on the location and scale of development and on investment in services and facilities. Development should be commensurate with a settlement's position in the settlement hierarchy.

| Level | Settlements |
|---|---|
| **Level 1**<br>Urban Area | Relates to the urban area of **Grimsby and Cleethorpes**, including the adjoining parish of Great Coates which functions as one entity, albeit with a different character. |

| Level | Settlements |
|---|---|
| | The urban area provides the greatest accessibility to key services and amenities and has historically delivered the greatest number of new homes. Future development of this area would involve brownfield and greenfield sites, including land adjacent to and beyond the settlement edge. Such development is regarded as sustainable where access to services and amenities is good or can be provided. |
| **Level 2** Local Service Centres | Relates to the stand alone town of **Immingham** and the 'Arc Settlements' of **Healing, Humberston, Laceby, New Waltham and Waltham**.<br>These settlements perform the role of key local service centres offering a good range of basic services and amenities, combined with good accessibility to the wider services available in the urban area. Future development would involve development principally of greenfield sites adjacent to but within the defined settlement development area boundary, with an emphasis on preventing coalescence and maintaining the individual identity of settlements. |
| **Level 3** Rural Settlements | Relates to the rural settlements of **Habrough and Stallingborough**.<br>These rural settlements offer a much lower provision of services but do offer good accessibility to higher level settlements. Future development would involve smaller scale development principally limited to infill sites within or sites within but immediately adjacent to the defined settlement development area boundary. |
| **Level 4** Minor Rural Settlements | Relates to the minor settlements of **Ashby cum Fenby, Aylesby, Barnoldby le Beck, Beelsby, Bradley, Brigsley, Hatcliffe, Hawerby cum Beesby, Irby upon Humber, East and West Ravendale, and Wold Newton**.<br>These small rural settlements offer very few services and amenities and poor accessibility to higher level settlements. Future development would involve only limited infill, conversion and re-use of existing buildings with very limited further development. |

**Table 5.1 Defined settlement hierarchy**

## Question 5

Settlement hierarchy

The policy has been revised, relating to Level 2 settlements, to include text to strengthen the approach to prevent coalescence of the 'Arc' settlements therefore maintaining their individual identities.

Do you have any comments?

| Draft Strategic Policy 1 Settlement hierarchy relationship to: | Links to: |
|---|---|
| National Planning Policy Framework | Paragraphs 8,9,10,and 11 |
| Local Plan Strategic Objectives | SO1, SO3, SO4, SO5 and SO8 |
| Evidence base and other key documents and strategies | • *Settlement Accessibility Assessment* (2023) |

**Table 5.2 Policy relationships**

## 5.2 Growth and distribution

**5.2.1** New housing will be distributed in relation to the spatial strategy. This should reflect Draft Strategic Policy 1 Settlement hierarchy, locations of existing employment clusters, development constraints, accessibility and service provision. It should specifically sets out what level of residential development will be commensurate with individual settlements.

**5.2.2** **The Draft Plan presents options on the spatial distribution which will affect the proportion of development to be delivered in each of the spatial zones.** In selecting your preferred option you should consider specifically;

1. the need to fulfil the housing needs requirements over the plan period and beyond;
2. the need to provide choice in the housing market;
3. the need to reconcile competing housing market pressures with the drive to promote sustainable transport choices;
4. the need to balance development pressures with the need to prevent coalescence of settlements;
5. the desire to regenerate brownfield sites with the need to provide sufficient deliverable housing sites to meet future housing needs which necessitates large area of greenfield development;
6. the need to regenerate and redevelop urban areas to address specific issues of inequality and deprivation, set against consideration of flood risk in these areas;
7. the need to foster and support economic growth, recognising the locational preferences and requirements of key sectors; and,
8. the provision of community facilities and services, including schools and healthcare.

**5.2.3** A number of spatial options are set out below which have different implications for the amount of development to be delivered in the different settlements across the borough. **For all of the options there is a emphasis on maximising delivery from brownfield sites where this is achievable.** (The Council prepares a register of

brownfield sites on an annual basis which provides details of known sites which are available for development). Each of the options is accompanied by an explanation of the implications of the approach.

### Statement 2

Sites under construction

The spatial strategy will need to recognise the status of sites that are under construction or that have gained planning consent. As the local plan will take some time to reach adoption it is likely that the status of some sites will change over this time and will need to be captured as time passes.

### Option 7

Urban focus including strategic urban extensions

This option would see development focused on the urban areas of Grimsby Cleethorpes and Immingham, with less growth in the arc villages and rural settlements. This option would see development of the Grimsby West and Humberston Road strategic urban extensions.

| Advantages | Disadvantages |
|---|---|
| This option directs most development to urban centres which offer the best accessibility to services and public transport. This option includes the strategic urban extensions where homes can be delivered together with supporting infrastructure, services and recreation and open space. It also focuses development in closes association and accessibility to the Humber employment zone. | This option would see a constraint on locations that have been favoured by the housing market, which may lead to under delivery. |

**Table 5.3 Advantages and disadvantages to Option 7**

### Option 8

Greater Arc growth, excluding strategic urban extensions

This option would see more growth in the arc villages of Humberston, New Waltham, Waltham Laceby and Healing with a relaxation of the restraint on growth in the gaps between settlements.

| Advantages | Disadvantages |
|---|---|
| This option delivers more housing in the locations favoured by the housing market. | This option would see more development in the gaps between the arc settlements and more pressure on existing services, for example health and schools and the transport network. |

**Table 5.4 Advantages and disadvantages to Option 8**

## Option 9

Arc constraints including strategic urban extensions and urban focus

This option would see a strengthening of the policy of restraint relating to the arc settlements and safeguarding the gaps between settlements. This option would see development of the Grimsby West and Humberston Road strategic urban extensions.

| Advantages | Disadvantages |
|---|---|
| This option maintains and strengthens the independence of settlements and safeguards the green areas between them, whilst promoting urban development including strategic urban extensions where homes can be delivered together with supporting infrastructure, services and, recreation and open space, and strategically close to the employment zone. | This option would see a constraint on locations that have been favoured by the housing market. |

**Table 5.5 Advantages and disadvantages to Option 9**

## Option 10

Wider distribution excluding strategic urban extensions

This option would see a wider relaxation of the policy of restraint, seeing a wider distribution of development with more development in the smaller settlements.

| Advantages | Disadvantages |
|---|---|
| This option maximises the range, type, and location of sites across the Borough. | This option would see more development in locations lacking in services and infrastructure and represents the least sustainable option. |

| Advantages | Disadvantages |
|---|---|
| | |

**Table 5.6 Advantages and disadvantages to Option 10**

Note

1. Under all options: brownfield sites where there is evidence that development is viable and achievable will be given priority through the site selection process.
2. Sites under construction are committed and are therefore not subject to review, this currently accounts for the future delivery of 3,406 homes.

### Question 6

Distribution of growth

Taking account of the advantages and disadvantages of the identified options, the Council is minded to support Option 9 Arc constraints including strategic urban extensions and urban focus.

Do you have any comments?

## 5.3 Development boundaries

**5.3.1** Development boundaries distinguish between built-up areas and areas of open countryside. The use of development boundaries in planning has been successful in indicating clearly the locations where development will usually be acceptable, subject to meeting normal development management criteria. It is an approach that has, in the past, been strongly supported in North East Lincolnshire and continues to be supported today.

**5.3.2** **The development boundaries will be identified on the Policies Map. These boundaries will take account of housing allocations when they are confirmed.** Where it is known that developments will incorporate extensive areas of perimeter landscaping at the edge of settlements, the development boundaries will been drawn to follow the extent of the built-up development.

**5.3.3** A number of considerations will inform the final process of defining the development boundaries, including the nature and form of settlement edges, and an assessment of the landscape sensitivities; this includes:

1. considering whether settlements include key characteristics or distinctive features which contribute to their sense of place;
2. identifying features that define current settlement edges and determining whether they are strong or weak; and,
3. assessing opportunities for enhancement through identification of approaches and views, distinctive features, visual open space and sensitivity to change.

| | |
|---|---|
| The need for new development | Ensuring that sufficient sites are available to accommodate future requirements by incorporating sites that:<br>1. contribute to the supply of housing (allocated sites); and,<br>2. contribute to the supply of employment land.<br>Boundaries are not drawn so tightly to exclude all new development; they are influenced by the physical features that define the settlement edge and will provide some opportunities for small scale development above and beyond allocated sites. |
| The setting of the settlement | Considering the particular landscape and surrounding countryside features in the vicinity of the settlement edge:<br>1. recreation and amenity open space (including school playing fields), which is physically surrounded by the settlement or adjoining settlement on three sides, is included within the boundary; and,<br>2. recreation or amenity open space that extends into the countryside or primarily relates to the countryside, is excluded from the boundary. |
| The existing form, character and pattern of development | Considering the impact of further development on the existing development pattern. Ensuring boundaries are not contiguous if the form of the settlement does not reflect this. If the settlement is characterised by small groups this is reflected in the boundaries. The defined boundaries are not drawn so as to 'round off' or 'straighten' edges as this would be contrary to an approach that seeks to safeguard local character and distinctiveness, as it is often the irregularity of settlement edges that adds to a settlement's attractiveness. |
| Preventing coalescence of settlements | Boundaries include the gardens (curtilage) of properties except where they are functionally separate from the dwelling or, where the scale of the site is such that it could, through future development, lead to ribbon development or coalescence with a nearby settlement. |
| The presence of physical boundaries | Recognising that natural or man made features such as rivers, woodlands, or roads and railways can form logical defining boundaries. However, areas of caravan, chalet and other temporary accommodation are excluded from the defined boundary reflecting their temporary status. |
| Minimising impacts on the character of open countryside | Boundaries ensure the intrinsic character and beauty of the countryside is respected, with particular consideration given to the Lincolnshire Wolds Area of Outstanding Natural Beauty designation. |
| Avoiding ribbon or scattered development | Ensuring that development does not creep along road frontages into open areas, or result in scattered development unrelated to existing development form. |

| | |
|---|---|
| | Freestanding buildings, individual and small groups of dwellings, including farm buildings which are detached or peripheral to the main built-up area of the settlement are excluded from boundaries. |
| Minimising impacts on heritage and biodiversity value | Ensuring that sites of heritage or biodiversity value are identified and not put at risk. |
| The presence of HSE consultation zones | Recognising that development opportunities may be limited or restricted in specific areas. |
| Traffic noise | Based on current assessments of noise, boundaries exclude areas where it is known that road surface noise impacts on living conditions. |
| Accessibility to services and facilities | Boundaries reflect the findings of the *Settlement Accessibility Assessment* (2023). |

**Table 5.7 Key aspects considered in defining development boundaries**

**5.3.4** Draft Strategic Policy 2 Development boundaries outlines the generic considerations that will be applied when considering all development proposals, (within development areas, within development boundaries; and within open countryside, outside development boundaries). They reflect core principles and considerations set out in National Planning Policy. These generic considerations provide the basis for considering whether the development proposed should be supported and approved.

**5.3.5** Draft Strategic Policy 2 Development boundaries specifically allows for development sites and opportunities to be identified and defined through the neighbourhood planning process. In some cases, where the local community decides that this is appropriate, a neighbourhood plan will effectively amend identified development boundaries.

**5.3.6** The Policy establishes the nature of development that would be supported and approved, both within, and beyond the development boundaries, setting out the key considerations and criteria that would apply. **Minor changes to the existing development boundaries policy are proposed to provide clarity on development allowed outside development boundaries.**

## Draft Strategic Policy 2

Development boundaries

1. Development boundaries will be identified on the Policies Map. All development proposals located within or outside of the defined boundaries will be considered with regard to suitability and sustainability, having regard to:

   A. the size, scale, and density of the proposed development;

B. access and traffic generation;
C. provision of services (education, healthcare, community, retail and recreation);
D. impact upon neighbouring land uses by reason of noise, air quality, disturbance or visual intrusion;
E. advice from the Health and Safety Executive;
F. flood risk;
G. the quality of agricultural land;
H. measures to address any contamination of the site; and,
I. impact on areas of heritage, landscape, biodiversity and geodiversity value, including open land that contributes to settlement character.

2. Development proposals located within but adjacent to defined boundaries will be permitted where schemes respond to:

A. the nature and form of the settlement edge;
B. the relationship between countryside and the settlement built-form; and,
C. opportunities to contribute to the network of green infrastructure.

3. Beyond the development boundaries land will be regarded as open countryside. Development will be supported where it is in harmony with the local setting and recognises the distinctive open character, landscape quality and role these areas play in providing the individual settings for independent settlements, and specifically;

4. A. supports a prosperous rural economy, particularly where it promotes the development and diversification of agricultural and other land based rural businesses; or,
B. promotes the retention and development of local services and community facilities; or,
C. supports rural leisure and tourism developments, including the creation of holiday accommodation; or,
D. consists of affordable housing to meet specific local needs; or,
E. is development that has been specifically defined and identified through the neighbourhood planning process; or,
F. it consists of the conversion of an existing building (where the existing building is integral to the conversion).

## Question 7

Development boundaries

Revisions to the Development Boundaries policy are proposed to provide clarity on the development related to conversion of buildings allowed outside the boundaries, criteria F.

Do you have any comments?

| Draft Strategic Policy 2 Development boundaries relationship to: | Link to: |
|---|---|
| National Planning Policy Framework | Paragraph 80 |
| Local Plan Strategic Objectives | SO4 and SO9 |
| Evidence base and other key documents and strategies | • *North East Lincolnshire, Landscape Character Assessment* (2015)<br>• *Settlement Accessibility Assessment* (2023) |

**Table 5.8 Policy relationships**

## 5.4 Green wedges

**5.4.1** **The introduction of a 'Green Wedges' policy is being considered**. A number of settlements in the Borough have seen rapid expansion since the Local Plan was adopted and seen further development pressures particularly during the period of speculative planning applications when the Council could not demonstrate a five year housing land supply. This has put considerable pressure on the open land that forms the existing strategic gaps between settlements.

**5.4.2** Whilst the existing Local Plan, Policy 40 Developing a green infrastructure network, affords some protection to the gaps between settlements it does not define edges to the protected areas. It is considered appropriate to explore the potential of strengthening the protection given to specific areas of land that are considered crucial in maintaining the individual character and setting of the settlements, provide important ecological corridors and promote the establishment of networks of green space. Policy 40 previously identified strategic gaps in the following broad locations:

- Immingham and industrial development to the north;
- Stallingborough and Healing;
- Healing and Grimsby;
- Laceby and Grimsby;
- Waltham and Grimsby and New Waltham;
- New Waltham and Grimsby and Humberston; and,
- Humberston and Cleethorpes.

**5.4.3** The purpose of the proposed Green Wedges Policy would be to provide greater protection to the open and undeveloped character of areas within them, maintain and strengthen the independence and identity of individual settlements. The Council is also keen to increase the biodiversity within these areas and support the strengthening of natural networks. It would therefore specifically support proposals to create biodiversity net gain sites or other approaches to enhance the natural environment in these areas.

**5.4.4** Whilst the aim would be to strengthen the landscape quality and environmental quality of these areas, it would not be intended that they should operate as an absolute restriction on all development proposals. Due to their multi-functional role, there are also various 'non-open space' uses that already exist and essential infrastructure that may be required. As such, certain types of development may be acceptable, as long as they are not detrimental to the character, role and function of the Green Wedge within which they are situated. This may include agricultural and forestry related development, green space, outdoor sport and recreation uses or the reuse of rural buildings and extensions or alterations to existing dwellings. It may also include flood defence or drainage works, provision of new infrastructure such as bridges or telecommunications, or specific development required by a public or private utility to fulfil their statutory obligation.

**5.4.5** If taken forward it is intended that the Green Wedges Policy would apply to land which has initially been assessed as meeting the criteria for identification.

### Statement 3

Identification of green wedge areas

The final identification of the boundaries to the green wedge areas will need to be reconsidered in light of the housing requirement, the spatial approach to be taken forward; and the final selection of development sites.

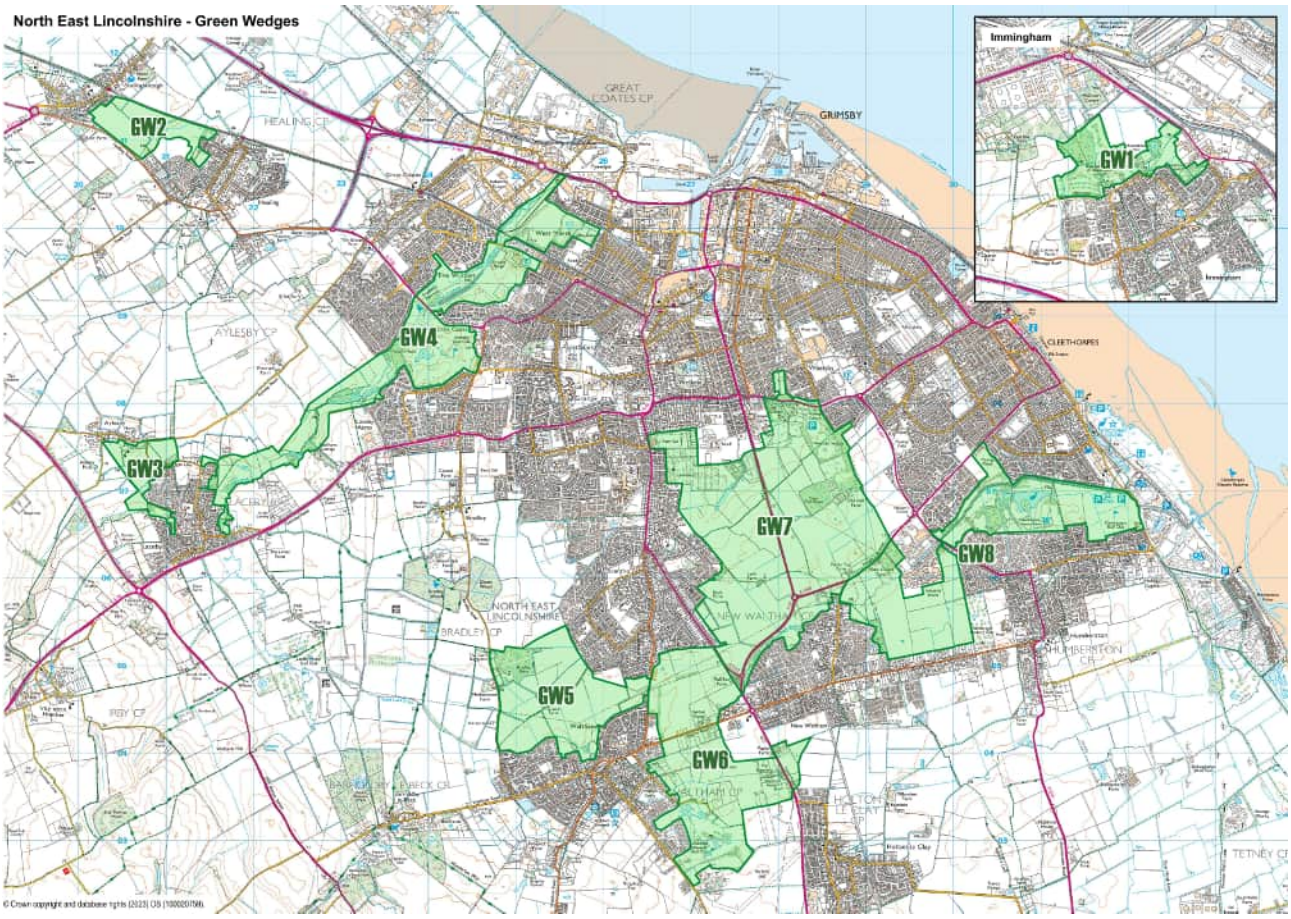


**Figure 5.1 Proposed Green Wedge Areas**

## Draft Strategic Policy 3

Green wedges

1. Green Wedges, as identified, have been identified to fulfil one or more of the following functions and policy aims:

   A. prevention of the physical merging of settlements, preserving their separate identity, local character and historic character, or provision of a buffer between non-compatible uses;

   B. provision of an accessible recreational resource, with both formal and informal opportunities, close to where people live, where public access is maximised without compromising the integrity of the Green Wedge;

   C. creation of a multi-functional 'green lung' to offer communities a direct and continuous link to the open countryside beyond the urban area;

   D. conservation and enhancement of local wildlife and protection of links between wildlife sites to support wildlife corridors, including provision of biodiversity net gain sites.

2. Within the Green Wedges planning permission will not be granted for any form of development, including change of use, unless:

A. it can be demonstrated that the development is not contrary or detrimental to the above functions and aims; or,

B. it is essential for the proposed development to be located within the Green Wedge, and the benefits of which override the potential impact on the Green Wedge. (*It may include flood defence or drainage works, provision of new infrastructure such as bridges or telecommunications, or specific development required by a public or private utility to fulfil their statutory obligation*).

3. Development proposals within a Green Wedge will be expected to have regard to:

A. the need to retain the open and undeveloped character of the Green Wedge, physical separation between settlements, historic environment character and green infrastructure value;

B. the maintenance and enhancement of the network of footpaths, cycleways and bridleways, and their links to the countryside, to retain and enhance public access, where appropriate to the role and function of the Green Wedge; and,

C. opportunities to improve the quality and function of green and blue infrastructure within the Green Wedge with regard to the green infrastructure network and Biodiversity Opportunity Mapping.

4. Development proposals adjacent to the Green Wedges will be expected to demonstrate that:

A. they do not adversely impact on the reasoning for the designation of the Green Wedge, taking into account scale, siting, layout, design, materials and landscape treatment; and,

B. they have considered linkages to and enhancements of the adjacent Green Wedge.

### Question 8

Green wedges

Do you have any comments about the proposed introduction of a Green Wedges policy, or the wording of the Green Wedges policy as set out?

### Question 9

Green wedges

Do you have any comments about the proposed areas identified for consideration of specific protection as a Green Wedge?

| Draft Strategic Policy 3 Green wedges relationship to: | Link to: |
|---|---|
| National Planning Policy Framework | Paragraph 174, 179 |
| Local Plan Strategic Objectives | SO2, SO5, SO6 |
| Evidence base and other key documents and strategies | • *North East Lincolnshire, Landscape Character Assessment*(2015)<br>• Green Wedges Methodology and Evaluation (2023) |

**Table 5.9 Policy relationships**

## 5.5 Infrastructure delivery, including telecommunications

**5.5.1** The delivery of key infrastructure of the right type, in the right place, and, at the right time, is vitally important to supporting growth and delivery of truly sustainable development. As settlements grow with new homes and places of work, it is important that the supporting infrastructure necessary to ensure health, social and cultural well-being and basic services meeting local needs are provided.

**5.5.2** Developers will be expected to provide these basic needs and contribute fairly to the delivery of new infrastructure to support new development and the creation of new sustainable communities. This includes aspects of physical infrastructure, social infrastructure, and environmental infrastructure.

**5.5.3** Developers will be expected to meet the infrastructure needs of the proposed development, and these will normally be secured through planning obligations, conditions or levy charges where appropriate. Where provision is required to address existing deficiencies as well as meeting future requirements, the Council will also utilise contributions from other public funding streams to ensure delivery.

**5.5.4** Draft Strategic Policy 4 Infrastructure provides the mechanism for ensuring that growth is delivered together with appropriate infrastructure. Where developer contributions are to be sought, the thresholds and triggers are set out in individual themed policies in this Plan, together with the mechanisms for determining the scale of contribution to be made.

**5.5.5** A planning obligation can only be taken into account when determining a planning application for a development, or part of a development, if the obligation meets all of the following tests:

1. it is necessary to make the development acceptable in planning terms;
2. it is directly related to the development; and,
3. it is fairly and reasonably related in scale and kind to the development.

**5.5.6** The Council will review the Infrastructure Needs to determine the infrastructure required to support sustainable communities over the extended plan period. The final balance of contributions will be subject to viability assessment to ensure that the sum of contributions is not so great that it will place such a large burden on development so as to prevent the delivery of the development.

**5.5.7** **The infrastructure policy has been revised to include contributions towards SEN (special education needs) provision and take account of the mandatory introduction of biodiversity net gain. Further revisions have been made to incorporate telecommunications within this policy rather than as a separate stand alone policy.**

### Draft Strategic Policy 4

Infrastructure

1. The Council will support developments to create, expand or alter service facilities, including schools, health facilities and key infrastructure to meet the needs of existing and new communities.
2. The Council will work with developers and partner organisations to ensure the delivery of infrastructure, services and community facilities necessary to develop and maintain sustainable communities; and will require provision of infrastructure and infrastructure improvements which are necessary to make development acceptable to be delivered in association with those developments. These improvements will where appropriate be secured by planning condition, obligations or levy charges as appropriate.
3. Proposals for telecommunications development, including consideration of appropriate prior approval applications will be permitted, or determined, provided that:

    A. the development is appropriate in terms of siting and appearance, having regard to technical and operational constraints, and does not intrude into or detract from the landscape or urban character of of the area with specific regard to the setting and beauty of the AONB;

    B. applicants demonstrate a sequential approach to show that development cannot be accommodated with less visual intrusion:

        i. on an existing building, mast of other structure, or;

        ii. on a site that already contains telecommunications equipment before new sites can be considered;

        iii. adequate screening and/or landscape measures are included, and;

        iv. provision is made for the removal of the facilities and reinstatement of the site as soon as reasonably practicable after it is no longer required for telecommunication purposes.

4. Contributions towards infrastructure will be based on the demands created y the specific development. This includes provision of new, or enhancement of the existing infrastructure and facilities, including, but not necessarily limited to:

A. physical infrastructure, including:

   i. transport improvements, including highways, public transport, provision for cyclists and pedestrians;
   ii. drainage and surface water management (including SuDs maintenance where appropriate); and,
   iii. flood defences (where site specific requirements warrant such an approach).

B. social infrastructure, including:

   i. affordable housing; and,
   ii. education, including primary and secondary and SEN (special education needs) provision of; one primary pupil/four dwellings, one secondary pupil/ five dwellings and 0.5 SEN pupil included for every 5.5 primary pupil places generated. (Pupil generation is based upon pupil generation ratios, as set out in the *Education Justification Statement* (2023).) The threshold at which contributions will be sought is ten units for primary and secondary and 24 units for SEN [i.e. 24 dwellings would generate a requirement for 0.5 SEN and 5,5 primary], excluding dwelling exclusively for over 55s, care homes, extra care, affordable homes and one-bed accommodation.

C. green infrastructure, including:

   i. green space, sport recreation and play space, including future maintenance;
   ii. habitat mitigation provision and maintenance, particularly in association with South Humber Bank employment sites; and,
   iii. Biodiversity Net Gain.

D. Existing infrastructure will be safeguarded, except where there is clear evidence that particular infrastructure is no longer required to meet current or future needs, or can be delivered through alternative provisions.

E. Where financial contributions are made, and in the event it is found that they exceed the cost of necessary works or the contributions remains unspent after an agreed period of time, the contributions will be returned, in part of entirely, as may be appropriate.

F. The Council will in addition support:

   i. proposals that deliver health infrastructure including doctor's surgeries and pharmacies, which offers improved services for their users; and,
   ii. applications made by the emergency services which will deliver improved services for their users.

G. The Council will seek to ensure that all development is commercially viable and deliverable. Where the delivery of a proposed scheme is threatened on the basis of viability, the Council may consider a reduction in the extent of the obligations required to submit a detailed Financial Viability Assessment on

an 'open book' basis, and in sufficient detail in order to justify any reduction from the expected requirements of the scheme. All such submissions, where required by the Council, should provide sufficient information to enable an independent assessment to be undertaken. As a minimum, this should be in accordance with the guidance on such content set out within *RICS Guidance Note GN2012/94 Appendix C*. All submissions will be subject to an independent assessment prior to the determination of the application.

### Question 10

Infrastructure

Revisions to the infrastructure policy are proposed, to include contributions towards SEN (special education needs) provision and take account of the mandatory introduction of biodiversity net gain; and incorporate telecommunications?

Do you have any comments?

| **Draft Strategic Policy 4 Infrastructure relationship to:** | **Link to:** |
|---|---|
| National Planning Policy Framework | Paragraph 8, 11, 20, 34, and 82 |
| Local Plan Strategic Objectives | SO2, SO5, SO7 and SO8 |
| Evidence base and other key documents and strategies | • *North East Lincolnshire Infrastructure Development Plan* Update (to be completed)<br>• *North East Lincolnshire Local Plan Viability Assessment Update* (to be completed)<br>• Education Justification Statement (2023) |

**Table 5.10 Policy relationships**

# Section 6 Climate change, flooding and energy

**6.0.1** The challenges of climate change, and the associated links to flooding and energy generation and consumption now have heightened importance. It is therefore considered appropriate to give these aspects greater status in the Local Plan, consequently their place in the structure has been revised to give them greater prominence.

**6.0.2** In September 2019 the Council declared a climate emergency and has since been working on a raft of measures to address this. In 2023 the Council revised its targets to become a net zero council, seeking now to achieve this position by 2030. This Local Plan sets out policies to address all aspects of climate change, supporting all businesses and communities to reduce their carbon footprint.

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## 6.1 Flood risk

**6.1.1** Flooding is a natural process that can occur at any time in a variety of locations. The severity of a flood event's impact, depends on a range of factors, including the combination of weather and rainfall patterns, sources of floodwater, local topography and patterns of development.

**6.1.2** With current climate change predictions pointing to the frequency, patterns and severity of flooding becoming more damaging, flood risk management is critical to protecting people and property from flooding. It is particularly important in the Borough as much of the urban area is within the high flood risk zone, including large parts of Grimsby, Cleethorpes and Immingham.

**6.1.3** **A revision to the flood risk policy has been proposed to safeguard land to ensure that future development along the estuary does not compromise the ability to maintain and possibly improve existing flood defence structures.**

**6.1.4** It is recognised that the Local Plan must strike a fine balance between providing for much needed regeneration and development activities within the urban areas (the main centres of population), and minimising the amount of new development exposed to flood risks. Where possible, development will be directed to areas at lowest risk of flooding in accordance with the sequential risk based approach required by the NPPF.

**6.1.5** The application of the sequential test within the Borough will be expected to follow the methodology set out in the Council's *Flood Risk Sequential and Exception Tests Guidance Note* which takes a rational approach to identifying the area of search for alternative sites with a lower probability of flooding, within defined regeneration areas. (Regeneration areas have been defined based on the 20% most deprived lower layer super output areas (LSOA) identified in the *Indices of Multiple Deprivation* 2019 and successor datasets.) It essentially ensures that parts of the urban area, which are ranked as being some of the most deprived areas in the country, and therefore most in need of development, remain capable of being developed in policy terms. The guidance has been developed in collaboration with the Environment Agency and provides a robust basis for the application of

the first part of the exception test, which requires the wider sustainability benefits of a proposal to outweigh the flood risk. Compliance with the second part of the exception test requires the development's safety to be demonstrated. (NPPF, paragraphs 161 to165.)

**6.1.6** The sites for employment and housing which will be assessed in the SHELAA will be subject to the sequential assessment and this will ensure that no housing development will be identified on greenfield sites within Flood Risk Zones 2 or 3, unless only part of the site is affected and these areas can be avoided.

**6.1.7** The *Strategic Flood Risk Assessment*(2022) (SFRA), supplemented by additional flood risk data (collected by the Council as the Lead Local Flood Authority, the Environment Agency and Internal Drainage Boards (IDBs), supports the planning process and provides a better understanding of flood risk in the Borough.

**6.1.8** Along with the other strategies and plans identified in Table 6.1 Policy relationships, it provides the basis for flood and coastal erosion management across the Borough. These studies include a number of actions, measures and flood defence investment priorities all of which seek to protect lives and property and build resilience to future flood events. This includes the decision presented in the *Shoreline Management Plan* "to hold the line" along the south bank of the Humber, which means that the currently defended frontages are likely to require increasing investment to address climate change impacts and increased exposure to wave attack. New development must not compromise the Council's or its partners' ability to deliver the action plans and where appropriate should help to contribute to their completion.

**6.1.9** Looking to the future, the Council is also a partner with the Environment Agency and 11 other Local Authorities from around the Humber, who are working to develop a long term strategy (Humber 2100+), that will address the flood risk and enable sustainable growth now and for the next 100 years**.** This work is progressing alongside the review of the local plan.

**6.1.10** Surface water runoff is also very likely to increase over the plan period as a result of more intense rainfall and new development across the Borough. This will place great pressure on existing drainage infrastructure and, if not carefully managed, will increase the risk of localised surface water flooding.

**6.1.11** Sustainable Drainage Systems (SuDs) slow the rate of surface water runoff and improve infiltration by mimicking natural drainage on a site. Developers should ensure that good SuDs principles are considered and integrated into schemes early in the design process. Examples of elements that can be incorporated into SuDs include permeable paving or road surfaces, soakaways and swales. Where possible, infiltration into the ground will always be encouraged in accordance with the drainage hierarchy. Further guidance on the design of SuDs are provided in the *North East Lincolnshire SuDs Guide* (2015).

**6.1.12** The provision of green infrastructure on a site can also reduce the risk of flash flooding by controlling surface water runoff. Features include green roofs, green walls and soft borders and landscaping, particularly large canopied trees.

**6.1.13** Pre-application discussions will be especially important as SuDs can be complex and the suitability of any proposed drainage solution will also depend on its interaction with surrounding and downstream sites.

## Draft Strategic Policy 5

Flood risk

1. Development proposals should have regard to the requirements of the flood risk sequential test and, if necessary, the exception test. The regeneration benefits of development in areas of high flood risk should also be considered in light of the Council's *Guidance Note on the application of the Sequential and Exception Tests in North East Lincolnshire*, and the Environment Agency's Standing Advice.
2. In order to minimise flood risk impacts and mitigate against the likely effects of climate change, development proposals should demonstrate that:
    A. where appropriate, a site specific flood risk assessment has been undertaken, which takes account of the best available information related to all potential forms of flooding;
    B. there is no unacceptable increased risk of flooding to the development site or to existing properties;
    C. the development will be safe during its lifetime;
    D. Sustainable Drainage Systems (SuDs) have been incorporated into the development unless their use has been deemed, and accepted by the Council as inappropriate;
    E. opportunities to provide natural flood management and mitigation through green infrastructure have been assessed and justified, based upon sound evidence, and, where appropriate, incorporated, particularly in combination with delivery of other aspects of green infrastructure in an integrated approach across the site;
    F. arrangements for the adoption, maintenance and management of any mitigation measures have been established and the necessary agreements are in place;
    G. access to any watercourse or flood defence asset for maintenance, clearance, repair or replacement is not adversely affected; and,
    H. the restoration, improvement or provision of additional flood defence infrastructure represents an appropriate response to local flood risk, and does not conflict with other Local Plan policies.
3. Sites fronting the sea wall defences between the ports of Immingham and Grimsby should specifically ensure that a 15metre buffer is maintained clear of development from the toe of the existing defences, so as not to prejudice future heightening of the existing sea wall defences.

### Question 11

Flood risk

Revisions to the flood risk policy are proposed to safeguard land for future flood defence works.

Do you have any comments?

| Draft Strategic Policy 5 Flood risk relationship to: | Links to: |
|---|---|
| National Planning Policy Framework | Paragraphs 152-173 |
| Local Plan Strategic Objectives | SO2, SO5 and SO6 |
| Evidence base and other key documents and strategies | • *Flamborough Head to Gibraltar Point Shoreline Management Plan* (2010)<br>• *Grimsby and Ancholme Catchment Flood Management Plan* (2009)<br>• *Draft Humber Flood Risk Management Plan* (2014)<br>• *Humber Flood Risk Management Strategy* (2008)<br>• *Local Flood Risk Management Strategy* (2015)<br>• *North East Lincolnshire SuDs Guide* (2015)<br>• *Preliminary Flood Risk Assessment* (2011)<br>• *Strategic Flood Risk Assessment* (2022) |

**Table 6.1 Policy relationships**

## 6.2 Water management

**6.2.1** The management of water resources is vital to ensure that water quantity and quality are maintained and improved throughout the Borough. Water resources include coastal waters, the internationally important Humber Estuary, rivers, streams, ponds and groundwater. They are important natural resources that provide wildlife habitats for a variety of species. They also facilitate land drainage, and many water bodies are valued tourism and recreation assets.

**6.2.2** Future growth over the plan period is likely to generate increased demands for water, especially non-potable water. Further capacity improvements may be required depending on the scale and speed of industrial development. Development will not therefore be permitted unless existing water supplies are adequate or they can be augmented to serve the development without affecting the water environment and groundwater systems.

**6.2.3** North East Lincolnshire is in an area of serious water stress. Anglian Water's *Water Resource Management Plan Draft* (WRMP24), identified that the supply of water can be managed in the long-term by various means including demand management, construction of two new reservoirs,(outside the Borough) and other sources of supply including desalination and transfers. However, demand measures including increased water efficiency should be considered first before any supply measures such as river/groundwater extraction, water storage (reservoirs) and water transfer. From a sustainability perspective, water should still be used efficiently in order to reduce the associated energy requirements (needed to pump water, for example) and to avert adverse environmental effects such as over-abstraction. Improving water efficiency will also help to reduce the volume of wastewater that the sewer system has to accommodate and therefore reduce discharges to water courses.

**6.2.4** Developers of new dwellings will be required to demonstrate that appropriate measures to conserve and reuse water, such as low flow showers and kitchen taps, and provision of water butts and rain/grey water harvesting have been incorporated to achieve water efficiency working to a standard of 110 litres per person per day or better.

**6.2.5** In most parts of the urban area rainwater drains into surface water sewers or sewers containing both surface and wastewater, these are known as 'combined sewers'. In Grimsby and Cleethorpes there are large areas served by combined sewers, mostly in the older parts of the towns.

**6.2.6** During periods of intense rainfall sewer flooding can occur. Flooding can also be triggered when a sewer is blocked or has insufficient capacity. There are a number of locations within Grimsby, Laceby, Humberston and New Waltham that are prone to flooding during heavy rainfall events. When this happens to combined sewers the risk of land and property flooding with water contaminated with raw sewage increases significantly.

**6.2.7** Specific problems occur when sewage works operate close to their capacity which can lead to water companies releasing untreated raw sewage into waterways. This is considered to be unacceptable by the Council who is working with the companies to address this current situation.

**6.2.8** Given the vulnerability of the sewer systems and likelihood of rainfall amounts and frequencies increasing due to climate changes, development proposals must provide infrastructure of an acceptable standard to cope sufficiently with sewage and surface water. Foul and surface water drainage should be separated to reduce the likelihood of flooding and contamination. The use of natural sewage treatment methods, such as wetland/reed beds, will be encouraged and supported where it is practicable.

**6.2.9** Groundwater resources provide an invaluable source of water for public supply, industry, agriculture and rivers; but can be harmed by a range of activities, such as contamination from industrial uses or infilling in the urban area. The Environment Agency has identified and mapped a number of these resources according to their significance and vulnerability to pollutants. A large area of North East Lincolnshire is designated as a Groundwater Source Protection Zone (see Figure 6.1 Ground water source protection zone). The zones (1 to 3) show the risk of contamination from any

activities that might cause pollution in the area; the closer the activity, the greater the risk. Zone 1 represents the area of greatest risk. The protection of the groundwater resources in these areas is particularly important.

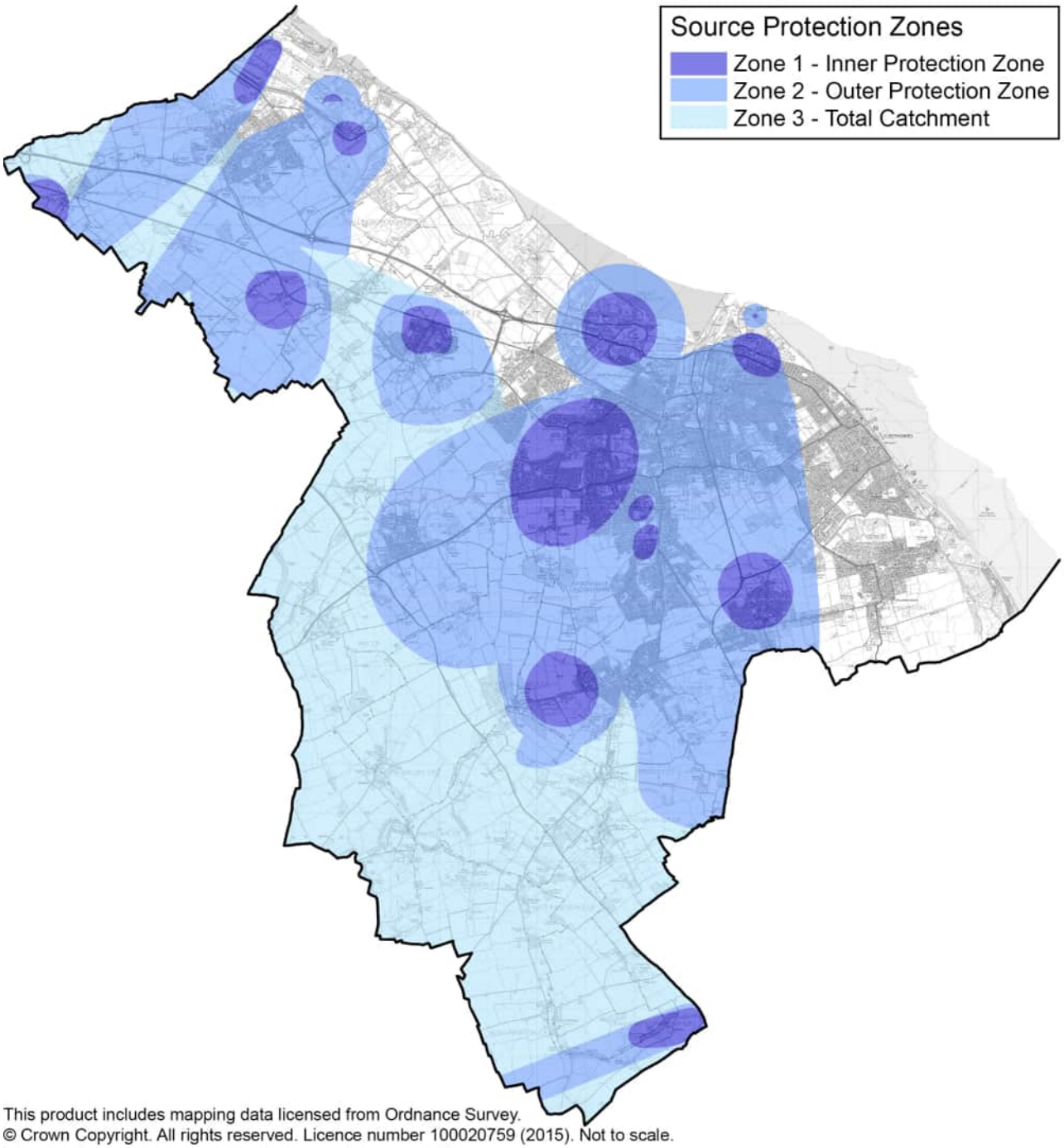




**Figure 6.1 Ground water source protection zone**

**6.2.10** Where development potentially impacts on groundwater, relevant site investigations, risk assessments and necessary mitigation measures for source protection zones will need to be agreed with the relevant bodies. The Environment Agency advocates

a risk-based approach to the protection of groundwater resources (*Groundwater Protection and Practice (GP3)* Environment Agency (2013); and the Council will support this. Where potential risks to groundwater exists, especially close to water supply abstractions, the Council will consult the Environment Agency at an early stage.

**6.2.11** Where development or land contamination from previous use could potentially impact surface water or groundwater, a preliminary risk assessment should be undertaken to assess the potential risk posed. Relevant site investigations, risk assessments and necessary mitigation measures will need to be agreed with the relevant bodies (the Environment Agency and relevant water companies). Any investigation should be undertaken in accordance with the Environment Agency guidance document *CLR 11 Model Procedures for the Management of Land Contamination*.

### Draft Strategic Policy 6

Water management

1. Development proposals that have the potential to impact on surface and ground water should consider the objectives and programme of measures set out in the *Humber River Basin Management Plan*.
2. Development proposals should consider how water will be used on the site and ensure that appropriate methods for management are incorporated into the design. Development proposals should demonstrate that:

    A. adequate and sustainable water supplies are available to support the development proposed;

    B. provisions are made for the efficient use of water, including is reuse and recycling. Proposals for residential development will be expected to demonstrate that a water efficiency standard of 110 litres per person per day can be achieved; and,

    C. adequate foul water treatment already exists or can be provided in time to serve the development. Appropriate and sustainable sewerage systems should be provided for the collection and treatment of foul and surface water to ensure new development does not overload the existing sewerage infrastructure, minimising the need to discharge water into sewers, particularly combined sewers.

3. Where development is proposed within a Source Protection Zone, the potential for any risk to groundwater resources and groundwater quality must be assessed and it must be demonstrated that these would be protected throughout the construction and operational phase of development.

### Question 12

Water management

No change to the water management policy is proposed.

Do you have any comments?

| Draft Strategic Policy 6 Water management relationship to: | Links to: |
|---|---|
| National Planning Policy Framework | Paragraphs 153,174 |
| Local Plan Strategic Objectives | SO2, SO6 |
| Evidence base and other key documents and strategies | • *Local Flood Risk Management Strategy* (2015)<br>• *River Basin Management Plan Humber River Basin District* (2022 update) |

**Table 6.2 Policy relationships**

## 6.3 Low carbon energy

**6.3.1** The energy sector in North East Lincolnshire is not only important to both the UK and local economy, but also plays a significant role in ensuring the UK's fuel security. The Borough is now established as an operations and maintenance base for offshore windfarms and additional sites to be developed around the Humber during the plan period to support Government targets to deliver 50GW of offshore wind by 2030.

**6.3.2** The presence of the ports, combined with the Borough's infrastructure network associated and long history of industry and energy production provides excellent foundations for a range of renewable energy technologies to continue to be developed, combined with the transition to a low carbon economy.

**6.3.3** **This policy supports the Council's drive to achieve net zero by 2030 and for the Borough as a whole to achieve net zero by 2050.**

**6.3.4** The concentration and nature of the commercial development along the South Humber Bank also presents opportunities for heat networks. These networks (often referred to as district heating schemes), supply heat from a central source directly to homes and businesses through a network of pipes. This is a more efficient method of supplying heat than individual boilers and is, therefore, considered to be low carbon technology.

**6.3.5** Other renewable energy technologies such as solar/photovoltaics and heat pumps, are becoming more affordable and popular increasingly so with forthcoming changes to building regulations standards. Community schemes also have the potential to play an increasing role in delivering renewable energy. In addition proposals for hydrogen generation and carbon capture are being advanced in the locality.

**6.3.6** The Borough has also been identified as one of three 'hotspots' in the UK having potential to secure geothermal energy from a vast saline aquifer that holds water underground at temperatures of between 40 and 60 degrees centigrade.

**6.3.7** Applications for nationally significant infrastructure, including energy developments over 50MW and offshore developments (and their associated onshore infrastructure) are not determined by the Council. They are examined by the Planning Inspectorate and determined by the Secretary of State, but the Plan is a material consideration in this decision-making process.

**6.3.8** Draft Strategic Policy 7 Renewable and low carbon infrastructure provides a positive framework for delivering sustainable energy supplies and will ensure that the Borough contributes to achieving national renewable energy generation targets. The Policy applies to proposals for all types of renewable and low carbon energy infrastructure, including biomass and biofuels technologies, energy from waste, solar, geothermal energy, wind turbines (onshore and onshore facilities required for the manufacture, commissioning, installation and servicing of offshore windfarms) hydro-power and micro-generation.

**6.3.9** Council has consented over 205MW of large scale solar farm projects since the Local Plan was adopted in 2018, together with many additional smaller scale solar projects linked to land and buildings across the Borough, and will continue to support the transition to a low carbon economy.

**6.3.10** Draft Strategic Policy 7 Renewable and low carbon infrastructure reflects *National Planning Practice Guidance* on wind energy developments, which requires local planning authorities to only permit applications if:

1. the development site is in an area identified as suitable for wind energy development in a Local or Neighbourhood Plan; and,
2. following consultation, it can be demonstrated that the planning impacts identified by affected communities have been fully addressed and therefore the proposal has their backing.

**6.3.11** The Council has undertaken work to identify broad areas which are potentially suitable for wind energy development. This work has focused upon the main constraints which would affect such developments, and has included consideration of:

1. landscape character and sensitivity (including the special qualities of the AONB designation);
2. residential amenity;
3. proximity to key infrastructure; and,
4. natural and historic environment designations.

**6.3.12** It should be recognised however, that opportunities for onshore wind energy developments are considered to be limited and renewable energy capacity is most likely to be increased through further solar farm development.

**6.3.13** The deployment of larger scale low carbon and renewable energy schemes, and the transmission infrastructure to support them, can have a range of positive or negative effects on nearby communities. They can provide landowners with the opportunity for rural diversification, deliver local jobs and opportunities for community based schemes and benefits. However, proposals can have a range of impacts that will vary depending on the scale of development, typed of area where the development is proposed and type of low carbon and renewable energy technology deployed.

**6.3.14** When considering planning applications for low carbon and renewable energy, an assessment will need to take account of the impacts on landscape, townscape, natural, historical and cultural features, flood risk and areas of nature conservation interests. Proposals should also ensure that high quality design features are used to minimise the the impacts on the amenity of the area in respect of visual intrusion, noise, dust and odour and traffic generation.

**6.3.15** In determining the character and sensitivity of the landscape to accommodate development, the impact of the development on the historic character, sense of place, tranquillity and remoteness of the landscape should be considered. Some energy developments appear industrial in nature, and where there are proposals in rural areas it will be important to ensure that any cumulative effects do not lead to a perception of industrialisation, either within a particular landscape of wider area. In assessing the capacity of the landscape to accept energy development, it will be important to consider Draft Strategic Policy 10 Landscape and the *Landscape Character Assessment*.

**6.3.16** Developers of large commercial scale solar or onshore wind developments will be expected to demonstrate a benefit to the communities within the locality of the development, recognising their social responsibility to the communities who are accepting the development.

**6.3.17** Development can impact on biodiversity at construction, operation and decommissioning stages. This is due to emissions, waste products and physical alterations to the environment arising from the development's footprint/structure and impacts on soil, hydrology and water quality. Proposals will also be considered against link Draft Strategic Policy 11 Biodiversity and Geodiversity and, where possible, mitigation measures should be used to compensate and improve biodiversity. The Council will give particular consideration to the potential for any proposal to disturb or displace SPA birds caused by the loss of suitable feeding, roosting and loafing sites or have the potential for damage or distance to the Humber Estuary Special Area of Conservation (SAC).

### Draft Strategic Policy 7

Renewable and low carbon infrastructure

1. The Council will support opportunities to maximise renewable energy capacity within the Borough supporting the drive to achieve net zero for the Council by 2030 and for the Borough as a whole by 2050.

2. Proposals for renewable and low carbon energy generating systems will be supported where any significant adverse impacts are satisfactorily minimised and the residual harm is outweighed by the public benefits of the proposal. Developments and their associated infrastructure will be assessed on their merits and subject to the following impact considerations, taking account of individual and cumulative effects:

    A. the scale and nature of the impacts on landscapes and townscapes, particularly having regard to the *Landscape Character Assessment* and impact on the setting and scenic beauty of the AONB;

    B. local amenity, including noise, air quality, traffic, vibration, dust and visual impact;

    C. biodiversity, geodiversity and nature conservation, with regard given to the findings of the site and project specific HRA and potential impacts on SPA birds, where appropriate;

    D. the historic environment, including individual and groups of heritage assets;

    E. telecommunications and other networks; including the need for additional cabling to connect to the National Grid, electromagnetic production and interference, and aeronautical impacts such as on radar systems;

    F. highway safety and network capacity;

    G. increasing the risk of flooding; and,

    H. the land, including land stability, contamination, soils resources and loss of agricultural land.

3. Where appropriate, proposals should include provision for decommissioning at the end of their operational life. Where decommissioning is necessary the site should be restored, with minimal adverse impact on amenity, landscape and biodiversity, and opportunities taken for enhancement of these features.

4. Development of large scale commercial solar or onshore wind will be expected to demonstrate a benefit to local communities in the locality.

5. Proposals for onshore wind energy development will be permitted if:

    A. the development site is located in one of the following identified broad areas:

        i. **Flat Open Farmland** - south of the settlements of Humberston, New Waltham and Waltham;

        ii. **Wooded Open Farmland** - east of the A18, and east and west of the A1173;

        iii. **Open Farmland** - along the A180 corridor; and,

        iv. **Industrial Landscape** - to the north west and south east of Immingham, and within the South Humber Bank employment zone; or,

    B. located in an area that is identified as potentially suitable for wind energy development in an adopted Neighbourhood Plan; and,

    C. demonstrate that the impacts identified through consultation with the local community have been satisfactorily addressed.

### Question 13

Low carbon energy

Revisions to the Low Carbon Energy policy are proposed to include refence to the net zero targets, and introduce an expectation on development of large scale commercial solar or onshore wind to demonstrate a benefit to local communities in the locality.

Do you have any comments?

| Draft Strategic Policy 7 Renewable and low carbon infrastructure relationship to: | Links to: |
|---|---|
| National Planning Policy Framework | Paragraphs 152-158 |
| Local Plan Strategic Objectives | SO2 |
| Evidence base and other key documents and strategies | • *Landscape Character Assessment* (2015)<br>• *Low Carbon and Renewable Energy Capacity in Yorkshire and Humber Study* (2011)<br>• |

**Table 6.3 Policy relationships**

## 6.4 Energy and low carbon living

**6.4.1** It is widely accepted that the burning of fossil fuels makes a significant contribution to climate change. Reducing greenhouse gas emissions is, therefore, a key part of the global response to minimising climate change.

**6.4.2** Low carbon living means reducing the carbon emitted as a result of direct and indirect lifestyle choices such as avoiding car travel and purchasing locally sourced food. The planning system will play a key role in facilitating and delivering this process and the policies throughout the Local Plan are intended to work together to ensure that energy demands and usage are reduced at every opportunity.

**6.4.3** North East Lincolnshire is considered an inefficient carbon economy due to its high industrial density relative to the size of population. A significant proportion of households are also classified as fuel poor (*Home Energy Conservation Act, Draft HECA Report* (2013)), and Draft Strategic Policy 8 Energy and low carbon living works towards ensuring that this situation is not exacerbated as new development is delivered across the Borough and promotes low carbon living.

**6.4.4** The energy hierarchy (see Table 6.4 Energy hierarchy) prioritises different means of cutting carbon emissions. It promotes elimination and efficiency considerations, which are often also the most cost efficient and effective means of achieving carbon

savings. Applying the hierarchy to development proposals should help to minimise the carbon footprint associated with new development both during construction and once in use. In turn, this should bring about energy cost savings for future occupiers.

**6.4.5** Proposals will not be expected to contribute to all aspects of the hierarchy, but measures to reduce demand and promote energy efficiency (levels 1 and 2) will be encouraged.

| Energy Hierarchy | |
|---|---|
| **Level 1: Reduce energy demand** | Even renewable energy carries an embodied carbon cost so using less energy is better than using clean energy. New developments should be designed to minimise the need for energy by taking account of:<br>• the scheme's layout;<br>• the design and construction of individual buildings; and,<br>• opportunities for passive heating and cooling systems. |
| **Level 2: Use energy and resources efficiently** | Development should use sustainable materials in the construction process, avoiding products with high embodied energy content and minimise construction waste. |
| **Level 3: Supply energy from renewable and low carbon sources** | Development could provide on-site decentralised or renewable energy. |
| **Level 4: Offset carbon emissions** | Emission could be offset by providing well-designed, multi-functional woodland, grassland or fenland that is suitable habitat for the particular area (the priority habitats relevant to North East Lincolnshire and as identified in the *UK Biodiversity Action Plan* should guide this decision), or through alternative carbon capture. |

**Table 6.4 Energy hierarchy**

**6.4.6 A revision has been proposed to require the incorporation of energy efficiency and low carbon technology as a specific consideration of the design stage.**

### Draft Strategic Policy 8

Energy and low carbon living

1. Where appropriate, the principles of the energy hierarchy should be followed in order to achieve energy efficient and low carbon development.
2. Design and Access Statements accompanying applications for major development should include information to demonstrate how appropriate design and construction practices have been considered and incorporated, specifically in relation to the following, and in accordance with other relevant policies in the Local Plan:

    A. considerations of landform, layout, building orientation, massing and landscaping;
    B. the use of materials, both in terms of embodied carbon and energy efficiency;
    C. the minimisation of waste and re-use of material derived from excavation and demolition; and,
    D. the incorporation of energy efficiency and low carbon technology.

### Question 14

Energy and low carbon living

Revisions to the energy and low carbon living policy to require the incorporation of energy efficiency and low carbon technology as a specific consideration of the design stage.

Do you have any comments?

| Draft Strategic Policy 8 Energy and low carbon living relationship to: | Links to: |
|---|---|
| National Planning Policy Framework | Paragraph 152-158 |
| Local Plan Strategic Objectives | SO2 |
| Evidence base and other key documents and strategies | • North East Lincolnshire Net Zero Carbon Roadmap (2021) |

**Table 6.5 Policy relationships**

# Section 7 The Natural environment

**7.0.1** The natural environment is a phrase used to describe 'green and blue spaces' in and around built-up areas. The elements that make up the natural environment include, parks, playing fields, gardens, agricultural fields and woodlands. Blue infrastructure includes the estuary and wetlands, the sea and coast, water bodies, rivers, streams, and sustainable drainage systems. The terms cover all land containing these features, regardless of ownership or public access.

**7.0.2** The value of these assets has been heightened in recent years as people have grown to value these spaces more, appreciate their importance to their health and wellbeing and appreciate the role they serve in supporting wildlife.

## 7.1 Health and wellbeing

**7.1.1** The vital role of planning in creating and supporting strong, vibrant and healthy communities, in terms of physical and mental health, is well recognised and is a key element in delivering sustainable development. **To reflect this the Council is including a new policy that specially addresses health and wellbeing**.

**7.1.2** The Borough's health priorities and issues are set out in the latest State of the Borough 2021; Joint Strategic Needs Assessment Theme Reports; and Public Health England Local Authority Health Profiles. Issues include mental health and emotional wellbeing particularly of children and young people, food insecurity, unpaid carers, obesity levels, dementia, increasing physical activity levels and the link between housing and health.

**7.1.3** When addressing these priorities and issues, it is essential that community needs are supported through appropriate physical and social infrastructure. This is supported by establishing calming environments with access to natural green space; and by other facilities and key services which contribute to improving physical and mental health and wellbeing, and the overall quality of life experienced by residents.

### Draft Policy 1

Health and wellbeing

1. The potential for achieving positive mental and physical health outcomes will be taken into account when considering all development proposals. Where potential adverse health impacts are identified, the developer will need to demonstrate how these will be addressed and mitigated.
2. The Council will expect development proposals to promote, support and enhance physical and mental health and wellbeing, and thus contribute to reducing health inequalities. This will be achieved by:

    A. in the case of development of 150 dwellings or more, developers submitting a fit for purpose Health Impact Assessment (HIA) as part of the application or at master planning stage where applicable, and demonstrating how the conclusions of the HIA have been taken into account in the design of the scheme. The HIA should be commensurate with the size of the development;

B. developing schemes where appropriate, creating or enhancing the role of allotments, orchards, or community gardens providing access to healthy, fresh and locally produced food; and

C. ensuring quality green infrastructure provides adequate access to nature for its benefits to mental and physical health and wellbeing and potential to overcome health inequalities.

3. Proposals for new health care facilities should relate well to public transport services, walking and cycling routes and be easily accessible to all sectors of the community. Proposals which utilise opportunities for the multi-use and co-location of health facilities with other services and facilities, and thus co-ordinate local care and provide convenience for the community, will be particularly supported.

### Question 15

Health and wellbeing

Do you have any comments about the introduction and wording of the Health and Wellbeing policy?

| Draft Policy 1 Health and wellbeing relationship to: | Links to: |
|---|---|
| National Planning Policy Framework | Paragraphs 8,92 and 93 |
| Local Plan Strategic Objectives | SO5, SO8, SO9 |
| Evidence base and other key documents and strategies | • State of the Borough (2021)<br>• Joint Strategic Needs Assessment Theme Reports<br>• Public Health England Local Authority Health Profiles |

**Table 7.1 Policy relationships**

## 7.2 Green infrastructure

**7.2.1** Draft Strategic Policy 9 Developing a green infrastructure network acknowledges the value of promoting a network of green space providing accessible green corridors, forming healthy traffic free links, connecting formal and informal green space, softening development edges, and maintaining the independent status and perception of individual settlements. These broad green corridors can provide access from the heart of the urban area to the open rural environment, promote active travel as well as providing additional benefits.

**7.2.2** Draft Strategic Policy 9 Developing a green infrastructure network outlines broad strategic gaps where the principle of maintaining the openness of land shall be maintained, and enhancement of the green infrastructure will be promoted. These areas are identified between the Grimsby/Cleethorpes urban area and the settlements of Humberston, New Waltham and Waltham and Holton le Clay to the south and Laceby, Healing and Bradley to the west.

**7.2.3** These predominantly open areas, which are located between the defined development boundaries, link with areas of formal and informal green space to form strategic green infrastructure corridors. These corridors stretch between the settlements and extend into the urban area. Within these corridors specific green wedges have been defined under a proposed new policy, where the boundaries of the green wedges have been clearly defined. These represent the most critical areas of the green infrastructure corridors that warrant greater protection.

**7.2.4** The *Landscape Character Assessment* (2015) provides an important evidence base that should be used to inform future decisions. In addition to providing an independent assessment of landscape character, an assessment of the sensitivity of the landscape, and the capacity for the landscape to absorb change in the form of new development; it has identified a range of key issues that have informed the Plan preparation process. This includes, outlining principles for the siting and design of new development, including the pattern, form and scale of built development. The provision of Green Infrastructure in order to reinforce and enhance landscape character is identified. This also includes specific consideration of the potential for coalescence of settlements.

**7.2.5** Conflict can arise between different uses by virtue of noise, odours, dust, and light intrusion. Green infrastructure when strategically placed to serve as a buffer can limit the nuisance to sensitive uses and permits activities without the need for onerous control measures. This is most frequently the case in relation to employment and residential uses. The Council will protect areas of green infrastructure from development where the development would impact upon the value of the land as a buffer between sensitive uses.

**7.2.6** **The Policy has been revised to emphasise the development and enhancement of a network of green space, building on existing assets and enhancing the overall quality of the environment. The open gap between New Waltham and Holton Le Clay has also been added to the areas offered specific protection.**

## Draft Strategic Policy 9

Developing a green infrastructure network

1. Development will be expected to maintain and improve the network of green infrastructure. Appropriate opportunities should be taken to improve the overall connectivity of green spaces, including improvements to access to the countryside and permeability of the urban area, for pedestrians, cyclists and horse riders. Recognition should also be made to the role such green infrastructure plays in

mitigating the effects of recreational pressure on the Humber Estuary SAC/SPA/ Ramsar, specifically designing natural green space which is attractive to walkers and dog walkers, particularly in areas where development is most likely to result in increasing visitors to the Humber Estuary SCA/SPA/Ramsar.

2. Proposals that would result in the loss or reduction in quality or existing public rights of way (PROWs) will not be permitted unless acceptable equivalent alternative provision is made. Where diversions are proposed, these should be convenient and attractive to users and not increase disturbance on protected wildlife sites.
3. The multiple value and functionality of green space should be recognised in the planning, design and implementation of developments, and particular attention should be given to planning positively for biodiversity and sustainable water management, including climate change mitigation, when considering the layout of development and delivery of biodiversity net gain proposals. The broad areas defined as strategic green infrastructure corridors are favoured locations for delivery of off-site biodiversity net gain sites.
4. In pursuance of a principle of developing a green infrastructure network the Council will protect the setting and separate identity of settlements; require buffers between potentially conflicting uses; prevent coalescence of settlements; retain the openness of land; control the nature and scale of urban and rural development; and seek to improve the quality of the green infrastructure. Specific emphasis will be afforded to the open areas between:

    A. Immingham and industrial development to the north;
    B. Stallingborough and Healing;
    C. Healing and Grimsby;
    D. Laceby and Grimsby;
    E. Waltham and Grimsby and New Waltham;
    F. New Waltham and Holton-le-Clay;
    G. New Waltham and Grimsby and Humberston; and,
    H. Humberston and Cleethorpes.

5. These predominantly open areas of green space link with areas of formal and informal green space to form strategic green infrastructure corridors, the framework of which will be identified on the Policies Map.
6. Development adjacent to defined development boundaries should pay particular regard to the nature and form of green infrastructure at or in proximity to the settlement edge. Where possible and where appropriate, development should contribute to enhancing the network of green infrastructure, respecting the relationship between countryside and the settlement built form, particularly avoiding hard settlement edges.

### Question 16

Green infrastructure networks

Revisions to the green infrastructure policy are proposed to emphasise the development and enhancement of a network of green space, building on existing assets and enhancing the overall quality of the environment. The open gap between New Waltham and Holton Le Clay has also been added to the areas offered specific protection.

Do you have any comments?

| Draft Strategic Policy 9 Developing a green infrastructure network relationship to: | Links to: |
|---|---|
| National Planning Policy Framework | Paragraph 174, Annex 2 |
| Local Plan Strategic Objectives | SO2, SO5 and SO6 |
| Evidence base and other key documents and strategies | • Landscape Character Assessment (2015) |

**Table 7.2 Policy relationships**

## 7.3 Landscape

**7.3.1** One of the core principles of the NPPF is that planning should recognise the intrinsic character and beauty of the countryside. Local plans should include strategic policies for the conservation and enhancement of the natural, built and historic environment, including landscapes and green infrastructure. This includes designated landscapes such as the Lincolnshire Wolds Area of Outstanding Natural Beauty but also the non-designated wider countryside.

**7.3.2** A *North East Lincolnshire Landscape Character Assessment* (2015) provides a useful aid to understand the character and local distinctiveness of the landscape, and helps to identify the features that give it a sense of place. It also provides information regarding the sensitivity of areas, and information as to how change can be accommodated. Mapping is also available relating to the historic landscape character, which has been collated through the *Lincolnshire Historic Landscape Characterisation Project*.

**7.3.3** The Lincolnshire Wolds Area of Outstanding Natural Beauty (AONB) designation puts it on a par with the protection offered to National Parks. A management plan (*Lincolnshire Wolds Management Plan 2018-2023*.) has been prepared for the AONB identifying the value and special qualities of the designation. The management plan does not carry the same planning weight as the Local Plan, but does establish key principles. For developments within the boundaries of the Lincolnshire Wolds AONB, the management plan will be a material consideration.

**7.3.4** When considering landscape character and designing landscape schemes it is important to recognise the wider role that landscape performs. Whilst complementing the character and appearance of the site, landscape elements can provide wider functional purposes. Trees and hedges can provide important shade, aid drainage and provide important biodiversity sites. Broader landscape areas can also provide

a mechanism for responding to climate change and flood alleviation. It is also recognised that landscaping can be beneficial to air quality and the atmosphere. Good landscaping can also instil a feeling of confidence and sense of well-being which can promote healthy living.

**7.3.5** Landscape plays an important role in defining the character and appearance of the environment and importantly, the settling of new development within the environment. It is important that new developments are located and designed so as to recognise existing landscape character. Where appropriate this should be through a specific landscape appraisal.

**7.3.6** The Council has produced a local tree strategy which demonstrates the Council's commitment to caring for trees under its management and help respond to the challenges of climate change and the natural ecosystem. The existing tree canopy coverage within North East Lincolnshire is estimated at 10.5 per cent, which is well below the national average of 15.8 per cent. The strategy seeks to ensure:

- The tree canopy cover of the Borough is increased towards reaching the national average.
- Trees are valued for the positive environmental, health and social benefits they bring.
- Trees are managed to increase safe useful life expectancy and to increase biodiversity.

**7.3.7** North East Lincolnshire contains large parts of two Historic Landscape Character Areas identified by the *Lincolnshire Historic Landscape Characterisation Project*: the Northern Marshes and The Wolds. These are largely rural areas (the Grimsby and Cleethorpes conurbation does not form part of the historic landscape character area), within which a number of zones are defined:

1. **NOM1** - The Humber Bank;
2. **NOM2** - The Immingham Coastal Marsh;
3. **NOM3** - The Grimsby Commuter Belt;
4. **WOL1** - The Brocklesby Heath (although the area relating to the Borough is too small to be of any significance); and,
5. **WOL3** - The Upper Wolds.

**7.3.8** The area of the Borough contained within zone WOL3 corresponds well with the area of the Borough that is part of the Lincolnshire Wolds AONB, and weight will be afforded to the impact of development on the historic landscape character that is present here. Stretching away from this area, along the course of Waithe Beck, are areas of Ancient Enclosure, a Landscape Park, and the historic settlement cores of Barnoldby le Beck, Ashby cum Fenby and Brigsley. This landscape is within the NOM3 zone and has not been assessed for significance but is considered to be of local historic interest.

**7.3.9** The presence and significance of mature trees and hedgerows should be recognised. Trees not only provide a living element in the environment that lasts for generations, they also provide important natural habitats, filter dust and emissions,

suppress noise and form familiar landmarks. Hedgerows possess many of the qualities common to trees and are just as viable, with many also having historical significance. The NPPF (para ) also sets out that; Planning policies and decisions should ensure that new streets are tree-lined, (unless, in specific cases, there are clear, justifiable and compelling reasons why this would be inappropriate) and that opportunities are taken to incorporate trees elsewhere in developments (such as parks and community orchards).

**7.3.10** The Council will seek to protect existing trees and hedgerows that offer value for amenity and biodiversity. The Council has extensive powers through Tree Preservation Orders to protect trees whether they are individual specimens, groups or trees of entire woodlands. Protection can also be provided for important hedgerows which meet certain criteria under the *Hedgerow Regulations* (1997). In addition to these powers the Council will seek, through conditions to safeguard important landscape assets, this will include measures to ensure they are integrated in landscaping schemes to safeguard them through the construction period to avoid damage due to proximity of vehicle and plant manoeuvres, material storage or provision of services.

**7.3.11** The design of new landscaping must take into account responsibility for future maintenance and, where appropriate this should accord with the delivery mechanisms for green space set out in Draft Policy 2 Green space and recreation.

**7.3.12** **A revision to the policy has been made to address the NPPF requirement for street trees to be provided within developments.**

### Draft Strategic Policy 10

Landscape

1. Landscape character should be given due consideration in the nature, location, design and implementation of development proposals. Developers should:

   A. have regard to the landscape context and type within which the development is to be located, (as identified in the *Landscape Character Assessment*); considering the landscape guidelines and management strategies relevant to the prevalent landscape type. Priority will be given to the protection and enhancement of the landscape character and natural beauty, and setting of the Lincolnshire Wolds Area of Outstanding Natural Beauty (AONB);

   B. complete a site specific landscape appraisal, proportionate to the anticipated scale and impact of a proposal, and submit a landscaping scheme for all development where this is appropriate, which complements the character and appearance of the site, responds to landscape character, climate change and flood alleviation where appropriate, and improves local biodiversity and levels of amenity;

   C. seek opportunities, when incorporating landscape buffers to offset development impacts, to enhance landscape quality including opportunities to incorporate suitable landscape planting;

D. retain and protect existing trees and hedgerows and incorporate new street trees which offer value for amenity, biodiversity and landscape; and,

E. take opportunities where appropriate, to retain, protect and restore elements that contribute to historic landscape character.

### Question 17

Landscape

Revisions to the landscape policy are proposed to address the requirement for street trees.

Do you have any comments?

| Draft Strategic Policy 10 Landscape relationship to: | Link to: |
|---|---|
| National Planning Policy Framework | Paragraphs 174 |
| Local Plan Strategic Objectives | SO6 |
| Evidence base and other key documents and strategies | • Landscape Character Assessment (2015)<br>• Lincolnshire Historic Landscape Characterisation Project (2011)<br>• North East Lincolnshire Tree Strategy (2023) |

**Table 7.3 Policy relationships**

## 7.4 Local green spaces

**7.4.1** Green space serves many functions and can be in either public or private ownership, together these spaces form a multi-functional network of open space. Such networks need to be planned and managed to deliver a combination of environmental and social benefits. This includes conserving and enhancing biodiversity, landscape enhancement, water management, recreation and play, social and cultural enhancement and community health and well-being. It is important that everyone, wherever they live, should have access to a range of accessible green space.

**7.4.2** The Council has over time identified the main green space assets within the Borough through previous audits and local evidence, and assessed local provision against established national and current local standards. The audits and evidence have illustrated that there are some localised deficiencies in the provision of facilities, which can be worsened by the presence of busy roads which act as barriers particularly hindering young children free access to green space. The Council

will continue to monitor provision and review standards against identified needs through the plan period. It recognises that standards should be matched to local circumstances.

**7.4.3** Natural England issued new greenspace standards in 2023 in a Green Infrastructure Framework. This sets out accessible greenspace standards and promotes fifteen guiding principles based upon, five benefits of green infrastructure, five descriptions of what good green infrastructure looks like, and five principles of how good green infrastructure could be delivered.

**7.4.4** The NPPF also includes provision for formal designation of land as Local Green Space through the Local Plan (NPPF paras 101-103). This allows communities to identify and protect specific green areas of particular importance to them. The NPPF emphasises that designating land as Local Green Space should be consistent with local planning of sustainable development and complement investment in sufficient homes, jobs and other essential services.

**7.4.5** Local Green Space designation should only be used where the green space is:

1. in reasonably close proximity to the community it serves;
2. demonstrably special to the local community and holds a particular local significance, for example because of its beauty, historic significance, recreational value (including as a playing field), tranquillity or richness of its wildlife; and
3. local in character and is not an extensive tract of land. (NPPF paragraph 102).

**7.4.6** **The Council is keen to provide the opportunity for communities to identify land that specifically meets the criteria for Local Green Space Designation set out above.**

### Question 18

Local Green Space Designation

Are there any areas of local green space that are considered to be particularly special and warrant designation as a designated Local Green Space site?

If so please identify the site(s) and provide a justification for your suggestion.

**7.4.7** Informal natural green space is used for a variety of pursuits including walking, dog walking, exercising and casual play. Within the Borough the majority of large areas of natural green space are concentrated in areas such as Freshney Parkway and Weelsby Woods in Grimsby, Cleethorpes Country Park, Coombe Briggs Meadows in Immingham, and Bradley and Dixon Woods. The Council recognises the visual importance of these areas in addition to their obvious value for active pursuits. Such areas provide a valuable role particularly where they stretch well into the urban area.

**7.4.8** Cemeteries also provide valuable pockets of green space. The older cemeteries, such as Scartho Cemetery, provide important mature habitat within the urban core. The Scartho Road Cemetery was opened in the late 19th century and contains many

mature trees dating from that time in addition to a diversity of ground flora which has evolved over the years. The combination of features has led to the designation of part of the cemetery as a Local Wildlife Site.

**7.4.9** Outdoor playing space comprises a mix of playing pitches, green courts, athletics tracks and children's equipped play areas. These facilities represent the formal pitch and play provision in the Borough. A number of these facilities are run by private bodies or organisations. They provide valuable facilities in the context of meeting the overall need. In rural areas many of these facilities are provided by the parish councils. In addition education sites include indoor/outdoor playing space which is increasingly being used for wider community use through the establishment of formal community use agreements. The Council Playing Pitch Strategy examined the distribution and quality, and usage of existing facilities and examines future requirements. This Strategy and its accompanying action plan will inform the future approach to playing pitch location and future management.

**7.4.10** Allotments also make a valuable contribution to meeting community and leisure needs, and can bring added benefits from a health and well-being stance as well as providing added green space in built-up areas. Current house building trends are towards smaller gardens, as pressure increases to optimise building land. Those who live in flats often have no individual garden. These circumstances disadvantage those on lower incomes. Allotments provide an opportunity to redress this imbalance and have an important tole in promoting healthier life.

**7.4.11** It is important that the local standards identified reflect local participation rates reflected in assessments which are subject to regular review; and assess the social impact and value that each green or play space contributes to an area when making decisions about resources and funding. **Natural England have introduced revised green infrastructure standards relating to the provision of Natural Green Space which are set out in the table below alongside current local standards.**

**7.4.12** The Council is considering whether to adopt these standards as a future target.

| Open space type | National standard, or recognised established guidance | Local evidence | Current local standard (provision) | Current local standard (accessibility) | Contribution trigger |
|---|---|---|---|---|---|
| Natural green space | 3ha/1,000 population (AGS)<br>Access to green space:<br><br>EITHER a Doorstep OR Local Accessible Greenspace<br><br>• A doorstep greenspace of at least 0.5ha within 200 metres, or<br>• A local natural greenspace of at least 2ha within 300 metres walk from home. AND<br>• A medium sized neighbourhood natural greenspace (10ha) within 1km. AND, beyond 15 minutes' walk:<br>• A medium/large wider neighbourhood natural greenspace (20ha) within 2km. and<br>• And large district natural greenspace (100ha) within 5-km. and<br>• A very large sub-regional greenspace within (500 ha) within 10 km | *Green Space Strategy* (2015) | 1ha/1,000 population (in addition, sites will be required to provide boundary landscaping where appropriate) | Informal amenity space - within 200m<br>Local recreational area - within 400m<br>District park - within 1,000m<br>Major park - within 3,000m | All development of 10 units of more |

| Open space type | National standard, or recognised established guidance | Local evidence | Current local standard (provision) | Current local standard (accessibility) | Contribution trigger |
|---|---|---|---|---|---|
| Children's play | 0.8ha/1,000 population, of which 0.25ha should be designated equipped playing space (FIT, Fields in Trust) | *Play Strategy* (2008), (review 2015) | 0.8ha/1,000 population, of which 0.1ha should be designated equipped playing space | Within 800m | All development of 50 units of more )on or offsite) |
| Outdoor sports | 1.6ha/1,000 population | *Playing Pitch Strategy* (2020) | 1.6ha/1,000 population | Within 1,200m | All development of 250 units or more (on or offsite) |
| Allotments | 0.5ha/1,000 households (National Society of Allotment and Leisure Gardeners) | *Allotment Strategy* (2011) | 0.2ha/1,000 population | No local standard has been set | All development of 250 units or more (on or offsite) |
| Woodland | Access to woodland:<br>1. 2ha within 500m<br>2. 20ha within 4km (Woodlands Trust) | N/A | No local standard has been set | No local standard has been set | No trigger identified |

**Table 7.4 Green space standards**

| Scale of development (number of units) | Open space type to be delivered | Delivery |
|---|---|---|
| Zero to 9 | No specific requirement | N/A |
| 10 to 49 | Natural green space | On-site or off-site if meets accessibility standards |
| 50 to 249 | Natural green space and children's plan | On-site or off-site if meets accessibility standards |
| 250 plus (The Council strategy for sports pitch provision focuses on hub sites rather than individual pitch sites which are often difficult and costly to manage) | Natural green space, children's play, outdoor sports and allotments | On-site or off-site if meets accessibility standards |

**Table 7.5 Green space delivery**

### Question 19

Local green spaces

Do you think the Council should adopt the revised Natural England standards for natural green space?

**7.4.13** The Council will discuss off-site contributions based upon location and neighbouring facilities and the strategy set out in the Council's relevant strategy documents.

**7.4.14** The safeguarding and provision of accessible green space is a key element in creating sustainable communities, and promoting healthy lifestyles. Good provision of recreation and open space can also have positive economic and environmental benefits. Draft Policy 2 Green space and recreation recognises the value of both public and private facilities, and sets out criteria to guard against the loss of facilities where they are valued.

**7.4.15** Developers are required to provide new open space and recreation facilities to meet the needs of new residents, based upon generic accessibility standards which are considered relevant to the Borough based upon walkable limits. Where facilities are already available within the walkable catchment of a site the Council will seek a commuted sum towards the improvement and maintenance of off-site facilities reflecting the future intensification of use of these facilities.

**7.4.16** Draft Policy 2 Green space and recreation is based around standards of provision and accessibility which are informed by local evidence of the Borough's existing provision and future requirements. Over the plan period the assessments of open space, sports and recreation, play space, and allotment provision will be subject to periodic review. The Policy recognises this and provides flexibility to accommodate variations in the standards.

## Draft Policy 2

Green space and recreation

1. The Council will safeguard against any loss of public or private green spaces, sport and recreation and equipped play facilities (including sites designated as local green space), in recognition of their importance to the health and well-being of residents and visitors to the Borough, and their importance to biodiversity. The green spaces, sport and recreation and equipped play facilities that are safeguarded under this Policy are identified on the Policies Map together with playing fields which form part of identified education areas, cemeteries, and allotments.
2. Loss of these areas will only be accepted where:
   A. there is evidence that the facility is surplus to green space and recreation requirements, and has been assessed in terms of biodiversity value; or,
   B. alternative replacement provision of at least equivalent size, usefulness, attractiveness and quality can be provided, meeting current standards of provision and accessibility, (recognising any subsequent review and revision).
3. Developers will be required to make provision for green space, sport and recreation facilities in accordance with the additional needs that the development generates taking account of current local standards of provision and accessibility, (recognising any subsequent review and revision). Delivery will be secured through planning conditions, obligations or charging levy as appropriate. In making this provision, recognition should be made to the role such green space plays in mitigating the effects of recreational pressure on the Humber Estuary SAC/SPA/Ramsar, specifically designing natural green space which is attractive to walkers and dog walkers, particularly in areas where development is most likely to result in increasing visitors to the Humber Estuary SAC/SPA/Ramsar.
4. Where existing facilities already meet current accessibility standards, the Council will seek a commuted sum towards the improvement and maintenance of off-site facilities, reflecting the future intensification of use of these facilities.
5. Where new green infrastructure is provided, the Council will expect proposals to include details to cover future long term maintenance. This may include, where accepted by the Council, provision of a commuted sum for maintenance, calculated on the basis of typical maintenance costs per square metre for a ten year period. Alternatively, the developer may make arrangements for the land to be maintained by a body other than the Council.
6. Where appropriate, development should enhance or otherwise accommodate the historic interest of open space sites, particularly where they contribute to the enhancement of the Borough's heritage assets.
7. Where education facilities are being developed which include playing pitch or sports facilities, provision shall be made, where feasible and appropriate, to incorporate community use.

### Question 20

Green space and recreation

No revisions to the green space and recreation policy are proposed, except to acknowledge local green space designations and publication of the new Natural England standards.

Do you have any comments?

| Draft Policy 2 Green space and recreation relationship to: | Links to: |
|---|---|
| National Planning Policy Framework | Paragraph 92,93,98-103 |
| Local Plan Strategic Objectives | SO2, SO5 and SO6 |
| Evidence base and other key documents and strategies | • Green Space Strategy (2016)<br>• Playing Pitch Strategy (2020)<br>• Allotment Strategy (2011) |

**Table 7.6 Policy relationships**

## 7.5 Protected habitats

**7.5.1** The natural environment is extremely important in ensuring a high quality of life for all who live, work and play in North East Lincolnshire. The natural habitats and ecosystems help to sustain our lives and our standard of living (providing what are often referred to as 'ecosystems services'), including food, fuel, textiles, medicinal products, clean air and fresh water. Ecosystems, and the life they support, play an important role in regulating our environment, for example, climate regulation by absorbing carbon dioxide, purifying our water, pollinating crops and controlling floods.

**7.5.2** **Biodiversity** - is shorthand for biological diversity. It is a term commonly used to describe the variety of life in a particular area, including plants, animals and other living organisms. The *Convention on Biological Diversity* (CBD) defines biodiversity as:

**7.5.3** *"the variability among living organisms from all sources including terrestrial, marine and other aquatic ecosystems, and the ecological complexes of which they are part, this includes diversity within species, between species and of ecosystems".* (*Convention on Biological Diversity*, United Nations (1992)).

**7.5.4** **Geodiversity** - is shorthand for geological diversity. It is a term which is commonly used to describe the variety of earth materials, forms and processes that constitute and shape the Earth. This includes a variety of rocks, minerals, fossils and other geological features.

**7.5.5** The importance of biodiversity and geodiversity is reflected in the wealth of national and international legislation that exists to protect these assets. The NPPF also seeks to ensure that the planning system contributes to and enhances the natural and local environment. It places a requirement on local planning authorities to:

1. minimise the impact of development on biodiversity and seek to provide net gains in biodiversity where possible;
2. allocate land for development with the least environmental or amenity value and seek to reuse brownfield land where it is not of high environment value;
3. plan for biodiversity across local authority boundaries, at a landscape-scale;
4. apply criteria-based policies against which planning application affecting designated biodiversity and geodiversity sites will be judged;
5. follow a strategic approach to protecting, creating, enhancing and managing positively biodiversity and green infrastructure; and,
6. promote the preservation, restoration, and re-creation of priority habitats and the protection and recovery of priority species populations.

**7.5.6** The NPPF (paragraph 180) emphasises that if harm resulting from development cannot be avoided (through locating development on an alternative site with less harmful impacts), adequately mitigated or, as a last resort compensated for, then planning permission should be refused.

**7.5.7** North East Lincolnshire is a diverse area displaying a wide variety of natural habitats, landscape and geological/geomorphological interest. Figure 7.1 Site hierarchy provides an overview of the hierarchy of sites relevant to the Borough.

**7.5.8** The biodiversity of the Humber Estuary is of international significance, particularly with regard to migratory and overwintering wading birds that feed on the saltmarsh and mudflats and move inland to roost. These designations are collectively referred to as Natura 2000 sites. In addition to these international designations, the Humber Estuary is also designated as, the Humber Estuary Site of Special Scientific Interest (SSSI).

**7.5.9** Over a number of years, surveys of local biodiversity and geodiversity sites have been carried out in the Borough. These have been funded by a number of organisations including the Council. A process is now in place where the Greater Lincolnshire Nature Partnership (GLNP) processes the data from the surveys against specified criteria for selecting local geological sites (LGSs) and Local Wildlife Sites (LWSs). Those sites which are identified as meeting the required criteria are then identified for possible designation. It is the Council which formally designates these sites.

**7.5.10** The Council undertakes a review of designated sites where circumstances have changed since original designation or where there are acknowledged development pressures. This is part of a rolling review process, which seeks to capture new sites and changes to existing sites. The review of sites utilities the GLNP process which ensure consistency across sites, and across the wider Lincolnshire geographical area.

**7.5.11** Draft Strategic Policy 11 Biodiversity and Geodiversity sets out a strategic approach which positively plans for the creation, protection, enhancement and management of sites of biodiversity and geodiversity. It acknowledges the hierarchy of international, national and locally designated sites and refers specifically to the designation process for local sites, linked to processes of monitoring and review undertaken in partnership with the Greater Lincolnshire Nature Partnership.

**7.5.12** Recognition is made that sites identified, to compensate for adverse effects on European sites should be given the same protection as the European site. This is significant in relation to the habitat mitigation provided within the South Humber Bank.

**7.5.13** The Council will seek to capture opportunities to develop ecological networks, incorporating biodiversity in and around new developments through thoughtful design approaches, and will specifically support proposals which seek directly to conserve or enhance biodiversity.

**7.5.14** In accordance with the NPPF, if significant harm resulting from a proposed development cannot be avoided (through locating on an alternative site with less harmful effects), adequately mitigates, or as a last resort compensated for, then planning permission will be refused.

**7.5.15** **A revision to the policy has been proposed to recognise the drive to enhance biodiversity and geodiversity.**

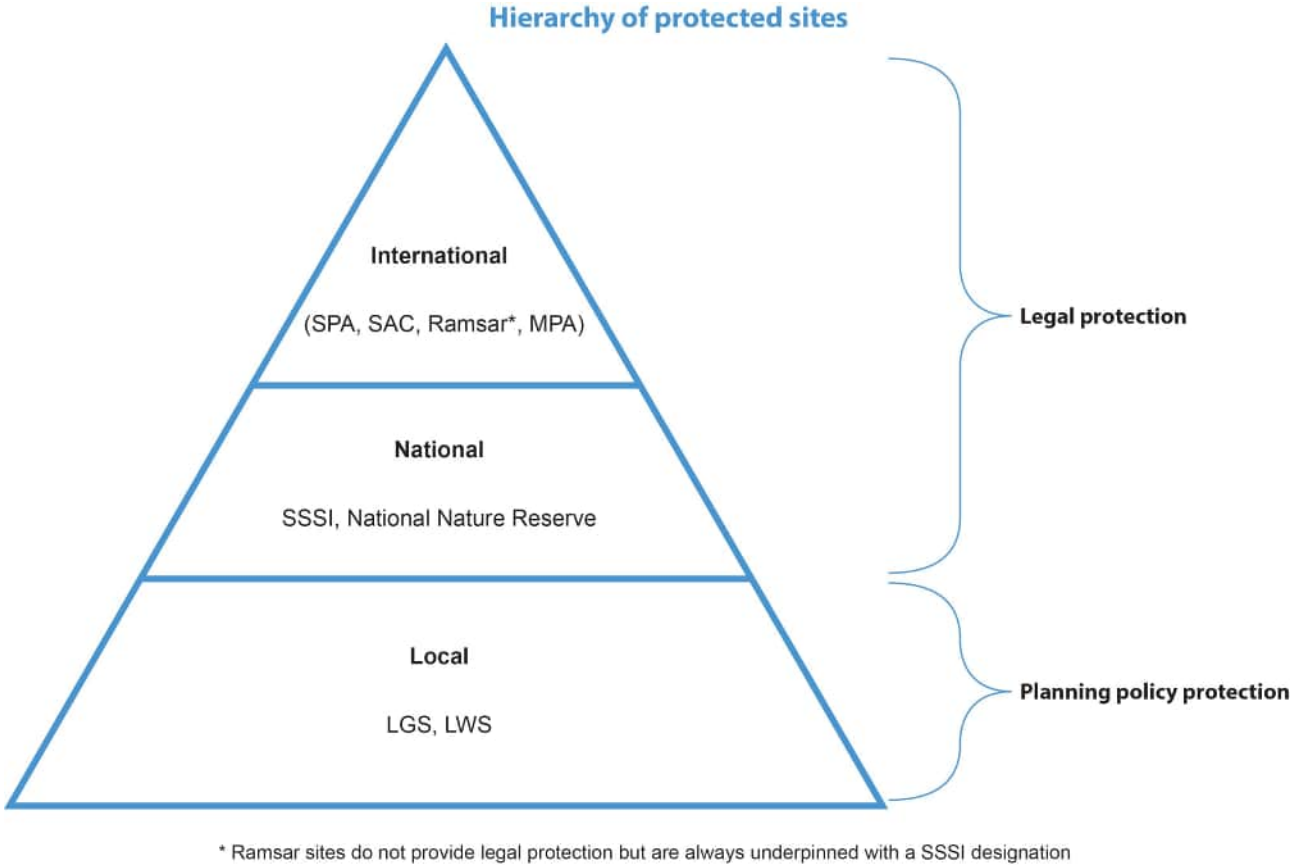


**Figure 7.1 Site hierarchy**

## Draft Strategic Policy 11

Biodiversity and Geodiversity

1. The Council will have regard to enhancing biodiversity and geodiversity when considering development proposals, seeking specifically to:

   A. establish and secure appropriate management of, long-term mitigation areas within the Estuary Employment Zone, managed specifically to protect the integrity of the internationally important biodiversity sites (see Draft Strategic Policy 12 Habitat Mitigation - South Humber Bank);

   B. designate Local Wildlife Sites (LWSs) and Local Geological Sites (LGSs) in recognition of particular wildlife and geological value;

   C. protect manage and enhance international, national and local sites of biological and geological conservation importance, having regard to the hierarchy of designated sites, and the need for appropriate buffer zones;

   D. minimise the loss of biodiversity features, or where loss is unavoidable and justified ensure appropriate mitigation and compensation measures are provided;

   E. create opportunities to retain, protect, restore and enhance features of biodiversity value, including priority habitats and species; and,

   F. take opportunities to retain, protect and restore the connectivity between components of the Borough's ecological network.

2. Any development which would, either individually or cumulatively, result in significant harm to biodiversity which cannot be avoided, adequately mitigated or as a last resort compensated for, will be refused.

## Question 21

Protected habitats - biodiversity and geodiversity

A minor revision to the protected habitats policy is proposed to reflect enhancement of biodiversity.

Do you have any comments?

| Draft Strategic Policy 11 Biodiversity and Geodiversity relationship to: | Links to: |
|---|---|
| National Planning Policy Framework | Paragraphs 179-182 |
| Local Plan Strategic Objectives | SO6 |
| Evidence base and other key documents and strategies | • Natural England datasets<br>• Greater Lincolnshire Nature Partnership datasets |

| Draft Strategic Policy 11 Biodiversity and Geodiversity relationship to: | Links to: |
|---|---|
| | |

**Table 7.7 Policy relationships**

## 7.6 Biodiversity net gain

**7.6.1** National planning policy states that development should deliver a net gain in biodiversity. The Environment Act sets out a mandatory requirement for development to deliver at least a 10% biodiversity net gain and approval of a biodiversity net gain plan. The Act includes provision for secondary legislation to set a date for the requirement to come into force.

**7.6.2** **A new policy is proposed to reflect this new requirement setting out the principles to guide how this will be delivered in the Borough.**

**7.6.3** Biodiversity net gain means leaving the natural environment in a measurably better state than before, and is central to delivering nature's recovery and increasing stocks of natural capital. Net gain should deliver genuine additional improvements for biodiversity by creating or enhancing habitats in association with development. Such improvements should go beyond any required mitigation and/or compensation measures following the application of the mitigation hierarchy. As part of delivering net gains for nature, development proposals will be expected to protect, provide and extend green infrastructure in accordance with Draft Strategic Policy 9 Developing a green infrastructure network.

**7.6.4** Biodiversity net gain can be achieved on-site, off-site or through a combination of on-site and off-site measures, or through the purchase of statutory biodiversity credits. Development proposals can, for example, provide a net gain in biodiversity on-site through the enhancement of the existing features of the site, the creation of additional habitats or the linking of existing habitats to reduce fragmentation in the local ecological network. The Council's preference is for biodiversity net gain to be delivered on, or adjacent to, the development site, in accordance with the mitigation hierarchy. Only in exceptional circumstances and in the interests of biodiversity, will biodiversity offsetting schemes be considered acceptable. An example of an off-site measure, if sufficient biodiversity net gain cannot be achieved within the development site, could be where there is opportunity to create, restore or enhance habitats off site that form part of the Nature Recovery Network and where this is considered the best outcome for biodiversity.

**7.6.5** Net gains in biodiversity can be delivered by almost all development, by following the principles of the mitigation hierarchy and understanding the ecological constraints and opportunities from the early stages of design. The Council will not tolerate the deliberate clearing of valuable habitats before the application process. If it is found that the habitat on site has been degraded since the 30th of January 2020 so that the habitat is lost prior to the baseline habitat survey, then the site will need to be reassessed using data (aerial imagery and other habitat data) held by the Council, from prior to the loss of the habitat.

**7.6.6** Biodiversity enhancements can include both the creation of new habitat as well as improving existing habitats and can include, but are not limited to:

1. Bird and bat boxes/bricks integrated into the structure of existing and/or new buildings
2. Wildlife friendly sustainable urban drainage (SuDs)
3. Wildlife tunnels under paths and roads
4. Wildlife friendly ponds
5. Living roofs and walls
6. Bug hotels
7. Using native plants in landscaping
8. Setting aside space within a development to create new habitat, such as woodland, wetland or wildflower meadows
9. Improve and re-naturalise waterways

**7.6.7** The proposals for enhancement of biodiversity will depend on the nature and scale of the development, however, a development with limited or no impacts on biodiversity should still seek to demonstrate a net gain.

**7.6.8** A suitable biodiversity metric should be used to demonstrate that a 'measurable biodiversity net gain' has been achieved. The preferred metric for calculating biodiversity net losses and gains is the Natural England Biodiversity Metric, which supports and reinforces the application of the mitigation hierarchy. The metric calculates the change in biodiversity resulting from a project or development by subtracting the number of pre-intervention or 'baseline' biodiversity units (i.e. those originally existing on-site and off-site where applicable) from the number of post-intervention units (i.e. those projected to be provided after the development or change in land management). All applications should be supported by the submission of the full metric assessment.

**7.6.9** Local Ecological Network Biodiversity Opportunity and Green Infrastructure Mapping has been prepared for the Council by the Greater Lincolnshire Nature Partnership (GLNP). These maps identify the known existing areas of high biodiversity value and areas of local biodiversity priority where it is considered most important and feasible to target habitat creation, extension and restoration. To complement these maps, a set of principles has been agreed by the Greater Lincolnshire Biodiversity Net Gain Task Group. The Group consists of relevant officer representatives from each of the ten planning authorities, Environment Agency, Natural England, and both relevant Nature Partnerships of Greater Lincolnshire and the Humber. The agreed principles are set out below:

- **Overriding principle**: Biodiversity Net Gain required by developments within Greater Lincolnshire should be delivered within Greater Lincolnshire, and only in exceptional circumstances should developers look to contribute to a national programme outside of Greater Lincolnshire.
- **Principle 1**: Apply the Mitigation Hierarchy and meet legal requirements
- **Principle 2**: Ensure unique and place-making biodiversity is not lost

- **Principle 3**: Make a measurable Net Gain contribution
- **Principle 4**: Achieve the best outcomes for biodiversity and secure a Biodiversity Net Gain legacy
- **Principle 5**: Be inclusive, equitable and transparent across Greater Lincolnshire, addressing the risks facing our area

**7.6.10** Development proposals should have regard to the above evidence and to the biodiversity opportunity area principles.

**7.6.11** Major and large scale development schemes should deliver wider environmental net gain wherever possible, reflecting the opportunities identified in the North East Lincolnshire Biodiversity Opportunity and GI Mapping, and Local Nature Recovery Strategy (or any subsequent replacements). Seeking to achieve wider environmental net gain should reduce pressure on, and achieve overall improvements in, natural capital and ecosystem services and the benefits that they deliver.

**7.6.12** The baseline data on habitats and species that underpin local biodiversity strategy, the local ecological network, biodiversity, and green infrastructure opportunities, will be kept up to date by the GLNP through the management of the Lincolnshire Environmental Record Centre.

### Draft Policy 3

Biodiversity net gain

1. Following application of the mitigation hierarchy, all development proposals should ensure opportunities are taken to retain, protect and enhance biodiversity and geodiversity features proportionate to their scale, through site layout, design of new buildings and proposals for existing buildings with consideration to the construction phase and ongoing site management.
2. Development proposals should create new habitats, and links between habitats, in line with North East Lincolnshire Biodiversity Opportunity and the biodiversity opportunity area principles, and the Local Nature Recovery Strategy (once completed), to maintain and enhance a network of wildlife sites and corridors, to minimise habitat fragmentation and provide opportunities for species to respond and adapt to climate change.
3. Proposals for major and large scale development should seek to deliver wider environmental net gains where feasible.
4. All qualifying development proposals must deliver at least a 10% measurable biodiversity net gain attributable to the development. The net gain for biodiversity should be calculated using Natural England's Biodiversity Metric.
5. Biodiversity net gain should be provided on-site wherever possible, where net gain cannot be achieved within the site boundary or where greater gains can be delivered off-site where the improvements can be demonstrated to be deliverable and are consistent with the Local Nature Recovery Strategy.

6. All development proposals must provide clear and robust evidence for biodiversity net gains and losses in the form of a biodiversity gain plan, which should be submitted with the planning application, setting out:

   A. information about the steps to be taken to minimise the adverse effect of the development on the biodiversity of the onsite habitat and any other habitat;
   B. the pre-development biodiversity value of the onsite habitat;
   C. the post-development biodiversity value of the onsite habitat following implementation of the proposed ecological enhancements/interventions;
   D. the ongoing management strategy for any proposals;
   E. any registered off-site gain allocated to the development and the biodiversity value of that gain in relation to the development; and,
   F. exceptionally any biodiversity credits purchased for the development through a recognised and deliverable offsetting scheme.

7. Demonstrating the value of the habitat (pre and post-development) with appropriate and robust evidence will be the responsibility of the applicant. Proposals which do not demonstrate that the post-development biodiversity value will exceed the pre-development value of the onsite habitat by a 10% net gain will be refused.
8. Ongoing management of any new or improved onsite and offsite habitats, together with monitoring and reporting, will need to be planned and funded for 30 years after completion of a development.

### Question 22

Biodiversity net gain

Do you have any comments about the wording of the biodiversity net gain policy?

| Draft Policy 3 Biodiversity net gain relationship to: | Links to: |
|---|---|
| National Planning Policy Framework | 174, 179, 180 |
| Local Plan Strategic Objectives | SO6 |
| Evidence base and other key documents and strategies | • North East Lincolnshire, Biodiversity Opportunity Mapping<br>• GLNP Biodiversity Opportunity Area Principles<br>• |

**Table 7.8 Policy relationships**

## 7.7 Habitat mitigation

**7.7.1** The Humber Estuary is designated as a Special Area of Conservation (SAC) and Special Protection Area (SPA) under the European Habitats Directive. The *Conservation of Habitats and Species Regulations 2010* (the Habitats Regulations) require consideration of the designations as well as consideration of the wetland as being of international importance under the Ramsar Convention. This established the importance and function of the South Humber Bank to species such as Curlew, Golden Plover and Lapwing.

**7.7.2** Specifically, it requires that an 'Appropriate Assessment' is undertaken to understand the implications of the site, and that, where for reasons of 'overriding public interest', (which include issues that are social or economic in nature), proposals for development are put forward that will have a negative impact upon the integrity of the designation, any necessary compensatory provisions are secured.

**7.7.3** The Council has worked hard over many years together with North Lincolnshire Council, nature conservation bodies and industry representatives, to develop a strategic approach that has identified and safeguarded land to ensure that the integrity of the Humber Estuary Natura 2000 sites is maintained whilst ensuring that development is not delayed in its delivery. This award winning approach, (2020 winner of RTPI Excellence in Planning for the Natural Environment Award) which was embodied within the local plan and has been working well.

**7.7.4** The approach has brought significant benefits for landowners/developers of sites along the South Humber Bank who seek to bring forward proposals which support the economic growth aspirations for the area, and for the birds for whom the mitigation land is provided. The identification of strategic sites means that the land lost from development is minimised, is optimally sited to maximise the potential for bird use and, most importantly, provides certainty across all interests that the integrity of the Humber Estuary Natura 2000 sites has been addressed and resolved. This has been recognised as an exemplar approach to delivering mitigation on a strategic basis.

**7.7.5** The current position March 2023, is that the Council has delivered two large mitigation sites, Cress Marsh 38.9ha and Novartis Ings 20.23ha. A further 4.51ha of mitigation land has been provided through a separate agreement. The provision of these sites has allowed for significant areas of land to be released for development and provides scope for additional land to come forward through the planning process.

**7.7.6** The Council has, through delivery of the mitigation sites, ensured that sufficient mitigation land is always in place to support the development of employment sites. This approach ensures the balance of mitigation land to developed sites on the South Humber Bank always remains effectively 'in credit'.

**7.7.7** The final total gross area safeguarded and delivered as mitigation equates to circa 120ha. Figure 7.2 Habitat mitigation, South Humber Bank identifies the mitigation land that has been identified. An area of complimentary grassland is also protected, shown on the plan below. The land adjacent to Old Fleet Drain is protected as part of the Great Coates Business Park Site (ELR015 a&b).

**7.7.8** Arrangements for the ownership and management of the mitigation areas must be secured for the lifetime of the development plan. Beyond this period, it is expected that impacts (loss of functionally linked land) will remain, and that ongoing long term management of the mitigation areas will continue to be required and must be secured. If these areas cannot be secured then sufficient alternative mitigation areas will be needed to address the impacts. This alternative mitigation will be in place and functional prior to the loss of the existing mitigation areas. Until the alternative mitigation is secured and delivered, the Council will need to identify whether there is sufficient mitigation capacity to allow further developments to be consented, in accordance with ensuring that the mitigation balance sheet remains 'in credit'.

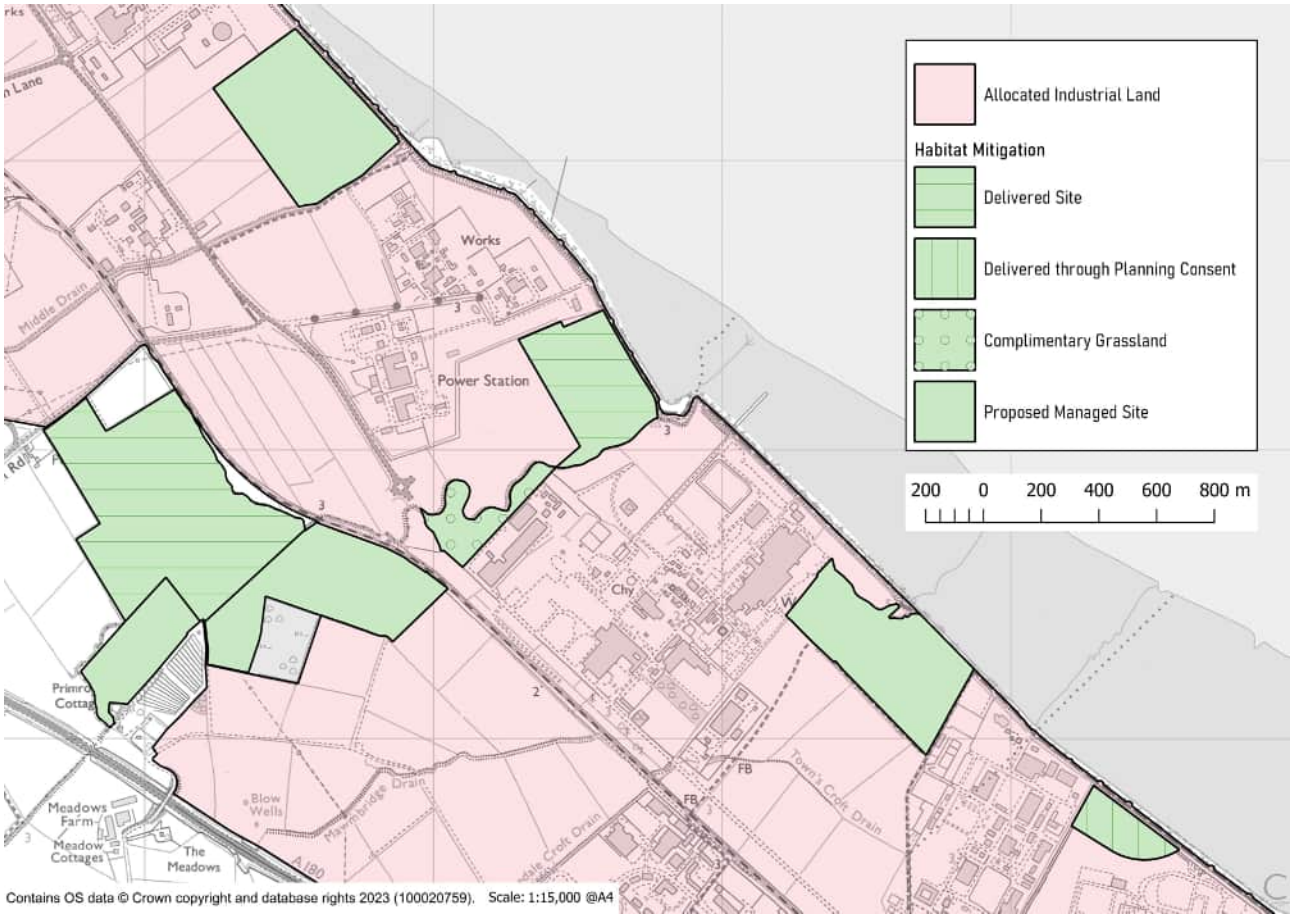


**Figure 7.2 Habitat mitigation, South Humber Bank**

**7.7.9** Draft Strategic Policy 12 Habitat Mitigation - South Humber Bank does include a mechanism to recover costs from developers via contributions to support delivery of the mitigation and importantly support the future management of the habitat provided.

**7.7.10** **An adjustment to the scale of the contribution is proposed as costs associated with the implementation, management and monitoring of the sites has proven to be significantly higher than was anticipated when the local plan policy was first implemented. Justification for the proposed increase in contributions is provided in South Humber Gateway Mitigation Contribution Justification Statement (2023).**

**7.7.11** The Council has recognised that developers may consider an alternative approach; whilst the Policy allows for the possibility and includes wording to address all possible eventualities, in practice it would be very challenging to deliver. Participation in the scheme of strategic mitigation will be the preferred approach and is therefore recommended.

## Draft Strategic Policy 12

Habitat Mitigation - South Humber Bank

1. Within the Mitigation Zone identified on the Policies Map, proposals which adversely affect the Humber Estuary SPA/Ramsar site due to the loss of functionally linked land will normally be required to provide their own mitigation in order to comply with the requirements of the Habitats Regulations.
2. The Strategic Mitigation sites, circa 120ha, identified on the Policies Map, represent those sites which have been identified to deliver appropriate mitigation which will address the adverse impacts of development within the Mitigation Zone at a strategic level. The identified Mitigation Sites will be safeguarded against development, and appropriate habitat will be delivered and managed on these sites in accordance with the *North East Lincolnshire South Humber Gateway Ecological Mitigation Delivery Plan*.
3. Development proposals on greenfield land (Exceptionally brownfield sites may be required to contribute if evidence identifies that SPA/Ramsar birds have been using the site in significant numbers.) within the Mitigation Zone will be required to make contributions towards the provision and management of the mitigation sites identified. Where landowners have contributed to the implementation strategy through the donation of land, the required contribution will be reduced by an equivalent value.
4. The Council will secure such contributions, based on a proportional approach relating to the site area. The formula for the calculation or the relevant contribution is as follows:

***Contribution (£) = SA x (£MC/ha)*** (Where: A = Gross site area of the development proposal, £MC/ha = Mitigation Contribution, per ha (TC/TL), TC = Total Cost of the Strategic Mitigation Scheme (for clarity including all land acquisitions and leases, costs of implementation works, associated fees and maintenance and monitoring costs), TL = Total area of the Land included in the Strategic Mitigation Scheme.).

The Mitigation Contribution (£MC/ha) will be **£20,660 / ha**. index linked (August 2023 baseline)
The Contribution shall be paid when development commences on site, or through agreement with the Council where a phased approach to payment is accepted by the Council.

5. All other planning requirements will also be expected to be met.
6. On an exceptional basis independent alternative mitigation proposals will be considered on sites within the identified Mitigation Zone. Proposals should be supported by evidence that demonstrates that the alternative mitigation contributes to the overall mitigation strategy and ensures that the development avoids adverse effects on the integrity of the SPA/Ramsar site, alone or in combination. It will be a requirement of any planning consent that mitigation is implemented prior to the commencement of development.

### Question 23

Habitat Mitigation - South Humber Bank

Revision to the habitat mitigation policy is proposed to increase the scale of the mitigation contribution to address the increased costs of delivery.

Do you have any comments?

| Draft Strategic Policy 12 Habitat Mitigation - South Humber Bank relationship to: | Links to: |
|---|---|
| National Planning Policy Framework | Paragraph 180, 181 |
| Local Plan Strategic Objectives | SO3, SO5 and SO6 |
| Evidence base and other key documents and strategies | • South Humber Gateway Mitigation Delivery Plan (2018)<br>•<br>• South Humber Gateway Mitigation Contribution Justification Statement (2023) |

**Table 7.9 Policy relationships**

# Section 8 Design and amenity

**8.0.1** Well-designed places influence the quality of people's experience as they spend time in them and move around them. Good design is not simply a reflection of an individual building but relates to many elements. There is now a greater recognition that the quality of a place is not just one derived from the visual, but all senses. The quality of the space and the buildings within is a reflection of many elements including; the structures, the landscaping, the movement through the space, and the interaction of light.

**8.0.2** The Government has produced a *National Design Guide* (2021)(https://www.gov.uk/government/publications/national-design-guide) setting out ten characteristics of good design and produced a separate *National Model Design Code* (2021). (https://www.gov.uk/government/publications/national-model-design-code). The Council is considering commissioning consultants to prepare a borough-wide design code to provide further clarity on the local design considerations.

**8.0.3** Well designed spaces can lift our spirits, by making us feel at home, giving us a buzz of excitement or creating a sense of delight. They have been shown to influence our health and well-being, our feelings of safety, security, inclusion and belonging, and our sense of community cohesion.

## 8.1 Design principles

**8.1.1** Good design is a key aspect of sustainable development. It is indivisible from good planning and can contribute positively to aspects of health and well-being. Good design goes beyond the aesthetics of simple visual appearance, it involves the consideration of place and the interactions of people with the places they live, work in and visit; and requires appreciation of environmental influences and impacts.

**8.1.2** The Council sets out here its desire to lift the quality of development within the Borough and to create places that work well and are pleasant and distinctive. It recognises that new development can be the vehicle for building a strong sense of place and creating a positive impression of the Borough.

**8.1.3** In 2008 an Urban Design Framework and Urban Realm Strategy established the Council's long-term principles supporting the development of quality environments across the Borough. The stated aim was to:

*"re-establish the importance of locating development in the right places, through the regeneration and repair of existing urban areas to ensure that new development contributes towards the vitality of existing local services and supports existing community infrastructure and public transport provision..."*

**8.1.4** The Strategy identified a series of actions aimed particularly at the regeneration of urban areas, whilst setting out guiding principles to protect and enhance the sense of place and identity of other areas, such as rural villages. Since the introduction of the Framework, the Council has commissioned masterplans for Grimsby and Cleethorpes and taken a lead delivering major regeneration projects embracing these principles, including major public realm and development projects in Grimsby town centre, and Cleethorpes.

**8.1.5** These documents set the local context but must be considered alongside the guidance set out in the National Design Guide. The National Design Guide addresses the question of how we recognise well-designed places, by outlining and illustrating the Government's priorities for well-designed places in the form of ten characteristics. The Council will expect developers to consider this guidance when designing their schemes.

**8.1.6** Good design is not restricted to major schemes - it is equally important that smaller schemes and minor works are well-designed. Good design is a prerequisite for delivering places that work well, feel right, look good and support healthy lives.

**8.1.7** Draft Strategic Policy 13 Good design in new developments establishes the local considerations that will apply when assessing the design quality of development proposals. There is strong emphasis on considering each site's particular context and on the important roles of high quality and inclusive design in delivering sustainable development.

**8.1.8** The Council considers that design review is a key element in achieving high standards of design. At a local level, the Council's Development Management team undertake design review as part of regular weekly team meetings. In this way the design rationale of schemes presented as applications and pre-application enquiries can be interrogated by a wider professional audience. At the pre-application stage developers are also encouraged to meet with members of the Council's Planning Committee following the end of a formal meeting. This gives applicants/developers an opportunity to explain their proposals and explore any queries with the local councillors who will subsequently deliberate on the formal planning application.

**8.1.9** When major developments are proposed, applicants are further encouraged through the Council's *Statement of Community Involvement* to engage in meaningful dialogue with the communities close to their sites. The Council expects to see evidence that such engagement has taken place and will wish to consider the applicant's responses to the issues raised by residents, community groups and others.

**8.1.10** When it is considered appropriate, the Council will also continue to draw on support available via the Design Network and developers will be encouraged to have their scheme's reviewed via this process. Locally, this key activity is currently undertaken by 'Integreat Plus', the design network member covering Yorkshire and Humberside.

**8.1.11** The attractiveness of buildings and spaces can be enhanced through the introduction of public art. This can take many forms; for example, statues, sculptures, stained glass and murals all of which can add to the visual interest and sense of place. The approach seeks to maintain the tradition of enriching the environment through public art. This is not only important as a way of establishing local identity and instilling a sense of local pride, but can also lift the value of development and promote additional investment. Draft Strategic Policy 13 Good design in new developments encourages development located specifically in prominent public locations, or sites with significance in terms of local heritage to incorporate elements of public art in other schemes.

**8.1.12** It is also widely recognised that poorly placed advertisements can have a negative impact on the appearance of the built and natural environment. The Government advises that control over advertisements should be simple, efficient, and effective in concept and operation. (NPPF paragraph 136). A wide range of advertisements may be displayed with 'deemed consent', for example without the need for specific consent from the Council. Where consent is required this is generally judged on the merits of each case. In sensitive environments careful consideration is required. Draft Strategic Policy 13 Good design in new developments provides for consent to be granted except where the proposal would have a significant impact on amenity and/or public safety, or will lead to an over abundance of advertisements.

### Draft Strategic Policy 13

Good design in new developments

1. A high standard of sustainable design is required in all developments. The Council will expect the design approach of each development to be informed by:
   - A. a thorough consideration of the particular site's context (built and natural environment, and social and physical characteristics);
   - B. the need to achieve:
     - i. protection and enhancement of natural assets;
     - ii. resource efficiency;
     - iii. climate change resilience;
     - iv. sustainable transport;
     - v. accessibility and social inclusion;
     - vi. crime and fear of crime reduction;
     - vii. protection and enhancement of heritage assets, including character and local distinctiveness;
     - viii. high quality public realm; and,
     - ix. efficient use of land.
   - C. design guidance for North East Lincolnshire published by the Council; and,
   - D. where applicable and relevant:
     - i. the objectives and expectations of the *Lincolnshire Wolds Area of Outstanding Natural Beauty Management Plan 2018-2023* (and any subsequent updates);
     - ii. Landscape Character Assessment; and,
     - iii. Conservation Area Appraisals.
2. Where a Design and Access Statement is required, this should describe the specific considerations and rationale on which design proposals have been based.

3. Incorporation of elements of public art that serve to enrich the wider area will be encouraged in the development of sites within or adjoining prominent public locations, or sites which have significance in terms of local heritage.
4. Proposals for express consent to display advertisements will be permitted if the proposal respects the interest of amenity and public safety, taking account of cumulative impacts.

### Question 24

Design Quality

No change to the Design principles policy is proposed.

Do you have any comments?

| Draft Strategic Policy 13 Good design in new developments relationship to: | Links to: |
|---|---|
| National Planning Policy Framework | Paragraphs 126-136 |
| Planning Practice Guidance, | Design: Process and Tools (2019) |
| Local Plan Strategic Objectives | SO6 and SO9 |
| Evidence base and other key documents and strategies | • *Design, North East Lincolnshire Places and Spaces Renaissance* (2008)<br>• *Lincolnshire Wolds Area of Outstanding Natural Beauty Management Plan 2018 -2023* (and subsequent updates)<br>• *Landscape Character Assessment* (2015) |

**Table 8.1 Policy relationships**

## 8.2 Historic environment

**8.2.1** North East Lincolnshire's historic environment is an asset of great social, cultural, economic and environmental value. This needs to be understood and taken fully into account as developments are being planned, designed and implemented. The Council is committed to making the most of the best buildings and places inherited from previous generations, including encouraging the reuse of heritage assets where appropriate; as it seeks to meet the needs of people living here now and in the future.

**8.2.2** North East Lincolnshire's historic environment plays a significant role in defining the character and setting of the Borough. Heritage assets contribute to a sense of community identity and local distinctiveness, and enhance the aesthetic, social and

cultural quality of life available to residents. They also make positive contributions to economic viability, environmental sustainability and regeneration, for example by attracting visitors and by providing high quality settings for commercial and cultural activities.

**8.2.3** The NPPF (paragraph 190), emphasises that local plans should set out a positive strategy for the conservation and enjoyment of the historic environment. This includes heritage assets most at risk through neglect, decay and other threats. In doing so, the strategy should take into account:

- *"the desirability of sustaining and enhancing the significance of the heritage assets and putting them to viable uses consistent with their conservation;*
- *the wider social, cultural, economic and environmental benefits that conservation of the historic environment can bring;*
- *the desirability of new development making a positive contribution to local character and distinctiveness;*
- opportunities to draw on the contribution made by the historic environment to the character of a place".

**8.2.4** The NPPF advises that, applicants seeking planning approval should be required to describe the significance of any heritage assets affected by the development proposals, including any contribution made by their setting. The NPPF also provides guidance regarding consideration of harm and of viability.

**8.2.5** Within North East Lincolnshire there are currently (April 2023):

1. 231 nationally listed buildings, (206 Grade II, 13 Grade II* and 12 Grade I);
2. 11 nationally Scheduled Monuments;
3. one nationally registered Park and Garden, (Peoples Park, Grimsby);
4. 16 Conservation Areas;
5. local lists of local heritage assets, comprising:
    a. a local list for Grimsby, adopted 2015, and Grimsby villages, adopted 2013;
    b. a local list for Cleethorpes, adopted 2013; and,
    c. a local list for Immingham and the villages, (draft).
6. in addition, there are many non-designated assets which are widely recognised as being of local heritage significance.

**8.2.6** In broad terms, the Council considers the following to be of particular importance for the contribution to the Borough's distinctive character and sense of place:

1. the unique legacy of buildings and structures associated with its maritime and fishing industry including the historic docks of Grimsby and Immingham (including the Dock Tower, Kasbah, Ice Factory and Smokehouses), and associated commercial and domestic architecture;
2. the seaside resort of Cleethorpes (including the Pier, promenades, and traditional seaside architecture);

3. the high quality archaeological deposits relating to the medieval town and Port of Grimsby and the settlement of Stallingborough;
4. the high quality early twentieth century domestic architecture of Grimsby, Cleethorpes and The Avenue, Healing;
5. the rural vernacular, archaeological and landscape character of traditional rural Wolds settlements (including Beelsby, Barnoldby le Beck, East Ravendale, Habrough and Wold Newton).
6. the isolated Iron Age and Roman settlements of the marshland parishes; and,
7. the rural character of Old Clee Conservation Area.

**8.2.7** An up to date register of nationally protected heritage buildings and sites can be found on the National Heritage List for England website (https://historicengland.org.uk). As these records are subject to continuous review and change these assets will not been identified on the Policies Map.

**8.2.8** On 17 January 2021 the Government announced additional law to protect historic assets.

**8.2.9** The new legal protections mean that historic statues should be ‘retained and explained’ for future generations. Individuals who want to remove any historic statue, will require listed building consent or planning approval. This will protect all statues and monuments in the Borough.

**8.2.10** If the Council intends to grant permission for the removal of a statue and Historic England objects, the Secretary of State will be notified so he can make the final decision about the application in question.

**8.2.11** Historic England and the Secretary of State will apply a policy off 'retain and explain', meaning historic statues will only be removed in the most exceptional circumstances.

**8.2.12** **A revision to the policy has therefore been proposed to address the new legal protections.**

**8.2.13** Draft Strategic Policy 14 Conserving and enhancing the historic environment sets out a clear approach providing guidance to developers on how to safeguard and respond to the historic environment, recognising designated and non-designated heritage assets. This includes understanding, safeguarding and where possible enhancing, the character, appearance, setting and integrity of identified heritage assets. It explains what supporting information will need to be submitted with applications and details how the Council will make appropriate judgements.

**8.2.14** Heritage assets are an irreplaceable resource. Therefore, proposals for development should be informed by, and will be determined in line with, statutory requirements, national policy and specific relevant guidance, principles and best practice.

**8.2.15** The determination of planning applications will be based on the assessment of the potential harmful impact. The Council will take into account the desirability of not only sustaining the asset's significance, but also enhancing that significance and the positive contribution both conservation and well-informed new design can make to sustainability, local character and distinctiveness.

**8.2.16** The significance of a heritage asset can be harmed or lost through alteration or destruction of the asset or development within its setting. Any harm or loss, including cumulative impacts leading to less than substantial harm, will require clear and convincing justification to allow the harm to be balanced against any public benefits of the proposal.

**8.2.17** The more important the asset, the greater the presumption against harm; proposals leading to substantial harm of the most important assets would have to be wholly exceptional, and will have to demonstrate a lack of viable alternative schemes or uses, and the most substantial overriding public benefits. The Borough's scheduled monuments, Grade I and II* listed buildings and the registered park and garden, are considered to be of the greatest importance in this regard.

**8.2.18** However, the same expectations for proportionate assessment and the need for justification through overriding public benefits apply to other designated assets and all non-designated assets, as appropriate to their significance. Non-designated assets could be buildings, Monuments, archaeological sites, places, areas of landscapes positively identified (in the Historic Environment Record, Conservation Area Appraisals or Neighbourhood Plans, or equivalent, or through assessment within the planning processes) as having a degree of significance meriting consideration in planning decisions.

**8.2.19** Draft Strategic Policy 14 Conserving and enhancing the historic environment goes on to outline the Council's strategy for securing and facilitating conservation of the historic environment and the Borough's heritage assets, how it has and will continue to implement that strategy over the plan period.

**8.2.20** There is a particular challenge in finding viable uses for heritage assets particularly where they are located within those parts of the Borough, where there are particularly demanding economic and social conditions that suppress property values. The 2014 record of 'Buildings and Risk' on the national register identifies two listed buildings, two scheduled monuments and seven conservation areas at risk. In addition survey work completed by the Heritage Trust for Lincolnshire in 2015 provides information on historic buildings, war memorials, archaeological sites, historic parks and gardens and conservation areas which helps to inform the overall heritage strategy.

### Draft Strategic Policy 14

Conserving and enhancing the historic environment

1. Proposals for development will be permitted where they would sustain the cultural distinctiveness and significance of North East Lincolnshire's historic urban, rural and coastal environment by protecting, preserving and, where appropriate, enhancing the character, appearance, significance and historic value of designated and non-designated heritage assets and their settings.
2. In addition, the Council will pursue an integrated approach that:

A. seeks to update existing Conservation Area Appraisals and Management Plans to identify the qualities and interests of each area and management guidelines to guide future development;

B. takes a positive and proactive approach to addressing Heritage at Risk (including those assets on the national and local Heritage at Risk Registers), where necessary using statutory powers to undertake enforcement action where there is identified harm, immediate threat or serious risk to the preservation of a heritage assets;

C. considers the use of Article 4 Directions to remove permitted development rights in all or part of conservation areas or on local list assets where there is evidence that important features are at risk of being degraded;

D. supports the development of Listed Building Heritage Partnership Agreements, where appropriate;

E. supports heritage-led regeneration;

F. encourages sympathetic uses, and repair, maintenance and restoration of heritage assets;

G. considers the use of Local Listed Building Consent Orders; and,

H. safeguards statues, plaques, memorials and monuments.

3. Development will be supported, and planning permission granted, where proposals:

A. protect the significance of heritage assets, including their setting; through consideration of scale, design, materials, siting, mass, use and views;

B. conserve and, where appropriate, enhance other historic landscape and townscape features, including historic shop fronts;

C. preserve and enhance the special character and architectural appearance of Conservation Areas, especially those positive elements in any Conservation Area Appraisal;

D. conserve and, where appropriate, enhance the design, character appearance and historic significance of the Borough's only registered park and garden (Peoples Park, Grimsby);

E. make appropriate provision to record, and where possible preserve in situ features of archaeological significance; and,

F. captures opportunities to increase knowledge and access to local heritage assets and better reveal their significance.

4. Where a development proposal would affect the significance of a heritage asset (whether designated or non-designated), including any contribution made to its setting, it should be informed by proportionate historic environment assessments and evaluations (such as heritage impact assessments, desk based appraisals, field evaluation and historic building reports) that:

A. identify all heritage assets likely to be affected by the proposal;

B. explain the nature and degree of any effect on elements that contribute to their significance and demonstrating how, in order of preference, any harm will be avoided, minimised or mitigated;

C. provide a clear explanation and justification for the proposal in order for the harm to be weighed against public benefits; and,

D. demonstrate that all reasonable efforts have been made to sustain the existing use, find new uses, or mitigate the extent of the harm to the significance of the asset; and whether the works proposed are the minimum required to secure the long-term use of the asset.

5. The Council will assess each application individually in terms of the magnitude of impact of any change on the significance of the asset or the contribution that setting makes to that significance or experiencing significance. Where an impact equates to substantial loss of significance (demolition in the case of direct harm or the effective destruction of an asset's setting in the case of indirect harm), a proposal will be considered to cause substantial harm. Permission will only be granted where substantial harm to assets of the highest significance is wholly exceptional, and for all other nationally designated assets, exceptional.

### Question 25

Historic environment

Revisions to the historic environment policy are proposed to address legislative changes to protect historic statues, plaques, memorials, and monuments.

Do you have any comments?

| Draft Strategic Policy 14 Conserving and enhancing the historic environment relationship to: | Links to: |
|---|---|
| National Planning Policy Framework | Paragraphs 189-208 |
| Local Plan Strategic Objectives | SO6 |
| Evidence base and other key documents and strategies | • Heritage at Risk Register<br>• Historic Environment Record (HER) |

**Table 8.2 Policy relationships**

## 8.3 Sustainable transport

**8.3.1** Transport has an important role to play in facilitating sustainable development, but also contributes to wider aspects of sustainability including health and environmental quality. Whilst behaviours, working patterns and lifestyle choices are changing transport choices, it is clear that new development will generate additional transport movements.

**8.3.2** The Council's approach as advocated in the current *Local Transport Plan 2011-2026* (LTP3) is to address a number of key challenges designed to address economic, social and environmental priorities explicitly geared towards local priorities. The identified challenges are:

| | |
|---|---|
| Enable sustainable growth through effective transport provision | For the long-term health of the local economy growth has to be sustainable. Regeneration aspirations will rely on effective transport links to enable employees and visitors to access new homes and workplaces. Development near the Port of Immingham docks and the South Humber Bank will need appropriate road and rail links enabling the transportation of cargo. |
| Improve journey times and reliability by reducing congestion | Tackling congestion has been raised by both the public and business and an issue in North East Lincolnshire. The problem of congestion in North East Lincolnshire tends to be localised and associated with peak travel times. Through analysis of traffic data several hotspots have been identified including; Tollbar Roundabout (A16), Westgate Roundabout (A180) and Cambridge Street/Little Coates Road junction. Traffic delays also occur along the A180 entering the resort of Cleethorpes during the summer and weekends. |
| Support regeneration and employment by connecting people to education, training and jobs | As well as providing links to workplaces there is a need to transport people to training and education sites where they can learn and up-skill to meet the needs of new emerging local industries. In North East Lincolnshire the main strategic employment sites are focused on the two ports and the land between which is detached from the main urban area, this presents particular challenges for public transport provision. |
| Enable disadvantaged groups and/or people living in disadvantaged areas to connect with employment, health, social and leisure | Social exclusion is a significant local issue. Providing access for all at an affordable rate to education, healthcare, employment, leisure and social opportunities enables people to make the most of life. |
| Provide safe access and reduce the risk of loss, death or injury due to transport accidents or crime | The number of traffic accidents on local roads has declined significantly in recent years but is still higher than similar places elsewhere in the country. This challenge seeks to build on the progress already made and to continue to improve safety and security in the area. |
| Improve the health of individuals by encouraging and enabling more physically active travel | Overall the health of local residents in North East Lincolnshire is improving but life expectancy is lower and early deaths from preventable causes are higher than national averages. Less than one in five people are getting enough exercise each week and |

| | |
|---|---|
| | more than 25% of people are classed as obese. The challenge for transport is to help improve the situation and increase the physical and mental health of local people. |
| Improve the journey experience on the local transport network | This challenge supports the idea that transport is not just about getting from A to B but about the quality of the journey. Comfort, reliability, punctuality and aesthetics are important in relation to many different forms of transport. It is also acknowledged that improving journey experience is a key tool in encouraging people to use more sustainable modes of travel. |
| Ensure transport contributes to environmental excellence, improved air quality and reduced greenhouse gas emissions | Delivering economic growth in parallel with guarding and enhancing the environment is an important part of building a sustainable economy.<br>Since emissions from transport are a significant contributor to greenhouse gas emissions, it is important that ways are sought to reduce fossil fuel dependence. This is especially important alongside establishing North East Lincolnshire as a centre for renewable technologies.<br>Whilst overall North East Lincolnshire has good air quality, there are a few key locations which exceed European guidelines and have been declared Air Quality Management Areas (AQMAs). It is important that the Council continues to manage and monitor air quality at these and other sites. |

**Table 8.3 Transport challenges**

**8.3.3** The Council's approaches and actions set out to address these locally identified challenges.

**8.3.4** A number of existing programmes and initiatives are in place to support sustainable transport. In addition to blue badge and concessionary bus passes, these include:

1. TravelLincs - a car sharing initiative, which puts people in touch with like minded car sharers;
2. Community Transport Services:
3. a. Phone n Ride - an on demand responsive bus service;
   b. Wheels to Work - a scooter based scheme facilitating access to employment, training and education; and,
   c. Dial a Ride - a scheme providing accessible transport for those who find it difficult to use public transport due to illness or disability.

**8.3.5** Draft Strategic Policy 15 Promoting sustainable transport recognises that significant benefits can be achieved by locating developments in places where the need to travel will be minimised and the option to make sustainable choices can be maximised.

**8.3.6** Draft Strategic Policy 19 Retail hierarchy, applies a sequential approach to safeguard the vitality of the town centres. As well as preventing damage to centres by out-of-centre development that would draw away trade and activity, this approach will also maximise sustainable transport opportunities and choices.

**8.3.7** Draft Strategic Policy 15 Promoting sustainable transport also seeks to prioritise pedestrian and cycle access, promoting active travel choices. North East Lincolnshire is relatively compact, the main centre of population and arc settlements being within only a few kilometres of each other. This means that the majority of everyday journeys are short and concentrated on a small number of routes. There are, therefore, benefits to be derived from promoting walking, cycling and public transport options in preference to dependence on the private car. Draft Strategic Policy 9 Developing a green infrastructure network specifically seeks out opportunities to improve the overall connectivity of green spaces, including improvements to access to the countryside and permeability of the urban area, for pedestrians, cyclists and horse riders. There are currently 204kms of footpaths and bridleways in the Borough. The Council has prepared a *Rights of Way Improvement Plan* (ROWIP) (2021-2031).

**8.3.8** Draft Strategic Policy 15 Promoting sustainable transport promotes improved bus and community transport accessibility working to a maximum 400m walk to bus stop. Four hundred metres is considered to be beneficial and reasonable, greater distances tend to deter regular bus use. The Council has and will continue to invest in improved bus facilities across the Borough. Latest improvements include new bus stop facilities in Grimsby town centre and up-to-date service information at bus stops.

**8.3.9** Having considered and assessed the implementation of these approaches further mitigation might be required. The mitigation measures should be clearly identified in development proposals, including within Transport Statements, Transport Assessments and Travel Plans, where these are required, and will be secured through conditions and/or legal agreements.

**8.3.10** The Council has identified through monitoring, modelling and alignment with regeneration priorities a number of priority areas where combinations of sustainable transport measures and highway improvements will be focused. These focus on the transport hubs of Grimsby town centre and Cleethorpes town centre and resort; the strategic transport corridor formed by the A180; urban area hotspots identified through monitoring and modelling and defined air quality management zones.

### Draft Strategic Policy 15

Promoting sustainable transport

1. To reduce congestion, improve environmental quality and encourage more active and healthy lifestyles, the Council will support measures that promote more sustainable transport choices. Where appropriate, proposals should seek to:

    A. focus development which generates significant movements in locations where the need to travel will be minimised;

B. prioritise pedestrian and cycle access to and within the site promoting active travel choices;

C. make appropriate provision for access to public transport and other alternative means of transport to the car, adopting a 400m walk to bus stop standard;

D. make suitable provision to accommodate the efficient delivery of goods and supplies; and,

E. make suitable provision for electric vehicle charging, car clubs and car sharing when considering car park provision.

2. Planning permission will be granted where any development that is expected to have significant transport implications delivers necessary and cost effective mitigation measures to ensure that development has an acceptable impact on the network's functioning and safety. These measures shall be secured through conditions and/or legal agreements.

3. Where appropriate, Transport Statements, Transport Assessments and/or Travel Plans should be submitted with applications, with the precise form being dependant on the scale and nature of development and agreed through early discussion with the Council.

4. The priority areas where combinations of sustainable transport measure and highway improvements will be focused are:

A. Grimsby town centre;

B. Cleethorpes town and centre and resort area;

C. A180 corridor, (urban and industrial); and,

D. urban area congestion hotspots and defined air quality management zones.

## Question 26

Promoting sustainable transport

Minor revisions to the promoting sustainable transport policy are proposed, to refer to active travel choices.

Do you have any comments?

| Draft Strategic Policy 15 Promoting sustainable transport relationship to: | Links to: |
|---|---|
| National Planning Policy Framework | Paragraphs 104-109 |
| Local Plan Strategic Objectives | SO7 |
| Evidence base and other key documents and strategies | • *Local Transport Plan 2011-2026* (LTP3) (2011) (under review) |

**Table 8.4 Policy relationships**

## 8.4 Parking provision

**8.4.1** Parking can present problems when it is not considered as part of an integrated design approach, or when too little parking is provided relative to the local site circumstances.

**8.4.2** Parking provision in new development must be designed to meet expected demand whilst making the most efficient use of land and maintaining the principles of sustainable development.

**8.4.3** It is important to ensure future developments provide sufficient parking that will not result in on-street parking congestion. There has to be a balance so that there is not an over provision of parking that would result in the inefficient use of land or encourage unsustainable transport choices.

**8.4.4** The approach taken must recognise that certain factors may require deviation from any set standards, such as on-street parking levels, parking restrictions, narrow streets and other local factors. The Council must ultimately weigh up all the specific issues for each development and establish a balanced outcome.

**8.4.5** Draft Policy 4 Parking sets out a flexible approach outlining key considerations to be taken into account with the aim of identifying the extent to which provision of additional off-street parking space could be minimised before problems would be experienced. This would naturally lead to a situation where developments in proximity to good transport services and close to frequently used services and facilities require fewer parking facilities than those in locations without these benefits.

**8.4.6** Draft Policy 4 Parking makes specific provision for people with mobility impairments. **The requirement of five percent is representative of the national average of those with mobility impairments who have potential need for parking. This is a slight increase from the 4% set out in the existing local plan policy.**

**8.4.7** The provision of electric charging points is now a requirement of part S of Building regulations for new homes and existing homes undergoing large renovations (of 10 more or dwellings). The rules also state that non-residential buildings, including those undergoing major renovation, with more than 10 parking spaces must have a charge point and cable routes for one fifth of the total number of spaces.

**8.4.8** **As the provision of charging points is now a mandatory requirement of building regulations, this element has now been removed from the policy.**

### Draft Policy 4

Parking

1. Development proposals that generate additional parking demand should ensure that appropriate vehicle, powered two wheeler and cycle parking provision is made. The form and scale of off-street parking required will be assessed against the following:

    A. the accessibility of the development;

B. the type, mix and use of the development;
C. the availability and frequency of public transport services; and,
D. local car ownership levels.

2. Developers will be expected to have considered and incorporated measures to minimise parking provision without causing detriment to the functioning of the highway network, local amenity and safety.
3. Where private and/or public on-site parking for public use is to be provided at least 5% of parking bays, should be designed, set out and reserved for people with mobility impairments. Such parking bays should be located as close to the main access to the building as possible.
4. Streets should incorporate green infrastructure, including street trees to soften the impact of car parking, help improve air quality and contribute to biodiversity.
5. Development proposals that make provision for surface parking areas to serve more than a single household, visitor, employee, or customer, should ensure that appropriate low maintenance landscaping is integrated into the overall design and layout of the sites.

### Question 27

Parking

Revisions to the parking policy are proposed, to remove reference to charging points as this is now a mandatory requirement, reflect the current requirement for parking for those with mobility impairments and address the requirement for street trees?

Do you have any comments?

| Draft Policy 4 Parking relationship to: | Links to: |
|---|---|
| National Planning Policy Framework | Paragraphs 107-113, |
| Local Plan Strategic Objectives | SO5, SO7 and SO9 |
| Evidence base and other key documents and strategies | • *Local Transport Plan* (LTP3) (2011)<br>• National Design Guide (2021) |

**Table 8.5 Policy relationships**

## Section 9 Employment

**9.0.1** The economy in North East Lincolnshire is going through a significant change as existing businesses focus on reducing their carbon footprint. This brings with it new challenges for existing businesses but also exciting opportunities.

**9.0.2** The established renewable energy sector sector has grown as Grimsby has established itself as the base for operations and maintenance operations associated with the offshore wind farms which are expanding at an exceptional rate. New renewables manufacturing companies have established including MyEnergi Ltd and there are opportunities for further future investment linked to carbon capture and hydrogen generation projects.

**9.0.3** There are also good prospects for growth aligned with traditional employment sectors. The designation of the Humber Freeport will see benefits across ports and logistics, food processing, chemicals and process industries. The injection of Levelling Up funding aligned to the Cleethorpes Masterplan will also support the visitor economy to prosper and grow.

## 9.1 Allocations

**9.1.1** The nature of many of the operations in North East Lincolnshire and the resulting business formation means that the land take is not well aligned to traditional standard floorspace to job density calculations. This has been particularly evidence with regard to energy and logistics operations. The nature of these developments also mean it is hard to predict future delivery patterns.

**9.1.2** The ultimate judgement of the land take is not a simple consideration of the quantitative analysis. A range of qualitative factors should also be considered that would typically consider the quality and demand for existing premises, the spatial distribution of supply and demand for premises, including insights from commercial property agents and local businesses.

**9.1.3** An assessment of future employment land needs was undertaken by consultants (Lichfields) as part of the HEDNA. This qualitative analysis was supplemented by a quantative Economic Development Needs Assessment exercise.

**9.1.4** In line with the requirements of the Planning Practice Guidance, Lichfields modelled a range of scenarios including:

- projections of demand-led employment growth using Experian's Local Market Quarterly Forecasts for December 2022.
- an 'economic growth' projection based on accelerating growth in key growth sectors at a rate over and above the Experian baseline.
- estimated growth in the local labour supply and the jobs and employment space that this could be expected to support. This is based on the PopGroup demographic analysis.
- consideration of past trends in completions of employment space based on monitoring data collected by the Council, and how these trends might change in the future.

**9.1.5** Making an allowance for losses in the order of around 2.34 ha per annum to translate net projections to gross requirements, as well as making a suitable adjustment for a margin of choice equal to five-years' worth of take up (13.13 ha in total), the demand-led range of total gross land requirements to 2042 results in the following demand projections for the Borough:

1. Econometric demand-led projections: 61.78 ha – 68.81 ha;
2. Labour Supply projections: 53.95 ha – 55.06 ha; and,
3. Past Development Trends: 112.41 ha.

**9.1.6** The existing supply set out in the Local Plan would, therefore theoretically be more than sufficient to meet the upper end of the identified need. The existing Local Plan identified c335ha of land for general development (although not all was expected to be delivered in the plan period), with additional land reserved for long term business expansion. Since the Local Plan was adopted in 2018, 49.81ha of land has been developed and a further 62.27ha of land is considered to be "in train" with consented development with committed end users in place. A further 139.05ha is held by two companies for long term business expansion.

**9.1.7** It should however, be noted that the forecasting approach in the HEDNA focuses on indigenous employment land needs. As evident from the review of key economic sectors and occupiers, the Borough is proving increasingly attractive to inward investors in sectors with significant geographical reach. In addition the HEDNA highlights the potential for port related growth is substantial. Associated British Ports (ABP) are progressing a Nationally Significant Infrastructure Project (NSIP) application for a new roll on roll off (RORO) terminal at Immingham. Grimsby and Immingham are also significant ports related to the import/export of vehicles which has the potential for significant land take.

**9.1.8** It is considered important particularly in the light of the potential additional jobs delivery from the identified future projects and investment that there is sufficient flexibility in the sites made available for development particularly as these projects are within the energy sector. It is also important to recognise the clustering benefits and operational requirements of particular business sectors. For example, it would be impractical for a food processing operation to locate on the same site or in close proximity to a chemical plant.

**9.1.9** In addition to the locational and sector considerations the HEDNA highlighted it is also appropriate to consider the needs of different scales of developments from the small local business to a large scale development by a global business. A portfolio of sites will therefore need to be identified. This includes sites well suited to the expansion of the ports and logistics and are included within the freeport zone; sites suitable for large scale energy related development; sites for smaller scale manufacturing and general businesses and sites reserved for long term expansion. These sites are held by existing companies for their long term development and are not available for general development.

**9.1.10** The Council has outlined three options for considering the land to be set out for employment development, these are set out below:

## Option 11

Land requirement

Maintaining the existing land requirement (carrying forward sites from the existing Local Plan).

## Option 12

Land requirement

Reduce the land requirement (reduce the number of allocated sites).

## Option 13

Land requirement

Increase the land requirement (increase the number of allocated sites).

**9.1.11** Taking these factors into account the local plan makes provision of sites to support the Policy-On projection of 4,560 jobs.

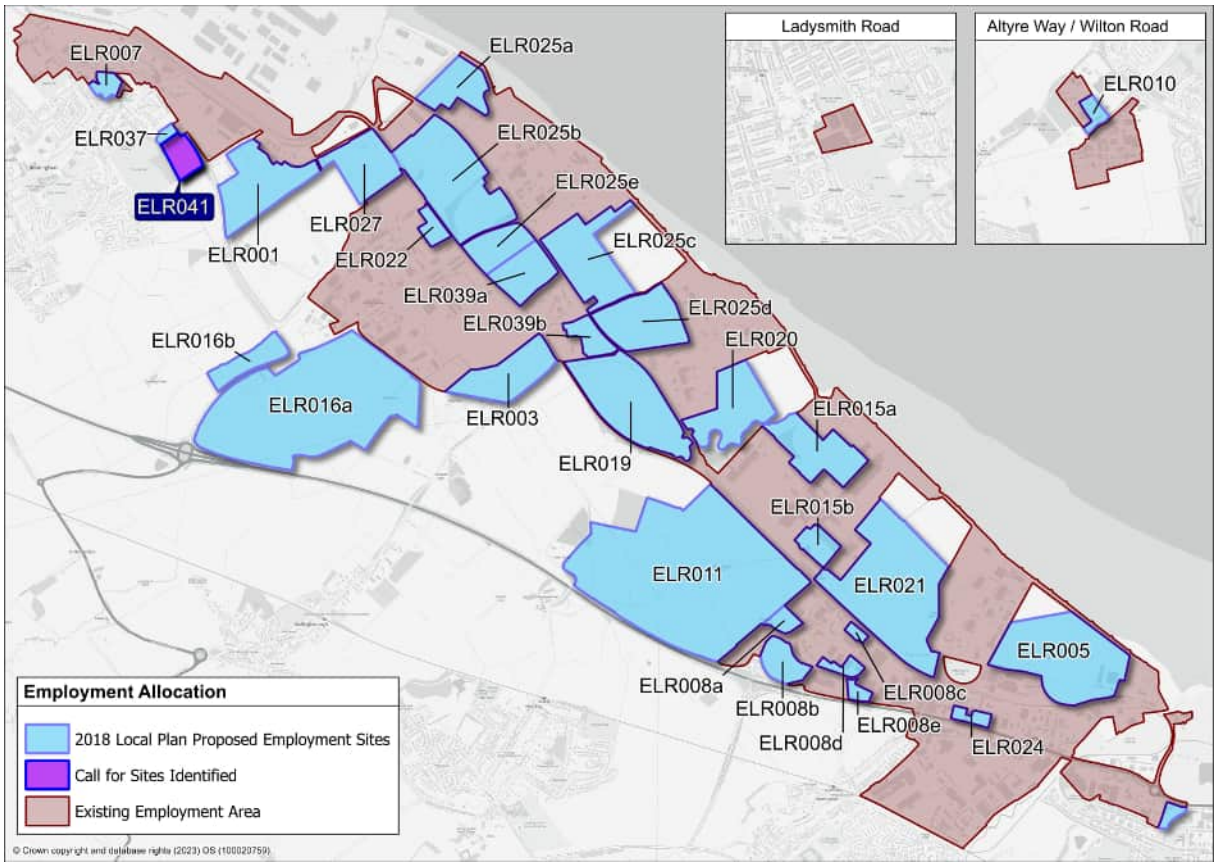


**Figure 9.1 Employment sites**

**9.1.12** Figure 9.1 Employment sites identifies the sites that have previously been allocated for employment development, together with a site promoted through the call for sites, each has been given a separate reference number and colour coded to reflect their current status. The Council will be looking to allocate sufficient sites to meet the future employment requirement.

### Question 28

Employment allocations

Which of the land requirement options do you consider appropriate to be taken forward?

### Question 29

Employment allocations

Are there any sites which you consider should definitely be identified for employment development?

If so, please explain why.

### Question 30

Employment allocations

Are there any sites which you consider should definitely NOT be identified for employment development?

If so, please explain why.

## 9.2 Existing sites

**9.2.1** In addition to undeveloped sites allocated for employment uses, there are other existing employment areas. These are home to many successful businesses that contribute to the local economy. There will inevitably be a degree of change over the plan period as businesses form, expand or contract and close. This is a normal process which the Local Plan needs to accommodate.

**9.2.2** There is no justification for safeguarding sites in the long-term where there is no prospect of future employment use. Such an approach would be considered unsustainable. To ensure land is used efficiently the policy allows for the redevelopment of a site or building subject to specific criteria. these relate to evidence confirming there is no reasonable prospect of re-establishing employment use ; and checks to ensure the new use is acceptable and will not compromise the existing employment uses in the area

**9.2.3** The existing employment areas are set out in Table 9.1 Existing employment areas below. **A revision has been made to include the addition of the Laceby Business Park.** These sites vary in their characteristics and uses, some include industrial operations, and warehousing whilst others are characterised by more business/office type activities.

| Settlement | Site Location Description |
|---|---|
| Immingham | Manby Road Industrial Estate |
| Stallingborough | Kiln Lane Industrial Estate |
| Grimsby | EuroparcEuropa ParkGreat Grimsby Business ParkAcorn Business ParkSouth Humberside Industrial EstateBirchin Way Industrial EstateLadysmith Road |
| Humberston | Wilton Road industrial EstateHewitts Circus Business Park |
| Laceby | Laceby Business Park |

**Table 9.1 Existing employment areas**

## Draft Policy 5

Existing employment sites

1. The exiting employment areas, identified in Table 9.1 Existing employment areas will be safeguarded for employment and business uses. Proposals which promote development or reuse of vacant sites located within existing employment areas for employment use will be supported subject to other relevant policies in the Local Plan.
2. Proposals for the development of non-employment uses on existing employment sites will be permitted where:
3. A. there is evidence to show that the site/building has reached the end of its economic life by:
    i. demonstrating that there is no demand for the reuse of the building/site, following a minimum period of at least 6 months marketing for the existing use with a recognised commercial agent at a reasonable price reflecting typical local land/property values; and,
    ii. demonstrating that the physical adaptation or reuse of the building is uneconomic in commercial terms; and,

    B. the non-employment use would be compatible with the operations of existing employment uses nearby.

## Question 31

Existing employment areas

Revision to the existing employment areas policy are proposed to include the addition of Laceby Business Park.

Do you have any comments?

| Draft Policy 5 Existing employment sites relationship to: | Links to: |
|---|---|
| National Planning Policy Framework | Paragraph 82-85 |
| Local Plan Strategic Objectives | SO3 and SO5 |
| Evidence base and other key documents and strategies | • Housing and Economic Development Needs Assessment (2023)<br>• Strategic Housing and Economic land Availability Assessment (2023) (in preparation) |

**Table 9.2 Policy relationships**

## 9.3 Skills

**9.3.1** If local people are to benefit fully from future employment growth it is vital that they have the skills to match the opportunities. This is a key element of the *North East Lincolnshire Economic Strategy* (2021).

**9.3.2** Whilst academic institutions are yielding improving results, at a general level, the low level of skills within the general workforce is identified as a key issue. Employment sectors have highlighted a lack of skills within the workforce as a key barrier to future growth, This relates to both trade skills and higher levels of senior/professional skills. It is important therefore that the approach to skills takes an "all ages approach".

**9.3.3** Whilst it is not for the Local Plan specifically to address the local skills issue in terms of training provision, it can assist in recognising and accommodating the establishment and expansion of training and skills facilities such as the CATCH (Centre for Assessment of Technical Competence Humberside) at Stallingborough, the MODAL (multi-modal logistics) training centre at Immingham, and the development of the HETA (Humberside Engineering Training Association) training facility at Stallingborough.

**9.3.4** The Local Plan will also contribute indirectly. Providing attractive, good quality housing, cultural, retail and leisure opportunities all impact on the quality of life. Creating places and an overall environment that are attractive to local people and those who wish to relocate, is key to retaining skills.

**9.3.5** Adult skills are key to supporting and developing the local economy and building a strong and resilient community in which residents want to stay and develop, people aspire to live and businesses are encouraged to invest. It is important that the

Local Plan supports approaches that develop learning and skills levels ensuring local people are equipped to access future jobs and investors have confidence that a suitable workforce is available to meet their needs.

**9.3.6** A *North East Lincolnshire Skills Action Plan* has been developed in collaboration with local education, skills and training providers. The approach set out in Draft Policy 6 Skills and training is intended to support the priorities set out in this action plan and the overall aims of the *North East Lincolnshire Economic Strategy*. In that context, developers of major developments will be encouraged to contribute to local employment development, skills and training, including:

1. making best efforts to employ local contractors, subcontractors, apprentices and trainees during construction; and,
2. where appropriate, encouraging businesses to adopt local labour agreements and develop and implement a business orientated 'employment and skills plan' to develop skills.

**9.3.7** **The policy has been strengthened to include support for local supply chains and seek local labour agreements as part of larger developments.**

### Draft Policy 6

Skills and training

1. The Council will support development proposals that relate directly to the development of local skills, and training opportunities, focussing on existing facilities and town centre locations.
2. Encouragement and support will be given to measures supporting in work training, development of adult skills as well as training for young people to secure employment.
3. Encouraging businesses to support local supply chains, and seek local labour agreements on all developments of 100m$^2$ or more, to secure local employment and training measures as part of the development.

### Question 32

Skills and training

Revisions to the skills and training policy are proposed to support local supply chains and seek local labour agreements as part of larger developments.

Do you have any comments?

| Draft Policy 6 Skills and training relationship to: | Links to: |
|---|---|
| National Planning Policy Framework | Paragraph 81 |

| Draft Policy 6 Skills and training relationship to: | Links to: |
|---|---|
| Local Plan Strategic Objectives | SO3 and SO5 |
| Evidence base and other key documents and strategies | • *Skills Action Plan (2022)*<br>• *North East Lincolnshire Economic Strategy*(2021) |

**Table 9.3 Policy relationships**

## 9.4 Visitor economy

**9.4.1** A sustainable visitor economy helps to create a vibrant and prosperous place. The visitor economy does not just include the economic activities generated by the people who visit the area for both business and leisure, but the necessary infrastructure that collectively make it a successful visitor destination. This includes:

1. the quality of the natural environment; the beach, country parks, wetlands and open spaces and the Lincolnshire Wolds;
2. the infrastructure; including transport facilities, (road and rail), parking, signage, public space, and a good range of visitor accommodation meeting business and family needs; and,
3. the services and cultural offer that caters for visitor needs (and local residents); restaurants, bars, leisure and cultural facilities and events.

**9.4.2** A sustainable visitor economy brings both direct and indirect economic benefits, but can also bring less obvious cultural and health benefits associated with active and socially engaging lifestyles, with a strong overlap with sport and recreation.

**9.4.3** The visitor economy brings both direct and indirect economic benefits, but can also bring less obvious cultural and health benefits associated with active and socially engaging lifestyles, with a strong overlap with sport and recreation.

**9.4.4** The visitor economy does, however, face a number of key challenges, including the need to:

1. compete with other centres and visitor destinations, particularly those that have a wider offer at both a regional and national scale;
2. improve the image and perception of the area;
3. develop and promote the current lack of year round and all-weather facilities and activities;
4. strengthen the non-retail, evening and family offer; and,
5. ensure the provision of good quality business and family accommodation, catering for a range of needs and budgets.

**9.4.5** The STEAM Report 2011-2022 showed that in 2022 there were in excess of 8.5million visitor trips of all types within North East Lincolnshire, which boosted the local economy by c£636m overall. The sector supported the employment of 6,176 people, making it the largest employer of all the key sectors. Overall visitor numbers and income generated have been on an steep upward trend since the impact of the covid pandemic, when restrictions were in place; but are yet to achieve the pre pandemic levels. The competitive nature of the sector is such that continued investment is required in order that market share is maintained and enhanced.

**9.4.6** The Local Plan must support developments that broaden the appeal to visitors, caters for their needs, and presents an attractive environment. Current attractions within the area are primarily focused in Cleethorpes, but also include the Fishing Heritage Centre, the Auditorium, Freshney Place Shopping Centre and Leisure Centre in Grimsby and Waltham Windmill. In addition, the Lincolnshire Wolds AONB is partially located within the Borough, but extends further south into East and West Lindsey. Business visitors are also particularly important to the local visitor economy, as this underpins the seasonal flow and ensures year round income for local businesses.

**9.4.7** The Victorian seaside town of Cleethorpes is a key attraction for many visitors including those who visit on business, day visitors and holiday makers particularly during the summer months. The town offers a traditional seaside experience, focused on its beach stretching four and a half miles from the mainline railway station and pier at the northern end of the resort and immediately adjacent to the town centre, to the caravan and chalet parks supported by a range of out-of-centre leisure and retail facilities in the south. However, like many Victorian seaside resorts, it suffers from a lack of investment in the physical fabric and public realm, and business is seasonal.

**9.4.8** Cleethorpes has a distinct and individual character that it is important to maintain and promote. Sea View Street offers an attractive area of activity, attractive to visitors and residents. Major national chains have invested in hotel and restaurant/bar accommodation in both the resort and town centre areas (Premier Inn, Brewers Fayre, Costa Coffee, Weatherspoons). The  Pier together with other facilities offers a range of eating and drinking outlets together with, all weather, visitor attraction. The proximity of many attractions to the town centre will enable opportunities for linked trips. Opportunities to further integrate the town centre with the resort area by focusing on the town centre opportunity sites and investment in the public realm and Victorian building fabric will create an enhanced town centre environment and visitor destination for both visitors and residents alike. Improving the connectivity and providing an appropriate range of attractions where the town centre and resort areas converge will help sustain both the town centre and visitor economies.

**9.4.9** A Cleethorpes Masterplan focusing on the seafront and town centre was prepared in early 2022. This sets out a clear vision for the future development and regeneration of the resort and main town centre area over the short, medium and long term. The Masterplan is set within the context of Cleethorpes' ambition to develop and grow the tourism offer including increasing footfall, creating sustainable jobs, encouraging more overnight stays, and extending the traditional tourism season.

**9.4.10** More than £18.4million Levelling Up funds was awarded to Cleethorpes for key town centre projects in 2023. The area of focus for the funding bid was Market Place, Sea Road and Pier Gardens, which were three initial projects identified in the Masterplan.

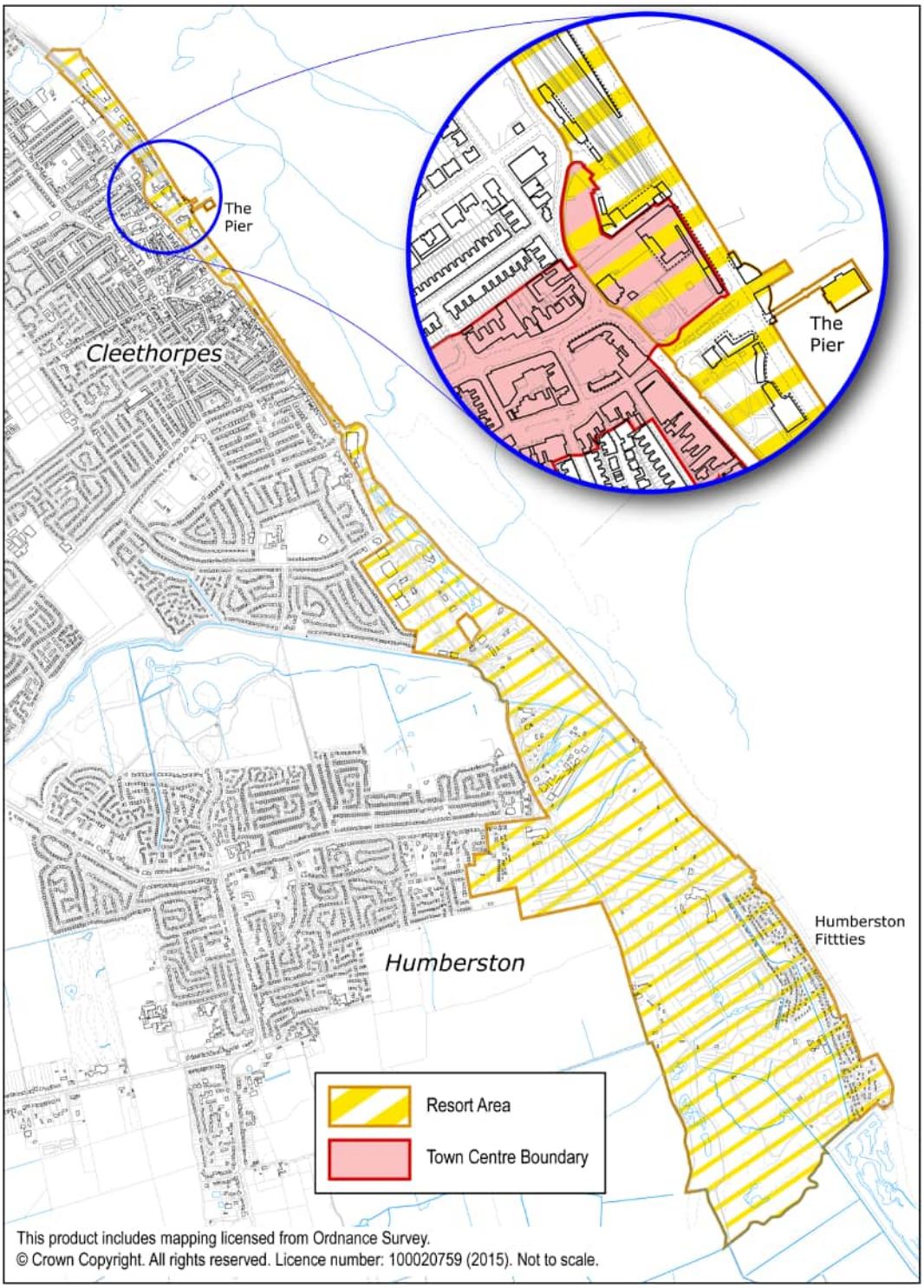


**Figure 9.2 Cleethorpes resort area**

**9.4.11** Increasing visitor and recreational activity can result in recreational pressure and potential disturbance affecting the Humber Special Area of Conservation (SCA), Special Protection Area (SPA) and Ramsar site (referred to collectively as Humber

Natura 2000 sites). The Council is an active member of the Humber Nature Partnership, an organisation made up of statutory regulators, public sector, business sector and voluntary sector members and other Humber stakeholders. It works collectively to deliver sustainable management of the Humber Natura 2000 sites and specifically works upon:

1. delivery of the Humber Management Scheme;
2. providing ecological services to members of the partnership; and,
3. developing and implementing projects to meet the Humber Conservation Objectives.

**9.4.12** Visitor recreational activity is concentrated around the resort of Cleethorpes and to avoid the Humber Natura 2000 sites being adversely affected by an increase in visitor numbers appropriate management will be required. The Council is working with Natural England developing a mitigation approach which considers potential impacts of development and incorporates improvements to visitor management as the visitor numbers increase, considering in particular the management suggestions set out in the *Footprint Ecology Desk Based Study on Recreation Disturbance to Birds on the Humber Estuary* (2010). This sets out recommendations to influence visitor flows and minimise disturbance, which includes, but is not limited to:

1. on and off-site education, highlighting the conservation importance of sites;
2. details of access points and parking, zoning etc.;
3. changing local by-laws to control access (particularly related to dogs), and zoning of particular activities through warden patrols and restricting access to parts of a site;
4. providing dedicated fenced dog exercise areas and alternative recreational facilities; and,
5. planning conditions on development in proximity to the SPA, relating to planting, screening, vehicle and pedestrian routing and access, to influence visitor flows and minimise disturbance.

**9.4.13** The Council will incorporate this mitigation approach within the review of the *Cleethorpes Habitat Management Plan* as committed to in the existing Local Plan. This has included examining the specific recreational disturbance pressures and reviewing appropriate mitigation responses which will be delivered in advance of impacts and as part of an ongoing mitigation approach in discussion with Natural England and RSPB, and final agreement with Natural England.

**9.4.14** The Council's *Economic Strategy* which will contribute to, and lead 'place marketing' through its DiscoverNEL brand. The aim of DiscoverNEL is to raise the profile of North East Lincolnshire as a location to Work, Stay and Play, supporting the increase in job opportunities and development of new homes. An ultimate aim of VESR is to become the destination management organisation to be able to apply for additional funding.

**9.4.15** The Plan can support such a strategy by ensuring appropriate provision is made in the key town centres, and that appropriate support is offered for the development of visitor attractions and accommodation in other appropriate locations.

**9.4.16** The approach seeks to optimise the area's tourism assets while protecting environmental resources that are fundamental to the tourist offer. It promotes development that would both broaden the tourism offer across the Borough, and support the long-term sustainability of the Cleethorpes resort. Tourist spending is at present, characterised by seasonality and dominated by day visitors. The challenge is to broaden the current offer to extend the season and extend visitor stays to maximise the contribution of tourism to the local economy.

**9.4.17** North East Lincolnshire's natural environment and ecology is also attractive to visitors and provides a different experience that complements that offered by the resort. This requires sensitive management. The Humber Estuary is designated as a Special Area of Conservation (SAC) and Special Protection Area (SPA) under the European Habitats Directive. The *Conservation of Habitats and Species Regulations 2010* (The Habitats Regulations) require consideration of the designations as well as consideration of the wetland as being of international importance under the Ramsar Convention. An area of the sand dunes is also designated as a SSSI. The Council will apply a level of protection to these sites which is commensurate with their high level of protection and recognise specifically the reasons for their designation. Tourism and visitor development within the Lincolnshire Wolds Area of Outstanding Natural Beauty should respect the national designation of this area on the basis of its landscape quality and follow the approaches set out in the AONB Management Plan.

**9.4.18** The Council will actively support tourism and cultural development proposals, granting approval to developments which accord with Draft Strategic Policy 16 Tourism and visitor economy, pursuing heritage grant funding and other appropriate funding bids when available.

### Draft Strategic Policy 16

Tourism and visitor economy

1. The Council will support development that is consistent with the following principles:

   A. safeguards, supports and enhances the growth of existing and new visitor, cultural, leisure attractions including visitor accommodation that are appropriate to their location, including the resort area and town centres;

   B. supports the provision of a wide range of attractions within the town centres of Grimsby and Cleethorpes;

   C. contributes towards the development of a year round all weather visitor economy;

   D. enhances the provision of support facilities for visitors e.g. car parking including ev parking, high quality accommodation, and signage;

   E. promotes rural 'green tourism' facilities and supports rural diversification where appropriate;

   F. safeguards and promotes local distinctiveness and cultural diversity;

   G. maintains the high water quality and attraction of Cleethorpes beach;

H. maintains the integrity of the designated Humber Estuary Natura 2000 sites and features of interest associated with the Humber Estuary SSSI. Securing appropriate, effective and timely mitigation when necessary; including a commitment to further development of the *Cleethorpes Habitat Management Plan* to manage increasing recreational pressures and access to sensitive areas. Any mitigation or management measures will be implemented prior to impacts occurring;

I. protects and enhances places of historic character and appearance;

J. protects and enhances sites of biodiversity and geodiversity importance; and,

K. raises the profile of the area at a regional and national scale, contributing to place marketing promoted through DiscoverNEL.

2. When developing within the AONB particular regard should be had to the criteria above and specifically the *Lincolnshire Wolds AONB Management Plan*.

### Question 33

Tourism and visitor economy

A minor revision to the tourism and visitor economy policy is proposed to clarify support for further visitor accommodation.

Do you have any comments?

| Draft Strategic Policy 16 Tourism and visitor economyr economy relationship to: | Links to: |
|---|---|
| National Planning Policy Framework | Paragraphs 81, 82, 83, 84, and 97 |
| Local Plan Strategic Objectives | SO3 and SO5 |
| Evidence base and other key documents and strategies | • *STEAM Final Trends Report (*2011-2022)<br>• *Lincolnshire Wolds Area of Outstanding Natural Beauty Management Plan*(2018-2023)<br>• Cleethorpes Habitat Management Plan (2023) Draft<br>• Cleethorpes Masterplan (2022) |

**Table 9.4 Policy relationships**

# Section 10 Housing

**10.0.1** Strategic Objective SO4 Housing of the Plan seeks to ensure that new housing meets the needs and aspirations of the Borough's communities. The Council recognises that everyone should be given the opportunity to access a decent home, one which they can afford and is in a community where they want to live. The Plan is designed to contribute to achieving these objectives by planning for a sufficient quantity, quality and type of housing in the right locations, taking account of need and demand and seeking to improve choice.

**10.0.2** This section of the Plan identifies site options from which the Council will need to allocate sites to accommodate the new homes needed in the Borough. When commenting on the site options you are encouraged to consider how land can be used efficiently by utilising previously developed land, how development would meet the needs and aspirations of all communities and how the infrastructure, employment and service needs of those communities would be met.

## 10.1 Housing allocations

**10.1.1** This section looks at how the level of new housing required (to be set out in 5.2 Growth and distribution) will be met in North East Lincolnshire over the plan period and beyond. The Council is minded to support setting the requirement at 415 dwellings per annum, as defined by the Experian baseline December 2022 economic scenario. This supports a very modest level of job growth of 130 jobs per annum.

**10.1.2** The Council is however, pursuing a strategy based on supporting and enabling economic growth backed by the council's economic strategy (2021), the South Humber Industrial Investment Programme (SHIIP) and further Investment and regeneration programmes linked to the designation of the Freeport and the Grimsby Town Deal.

**10.1.3** The Council has stated it is minded to support the allocation of sufficient land for employment uses to facilitate delivery of a higher level of jobs growth as set out in the Experian Policy On Scenario. It is therefore considered appropriate to make provision for housing to allow flexibility to match the projections of higher jobs growth if this materialises to ensure that this does not act as a constraint on future growth.

**10.1.4** The NPPF sets out at paragraph 68

**10.1.5** *"Strategic policy-making authorities should have a clear understanding of the land available in their area through the preparation of a strategic housing land availability assessment. From this, planning policies should identify a sufficient supply and mix of sites, taking into account their availability, suitability and likely economic viability. Planning policies should identify a supply of:*

a. *specific, deliverable sites for years one to five of the plan period (With an appropriate buffer, as set out in paragraph 74); and*

b. *specific, developable sites or broad locations for growth, for years 6-10 and, where possible, for years 11-15 of the plan."*

**10.1.6** Some development in the Borough is already committed and will continue to come forward from sites which have planning permission and which are under construction (as shown in Table 10.1 Sites under construction). these sites in total will provide 3,390 future homes.

| Site reference | Settlement | Site location | Estimated units remaining (1 April 2023) |
|---|---|---|---|
| HOU018 | Grimsby | Macaulay Lane | 99 |
| HOU044 | Grimsby | Former Bird's Eye, Ladysmith Road | 206 |
| HOU076 | Grimsby | Scartho Top | 840 |
| HOU128 | Grimsby | Former Western School | 400 |
| HOU144 | Grimsby | College Street | 14 |
| HOU150 | Grimsby | Land south Diane Princess of Wales Hospital | 169 |
| HOU296 | Grimsby | Shaw Drive/Glebe Road | 113 |
| HOU316 | Grimsby | Former Leaking Boot PH | 9 |
| HOU056B | Cleethorpes | Former Thrunscoe Centre | 20 |
| HOU002 | Immingham | Land west Pilgrims Way | 111 |
| HOU301 | Immingham | Trenchard Close | 18 |
| HOU382 | Immingham | Former Resource Centre, Margaret Street | 1 |
| HOU111 | Waltham | Land r/o Sandon House | 199 |
| HOU112 | Waltham | Land NW of Golf Course lane | 62 |
| HOU288 | Waltham | Land east of Grimsby Road | 45 |
| HOU292 | Waltham (Barnoldby le Beck) | Land west of Bradley Road | 49 |
| HOU356 | Waltham | Land south of Ings Lane | 2 |
| HOU095A | New Waltham | Land west of Greenlands | 33 |
| HOU095B | New Waltham | Land adjacent to 401 Louth Road | 7 |
| HOU105 | New Waltham | Land west of Louth Road | 366 |
| HOU146 | New Waltham | Land south of 32-66 Humberston Avenue | 64 |

| Site reference | Settlement | Site location | Estimated units remaining (1 April 2023) |
|---|---|---|---|
| HOU289 | New Waltham | 25 Enfield Avenue | 12 |
| HOU092 | Humberston | Land rear of 184 Humberston Avenue | 157 |
| HOU101B | Humberston | Humberston park Golf Club | 22 |
| HOU147 | Humberston | Land at 184 Humberston Avenue | 30 |
| HOU295 | Humberston | Land at Forest Way | 6 |
| HOU010B | Healing | Land north of Grampian Avenue and west of Larkspur Avenue | 133 |
| HOU068A | Laceby | Land at Blyth Way | 51 |
| HOU075A | Laceby | Fieldhead Road | 152 |
| | | | **3,390** |

**Table 10.1 Sites under construction**

**10.1.7** Further supply will be provided from small 'windfall' sites over the plan period. (Sites of less than ten dwellings which were not expected to come forward). These sites have historically made a significant contribution to the overall supply supplemented by the occasional large site windfall.

**10.1.8** The NPPF acknowledges that small and medium sized sites can make an important contribution to meeting the housing requirement of an area (paragraph 69). The NPPF specifically states that councils should seek to accommodate at least 10% of their housing requirement on sites no larger than one hectare. Based on the annual requirement of 415 dwellings per annum, this would equate to a small sites annual target of 42.

**10.1.9** The Council has assessed historic windfall trends (Windfall Allowance Technical Paper 2023) and found that there is a consistent source of small site windfall completions. This conservative based assessment verifies that an assumption of 65 dwellings per annum will continue to be delivered from small site windfalls. Further supply from this source could be expected to be achieved over the plan period, the Urban Area and Western and Southern Arc in particular provide significant opportunity for housing to come forward in small developments, arising mainly through the change of use and conversion of buildings which are currently in non-housing uses, and the opportunity to develop small infill sites.

**10.1.10** There is also the potential for some major windfall sites to come forward during the plan period, however, no allowance has been made for these in the Council's provision from windfall figure. Historic major windfall completions show that it is not a consistent source of supply. There are however, a number of large sites with the potential to come forward for housing development during the plan period

particular. This includes Council sites brought forward through further property and land rationalisation; potential residential development included as part of town centre mixed use development, and sites identified as town centre opportunity sites.

**10.1.11** The Council must also factor in likely demolitions which would result in a reduction in the stock of homes and which must therefore be addressed. Lincolnshire Housing Partnership have recently completed their process of property rationalisation, including significant demolitions. These demolitions have been accounted for in the assessment of future needs. The Council has looked back at historic trends, (omitted the years when Lincolnshire Housing Partnership undertook their major property rationalisation programme); to determine what would be an appropriate assumption of future losses. This has confirmed an assumption of 45 losses per year is an appropriate figure to be taken forward.

**10.1.12** Taking these factors into account this identifies that sites capable of delivering at least 6,350 homes would need to be identified if the full requirement was to be met over the full plan period. As some sites may be delayed in their implementation or hit problems in their progress it is appropriate to provide a buffer. (The NPPF requires a buffer of between 5% and 20% to be applied to the five year housing land supply assessment based on a set range of circumstances). Applying a buffer of 10% would raise the figure to 6,985.

| | |
|---|---|
| Baseline requirement 2023 to 2042 | 10,140 |
| minus windfall contribution | -1,300 |
| minus sites under construction | -3,390 |
| plus demolitions and losses | 900 |
| Requirement to be found | at least 6,350 |
| Requirement applying 10% buffer | at least 6,985 |

**Table 10.2 Overall Requirement Based on Meeting Higher Jobs Growth**

**10.1.13** Set out below are a series of plans that identify possible future housing sites, these are individually referenced and coloured to indicate their status. Red sites are those under construction (identified to provide context only). Amber indicates those sites with planning permission but which are yet to commence development on site. Many of these sites are however, currently progressing. The green sites, include sites previously allocated but yet to secure planning consent, together with new sites promoted through the 'call for sites', these are sites promoted by landowners and developers and sites previously identified as deliverable. Appendix B Housing site options provides an indication of their estimated capacity.

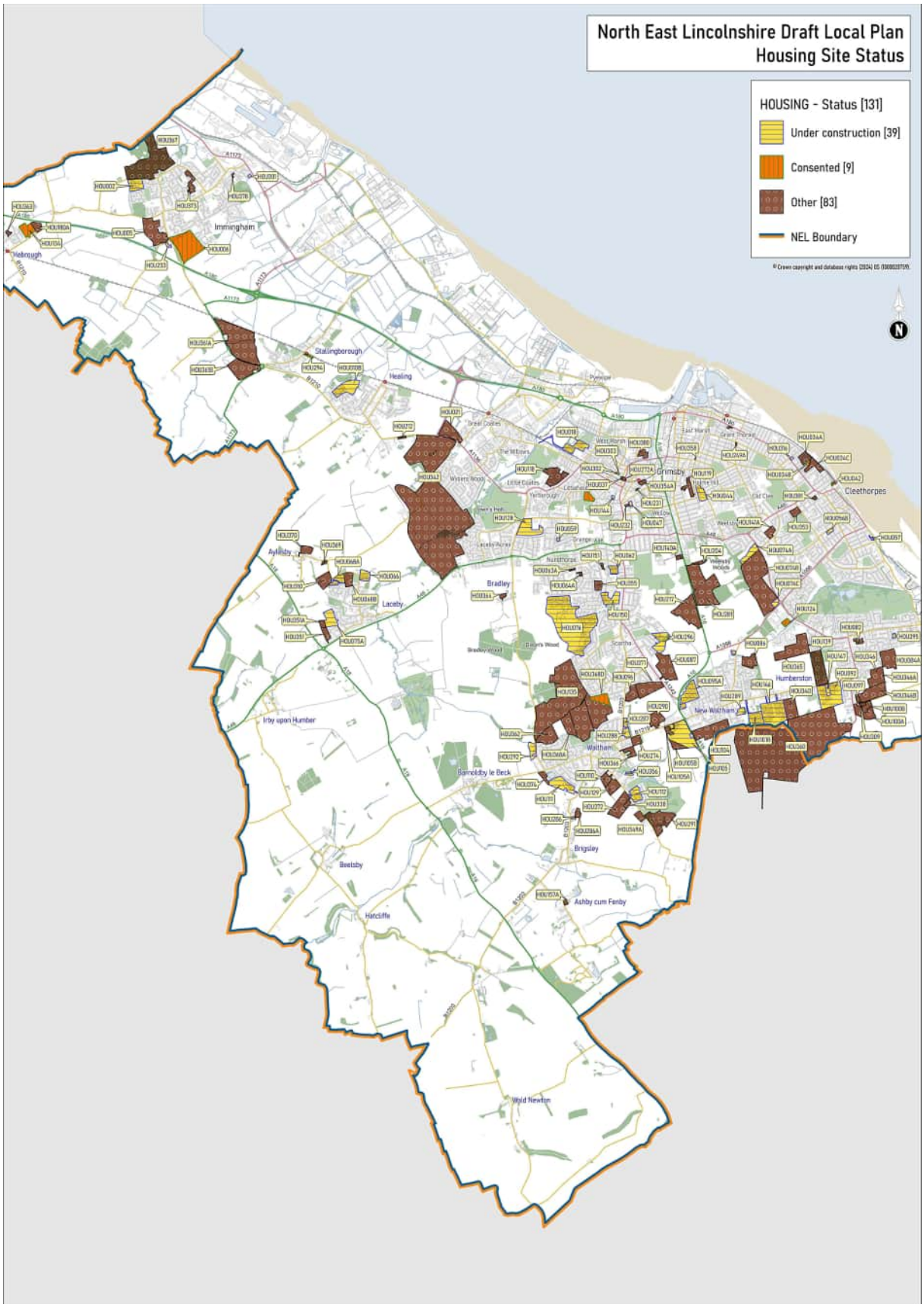


**Figure 10.1 Housing sites**

**10.1.14** You are asked to review the sites and comment on the sites presented (quoting their individual reference number) responding to the questions set out below.

### Question 34

Housing allocations

Are there any site(s) which you consider should definitely be identified for future housing, or other broad areas that should be considered for future growth?

If yes, please identify the site(s)/broad areas, and explain why.

### Question 35

Housing allocations

Are there any site(s) which you consider should definitely NOT be identified for future housing?

If yes, please identify the site(s) and explain why.

## 10.2 Strategic sites

**10.2.1** The Local Plan has previously identified large housing sites for housing development, because of their scale these sites are defined as 'strategic housing sites. It is recognises that planning and development of these sites is complex, often contentious and can take a long time to progress. The NPPF recognises that; "planning for a large number of new homes can often be best achieved through planning for large scale development ... provided they are well located and designed , and supported by the necessary infrastructure and facilities." (NPPF paragraph 73).

**10.2.2** The NPPF recognises that delivery of large scale developments may need to extend beyond an individual plan period, specifically set within a vision that looks ahead at least 30 years. The Council recognises that development of the Borough will continue in the future, beyond the current Local Plan, and considers that development of strategic sites has a key part to play if the independence of settlements is to be maintained and the systematic erosion of the green space between settlements is to be addressed.

**10.2.3** Strategic sites when carefully planned can deliver the homes to meet the needs of different community groups together with the open space, recreational facilities, schools and supporting facilities as part of a sustainable community. This is in contrast to a patchwork of small housing sites, where provision often relies on existing infrastructure to expand to meet new demands.

**10.2.4** There are two strategic sites which are identified in the housing allocation options. The Council has identified that it is minded to support progress of these strategic sites to meet future housing requirements in a sustainable way.

**10.2.5** **Only if these site options are progressed the following policy would set the framework for development of these sites, but may need to be expanded to include specific provision of infrastructure linked to the site(s) which are progressed.**

### Draft Strategic Policy 17

Development of strategic housing sites

1. Development of all strategic sites must be planned and implemented in a coordinated way linked to the timely delivery of key infrastructure. Development will be expected to:

   A. create balanced sustainable communities through provision of a range of housing types, sizes and tenures, including general market, affordable housing and housing for the young and elderly;

   B. ensure that local infrastructure requirements for the new community are met through provision of facilities and services (schools, community facilities, local centres, play and playing pitch provision, and healthcare) in a planned and phased manner;

   C. create high standards of design that create a specific sense of place which relates well to adjoining areas, recognising and safeguarding important views and connections, and important ecological sites;

   D. create safe and welcoming places which promote a strong sense of community;

   E. deliver development within a framework of green infrastructure, that maximises linkage to the wider green infrastructure network, promotes healthy lifestyles, ensures rights of way are protected and enhanced, enhances the ecological value of the site through the implementation of measures to secure at least 10% biodiversity net gain, and softens development edges;

   F. maximise accessibility to sustainable travel choices, promoting walking, cycling and public transport; and address necessary improvements to the highway network, both on and off-site;

   G. deliver foul and surface water drainage infrastructure in a way that ties into green infrastructure provision, promotes a strong sense of place, and is co-ordinated with the phasing of the overall site;

   H. minimise environmental impact safeguarding and enhancing biodiversity value, incorporating identified Local Wildlife Sites (LWS) and Sites of Nature Conservation Interest (SNCI);

I. take account of approved design guides, or other mechanisms to ensure high quality and locally distinctive design; and,

J. explore through consultation with the community, and deliver arrangements for long-term stewardship relating to drainage infrastructure, green infrastructure, open space and social infrastructure.

2. The following provision must be made in the development of the strategic sites; and delivery will be secured through planning conditions and appropriate contributions:

3. A. prepare a masterplan for the whole site which will provide the framework for future development of the site to ensure the site is developed in a comprehensive and coordinated, manner. The Masterplan is to be agreed with the Council prior to the determination of any planning applications on the site and will form a material consideration, and the basis for determining subsequent planning applications;

B. phased development in accordance with a phasing and implementation plan included in the Masterplan, including details to secure, and phasing of delivery of:

i. education facilities,

ii. open space, play and recreation provision, specifically the provision of equipped play; areas, allotments, provision and sports fields including changing and parking facilities;

iii. green infrastructure, including delivery of biodiversity net gain;

iv. social infrastructure;

v. affordable housing;

vi. self build/custom build homes;

vii. extra care and retirement homes;

viii. drainage and surface water infrastructure;

ix. legible and permeable, public transport, cycle and pedestrian connections throughout the development; and,

x. renewable energy and digital infrastructure.

C. develop a design guide, and deliver high quality design in accordance with the approved guide;

D. undertake a heritage impact assessment to inform the Masterplan. The heritage impact assessment will identify heritage assets including, assess their significance, and assess the impact of the development on their significance. Appropriate measure for mitigation and adding value should be identified and set out in the assessment. The heritage assessment must form the basis for

approaches to the layout and design of development across the site. Planning applications for the site should accord with the heritage impact assessment; and,

E. complete, a renewable energy and digital strategy, to explore the opportunities for site-wide renewable energy generation and distribution, and digital infrastructure provision and innovation, including innovation in design and build. Where the strategy demonstrates that opportunities are technically feasible and financially viable these should be delivered as part of the development.

### Question 36

Strategic sites

Do you have any comments about the wording of the strategic sites policy?

| Draft Strategic Policy 17 Development of strategic housing sites relationship to: | Links to: |
|---|---|
| National Planning Policy Framework | Paragraph 68-73 |
| Local Plan Strategic Objectives | SO1, SO4, SO7 and SO9 |
| Evidence base and other key documents and strategies | • *Strategic Housing and Economic Land Availability Assessment* (2023) (in preparation) |

**Table 10.3 Policy relationships**

## 10.3 Affordable housing

**10.3.1** Affordable housing is provided for people whose needs are not met by the market housing.

**10.3.2** National Planning Policy lists the definitions which define affordable housing, this includes affordable housing for rent, starter homes, discounted market sales housing and other affordable routes to home ownership provided to those who could not achieve home ownership through the market (NPPF Annex 2).

**10.3.3** Affordable housing can also be provided through the acquisition of existing property, for example, the purchase of private stock and re-provision as affordable housing, or empty properties brought back into use and provided as affordable housing.

**10.3.4** The provision of affordable housing helps to ensure that there is an adequate supply of good quality housing for households who cannot access the market housing. It also assists in the creation of sustainable communities, ensures that communities are mixed, and supports economic growth by providing housing to support additional demand generated by the anticipated increase in employment opportunities.

**10.3.5** The *Housing and Economic Development Needs Assessment* (HEDNA) (2023) identifies the level of affordable housing need, assessing the level of current need and estimating the level of future need. The assessment estimates the net level of current housing need at 560 households and the estimate of future housing need at between 620 and 744 based on 25% and 31% income assumptions. When current supply is taken into account based on committed known supply and assumed future supply based on five year average delivery from 2016/17 to 2020/21 this generates a level of net annual affordable housing need of between 177 and 302.

**10.3.6** When this is considered across each of the spatial zones, there is currently a higher concentration of need identified in the urban area, reflecting the existing communities and availability of housing currently in the area.

**10.3.7** The analysis in the HEDNA has shown that affordable rents are more affordable that intermediate homes in North East Lincolnshire and there is a significantly greater need for social/affordable rented properties than shared ownership. The future provision is however, heavily influenced by the Government's policy parameters and guidelines that seek to promote delivery of affordable home ownership.

**10.3.8** First Homes remains the Government's preferred discounted market tenure and should account for at least 25% of all affordable housing units delivered by developers through planning obligations. If this is taken as a given and in effect ring-fenced from the rest of the requirements, then the remaining 75% of affordable housing requirements needs to re-distributed between affordable rent and intermediate housing. If the residual is split 80:20 (affordable rent : intermediate), then this would broadly equate to an overall split of affordable housing need as c.60% social/affordable rent; 25% First Homes; and the remaining 15% intermediate housing. This results in the indicative policy split set out in the table below (Based on the proportion of household income spent on rent at 25% and 31%).

| Tenure | Measure | Housing need (net) 25% on rent or 4 times salary (Single Earner Income multiplier) | Housing need (net) 31% on rent or 4.5 times salary (Dual Income multiplier)0 | Split of housing need (rounded) | Indicative policy split (%) |
|---|---|---|---|---|---|
| Affordable Homes to Rent | Social rent/ Affordable rent | 302 | 177 | 80% | **60%** |
| Affordable Homes to Purchase | First homes/ Intermediate including shared ownership | -4 | 44 | 20% | **40%** |
| All | - | 298 | 221 | 100% | **100%** |

| Tenure | Measure | Housing need (net) 25% on rent or 4 times salary (Single Earner Income multiplier) | Housing need (net) 31% on rent or 4.5 times salary (Dual Income multiplier)0 | Split of housing need (rounded) | Indicative policy split (%) |
|---|---|---|---|---|---|
| | | | | | |

**Table 10.4 Social/Affordable Rent and Intermediate Split**

**10.3.9 The Policy wording has been revised to include detail on the affordable housing split, addressing the policy parameters and guidelines set by Government.**

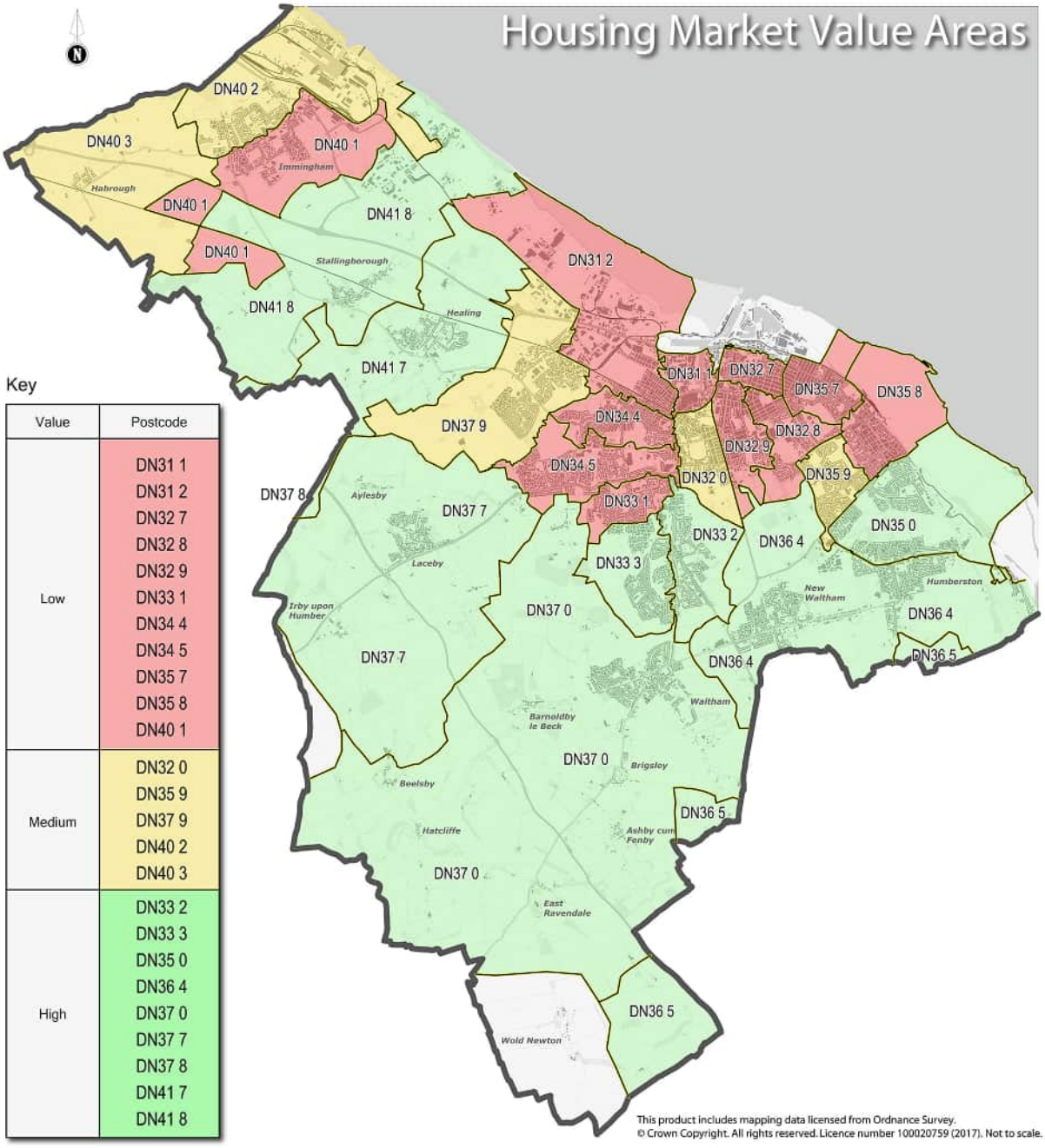


**Figure 10.2 Housing market areas**

**10.3.10** Draft Strategic Policy 18 Affordable housing recognises that viability will ultimately determine the thresholds and scale of contribution sought. However, the scale of affordable housing need is significant. When combined with the pressure on other funding sources this means that the challenge of delivering affordable housing through the planning process is heightened, It is important that flexibility is maintained with the Policy to ensure that the contribution supports future growth.

**10.3.11** The development threshold has been set at a level which complies with the NPPF; affordable housing will not be sought from developments of ten units or less and which have a combined gross floorspace of no more than 1,000m$^2$.

**10.3.12** Applying a threshold of five units would bring more developments within the scope of the Policy however, it is apparent that many of those developments fell in central urban areas where there is a need to improve the existing housing mix and quality of stock. To introduce such a requirement could potentially damage or prevent the likelihood of small scale developments occurring in regeneration areas, or areas where small scale development would assist in broadening the housing tenure mix or the refurbishing of existing properties. The Council has therefore not revised the threshold to five units.

**10.3.13** The Council will not normally apply a less than ten unit threshold. However, where density has been reduced to specifically avoid payment of a contribution, and the proposed development is not representative of the area's character and context, the Council will consider carefully whether the development represents an efficient use of land.

**10.3.14** It is recognised that there is significant variation in viability across the Borough. This is not matched to the locations of greatest affordable need identified in the HEDNA. Draft Strategic Policy 18 Affordable housing, therefore allows for some flexibility when considering whether on-site or off-site contributions are to be provided. In taking forward this approach the Council will have to reconcile the desire to create balanced and sustainable communities with the desire to address affordable housing needs/demands across the Borough. In exceptional circumstances off-site contributions will be considered where, for example, a site would not be sustainable for low income households because of limited access to public transport and services (except where a specific local need has been identified). The variation in viability is illustrated in Figure 10.2 Housing market areas. This identifies the housing market zones (referred to in Draft Strategic Policy 18 Affordable housing) that provide the basis for the variations in affordable housing requirement across the Borough. Reference is also made in 10.1 Housing allocations to the affordable housing value area that is applicable to each allocated housing site.

**10.3.15 The Council will be completing a viability assessment prior to the next stage of Local Plan to ensure the collective contributions do not restrict development from being progressed. The policy thresholds and requirements may therefore be subject to future adjustment.**

**10.3.16** Support for the delivery of new affordable homes has been made by working with Registered Providers (RPs), Council top-up of section 106 contributions, utilisation of Council assets; and directly through the planning process. Delivery through the planning process has ideally been through on-site provision, but where this has not been appropriate, off-site provision of homes or commuted financial payments have been secured.

**10.3.17** The NPPF advises that councils should consider adjusting their housing requirement figures upward where this can help to deliver additional affordable housing. Given that a significant upward adjustment is already being considered to the overall housing requirement to reflect market signals and incorporate jobs growth, it is considered that any further upward adjustment would not be grounded in realism, and would therefore be inappropriate.

## Draft Strategic Policy 18

Affordable housing

1. The Council will seek, in part, to address the scale of affordable housing need identified in the Housing and Economic Development Needs Assessment(2023), by increasing the provision of affordable homes through the planning system.
2. The Council will require contributions to be made in accordance with the following qualifying thresholds and requirements, [1]:

| Housing market zone | Percentage of housing units required to be affordable on greenfield sites | Percentage of housing units required to be affordable on brownfield sites | Housing unit threshold |
|---|---|---|---|
| High | 20 | 15 | Greater than ten units or which have a combined gross floorspace of more than 1,000m$^2$ |
| Medium | 10 | 10 | Greater than ten units or which have a combined gross floorspace of more than 1,000m$^2$ |
| Low | 0 | 0 | Greater than ten units or which have a combined gross floorspace of more than 1,000m$^2$ |

**Table 10.5 Qualifying threshold and requirements for affordable housing**

3. The split will be delivered in accordance with the following affordable housing split, having regard to up to date evidence of local housing need and discussions with registered affordable housing providers.

| Affordable Homes Tenure | Tenure Types Included | Split |
|---|---|---|
| Affordable Homes to Rent | social rent / affordable rent | 60% |
| Affordable Homes to Purchase | first homes / intermediate housing including shared ownership | 40% |

**Table 10.6 Affordable housing split**

**A. the viability of site development:**

1 The threshold and scale of contribution will be subject to possible adjustment pending consideration of viability at a later stage

i. in circumstances where specific site viability is raised, the developer will be required to provide a Financial Viability Statement in accordance with Draft Strategic Policy 4 Infrastructure.

**B. the extent of housing need in the settlement:**

i. the Council will consider the size of property in relation to the requirements of Policy ...Housing mix and specific local identified affordable housing needs.

**C. off-site contributions:**

i. where the Council considers that an off-site contribution (in total or in part) is justified, where supported by up-to-date contribution shall be of equivalent value and will be accepted in lieu of on-site provision.

### Question 37

Affordable housing

Revisions to the affordable housing policy are proposed to include detail on the split of affordable provision to be provided.

Do you have any comments?

### Question 38

Affordable housing

Do you consider any revision to the housing market area designations should be made?

If so please explain why.

| Draft Strategic Policy 18 Affordable housing relationship to: | Links to: |
|---|---|
| National Planning Policy Framework | Paragraphs 62-65, and Annex 2 |
| Local Plan Strategic Objectives | SO4 and SO5 |
| Evidence base and other key documents or strategies | • *Housing and Economic Development Needs Assessment* (2023)<br>• *North East Lincolnshire Viability Assessment* (to be completed) |

**Table 10.7 Policy relationships**

## 10.4 Rural housing

**10.4.1** Rural housing sites can provide particular benefits, including supporting the provision of affordable housing which allows people to remain in their village or near family, or allowing people to take-up rural employment. Specific rural exception sites are defined in the NPPF (Annex 2) as:

**10.4.2** *"*A site that provides entry-level homes suitable for first time buyers (or equivalent, for those looking to rent), in line with paragraph 72 of the Framework..*"*

**10.4.3** The rural area has comparatively higher average house prices than the sub-urban and urban areas of North East Lincolnshire. It may therefore be harder for families to stay together due to an inability to afford a house nearby. Retaining people in villages, who may not normally be able to afford to purchase existing homes, can help maintain the demand for services in village communities and keep them running.

**10.4.4** There is an identified annual affordable housing need for between 25 and 30 net additional affordable homes to be provided across the rural area, equating to 125 to150 over the next five years *Housing and Economic Development Needs Assessment* (2023)). It is unlikely that this need would be met by the normal housing market.

**10.4.5** The NPPF (paragraph 78) specifically states that local authorities should consider whether allowing some market housing would facilitate the provision of significant additional affordable housing in rural areas to meet local needs, for example, where essential to enable the delivery of affordable units without grant funding.

**10.4.6** It is recognised that availability of homes in rural areas often restricts people's access to an affordable home. This is a position which is compounded by the restrictions on future growth in the rural area, which, when combined with the fact that smaller properties are often extended, reduces the supply of smaller properties. Without provision to address this through an exceptions approach it is unlikely that the element of affordable rural need would be met.

**10.4.7** The Plan does not identify specific sites, as decisions will be based on evidence of local need, which may change over the plan period. This will also allow for developments to be brought forward by local communities through the neighbourhood planning process or separately through an application process where supported by local evidence. Housing schemes promoted under Draft Policy 7 Rural exceptions must be genuinely designed to meet a specific need. Secure arrangements must also be in place to ensure that the scheme remains affordable both initially and in respect of successive occupiers. The precise arrangements may vary but it will be important to have the involvement of a Registered Provider of housing trust that can retain a long-term interest.

### Draft Policy 7

Rural exceptions

1. Exceptionally, over and above the housing supply set out in this Plan, provision for an appropriate scale and mix of affordable housing in the rural area will be permitted where the following criteria are met:

   A. there is up-to-date local survey evidence of identified need for the housing proposed;

   B. the development is within or adjacent to an existing development boundary as identified on the Policies Map;

   C. the development is of a scale and is in keeping with the form and character of the settlement; and,

   D. there are secure arrangements to ensure that all the affordable homes will be occupied by local people in need of affordable homes, and that the benefits of the low cost provision will remain affordable to local people in perpetuity.

2. The Council will permit market housing to facilitate the provision of additional affordable homes only when evidence on viability supports such a stance, there is evidence that there is a need for the affordable housing proposed, and that the benefit in providing the affordable housing clearly outweighs any adverse environment impact.

### Question 39

Rural exceptions

No change to the rural exceptions policy is proposed.

Do you have any comments?

| Draft Policy 7 Rural exceptions relationship to: | Links to: |
|---|---|
| National Planning Policy Framework | Paragraph 78, Annex 2 |
| Local Plan Strategic Objectives | SO4 |
| Evidence base and other key documents and strategies | • *Joint Strategic Needs Assessment* (JSNA) (2013)<br>• *Housing and Economic Development Needs Assessment* (HEDNA) (2023) |

**Table 10.8 Policy relationships**

## 10.5 Housing mix

**10.5.1** It is vital that the right types of homes are delivered to ensure all residents of the Borough can be housed adequately, irrespective of their personal circumstances. This means ensuring that there is a suitable mix of properties in terms of affordability,

size and tenure; and providing for all needs, including for example, supported housing and other specific needs homes. It is also important if economic growth is to be sustained over the plan period that homes are provided to meet future needs.

**10.5.2** North East Lincolnshire's existing housing stock contains a significantly higher proportion of terraced properties than the national average at 33% compared to 25% nationally (Census 2011, Office for National Statistics). Consequently the proportions of semi-detached and detached properties are lower than average, and the same applies to flats and apartments. Within that overall picture, there are notable locational differences. Terraced properties are a particular feature of the urban areas of Grimsby and Cleethorpes, whereas many of the smaller villages provide a wider mix of properties and a larger concentration of detached and semi-detached properties.

**10.5.3** Most homes in the Borough are owned by their occupiers, either with a mortgage (35% of all households) or outright (31% of households). At 66% of all households, home ownership is higher than the regional and national averages at 64% and 63% respectively. The private rented sector accounts of 18% of households.

**10.5.4** The *Housing and Economic Development Needs Assessment* (HEDNA) (2023) identified that 42.8% of housing was under-occupied, whilst 16.1% was over-occupied.

**10.5.5** The Council has worked hard to bring empty homes back into use. A range of initiatives have been brought forward, which the Council has outlined in the *Empty Property Strategy 2020-2023* to sustain this momentum. In March 2022 1,348 properties in the Borough were classed as empty homes. These are not distributed evenly but clustered in urban areas displaying high levels of deprivation.

**10.5.6** Improving the quality of existing homes, and bringing empty properties back into use will promote and support wider regeneration initiatives, improve local health and well-being, and stimulate further investment.

**10.5.7** The HEDNA (2023) has assessed future housing needs, considering the breakdown of the projected change by age and type of household. It considered the current occupancy pattern by household composition, property size and tenure, and included an adjustment to reflect the post pandemic shift towards homeworking and the need for larger properties to accommodate this. In summary the HEDNA findings can be summarised as follows:

- In line with wider trends, older couple household groups are projected to see the fastest growth in North East Lincolnshire, increasing by 33% between 2022 and 2042. Older single household types are also expected to see a significant increase of 15%. Growth of households with younger single people is expected to be 8%, whist the number of families with children is expected to decline by -0.4%. Other households are expected to decline by a substantial 17% over the same period.
- Based on overall household growth and existing occupancy patterns, the assessment indicates that housing need in North East Lincolnshire is predominantly made up of two and three bed dwellings. This takes into account

that although older households are likely to make up the majority of future household growth, these often remain in their large family home, are the least active in the housing market and tend to occupy houses larger than they 'need'.

- Housing waiting list information shows that most households in need of affordable housing require one or two bed dwellings; however, the waiting list and Census data both show that overcrowding remains a problem. Within the social rented sector, there is likely to be some scope for more efficient use of the existing stock.
- The HEDNA recommends that for market housing, between 35% and 45% of housing should be for smaller one or two bed properties. For social housing, between 55% and 75% of the social housing provision should be for smaller one and two bed properties, with the majority of the remainder being for three and four bed properties.

| Suggested range | 1 bed | 2 bed | 3 bed | 4+ bed |
|---|---|---|---|---|
| Market housing | 5 to 10% | 30 to 35% | 50 to 55% | 5 to 10% |
| Social housing | 30 to 45% | 25 to 30% | 15 to 25% | 5 to 20% |

**Table 10.9 Estimated overall need/demand by size and suggested housing mix**

**10.5.8** It should be acknowledged that much of this assessment of future need is based on the historical relationship between demographics and housing supply using existing household projections. However, if a higher level of growth is pursued than that set out in the 2014-based SNPP Rebased to 2021 Census forecasts, based on a stronger economic performance, then it would be logical to provide more of the type and sizes of homes desired by working families. This would point to an increased proportion of three and four bed properties than set out in the table above.

**10.5.9** The long term aim is to deliver a balanced housing stock, which meets the identified needs of the area, recognising that on individual development schemes viability will be a key consideration.

**10.5.10** It is important that the Local Plan provides enough homes to meet the needs and aspirations of local people and to attract new people to live in the area in order to support economic objectives. The quality and range of properties on offer is also a key element of capturing the benefits of economic growth as the choice of suitable homes can influence investment decisions.

**10.5.11** In addition to ensuring that sufficient housing is delivered overall, the Plan must ensure that the housing needs of different households are met by, providing the right types and mix of housing. Providing the right types of homes is key to ensuring that development does not compound existing housing problems, such as affordability and provides for both current and future residents' needs. It is expected that the mix of housing will vary site-by-site and will be informed by local evidence at the time.

**10.5.12** The Council does not wish to be prescriptive regarding the specific mix of properties to be built on sites as this is likely to be influenced by many factors, which may include viability. The Council will assess the range of housing proposed based on

the local context, considering the mix of existing properties, demand for market and affordable housing, affordability and supply within the immediate vicinity . This may include reference to the HEDNA supplemented by local planning and housing data.

**10.5.13 The Council proposes to merge the policies relating to housing mix and provision for elderly person's housing needs and housing density to form a single comprehensive policy.**

## Draft Policy 8

Housing mix

1. In developing allocated and windfall housing sites, developers will be required to adopt an approach that will establish sustainable communities, providing a choice of homes to meet an appropriate range of housing needs. A mix of housing tenures, types and sizes should be provided, appropriate to the site size, characteristics and location.
2. Support will be given to developers seeking to improve or redevelop empty or derelict properties to provide new housing opportunities.
3. On larger strategic sites developers will be required to deliver specific provision to meet key housing needs. Where strategic sites will deliver a range of community facilities, consideration should be given to providing for specific housing needs for elderly people, including aftercare and supported homes.
4. The Council will support the provision of housing that maximises independence and choice for older people and other people with specific needs. When assessing the suitability of sites and/or proposals for the development of residential care homes, extra care housing and continuing care retirement communities, the Council will have regard to the following:

    A. the local need for the accommodation proposed;
    B. the ability of future residents to access essential services, including public transport and shops;
    C. whether the proposal would result in an undue concentration of such provision in the area; and,
    D. impact upon the local environment and the character of the area.

5. All new specialist homes designed for older people shall be built to current Lifetime Homes Standards, (or subsequent replacements), as a minimum.
6. In addition to the provision of specialist accommodation, the Council aims to ensure that older people are able to secure and sustain ongoing independence either in their own homes or with the support of family members. To enable this, the Council will:

A. encourage the incorporation of features within all new residential development to enable new housing to be adaptable to meet household needs over time; and,

B. support evidence based proposals for self-contained annexes and extensions to existing dwellings in order to accommodate, for example, an elderly or disabled dependent.

7. The Council will address development density on a site by site basis, utilising the information available through the site appraisal, design and access statement and any related designed guidance. Sites should be developed efficiently but respect local character and context.
8. Proposals for a self-contained annex should accommodate the functional need of the occupant(s), be proportionate in scale and remain ancillary to the main dwelling throughout the lifetime of its occupancy.
9. Where appropriate, the Council will consider the use of planning conditions to restrict occupancy and subsequent sale.

### Question 40

Housing mix

Revisions to the housing mix policy are proposed merge the policies relating to housing mix and provision for elderly person's housing needs and housing density to form a single comprehensive policy.

Do you have any comments?

| Draft Policy 8 Housing mix relationship to: | Links to: |
|---|---|
| National Planning Policy Framework | Paragraph 60-62 |
| Local Plan Strategic Objectives | SO1 and SO4 |
| Evidence base and other key documents and strategies | • *Joint Strategic Needs Assessment* (JSNA) (2021)<br>• *Housing and Economic Development Needs Assessment* (HEDNA) (2023) |

**Table 10.10 Policy relationships**

## 10.6 Self build

**10.6.1** Self-build and custom build both provide routes to home ownership for individuals and groups who want to play a greater role in developing their own homes.

**10.6.2** The definition of self-build refers to projects where someone directly organises the design and construction of their new home. This covers quite a wide range of projects. The most obvious example is a traditional 'DIY self-build' home, where the self-builder selects the design they want and then does much of the actual construction work themselves. But self-build also includes projects where the self-builder arranges for an architect/contractor to build their home for them; and those projects that are delivered by kit home companies (where the self-builder still has to find the plot, arrange for the slab to be installed and then has to organise the kit home company to build the property for them). Many community-led projects are defined as self-builds too.

**10.6.3** Custom build refers to developer built one-off homes or developer-led group projects where the developer organises a group and builds the homes, often leaving the self-builders to complete final finishing details.

**10.6.4** The *Self-build and Custom Housebuilding Act* (March 2015), requires councils to establish a register of individuals and community groups who have expressed an interest in acquiring land to bring forward self-build and custom build projects. The Council undertook an process in 2023 to reaffirm the numbers on the register. The North East Lincolnshire Register shows that at the end of October 2022 46 individuals and 5 groups had registered their interest in building a self build home.

**10.6.5** The Act states that regard to the register must be made in relation to the following functions:

1. planning;
2. housing;
3. the disposal of any land by the authority; and,
4. regeneration.

**10.6.6** When submitting a planning application, applicants are now asked whether the proposed home(s) would be developed as a self build home. This provides a mechanism for self builders to identify future development sites.

**10.6.7** Draft Policy 9 Self-build and custom build homes makes specific provision for self-build and custom build homes as an element of the strategic sites allocated in the Plan. This will provide specific opportunities in addition to windfall sites that will come forward over the plan period through the release of surplus council assets and other windfall opportunities.

### Draft Policy 9

Self-build and custom build homes

1. The Council will support the development of self-build and custom build homes to help in meeting overall housing need. In addition to 'windfall' development opportunities, landowners promoting the development of "strategic sites", in combination with development partners will be expected to make provision for 1%

of homes to be delivered on site by self builders, or through a custom build option. Plots should be made available and offered at competitive rates, to be agreed with the Council. These rates should be fairly related to the particular site and plot costs.

2. Where there is evidence that developable plots have been marketed at competitive rates for a period of more than 24 months without interest from self-build or custom builders, those plots may revert to delivery through conventional means.

### Question 41

Self-build

A minor revision to the self-build and custom build policy is proposed to reflect the status and identification of strategic sites has yet to be confirmed.

Do you have any comments about the currently proposed wording?

| Draft Policy 9 Self-build and custom build homes relationship to: | Links to: |
|---|---|
| National Planning Policy Framework | Paragraph 62, Annex 2 |
| Local Plan Strategic Objectives | SO4 |
| Evidence base and other key documents and strategies | North East Lincolnshire Register of Self-Build interest<br>*Housing and Economic Needs Assessment* (2023) |

**Table 10.11 Policy relationships**

## 10.7 Gypsies and Travellers

**10.7.1** *Planning Policy for Traveller Sites* (2015) sets out the Government's approach to planning for travelling communities. This seeks to align planning for travelling communities more closely with planning for other forms of housing provision. This includes the requirement for councils to demonstrate a five year supply of pitches against locally assessed targets.

**10.7.2** The *North East Lincolnshire Gypsy and Traveller Accommodation Assessment* (Accommodation Assessment) (2021) provides an objective assessment of future pitch requirements for gypsy and travellers including travelling showpeople. The assessment accords with the latest national policy assessing current unmet needs and needs likely to arise in the future. This is based upon a combination of on-site surveys, planning records, interviews and an assessment of site preferences.

**10.7.3** The assessment concluded that:

- There is a need for no pitches for households that met the planning definition. This is because there are currently four vacant pitches at the Mill House site at Habrough to meet any current and future need from family members who are currently travelling or living locally in bricks and mortar.
- There are also two vacant pitches on the Rear of Mill House site. These are currently being used as private transit pitches for family members and will be used to meet need from older children currently living on other pitches on the site when they need them.
- There is a need for no pitches for undetermined households as interviews were completed with all Gypsies and Travellers living on sites in North East Lincolnshire.
- Whilst not now a requirement to include in a GTAA, there is a need for no pitches for households that did not meet the planning definition. Both households are currently living in bricks and mortar and are happy to stay where they are.
-

**10.7.4** In addition to permanent provision, the Accommodation Assessment considered additional requirements generated by unauthorised developments and migration patterns. The assessment identified that due to low historic low numbers of unauthorised encampments, and the existence of private transit pitches, it was not recommended that there is a need for a formal public transit site in the Borough at this time. The Council will need to monitor the position in future years and act accordingly.

**10.7.5** The Council received the GTAA at Cabinet in June 2021 and agreed to explore a managed approach, using 'negotiated stopping agreements' (NSAs) whereby caravans can be directed to a suitable piece of ground for an agreed and limited period of time, with the provision of limited services such as water, waste disposal and toilets. This approach was subsequently adopted by the Council at Cabinet on 20 July 2022. **The policy has been therefore been revised to reflect the Council's adoption of this revised managed approach.**

### Draft Policy 10

Provision for gypsies and travellers

1. In determining proposals for new sites to accommodate gypsies, travellers and travelling showpeople, consideration will be given to whether:

   A. there is a proven identified need for the scale and nature of the development proposed which supports the development of, or extension to an existing gypsy, traveller or showpeople site;

   B. the development is sensitive to the character and appearance of the landscape and the amenity of neighbouring properties;

   C. the site has safe and satisfactory vehicular and pedestrian access;

   D. there are no significant constraints to development in terms of flood risk, poor drainage, land contamination, or environmental impacts;

E. the site is suitable with regard to accessing local services and amenities; and,

F. the site can be properly serviced and supplied with essential infrastructure, including water, power, sewerage, drainage and waste disposal.

2. The Council will operate a managed approach to unauthorised encampments using 'negotiated stopping agreements' (NSAs) whereby caravans can be directed to a suitable piece of ground for an agreed and limited period of time, with the provision of limited services such as water, waste disposal and toilets.

## Question 42

Provision for gypsies and travellers

The Council has adopted a revised approach to unauthorised encampments which is reflected in revisions to the policy.

Do you have any comments?

| Draft Policy 10 Provision for gypsies and travellers relationship to: | Links to: |
|---|---|
| National Planning Policy Framework | *Planning Policy for Traveller Sites* (2015) |
| Local Plan Strategic Objectives | SO4 |
| Evidence base and other key documents and strategies | • *North East Lincolnshire Gypsy and Traveller Accommodation Assessment* (2021) |

**Table 10.12 Policy relationships**

# Section 11 Town centres, social and cultural places

**11.0.1** Great places are successful places. They encourage people to connect with one another and it is this interaction that builds stronger, healthier communities. The policies in this section complement the strategic framework set out in earlier parts of the Local Plan. The policies in this section relate to those places which are the focus for social, cultural and community activities.

## 11.1 Town, district and local centres

**11.1.1** North East Lincolnshire has a mix of different retail centres which provide different functions offering a varied mix of services and amenities. The three town centres within the Borough; Grimsby, Cleethorpes and Immingham, all have unique characteristics that define them.

**11.1.2** Grimsby is the highest order centre in the Borough and is the sub-regional centre. It benefits from limited competition and high expenditure retention rates. It provides the main comparison shopping offer for residents of the Borough offering a range of multiple retailers and a limited range of business, leisure, civic and cultural activities.

**11.1.3** Cleethorpes is a main town centre offering a dual role in meeting the day-to-day convenience needs of its local residents, as well as providing a niche and independent offer that is attractive to the resort's visitors.

**11.1.4** In contrast, Immingham town centre provides the main convenience provision for its residents. It faces the challenge of retaining its role as the community and service centre, whilst seeking to broaden its offer, capitalising upon its proximity to the employment growth proposed along the South Humber Bank.

**11.1.5** Freeman Street was once a vibrant area benefiting from its association with the docks. Over time, its retail status has changed significantly as key nationally renown operators have moved out as a result of changes in the nature of the dock activities, and also the increasing attractiveness and status of 'Top Town' (Grimsby town centre).

**11.1.6** Freeman Street has now established a new identity albeit on a smaller footprint; building on strong links to the past such as the indoor market and a new range of diverse convenience outlets and specialist shops, including those with an ethnic focus.

**11.1.7** Given the area's increasingly local focus and convenience role, but more substantive scale and catchment Freeman Street was defined in the existing Local Plan as a District Centre.

**11.1.8** The Borough's main town centres are supported by a network of local centres. They provide a range of day-to-day services to local walkable catchment areas. The centres play an important and vital role in meeting the day-to-day needs of local communities, particularly in respect of top-up convenience retailing. With the emphasis on local provision increasing recently local centres have been contributing substantially towards the sustainability of local communities.

**11.1.9** A *refresh of the Local Centres Study* was undertaken in 2023. It identifies local centres based on the following definition to provide a clear definition of a Local Centre and assessed the compatibility of centres with that definition. Specifically, having regard to the changes in policy brought about by the NPPF, the Study defined a local centre as:

*"A group of five or more shops in one or more continuous rows serving a local catchment; largely retail based including at least one supermarket or convenience store with other retail elements and local services (hairdressers, café etc), typically including a high proportion of independent small or micro businesses."* (*Local Centres Study* (2023)).

**11.1.10** The role of local centres is to provide appropriate facilities to meet the day-to-day needs of local residents based on a walking catchment area of approximately 800m. Changes need to be permitted if this role is to be sustained, but it is important that the scale of that change is appropriate to the local centre. It is considered that the use of the impact threshold will deter major redevelopment proposals which are more appropriate for town centre locations.The local centres will be identified on the Policies Maps.

**11.1.11** Town centres function as the heart of local communities providing facilities and services that are essential to peoples' needs. They also serve a valuable role as a community hub where people meet for social and leisure activities. The NPPF recognises this and advocates a strong town centre first approach to the development of town centre uses. Draft Strategic Policy 19 Retail hierarchy reflects this approach whilst acknowledging the scope of town centre uses that make up a vibrant and attractive town centre.

**11.1.12** Draft Strategic Policy 19 Retail hierarchy applies a sequential approach to safeguard the vitality of the town centres applying a 200m$^2$ threshold reflecting the scale and nature of units within the town centres. The Council will robustly apply the sequential approach, seeking to avoid compounding damage that has resulted from out-of-centre development which has drawn people and trade away from town centres, causing or contributing to their decline.

**11.1.13** Since the development of the initial Grimsby Town Centre Masterplan in 2009, Grimsby has seen considerable change, with significant public and private sector investment secured for the town centre.

**11.1.14** As a result of this investment, a tangible and positive change is being made to the town centre. Some of this can been seen in the:

1. Enhancement to the public realm and creation of a Cycle Hub at Grimsby Town railway station (2014);
2. Private investment in a Holiday Inn Express adjacent to the railway station (2015);
3. Town centre wide streetscape improvements (2016);
4. The successful development of the Cartergate office and retail development protecting 300 jobs in the town centre:
5. Repairs to the Victoria Mill silo building to safeguard its future (2017);

6. Public realm improvements in Town Hall Square (2018);
7. Acquisition of Garth Lane, a key town centre development site (2019);
8. Creation of a Heritage Action Zone and Heritage Trail (2018 to 2023);
9. Creation of the Partnership Scheme in Conservation Area (PSICA) to support redevelopment of the Kashbah (2018 to 2023);
10. Private sector conversion of a derelict Cooperage into town centre housing (2020).

**11.1.15** A new Grimsby Town Centre masterplan was prepared in 2020 which builds on these improvements and sets out a clear set of future priorities for the town centre that will further strengthen what it has to offer. It also sets out a number of key principles:

1. Introduce more diverse uses into the town centre;
2. Reconnect the town centre with the waterfront;
3. Celebrate and enhance our heritage assets;
4. Promote and support community ownership and participation;
5. Improve permeability of the town centre;
6. Identify development opportunities;
7. Prioritise health and wellbeing; and,
8. Enhance opportunities for employment, skills and enterprise.

**11.1.16** With funding primarily through the Grimsby Town Deal work is now underway to deliver a new market hall and leisure scheme, and work is progressing on further public realm works in Riverhead Square to create a new social space. In addition the scheme to deliver Grimsby's Horizon Youth Zone facility is now well under way.

**11.1.17** The Council is also now the owner of the Freshney Place centre and has seen occupancy rates rise to over 85% in 2022; and the Council has recently entered talks to develop a CDC, (Community Diagnostics Centre) within the centre which if completed would see occupancy rates rise further and further broaden the town centre offer.

**11.1.18** Momentum for change is therefore gathering pace and these achievements to date are paving the way for the next wave of investment which will help keep Grimsby on its positive trajectory for the next decade.

**11.1.19** A *Cleethorpes Masterplan* (2022) has also been completed covering the Cleethorpes Town Centre and resort frontage. The Masterplan is set within the context of Cleethorpes' ambition to develop and grow the tourism offer including increasing footfall, creating sustainable jobs, encouraging more overnight stays, and extending the traditional tourism season. It also supports the creation of a green economy and environment which maximises low carbon and healthy initiatives.

**11.1.20** On the back of the masterplan the Council has secured more than £18.4m of Levelling Up grant monies for the resort. The focus of the funding bid was Market Place, Sea Road and Pier Gardens.

**11.1.21** The key vision is to reintroduce the historic Market Square, creating a safe and flexible space that can accommodate markets, festivals and associated retail events. The funding will also support the redevelopment of the Sea Road site, and provide an opportunity to improve Pier Gardens, retaining the Victorian heritage and feel, but making it more attractive.

**11.1.22** Taking forward the visions set out in these masterplans the Local Plan identifies a number of opportunity sites within the defined town centre boundaries. These sites present the initial development opportunities within the town centres, offering potential for mixed use development that builds upon upon the committed works outlined above.

**11.1.23 The retail hierarchy and town centre policies have been significantly revised, including merging policies and addressing changes to national planning policy.**

## Draft Strategic Policy 19

Retail hierarchy

1. Proposals for development within the defined town centres, district centres and local centres, will be supported where the scale and nature of the proposed development will support and enhance the individual role of the centre in accordance with the following retail hierarchy:

**A. Sub-regional centre - Grimsby**

i. development that continues to support the centre's sub-regional role, and which extends the range and quality of facilities and services offered and broadens the town centre's appeal will be encouraged;

**B. Main town centre - Cleethorpes**

i. development that supports the viability and vitality of the town centre, and strengthens the association of the commercial core and resort area will be encouraged, with the aim of broadening the town centre's appeal;

**C. Small town centre - Immingham**

i. development that supports the role of the town centre, and which extends the range and quality of facilities and services offered reflecting its location at the heart of the employment growth proposed, will be encouraged;

**D. District centre - Freeman Street, Grimsby**

i. development that supports the consolidation and redefining of the centre as a district centre will be encouraged, particularly where this broadens the range, and quality of facilities, services and cultural activities; and,

**E. Local centres**

i. development that respects the individual local scale and character of the centre will be supported.

2. Proposals for main town centre uses, specifically retail and leisure uses comprising 200m$^2$ gross or more; ((With respect to local centres the floor space threshold to be applied is 300m2 gross floorspace) in any location outside the defined primary shopping frontages, will only be acceptable if it is demonstrated that:

   A. the development cannot be accommodated on a suitable site within first, the identified primary shopping frontages, then, within the defined town centre boundary, including identified opportunity sites, or finally close to, the town centre boundary (sequential test); and,

   B. the proposed site is accessible and well-connected to the town centre; and,

   C. development will not adversely impact upon the vitality and viability of any of the town centres, (impact test) having regard to:

      i. committed, planned or proposed public and private investment in the town centres; and,

      ii. evidence as to retail expenditure capacity which shows that the development would not adversely impact upon consumer choice and existing town centre trading levels;

      iii. within the defined local centres, small scale developments, (not exceeding 300m$^2$ gross floorspace), will be acceptable provided they are appropriate to the scale and character of the particular centre.

3. Within Grimsby Town Centre the following opportunity sites capable of delivering a range/mix of uses have been identified:

   A. Garth Lane/Alexander Dock;

   B. Cartergate;

   C. Upper Burgess Street; and,

   D. Abbey Walk.

4. Within Cleethorpes Town Centre the following opportunity sites have been identified:

5. A. Osbourne Street; and,

   B. Sea Road.

## Question 43

Retail hierarchy, town, district and local centres

Significant revisions to the retail hierarchy and town centre policy are proposed, including merging policies and providing clarity on development in local centres.

Do you have any comments about the proposed revised wording?

| Draft Strategic Policy 19 Retail hierarchy relationship to: | Links to: |
|---|---|
| National Planning Policy Framework | Paragraphs 23 to 27 |
| Local Plan Strategic Objectives | SO8 |
| Evidence base and other key documents and strategies | • *Grimsby Masterplan (2020)*<br>• *Cleethorpes Masterplan (2022)*<br>• *Local Centres Study* (2023) |

**Table 11.1 Policy relationships**

## 11.2 Town centre uses

**11.2.1** In September 2020 Government introduced changes to the Use Classes Order which brought together a range of “Commercial, Business and Service” uses under one Use Class (E). That new E Use Class is broadly compatible with the NPPF definition of Main Town Centre Uses, though not precisely. The aim of the new E Use Class is to allow units in town centres to change to other uses that are suitable in town centres without the need for planning permission.

**11.2.2** Since the Local Plan was adopted in 2018 there have been significant shifts in the role and offer of town centres and the way people use local facilities. If the town centres are to thrive the Local Plan policies need to change to recognise his changing role and encourage a broader mix of uses to support a wider customer base and broader offer. This includes a broader mix of uses including leisure and care type facilities; exploring the opportunity for increased town centre residential offer and improving the offer to a broader age group.

**11.2.3** The primary shopping frontages are defined in the NPPF Glossary as those frontages where retail development is concentrated, The NPPF requires that primary shopping areas are identified, and that the range of uses considered acceptable in such areas is also clearly defined.

**11.2.4** The primary shopping frontages apply to the most important frontages in the town centres, where the greatest pedestrian flows and concentration of town centre uses can be identified. Protection of such frontages is important in ensuring the vitality and viability of the centres, and ensuring that these frontages remain attractive. The area comprising these frontages is defined as the primary shopping area.

**11.2.5** The Council will apply a 'town centre first' approach in relation to office accommodation. This will ensure that the town centres maintain their vitality and viability and that aspirations for them to fulfil their identified role in the retail hierarchy are achieved. Proposals to develop office accommodation in and immediately around the defined town centres - whether through the conversion or refurbishment of existing buildings or through the construction of new ones - will generally be

supported by the Council. Conversely, a more restrictive approach will be applied when considering proposals for the development of office accommodation outside the town centres.

**11.2.6** This approach is advocated in the NPPF, in which it is recommended that proposals to develop office accommodation above a specified size (floorspace) threshold outside town and city centres should be permitted only if impact and sequential-location tests can be satisfied. The floorspace threshold referred to in the NPPF is 2,500m$^2$ but, in the local context, it is considered that developments below that size may have an adverse impact upon town centre vitality and viability: consequently, a lower floorspace threshold is considered appropriate for North East Lincolnshire. A 500m$^2$ threshold is considered to be appropriate to the local market conditions. Most office provision delivered in the Borough is developed as an ancillary element of larger scale B2/B8 developments, or falls below the 500m$^2$ threshold. Proposals above this threshold are expected to apply a town centre first approach.

**11.2.7** Draft Policy 11 Town centre uses recognises that there is a need for some office provision which is ancillary to B2 and B8 uses. Currently this is mostly clustered along the South Humber Bank. Draft Policy 11 Town centre uses acknowledges the nature of these uses and make suitable provision to accommodate future growth.

**11.2.8** The NPPF recognises the role that planning can play in better enabling people to live healthier lives. Locally, key indicators of health show that there is a need to improve health and that obesity is one of the key issues. Locating interacting uses, e.g. homes, workplaces and shops, so that it is easy for people to walk or cycle between them, rather than depend on use of cars as part of a solution.

**11.2.9** Childhood obesity has specifically been identified as a significant threat to child health in North East Lincolnshire with additional implications for long-term adult health. Rates of child obesity at reception year in the Borough are significantly higher than the regional and national average and improving nutrition in early years is seen as one of the most effective approaches to reducing this worrying trend.

**11.2.10** In 2008 the Government published *Healthy Weight, Healthy Lives* which encouraged councils to use planning powers to control more carefully the rising numbers of fast food takeaways. Whilst this document is now dated, the 2013 Public Health reforms were based upon returning much of the responsibility for local public health to individual councils and health and well-being boards. There remains a clear message highlighting that local planning authorities should work with public health leads and organisations to understand and take account of the health status and needs of the local population. It is appropriate, therefore to consider what steps can be taken here. A study (Catteral V., Barnes G (2016) *Health on the High Street - North East Lincolnshire*. Public Health, North East Lincolnshire Council, http://www.nelincsdata.net/strategicassessment) undertaken by the Public Health team in the Council identified that around 50% of fast food takeaways were located in the five wards with the highest levels of childhood obesity in reception year pupils. A recommendation from this study states:

*"In order to tackle the proliferation and health impact of fast food takeaways within the locality, a combination of three approaches could be taken:*

- *Regulatory and planning measures could be used; fast food exclusion zones around schools have been successfully implemented by other local authorities and it is recommended by the Academy of Medical Royal Colleges that planning decisions should be subjected to a health impact assessment. Other regulations such as restricting opening times of takeaways to prevent them targeting their food at school children can also be adopted;*
- *As planning measures will not affect existing fast food takeaways, it would also be beneficial to work with the local food industry and local takeaways to help them make their food healthier: there is the potential to expand the work carried out under the Council's Healthy Choices Award;*
- *Likewise, there is also potential to work with local schools to promote healthy lifestyles and eating habits amongst children."*

**11.2.11** A number of councils have restricted further development of hot food takeaways close to school premises by introducing a 400m 'exclusion zone'. It is considered appropriate, given the drive to improve health in the Borough, to adopt a similar approach. The approach to controlling the proliferation of takeaways is supported by the Director of Public Health in North East Lincolnshire and sits alongside other activities to improve nutrition and physical activity inside schools. The location of the hot food takeaway will be measured from the main entrance to the school building. This consideration will carry less weight where the proposed location of the hot food takeaway is within a defined town, district or local centre boundary and would not result in an unacceptable concentration in the centre.

**11.2.12** Analysis of the current distribution of hot food takeaways in relation to school sites has highlighted that the majority of hot food takeaways are located in existing town and local centres. It has also highlighted that some schools are located within 400m of town and local centres. Consequently a number of existing hot food takeaways are located within 400m of schools. There is clearly a balance to identifying suitable locations for hot food takeaways and considering the health of school children.

**11.2.13** The Council accepts that some take away uses offer healthier alternative foods; however, the importance of promoting healthier lifestyles is a key local objective. Whilst the Local Plan cannot influence the existing location of take away uses, or ultimately the choices made by individuals, it is considered important not to compound existing unsatisfactory relationships by allowing further hot food takeaways close to schools.

**11.2.14** It is acknowledged that primary school children (four to 13 years) do not leave school grounds at lunchtime however, it is the age at which healthy eating behaviours can be influenced by the actions of their parents and carers. Additional planning control in such circumstances would be of very limited value. The Policy therefore will not apply to primary schools. Secondary school children (14 to 16 years) have much more autonomy over their food choices. The most popular time for secondary school children to purchase food is after school and some secondary schools allow children to leave school premises at lunchtime. The Policy does not apply to further education establishments and specific training facilities, these facilities serve a broad age range which is typically considered to be of 'adult' status. The Policy therefore applies to secondary schools.

**11.2.15** The Policy refers to consideration being given to an 'unacceptable concentration' of take away uses. This reflects the possible detrimental impacts on the vitality and viability of the centre and potential harm to residential amenity that may result from an increasing concentration of take away uses. When applying this consideration regard will be paid to:

1. the number of existing hot food takeaways in the area and their proximity to each other. (The Council will seek to prevent more than two hot food takeaways locating adjacent to each other, with at least two units between them.);
2. the role and character of the centre and the balance of other shops and services that would remain in the centre; and,
3. the level of vacancy and general health of the centre.

## Draft Policy 11

Town centre uses

1. Within the Grimsby, Cleethorpes and Immingham town centres, the Council will encourage and support mixed use development that adds to town centre vitality and viability; extends the range of offer to a broad spectrum of the population; and promotes an extension of the daytime and evening economy. Acceptable town centre uses are considered to be:

   A. Commercial, Business and Service (Use Class E a-g);
   B. Learning and non-residential institutions (Use Class F1);
   C. Local Community Uses (Use Class F2);
   D. Drinking establishments;
   E. Hot food takeaways;
   F. Hotels (Use Class C1);
   G. Residential institutions (Use Class C2);
   H. C3 Dwelling houses (first floor and above, or with identified opportunity sites);
   I. D1 clinics, health centres, creches, day nurseries, day centres; and,
   J. D2 Assembly and Leisure.

2. Within all centres, development will be expected to:

   A. enhance the centre's attractiveness, as a place to visit, work and socialise, in line with policies relating to primary shopping frontages;
   B. contribute to a mixture of mutually compatible and complementary uses;
   C. maintain and sustain the quality of historic environment;
   D. have particular regard to the desirability of retaining and improving traditional shop fronts;
   E. ensure the installation of security grilles and shutters does not detract from the visual amenities of the street scene;

F. have regard to the need for careful design and placement of advertisements and signage consistent with appropriate design guidance, conservation area appraisals, and specific shop front guidance; and,

G. seek opportunities to add to the cultural richness of the centre.

3. Proposals for hot food takeaways need to demonstrate that account has been taken of:

A. the impact on the amenity of nearby residents; and,

B. the impact on highway safety; and,

C. the relationship with any school located within 400m of the proposed A5 use; and,

D. whether the proposal would result in an unacceptable concentration of A5 uses in the centre.

**Primary frontages**

4. Within the Primary Shopping Areas, development proposals for town centre uses as defined in the NPPF should wherever possible maintain an active frontage. Where an active frontage would not be appropriate or otherwise cannot be achieved, care should be taken to ensure that the frontage provides visual interest and would not be to the detriment of the character of the centre or to maintaining or enhancing footfall in the Primary Shopping Area. Proposals that would result in lengthy 'dead frontages' within a Primary Shopping Area will not normally be acceptable.

**Office development**

5. Provision of office accommodation will be encouraged within the defined town centres, as identified on the Policies Map.

6. Outside town centre boundaries, developments that include more than 500m$^2$ of floorspace for office use will only be permitted when:

7. A. a sequential test shows that there are no sites suitable to accommodate the proposed development within the town centre or on the edge of the town centre; and,

B. an impact test demonstrates that the proposal:

i. will not compromise existing, committed or planned investment in the town centre; and,

ii. will not have an adverse impact upon the vitality and viability of the town centre through loss of anticipated expenditure up to five years from the date of the application, or for major schemes where the full impact will not be realised in five years, the impact should also be assessed up to ten years from the time the application is made.

C. Developments that include office uses that are ancillary to a B2 or B8 operation will be permitted provided that:

D. i. the office element of the proposed scheme is a necessary part of the B2 or B8 operation; and,

ii. the floorspace provided for the office element comprises no more than 10% of the total floorspace of the B2 or B8 operation; and,

iii. where possible, the office element is physically integrated into the fabric of the building that accommodates the B2 or B8 use.

### Question 44

Town centre uses

Significant revisions to the town centre uses policy are proposed, including merging policies and addressing changes to national planning policy.

Do you have any comments about the proposed revised wording?

| Draft Policy 11 Town centre uses relationship to: | Links to: |
|---|---|
| National Planning Policy Framework | Paragraphs 23 to 27 |
| Local Plan Strategic Objectives | SO8 |
| Evidence base and other key documents and strategies | • *Grimsby Masterplan (2020)*<br>• *Cleethorpes Masterplan (2022)*<br>• *Local Centres Study* (2023) |

**Table 11.2 Policy relationships**

## 11.3 Social and cultural places

**11.3.1** Planning is about creating sustainable places and communities for the long-term. Social and cultural elements have been widely used in recent years to drive regeneration, build cohesive communities and in many cases change the way different areas are perceived. On a national scale events such as Hull's City of Culture role in 2017, mark the way major cultural projects can help to put places in the spotlight, boost economic development and regeneration and bring communities together.

**11.3.2** At a smaller scale cultural venues such as the Auditorium, Central Hall and Grimsby Minister; and events such as the annual Grimsby Jazz Festival, farmers markets and individual community events can also play a part in building local confidence, instilling a sense of pride and creating a sense of well-being. These events often rely on suitable venues and spaces being available. It is, therefore, important that the Plan acknowledges and seeks to safeguard and enhance the range and quality of these spaces and venues. Whilst the buildings and places are important it must be recognised that, they are nothing without the societies, organisations and individuals who arrange and promote the social and cultural activities. **A revision to the policy has been made to recognise the Council's support for cultural activities that help to animate the public realm.**

**11.3.3** The introduction of the *Localism Act 2011* has brought changes to social and community asset planning. Whilst empowering communities to take control of community assets it not new, *The Localism Act* ( Part 5, Chapter 3, assets of Community Value.) introduced the new 'Community Right to Bid' in relation to assets of community value. It allows communities to nominate a building or other land that they believe to be of importance for community well-being. The land and/or buildings can be in private or public ownership, and could be of cultural, recreational or sporting interest such as libraries, theatres, cinemas, pubs, or leisure facilities. When a successfully nominated asset comes up for sale, local community organisations have up to six months to exercise the right of first offer to the owner to buy it on the open market. The 'listing' of a community asset can be a material consideration in the determination of planning applications.

**11.3.4** Draft Strategic Policy 20 Social and cultural places refers specifically to social and cultural places which serve as venues for social and cultural activities, support and broaden people's social and cultural experiences, and promote a sense of community pride and mental well-being. It does not relate to aspects of social care or service delivery which are addressed under Draft Strategic Policy 4 Infrastructure.

**11.3.5** Draft Strategic Policy 20 Social and cultural places reflects the changing nature of the provision of social and cultural facilities, reflecting both the changing council role as an enabler rather than a direct provider; and the opportunities presented by the *Localism Act 2011*. The Council will support local communities who wish to take control of community assets, whether by using existing facilities or developing new facilities.

### Draft Strategic Policy 20

Social and cultural places

1. The Council will support existing assets of social and cultural value and support the development of new facilities and cultural places by:

   A. supporting developments to extend or broaden the appeal of social and cultural facilities, including proposals to co-locate facilities;

   B. supporting the development of new social and cultural facilities;

   C. developing and enhancing areas of public realm, providing safe and accessible venues for cultural activities;

   D. promoting development that provides opportunities for social interaction, including through mixed use development, and active street frontages; and,

   E. promoting elements of public art that serve to enrich the wider area in accordance with Draft Strategic Policy 13 Good design in new developments,

2. The temporary use of sites and premises for cultural activities in locations where they can animate the public realm will be supported where they are sensitive to the nature of neighbouring uses; including the provision of public art that celebrates the area's rich heritage and culture.
3. The Council will have regard to the listing of community assets under the provisions of the *Localism Act 2011* when considering planning applications.

### Question 45

Social and cultural places

Revisions to the social and cultural places policy are proposed to recognise the Council's support for cultural activities that help to animate the public realm.

Do you have any comments?

| Draft Strategic Policy 20 Social and cultural places relationship to: | Links to: |
|---|---|
| National Planning Policy Framework | Paragraphs 8,20,84 and 93 |
| Local Plan Strategic Objectives | SO5 |
| Evidence base and other key documents or strategies | • http://www.discovernel.co.uk/#/ DiscoverNEL aims to attract (and keep) the workforce in the local area to support investment and business growth. DiscoverNEL is a sister brand to InvestNEL, see http://www.investnel.co.uk/ |

**Table 11.3 Policy relationships**

# Section 12 Providing for minerals

Minerals are finite natural resources which are essential to support sustainable economic growth. However, minerals can only be worked where they are found, which can cause conflict with other land uses. The role of the planning system is to ensure a sustainable supply of minerals, including aggregates, and to secure the long-term conservation of mineral resources.

The *National Planning Policy Framework* (NPPF) (paragraphs 209 to 217) outlines the national policy context. It places a number of requirements on minerals planning authorities (MPAs), including the need to identify and include policies relating to: managing the extraction of minerals resource of local and national importance; the contribution that can be made to supply from substitute, secondary, and recycled minerals; the safeguarding of known locations of minerals resource of local and national importance; the safeguarding of minerals related infrastructure; the definition of criteria against which planning applications should be judged, including environmental criteria; and to ensure that policies are in place to reclaim land.

Additionally, MPAs are required to plan for a steady and adequate supply of aggregates, and industrial minerals. They should prepared a Local Aggregates Assessment (LAA) to consider the future need for aggregates.

**No revisions to the minerals policies as set out in the existing local plan are proposed. (Only minor changes to supporting text have been made where appropriate to refer to current evidence.)**

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**12.0.1** Minerals in North East Lincolnshire fall into the following categories:

1. **Aggregate minerals** - these are necessary to support construction activity and include sand and gravel, and crushed rock;
2. **Industrial minerals** - these are necessary to support construction, and industrial and manufacturing processes, and include a wide range of mineral resources including brick clay and silica sand; and,
3. **Energy minerals** - these are used in the generation of energy and include shallow and deep-mined coal, as well as oil and gas, including 'unconventional' hydrocarbons such as shale gas.

**12.0.2** North East Lincolnshire is underlain by white chalk, which forms the dominant bedrock geology of the area. On the surface of this chalk, there are deposits of clay, silt, sand, and gravels. The area has mineral resources including aggregates such as sand and gravel, and silica sand, and chalk.

**12.0.3** There is a clear need for aggregates such as sand and gravel, and the resource is commonly used in construction. Blown sand (silica sand) occurs in limited areas and quantities, and is therefore a scarce resource. Sand, gravel, and silica sand are considered to be of local and national importance. Chalk also occurs extensively locally. However, there is no identified demand for chalk in North East Lincolnshire.

It's use as a building stone is very limited locally, and therefore the resource identified in North East Lincolnshire is not considered to be of local or national importance.

**12.0.4** The Port of Immingham, plays a significant infrastructure role in bringing energy minerals, including coal and oil, to the UK market. In 2011, 13million tonnes of coal were imported to the UK at Immingham.(*Port of Immingham Master Plan 2010-2030* (2012)).

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## 12.1 Safeguarding minerals and related infrastructure

**12.1.1** The Plan recognises important mineral resources by safeguarding them for the benefit of future generations. This recognises that while North East Lincolnshire's minerals resource is not currently extracted, a long-term approach is required to ensure that resources are not needlessly sterilised. As resources are used elsewhere and their quantity is diminished, North East Lincolnshire's resource may become viable to extract. Recognising that incompatible development close to a Minerals Safeguarding Area may lead to sterilisation of part of the resource, it is considered appropriate to extend the areas to take account of such risks. In the case of the mineral resources in North East Lincolnshire a 200m buffer is considered to be necessary.

**12.1.2** Safeguarding minerals resource, through the designation of 'Minerals Safeguarding Areas' (MSAs), creates no presumption that the mineral will be worked. The designation of MSAs indicates that an economic mineral resource exists in the location, this can then be taken into consideration to determine whether non-mineral development overlying, or situated close to, the mineral resource should proceed.

**12.1.3** The designation of MSAs does not preclude other forms of development from being permitted, but it does ensure that the presence of an important mineral resource is taken into consideration during the decision-making process.

**12.1.4** The Port of Immingham plays a significant infrastructure role in bringing energy minerals, including coal and oil, to the UK market. The port estate benefits from extensive permitted development rights, granted to Associated British Ports (ABP) as a statutory undertaker.

**12.1.5** In addition, there are three sites producing secondary and recycled aggregates in North East Lincolnshire. These are located at:

1. Brianplant - South Humberside Industrial Estate, Grimsby;
2. H. Cope & Sons - Moody Lane, Grimsby; and,
3. Stoneledge - South Humberside Industrial Estate, Grimsby.

**12.1.6** The Plan safeguards all mineral resource identified by the British Geological Survey in North East Lincolnshire which meet the NPPF's definition of 'local or national importance'. This includes deposits of sand and gravel and silica sand (blown sand).

**12.1.7** No provision has been made for the safeguarding of any chalk, which occurs extensively across the Lincolnshire Wolds, or coal. The coal resource underlying North East Lincolnshire is at a depth of greater than 500 metres. The Coal Authority has confirmed that there are no surface coal resources present which would need to be protected.

**12.1.8** Brick clay has been worked in North East Lincolnshire in the past, however, the British Geological Survey (BGS) only identify brick clay where it is actively worked. As there are no active workings in North East Lincolnshire, the resource is not identified. There are therefore no proposals to safeguard brick clay.

**12.1.9** There are no sources of building stone in North East Lincolnshire, and it has been of limited use in the local vernacular building construction.

### Draft Strategic Policy 21

Safeguarding minerals and related infrastructure

1. The Council will safeguard mineral deposits of sand and gravel, and blown sand (silica sand) within the identified Minerals Safeguarding Areas identified on the Policies Map (Minerals Safeguarding Areas).
2. Prior extraction of mineral should take place, unless it is not feasible or environmentally acceptable to extract the mineral.
3. Non-mineral development proposals within, or adjacent to Minerals Safeguarding Areas which do not allow for the prior extraction, will be permitted where:

    A. the need for the development outweighs the need to safeguard the site for future mineral extraction;

    B. the mineral is proven to not be present, not of a quality or quantity to justify its extraction, or too deep to allow for extraction; or

    C. the proposed development is temporary in nature and would not prevent minerals extraction taking place in the future.

4. This Policy would not apply to the following:

    A. applications for household development or applications to extend existing commercial premises;

    B. minor developments and 'infill' schemes; or,

    C. applications for Listed Buildings Consent, Advertisement Consents, Tree Works, Prior Notifications, or Certificates of Lawfulness of Existing or Proposed Use of Development.

5. Within Minerals Safeguarding Areas, non-mineral development, with the exception of the development set out above, will not be permitted until the developer has provided evidence to the Council to determine whether the mineral is feasible and viable to extract ahead of development (Evidence should be submitted prior to the determination of the planning application in the form of a site specific desk based mineral assessment. This should provide detail of the existing surface and

solid geological and mineral resource including an estimate of economic value (for example quantity and quality, its potential for use in the forthcoming development and an assessment of whether it is feasible and viable to extract the mineral resource ahead of development). Where prior extraction can be undertaken, the developer should provide an explanation of how this will be carried out as part of the overall development.

6. Significant existing and planned infrastructure identified on the Policies Map, that supports the supply of minerals in the Borough will be safeguarded against development that would unnecessarily sterilise or prejudice its use, including development of incompatible land uses nearby. This includes strategic rail freight links, sites for concrete batching, manufacture of coated materials and concrete products, and sites associated with the handling, processing, and distribution of substitute, recycled and secondary aggregate material. Development that may sterilise or prejudice the operation of the safeguarded site will not be permitted unless:

   A. an alternative site is available upon which the safeguarded use can relocate to; or,

   B. it can be demonstrated that the infrastructure no longer meets the current or anticipated future needs.

### Question 46

Safeguarding minerals and supporting infrastructure

Do you agree that it is appropriate to retain this policy in the local plan?

| Draft Strategic Policy 21 Safeguarding minerals and related infrastructure relationship to: | Links to: |
|---|---|
| National Planning Policy Framework | Paragraphs 209 to 217 |
| Local Plan Strategic Objectives | SO10 |
| Evidence base and other key documents and strategies | • *Minerals Issues Paper* (2014)<br>• *Mineral Safeguarding in England Good Practice Advice* (2011) |

**Table 12.1 Policy relationships**

## 12.2 Future mineral extraction

**12.2.1** North East Lincolnshire's current role in the provision of aggregates is very limited. The area does not produce aggregates from primary sources, but there are some local producers of recycled aggregates. The extraction of aggregates, chalk, and brick clay has occurred in the past, but there are no current active workings.

**12.2.2** The Council has worked collaboratively with neighbouring authorities to produce a *Local Aggregates Assessment* (LAA) as required by the NPPF. The *Humber Area Local Aggregates Assessment* (Annual Monitoring Report, 2022), provides an assessment of the latest aggregates supply across the Humber authorities. (The LAA sets out the current and future situation in the Humber area regarding aggregate supply and demand including sales data and aggregate apportionment levels, based on rolling average of ten year sales data, and other relevant local information.)

**12.2.3** The Council participates in the Yorkshire and Humber Aggregate Working Party (AWP). The Humber Area LAA is due to be considered by the AWP in the near future. Until this time, there is no formal agreement between the authorities on how the future need for aggregates should be met. Historically, North East Lincolnshire did not have an apportionment under the *Regional Spatial Strategy* (RSS), in recognition that the area does not have any sites contributing primary land-won aggregates to supply. Further discussion is required with the other Humber authorities and the Yorkshire and Humber AWP regarding North East Lincolnshire's role in future supply.

| Land-won Sand and Gravel | Crushed Rock | Landings of Marine Dredged Sand and Gravel | Overall Primary Aggregates Figures |
|---|---|---|---|
| Sales 3.24mt (2021) | Sales 11.28mt (2021) | 6.98mt can be extracted from 10 licences annually | Total primary aggregate sales 14.52mt |
| 10 year sales average 3.89mt | Annual rate or future demand 56.73mt | | |
| Reserves of 39.93mt | Reserves of 290.28mt | 0.29mt marine dredged landings | Total primary aggregates reserves 330.25mt |
| Landbank of 10.26 years | Landbank of 5.12 years | | |

**Table 12.2 YHAWP Annual Monitoring Report, 2022**

**12.2.4** There are no active sites in North East Lincolnshire contributing to primary aggregate production. The Council has previously written to minerals site operators in neighbouring authorities (East Riding of Yorkshire, Lincolnshire, and North

Lincolnshire) and responses indicated a lack of interest in North East Lincolnshire's resource at this stage. The Council's call for sites has not identified any potential minerals sites.

**12.2.5** The Plan seeks to promote the use of aggregates from renewable sources, such as secondary and recycled aggregates, which minimise the need for primary extraction. The potential for an increase in the landing of marine dredged aggregates also has the potential to reduce reliance on primary sources.

**12.2.6** Sites within the North Lincolnshire area have historically provided aggregates to meet demand across the joint area. At present North Lincolnshire have submitted their local for examination which includes their minerals related policies. The Council are therefore unable to confirm for certain that future need across the joint area would be met from sites within North Lincolnshire.

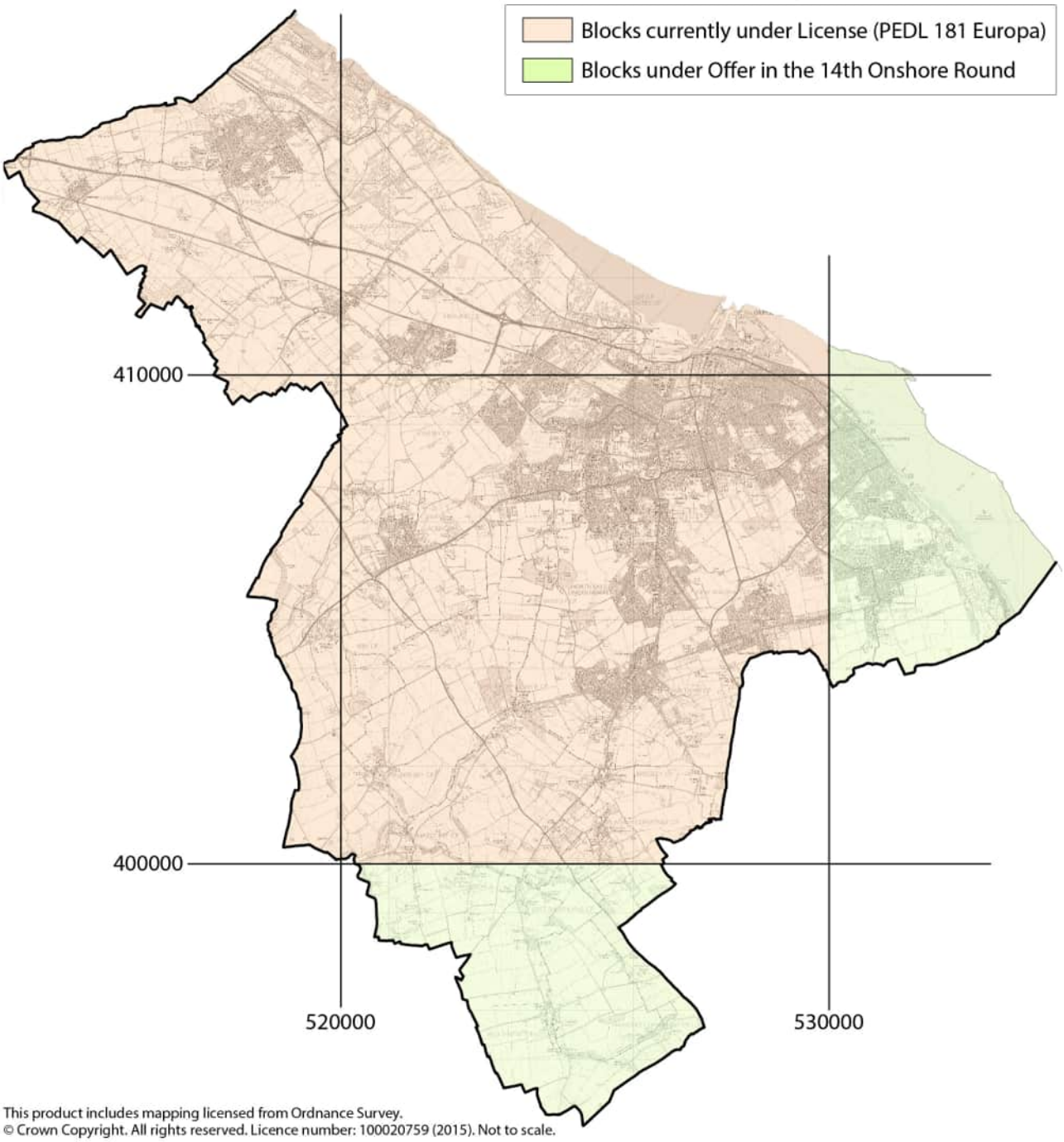


**Figure 12.1 Petroleum licensed area within North East Lincolnshire**

**12.2.7** Minerals are also used in the generation of energy. Part of the Borough is covered by a 'Petroleum Exploration and Development Licence' which is a licence issued by the Government allowing the area to be explored and developed (subject to receiving planning permission and other consents) for oil and gas. There have, however, been no discoveries of oil or gas within the area. Coal underlies North East Lincolnshire, although it is at a considerable depth.

**12.2.8** The Plan does recognise the possibility of future mineral extraction and therefore sets out the basis for considering such proposals.

**12.2.9** Mineral resources are finite, meaning they can only be worked where they lie. This can lead to conflict where the presence of particular mineral resources coincide with attractive or environmentally important landscapes. Draft Policy 12 Future mineral extraction and Secondary Aggregates sets out criteria to ensure that proposals for the extraction of minerals are subject to appropriate detailed assessment.

**12.2.10** The Council will be particularly stringent in assessing proposals to limit the amenity and environmental impacts. Developers will in appropriate cases by required to submit an Environmental Statement in accordance with the *Town and Country Planning (EIA) Regulations 2011*.

**12.2.11** Within, or within the setting of, the Lincolnshire Wolds great weight will be given to conserving the landscape and scenic beauty, in accordance with the NPPF (paragraph 176). The Wolds were designated in 1973 and, along with National Parks and Broads, is the highest status of protection in relation to landscape and scenic beauty. The statutory *Lincolnshire Wolds AONB Management Plan (2018-2023)*, identifies the main challenge is to ensure that the Wolds retains its unique landscape and undeniable special character, whilst maintaining and supporting its communities.

**12.2.12** The Council will support developments that can make a contribution to secondary aggregate supplies through the processing of Construction Demolition and Excavation (CD&E) waste. This approach is supported by measures for recycling and recovery set out in Draft Strategic Policy 22 Future requirements for waste facilities.

### Draft Policy 12

Future mineral extraction and Secondary Aggregates

1. The Council will, in conjunction with neighbouring mineral planning authorities, work to maintain across the Humber area, an appropriate contribution towards the regional supply of aggregates, and maintenance of appropriate landbanks.
2. When considering proposals for the extraction of minerals, (The criteria set out apply to all aspects of mineral extraction including all phases of hydrocarbon extraction, exploration, appraisal (testing) and production) that would contribute to the Humber area supply, the Council will consider whether:

    A. the arrangements for the extraction and transportation of the mineral would result in unacceptable adverse impacts on the public highway, and/or to the environment and local amenities, considering:

        i. visual intrusion;
        ii. noise;
        iii. blast vibration;
        iv. dust;
        v. air emissions;
        vi. lighting;

vii. vehicle movements;

viii. proximity of sensitive neighbouring uses;

B. stability of land; and,

C. quality of groundwater supplies.

3. Proposed development located within or affecting the character and setting of the Lincolnshire Wolds Area of Outstanding Natural Beauty (AONB) will be granted planning permission in exceptional circumstances, and only where it has been demonstrated that:

A. there is proven public interest in developing the site; and,

B. the Humber area need cannot be served through development of alternative sites, not affecting the Lincolnshire Wolds AONB; and,

C. the impact on the intrinsic qualities of the AONB can be satisfactorily addressed.

4. The Council will support developments that can make a contribution to secondary aggregate supplies through the processing of Construction Demolition and Excavation (CD&E) waste. Development of this nature should accord with Draft Strategic Policy 22 Future requirements for waste facilities.

### Question 47

Future mineral extraction and secondary aggregates

Do you agree that it is appropriate to retain this policy in the local plan?

| Draft Policy 12 Future mineral extraction and Secondary Aggregates relationship to: | Links to: |
|---|---|
| National Planning Policy Framework | Paragraph 209 to 217 |
| Local Plan Strategic Objectives | SO10 |
| Evidence base and other key documents and strategies | • *Humber Area Local Aggregate Assessment* (Humber Area LAA) (October 2019)<br>• YHAWP Annual Monitoring Report (2022) |

**Table 12.3 Policy relationships**

## 12.3 Restoration and aftercare - minerals

**12.3.1** Responsible restoration and aftercare of minerals sites can provide for a wide range of opportunities for enhancements and beneficial after-uses. However, opportunities for enhancement should not take precedence over the need to protect and maintain existing environmental assets.

**12.3.2** General principles for the restoration of minerals sites are set out in the NPPF. There are often competing interests in terms of achieving different restoration and after-use objectives. It is important to balance these competing interests to ensure that outcomes reflect the needs and desires of the local community. Restoration should seek to maximise public and environmental benefits whilst also giving consideration to the land use context and local environmental conditions.

**12.3.3** After-use with the primary purpose of restoration to agriculture, forestry, economic development, and amenity purposes should seek to integrate secondary after-use aspects in order to maximise opportunities. Secondary after-use aspects may include: landscape enhancement, habitat enhancement or creation of ecological networks (contributing towards the UK Biodiversity Action Plan (BAP) targets and green infrastructure linkages), water catchment conservation, flood attenuation, enhancement of the historic environment, geodiversity, recreation, and environmental education. A mix of after-uses may be the most valuable way of restoring a piece of land and maximising opportunities.

**12.3.4** The restoration of a site should be considered at all stages of development and should commence at the earliest opportunity. It should be completed within an acceptable timescale, as set out in the relevant planning approval. Restoration will be expected to be phased, allowing worked land to be restored, minimising local disturbance and impacts, as development proceeds. Where phased restoration is not appropriate, all restoration works should proceed as soon as practically possible after extraction has been completed.

**12.3.5** Restoration should take account of the landscape of the wider area, take opportunities for mitigating climate change, re-create/enhance important habitats and seek to establish a coherent and resilient ecological network where possible. This approach will ensure the multi-functionality of the proposed restoration is fully explored and the greatest range of environmental benefits are delivered.

**12.3.6** Soils displaced should be adequately protected to maintain soil quality, especially if the original site qualified as best and most versatile agricultural land (grades 1, 2, and 3a). Restoration of best and most versatile agricultural land should be returned to an equivalent standard to that which existed prior to extraction, though the proposed after-use need not always be for agriculture.

**12.3.7** The period of aftercare should be given detailed consideration. This is to maintain and improve the structure and stability of soils and allow vegetation to mature. The length of the aftercare period will normally be at least five years, negotiated on an site-by-site basis. In some cases longer-term management may be required, in such cases a management organisation will need to be identified.

## Draft Policy 13

Restoration and aftercare (minerals)

1. All applications for mineral related development should be accompanied by detailed proposals for subsequent restoration of the entire site, which include:

   A. take account of the former use of the site;

   B. ensure land is restored at the earliest opportunity, and to a high quality recognising key biodiversity objectives;

   C. provide specific details relating to:

      i. stripping of soils and soil-making materials, and either their storage of their direct replacement on another part of the site;

      ii. storage and replacement of overburden;

      iii. achieving the landscape and landform objectives for the site, (to be agreed taking account of local topography and filling proposals);

      iv. the contribution to other multi-functional environmental gains consistent with local landscape character, informed by the latest *Landscape Character Assessment*;

      v. restoration, including soil placement, relief of compaction and provision of surface features; and,

      vi. aftercare.

   D. include a phasing plan for the restoration, which seeks to minimise local disturbance and impacts, and which represents a rolling programme of restoration and aftercare management.

## Question 48

Restoration and aftercare (minerals)

Do you agree that it is appropriate to retain this policy in the local plan?

| Draft Policy 13 Restoration and aftercare (minerals) relationship to: | Links to : |
|---|---|
| National Planning Policy Framework | Paragraph 209 to 217 |
| Local Plan Strategic Objectives | SO10 |
| Evidence base and other key documents and strategies | • *Landscape Character Assessment* (2015) |

**Table 12.4 Policy relationships**

# Section 13 Providing for waste

In England, we generate around 187.3 million tonnes of waste every year. (Further information is available at: https://www.gov.uk/.) Waste is produced in everyday activities. We all produce waste at home and at work, and this waste needs to be managed in a sustainable way which does not cause harm to the environment or human health. The management of waste is highly regulated to ensure that harm to the environment and human health does not occur.

The Government's aim is to move towards a 'zero waste economy'. This does not mean that waste will not be generated, but it does mean that all waste will be treated as a resource. This means that waste products would be reduced, reused, and recycled where possible, and that things would only be thrown away as a last resort. It means recovering value from waste by turning it into products that society needs, such as heat and electricity.

**No revisions to the waste policies as set out in the existing local plan are proposed, only minor revisions to update the supporting text have been made.**

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**13.0.1** Waste is categorised into several 'waste streams'. The role of the Council is not to manage all of the waste generated in North East Lincolnshire, though the Council does hold contacts with operators to manage the waste that it collects from households, street sweepings, bins, and community recycling centres. The role of the planning system is to ensure that appropriate waste management facilities can come forward to provide capacity sufficient to meet the area's need for waste management capacity, when it is required, to ensure waste is managed in a sustainable manner.

**13.0.2** In North East Lincolnshire, waste arises in the following streams:

1. **Local Authority Collected Municipal Waste (LACMW)** (This waste stream has previously been referred to as 'Municipal Waste'). - this waste stream is collected by the Council, in its role as the area's waste collection authority (WCA), and is primarily composed of waste from households. It also includes waste from street cleaning and civic amenity sites;
2. **Commercial and Industrial Waste (CIW)** - this waste stream is produced by businesses. It is collected and managed on a commercial basis by private waste management companies;
3. **Construction, Demolition and Excavation Waste (CDEW)** - this waste stream is produced in the construction of new buildings and demolition of existing buildings. It is collected and managed on a commercial basis by private waste management companies. A significant proportion of this waste stream is 'inert' and can be reused on-site;
4. **Hazardous Waste** - this is the waste stream formerly referred to as 'specialist waste'. Hazardous waste is waste considered harmful, or potentially harmful, to humans or the environment. This waste stream includes items such as batteries, solvents, and products which contain harmful material or substances, such as fridges;

5. **Agricultural Waste** - this is waste produced on premises used for agriculture (Based on the definition of agriculture provided in the *Agriculture Act 1947).* Some wastes produced on farms will be classified as hazardous wastes, for example, containers which have contained pesticides;
6. **Wastewater** - this waste stream includes dirty water and sewerage; and,
7. **Low Level Radioactive Water (LLRW)** - this includes items which are contaminated by radioactive particles from the non-nuclear industry, for example, waste from hospital x-ray departments.

**13.0.3** Waste from Mines and Quarries (This comprises non-valuable material produced during extraction and processing.) is not considered because no primary mineral extraction takes place in North East Lincolnshire.

**13.0.4** The quantities of agricultural waste, and low level radioactive waste generated in North East Lincolnshire are considered to be small.

**13.0.5** The *Waste Management Plan for England* (2021) and *National Planning Policy for Waste* (NPPW) (2014) set out the National Planning Policy context for the management of waste. However, while the *National Planning Policy Framework* (2021) does not contain specific waste policies, it's principles are still relevant.

**13.0.6** The *Waste Management Plan for England* re-affirms the Government's key commitments, including meeting a series of targets, such as for at least 65% of municipal waste to be reused or recycled by 2035; and amount of waste going to landfill is reduced to 10% or less of total amount of municipal waste.

**13.0.7** The NPPW (page 3) places several requirements on waste planning authorities (WPAs) when preparing local plans. In particular, there is a requirement to plan to provide waste management facilities to meet the area's need for waste management capacity, ensuring that the planned provision and its spatial distribution is based on a robust analysis of the best available data. WPAs should work collaboratively with other authorities to collect and share relevant data and information on waste arisings, and take account of waste movements between local authority areas (NPPW (Page 4)). WPAs should also have regard to any nationally identified waste management requirement, including the Government's advice on forecasts (NPPW (page 4)). WPAs are required to identify suitable sites and areas for new or enhanced waste management facilities in appropriate locations. The document provides outline criteria for assessing the suitability of waste management sites.

**13.0.8** Both the *Waste Management Plan for England* and NPPW outline the importance of three key principles in waste management, which were established in the European Union's *Waste Framework Directive* (Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives.): the waste hierarchy, the principle of self-sufficiency, and the proximity principle.

**13.0.9** The waste hierarchy is established in law (*The Waste (England and Wales) Regulations 2011* (S.I. 2011/988)), and sets out the priority order for the management of waste, and the Local Plan will need to outline how the waste hierarchy will be met. There are five stages to the hierarchy:

1. **prevention** - this involves reducing the generation of waste in the first place. This means using less material in the design and manufacture of products, and keeping products for longer and re-using them where possible. Stringent packaging regulation has been a key factor in preventing waste in recent years;
2. **reuse** - this means cleaning, repairing and refurbishing products so that they can be reused;
3. **recycling** - this means turning waste into a new product, material or substance, and includes composting;
4. **other recover** - waste can replace other materials that would otherwise have been used, for example, it can be used to generate electricity and heat. This includes recovery processes where value is recovered from waste, such as anaerobic digestion, incineration where energy is recovered, gasification and pyrolysis processes that produce energy, and some backfilling operations; and,
5. **disposal** - this is the least desirable option and should be considered only where none of the other options is appropriate. This means the use of methods such as landfill and incineration without recovery. This is the last resort for managing waste, particularly biodegradable waste.

**13.0.10** The principles of self-sufficiency and proximity require, where possible, for waste to be managed and recovered in facilities close to where it was produced, and for area's to manage the waste they produce. In requiring waste to managed close to where it was produced, these principles provide an incentive for communities to reduce the quantity of waste that they produce, by making them responsible for its management.

**13.0.11** However, extensive movements of waste occurs between waste planning authority areas, due to commercial contracts and the location of facilities. Many types of waste require specialist treatment, and it is not viable for every local authority area to be able to manage all of the waste it generates. Contact has been made with all authorities which receive waste from North East Lincolnshire to ascertain if there are any planning reasons why these movements can not continue to occur, which would cause a future capacity gap to arise. In particular, North East Lincolnshire's hazardous waste is exported to many other authorities for treatment.

## 13.1 Future waste facilities

**13.1.1** Waste management, in terms of planning for facilities, is increasingly becoming similar to that for general industrial facilities, in that proposals come forward as a consequence of site finding and progression through the development control process by industry stakeholders; largely outside of the plan-making process. It is therefore not appropriate for the Plan, to attempt to identify all of the sites that will be required for waste management facilities over the full plan period. To do so would be too prescriptive and inflexible and would mean that good sites identified outside of the plan-making process could be prevented from being implemented.

**13.1.2** Evidence has been prepared (*North East Lincolnshire Waste Needs Assessment* (2015)). to assess the level of waste that can be expected to be generate across the plan period. An indication of the expected arisings in the plan

period is provided below. Acting as waste disposal authority (WDA), the Council are also preparing a revised *Municipal Waste Management Strategy*. The Council is a member of the Yorkshire and Humber Waste Technical Advisory Body, which brings together representatives from all waste planning authorities in the Yorkshire and Humber area to address cross-boundary waste issues, in recognition that waste movements occur between authorities.

**What do we need to plan for?**

**13.1.3** Forecasts of waste arisings in the period to 2032 have been closely aligned to key local plan evidence documents. This includes the findings for the *Strategic Housing Market Assessment* (2013), *Local Economic Assessment* (2014), and *Demographic analysis and forecast* (2015) with regards to the potential for population growth (and the resulting household growth) linked to economic growth forecasts.

**13.1.4** Waste in the local authority collected stream is expected to decline in the first few years of the plan period, due to a reduction in the quantity of waste produced per person. However, it is expected to increase in later years of the plan period due to the rate of population growth. North East Lincolnshire is net self-sufficient in the management of waste, in that as much waste is managed in the area as is generated.

**13.1.5** Some growth is expected in the commercial and industrial waste stream, due to the expansion of the commercial and particularly, the industrial sector, in North East Lincolnshire. These forecasts are aligned to jobs growth forecasts, but also incorporate adjustments for both the commercial and industrial sectors to represent resource efficiency changes. Over the plan period, the commercial and industrial waste stream is expected to grow by just over 9%. It is estimated that around 175,500 tonnes per annum is currently produces, and that arisings in this waste stream will remain static across the plan period.

**13.1.6** The Council's *Waste Needs Assessment* (2015) suggests that no additional capacity is required to meet North East Lincolnshire's waste management needs. While a shortfall of waste management capacity is identified for the hazardous waste stream, this is not significant enough to enable an economically viable facility to be brought forward. The Council will work with other regional authorities through the Yorkshire and Humber Waste Technical Advisory Body (WTAB) to identify how the identified shortfall can be met in regional facilities.

**13.1.7** Forecasts are not provided for agricultural waste, low level radioactive waste, and wastewater. Agricultural waste is expected to form a small component of the waste stream, and some growth in the agricultural sector is reflected in the commercial and industrial waste, and hazardous waste forecasts. Low level radioactive waste is produced primarily at healthcare premises in North East Lincolnshire, and there is not expected to be a significant increase in production requiring treatment capacity to be identified. Wastewater is planned for by Anglian Water. The Council will work with Anglian Water to establish the need for future capacity, and report on progress in the *Infrastructure Delivery Plan* (IDP).

| Waste stream (Tonnes to be managed per annum, figures have been rounded to nearest 100) | Baseline | 2016/17 | 2021/22 | 2026/27 | 2031/32 |
|---|---|---|---|---|---|
| Local Authority Collected Municipal Waste | 77,400 | 76,100 | 75,500 | 79,000 | 82,300 |
| Commercial and Industrial Waste | 310,200 | 314,900 | 322,900 | 331,000 | 339,300 |
| Construction, Demolition and Excavation Waste | 175,500 | 175,500 | 175,500 | 175,500 | 175,500 |
| Hazardous Waste | 76,000 | 76,000 | 76,000 | 76,000 | 76,000 |
| **Total** | **639,100** | **642,500** | **649,900** | **661,500** | **673,100** |

**Table 13.1 Waste management requirement to 2032**

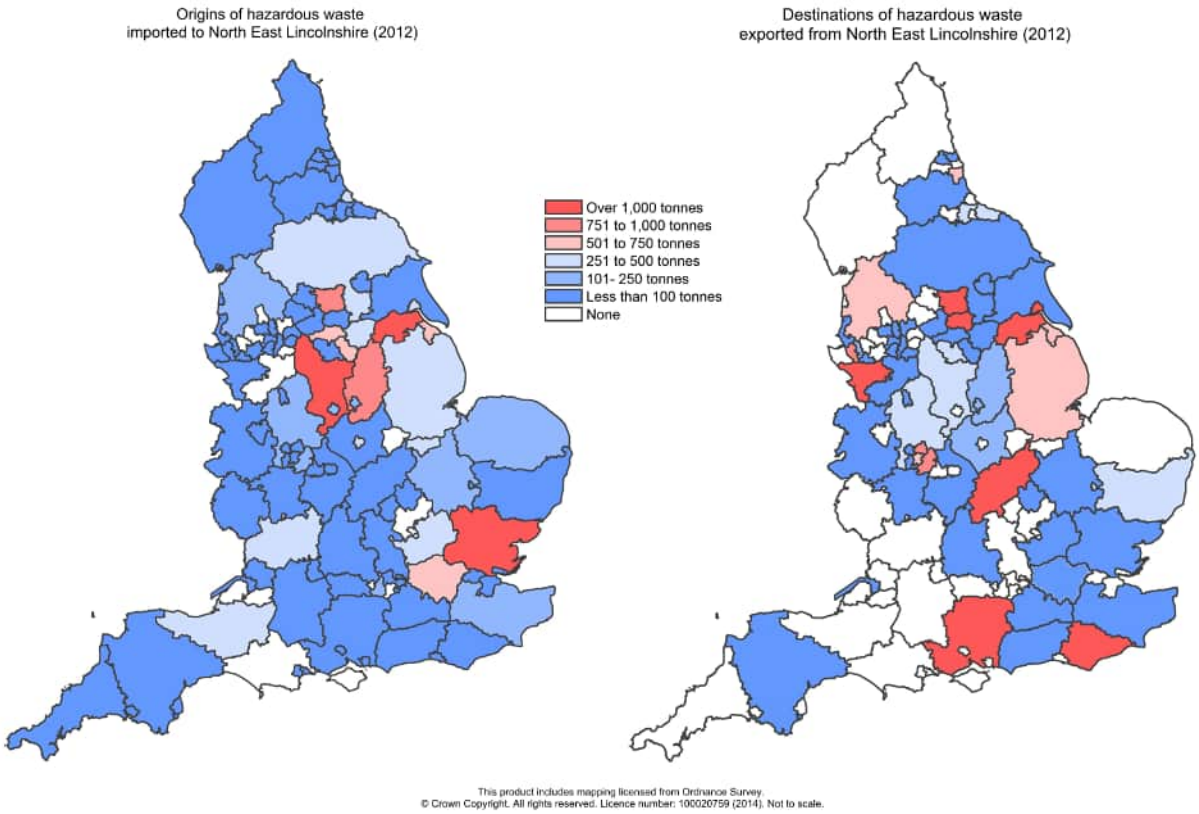


**Figure 13.1 Hazardous waste movements**

**13.1.8** As an increase is expected, further discussions with other authorities will continue in recognition that waste movements will continue to occur due to existing contacts remaining in place. Figure 13.1 Hazardous waste movements provides an illustration of the scale of hazardous waste movements. It shows, on the left, where hazardous waste arises that is received at facilities in North East Lincolnshire and, on the right, the destinations of hazardous waste arisings in North East Lincolnshire.

**13.1.9** The areas from which North East Lincolnshire receives the highest quantity of hazardous waste is primarily those which have a quick connection to the Borough via the motorway network. However, due to the presence of a facility in North East Lincolnshire with a large catchment area, the Borough receives small waste movements from across the country. Conversely, much of North East Lincolnshire's hazardous waste is handled elsewhere, and in particular Cheshire West and Chester, Leeds, and North Lincolnshire play significant roles.

**13.1.10** Draft Strategic Policy 22 Future requirements for waste facilities sets out precise locational criteria to ensure that proposals for waste management facilities will not cause harm to amenity or the local environment. The approach generally seeks to locate waste management facilities away from residential areas, except where there would be clear benefits to the residential communities.

**13.1.11** Many waste management facilities are industrial in nature and are therefore not appropriate to be located in close proximity to residential areas. Significant levels of traffic movements are also often required to transport waste to these facilities, and the location of much of the area's industrial land is within easy access for the strategic road network, particularly the A180(T). The Council has historically been successful in locating major waste facilities within the existing employment areas.

**13.1.12** Draft Strategic Policy 22 Future requirements for waste facilities also provides some flexibility, to allow specific waste developments in rural areas where they would benefit from this location, provided that they meet development management criteria outline in other sections of the Plan. This refers specifically to composting or wastewater treatment facilities.

**13.1.13** Draft Strategic Policy 22 Future requirements for waste facilities supports to co-location of facilities, to maximise efficiency and minimise adverse impacts, and promotes co-location where use of the output of a waste facility, such as a district-heating scheme, or industrial process. The existing waste to energy plant at Stallingborough is a good example of such a joint venture. It exports steam, an output of the waste process, directly to a neighbouring chemical factory for use in their production processes. This provides operational and commercial benefits for both the waste operator and the chemical company.

## Draft Strategic Policy 22

Future requirements for waste facilities

1. Proposals for waste management facilities should be developed on sites in accordance with the following locational criteria:

| Waste management facility | Locational preference |
|---|---|
| Materials recycling facilities<br>Waste transfer facilities<br>Civic amenity sites | Existing employment land at:<br>1. Kiln Lane Industrial Estate, Stallingborough; |

| | |
|---|---|
| Waste treatment and recovery facilities, (including energy from waste, and biological/ mechanical treatment) | 2. South Humberside Industrial Estate, Grimsby;<br>3. Wilton Road Industrial Estate, Humberston; or,<br><br>Allocated employment sites at:<br><br>1. ELR015 a&b Great Coates Business Park, Moody Lane, Grimsby.<br>Current waste management facilities.<br>(While the preferred location for civic amenity sites is on industrial land/employment allocations, other locations may be appropriate to allow the civic amenity site to be accessible to residential properties thereby reducing the distance travelled by residents to dispose of waste, these proposals will be considered on a site-by site basis.) |
| Outdoor composting facilities | Adjacent to current waste management facilities, or land in rural locations, where development meets the Council's criteria for developments in these locations (outlined in Draft Strategic Policy 2 Development boundaries). |
| Wastewater recycling facilities | Adjacent to existing sites, or new sites where it can be demonstrated that expansion of existing facilities is not feasible. |

**Table 13.2 Locational criteria**

2. Development should be located, designed and operated to minimise impacts, having specific regard to:

   A. visual intrusion;
   B. landscape character;
   C. noise, light and vibration;
   D. odours;
   E. air emissions, including dust;
   F. vermin and birds;
   G. litter;
   H. traffic and access;
   I. potential land use conflict;
   J. stability of land;
   K. protection of water quality and resources and flood risk management;
   L. conserving the historic environment; and,
   M. nature conservation.

3. The Council will support the co-locating of complementary waste facilities to facilitate efficiencies in waste management and transport; and the co-location of waste facilities with developments that could make use of the output of a waste facility, such as a district-heating scheme, or industrial process.
4. The Council will also seek to secure the recycling of Construction, Demolition and Excavation (CD&E) waste at the locations where waste is produced, including the temporary provision for recovery, separation and where appropriate processing of on-site materials.

### Question 49

Future waste facilities

Do you agree that it is appropriate to retain this policy in the local plan?

| Draft Strategic Policy 22 Future requirements for waste facilities relationship to: | Links to: |
|---|---|
| National Planning Policy Framework | Paragraphs (see NPPF prinicples) |
| Local Plan Strategic Objectives | SO10 |
| Evidence base and other key documents and strategies | • *Municipal Waste Management Plan, Summary 2016-2019*<br>• *Municipal Waste Management Plan, Technical Plan 2016-2019*<br>• *North East Lincolnshire Waste Needs Assessment* (2015) |

**Table 13.3 Policy relationships**

## 13.2 Safeguarding waste facilities and related infrastructure

13.2.1 There is a necessity to ensure that there are sufficient waste management facilities within the Borough to meet the requirements of the area. Over time waste sites will cease to operate which could lead to a loss in overall waste management capacity. The Council has identified the current waste sites and wastewater treatment facilities on the Policies Map (Minerals and Waste) and listed the locations in Table 13.4 Licenced waste operators and Table 13.5 Wastewater treatment facilities. This does not include the numerous small recycling sites that are located across the Borough or sites granted a waste licence on a temporary basis related to a specific development.

**13.2.2** The Council will seek to ensure that new development in proximity to a waste site is not incompatible with the waste management facility and will not prejudice its ongoing operation. The vast majority of waste sites and facilities (listed in Table 13.4 Licenced waste operators and Table 13.5 Wastewater treatment facilities (These sites are derived from the Environment Agency's record of environmental permits (waste operations)). below) are located within employment areas. In such areas there is unlikely to be any compatibility concerns. However, waste facilities can be considered as bad neighbours where neighbouring uses are more sensitive for example, residential.

**13.2.3** There is no established, evidence based distance to define a 'Waste Buffer' that covers every waste facility type. Public perception concern about the risk of effects arising from waste facilities (e.g. effects on health from bio-aerosols or emissions, or noise, dust and traffic emissions), have led to a commonly referred to 250 metre suggested buffer distance between waste facilities and sensitive receptors. (Health and Safety Executive (HSE) *Bioaerosol emissions form waste composting and the potential for workers' exposure* (2010). Prepared by the Health and Safety Laboratory for the Health and Safety Executive). Therefore, the buffer which the Council will apply will normally cover and extend for up to 250 metres beyond the boundary of safeguarded sites. However, each site will be considered individually, and if circumstances suggest the depth of the 250 metre zone for the edge of the site should be varied, for example due to mitigation measures proposed, then this will be taken into account.(Anglian Water adopt a risk assessment process to consider any application within 400m of a wastewater treatment works or within 15m of a sewerage pumping station. While the results of the assessment will not decide the outcome of a planning application, it will inform potential developers and provide planning officers and elected councillors with evidence based findings to help inform their planning decisions. Further details are set out in *Anglian Water's Asset Encroachment Policy* (Dec 2012), or any successor document). Identifying the waste sites and facilities together with defining a 250m buffer, is designed to inform prospective developers and waste operators of an existing waste management operation and to ensure compatibility of adjacent new development.

| Ref no. | Operator | Site location |
|---|---|---|
| WM01 | Mettalis Recycling Ltd | Mineral Quay, Immingham Docks, Immingham |
| WM02 | Immingham Storage Company Ltd | Immingham Oil Storage, West Riverside, Immingham Docks, Immingham |
| WM03 | Associated British Ports | Immingham Dock Olive Residue Storage |
| WM04 | SAR Recycling Ltd | Pelham Industrial Estate, Manby Road, Immingham |
| WM05 | Grimsby Operations Ltd | Household Waste Recycling Centre, Queens Road, Immingham |
| WM07 | Integrated Waste Management Ltd | Queens Road, Immingham |

| Ref no. | Operator | Site location |
|---|---|---|
| WM08 | Selvic Shipping Services Ltd and FBM Metals (UK) Ltd | Kiln Lane Treatment Plant, Netherlands Way, Stallingborough |
| WM09 | SJP Trading Ltd | Huckers Yard, Netherlands Way, Stallingborough |
| WM10 | BOC Ltd | Hobson Way, Stallingborough |
| WM11 | NewLincs Development Ltd | Stallingborough Transfer Station NewLincs EFW, South Marsh Road, Stallingborough |
| WM12 | Metropes (Metals) Ltd | Estate Road No 3, South Humberside Industrial Estate, Grimsby |
| WM14 | Jonathan Potts Ltd | Estate Road No 1, South Humberside Industrial Estate, Grimsby |
| WM15 | Brianplant (Humbersid0e Ltd | Estate Road No 2. South Humberside Industrial Estate, Grimsby |
| WM16 | H Cope & Sons Ltd | Moody Lane, Grimsby |
| WM17 | UK Waste Management Ltd | Gilbey Road Transfer Station, Gilbey Road, Grimsby |
| WM18 | | Household Waste Recycling Centre, Estuary Way, Grimsby |
| WM20 | Freshney Cargo Services Ltd | Westside Road, Royal Dock, Grimsby |
| WM21 | Brianplant (Humberside) Ltd | Rear of number's 2 & 3 Cold Stores, Wickham Road, Fish Docks, Grimsby |
| WM22 | W Bloy Ltd | King Edward Street, Grimsby |
| WM24 | Rimar Salvage | Railway Street, Grimsby |
| WM25 | North East Lincolnshire Council | Works Department, Doughty Road, Grimsby |

**Table 13.4 Licenced waste operators**

| Ref no. | Operator | Site location |
|---|---|---|
| WM06 | Anglian Water Services Ltd | Queens Road Treatment Facility, Immingham |
| WM19 | Anglian Water Services Ltd | Pyewipe Treatment Facility, Gate Way, Grimsby |
| WM26 | Anglian Water Services Ltd | Grimsby Road Treatment Facility, Laceby |
| WM27 | Anglian Water Services Ltd | East Ravendale Treatment Facility |

**Table 13.5 Wastewater treatment facilities**

### Draft Strategic Policy 23

Safeguarding waste facilities and related infrastructure

1. The Council will safeguard the existing waste management facilities identified on the Policies Map (Minerals and Waste) from the encroachment of incompatible development unless the planning permission has expired and/or it can be demonstrated that the site is no longer required.

### Question 50

Safeguarding waste facilities

Do you agree that it is appropriate to retain this policy in the local plan?

| Draft Strategic Policy 23 Safeguarding waste facilities and related infrastructure relationship to: | Links to: |
|---|---|
| National Planning Policy Framework | Paragraphs (see NPPF principles) |
| Local Plan Strategic Objectives | SO10 |
| Evidence base and other key documents and strategies | • *North East Lincolnshire Waste Needs Assessment* (2015) |

**Table 13.6 Policy relationships**

## 13.3 Restoration and aftercare - waste

**13.3.1** Responsible restoration and aftercare of landfill and landraise waste sites can provide for a wide range of opportunities for enhancement and beneficial after-uses. However, opportunities for enhancement should not take precedence over the need to protect and maintain existing environmental assets.

**13.3.2** As with minerals sites there are are often competing interests in establishing restoration and after-use objectives. It is important to balance these competing interests. Restoration should seek to maximise public and environmental benefits whilst also giving consideration to the land use context and local environmental conditions.

**13.3.3** After-use with the primary purpose of restoration to agriculture, forestry, economic development, and amenity purposes should seek to integrate secondary after-use aspects in order to maximise opportunities. Secondary after-use aspects may include: landscape enhancement, habitat enhancement or creation of ecological networks (contributing towards BAP targets and green infrastructure linkages), water

catchment conservation, flood attenuation, enhancement of the historic environment, geodiversity, recreation, and environmental education. A mix of after-uses may be the most valuable way of restoring a piece of land and maximising opportunities.

**13.3.4** The waste hierarchy is clear that waste disposal through means such as landfill is the least desirable waste management option and should only be considered when no other options are available. The Council will, therefore, require an application for landfill or landraise to clearly demonstrate that there is a need for such an operation. The evidence will need to show that the need arises mainly from within the Borough and that the waste could not be moved further up the waste hierarchy.

**13.3.5** All applications will be expected to properly and thoroughly address the restoration needs of the sites. The restoration of landfill/landraise waste sites, as with mineral extraction sites, should be considered at all stages of development and should commence at the earliest opportunity. It should be completed within an acceptable timescale, as set out in the relevant planning approval. Restoration will expect to be phased, allowing worked land to be restored, minimising local distance and impacts, as development proceeds. Where phased restoration is not appropriate, all restoration works should proceed as soon as practically possible after extraction has been completed.

**13.3.6** Restoration should take account of the landscape of the wider area, take opportunities for mitigating climate change, re-create/enhance important habitats and seek to establish a coherent and resilient ecological network where possible. This approach will ensure the multi-functionality of the proposed restoration is fully explored and the greatest range of environmental benefits are delivered.

**13.3.7** Soils displaced should be adequately protected to maintain soil quality, especially if the original site qualified as best and most versatile agricultural land (grades 1, 2 and 3a). Restoration of best and most versatile agricultural land should be returned to an equivalent standard to that which existed prior to extraction, though the proposed after-use need not always be for agriculture.

**13.3.8** The period of aftercare should be given detailed consideration. This is to maintain and improve the structure and stability of soils and allow vegetation to mature. The length of the aftercare period will normally be at least five years, negotiated on a site-by-site basis. In some case longer-term management may be required, in such cases a management organisation will need to be identified.

### Draft Policy 14

Restoration and aftercare (waste)

1. In exceptional cases, where it can first be demonstrated that there is a need arising within the Borough for an additional landfill/landraise operation, applications should be accompanied by detailed proposals for subsequent restoration of the site, which should:

   A. take account of the former use of the site;

B. ensure land is reclaimed at the earliest opportunity, and to a high quality recognising key biodiversity objectives;

C. provide specific details relating to:

   i. stripping of soils and soil-making materials, and either their storage or their direct replacement on another part of the site;

   ii. storage and replacement of overburden;

   iii. achieving the landscape and landform objectives for the site, (to be agreed taking account of local topography and filling proposals);

   iv. the contribution to other multi-functional environmental gains consistent with local landscape character, informed by the latest *Landscape Character Assessment*;

   v. restoration, including soil placement, relief of compaction and provision of surface features; and,

   vi. aftercare.

D. include a phasing plan for restoration which seeks to minimise local disturbance and impacts, and which represents a rolling programme of restoration and aftercare management.

## Question 51

Restoration and aftercare (waste)

Do you agree that it is appropriate to retain this policy in the local plan?

| Draft Policy 14 Restoration and aftercare (waste) relationship to: | Links to: |
|---|---|
| National Planning Policy Framework | Paragraphs (NPPF Principles) |
| Local Plan Strategic Objectives | SO10 |
| Evidence base and other key documents and strategies | • *North East Lincolnshire Waste Needs Assessment* (2015) |

**Table 13.7 Policy relationships**

# Appendix A Strategic objectives and policy relationship

| Policy | SO1 | SO2 | SO3 | SO4 | SO5 | SO6 | SO7 | SO8 | SO9 | SO10 |
|---|---|---|---|---|---|---|---|---|---|---|
| Employment land requirement | | | | | | | | | | |
| Housing requirement | | | | | | | | | | |
| Draft Strategic Policy 1 Settlement hierarchy | X | | X | X | X | | | X | | |
| Distribution of growth | | | | | | | | | | |
| Draft Strategic Policy 2 Development boundaries | | | | X | | | | | X | |
| Draft Strategic Policy 3 Green wedges | | X | | | X | X | | | | |
| Draft Strategic Policy 4 Infrastructure | | X | | | X | | X | X | | |
| Draft Strategic Policy 5 Flood risk | | X | | | X | X | | | | |
| Draft Strategic Policy 6 Water management | | X | | | | X | | | | |
| Draft Strategic Policy 7 Renewable and low carbon infrastructure | | X | | | | | | | | |
| Draft Strategic Policy 8 Energy and low carbon living | | X | | | | | | | | |
| Draft Policy 1 Health and wellbeing | | | | | X | | | X | X | |
| Draft Strategic Policy 9 Developing a green infrastructure network | | X | | | X | X | | | | |
| Draft Strategic Policy 10 Landscape | | | | | | X | | | | |
| Draft Policy 2 Green space and recreation | | X | | | X | X | | | | |
| Draft Strategic Policy 11 Biodiversity and Geodiversity | | | | | | X | | | | |
| Draft Policy 3 Biodiversity net gain | | | | | | X | | | | |

| Policy | SO1 | SO2 | SO3 | SO4 | SO5 | SO6 | SO7 | SO8 | SO9 | SO10 |
|---|---|---|---|---|---|---|---|---|---|---|
| Draft Strategic Policy 12 Habitat Mitigation - South Humber Bank | | | X | | X | X | | | | |
| Draft Strategic Policy 13 Good design in new developments | | | | | | X | | | X | |
| Draft Strategic Policy 14 Conserving and enhancing the historic environment | | | | | | X | | | | |
| Draft Strategic Policy 15 Promoting sustainable transport | | | | | | | X | | | |
| Draft Policy 4 Parking | | | | | X | | X | | X | |
| Employment allocations | | | | | | | | | | |
| Draft Policy 5 Existing employment sites | | | X | | X | | | | | |
| Draft Policy 6 Skills and training | | | X | | X | | | | | |
| Draft Strategic Policy 16 Tourism and visitor economy | | | X | | X | | | | | |
| Housing allocations | | | | | | | | | | |
| Draft Strategic Policy 17 Development of strategic housing sites | X | | | X | | | X | | X | |
| Draft Strategic Policy 18 Affordable housing | | | | X | X | | | | | |
| Draft Policy 7 Rural exceptions | | | | X | | | | | | |
| Draft Policy 8 Housing mix | X | | | X | | | | | | |
| Draft Policy 9 Self-build and custom build homes | | | | X | | | | | | |
| Draft Policy 10 Provision for gypsies and travellers | | | | X | | | | | | |
| Draft Strategic Policy 19 Retail hierarchy | | | | | | | | X | | |

| Policy | SO1 | SO2 | SO3 | SO4 | SO5 | SO6 | SO7 | SO8 | SO9 | SO10 |
|---|---|---|---|---|---|---|---|---|---|---|
| Draft Policy 11 Town centre uses | | | | | | | | X | | |
| Draft Strategic Policy 20 Social and cultural places | | | | | X | | | | | |
| Draft Strategic Policy 21 Safeguarding minerals and related infrastructure | | | | | | | | | | X |
| Draft Policy 12 Future mineral extraction and Secondary Aggregates | | | | | | | | | | X |
| Draft Policy 13 Restoration and aftercare (minerals) | | | | | | | | | | X |
| Draft Strategic Policy 22 Future requirements for waste facilities | | | | | | | | | | X |
| Draft Strategic Policy 23 Safeguarding waste facilities and related infrastructure | | | | | | | | | | X |
| Draft Policy 14 Restoration and aftercare (waste) | | | | | | | | | | X |

**Table A.1 Relationship between the Strategic Objectives and Draft Plan Policies**

# Appendix B Housing site options

**B.1** The following table sets out details of the housing site options, their status and estimated potential yield.

| Site reference | Settlement | Site location | Status | Estimated yield (source) |
|---|---|---|---|---|
| HOU002 | Immingham | Land to west of Pilgrims Way | Under construction | 145 (consented) |
| HOU005 | Immingham | Land to the west of Stallingborough Road | Other | 319 (estimated) |
| HOU006 | Immingham | Land to the east of Stallingborough Road | Consented | 605 (consented) |
| HOU233 | Immingham | Land at Willows Farm | Under construction | 8 (consented) |
| HOU301 | Immingham | Land at Trenchard Close | Under construction | 18 (consented) |
| HOU367 | Immingham | Former Immingham Golf Course | Other | 764 (estimated) |
| HOU373 | Immingham | Land of former tower blocks Washdyke Lane | Other | 107 (promoted) |
| HOU378 | Immingham | 32 Battery Street | Other | 2 (promoted) |
| HOU379 | Immingham | Corner of Waterworks Street and Humberville Road | Other | 4 (promoted) |
| HOU294 | Stallingborough | Land off Station Road adjacent to railway station | Consented | 14 (consented) |
| HOU361A | Stallingborough | Land west of Stallingborough | Other | 750 (promoted) |
| HOU361B | Stallingborough | Land west of Stallingborough (south of Little London Farm) | Other | 250 (promoted) |
| HOU010B | Healing | Land north or Wisteria Drive (Larkspur Avenue), Land west of Healing | Under construction | 250 (consented) |
| HOU212 | Healing | Land at Meadow Farm | Other | 12 (promoted) |
| HOU134 | Habrough | Land at Station Road | Consented | 118 (consented) |
| HOU180A | Habrough | Land north west of Station Road | Other | 50 (promoted) |

| Site reference | Settlement | Site location | Status | Estimated yield (source) |
|---|---|---|---|---|
| HOU363 | Habrough | Chapel Lane | Other | 10 (promoted) |
| HOU066 | Laceby | Land north of Nursing Home, Butt Lane | Under construction | 68 (consented) |
| HOU068A | Laceby | Land off Blyth Lane | Under construction | 100 (consented) |
| HOU068B | Laceby | Land off Butt Lane | Other | 119 (estimated) |
| HOU075A | Laceby | Land of Field Head Road and west of Charles Avenue | Under construction | 152 (consented) |
| HOU310 | Laceby | Field west of Butt Lane | Other | 150 (promoted) |
| HOU351 | Laceby | Land at Caistor Road | Other | 64 (promoted) |
| HOU351A | Laceby | Land at Caistor Road | Other | 90 (promoted) |
| HOU369 | Aylesby | Land south of Main Road | Other | 20 (estimated) |
| HOU370 | Aylesby | Land north of Main Road | Other | 10 (promoted) |
| HOU017 | Grimsby | Land at 71 to 85 Hamilton Street and Cleethorpe Road | Other | 30 (2018 allocation) |
| HOU018 | Grimsby | Land at Macaulay Lane ('West Marsh Renaissance') | Under construction | 224 (consented) |
| HOU021 | Grimsby | Land west of Great Coates (Church Farm) | Other | 150 (promoted) |
| HOU037 | Grimsby | Land to west of Cartergate | Other | 14 (2018 allocation) |
| HOU044 | Grimsby | Ladysmith Road (former Birds Eye site) | Under construction | 260 (consented) |
| HOU045 | Grimsby | Land at cricket ground and Littlefield Lane | Consented | 78 (promoted) |
| HOU047 | Grimsby | Claremont House, 7 Welholme Avenue | Under construction | 22 (consented) |
| HOU059 | Grimsby | The Cedars offices, Eastern Inway | Under construction | 17 (consented) |
| HOU061A | Grimsby | Land south of depot, Weelsby Avenue | Other | 33 (estimated) |

| Site reference | Settlement | Site location | Status | Estimated yield (source) |
|---|---|---|---|---|
| HOU062 | Grimsby | Land south of Cornwell Close, Diana Princess of Wales Hospital | Under construction | 104 (consented) |
| HOU063A | Grimsby | Land north of Wootton Road | Other | 16 (estimated) |
| HOU064A | Grimsby | Burwell Drive/Winchester Road | Other | 20 (promoted) |
| HOU074A | Grimsby | Land at Humberston Road (north of Weelsby Hall Farm site (HOU074B)) | Under construction | 122 (consented) |
| HOU074C | Grimsby | Land at Hewitts Circus (south east of Weelsby Hall Farm site (HOU074B)) | Under construction | 152 (consented) |
| HOU076 | Grimsby | Scartho Top | Under construction | 1,349 (estimated) |
| HOU096 | Grimsby | Land south of Southern Walk | Other | 141 (promoted) |
| HOU118 | Grimsby | Central Parade, Yarborough Estate, Freshney Green | Other | 165 (2018 allocation) |
| HOU119 | Grimsby | Cordage Mill, Convamore Road | Other | 113 (2018 allocation) |
| HOU128 | Grimsby | Land at former Western School and to the rear of Grange Primary School | Under construction | 387 (consented) |
| HOU140A | Grimsby | Land at Weelsby Avenue depot | Other | 23 (2018 allocation) |
| HOU144 | Grimsby | Land off College Street | Under construction | 14 (consented) |
| HOU150 | Grimsby | Land at the south Diana Princess of Wales Hospital site | Under construction | 221 (consented) |
| HOU151 | Grimsby | Land at the north west of Diana Princess of Wales Hospital site | Other | 19 (2018 allocation) |

| Site reference | Settlement | Site location | Status | Estimated yield (source) |
|---|---|---|---|---|
| HOU204 | Grimsby | Peaks Lane | Other | 18 (promoted) |
| HOU217 | Grimsby | Land west of Peaks Parkway | Other | 550 (promoted) |
| HOU231 | Grimsby | Fletchers Yard, Wellowgate | Other | 12 (consented) |
| HOU232 | Grimsby | 2 to 4 (Hazeldene House) and 2A Welholme Road | Other | 14 (consented) |
| HOU272A | Grimsby | Land at Cartergate | Other | 12 (promoted) |
| HOU281 | Grimsby | Land to the south end of Peaks Lane, west of Peaks Parkway (A16) | Other | 635 (promoted) |
| HOU296 | Grimsby | Land off Shaw Drive and Glebe Road | Under construction | 160 (consented) |
| HOU302 | Grimsby | 2 to 6 Littlefield Lane | Other | 10 (consented) |
| HOU303 | Grimsby | 29 to 31 Chantry Lane | Consented | 11 (consented) |
| HOU342 | Grimsby | Grimsby West Urban Extension | Other | 3,337 (2018 allocation) |
| HOU354A | Grimsby | Duchess Street car park | Other | 80 (2018 allocation) |
| HOU355 | Grimsby | Scartho Top playing field, Heimdal Road | Other | 100 (2018 allocation) |
| HOU358 | Grimsby | Land corner of Convamore Road and Eleanor Street | Under construction | 15 (consented) |
| HOU371 | Grimsby | Land west of Louth Road | Other | 250 (promoted) |
| HOU380 | Grimsby | Garth Lane (Alexander Docks) | Other | 67 (estimated) |
| HOU034A | Cleethorpes | Chapmans Pond, Hawthorne Avenue | Other | 110 (consented) |
| HOU034B | Cleethorpes | Land off Pelham Road | Consented | 14 (consented) |
| HOU034C | Cleethorpes | Land off Pelham Road | Other | 118 (estimated) |
| HOU042 | Cleethorpes | Site of former Clifton Bingo, Grant Street | Consented | 99 (consented) |

| Site reference | Settlement | Site location | Status | Estimated yield (source) |
|---|---|---|---|---|
| HOU056B | Cleethorpes | Thrunscoe Centre, Highgate | Under construction | 42 (consented) |
| HOU057 | Cleethorpes | Winter Gardens, Kingsway | Under construction | 25 (consented) |
| HOU074B | Cleethorpes | Land north and west of Pennells Garden Centre, Weelsby Hall Farm, Humberston Road | Other | 1,500 (promoted) |
| HOU141A | Cleethorpes | Former Matthew Humberston C of E School (Lower) playing fields | Other | 100 (2018 allocation) |
| HOU249A | Cleethorpes | 65 Park Street/Land at Brereton Avenue | Other | 14 (consented) |
| HOU316 | Cleethorpes | Former Leaking Boot, Grimsby Road and Suggitts Lane | Under construction | 21 (consented) |
| HOU353 | Cleethorpes | Lindsey Lower School playing fields, Beacon Avenue/Bentley Street | Other | 80 (2018 allocation) |
| HOU381 | Cleethorpes | Bursar Primary School, Bursar Street | Other | 16 (promoted) |
| HOU082 | Humberston | Land at South View adjacent to Coach House Public House | Other | 17 (2018 allocation) |
| HOU084A | Humberston | Land south of Humberston | Other | 198 (2018 allocation) |
| HOU092 | Humberston | Land to rear of 184 Humberston Avenue ('Keystone Development') | Under construction | 400 (consented) |
| HOU097 | Humberston | Land north of South Sea Lane | Other | 31 (2018 allocation) |
| HOU100A | Humberston | Land south of South Sea Lane | Other | 125 (promoted) |
| HOU100B | Humberston | Land south of South Sea Lane | Other | 202 (estimated) |

| Site reference | Settlement | Site location | Status | Estimated yield (source) |
|---|---|---|---|---|
| HOU124 | Humberston | Land off Altyre Way, Humberston Road | Consented | 50 (consented) |
| HOU139 | Humberston | Land to the north of Humberston Avenue | Other | 311 (2018 allocation) |
| HOU147 | Humberston | Land at 184 Humberston Avenue | Under construction | 30 (consented) |
| HOU295 | Humberston | Land off Forest Way | Under construction | 9 (consented) |
| HOU309 | Humberston | Land at South Sea Lane | Other | 60 (promoted) |
| HOU340 | Humberston | Land south of 69 to 90 Humberston Avenue | Other | 190 (promoted) |
| HOU346 | Humberston | Land off Church Lane | Other | 89 (promoted) |
| HOU346A | Humberston | Land off Church Lane | Other | 93 (promoted) |
| HOU346B | Humberston | Land off Church Lane | Other | 424 (estimated) |
| HOU365 | Humberston | Land off Conistion Crescent | Other | 347 (estimated) |
| HOU086 | New Waltham | Land off Weelsby View | Other | 150 (promoted) |
| HOU087 | New Waltham | Land off Louth Road and Side Lane | Orher | 500 (promoted) |
| HOU095A | New Waltham | Land west of Greenlands | Under construction | 204 (consented) |
| HOU095B | New Waltham | Land adjacent to 401 Louth Road | Under construction | 9 (consented) |
| HOU101B | New Waltham | Humberston Park Golf Club (Par 3) | Under construction | 121 (consented) |
| HOU104 | New Waltham | Land at Louth Road | Other | 300 (2018 allocation) |
| HOU105 | New Waltham | Land west of Louth Road and opposite Toll Bar School | Under construction | 400 (consented) |
| HOU105A | New Waltham | Land west of Louth Road and opposite Toll Bar School | Other | 39 (promoted) |

| Site reference | Settlement | Site location | Status | Estimated yield (source) |
|---|---|---|---|---|
| HOU105B | New Waltham | Land west of Louth Road and opposite Toll Bar School | Other | 57 (promoted) |
| HOU146 | New Waltham | Land to south of 32 to 66 Humberston Avenue (Millennium Park) | Under construction | 385 (consented) |
| HOU280 | New Waltham | Land off Peaks Lane | Under construction | 20 (promoted) |
| HOU289 | New Waltham | Land at 31 Enfield Avenue and 25 Enfield Avenue | Under construction | 13 (consented) |
| HOU360 | New Waltham | Land south of New Waltham (Millenium Farm) NOTE: this site extends over the Council boundary into East Lindsey District Council area | Other | 3,000 to 3,500 (promoted) |
| HOU110 | Waltham | Land at Cheapside | Other | 230 between HOU110 and HOU129 (2018 allocation) |
| HOU111 | Waltham | Land rear of Sandon House, Barnoldby Road and west of Brigsley Road | Under construction | 199 (consented) |
| HOU112 | Waltham | Land to north west of Golf Course Lane | Under construction | 95 (consented) |
| HOU129 | Waltham | Land to the west of Cheapside | Other | 230 between HOU110 and HOU129 (2018 allocation) |
| HOU135 | Waltham | Land to west of Fallowfield Road, Scartho | Other | 1,700 (promoted) |
| HOU274 | Waltham | Land to the south of Station Road and east of Carmargue Avenue | Other | 100 (promoted) |
| HOU287 | Waltham | Land east of Grimsby Road | Under construction | 23 (consented) |

| Site reference | Settlement | Site location | Status | Estimated yield (source) |
|---|---|---|---|---|
| HOU288 | Waltham | Land east of Grimsby Road and north or Station Road | Under construction | 51 (consented) |
| HOU290 | Waltham | Land rear of Grove Farm Stables, Station Road | Other | 150 (promoted |
| HOU291 | Waltham | Waltham Airfield | Other | 200 (promoted) |
| HOU292 | Waltham | Land west of Bradley Road | Under construction | 66 (consented) |
| HOU338 | Waltham | The Old Nurseries, Cheapside | Other | 14 (promoted) |
| HOU349A | Waltham | Land to the south west of Cheapside | Other | 68 (estimated) |
| HOU356 | Waltham | Land south of Ings Lane | Under construction | 10 (consented) |
| HOU362 | Waltham | Land east of Bradley Road | Other | 199 (promoted) |
| HOU366 | Waltham | Land east of Ings Lane | Other | 90 (estimated) |
| HOU368A | Waltham | Land east of Bradley Road (Grove Farm site 1) | Other | 87 (promoted) |
| HOU368B | Waltham | Land east of Bradley Road (Grove Farm site 2) | Other | 300 (promoted) |
| HOU368C | Waltham | Land east of Bradley Road (Grove Farm site 3) | Other | 144 (promoted) |
| HOU368D | Waltham | Land east of Bradley Road (Grove Farm site 4) | Consented | 64 (consented) |
| HOU372 | Waltham | Land west of Cheapside | Other | 215 (promoted) |
| HOU374 | Barnoldby-le-Beck | Land off Waltham Road (adjoining Waltham village) | Other | 36 (promoted) |
| HOU364 | Bradley | Church Lane | Other | 40 (estimated) |
| HOU157A | Ashby-cum-Fenby | Church Fields | Other | 3 (promoted) |
| HOU286 | Brigsley | Land rear of Strands, Waltham Road | Other | 14 (promoted) |

| Site reference | Settlement | Site location | Status | Estimated yield (source) |
|---|---|---|---|---|
| HOU286A | Brigsley | Land rear of Strands, Waltham Road | Other | 16 (promoted) |

**Table B.1 Housing site options**

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*North East Lincolnshire Council and EQUANS, working in partnership to deliver a stronger economy and stronger communities*

# Appendix 2: NELC Local Plan 2018

# Planning for Growth

Local Plan 2013 to 2032
(Adopted 2018)

Local Plan
North East Li Inshi

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Working in Partnership

# Foreword

Local Plan
North East Lincolnshire

North East Lincolnshire Council is focused on creating opportunity for people: opportunity to get a job; to have a home; and to be part of a strong community. This Local Plan shows where we will be helping to create new jobs, where homes will be built and how we are going to protect and enhance those features of our Borough which are special.

We are entering a period of economic growth that has not been seen in a generation. Between 2013 and 2032 we plan to help deliver 8,800 new jobs. A significant proportion of these will be focused around our five key economic sectors:

- Ports and logistics;
- Chemicals;
- Food processing;
- Renewable energy; and,
- Visitor economy, services and retail.

Our *Economic Strategy* sets out how we are supporting these sectors to create sustained employment for people in North East Lincolnshire. This Local Plan shows where we want those jobs to be created, and what that means for our Borough. It gives us a picture of what our growth plans will look like by 2032.

Our thriving economy will encourage more people to choose to live here. The evidence shows that more than 13,000 homes will be needed to meet the demands of our growing population. This will mean change for all parts of the Borough.

That change comes with great opportunities as well as challenges. New housing in our area will attract more investment from Government. New housing creates jobs and develops skills. New homes help attract and retain our young people, giving them a chance to have a home of their own in communities they feel part of, and where they can access good employment.

Supporting Stronger Communities is one of the key ambitions of the Council, along with enabling a Stronger Economy. This Local Plan shows how communities will be supported by protecting our world class environments, such as the coast and the Lincolnshire Wolds Area of Outstanding Natural Beauty, for everyone to enjoy now and into the future. It also shows how new development will help enhance the area through regeneration of our town centres.

Delivery of this ambition means working together across council departments and political parties. We will also work with our partners to deliver the best outcomes in the most effective and efficient ways. We will work with communities and support them in taking greater control over the things that matter most to them.

This is our Plan for Growth. We would like to thank everyone who has helped to develop this Plan, and look forward to working with you to ensure that everyone benefits from a sustainable future.

# Foreword

Councillor Ray Oxby

Leader of the Council and Portfolio Holder for Communities

Councillor David Watson

Deputy Leader and Portfolio Holder for Energy and Environment

Councillor Stephen Beasant

Leader of the Liberal Democrat group

Councillor Philip Jackson

Economy Scrutiny Panel Chair and Leader of the Conservative group

Councillor John Stockton

Leader of the UKIP group

## Policies

Policies

Figures

Local Plan
North East Lincolnshire

Local Plan
North East Lincolnshire

**1.1** The Local Plan (the Plan) is a key document which will guide the changing use of land in the Borough and define the purpose to which it is put in the future. The Plan has three central themes:

1. building the economy we need;
2. building the homes we need; and,
3. building the places we need.

**1.2** It also sets out the Council's approach to accommodating the future requirements in relation to the demands on the Borough's mineral resource and waste needs.

**1.3** The Plan sets out the Council's vision and strategy for development, including why, where and how the Borough will grow. The Plan is a plan for growth and aims to ensure North East Lincolnshire becomes a sustainable location in which people can live, work, and enjoy their recreation, both now and in the future.

**1.4** The Borough faces some critical challenges over the period of the Plan, including:

1. directing growth in a positive and sustainable way;
2. addressing current weaknesses and community problems;
3. promoting the well-being of the population;
4. creating places that we are proud to be part of;
5. growing the economic opportunities;
6. ensuring housing growth takes place in appropriate locations;
7. protecting the environment that makes the Borough unique; and,
8. ensuring that infrastructure needs are met.

**1.5** The Plan has been prepared at a time when there is genuine opportunity to deliver major economic growth over the next 15 to 20 years. The prospect of growth is real; we are already witnessing the signs of a new and exciting future for the area. New industries associated with growth in offshore wind operations and maintenance activities at the Port of Grimsby will stay with us for at least one generation, and possibly a number of generations. The challenge is to continue to capture this potential and ensure that it makes for more prosperous communities.

**Preparing this Local Plan**

**1.6** The preparation of this Plan commenced in 2012, and included five rounds of public consultation. An examination of the Plan was conducted during 2017 by a independent Inspector. Further details are available on the North East Lincolnshire Council website for the foreseeable future.

**1.7** The Council made the formal decision to adopt the Plan on 22 March 2018.

**Replacement of previous Local Plans**

**1.8** On adoption this Plan replaces the *North East Lincolnshire Local Plan, including Minerals and Waste Policies* (adopted November 2003, and saved policies (2007)) and the following Supplementary Planning Guidance documents:

1. *Conversion of Properties to Flats and Houses in Multiple Occupation* (2002);
2. *Mobility and Parking Standards* (2004);
3. *Contributions to Education Facilities* (2005);
4. *Investment through Growth* (2005);
5. *Landscape Design* (2005); and,
6. *The Grimsby Strategic Framework* (2005).

# Relationship to other strategies and plans

Local Plan
North East Lincolnshire

Local Plan
North East Lincolnshire

**2.1** National Planning Policy is set out in the *National Planning Policy Framework* (NPPF) (2012), the *National Planning Policy for Waste* (NPPW) (2014), and *Planning policy for traveller sites* (2015).

**2.2** The NPPF (paragraph 14) sets out that the overriding principal purpose of planning is to achieve sustainable development. The Plan, should therefore:

1. positively seek opportunities to meet the development needs of the Borough; and,
2. meet objectively assessed needs, with sufficient flexibility to adapt to rapid change, unless:

    a. any adverse impacts of doing so would significantly and demonstrably outweigh the benefits, when assessed against the policies in the NPPF taken as a whole; or,
    b. specific policies in the NPPF indicate development should be restricted.

**2.3** The NPPF (paragraph 156) recognises that local plans are the key to delivering sustainable development that reflects the vision and aspirations of local communities. Achieving each of the economic, social and environmental dimensions of sustainable development requires strategic priorities for the area to be established, and strategic policies to deliver:

1. the homes and jobs needed in the area;
2. the provision of retail, leisure and other commercial development;
3. the provision of infrastructure for transport, telecommunications, waste management, water and energy (including heat);
4. the provision of health, security community and cultural infrastructure and other local facilities; and,
5. climate change mitigation and adaptation, conservation and enhancement of the natural and historic environment, including landscape.

**2.4** Crucially, the NPPF requires local plans to:

1. plan positively for the development and infrastructure requirement in the area to meet the objectives, principles and policies of the NPPF;
2. proactively drive and support sustainable development;
3. be drawn up over an appropriate timescale, preferably a 15 year time horizon, taking account of longer-term requirements and be kept up-to-date;
4. be based on co-operation with neighbouring authorities, public, voluntary and private sector organisations;
5. indicate broad locations for strategic development on a key diagram and land use designations on a policies map;
6. allocate sites to promote development and flexible use of land, bringing forward new land where necessary, and provide detail on form, scale, access and quantum of development where appropriate;
7. identify areas where is may be necessary to limit freedom to change the use of buildings, and support such restrictions with a clear explanation;
8. identify land where development would be inappropriate, for instance because of its environmental or historic significance;
9. support the transition to a low carbon future in a changing climate;
10. secure high quality design and a good standard of amenity; and,
11. contain a clear strategy for enhancing the natural, built and historic environment, and supporting Nature Improvement Areas where they have been identified.

**2.5** The NPPF also places a strong emphasis on viability and deliverability; stressing the need to ensure that there is a reasonable prospect that development, and any necessary infrastructure, is deliverable in a timely manner.

**2.6** The NPPF sets out the Government's aim to ensure that resources are used in a sustainable and efficient manner. This means ensuring that sufficient facilities are provided for waste to be managed sustainably through the reuse, recovery, and, as a last resort, the disposal of waste in a manner which does not endanger human health and the environment.

**2.7** *Planning policy for traveller sites* outlines the Government's aim to ensure fair and equal treatment for travellers, in a way that facilitates the traditional and nomadic way of life of travellers while respecting the interests of settled communities. In the same way as planning for housing need, the Government expects local planning authorities to undertake an assessment of need for pitches and plots to meet gypsy and traveller needs, and plan positively to meet this need through the identification of sites.

**2.8** The Government has prepared National Policy Statements (NPSs) which outline the Government's objectives for the development of nationally significant infrastructure. These NPSs cover different types of infrastructure relevant to North East Lincolnshire, including ports and renewable energy.

Local Plan
North East Lincolnshire

**3.1** The *Localism Act 2011* and the NPPF places a legal duty on local planning authorities and specific prescribed bodies to engage constructively, actively, and on an ongoing basis to maximise the effectiveness of tackling strategic cross-boundary matters through Local Plan preparations. The Duty to Co-operate is not a duty to agree, however, local planning authorities are required to make every effort to secure the necessary co-operation in order to produce effective and deliverable policies on strategic cross-boundary matters.

**3.2** North East Lincolnshire has close ties with neighbouring authorities, and others further afield. The Borough is separated by the Humber Estuary from East Riding of Yorkshire and Kingston upon Hull on the north bank, but shares several environmental and economic influences and issues. North Lincolnshire lies to the west and the districts of East Lindsey and West Lindsey, within the County of Lincolnshire, directly adjoin the Borough to the south.

**3.3** The Council has worked specifically with neighbouring authorities including East Riding of Yorkshire Council, Hull City Council, and North Lincolnshire Council to jointly prepare evidence. This has helped to bring about mutual understanding of the wider implications of potential policy approaches across the authorities. The Council is, however, committed to working closely with all neighbouring authorities as their respective Local Plans are progressed. This is to ensure that functional relationships are fully explored and addressed, with specific relationship to aspects of flood risk, housing, economic development, habitat protection, waste and minerals, transportation, landscape and ecology, and wider infrastructure delivery.

**3.4** A separate *Duty to Co-operate Statement* has been prepared, which details the work that has been undertaken with neighbouring authorities and other prescribed bodies during the development of the Plan. The paragraphs that follow provide an overview of the context in which the Duty to Co-operate mandate operates for North East Lincolnshire.

**Functional economic area**

**3.5** The North East Lincolnshire economy itself functions as part of a wider economic area. The Humber Estuary is promoted as the UK's energy estuary and particularly as a focus for renewable energy. Each authority has a distinct and mutually supportive economic role in developing the sub-regional economy.

**3.6** The cross-boundary nature of the functional economic area reflects the importance of communication and co-operation between neighbouring local authorities. Table 3.1'Functional economic themes in North East Lincolnshire' provides an overview of the main functional economic themes that operate in the Borough.

**3.7** The travel to work patterns demonstrate a high degree of self-containment with over 86% of employed residents working within the Borough.[1] Equally, over 80% of those who work in the Borough also live there. Of those who do commute outside the Borough, most travel to locations in Lincolnshire or within Yorkshire and Humber. A similar pattern also emerges with the few workers that commute into the area coming from elsewhere within Lincolnshire and Yorkshire and Humber.

**3.8** Geographically, Grimsby's 'travel to work area' extends beyond the Borough boundary; a reflection of the small geographical size of the Borough and the employment opportunties available, particularly along the South Humber Bank.

1 *Annual Population Survey* (2013).

| Functional economic themes in North East Lincolnshire[2] | | |
|---|---|---|
| **Theme** | **Comment** | **Strategic relationships** |
| **Transport** | Accessibility and connectivity are important determinants in functional economic geographies. | Lincolnshire, the Humber area and east Yorkshire. |
| **Rural/Urban** | Urban and rural areas often have separate economies and requirements. | North Lincolnshire and Hull. |
| **Labour markets** | Significant degree of interdependence between local authority areas in the Humber area. | Hull, East Riding, North Lincolnshire, East Lindsey and West Lindsey. |
| **Housing markets** | Clear indication from the 2013 *Strategic Housing Market Assessment* of strong interactions between the economic and residential functions of adjacent authorities. | North Lincolnshire, East Lindsey and West Lindsey. |
| **Administrative boundaries** | Key economic linkages north and south of the Humber Estuary as a result of the Borough's association with the Humber LEP and Greater Lincolnshire LEP. | Humber LEP: North Lincolnshire, Hull and East Riding.<br><br>Lincolnshire LEP: County of Lincolnshire. |

Table 3.1 Functional economic themes in North East Lincolnshire

**3.9** The retail catchment also stretches beyond the Borough boundary, again reflecting the strength of the Grimsby centre but also the weakness of neighbouring competing centres. This is highlighted in the high levels of retained expenditure in the Borough. The local economy is also boosted by the additional trade captured as a consequence of the draw of Cleethorpes as a key tourist resort.

**3.10** North East Lincolnshire Council is a member of two Local Enterprise Partnerships (LEPs). Both LEPs have produced *Strategic Economic Plans* (SEP). The SEP forms the basis of a Growth Deal with Government and will be a determinant of the allocation of the Local Growth Fund (LGF) to each LEP. Further details on the LEP priorities are provided in the following section.

2 *North East Lincolnshire Economic Baseline* (2014).

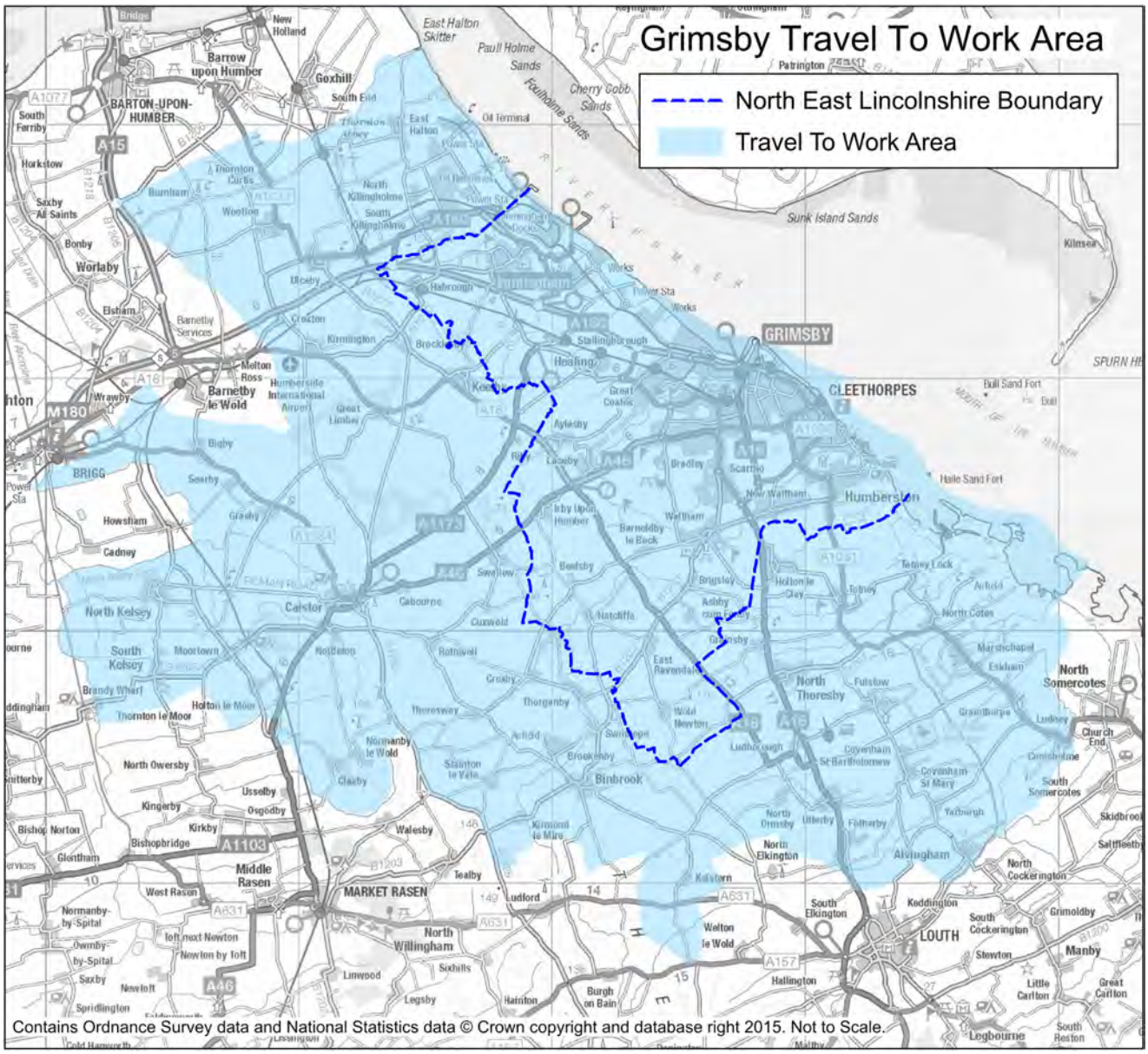


Figure 3.1 Travel to work area

**3.11** If the scale of the opportunity reflected in the SEPs is fully realised and a step change in local economic performance is achieved the functional and strategic relationships with neighbouring authorities may be altered during the lifetime of the Plan. As these changes are difficult to predict, the Local Plan needs to be flexible to accommodate this and react to future trends as the emerge.

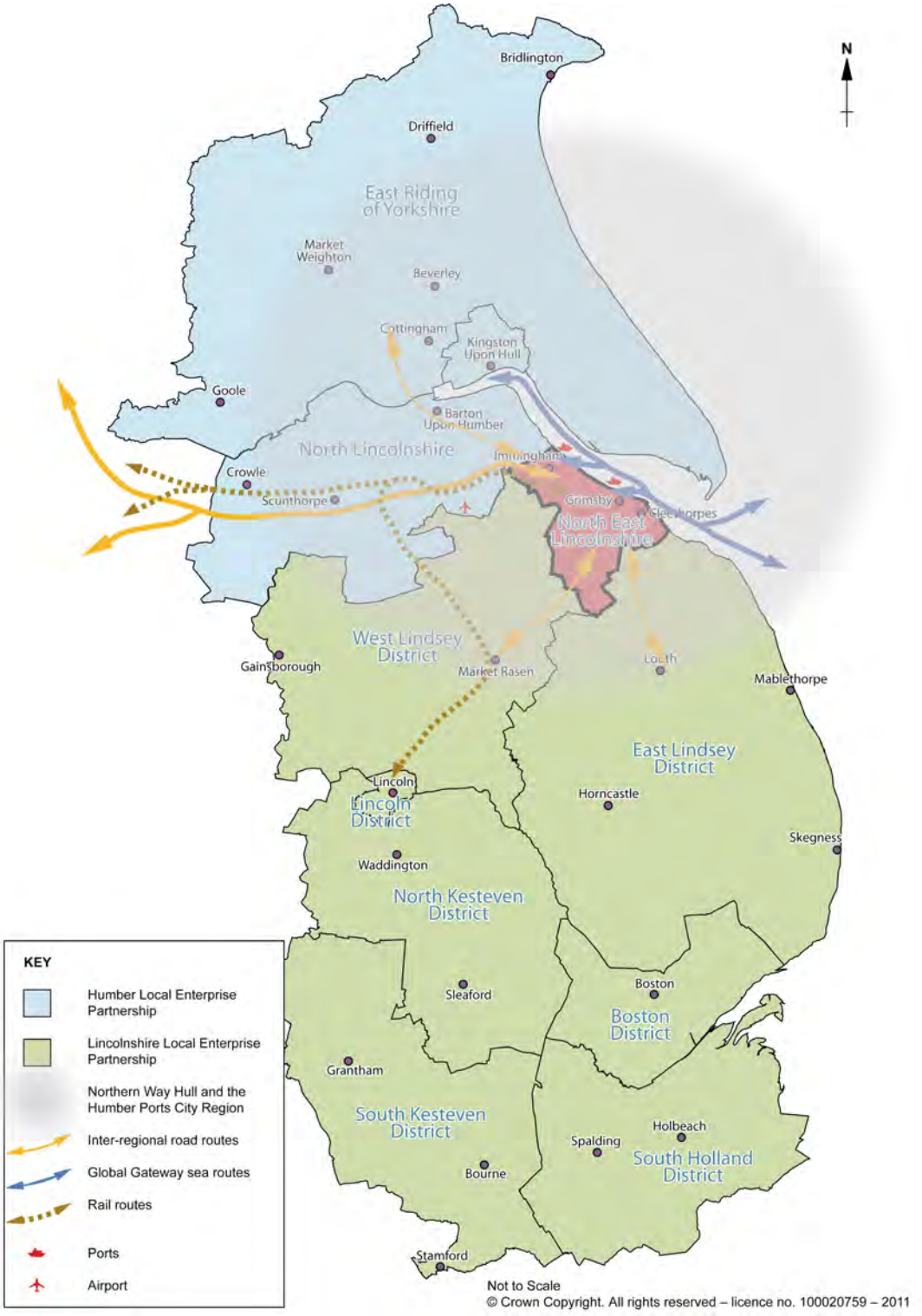


Figure 3.2 Local Enterprise Partnerships

## Local Enterprise Partnerships

### Humber Local Enterprise Partnership Strategic Economic Plan (2014-2020) (Humber SEP)

**3.12** The Humber LEP comprises of North and North East Lincolnshire together with Hull and East Riding. The Humber SEP is an integrated plan for growth and is structured around five 'strategic enablers': infrastructure; business; growth; sense of place; flood risk; and, environmental management.

**3.13** The Humber SEP refers to the LEP's commitment to producing a *Humber Spatial Plan* as part of the Hull & Humber City Deal. This will not be a statutory plan and will not set out new policy. It takes as its basis the respective existing and emerging plans of the four local authorities and is intended to provide a single point of reference for potential investors and developers as to the overall strategic planning framework in the Humber. It also identifies major infrastructure and other investment priorities which would facilitate growth.

**3.14** The Humber LEP focuses on capturing the advantages offered by the estuary and the ports, and opportunities provided by large areas of developable land. These is also a strong focus on ensuring local people are able to take advantage of future employment opportunities. The *Strategic Economic Plan* includes a draft 'spatial plan key diagram', which recognises that housing of the right type, in the right areas, is important to attract new investment; and that accessibility and connectivity within the LEP area and beyond are important to the area's overall attractiveness and job opportunities.

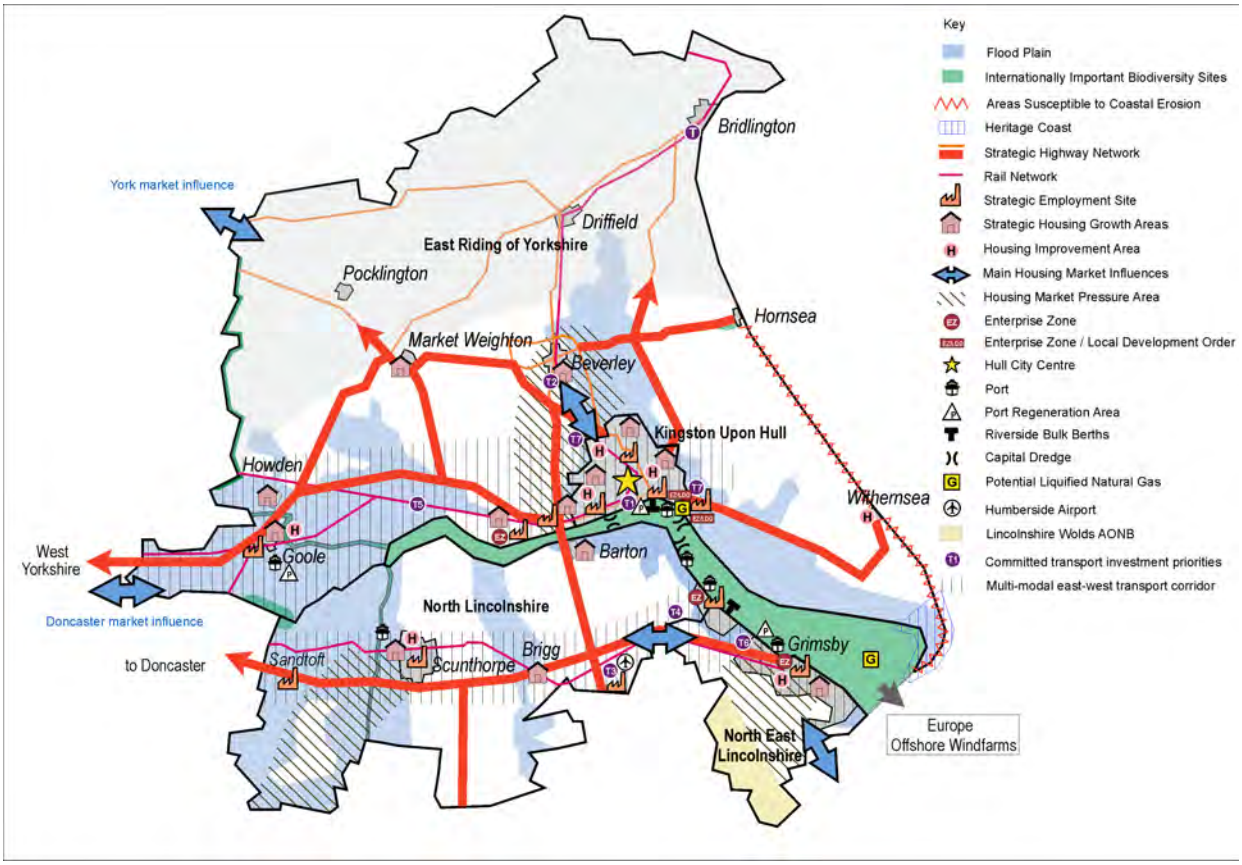


Figure 3.3 Draft Humber LEP spatial key diagram

**Greater Lincolnshire Local Enterprise Partnership Strategic Economic Plan (Lincolnshire SEP)**

**3.15** The Greater Lincolnshire LEP comprises Lincolnshire County Council together with North and North East Lincolnshire. The Greater Lincolnshire LEP *Strategic Economic Plan* (2014) sets out Greater Lincolnshire's priorities for growth. These are focused on driving growth in the area's three strongest sectors - agri-food, manufacturing and visitor economy - and growing specific opportunities in health and care, local carbon and ports and logistics.

**3.16** The Lincolnshire SEP recognises the important role that key priorities play in meeting these strategic priorities. In North East Lincolnshire identified projects include: access to Employment Zones, which will deliver junction improvements on the A16 and A46 routes to and from Grimsby and support the development of new housing and employment sites. In addition, the LEP commits to promoting regeneration in Cleethorpes.

## Neighbourhood plans

**3.17** Neighbourhood planning, introduced by the *Localism Act* (2011), gives communities opportunities to shape the places they live in. Neighbourhood Plans can be prepared by town/parish councils or Neighbourhood Forums where town or parish councils do no exist. They must meet basic conditions set out in the legislation, including the need to be in general conformity with the strategic policies of the Local Plan and National Planning Policy. Once adopted, a Neighbourhood Plan will form part of the statutory development plan and will be used to make decisions on planning applications.

**3.18** At the time of publication no Neighbourhood Plans had been prepared in North East Lincolnshire. However, the Council will support any expressions of interest that come forward over the plan period.

## Local Nature Partnership

**3.19** Local Nature Partnerships (LNPs) work strategically to help areas manage the natural environment. There are two LNPs working within the Borough and the Council has sought opportunities to work collaboratively to deliver a strategic approach to encourage biodiversity:

1. the Greater Lincolnshire Nature Partnership, which works across Lincolnshire, North Lincolnshire and North East Lincolnshire, operates within a global framework of biodiversity conservation; and,
2. the Humber Nature Partnership, which works to support the sustainable management of the Humber Estuary European Marine Site in recognition of its international importance for wildlife.

## Marine Management Organisation

**3.20** As a coastal local planning authority the Council must take into account relevant marine plans prepared by the marine planning authority for England, the Marine Management Organisation (MMO), insofar as they have implications for onshore activities - and vice versa. Given the nature of marine plan boundaries there is often overlap with terrestrial plan areas and it is important, therefore, that there is compatibility between these types of development plans.

**3.21** Marine plans are a material consideration for the MMO and other public authorities with decision-making functions. The East Inshore and East Offshore Marine Plans provide guidance for sustainable development in English waters, and covers the coast and seas from Flamborough Head to Felixstowe, which includes North East Lincolnshire. The Council has worked collaboratively to ensure that the marine relevance of the Plan policies is fully understood.

Local Plan
North East Lincolnshire

Local Plan
North East Lincolnshire

**4.1** Positive planning is about understanding the relationship between people and places, meeting their needs and addressing the barriers to improved lives. In order to develop a strong plan for the future of the Borough, the characteristics of the place and the people whose lives are lived and shared there today must first be understood. **What is North East Lincolnshire like as a place? What is life like for the people who live here? What changes need to be made?** Answering those questions helps to make informed decisions about how to plan for the future.

**4.2** In Section 7'Summary', the strengths and weaknesses, the opportunities for improvement and the threats to North East Lincolnshire's future well-being are explored.




Figure 4.1 North East Lincolnshire

Local Plan
North East Lincolnshire

## What is North East Lincolnshire like as a place?

**5.1** Geographically, North East Lincolnshire is a relatively small area, covering 74 square miles (192sq km), on the east coast of England, at the mouth of the Humber Estuary. Although quite a small Borough, this is a complex place.

**5.2** It is a meeting place: the Humber Estuary meets the Lincolnshire coast; the Lincolnshire Wolds meet the coastal plain; ports and industry meet farmland and seaside; town meets county; Lincolnshire meets the Humber and Yorkshire; the Midlands meet the North; England meets the North Sea and its continental neighbours. These meeting have defined the place and influenced the lives of the people who live here, and they continue to do so. They combine to make North East Lincolnshire a place of contrasts, a place of challenges and a place of opportunities.

**5.3** In broad terms, North East Lincolnshire can be sub-divided into four 'Spatial Zones' - areas with similar characteristics, which display close physical and functional relationships. Those zones are outline verbally below, and graphically on Figure 5.1'Spatial zones'.

### Estuary Zone

**5.4** Consisting of mainly low-lying land, bordering and including the South Humber Bank, the Estuary Zone is an area of both ecological and industrial importance, giving rise to some particularly complex environmental planning issues and challenges, particularly associated with the Humber Estuary's international designations. It includes the nationally important port, and town of Immingham and accommodates a major concentration of port-related and energy-related industry and commerce: these and the estuary itself are the main influences on the character, appearance and form of this part of the Borough.

### Urban Area

**5.5** The Urban Area includes the port and town of Grimsby and the resort of Cleethorpes, two distinct and distinctive towns forming a continuous built-up area that extends along the estuary and coast for approximately 12kms, and about 4kms (average) inland. More than three-quarters of North East Lincolnshire's population live in the Urban Area. The townscape is varied, including Grimsby's docks and town centre, the sea front and seaside town at Cleethorpes all of which include buildings and places of significant heritage value together with large residential suburbs (some built by private enterprise, some by the Council and other social housing providers) which have developed successively since the Victorian era and continue to grow. Grimsby has some diverse inner urban areas including places where housing, commerce and industry are mixed; areas of older, terraced houses; areas of more recent high-rise and low-rise social and private housing; and larger houses and villas from the Victorian and Edwardian periods.

### Western & Southern Arc

**5.6** Wrapping around the western and southern edges of the Urban Area, and only slightly detached from it is an 'arc' of smaller settlements that have expanded to accommodate, at present, about 15% of the Borough's population. Some of these are villages that have grown but retain their older village cores (Waltham and Laceby); others are more recent suburban settlements with little remnant of an older village core (Humberston, New Waltham and Healing).

**Rural Area**

**5.7** The largest of the Spatial Zones by area, the Rural one is the smallest by population. It is characterised by an attractive rural landscape of open fields, farms and woodlands, rising and rolling into the Lincolnshire Wolds (a designated Area of Outstanding Natural Beauty) in the south of the Borough. There are several small villages and hamlets within this Zone, together providing homes for about two percent of North East Lincolnshire's population.

## Statement 1

**Planning for the Spatial Zones**

Recognising the varied geography of the Borough, the concept of 'Spatial Zones' has been developed, originally through the preparation of the Local Development Framework (LDF) Core Strategy, and then in the *New Local Plan Initial Issues and Options Paper* (2012).

Consultation has confirmed support for this as an approach that provides a logical basis for developing locally relevant policies. It provides an effective mechanism for considering and illustrating how 'planning for growth' will be delivered in different geographical areas in ways that recognise their different characteristics and reflect local distinctiveness.

The Spatial Zones are identified diagrammatically on Figure 5.1'Spatial zones'. The area boundaries are deliberately not distinct as the issues pertinent to different areas in some cases overlap.

The Vision (Section 9'A vision for North East Lincolnshire') on which this Local Plan is based describes a desired future for the whole Borough and for each Spatial Zone.

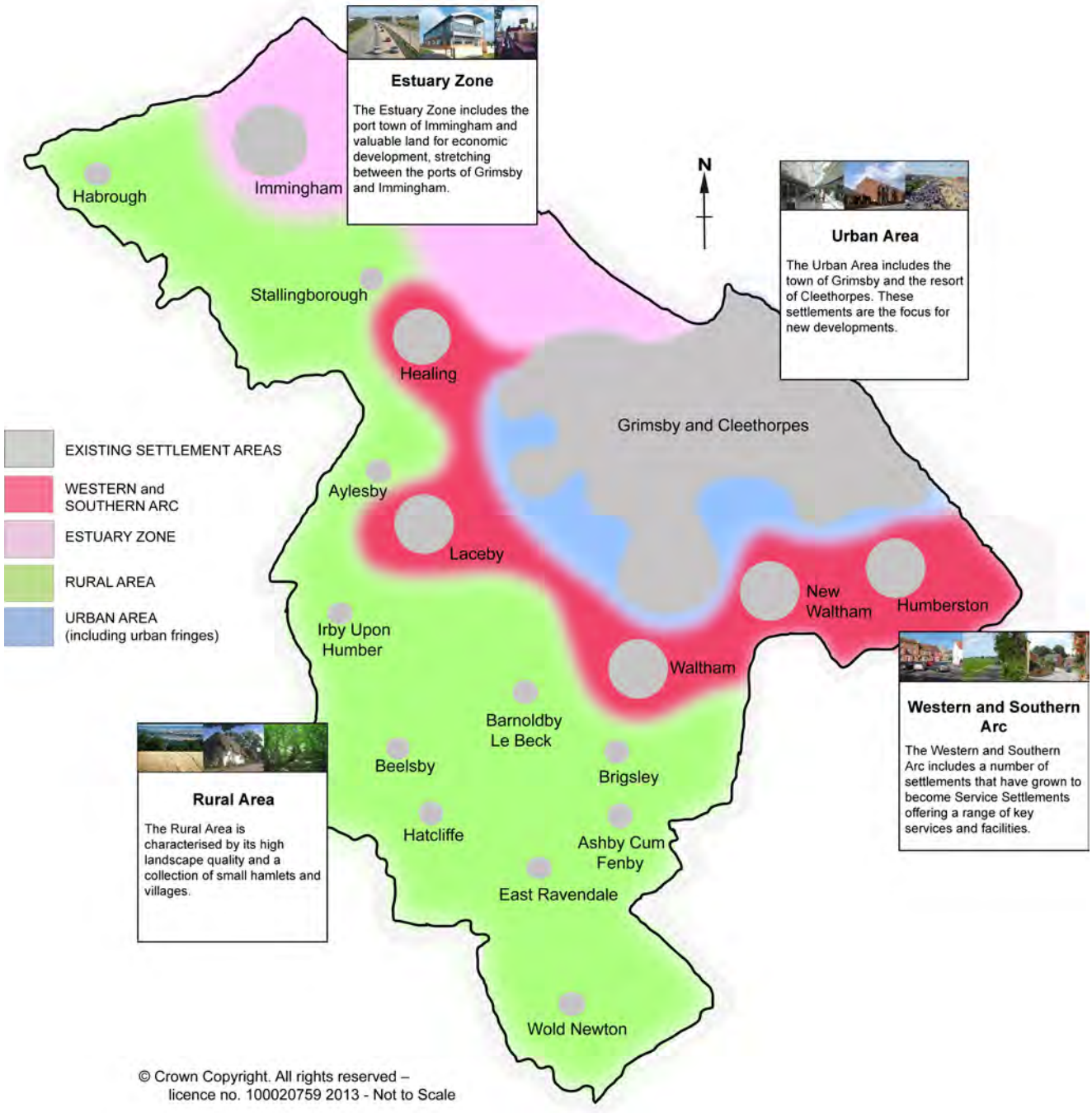


Figure 5.1 Spatial zones

Local Plan
North East Lincolnshire

**6.1** Together with other strategies being pursued by the Council and its partners and the work of local people, this Plan is intended to support the future well-being of North East Lincolnshire's communities. To do so, it must take account of all the different elements that affect life, including health, learning, employment, homes, environment, travel and access. These factors should not be considered in isolation from each other: they interact and are interdependent. Strength in one area will have an effect on other areas, whilst weakness in one area will similarly impact on others. Life experienced by people living in North East Lincolnshire today is a result of the interaction of all these factors.

**6.2** North East Lincolnshire is home to an estimated 159,804 people[3], most of whom live in urban places. Population change in Borough has been relatively static over recent years, with an increase of 1.1% in the decade 2004 to 2014, which compares to 8.2% nationally[4]. The net internal migration flows have been similarly static, with an outward trend recorded between the years 2011 to 2014. A large proportion of these movements can be attributed to outward migration amongst the 15 to 19 year age group and inward migration in the 20 to 29 year age group, which is influenced by students going on to higher education out of the area and a smaller proportion returning afterwards.

**6.3** The Borough's population is ageing. The number of young people living in the Borough is reducing and the proportion of older people (age 65 and over) is rising - and is predicted to continue to rise at a faster rate than the rest of the country during the plan period. There have been particularly sharp declines in the number of residents aged 5 to 15 and 30 to 40, which reflects historically weak training and employment opportunities and may also be attributed to shortcomings in the Borough's housing offer. The loss of economically active population is a particular challenge for the Plan, and one that must be reversed if economic growth aspirations are to be fully realised during the plan's timeframe.

**6.4** The Plan must respond to these trends and forecasts by ensuring there is an appropriate mix of facilities, services and housing within and close to communities. Section 8'Future development requirements' considers the growth trends and associated consequences for jobs and homes in more detail.

| **Key statistics: Area, population and demographics[5]** | | | | |
|---|---|---|---|---|
| **Area** | 192km$^2$ (74miles$^2$) | | | |
| **Population** | 159,616 | | | |
| **Age distribution** | **Year** | **0 to 19** | **20 to 64** | **65 and over** |
| | **2001** | 27.18% | 56.28% | 16.53% |
| | **2011** | 24.2% | 58.2% | 17.6% |
| **Population change (2001 to 2011)** | +1.0% | | | |

3 Office for National Statistics (2015).
4 Office for National Statistics (2015).
5 Source: Office for National Statistics.

| Key statistics: Area, population and demographics[5] | | |
|---|---|---|
| **Net internal migration** | **2011** | -300 |
| | **2012** | -500 |
| | **2013** | -130 |
| | **2014** | -430 |
| **Males/Females (%)** | | 49/51 |
| **Density** | | 8.3 persons per hectare (3.4 persons per acre) |
| **Percentage of population living in the three towns** | | 83 |
| **Percentage of population living in 'Arc' settlements** | | 15 |
| **Percentage of population 'white British'** | | 95.4 |
| **Percentage of population born in England** | | 93.7 |

Table 6.1 Key statistics: Area, population and demographics

## Doing business and working in North East Lincolnhshire

**6.5** The North East Lincolnshire economy currently comprises about 4,930 firms and employs some 64,650 people. There is a focus upon five key sectors - ports and logistics, renewables and energy, chemicals and processing, tourism and retail, and food processing. These collectively employ 19,230 people (30% of total) across 1,180 firms (27% of the total). The five sectors alone generate approximately 60% of the area's GDP.[6] The remaining 70% of all employment is split roughly equally between the public sector and other businesses.


Figure 6.1 Economic structure

5 Source: Office for National Statistics.
6 *North East Lincolnshire Sector Study* (2014).

### Ports and Logistics

**6.6** The Ports of Immingham and Grimsby combine to form the largest port complex in the UK by tonnage handled and the fourth largest in Europe. They are of international trading significance, providing a regional and national economic gateway and linking to European and other trading markets. Goods can be delivered to 75% of the UK population within a four-hour drive time, making the ports central to the UK's trade and communication links. As the movement of goods by sea remains the most economically efficient means of transporation, the Borough's logistics operations are set to remain strong for the foreseeable future.

### Renewables and Energy

**6.7** The Humber is now experiencing significant investment in the offshore wind industry, arising primarily as a result of the further development of 4,000 wind turbines in the southern North Sea. It is forecast that by 2030 these turbines will generate 50% of the UK's offshore energy provision. Sites for the manufacture and assembly of turbines will also be developed within the plan period. The development of Greenport at Hull (nacelee[7] and pre-installation assembly facility) is expected to generate around 700 jobs, whilst the ABLE Marine Energy Park at Killingholme will provide an offshore specific, port facility generating an estimated 5,000 jobs directly, and an estimated 10,000 jobs in the local supply chain.

**6.8** The Port of Grimsby's location as the closest operating port to these new offshore developments has attracted significant interest from Operations and Maintenance (O&M) companies looking to serve the needs of the expanding offshore wind energy sector with significant job numbers already created. The Port benefits from an Enterprise Zone and Simplified Planning Zone, which promotes investment from the renewables industry. This, together with the promotion of other low carbon energy schemes, such as biomass and fuel production is signifcant, but the rising pace of technological improvements mean that estimating forecasts of future growth is inherently difficult. What is apparent is that there are significant opportunities for economic growth in this sector.

### Chemicals and Processing

**6.9** The Phillips 66 and Total refineries located just outside the Borough, on the South Humber Bank, make up approximately 27% of the UK's refining capacity. Within the Borough, there is also a strong chemicals/process industry base with firms such as Novartis, BASF, BOC employing over 3,500 people. Whilst the *Economic Baseline Study* identifies potential for some growth in the sector, it recognises that all of these operations are inextricably linked to global market changes, with investment decisions relating to these sites made on that basis.

**6.10** A number of the above mentioned operations have land held to facilitate future business expansions, but this is very much dependent upon the area being able to compete successfully with other locations around the world.

### Food Processing

**6.11** Grimsby's association with the fishing industry dates back to the mid-19th century. Whilst the industry suffered from gradual decline since the mid-1970's, Grimsby has maintained its role and is recognised as one of the primary fish processing locations within Europe: 70% of all of the UK's fish is processed in Grimsby, and two firms have obtained Protected Geographical Indication (PGI) for Grimsby Smoked Fish. Key operators within the area include Young's (with the company HQ in Grimsby), Iceland Seachill, and Morrisons. The sector employed around 4,000 people across 90 firms in 2013.[8]

7 Cover housing that houses all of the generating components in a wind turbine, including the generator, gearbox, drive train and brake.
8 *North East Lincolnshire Sector Study* (2014).

**6.12** Local food processing operations have diversified over recent years as consumer demand have changed. This has largely been the result of having cold store facilities within the Borough, good access to logistics, the right workforce skills and the close proximity to Lincolnshire's agricultural market. Ready meals, soups and pizzas are currently processed within North East Lincolnshire, including recognised brands such as The Covent Garden Soup Company. In recognition of the Borough's strengths in food processing, the Council and the Humber LEP recently signed an Memorandum of Understanding (MOU) with the Malaysian Government that seeks to secure a location for a UK production base for a specialist food operator (understood to be of significant size, up to 80ha).

**Tourism and Retail**

**6.13** The seaside town of Cleethorpes dominates the Borough's visitor economy, supported by the cultural and tourism offer in Grimsby and the wider environment, which attracts both holiday makers and people visiting the area on business. Tourism also accounts for a significant number of jobs equating to approximately 7.2%[9] of those in the Borough. Jobs linked to the tourism industry are of particular importance to Cleethorpes, and generate income in the region of £0.5billion.[10]

**6.14** Tourism is currently one of the UK's fastest growing sectors and recent investment in the Borough has delivered two national brand hotels: the Holiday Inn Express in Grimsby, and Premier Inn in Cleethorpes. A Direct Marketing Organisation (DMO) has also been established, which works to promote the area through Invest North East Lincolnshire and Discover North East Lincolnshire. It is important that the Local Plan provides the right framework to support additional tourism related activity and works towards enhancing the attractiveness of the Borough.

**Challenges and Difficulties**

**6.15** Compared to its neighbours, North East Lincolnshire performs strongly in terms of economic output (GVA), reflecting the concentration of industrial activity. However, despite the good 'headline' performance, GVA levels have fallen from similar to the national average in 1998, to approximately 85% today. This productivity gap is indicative of the Borough's low wage economy and is a symptom of the relatively low skills base.

**6.16** In 2014, 13.7% of the Borough's working population were employed in non-skilled trades occupations compared to 10.9% nationally. The figure for those employed as managers, directors and professional staff represented 18.9% of the population, substantially less than the national share at 30%.[11] Firms in the Borough often, therefore, experience recruiting difficulties and this is demonstrated by the large number of contractors working within the area, particularly within the offshore O&M operations.

**6.17** Unemployment amongst the economically active working age population (16 to 74) was recorded at 9% between 2014 and 2015. This compares poorly to the regional average of 6%.[12] There are generally higher rates of employment amongst women than men in the Borough.

**6.18** A number of other indicators show that North East Lincolnshire is under-performing against regional and national averages. These include rates of personal insolvencies, jobseeker's allowance claimants, and people of working age claiming other key benefits. The numbers of people falling into these categories is higher

9 *Hotel Study for North East Lincolnshire* (2013).
10 *Development and Growth Plan* (2012).
11 *ONS Annual Population Survey* (2015).
12 *ONS Annual Population Survey* (2015).

locally than regional and national averages. Those claiming out-of-work benefits tend to be residents in inner areas of Grimsby and Cleethorpes, such as the East Marsh, West Marsh, South and Sidney Sussex areas.

**6.19** A significant proportion of industrial accommodation within the Borough is classes as poor quality and nearing the end of its useful economic life. Along with the low rental values and high costs of refurbishment, this has served to deter investment in existing sites. Development opportunities on good quality serviced land is becoming increasingly limited too; Europarc is currently the only location within the Borough where land is readily available for development as the costs of bringing forward speculative commercial development within the Borough have long been unviable.

**6.20** Employment opportunities are limited in the Borough's rural areas and access to employment can be difficult for those relying on public transport.

## Learning and developing skills in North East Lincolnshire

**6.21** The Council is committed to the transformation of learning and teaching environments throughout the Borough and will continue to work together with schools and partners to achieve its education goals.

**6.22** Although the local skills base is improving, educational attainment remains lower than the regional and national average at present. However, the number of residents attaining a qualification equivalent to a NVQ at level 2 or 3 is increasing at a rate faster than the regional and national average. The number of residents who have attained a qualification equivalent to an NVQ at level 4 remains significantly lower than the regional average (23.3% and national average (27.4%) at 16.2% of local residents.[13] The number of working age residents with no qualifications remains high, at 29.5%. This is significantly higher than the overall average for England, which stands at 22.5% of the population.[14]

**6.23** In 2010, just 8% of young people from low-income backgrounds progressed to Higher Education, compared to 18% nationally.[15] Responding to this situation, the Grimsby Institute of Further and Higher Education (GIFHE) has recently been granted the power to award foundation degrees and has further plans to expand its higher education provision.

## Moving around North East Lincolnshire - and beyond

**6.24** **Grimsby** is a sub-regional centre, drawing on a catchment wider than North East Lincolnshire that stretches to the west and south. The Grimsby travel to work area extends across the Borough boundaries into areas of North Lincolnshire, West Lindsey and East Lindsey. Grimsby has over time coalesced with Cleethorpes and the settlements combined form the main urban area.

**6.25** **Immingham** stands as an independent town serving the surrounding rural community including settlements in adjoining North Lincolnshire. The town's proximity to the expanding port presents challenges in relation to traffic movements and air quality.

**6.26** **The 'Arc' settlements** around the southern and western edges of the main urban area offer differing levels of services and facilities. These settlements typically provide a good range of accessible services for local residents.

13 Census 2011, Office for National Statistics.
14 Census 2011, Office for National Statistics.
15 Department for Business, Innovation and Skills and Child Poverty Local Profile, Office for National Statistics.

**6.27** **The rural area** includes a variety of small villages in rural surroundings. Service provision in these settlements is very limited with many settlements providing no amenities or services at all. In the rural area, household access to a car or van is much higher than in the urban area where residents can easily access services by walking, bike or public transport services. On average, there is one car or van for each household in North East Lincolnshire, however, settlements in the rural area typically see a rate of 1.5 cars per household.

### Roads

**6.28** North East Lincolnshire benefits from good strategic road infrastructure. The A180 provides a fast dual-carriageway link to the strategic highway network, connecting just outside the Borough with the M180 and the national motorway network.

**6.29** The A180 provides access to the Port of Grimsby, and to the Port of Immingham via the A160. The area has dual-carriageway links to Scunthorpe via the A180, and Hull via the A180 and A15, and single carriageway main road links to Lincoln via the A46, and Louth via the A16.

**6.30** Whilst there is high car dependency (69.2% of households with access to at least one car or van[16] ), congestion within the Borough tends to be localised and associated with peak travel times. Congestion 'hotspots' are identified in the Local Transport Plan 3 (LTP3) at Tollbar Roundabout (A16), Westgate Roundabout (A180) and Cambridge Road/Little Coates Road junction. Congestion also occurs at Nuns Corner, Scartho Road and Peakes Parkway. Traffic delays during the summer and weekends are common along the A180 into Cleethorpes.

**6.31** The are has marginally more people commuting into the area for work than out. North East Lincolnshire sees net outflows of people to North Lincolnshire, Leeds, and Lincoln. But the area sees a net inflow from a number of areas, particularly from East Lindsey and West Lindsey.[17]

**6.32** The A160 is a key route for traffic accessing the Port of Immingham. The dualling of this section of road, together with junction improvements and revisions to the port entrance, which are currently under construction as part of the A160/A180 highway scheme, is a response to the expected increase in traffic as the port expands. Significant improvements to the town centre and residential parts of Immingham are, however, expected as a result of the A18-A180 link, which will remove dock bound traffic along Pelham Road. Work on the link road is due to be completed in early 2016. It will also improve the linkage to the Port of Immingham from the south, and adjacent employment sites.

### Trains

**6.33** There are eight train stations in North East Lincolnshire. Frequent passenger rail services are provided to Grimsby and the resort of Cleethorpes, with local passenger rail connections available to settlements including Great Coates, Healing, Stallingborough, and Habrough. Grimsby Town and Cleethorpes stations have the greatest usage of all the stations, but passenger numbers have declined between 2011 and 2014.[18]

**6.34** The freight network servicing the ports is one of the busiest in the country, with over 300 movements a week occurring on the lines in the Borough.

16 *Census 2011*, Office for National Statistics.
17 *Census 2011*, Office for National Statistics.
18 Estimates of station usage 2012-13, Office of Rail Regulation.


Figure 6.2 Transport network

## Buses

**6.35** Bus services dominate the public transport provision in the Borough. There are regular, frequent bus services across most parts of the urban core. Most of the smaller settlements are also connected, although frequency and operating times may be more restricted.

**6.36** The opening of the new bus station in Grimsby town centre has greatly improved public transport access. With around 30% of the population without access to a car, continued investments in public transport provision will be vital during the plan period. It is important that the Plan directs new job opportunities to accessible

locations and, where possible, generates the critical mass of population needed to support viable transport services.

### Air

**6.37** Humberside Airport is located just outside the Borough, in North Lincolnshire, and is within easy reach of the A180. There are daily services to and from Amsterdam (with worldwide connections) and Aberdeen. Humberside Airport is an important base for helicopter services connecting offshore energy installations.

### Freight

**6.38** The Borough's economy is heavily reliant on good rail and road freight links, along with sea traffic. The LTP3 outlines a number of freight transport related issues, which have a direct bearing on the Borough's economic performance:

1. local access to sites such as ports, affecting their day-to-day operations;
2. transit routes that affect communities through high levels of HGV traffic and the severance, noise and pollution this can bring;
3. access to main trunk routes, especially the motorway network;
4. capacity constraints some distance from the area, such as constraints on the M1, A1 and East Coast Mainline; and,
5. rail freight capacity in terms of train paths, line speeds and height restrictions.

## A place to live in North East Lincolnshire

**6.39** The need to provide more homes to meet the needs of a growing and evolving national population is reflected in North East Lincolnshire. There are also a number of local factors that influence the Borough's housing need and make the challenge of meeting this need more complex:

1. population growth due to birth rates remaining higher than mortality rates;
2. demographic changes leading to smaller average household sizes (which would require more homes to be built even if there were no growth in overall population size);
3. relatively low levels of house building in the past ten years; and,
4. the need to replace some housing that no longer meets modern expectations.

**6.40** Between the 2001 and 2011 Census there was a 5.6% increase in households in the Borough, and a 1% increase in population. The demographic changes occurring in the Borough, such as an ageing population with people living longer, is reducing the average number of people that live in each household. Almost a third (31% compared to 28% in 2001) of houses in the Borough are now inhabited as single person households[19] and a significant proportion are inhabited by a sole resident aged 65 or over. Between the 2001 and 2011 Census, the number of one person households comprising of people below the age of 65 increased significantly, from 14% of all households to 18% of all households.

**6.41** House prices are relatively low in North East Lincolnshire. The average house price in the area, based on all sales transactions in 2013, is £119,500.[20] At around £250,000 in 2013, the national average, therefore, stands at over double the local average house price. Prior to the economic downturn, average house prices grew steadily in the area, but have remained relatively stable since 2007. While house prices remain relatively low compared to other areas, there is still an affordability issue because 61% of North East Lincolnshire's households have a gross household income of less than £30,000 a year.

**6.42** Despite the stability seen in house prices, the economic downturn had a dramatic effect on house sales with a sharp decrease in the number

19 *Census 2011*, Office for National Statistics.
20 This data covers the transactions received at Land Registry in the period 1 January 2013 to 31 December 2013. Land Registry © Crown Copyright 2014.

of transactions. In North East Lincolnshire, transactions dropped to a rate less than half of pre-recession levels, due in part to stricter lending and the removal of many 100%, 95%, and 90% mortgage offers from the market. Market signals show a general upward trend in transactions since 2009, and a noticeable increase between 2012 and 2013.

**6.43** Locally, 66% of residents own their homes (either with a mortgage or outright) and more people in North East Lincolnshire own their home outright than the regional and national average.

**6.44** The Borough has higher numbers of people in social rented accommodation than the regional and national averages. North East Lincolnshire has a particularly strong private rented sector, which has formed the second largest tenure in the Borough for some time. Average rents across all types of properties are around £412 a month. Rental values in the area are significantly lower than the national average, particularly in the case of larger properties. Where, on average, a four bedroom property in England has a rent of £1,100, in North East Lincolnshire it is £643.

| Housing completions | | | | | |
|---|---|---|---|---|---|
| **Year** | **New build completions (a)** | **Conversions & Change of use completions (b)** | **Gross completions (c)** | **Demolitions and losses (d)** | **Net completions (e)** |
| 2004/05 | 180 | 27 | 207 | 5 | 202 |
| 2005/06 | 190 | 39 | 229 | 28 | 201 |
| 2006/07 | 370 | 79 | 449 | 91 | 358 |
| 2007/08 | 303 | 143 | 446 | 104 | 342 |
| 2008/09 | 261 | 62 | 323 | 246 | 77 |
| 2009/10 | 213 | 101 | 314 | 61 | 253 |
| 2010/11 | 315 | 45 | 360 | 154 | 206 |
| 2011/12 | 297 | 49 | 346 | 59 | 287 |
| 2012/13 | 352 | 74 | 426 | 21 | 405 |
| 2013/14 | 311 | 53 | 364 | 50 | 314 |
| 2014/15 | 320 | 51 | 371 | 5 | 366 |

Table 6.2 Housing completions

**6.45** Table 6.2'Housing completions' presents the Borough's overall housing performance in the period from 1 April 2004 to 31 March 2014. Gross annual completions[21] have not risen above 450 in any of the previous ten years. The monitoring of performance against the Borough's housing requirement is, however, based on the number of net additional homes provided, known as net completions.[22] Net completions in North East Lincolnshire exceeded 400 homes in just one of the past ten years.

**6.46** The number of net housing completions has been affected by significant numbers of demolitions and losses to stock in recent years. In particular, demolitions and losses from regeneration sites is evident in the period from 2010/11 to 2013/14, where demolitions from the Freshney Green and Guildford Street schemes (the latter is now know as 'Orchard Drive') accounted for 56% of all demolitions.

**6.47** New build housing has accounted for 80.6% of all new homes built, and the remaining 19.4% accounts for new homes formed through conversion and change of use.

**6.48** The Council transferred its social housing to Shoreline Housing Partnership, a registered provider of social housing, in 2005 and has since been working in partnership together with other registered providers, private developers and contractors, as well as local communities, to bring forward neighbourhood improvements. Some of the Borough's social housing areas are areas of significant levels of deprivation. Shoreline Housing Partnership has sought to identify the priorities that need to be tackled.

## Health and well-being in North East Lincolnshire

**6.49** In 2015, North East Lincolnshire was ranked 65th most deprived, out of 326 local authorities in England, with an average score of 30.9 on the Indices of Deprivation.[23] This compared to a rank of 46th most deprived out of 325 local authorities in England with an average score of 29.8 of the Indices of Multiple Deprivation in 2010.[24] Of the 106 Lower Layer Super Output Areas (LSOA) in North East Lincolnshire at the time of the IMD 2010[25], 27 were ranked amongst the 10% most deprived in England, compared to 31 in 2015. A LSOA within the East Marsh area in central Grimsby is ranked as the thirteenth most deprived area in England, compared to second in 2010.

**6.50** The Local Plan can help to overcome deprivation across the Borough by improving access to education, employment, housing, healthcare and other factors, which, when combined together, will help improve the prosperity and sustainability of affected communities. However, this is set against recognition of continued welfare reform and cuts to public regeneration investments. With these issues likely to challenge the ways in which deprivation is combated, the role of the Plan is of increasing importance in this context and must work to ensure that the spatial relationships within the Borough maximise the opportunity for change.

**6.51** In the past, North East Lincolnshire's residents have been more likely to suffer from certain types of health issues. However, in recent years the health of the area's population has improved considerably. Since 2007, infant mortality rates in the Borough have dropped and

21 Gross completions represents all new homes created and includes new build, conversions and change of use (a+b=c).
22 Net completions represents the additional homes provided, and is the gross completions minus demolitions and losses (c-d=e).
23 *Indices of Deprivation 2015* (2015).
24 *Indices of Deprivation 2010* (2012).
25 England is split up into Lowe Layer Super Output Areas (LSOA) which are small geographical areas with constant boundaries allowing for the comparison of data across areas. LSOAs are the geographical data set used for formulating the Indices of Multiple Deprivation. Each LSOA has a population of approximately 1,000 people. The IMD presents relative deprivation and therefore a LSOA may not be any less deprived than previous IMDs even if its score increases.

are now amongst the lowest in the region. Life expectancy has increased in the area although not at the same rate that it has across the rest of the country, widening the health inequality gap.

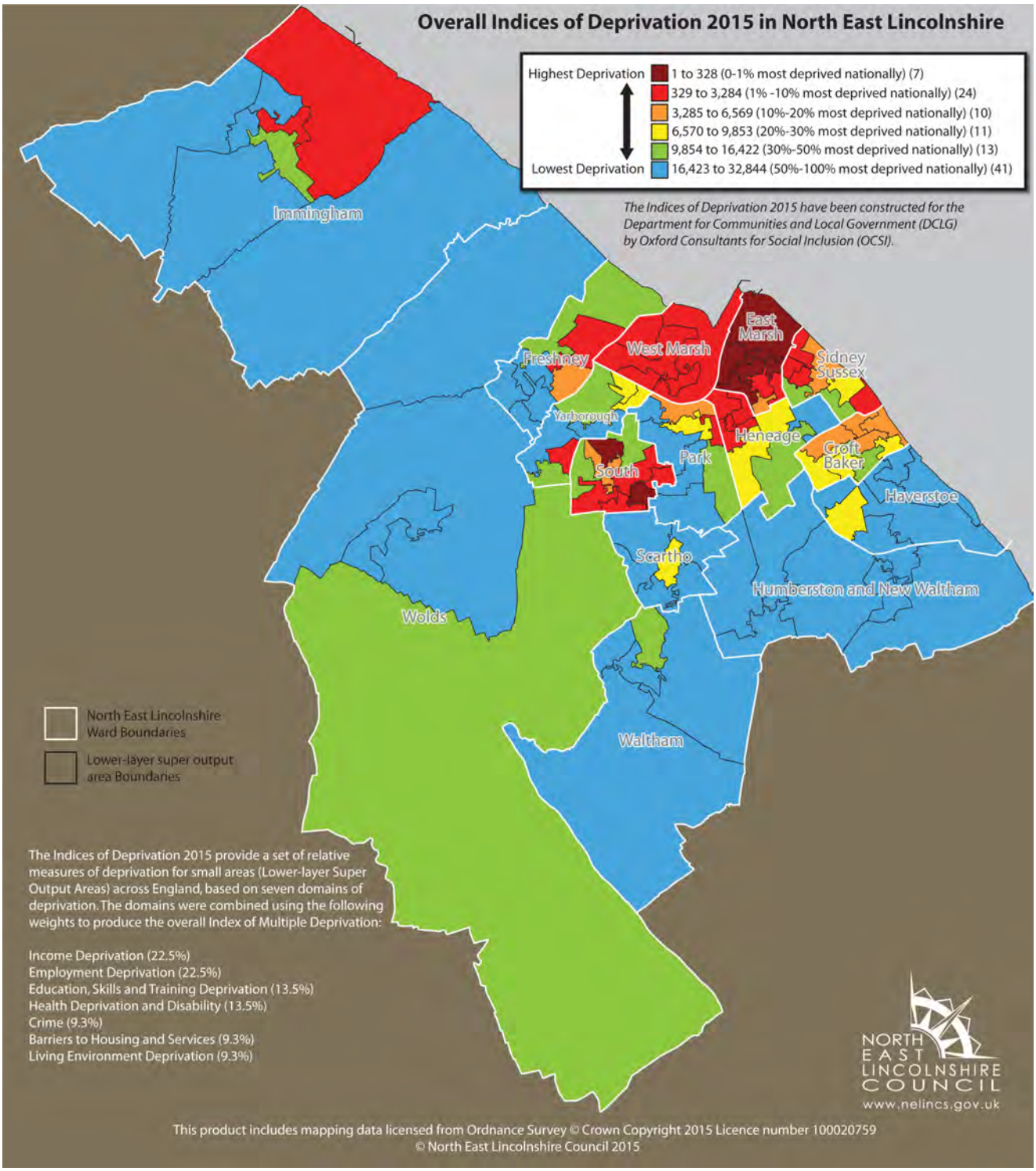


Figure 6.3 Map of Deprivation

**6.52** Those living in the most deprived areas of the Borough have life expectancies 11.1 years (men) and 8.8 years (women) shorter than those in least deprived areas. Lifestyle choices such as smoking, poor diet and lack of exercise are often related to avoidable deaths of people under 65. Adult obesity is high, with 29.3% of adults classed as obese (English local authorities range from 13.9% adults classed as obese in the best authority, to 30.7% of adults classed as obese in the worst authority). 26.8% of children live in poverty compared to 20.6% nationally.[26]

| Key statistics: Health and deprivation | |
|---|---|
| North East Lincolnshire residents living in 10% most deprived areas in England (2015) | 29% |
| Children in poverty | 26.8% |
| Life expectancy at birth (2000/02 to 2010/12) (male)[27] | 77.9 |
| Life expectancy at birth (2000/02 to 2010/12) (female)[28] | 80.1 |

Table 6.3 Key statistics: Health and deprivation

## Historic environment in North East Lincolnshire

**6.53** The Borough has many designated and non-designated heritage assets of note that contribute to its distinctiveness and character, including a unique legacy of buildings and structures associated with the fishing industry in Grimsby and traditional seaside resort of Cleethorpes.

**6.54** In total, there are 222 Listed Buildings; 16 Conservation Areas; 11 Scheduled Ancient Monuments; and a Registered Park and Garden, the historic Peoples Park. The Grade I Listed Dock Tower, in Grimsby, is of particular note as an important local landmark. A number of historic assets, including listed buildings, scheduled ancient monuments and several conservation areas are identified on the national 'heritage at risk' register. The poor condition of some historic buildings has contributed to seven of the Borough's conservation areas identified as being in a poor or very bad condition, with three of these identified as deteriorating further. However, two are considered to be showing signs of improvement.

**6.55** Balancing the regeneration needs with the protection of historic environment brings about considerable challenge, particularly in recent years where economic conditions and depressed property values have meant that achieving a viable use for a heritage asset and funding the repair and maintenance has been so significant that development opportunities have not materialised. For those buildings in extremely poor conditions such as the Grade II* listed Ice Factory and Grade II listed Garth Land Mill (which has suffered fire damage), this situation is greatly exacerbated.

| Key statistics: Historic environment | |
|---|---|
| Listed buildings | 222 |
| Conservation areas | 16 |
| Scheduled Ancient Monuments | 11 |
| Registered parks and gardens | 1 |
| Heritage assets at risk: Listed buildings Grade I and II* | 2 |

26 *Child Poverty Local Profile* (2010).
27 *Life expectancy at birth and at age 65 by local areas in the United Kingdom, 2000-02 to 2010-12* (2013).
28 *Life expectancy at birth and at age 65 by local areas in the United Kingdom, 2000-02 to 2010-12* (2013).

| Key statistics: Historic environment | |
|---|---|
| Heritage assets at risk: Conservation areas | 7 |
| Heritage assets at risk: Schedule Ancient Monuments | 2 |

Table 6.4 Key statistics: Historic environment

## Natural environment in North East Lincolnshire

### Ecology and Geology

**6.56** North East Lincolnshire features a diverse range of important natural environment assets. The Greater Lincolnshire Nature Partnership (GLNP) has recently selected 38 local sites of wildlife or geological value across the Borough.

**6.57** The coastal area is a valued and attractive tourist and recreation destination. The Humber Estuary, which bounds the Borough to the north east, is the second largest coastal plain estuary in the UK. It is internationally recognised as an important natural habitat and is a designated Site of Special Scientific Interest (SSSI), Special Protection Area (SPA), Special Area of Conservation (SAC), and Ramsar site. These designations recognise the importance of the estuary and coastal area for migrating birds and waterfowl; the importance of the area's saltmarsh and intertidal mudflats; and, species such as grey seals and lamprey. Given the particular sensitivity of the coastal zone habitats, the development pressures around the Humber Estuary must be carefully managed to ensure that the integrity of these sites is safeguarded.

### Flooding

**6.58** Flooding is a particularly important issue in the Borough as much of the urban area is within the high flood risk zone and large parts of the Borough have witnessed severe flooding events in recent years that have affected many homes and businesses. In 2007, over 630 properties suffered river and surface water flooding. In 2012, 23 properties suffered surface water flooding in Immingham, and in December 2013 the Port of Immingham and seafront properties in Cleethorpes suffered the consequences of a combined high tide and storm surge.

**6.59** The Borough is vulnerable to the following forms of flooding:

1. flooding from Ordinary Watercourses (fluvial flooding);
2. surface water flooding (pluvial flooding);
3. groundwater flooding;
4. sewer flooding;
5. coastal flooding and erosion; and,
6. flooding from main rivers.

**6.60** The consequences of flooding differ depending on the cause of flood. However, climate change will see these impacts worsen as increased rain, peak river flows and rising sea levels have the potential to cause greater destruction. Flood Zones 2 and 3, identified on Figure 6.4'Flood risk area' below, shows those areas with medium or high probability of river or sea flooding. These zones are based upon the definitions set out the *Technical Guidance to the NPPF* (2012).

**6.61** Whilst the flood defences within the Borough are of a good standard, and have been subject to investment and improvement over recent years, it is estimated that approximately 27,000 homes are at risk of flooding if defences were breached. Large areas of land of economic importance around the South Humber Bank are also at risk of flooding. Continued commitment to maintaining these defences will be vital to the future prosperity of North East Lincolnshire.

**6.62** The areas at greatest risk coincide with those area suffering from the highest levels of deprivation. This presents a challenging dynamic that the Plan must consider responsibly. Supporting development that will bring about much

needed regeneration benefits will have to be balanced with matters of safety and wider sustainability.

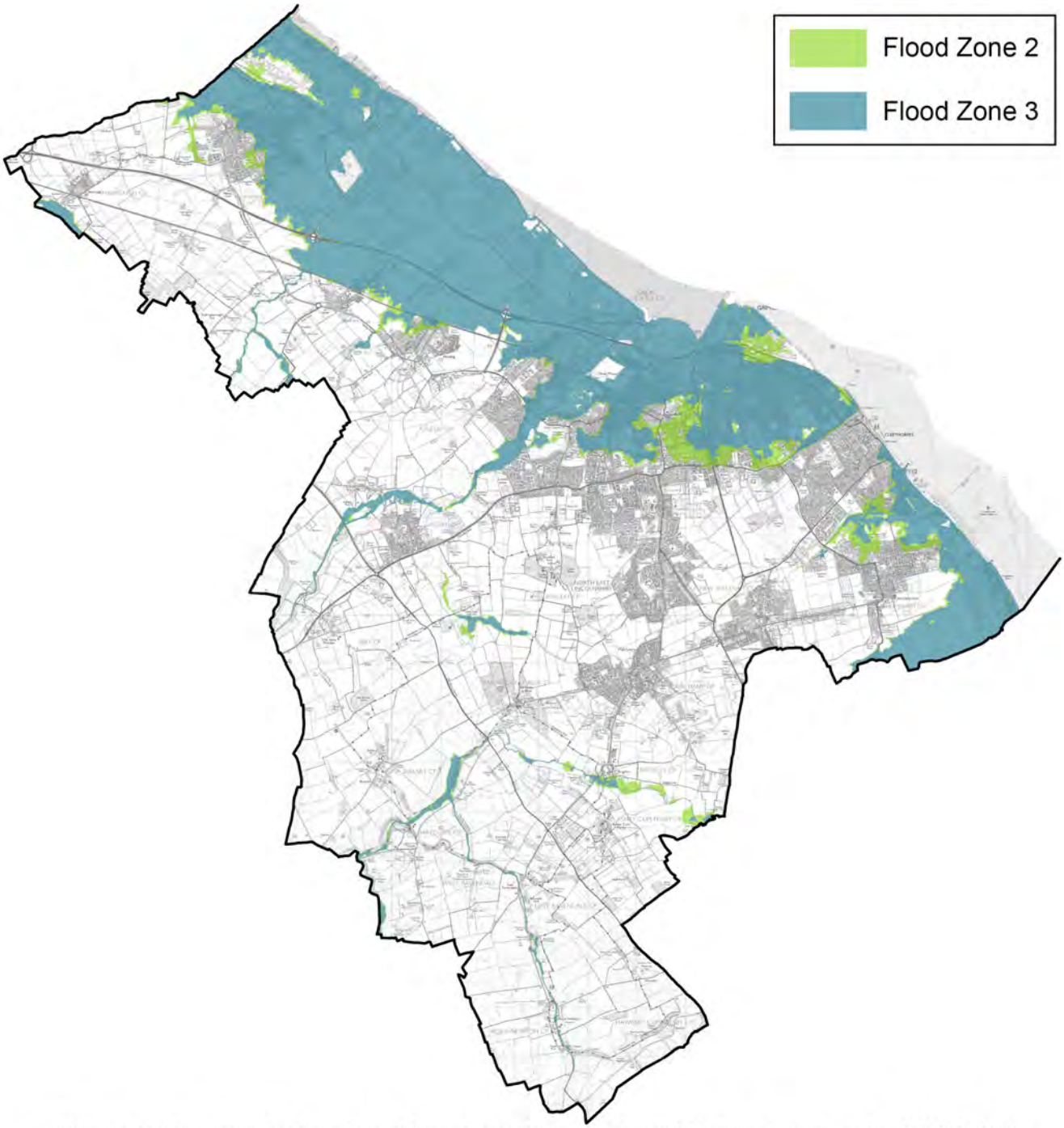




Figure 6.4 Flood risk area

### Landscape

**6.63** The Lincolnshire Wolds Area of Outstanding Natural Beauty (AONB) stretches into the south west area of the Borough. The area is designated for its high landscape quality and numerous small villages are scattered throughout it. The area also features numerous important archaeological deposits, including deserted medieval villages and important earthworks.

**6.64** Strategic Gaps were identified in the *North East Lincolnshire Local Plan 2003*, and have helped to prevent coalescence of the Grimsby/Cleethorpes urban area with Humberston, Waltham and New Waltham to the south and Bradley, Laceby and Healing to the west. Continued commitment to retaining the individual identity of settlements and preventing coalescence will be important over the plan period.

## Minerals and Waste

**6.65** The area features some mineral deposits of economic importance, however, no primary extraction occurs in the Borough. The Borough's role is limited to the production of secondary and recycled aggregates, and the importation and transportation of minerals through the Ports of Immingham and Grimsby.

**6.66** The quantity of waste collected by the Council has reduced in recent years, to less than 80,000 tonnes per annum. North East Lincolnshire is an area that performs comparatively better than regional and national averages in the sustainable management of waste it collects. It managed around 97% of this waste through recycling, composting, and recovery methods in 2013/14 with just three percent of wasted going to landfill. Recycling rates in the area need to increase over the plan period.

**6.67** It is estimated that over 300,000 tonnes of commercial and industrial wastes; over 175,000 construction, demolition, and excavation wastes; and, over 75,000 tonnes of hazardous waste arose in North East Lincolnshire in 2013/14. It is estimated that much of the area's commercial and industrial waste is disposed of via landfill. While a significant proportion of construction and demolition wastes are also managed via landfill, much of this waste stream is inert, and a significant amount is re-used on construction sites, or recycled to become aggregate.

Summary

Local Plan
North East Lincolnshire

**7.1** The preceding sections have sought to highlight a number of important issues, many of which can be addressed locally through the Local Plan. Table 7.1'SWOT analysis (strengths and weaknesses)' and Table 7.2'SWOT analysis (opportunities and threats)' provide an overview of the key strengths, weaknesses, opportunities and threats that exist within North East Lincolnshire.

**7.2** The tables draw together information presented in the wide range of evidence that has been prepared to inform the Local Plan. It indicates that, for North East Lincolnshire, a plan that simply supports and promotes 'business as usual' will do little to address the deep-rooted social and economic problems that communities face. Nor will it serve to break the vicious cycle of deprivation that is being witnessed in large pockets of the Borough, a result of a combination of linked and mutually reinforced problems such as unemployment, poor skills, low incomes, poor housing, and poor health.

**7.3** Within the region, North East Lincolnshire is relatively unique in respect of the complexity and scale at which the challenges operate. Equally, the scale of the Borough's economic opportunity, which is now building up momentum, is significant and differs greatly from nearby authorities, particularly to the south. These opportunities should stimulate wide ranging positive change within the Borough. The Plan must, therefore, do all it can to harness the potential by facilitating the right land use and development patterns to sustain the communities and help them to prosper.

| SWOT analysis | |
|---|---|
| **Strengths** | **Weaknesses** |
| 1. Economy: Strong and established industrial base, built on natural comparative advantage of Humber Estuary.<br>2. Economy: National significance of five key sectors.<br>3. Infrastructure: Including dock infrastructure, pipelines, road and rail freight infrastructure, and flood defences.<br>4. Green Infrastructure: Internationally significant wildlife sites, AONB and open space and recreational facilities.<br>5. Minerals: Resources include aggregates (sand and gravel), silica sand, and chalk.<br>6. Waste: Good record of sustainable waste management.<br>7. Heritage: The heritage assets of the Borough contribute to the quality of places in which people want to live, work and invest. | 1. Demographics: An ageing population has implications for accommodation, healthcare and access to services for older people.<br>2. Demographics: Areas of concentrated deprivation.<br>3. Economy: High unemployment, low wage economy and weak levels of entrepreneurship.<br>4. Economy: Lack of readily available and good quality sites and premises in suitable locations to match business needs.<br>5. Economy: Large number of land hungry operations e.g. storage and processing plants.<br>6. Economy: Limited employment opportunities within the rural areas.<br>7. Education: Low skills base a consequence of poor educational attainment.<br>8. Housing: Supply incompatible with demand.<br>9. Housing: Quality of the housing offer.<br>10. Health and well-being: Home to some of the most deprived communities in England.<br>11. Town centres: Poor quality and lacking key facilities.<br>12. Environment: Significant proportion of the urban area at high risk of flooding. |

| SWOT analysis | |
|---|---|
| **Strengths** | **Weaknesses** |
| | 13. Environment: Pockets of poor Air Quality and Grimsby and Immingham.<br>14. Transport: Car dependency and road congestion hotspots.<br>15. Transport: Accessibility to employment for people with no car.<br>16. Heritage: Number of buildings on the Heritage at Risk Register. |

Table 7.1 SWOT analysis (strengths and weaknesses)

| SWOT analysis | |
|---|---|
| **Opportunities** | **Threats** |
| 1. Economy: Build on international significance of the ports and recent renewable energy related investments in the Humber.<br>2. Economy: Niche development of the O&M market - builds on investment by Dong, Siemens, RWE etc.<br>3. Economy: Ongoing role of the Ports within the UK import/export market.<br>4. Economy: Links to the wider Lincolnshire agricultural economy to promote further innovation in food processing/food science and technology.<br>5. Economy: SHIIP/Enterprise Zone designation provides opportunities to attract significant levels of business investment.<br>6. Heritage: Assets provide opportunities for heritage led regeneration.<br>7. Heritage: The historic environment can play a key role in helping to | 1. Demographics: Increasingly aged population and loss of economically active population presents a challenge for achieving suitable labour supply to meet growth aspirations.<br>2. Education: Lack of higher education facilities and deficit of talented young people who leave to study elsewhere.<br>3. Economy: Low value rents and land prices combine to impact upon commercial viability.<br>4. Economy: Many key sectors forecast to grow in terms of GVA, but decline in employment numbers.<br>5. Economy: Public sector finance cuts threaten public sector jobs and targeted public sector investment in areas of weakness.<br>6. Economy: International competition for investment, especially in chemicals/processing and food processing sectors.<br>7. Economy: Legislative change, especially at the European level placing restrictions on process industries and ports.<br>8. Economy: Changing government policy, particularly related to ongoing support for renewable energy.<br>9. Climate Change: Potential for stresses on habitats and species to increase. |

| SWOT analysis | |
|---|---|
| **Opportunities** | **Threats** |
| reinforce the distinct identity of the various parts of the Borough.<br>8. Housing: Supply to be improved through changes in the local economy. | 10. Climate Change: Increase in flood risk and severity of flood events.<br>11. Housing: Low demand for housing in areas where there is greatest potential for employment related development.<br>12. Housing: Weak viability may limit opportunities on brownfield sites and inhibit affordable housing delivery.<br>13. Heritage: Out of date Conservation Area Appraisals.<br>14. Heritage: Impact of new development upon the character of the Borough's historic assets and loss of assets through neglect and lack of investment. |

Table 7.2 SWOT analysis (opportunities and threats)

Local Plan
North East Lincolnshire

Local Plan
North East Lincolnshire

Key evidence has been prepared to inform the principle development requirements that need to be accommodated in the Borough over the plan period. This assessment has been undertaken in the context of the national policy framework set out in the NPPF.

This section of the Plan seeks to answer the question: **What are our future development needs?** It relates specifically to employment growth (the number of jobs and amount of employment land) and housing needs, with other development aspects considered in later sections in the Plan.

## Jobs (land requirement)

**8.1** Economic forecasts have been generated to assess the extent of growth that can be anticipated over the plan period (i.e. to 2032). Two models have been used in the assessment:

1. the Regional Econometric Model (REM) (updated since the *Consultation Draft Local Plan* was issued); and,
2. the approach considered by Atkins in the *Economic Futures Report*[29].

**8.2** The REM model considers a range of factors along with economic activity trends, including population growth, and is, in effect, a labour market supply-led model.[30] The latest application of the model forecasts approximately 7,300 jobs being generated over the plan period.

**8.3** The *Economic Futures Report* takes a labour demand-led approach. It analyses the potential for growth by considering the current state of businesses withing the area (derived from local business surveys), and considers a range of growth rates in order to ascertain the potential requirement for jobs from a business-led perspective. It also captures the extent of known projects and the impact of an economic development strategy in the forecasting calculations. The scenarios point to a range of between 4,000 and 14,000 jobs being created.

**8.4** The Council is pursuing a scenario that will lead to approximately 8,800 jobs being generated. It is based on an expectation that the scenario will be supported by a moderately successful economic development and inward investment strategy. It is recognised that this level of growth is aspirational, but with commitments to both the South Humber Industrial Investment Programme (SHIIP), an the extension of the Humber Enterprise Zone from April 2016 (which will include a number of sites identified in this Plan), there is good evidence to support confidence in the deliverability of this level of growth.

**8.5** Table 8.2'Employment growth forecast by SIC code' shows the spread of the predicted 8,800 jobs across the whole economy, not just the Borough's five key sectors. However, it should be noted that the standard industrial classification (SIC) codes are not directly compatible with the nature of local industries. For example, food processing figures are incorporated largely within the manufacturing sector, but also feature in the wholesale retail, and, potentially, transportation and storage predictions.

29 *North East Lincolnshire Economic Futures Report* (2014).
30 A model that applies local population growth (e.g. labour force) to economic trends to identify the supply of labour.

| Medium growth employment forecast by SIC code | | |
|---|---|---|
| **Sector** | **% change** | **Jobs total** |
| Accommodation and food services | 24.4 | 831 |
| Administrative and support service activities | 15.8 | 946 |
| Agriculture, forestry and fishing | 0 | 0 |
| Arts, entertainment and recreation | 12.8 | 192 |
| Construction | 37.7 | 908 |
| Education | 9.8 | 619 |
| Electricity, gas, steam and air conditioning supply | 0 | 0 |
| Financial and insurance activities | 31.7 | 253 |
| Human health and social work activities | 6.5 | 669 |
| Information and communication | 16.9 | 481 |
| Manufacturing | 12.7 | 1206 |
| Other service activities | 35.5 | 284 |
| Professional, scientific and technical activities | 16.6 | 118 |
| Public administration and defence, compulsory social security | 0 | 0 |
| Real estate activities | 16.6 | 99 |
| Transportation and storage | 21.5 | 1,095 |
| Water supply, sewerage, waste management and remediation activities | 16.4 | 82 |
| Wholesale and retail trade, repair of motor vehicles and motorcycles | 9.3 | 1,012 |
| **Total** | **13.6** | **8,792** |

Table 8.2 Employment growth forecast by SIC code

## Policy 1

**Employment land supply**

1. Between 2013 and 2032, the Council will support the development of a portfolio of sites which will support the generation of 8,800 jobs.

2. The provision of a portfolio of sites will enable the development of B-class uses to accommodate growth primarily within the Renewables and Energy, Chemicals and Process Industries, Food Processing, and Ports and Logistics sectors. Sites selected will also ensure sufficient flexibility and choice for investors within these sectors, whilst ensuring that a minimum requirement of 123.6ha is accommodated.

3. Additionally, the Council will support the development of the Visitor Economy, ensuring provision of a minimum of 33,600m$^2$ for non B-class uses within town centre opportunity sites.

**Justification**

**Provision for B-Class uses**

**8.6** To determine the employment land requirement, the business operations, defined by the SIC codes in Table 8.2'Employment growth forecast by SIC code', have been apportioned to Planning Use Classes. Traditionally, employment land has related to Use Class B1, B2 and B8. The *North East Lincolnshire Economic Futures Report* (2014) indicates that the number of jobs predicted to be generated within these industrial classifications relates to just 50% of the total jobs growth for the Borough. This is due to the fact that jobs growth in other parts of the economy, such as Wholesale and Retail Trade, would normally fall within non-B use classes and, therefore, is not considered as part of the Employment Land Supply.

**8.7** Analysis within the *Economic Futures Report* applied the requirement for new jobs within Use Class B1, B2 and B8 to a land requirement based on standard floorspace and job densities. It identified a floorspace requirement of 151,773m$^2$, which equates to a total land requirement of 45ha.

**8.8** However, due to the nature of the operations, many businesses within the Borough falling within use class categories B2 and B8 have exceptionally large building footprints. These uses typically have lower floorspace to job densities than the national standards would suggest. Local analysis[(31)] has identified that, overall, the floorspace density (i.e. site coverage) tends to be greater (i.e. more floorspace is developed per ha), but that job densities (i.e. the number of square metres per job) tend to be significantly lower. Consequently, the application of standard calculations results in an under-estimate of the total floorspace requirement, and therefore the land requirement.

**8.9** Evidence in the *Employment Land Technical Paper*, demonstrates that the floorspace requirements, and therefor land requirements area as follows:

31 *Employment Land Technical Paper* (2015).

| Industrial floorspace requirements | B1a | B1(c) and B2 | B8 | Total |
|---|---|---|---|---|
| Jobs generated 2013 to 2032 | 2,031 | 958 | 994 | 3,983 |
| Average North East Lincolnshire floorspace coverage | 75% | 50% | 50% | |
| Average North East Lincolnshire job density (square metres per job) | 12m$^2$ | 117m$^2$ | 301m$^2$ | |
| North East Lincolnshire floorspace requirement (square metres) 2013 to 2032 | 23,374m$^2$ | 112,539m$^2$ | 299,904m$^2$ | 435,817m$^2$ |
| North East Lincolnshire land requirement (ha) 2013 to 2032 | 3.2ha | 21.8ha | 57.4ha | 82.4ha |
| 50% buffer | 1.6ha | 10.9ha | 28.7ha | 41.2ha |
| **Total land requirement: employment uses** | **4.8ha** | **32.7ha** | **86.1ha** | **123.6ha** |

Table 8.3 Industrial floorspace requirements

**8.10** It is important that there is sufficient flexibility and choice in the selection of sites made available for development. An additional allowance of up to 50% is recommended in the *Economic Futures Report* and, in light of the current restrictions on the availability of land and premises, a buffer of 50% has been applied to and incorporated in the overall land requirement.

**8.11** In view of the local context and the resulting scale of the employment land requirement, the provision of sites is expressed as a portfolio. The portfolio comprises strategic sites, sites for the ports and logistics, sites reserved for long term business use and sites for general employment needs. Site specific details and further information on the site selection process are presented in Policy 7'Employment allocations'.

### Provision for non-B Class uses

**8.12** Traditional employment land provision will accommodate approximately half of the jobs anticipated to be generated over the plan period. The Local Plan needs to show how these additional jobs will also be accommodated. The details in Table 8.3'Industrial floorspace requirements' show that anticipated growth within the Wholesale and Retail trade is expected to generate a further 1,012 jobs, which generates a requirement for a minimum provision of 18,734m$^2$ of A Class floorspace. This compares to the *Retail, Leisure and Three Centres Study, Retail Floorspace Capacity Update* (2016) which identifies an expenditure based requirement for the town centres of circa 31,000m$^2$ net of comparison floorspace, and 2,600m$^2$ net convenience floorspace. The higher requirement would ensure that the total anticipated jobs identified can be accommodated.

**8.13** Support uses including finance and insurance are likely to be brought forward through mixed use schemes; whilst other uses, such as those for education and health which are not specifically defined by job density allowances, will be supported where required to meet growth in these sectors.

| Policy 1'Employment land supply' relationship to: | Links to: |
|---|---|
| National Planning Policy Framework | Paragraphs 21, 156 and 157 |
| Local Plan Strategic Objectives | SO3 and SO5 |
| Evidence base and other key documents and strategies | • *Employment Land Technical Paper* (2015)<br>• *North East Lincolnshire Economic Futures Report* (2014)<br>• *Retail, Leisure and Three Centres Study, Retail Floorspace Capacity Update* (2016) |

Table 8.4 Policy relationships

## Homes (housing supply)

**8.14** The NPPF (paragraph 47) requires that local authorities establish their need for market and affordable housing through an objective assessment.

**8.15** For the Plan to be found sound in terms of housing provision, it is necessary to have first identified the full objectively assessed need. It is then necessary to determine how that need can be met.

**8.16** The Council has undertaken work to objectively assess the need for housing in North East Lincolnshire through the production of the *North East Lincolnshire Strategic Housing Market Assessment* (SHMA) (2013) and, an addendum, *Demographic analysis and forecast* (2015), which updates the SHMA in light of the new economic growth forecasts available in the *Economic Futures Report* (2014) and new DCLG household projections.

**8.17** The Council has considered a range of demographic and trend based scenarios, as well as a number of employment-led scenarios. These include scenarios based on the 'official' household projections prepared by DCLG, alternative trend-based scenarios which look at longer term migration rates, and four scenarios driven by forecast increases in jobs growth based on the Local Economic Assessment (LEA)[32] and *Regional Econometric Model* (REM) outputs. The Council has worked with demographic modelling specialists to translate all of the population growth forecasts generated by these scenarios into the need for housing that they would generate.

32 The Local Economic Assessment consists of three separate documents these are: *Economic Baseline* (2014), *Sector Study* (2014) and *Economic Futures Report* (2014).

## Policy 2

**The housing requirement**

1. Between 2013 and 2032, provision will be made to meet an objectively assessed housing requirement of at least 9,742. This reflects an annualised requirement of 512 new homes per year based upon the Jobs-Led Baseline - UR forecast.

2. The housing requirement has been directly modelled to the forecast increase in jobs. This creates a stepped housing requirement which increases during the plan period in line with the expected increases in jobs growth.

   A. 2013/14 to 2017/18 - 397 homes per year
   B. 2018/19 to 2022/23 - 488 homes per year
   C. 2023/24 to 2027/28 - 649 homes per year
   D. 2028/29 to 2031/32 - 518 homes per year

3. The Council will however, bring forward sufficient land to provide the flexibility to enable the Jobs-Led Scenario 1 - UR (medium growth) forecast housing requirement to be met. This equates to an overall housing requirement of 13,340 new homes representing an annualised requirement of 702 homes per year.

**Justification**

**8.18** The Council has identified an objectively assessed housing requirement of 9,742 which represents an uplift in annual completions against past delivery rates. It is based upon the Job-Led Baseline - UR stepped housing requirement which increases in line with the number of homes required as job opportunities come on-stream. This provides a requirement which is broken down to three five year periods from 2013 to 2028 and a final year period from 2029 to 2032. On average, a minimum of around 510 new homes would be required each year.

**8.19** The Jobs-Led Baseline - UR Scenario is based on an improvement in the local economy which would bring about a reversal of trends in people leaving the area, plus inward migration to provide part of the labour force required. It also provides enough homes to meet demographic changes occurring, including meeting the needs of an ageing population. This is considered to be the minimum number of new homes that would be required and represents the Objectively Assessed Housing Need (OAHN) for the Borough.

**8.20** The Council has recognised, and provided through the portfolio of employment sites, the opportunity for increased employment growth. Initial evidence from the early years of the plan period demonstrate that a higher rate of employment growth, consistent with Jobs-Led Scenario 1 - UR (medium growth) is being delivered. However, this is not currently reflected in the levels of housing delivery. The reasons for this are, as yet, unclear, but initial indications suggest a possible lag between economic growth and housing delivery, possibly reflecting the time for confidence to build in the housing market, permissions to be secured and construction to commence; although this could be a reflection of increased commuting on a short and long term basis.

**8.21** Notwithstanding these initial housing delivery rates, the Council is committed to establishing a Plan that is capable of supporting the possible enhanced growth opportunities in the Borough and provide the opportunity to boost housing supply. Through the Plan, the Council is seeking not only to nurture and facilitate economic growth, but to build upon the principles of sustainable planning and capture the benefits of growth locally. Consequently the Plan outlines a housing land supply which incorporates an effective buffer capable of supporting a rate of housing growth that aligns with the higher economic performance outline in Jobs-Led Scenario 1 - UR.

**8.22** In accommodating the flexibility through the increased site allocations, the Council has not identified reserve site allocations or included specific phasing of sites as these measures would introduce constraints to the overall supply that would be counter to the Plan's overall Planning for Growth strategy.

**8.23** Figure 8.1'Housing requirement and future housing supply' shows how the buffer will apply over the plan period, effectively providing a portfolio of housing sites capable of delivering the higher growth scenario.

| | 2013/14 | 2014/15 | 2015/16 | 2016/17 | 2017/18 | 2018/19 | 2019/20 | 2020/21 | 2021/22 | 2022/23 | 2023/24 | 2024/25 | 2025/26 | 2026/27 | 2027/28 | 2028/29 | 2029/30 | 2030/31 | 2031/32 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Actual NET completions | 314 | 386 | 357 | 276 | | | | | | | | | | | | | | | |
| Shortfall accruing | 83 | 31 | 40 | 121 | | | | | | | | | | | | | | | |
| Scenario 1 UR | 505 | 505 | 505 | 505 | 505 | 657 | 657 | 657 | 657 | 657 | 857 | 857 | 857 | 857 | 857 | 811 | 811 | 811 | 811 |
| Baseline UR | 397 | 397 | 397 | 397 | 397 | 488 | 488 | 488 | 488 | 488 | 649 | 649 | 649 | 649 | 649 | 518 | 518 | 518 | 518 |

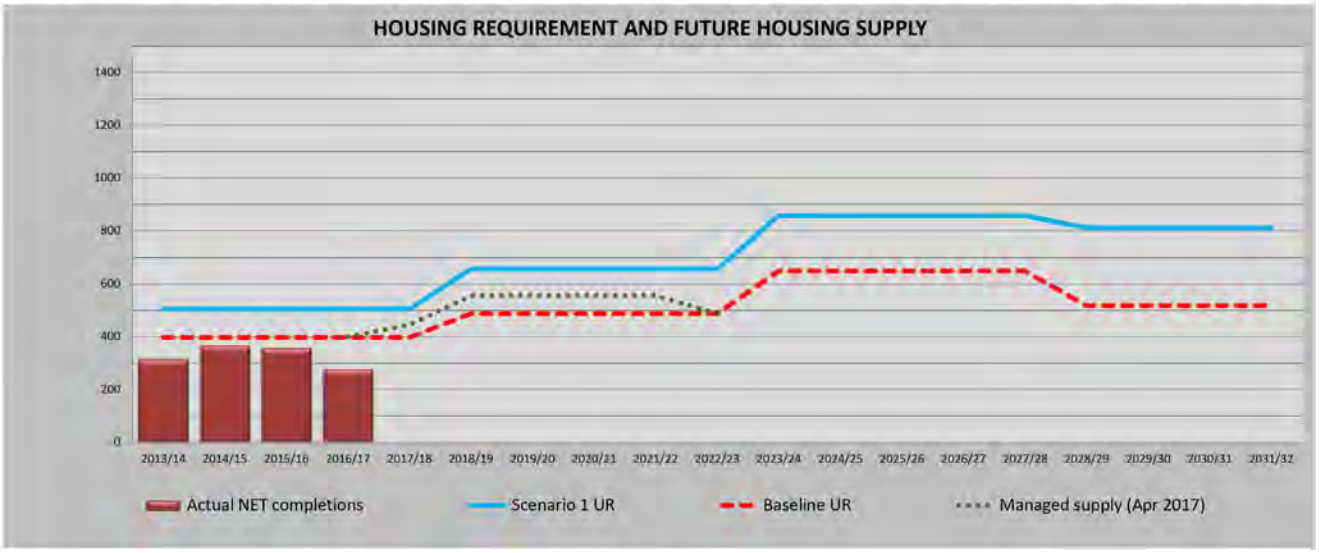


Figure 8.1 Housing requirement and future housing supply

8.24 The Council will calculate the future Five Year Housing Supply Assessment based upon the following steps:

| Calculation of Five Year housing land supply | |
|---|---|
| **Step** | |
| Step One | Identify the Housing Requirement that forms the basis for the Assessment 2013 to 2032 = (Jobs-Led Baseline - UR, 9,742) |
| Step Two | Identify the Housing Requirement over the five year period = A |
| Step Three | Identify the Housing Delivery 2013/14 to (the current year) = B |
| Step Four | Identify the shortfall/oversupply A-B=C |
| Step Five | Identify the Fiver Year Housing Requirement accounting for shortfall/oversupply A+C<br><br>*Applying the 'Sedgefield approach' were any shortfall is included in the five year period* |
| Step Six | Apply the appropriate buffer (D) based on past delivery (A+C)xD<br><br>*NPPF (paragraph 47) states that 'to boost significantly the supply of housing, local planning authorities should: identify and update annually a supply of specific deliverable sites sufficient to provide five years worth of housing against housing requirements with an additional buffer of 5% (moved forward from later in the plan period) to ensure choice and competition in the market for land. Where there has been a record of persistent under delivery of housing, local planning authorities should increase the buffer to 20% (moved forward from later in the plan period) to provide a realistic prospect of achieving the planned supply and to ensure choice and competition in the market for land.* |
| Step Seven | Identify the available housing supply E<br><br>*An assessment of the estimated supply within the five year period taking account of sites under construction, sites with planning approval, sites where a resolution to grant subject to a 106 agreement is in place, allocations expected to commence within a five year period and minor consents.* |
| Step Eight | Make an allowance (85/year) for demolitions and losses with the five year period F=E-425 |
| Step Nine | Assess the available supply against the identified supply F/((A+C)xD) |
| Step Ten | Determine the Five Year Housing Supply in years (F/((A+C)xD))x5 |

Table 8.5 Calculation of Five Year housing land supply

| Policy 2'The housing requirement' relationship to: | Links to: |
|---|---|
| National Planning Policy Framework | Paragraph 47 |
| Local Plan Strategic Objectives | SO4 |
| Evidence base and other key documents and strategies | • *Demographic analysis and forecasts* (2015)<br>• *Local Economic Assessment Economic Futures Report* (2014)<br>• *North East Lincolnshire Strategic Housing Market Assessment* (2013) |

Table 8.6 Policy relationships

A vision for North East Lincolnshire

Local Plan
North East Lincolnshire

**9.1** Section 5'Spatial Portrait' and Section 6'What is life like in North East Lincolnshire?' set out the range of issues that the Borough faces. They demonstrate a clear need for change, which serves as a strong indication that a 'business as usual approach to planning for the Borough's future is not one that should be considered appropriate.

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**9.2** Despite the challenges, the Borough is well positioned to maximise the potential of economic activity in key sectors. This economic growth is, essentially, a vehicle for change which, if planned for correctly, will improve the well-being of the community and revitalise towns and neighbourhoods. To achieve this, North East Lincolnshire must work alongisde its neighbours to facilitate the real opportunities for change and growth that exists and maintain the Borough's distinctive role within the wider Humber Bank so that the growth is complementary to that in surrounding areas. Together with driving the economic priorities, the area's most valued assets must be protected and the constraints faced in relation to flooding, regeneration and biodiversity must also be respected.

**9.3** The Plan's vision has been developed over a number of years. Initially, it was progressed through the LDF Core Strategy and then, later, through the *New Local Plan Initial Issues and Options Paper* (consultation in 2012). Whilst the consultation process identified strong support for taking forward the original vision, it has since been revised to reflect changing circumstances and aspirations.

**9.4** A number of important local strategies and plans have also helped to shape and inform the vision, and ensure that the Plan is consistent with ongoing and future activity across the Council and the partners it works with. These include:

1. the *Sustainable Community Strategy* (2010);
2. the Council's Partnership Board Plan: *Development and Growth Plan* (2012);
3. *Health and Well-being Strategy* (2013) and *Safer Stronger Communities Partnership Plan* (2014/17); and,
4. the *North East Lincolnshire Council Plan* (2014-2015).

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## The overall spatial vision

**Spatial vision**

By 2032 North East Lincolnshire will be nationally and internationally recognised as a centre for offshore renewables, focusing on operations and maintenance and contributing significantly to the Humber's 'Energy Estuary' status. Growth in key sectors, food, energy, chemicals, ports and logistics, will be matched by a strong tourism and leisure offer. Evident through increased jobs and diversity of skills, the barriers to accessing jobs will have been broken down. This will be facilitated through the establishment of facilities to improve education and skills, and measure implemented to address housing need and affordability, and health and service needs, including countering deprivation issues in specific wards. A platform for sustainable economic growth will have been created, with conditions to capture and sustain more and better jobs in the area well established.

Good progress will have been made to make North East Lincolnshire a forward looking Borough where aspirations have been raised, and gaps narrowed in terms of social inequality; whether caused by health, education, age, disability, ethnicity, location or other aspects. Housing initiatives will have successfully revitalised areas of low housing demand, and steps taken to lift housing delivery to support economic growth, recognising the need to provide housing to address demographic change, and improve prospects for economic growth, whilst providing choice within the housing market, and being sensitive to the scale and character of settlements. Town centres will be successful, having developed their offer to support growth.

Environmental quality will be a source of pride, aspiration and confidence. The special character, biodiversity and distinctiveness of the Borough will continue to be protected and enhanced. The Borough's ecological and green infrastructure networks will have been improved, providing improved habitats and access to nature for local communities.

A commitment will have been demonstrated, to address the causes and consequences of climate change, including bringing about an overall reduction in the proportion of properties at risk from flooding.

**9.5** The following 'Place statements' complement the overall spatial vision clarifying the role of different settlements in meeting the overall vision.

## Place statements

**Urban Area (Grimsby and Cleethorpes)**

**9.6** By 2032 the urban area will have witnessed a step change in the image and desirability of the urban environment. New sustainable communities will have been created, providing good quality housing, meeting people's needs and aspirations within attractive and easily accessible environments. Communities will have good access to quality jobs, healthcare and education, open space and retail facilities.

**9.7** Grimsby will have strengthened its role as the sub-regional centre, accommodating new retail and leisure expansion, including environmental enhancement of the townscape. The buildings

and structures associated with Grimsby's fishing heritage will have been appreciated and managed, and the potential they offer for heritage-led regeneration realised. Cleethorpes will have built-upon its role as a regional tourist destination, reinforcing its character as a historic seaside resort, and enhancing the quality and diversity of its offer to visitors, including those on business and those looking for an enjoyable day out.

**Estuary Zone (Land adjacent to the Estuary including the port town of Immingham)**

**9.8** The land adjacent to the Estuary in and around the ports, and adjacent to the deep water channel is a valuable economic resource. By 2032 opportunities will have been taken to strengthen key economic sectors, capturing local economic benefits and realising the full potential of offshore renewable operations. Development will have been secured, strengthening the offer of the wider Humber sub area, whilst recognising the environmental and biodiversity qualities of the Humber Estuary, maintaining the integrity of designated sites, addressing the causes and consequences of climate change, and providing infrastructure improvements. Areas of land will have been identified and secured, and a long term management plan will be in place, to safeguard sites for roosting, loafing and foraging birds as part of a sub-regional delivery plan.

**9.9** Immingham will have strengthened its role as an independent town. The town centre will have been redeveloped to provide new retail facilities and community focus. Highway improvements will have helped to alleviate localised air quality issues. Other environmental improvements and enhancements to healthcare and education facilities will have revitalised the town and sustained its role supporting the needs of surrounding villages.

**Western and Southern Arc (Healing, Laceby, Waltham, New Waltham and Humberston)**

**9.10** The arc of larger villages outside the urban area, have seen historic patterns of growth. By 2032, these settlements will have grown but their character will have been protected through good design and sensitive planning. They will have been sustained by improving local community facilities e.g. shops, children's playgrounds, and sports pitch improvements. Accessible employment opportunities will have been established, particularly Hewitts Circus Business Park. The open countryside that separates settlements will have been protected to maintain the sense of separation; recognising the value and importance of environment corridors stretching into the urban area. Growth will, however, have been sensitive to the scale and character of settlements, and sought to build upon the network of green infrastructure.

**Rural Area (Open countryside including rural settlements)**

**9.11** The special character and distinctiveness of the rural area will have been protected. The countryside is recognised as being of particular value to be enjoyed by local communities through a network of footpath and bridleway routes. Designated landscape, nature conservation habitat sites and heritage assets will continue to be offered high levels of protection. Opportunities will have been created and taken up to address local housing needs; and provision made for a diversity of rural employment opportunities that support the vitality and respect the local character of rural settlements.

## Strategic objectives

**9.12** The objectives set out below relate directly to the spatial vision. They provide a framework for the Plan policies to facilitate the form and pattern of development necessary to ensure that the vision is fully realised by 2032. The objectives are mutually supportive and are not listed in order of priority.

**9.13** Table 9.1'Relationship between Strategic Objectives and Policies' that follows the list of objectives demonstrates which objective(s) each policy in the Plan is working towards.

**SO1 Population**

**Meet development needs and facilitate economic development by supporting population growth, retaining working age population and providing for a generally ageing population.**

Critical success factors:

1. delivered new jobs (a minimum of 8,800[33] ) and new homes (a minimum of 9,742[34] ) by 2032; and,
2. delivered a mix of housing, by type and location.

**SO2 Climate change**

**Address the causes and effects of climate change by promoting development that minimises natural resource and energy use; reduces waste and encourages recycling; reduces pollution; brings about opportunities for sustainable transport use; responds to increasing flood risk; and, incorporates sustainable construction practices. Promote appropriate distribution of development and the role of green infrastructure in mitigating aspects of flood risk. Recognise the increased stress on habitats and species that climate change causes.**

Critical success factors:

1. reduced the waste generated and increased waste recycling;
2. reduced the overall proportion of dwellings at risk from flooding;
3. addressed the issue of poor air quality;
4. reduced the number of declared Air Quality Management Areas in the Borough;
5. increased usage of sustainable transport modes;
6. delivered residential development in locations that provide easy connections by public transport to schools, employment, hospitals and health centres;
7. delivered energy efficient housing stock; and,
8. increased functional green infrastructure.

33 *North East Lincolnshire Economics Futures Report* (2014).
34 *North East Lincolnshire Demographic Analysis and Forecasts* (2015).

**SO3 Economy**

**Support environmentally responsive local economic growth by promoting conditions that sustain an increase in the number of better paid jobs; removing barriers to investment and access to jobs; and, raising skills. Promote rural regeneration and diversification, including a strengthened tourism offer.**

Critical success factors:

1. reduced unemployment, through job creation and development to skills to support sector growth;
2. reduced the proportion of population subject to social deprivation;
3. delivered infrastructure to support economic development; and,
4. strengthened rural economy.

**SO4 Housing**

**Significantly boost housing supply to meet the existing and future housing needs of the whole community. High quality market and affordable housing, specific provision for the elderly, special needs housing and gypsy and travellers accommodation will be supported. A balanced supply of deliverable sites will be identified to achieve as a minimum, the objectively assessed needs of the Borough.**

Critical success factors:

1. boosted supply of housing through the allocation of deliverable sites, whilst seeking to avoid the coalescence of settlements;
2. supported the delivery of affordable housing;
3. identified suitable sites to meet the specific needs of gypsies and travellers;
4. addressed the specific housing needs of an ageing population;
5. brought empty properties back into use for residential or alternative use; and,
6. achieved a balance between brownfield and greenfield development which has delivered urban regeneration.

**SO5 Social and health inequality**

**Narrow the gap in terms of social and health inequality by addressing issues of housing choice, providing accessible employment and training opportunities, promoting healthier lifestyles, providing healthcare and community facilities, improving educational attainment and cultural facilities; and establishing protecting and maintaining a network of accessible good quality open space, sport and recreation facilities.**

Critical success factors:

1. reduced deprivation, narrowing the gap in terms of social and health inequality; and,
2. safeguarded and develop, open space and sport and recreation facilities to maintain or exceed local accessibility standards, promoting healthy lifestyles.

**SO6 Built, historic and natural environment**

**Ensure that the development needs of the Borough are met in a way that safeguards and enhances the quality of the built, historic and natural environment and ensures that the development needs are met in a way that minimises harm to them. Direct development to locations of least environmental value and proactively manage development to deliver net gains in biodiversity overall. Encourage the use of brownfield land.**

Critical success factors:

1. safeguarded designated, landscape, and heritage assets, and protected important species and habitats;
2. reduced the number of buildings of the Heritage at Risk Register;
3. adopted up-to-date Conservation Appraisals for Conservation Areas;
4. delivered net gains in biodiversity;
5. maximised use of brownfield land; and,
6. delivered development in locations of least environmental value.

**SO7 Transport**

**Improve accessibility to jobs and services by sustainable transport modes, including cycling and walking; reduce the overall need to travel with employment and housing growth spatially balanced; and, provide the necessary infrastructure to support sustainable growth.**

Critical success factors:

1. delivered key transport infrastructure to support sustainable growth; and,
2. improved sustainable transport options to reduce the dependency on the car.

**SO8 Town centres and local facilities**

**Strengthen the vitality and viability of town centres, meeting the needs for retail, commercial and leisure uses, focusing appropriate uses on town centre sites, promote regeneration where appropriate and support the retention of local community and service facilities.**

Critical success factors:

1. delivered town centre growth and regeneration, improving vitality and viability widening choice and offer; and,
2. sustained a network of local centres providing local day to day service needs.

**SO9 Design**

**Raise the quality of developments by applying the principles of good sustainable and inclusive design; promote safe, secure and accessible streets and places; and, recognise the importance of supporting and strengthening local character and distinctiveness.**

Critical success factors:

1. lifted the quality of development, reducing crime and fear of crime issues.

**SO10 Minerals and Waste**

**Safeguard important mineral resources and support minerals infrastructure for the future. Promote the application waste hierarchy in the management of waste and deliver sustainable facilities to manage waste.**

Critical success factors:

1. safeguarded mineral resource;
2. planned for the supply of minerals to accommodate future growth;
3. delivered adequate provision for the management of waste arisings; and,
4. achieved reduction in waste generation and increased waste recycling.

## Strategic objectives and policy relationship

| Relationship between the Strategic Objectives and Plan Policies | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Policy** | **SO1** | **SO2** | **SO3** | **SO4** | **SO5** | **SO6** | **SO7** | **SO8** | **SO9** | **SO10** |
| Employment land requirement | | | ✓ | | ✓ | | | | | |
| The housing requirement | | | | ✓ | | | | | | |
| Settlement hierarchy | ✓ | | ✓ | ✓ | ✓ | | | ✓ | | |
| Distribution of housing growth | | | | ✓ | | | | | | |
| Development boundaries | | | | ✓ | | | | | | |
| Infrastructure | | ✓ | | | ✓ | | ✓ | ✓ | | |
| Employment allocations | | | ✓ | | ✓ | | | | | |
| Existing employment areas | | | ✓ | | ✓ | | | | | |
| Habitat Mitigation - South Humber Bank | | | ✓ | | ✓ | ✓ | | | | |
| Office development | | | ✓ | | ✓ | | | | | |
| Skills and training | | | ✓ | | ✓ | | | | | |
| Tourism and visitor economy | | | ✓ | | ✓ | | | | | |
| Housing allocations | | | | ✓ | | | | | | |
| Development of strategic housing sites | ✓ | | | ✓ | | ✓ | | | ✓ | |

| Relationship between the Strategic Objectives and Plan Policies | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Policy** | **SO1** | **SO2** | **SO3** | **SO4** | **SO5** | **SO6** | **SO7** | **SO8** | **SO9** | **SO10** |
| Housing mix | ✓ | | | ✓ | | | | | | |
| Provision for elderly person's housing needs | ✓ | | | ✓ | | | | | | |
| Housing density | | | | ✓ | | ✓ | | | ✓ | |
| Affordable housing | | | | ✓ | ✓ | | | | | |
| Rural exceptions | | | | ✓ | | | | | | |
| Self-build and custom build homes | | | | ✓ | | | | | | |
| Provision for gypsies and travellers | | | | ✓ | | | | | | |
| Good design in new developments | | | | | | ✓ | | | ✓ | |
| Retail hierarchy and town centre development | | | | | | | | ✓ | | |
| Grimsby town centre opportunity sites | | | | | | | | ✓ | | |
| Cleethorpes town centre opportunity sites | | | | | | | | ✓ | | |
| Primary shopping frontages | | | | | ✓ | | | ✓ | | |
| Freeman Street district centre | | | | | | | | ✓ | | |
| Local centres | | | | | ✓ | | | ✓ | | |
| Social and cultural places | | | | | ✓ | | | | | |

| Relationship between the Strategic Objectives and Plan Policies | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Policy** | **SO1** | **SO2** | **SO3** | **SO4** | **SO5** | **SO6** | **SO7** | **SO8** | **SO9** | **SO10** |
| Grimsby Town Football Club Community Stadium | | | | | ✓ | | | | | |
| Renewable and low carbon infrastructure | | ✓ | | | | | | | | |
| Energy and low carbon living | | ✓ | | | | | | | | |
| Flood risk | | ✓ | | | ✓ | ✓ | | | | |
| Water management | | ✓ | | | | ✓ | | | | |
| Telecommunications | | | ✓ | | | | | | | |
| Promoting sustainable transport | | | | | | | ✓ | | | |
| Safeguarding transport infrastructure | | | | | | | ✓ | | | |
| Parking | | | | | ✓ | | ✓ | | ✓ | |
| Conserving and enhancing the historic environment | | | | | | ✓ | | | | |
| Developing a green infrastructure network | | ✓ | | | ✓ | ✓ | | | | |
| Biodiversity and Geodiversity | | | | | | ✓ | | | | |
| Landscape | | | | | | ✓ | | | | |
| Green space and recreation | | ✓ | | | ✓ | ✓ | | | | |
| Safeguarding minerals and related infrastructure | | | | | | | | | | ✓ |

| Relationship between the Strategic Objectives and Plan Policies | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Policy** | **SO1** | **SO2** | **SO3** | **SO4** | **SO5** | **SO6** | **SO7** | **SO8** | **SO9** | **SO10** |
| Mineral extraction and secondary aggregates | | | | | | | | | | ✓ |
| Restoration and aftercare (minerals) | | | | | | | | | | ✓ |
| Future requirements for waste facilities | | | | | | | | | | ✓ |
| Safeguarding waste facilities and related infrastructure | | | | | | | | | | ✓ |
| Restoration and aftercare (waste) | | | | | | | | | | ✓ |

Table 9.1 Relationship between Strategic Objectives and Policies

## Monitoring

**9.14** The objectives are linked to particular indicators and targets that the Council will monitor (See 'Appendix A Monitoring framework').[35] Monitoring is an integral part of the cyclical planning process of Plan-Monitor-Manage. It provides the basis for assessing the ongoing performance of the Plan, which brings about opportunity for intervention if policies are shown to be failing or circumstances change during the course of the plan period.

35 The critical factors set out in the objectives will form part of the monitoring framework.

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The Plan as a whole sets out the spatial development strategy for the Borough, providing the basis for future planning decisions. It promotes sustainable development which seeks to improve the quality of life, bring forward quality development to meet identified needs and which delivers economic, social and environmental benefits.

The spatial strategy is expressed in Policy 3'Settlement hierarchy' and Policy 5'Development boundaries' below, and is represented graphically in Figure 10.1'The Key Diagram'. This provides an overview of the key directions for growth, major constraints and areas of planning restrain. Together with Policy 1'Employment land supply' and Policy 2'The housing requirement', they are considered to be the strategic policies of the Local Plan.

## Settlement hierarchy

**10.1** The settlement hierarchy is one of the key factors which influences and underpins the spatial distribution of future development. Broadly speaking, it is a factor which should be taken into account when assessing the amount of development appropriate in different settlements and areas of the Borough. A settlement that sits higher in the hierarchy would, in principle, be expected to accommodate a higher level of growth.

### Policy 3

**Settlement hierarchy**

1. The following settlement hierarchy will provide the framework for the Council's decisions on the location and scale of development and on investment in services and facilities. Development should be commensurate with a settlement's position in the settlement hierarchy.

| | |
|---|---|
| **Level 1**<br><br>Urban Area | Relates to the urban area of Grimsby and Cleethorpes, including the adjoining parish of Great Coates which functions as one entity, albeit with a different character.<br><br>The urban area provides the greatest accessibility to key services and amenities and has historically delivered the greatest number of new homes. Future development of this area would involve brownfield and greenfield sites, including adjacent to and beyond the settlement edge. Such development is regarded as sustainable where access to services and amenities is good or can be provided. |

| | |
|---|---|
| | Relates to the stand alone town of Immingham and the 'Arc Settlements' of Healing, Humberston, Laceby, New Waltham and Waltham.<br><br>These settlements perform the role of key local service centres offering a good range of basic services and amenities, combined with good accessibility to the wider services available in the urban area. Future development would involve development principally of greenfield sites adjacent to but within the defined settlement development area boundary. |
| | Relates to the rural settlements of Habrough and Stallingborough.<br><br>These rural settlements offer a much lower provision of services but do offer good accessibility to higher level settlements. Future development would involve smaller scale development principally limited to infill sites within or sites within but immediately adjacent to the defined settlement development area boundary. |
| **Level 4**<br><br>Minor Rural Settlements | Relates to the minor settlements of Ashby cum Fenby, Aylesby, Barnoldby le Beck, Beelsby, Bradley, Brigsley, Hatcliffe, Hawerby cum Beesby, Irby upon Humber, East and West Ravendale, and Wold Newton.<br><br>These small rural settlements offer very few services and amenities and poor accessibility to higher level settlements. Future development would involve only limited infill, conversion and re-use of existing buildings with very limited further development. |

Table 10.1 Defined settlement hierarchy

**Justification**

**10.2** Policy 3'Settlement hierarchy' is informed by the spatial portrait set out in Section 5'Spatial Portrait', the preparation of *Settlement Profiles* (2013)[(36)] , which provides a snapshot of individual settlements; and the more detailed *Settlement Accessibility Assessment* (2013). The detailed assessment is founded on an objective approach which uses a number of key indicators to assign points to settlements. The settlements which accumulate the highest number of points are deemed to be those which provide the greatest level of accessibility for residents to a wide range of key services and amenities, including educations, healthcare and recreation.

**10.3** The defined settlement hierarchy in Policy 3'Settlement hierarchy' establishes four levels of settlement. This hierarchy should be considered

36 A copy of the *2013 - Settlement Profiles* document is available to download from the Council's website at: https://www.nelincs.gov.uk/.

alongside key development needs and constraints, infrastructure capacity and the availability of land for development.

| Policy 3'Settlement hierarchy' relationship to: | Links to: |
|---|---|
| National Planning Policy Framework | Paragraphs 14, 154 and 157 |
| Local Plan Strategic Objectives | SO1, SO3, SO4, SO5 and SO8 |
| Evidence base and other key documents and strategies | • *Settlement Accessibility Assessment* (2014) |

Table 10.2 Policy relationships

## Distribution of development

**10.4** New housing will be distributed in relation to the following spatial strategy. This reflects Policy 3'Settlement hierarchy', locations of existing employment clusters, development constraints, accessibility and service provision. It specifically sets out that residential development will be commensurate with the scale of individual settlements and their position in the settlement hierarchy.

### Policy 4

**Distribution of housing growth**

1. The delivery of new dwellings will be distributed as follows:

| Housing spatial distribution | | | |
|---|---|---|---|
| **Settlement level** | **Settlement** | **Spatial Zone** | **Proportion of residential development** |
| **Level 1**<br>Urban area | Grimsby | Urban Area | In combination, between 60 - 65% of new homes will be constructed in and on the fringes of the urban area. |
| | Cleethorpes | | |
| **Level 2**<br>Local service centres | Immingham | Estuary Zone | Between 5 - 10% of new homes will be constructed in and on the fringes of Immingham. |
| | Healing | Western and Southern Arc | In combination, between 30 - 35% of new homes will be constructed in and on the fringes of the arc settlements. |
| | Humberston | | |
| | Laceby | | |

| Housing spatial distribution | | | |
|---|---|---|---|
| **Settlement level** | **Settlement** | **Spatial Zone** | **Proportion of residential development** |
| | Waltham | | |
| | New Waltham | | |
| **Level 3**<br><br>Rural settlements | Habrough | Rural Area | In combination, between 1 - 2% of new homes will be constructed in and on the fringes of the rural settlements. |
| | Stallingborough | | |
| **Level 4**<br><br>Minor rural settlements | All other settlements | | Housing delivery in this area will comprise windfalls and exceptions only. |

Table 10.3 Housing - spatial distribution

**Justification**

**10.5** Policy 4'Distribution of housing growth' acknowledges the tensions that exist between different local plan objectives, key among these are:

1. the desire to regenerate brownfield sites with the need to provide sufficient deliverable housing sites to meet future housing needs which necessitates large area of greenfield development;
2. the need to regenerate and redevelop urban areas to address specific issues of inequality and deprivation, set against consideration of flood risk in these areas;
3. the need to foster and support economic growth, recognising the locational preferences and requirements of key sectors. This raises tensions with regard to designated habitats, flood risk and sustainable transport; and,
4. the need to reconcile competing housing market pressures with the drive to promote sustainable transport choices.

| Policy 4'Distribution of housing growth' relationship to: | Links to: |
|---|---|
| National Planning Policy Framework | Paragraphs 17, 52 and 55 |
| Local Plan Strategic Objectives | SO4 |
| Evidence base and other key documents and strategies | • *Settlement Accessibility Assessment* (2014)<br>• *Strategic Housing Land Availability Assessment* (2016)<br>• *North East Lincolnshire Site Selection Update Report* (2016) |

Table 10.4 Policy relationships

## Key diagram

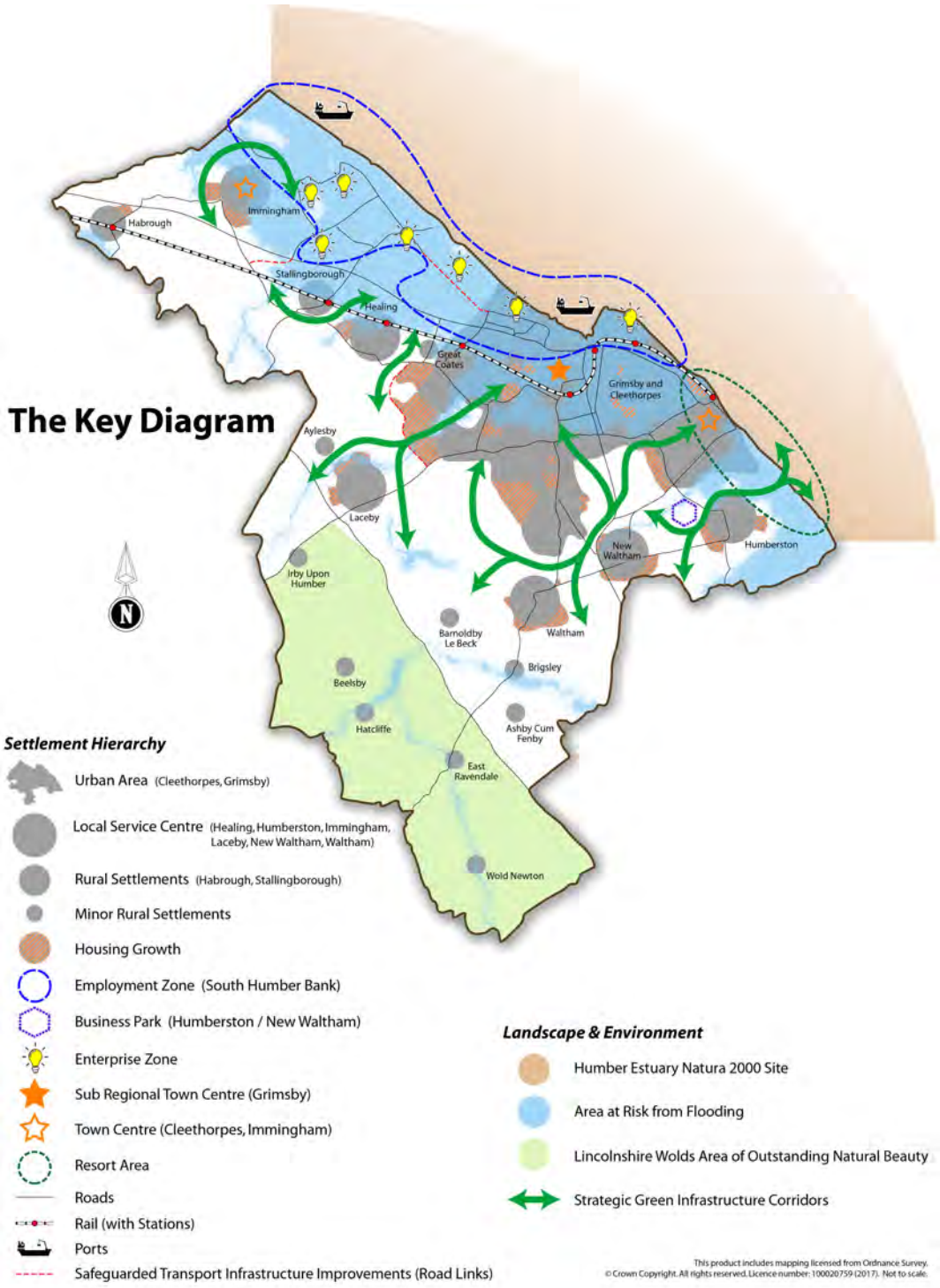


Figure 10.1 The Key Diagram

Local Plan
North East Lincolnshire

Local Plan
North East Lincolnshire

This section of the Plan includes policies which cover subjects that do not relate to specific land uses (such as housing or employment), but have a general application across different aspects of planning. The policies relate to two important aspects:

1. settlement boundaries; and,
2. infrastructure.

---

## Development boundaries

**11.1** evelopment boundaries distinguish between built-up areas and areas of open countryside. The use of development boundaries in planning has been successful in indicating clearly the locations where development will usually be acceptable, subject to meeting normal development management criteria. It is an approach that has, in the past, been strongly supported in North East Lincolnshire and continues to be supported today.

**11.2** The development boundaries have been identified on the Policies Map. These boundaries take account of housing allocations. Where it is known that developments will incorporate extensive areas of perimeter landscaping at the edge of settlements, the development boundaries have been drawn to follow the extent of the built-up development.

**11.3** The Policy goes on to establish the nature of development that would be supported and approved, both within, and beyond the development boundaries, setting out the key considerations and criteria that would apply.

### Policy 5

**Development boundaries**

1. Development boundaries are identified on the Policies Map. All development proposals located within or outside of the defined boundaries will be considered with regard to suitability and sustainability, having regard to:

   A. the size, scale, and density of the proposed development;

   B. access and traffic generation;

   C. provision of services (education, healthcare, community, retail and recreation);

   D. impact upon neighbouring land uses by reason of noise, air quality, disturbance or visual intrusion;

   E. advice from the Health and Safety Executive;

   F. flood risk;

   G. the quality of agricultural land;

H. measures to address any contamination of the site; and,

I. impact on areas of heritage, landscape, biodiversity and geodiversity value, including open land that contributes to settlement character.

2. Development proposals located within but adjacent to defined boundaries will be permitted where schemes respond to:

A. the nature and form of the settlement edge;

B. the relationship between countryside and the settlement built-form; and,

C. opportunities to contribute to the network of green infrastructure.

3. Beyond the development boundaries land will be regarded as open countryside. Development will be supported where it recognises the distinctive open character, landscape quality and role these areas play in providing the individual settings for independent settlements, and:

A. supports a prosperous rural economy, particularly where it promotes the development and diversification of agricultual and other land base rural businesses; or,

B. promotes the retention and development of local services and community facilities; or,

C. supports rural leisure and tourism developments; or,

D. it consists of affordable housing to meet specific local needs; or,

E. it is development that has been specifically defined and identified through the neighbourhood planning process.

**Justification**

**11.4** A number of considerations informed the process of defining the development boundaries, including the nature and form of settlement edges. The *Landscape Character Assessment* (2015) provides an assessment of the landscape sensitivities and was valuable evidence for:

1. considering whether settlements include key characteristics or distinctive features which contribute to their sense of place;

2. identifying features that define current settlement edges and determining whether they are strong or weak; and,

3. assessing opportunities for enhancement through identification of approaches and views, distinctive features, visual open space and sensitivity to change.

| Key aspects considered in defining development boundaries | |
|---|---|
| The need for new development | Ensuring that sufficient sites area available to accommodate future requirements by incorporating sites that:<br><br>1. contribute to the supply of housing (allocated sites); and,<br><br>2. contribute to the supply of employment land.<br><br>Boundaries are not drawn so tightly to exclude all new development; they are influenced by the physical features that define the settlement edge and will provide some opportunities for small scale development above and beyond allocated sites. |
| The setting of the settlement | Considering the particular landscape and surrounding countryside features in the vicinity of the settlement edge:<br><br>1. recreation and amenity open space (including school playing fields), which is physically surrounded by the settlement or adjoining settlement on three sides, is included within the boundary; and,<br><br>2. recreation or amenity open space that extends into the countryside or primarily relates to the countryside, is excluded from the boundary. |
| The existing form, character and pattern of development | Considering the impact of further development on the existing development pattern. Ensuring boundaries are not contiguous if the form of the settlement does not reflect this. If the settlement is characterised by small groups this is reflected in the boundaries.<br><br>The defined boundaries are not drawn so as to 'round off' or 'straighten' edges as this would be contrary to an approach that seeks to safeguard local character and distinctiveness, as it is often the irregularity of settlement edges that adds to a settlement's attractiveness. |
| Preventing coalescence of settlements | Boundaries include the gardens (curtilage) of properties except where they are functionally separate from the dwelling or, where the scale of the site is such that it could, through future development, lead to ribbon development or coalescence with a nearby settlement. |
| The presence of physical boundaries | Recognising that natural or man made features such as rivers, woodlands, or roads and railways can form logical defining boundaries. However, areas of caravan, chalet and other temporary accommodation are excluded from the defined boundary reflecting their temporary status. |

| Key aspects considered in defining development boundaries | |
|---|---|
| Minimising impacts on the character of open countryside | Boundaries ensure the intrinsic character and beauty of the countryside is respected, with particular consideration given to the Lincolnshire Wolds Area of Outstanding Natural Beauty designation. |
| Avoiding ribbon or scattered development | Ensuring that development does not creep along road frontages into open areas, or result in scattered development unrelated to existing development form.<br><br>Freestanding buildings, individual and small groups of dwellings, including farm buildings which are detached or peripheral to the main built-up area of the settlement are excluded from boundaries (reflecting NPPF paragraph 55). |
| Minimising impacts on heritage and biodiversity value | Ensuring that sites of heritage or biodiversity value are identified and not put at risk. |
| The presence of HSE consultation zones | Recognising that development opportunities may be limited or restricted in specific areas. |
| Traffic noise | Based on current assessments of noise, boundaries exclude areas where it is known that road surface noise impacts on living conditions. |
| Accessibility to services and facilities | Boundaries reflect the findings of the *Settlement Accessibility Assessment* (2013). |

Table 11.1 Key aspects considered in defining development boundaries

**11.5** Policy 5'Development boundaries' outlines the generic considerations that will be applied when considering all development proposals, (within development areas, within development boundaries; and within open countryside, outside development boundaries). They reflect core principles and considerations set out in National Planning Policy. These generic considerations provide the basis for considering whether the development proposed should be supported and approved.

**11.6** Policy 5'Development boundaries' specifically allows for development sites and opportunities to be identified and defined through the neighbourhood planning process. In some cases, where the local community decides that this is appropriate, a neighbourhood plan will effectively amend identified development boundaries.

**11.7** In accordance with the NPPF (paragraph 54), the Policy also makes provision for allowing some market housing where this would support the development of a significant number of affordable housing units to meet local needs in rural areas. For example, to enable the delivery of affordable units without grant funding. Policy 19'Rural exceptions' provides further clarification.

| Policy 5'Development boundaries' relationship to: | Link to: |
|---|---|
| National Planning Policy Framework | Paragraphs 55 and 58 |
| Local Plan Strategic Objectives | SO4 and SO9 |
| Evidence base and other key documents and strategies | • *North East Lincolnshire, Landscape Character Assessment* (2015)<br>• *Settlement Accessibility Assessment* (2014) |

Table 11.2 Policy relationships

## Infrastructure

**11.8** The delivery of key infrastructure of the right type, in the right place, and, at the right time, is vitally important to supporting growth and delivery of truly sustainable development. As settlements grown with new homes and places of work, it is important that the supporting infrastructure necessary to ensure health, social and cultural well-being and basic services meeting local needs are provided.

**11.9** Developers will be expected to provide these basic needs and contribute fairly to the delivery of new infrastructure to support new development and the creation of new sustainable communities. This includes aspects of physical infrastructure, social infrastructure, and environmental infrastructure.

**11.10** Developers will be expected to meet the infrastructure needs of the proposed development, and these will normally be secured through planning obligations, conditions or levy charges where appropriate. Where provision is required to address existing deficiencies as well as meeting future requirements, the Council will also utilise contributions from other public funding streams to ensure delivery.

### Policy 6

**Infrastructure**

1. The Council will support developments to create, expand or alter service facilities, including schools, health facilities and key infrastructure to meet the needs of existing and new communities.

2. The Council will work with developers and partner organisations to ensure the delivery of infrastructure, services and community facilities necessary to develop and maintain sustainable communities; and will require provision of infrastructure and infrastructure improvements which

are necessary to make development acceptable to be delivered in association with those developments. These improvements will be secured by planning condition, obligations or levy charges as appropriate.

3. Contributions towards infrastructure will be based on the demands created by the specific development. This includes provision of new, or enhancement of the existing infrastructure and facilities, including, but not necessarily limited to:

   A. physical infrastructure, including:

      i. transport improvements, including highways, public transport, provision for cyclists and pedestrians;
      ii. drainage and surface water management (including SuDS maintenance where appropriate);
      iii. flood defences (where site specific requirements warrant such an approach).

   B. social infrastructure, including:

      i. affordable housing;
      ii. education, including primary and secondary provision[37].

   C. green infrastructure, including:

      i. green space, sport recreation and play space, including future maintenance;
      ii. habitat mitigation provision and maintenance, particularly in association with South Humber Bank employment sites.

   D. Existing infrastructure will be safeguarded, except where there is clear evidence that particular infrastructure is no longer required to meet current or future needs, or can be delivered through alternative provision.

   E. Where financial contributions are made, and in the event it is found that they exceed the cost of necessary works or the contribution remains unspent after an agreed period of time, the contributions will be returned, in part of entirely, as may be appropriate.

   F. The Council will in addition support:

      i. proposals that deliver health infrastructure including doctor's surgeries and pharmacies, which offers improved services for their users; and,
      ii. applications made by the emergency services which will deliver improved services for their users.

   G. The Council sill seek to ensure that all development is commercially viable and deliverable. Where the delivery of a proposed scheme is threatened on the basis of viability, the Council may consider a reduction in the extent of the obligations required to be met. In

37 Pupil generation is based upon pupil generation ratios of; one primary pupil/four dwellings and one secondary pupil/five dwellings. The threshold at which contributions will be sought is ten units.

such circumstances, developers will be required to submit a detailed Financial Viability Assessment on an 'open book' basis, and in sufficient detail in order to justify any reduction from the expected requirements of the scheme. All such submissions, where required by the Council, should provide sufficient information to enable an independent assessment to be undertaken. As a minimum, this should be in accordance with the guidance on such content set out within *RICS Guidance Note GN2012/94 Appendix C*. All submissions will be subject to an independent assessment prior to the determination of the application.

**Justification**

**11.11** The Council has produced an *Infrastructure Development Plan* (IDP) (2015) which sets out the infrastructure required to support sustainable communities over the plan period. The IDP identifies the following:

1. Improvement/enhancement of the current transport network, including requirements for highway provision and improvements; improved pedestrian, cycle and public transport facilities.
2. Requirement for improved education facilities for both primary and secondary provision throughout the area. In the majority of cases, additional school places can be made available either by take-up of existing capacity, or through additional provision by extending existing school facilities. However, the scale of development proposed in certain locations requires new school provision for primary in the Cleethorpes and Waltham planning areas, and in secondary provision in Grimsby town centre and in association with the Grimsby West strategic housing site.
3. Provision of green infrastructure. The standards identified in the Plan will apply to new development. A future Supplementary Planning Document will provide additional guidance on delivery and future management.
4. Provision of playing pitches. Provision of new facilities will be secured through a combination of on-site provision and off-site contributions towards enhanced provision and include management regimes.
5. Whilst there is sufficient electricity, gas and water supply to accommodate required growth, developers will be required to pay for local connections and substation upgrades to meet specific site requirements.
6. Requirements to improve Flood Defences in certain areas in the period to 2032. Specific schemes will be identified in the updated *Humber Flood Risk Management Strategy* and identified by the Environment Agency accordingly. Flood Risk Assessments will be required where appropriate, and mitigation strategies implemented where necessary.
7. Potential provision of health services. Existing facilities are such that it is unlikely that specific new provision of new surgeries will be required over the plan period, although capacity may be improved by additional provision at existing facilities. Funding will be secured from government sources through higher patient numbers. Qualitative and efficiency improvements are the primary focus of primary care provision and as a result there is no specific need to ensure improved primary or secondary care facilities.
8. There is currently sufficient capacity to address waste management requirements in the short to medium term.

**11.12** The strategic ecological mitigation requirements identified in Policy 9'Habitat Mitigation - South Humber Bank' are considered

to be essential requirements to deliver the anticipated level of economic growth. Under normal circumstances, developers would be required to undertake a site specific Appropriate Assessment and identify and implement all necessary mitigation measures. The approach identified in Policy 9'Habitat Mitigation - South Humber Bank' supports a strategic approach to provision against which all developers within the Mitigation Zone will be required to make appropriate contributions in lieu of meeting site specific requirements.

**11.13** Policy 6'Infrastructure' provides themechanism for ensuring that growth is delivered together with appropriate infrastructure. Where developer contributions are to be sought, the thresholds and triggers are set out in individual themed policies in this Plan, together with the mechanisms for determining the scale of contribution to be made.

**11.14** The Council recognises that contributions may be delivered through planning obligations or levy. To ensure that planning obligations and the levy can operate in a complementary way, the Levy Regulations 122 and 123[(38)] place limits on the use of planning obligations in three respects:

1. they put the Government's policy tests on the use of planning obligations (NPPF, paragraph 204) on a statutory basis, for developments that are capable of being charged the levy;
2. they ensure the local use of the levy and planning obligations does not overlap; and,
3. they impose a limit on pooled contributions from planning obligations towards infrastructure that may be funded by the levy.

**11.15** A planning obligation can only be taken into account when determining a planning application for a development, or part of a development, if the obligation meets all of the following tests:

1. it is necessary to make the development acceptable in planning terms;
2. it is directly related to the development; and,
3. it is fairly and reasonably related in scale and kind to the development.

**11.16** The balance of contributions have been subject to viability assessment to ensure that the sum of contributions is not so great that it will place such a large burden on development so as to prevent the delivery of the development. Details of the viability assessment that has resulted in the stated contributions can be found in the *North East Lincolnshire Local Plan Viability Assessment Update* (2015).

| Policy 6'Infrastructure' relationship to: | Link to: |
|---|---|
| National Planning Policy Framework | Paragraph 162 |
| Local Plan Strategic Objectives | SO2, SO5, SO7 and SO8 |
| Evidence base and other key documents and strategies | • *North East Lincolnshire Infrastructure Development Plan* (2015)<br>• *North East Lincolnshire Local Plan Viability Assessment Update* (2015) |

Table 11.3 Policy relationships

38 *Community Infrastructure Levy Regulations 2010.*

Building the economy we need

Local Plan
North East Lincolnshire

The North East Lincolnshire economy is experiencing significant change, in part arising from the development of a new renewable energy sector, based primarily around the development of offshore windfarms. Within Grimsby, the development of the supporting O&M operations is set to bring new life to the Port over the next 25 years.

There are, also good expectations of growth within traditional employment sectors that are prevalent within the area, namely: ports and logistics, food processing, chemicals and process industries and the visitor economy.

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**12.1** There are, however, a number of challenges to be overcome if the full economic opportunities are to be realised, these are:

- **The land and premises** - The industrial accommodation within North East Lincolnshire includes a significant proportion of second hand, poor quality stock. Much of which is nearing the end of its useful economic life and is in some cases fails to meet the requirements of modern day businesses.

  The *Commercial Market Assessment* (2014) identifies the levels of available stock amounts to approximately 3% of the overall level of provision. It also identifies a mismatch between the size of available units and user requirements. As a result, there is restricted choice for investors. This acts as a key deterrent to investment when coupled with the relatively high costs of refurbishment and low rental values.

  The lack of good quality serviced land that is readily available for development is also an issue. Europarc is the only only quality serviced land currently available. The low land and rental values within the area, together with the costs of provision of key infrastructure to enable such land to come forward effectively results in commercial development being unviable on a speculative basis. Whilst there is developer interest in bringing forward sites, developers are seeking support from the public sector to enable their delivery.

**12.2** To overcome this issue, the Council has, developed a South Humber Industrial Investment Programme (SHIIP), which seeks to provide public sector support specifically to deliver land and premises. A number of actions are proposed within the Programme, including support for the delivery of key infrastructure to improve site accessibility and availability, support for development of speculative units and addressing ecological constraints.

- **The environmental constraints** - The Humber Estuary is designated as a Special Area of Conservation and Special Protection Area (SPA) under the European Habitats Directive. The Conservation of Habitats and Species Regulations 2010 (The Habitats Regulations) require consideration of the designations as well as consideration of the wetland as being of international importance under the Ramsar Convention.

  The land adjacent to the estuary between the twin ports of Immingham and Grimsby is of strategic employment significance. As development has taken place there has been growing concern about the importance of the agricultural land being developed. Several bird species use this land for roosting and feeding and without appropriate mitigation future development would be put at risk.

**12.3** The Council has worked with representatives from the unitary authorities of North and North East Lincolnshire, nature conservation bodies and industry representatives

as part of the South Humber Ecology Group to identify the requirements for strategic mitigation to safeguard the integrity of the designations. Once agreed, mitigation will be fully implemented through SHIIP, with the costs being recouped through development contributions as appropriate. It is anticipated that the implementation of the strategic mitigation works will enable sites to come forward without further restrictions regarding the potential to impact on functionally linked land for SPA and Ramsar birds.

- **The low wage and low skill economy** - The skill base has traditionally been around relatively low skill process operations. As a result, wages remain significantly lower than the regional or national averages. The *North East Lincolnshire Sector Study* (2014) specifically identifies skills shortages as an issue for various sectors, particularly ports and logistics, renewables and energy and chemical and process industries.

  Educational attainment levels are currently improving, with a three percent drop in the number of people with no qualifications between 2009 and 2013, and a rise of 2.6% attaining higher level qualifications (degree level or equivalent).[39]

  The Humber LEP has worked to bring together the needs of business and education provision for the Humber through the development of the Virtual College. This has seen joint working between local education providers and Renewable Energy providers. In addition, the Humber LEP have recently been successful in its bid to develop a National College for Renewable Energy within the LEP area.

**12.4** A key part of the *Economic Development Strategy* (2015) is to stimulate economic investment that generates high value jobs, and ensure that the resident population have access to the necessary training to access those jobs.

- **The perception of the area** - North East Lincolnshire as an area has, historically, not promoted its assets and opportunities well. This has led to a perception of the area that has focused inwardly upon the negative aspects, rather that highlighting the positive aspects that create an improved perception.

**12.5** The 'Discover North East Lincolnshire' and 'Invest North East Lincolnshire' brands are examples of two initiatives that seek to address this. These brands focus on the positive aspects that many local residents take for granted but which are important to building confidence with future investors.

**12.6** The Policies of the Plan specifically seek to ensure that investment opportunities are capitalised, and that the constraints to development, are addressed and where possible overcome.

39 *North East Lincolnshire Economic Baseline* (2014).

## Provision for employment

**12.7** Section 8'Future development requirements' establishes a requirement to identify a minimum of 123ha of employment land (Use Classes B1, B2 and B8). In meeting this requirement, site specific allocations need to reflect the needs of modern day businesses.

**12.8** The *Employment Land Review* (2014) identified a total potential supply of 758ha of land which could be considered suitable for employment uses. However, through the assessment process it was established that 332ha of land was constrained in some way and would, therefore, be unavailable to meet generic market needs. This includes:

1. the need to retain land to accommodate strategic habitat mitigation, relating to the Humber Estuary SPA (c118ha); and,
2. landowners desire to hold large tracts of land for their own long-term business purposes, including provision of appropriate buffer zones from neighbouring uses, but also to provide the potential to expand operations should the need arise in the long-term (214ha).

**12.9** The South Humber Bank, especially the area defined between the Ports of Immingham and Grimsby and situated along the A180 corridor, has traditionally been the main focus for employment operations. This has arisen due to the advantages of locating in close proximity to the Ports, the Estuary frontage and its relative accessibility to wider road, rail and pipeline networks. There has been little development of commercial activity within other areas of the Borough, except for a small amount of development in the south of the Borough at Wilton Road Industrial Estate and Altyre Way.

**12.10** There is no evidence of market demand nor significant developer interest in bringing further sites forward in the south of the Borough; consequently, the focus of the employment land provision remains around the South Humber Bank.

**12.11** All of the key sectors are located within this area, however, each has specific characteristics which result in the broad clustering of activity, as shown on Figure 12.1'Sector distribution, South Humber Bank'.

### Ports and Logistics

**12.12** The Ports and Logistics sector is primarily focused around the operational ports and the immediate hinterland. Key requirements are the provision of large sites with good access to the road/rail network.

**12.13** Associated British Ports (ABP), the Port operator and landowner, have developed a strong development management approach which limits development to dock related employment uses. In many cases planning permission is not required due to the permitted development rights granted under S17 of the *Town and Country Planning General Development Order 1995*.

**12.14** The *Port of Immingham Masterplan 2010-2030* indicates that meeting trade demand forecasts will primarily be accommodated within the Port area. However, ABP have identified two sites within their ownership which lie outside the defined port operational area to accommodate further growth needs specific to the Port.

**12.15** In addition to general cargo operations, the Port of Grimsby operates as a major car import and export terminal and has seen recent investment in the new Grimsby River vehicle terminal. It is anticipated that any future port requirements will be accommodated, as at present, within the operation Port area under the jurisdiction of ABP.

**12.16** A key concern that was highlighted in the business surveys undertake in the *North East Lincolnshire Sector Study* (2014) was the shortage of land for logistics operations outside of the control of ABP, for which a requirement of 86ha has been identified. In order to ensure appropriate provision of land, sites are required to be provided which are of sufficient size to accommodate large

space but low volume job generators within close proximity to, but not necessarily directly related to the Ports.

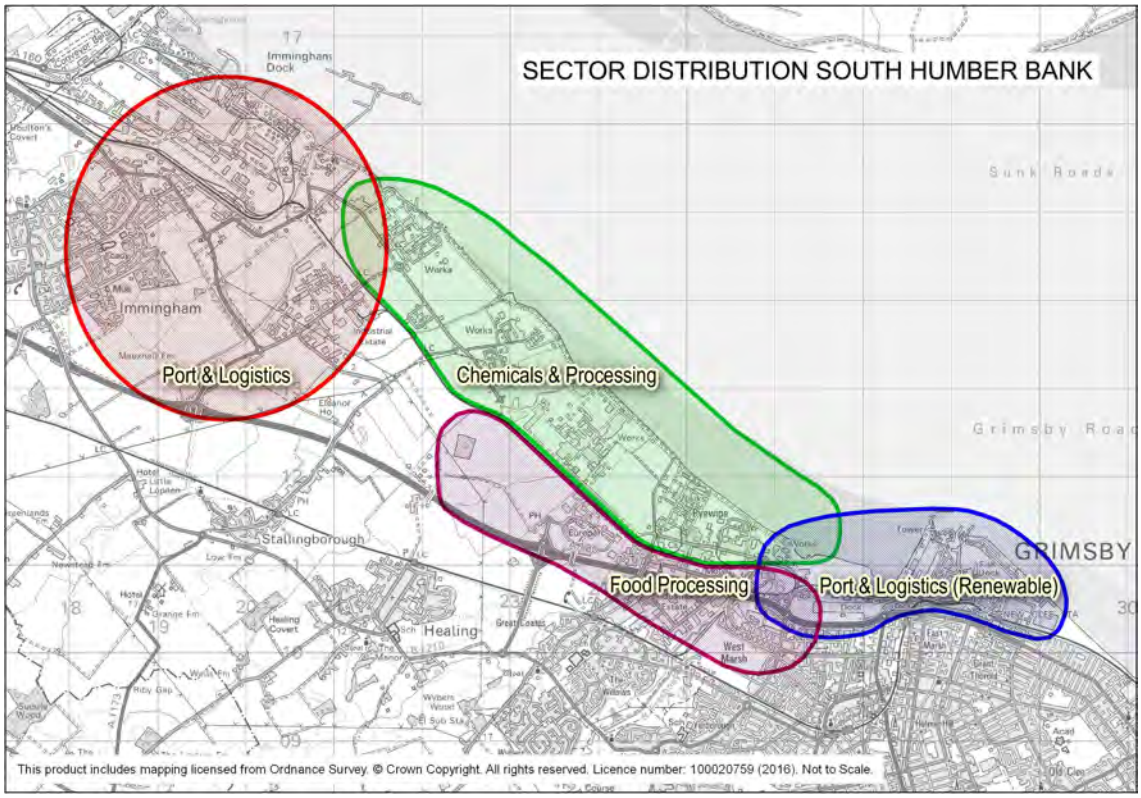


Figure 12.1 Sector distribution, South Humber Bank

**Renewables and Energy**

**12.17** The Port of Grimsby is now firmly established as the base of the offshore O&M operations servicing the windfarm developments within the North Sea. Recent investment in the Port by major companies including Dong, Centrica, Siemens, and Eon are expected to continue as the operations offshore continue to grow. An Enterprise Zone has been declared within the Port of Grimsby specifically to support the growing renewables sector.

**12.18** The significant complementary activities by both ABLE UK (Killingholme) and Siemens (Hull) are anticipated to generate requirements within the overall supply chain, specifically in manufacturing and support operations. Enquiries from such companies are growing. Office, workshops and warehouse and storage facilities are widely anticipated to be required, either close to or within the Port of Grimsby.

**12.19** Another significant area of growth is the development of energy plants, including operations generating power through biomass processing, and waste. This activity sites primarily within the Chemicals and Processing Cluster identified in Figure 12.1'Sector distribution, South Humber Bank'.

**Chemical and Process Industries**

**12.20** Operators within this sector are primarily large space occupiers, requiring significant levels of on-site infrastructure, such as pipelines, and extraction plants. Consequently, these operators tend to have relatively low job densities.

**12.21** Due to the nature of the processes, a number of industrial plants hold large tracts of land which serves both as a buffer to protect the operations from inappropriate neighbouring uses, and provides potential areas for expansion should the need arise. Due to the nature of these industries, expansion proposals are difficult to predict. It is therefore important to ensure the Plan is sufficiently flexible to accommodate these needs when they arise.

### Food Processing

**12.22** By virtue of its long association with the Port of Grimsby, the food processing sector tends to be clustered around the older industrial areas of Grimsby. A more recent trend has seen significant food producers clustering at Europarc in response to a demand for a 'clean' environment, good accessibility and better locational image/perception. The *Commercial Property Market Assessment* (2014) identified a specific requirement to provide appropriate quality food grade accommodation as opportunities to find appropriate previously used accommodation are now in short supply.

**12.23** The Humber LEP, together with the Council have recently signed a Memorandum of Understanding (MOU) with the Malaysian Government, who are seeking to establish a UK base for food production. The MOU commits all parties to securing a location for a food business park, anticipated to be up to 80ha.

### Visitor Economy and Retail

**12.24** The accommodation requirements in relation to this sector are associated with the town centre and resort areas, and are therefore considered further in Section 14'Building the places we need'.

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## Employment allocations

**12.25** To ensure that appropriate land is identified which meets the needs set out in Policy 1'Employment land supply', the sites listed in Table 12.1'Employment allocations' have been identified.

### Policy 7

**Employment allocations**

1. The following employment sites, as identified on the Policies Maps, are allocated for employment development, use classes B1 (Business), B2 (General Industrial) and B8 (Storage and Distribution).

| | Allocation reference/ Settlement (ELR ref) | Site location | Enterprise/ Habitat mitigation zone | Gross site area (expected delivery in plan period) | Indicative sector |
|---|---|---|---|---|---|
| Strategic sites | ELR001 Immingham | Kings Road | Imm-Port Enterprise Zone/Habitat mitigation zone | 21.6ha | Ports and logistics |
| | ELR016 a&b Stallingborough | Stallingborough Interchange[40] | ELR016a - Stallingborough Enterprise Zone | 20ha[41] | Ports and logistics |
| | ELR027 Immingham | Land east of Queens Road | Queens Road Enterprise Zone/Habitat mitigation zone | 15ha | Ports and logistics |
| | ELR015 a&b Grimsby | Great Coates Business Park, Moody Lane | Humber Gate Enterprise Zone/Habitat mitigation zone | 22.6ha | Chemicals and process industries |
| | ELR008 a-e Grimsby | Europarc Phase III | Habitat mitigation zone | 14.9ha | Food processing |
| | ELR011 Grimsby | Europarc Phase IV | Habitat mitigation zone | 15ha[42] | Food procession |
| | ELR020 Stallingborough | RWE/Helius Site, Hobson Way | Habitat mitigation zone | 19.5ha | Renewables and energy |
| | ELR019 Stallingborough | Abengoa Site, Hobson Way | Hobson Way Enterprise Zone/Habitat mitigation zone | 20ha[43] | Renewables and energy |
| General needs | ELR010 Humberston | Altyre Way (Hewitts Circus Business Park) | - | 2.49ha[44] | Mixed |
| | ELR007 Immingham | Land at Hall Park Way | - | 1.21ha | Mixed |

41 Total area 64ha, of which 20ha expected to be delivered within the plan period. The ELR016b site has been reduced in area from that identified in the *Employment Land Review.*
40 Site known to include features of specific archaeological value.
42 Total 80ha of which 15ha expected to be delivered over the plan period.
43 Total 31.7ha of which 20ha expected to be delivered over the plan period.
44 Office scheme currently under construction, application DM/107/14/FUL.

| | Allocation reference/ Settlement (ELR ref) | Site location | Enterprise/ Habitat mitigation zone | Gross site area (expected delivery in plan period) | Indicative sector |
|---|---|---|---|---|---|
| | ELR022 Stallingborough | Plot Q, Kiln Lane | Habitat mitigation zone | 2.11ha[45] | Renewables and energy |
| | ELR024 Grimsby | Estate Road 1 | Habitat mitigation zone | 2.3ha | Mixed |
| | ELR036 Grimsby | Land at Westgate Park, Armstrong Street | - | 0.61ha | Mixed |
| | ELR037 Immingham | Land to rear of Marlin House | - | 1.1ha | Mixed |
| Port specific | ELR003 Stallingborough | Land south of Kiln Lane | Habitat mitigation zone | 16.9ha | Ports and logistics |
| | ELR005 Grimsby | Former Huntsman Tioxide Site, Moody Lane[46] | Moody Lane Enterprise Zone/Habitat mitigation zone | 25ha[47] | Ports and logistics |
| Land reserved for long-term business expansion | ELR021 Grimsby | Novartis, Moody Lane | Habitat mitigation zone | 56ha | Chemicals and process |
| | ELR025 a-e Stallingborough | Cristal, Laporte Road | Habitat mitigation zone | 122ha | - |
| | ELR039 a&b Stallingborough | BOC | Habitat mitigation zone | - | - |

Table 12.1 Employment allocations

2. Sites ELR016a and ELR016b have been identified as having high potential to support SPA/Ramsar birds and proposals will need to be supported by an assessment for these species. This assessment should incorporate a suitable level of data collection and/or bird surveying to determine the individual and cumulative importance of the site for SPA/Ramsar species. Where the assessment identifies the potential for adverse effects resulting from the off-site habitat loss and/or disturbance, appropriate and timely measures must b taken to mitigate such impacts. Such mitigation is likely to be in the form of alternative habitat manged specifically for the affected bird species and/or contributions towards the provision of strategic mitigation sites. Any strategic mitigation provision must be additional to that provided through

45 Renewable energy plant under construction, application DM/0848/14/FUL.
47 Total 39.5ha of which 25ha expected to be delivered over the plan period.
46 A section of the former Huntsman Tioxide site has been identified as a LWS.

the South Humber Bank Strategic Mitigation which only mitigates for sites within the South Humber Bank Mitigation Zone. All such measures must be in place and operational prior to the relevant impact(s), and must be maintained for the duration of the impact(s).

**Operational Port areas**

3. Within the operation port areas identified on the Policies Map development proposals for port related use will be supported and, where appropriate, approved by the Council if the submitted scheme accords with the development plan as a whole and subject to the ability to satisfy the requirements of the *Habitats Regulations*.[48]

4. Within the Port of Grimsby a diversification of uses will be supported where it is proposed on land identified as surplus to port requirements, and the proposed use can be shown to be in accordance with the development plan as a whole, and would not conflict with port operations.

**Land reserved for long-term business expansion**

5. Land reserved for long-term business expansion, as identified on the Policies Map will be safeguarded for future employment development within use classes B1 (Business), B2 (General Industrial) and B8 (Storage and Distribution).

**Justification**

**12.26** The justification for the site selection process is detailed in the *Employment Land Technical Paper* which provides commentary on the availability, suitability and deliverability assessments that have been undertaken. The assessment identified a number of developable sites which, together exceed the land requirement identified in Policy 1'Employment land supply'. Importantly, it also highlighted the clustering benefits and operational requirements of particular business sectors in the Borough. For example, it would be impractical for a food processing operation to locate on the same site, or in the vicinity, of a chemical/processing plant. In view of the need to ensure there is a choice of sites available during the plan period, all sites considered developable are allocated, and an indicative sector attributed to each site as a guide to investors/applicants of the most suitable uses.

**12.27** In addition to particular locational and sector considerations, the Council has also considered the need to provide for different scales of development. A portfolio of sites has, therefore, been identified in Policy 7'Employment allocations' to accommodate the full range of business sizes from major international companies to small, locally based Small and Medium-sized Enterprise (SME) operations. These sites have been categorised as follows.

**Strategic sites**

**12.28** Strategic sites are large-scale, principally estuary wide sites identified to meet demands arising from large-scale operations and major

48 The extent of the operational port areas of Immingham and Grimsby ports extends beyond the jurisdiction of North East Lincolnshire Council, the Policies Map identifies only land within the control of North East Lincolnshire Council.

investment opportunities from all sectors. They are therefore intended to serve a long-term strategic function, which may see delivery beyond the current plan period. Some strategic sites are designated Enterprise Zones, where additional incentives are available to attract investment. Early development of sites within the designated Enterprise Zones is anticipated.

**12.29** Given their long-term and strategic function, it is anticipated that some strategic sites will not be fully developed within the plan period. On these sites the amount of land that is expected to be brought forward over the plan period is identified in Table 12.1'Employment allocations'. This quantum is derived from the proposed delivery strategy identified within SHIIP as set out in the *Employment Land Technical Paper* and *South Humber Industrial Investment Summary Paper*.

**12.30** However, if development progresses faster than envisaged, or a major scheme requiring a significant land take were to be progressed, the Council would support the development of a greater proportion of the site provided the proposal is contained within the site boundary identified on the Policies Map, and accords with other policies within this Plan.

**General needs**

**12.31** General needs sites are considered appropriate for meeting general demand within the local economy. Development of such sites is largely anticipated by smaller scale SME operations.

**Port specific**

**12.32** The Port operator, ABP, has secured land outside of the outside of the Operational Port Area in order to accommodate increasing demand generated by port activities within the Ports and Logistics sector at both Immingham and Grimsby. These sites are allocated specifically to support the long-term development of the ports.

**12.33** Over the plan period, it is anticipated that some parts of the current operational port area will become surplus to port requirements. This is largely anticipated to be in the area to the east of the Royal Dock. In such circumstances the Council will support a diversification of use which takes advantage of the dockside location provided that the change of use would not conflict with port operations.

**Land reserved for long-term business expansion**

**12.34** The nature of the chemical and process sectors is such that large tracts of land are held primarily as buffer zones to avoid unnecessary disturbance to neighbours, or the company in the event of a major incident. However, the companies involved have also indicated long-term interests in developing land to meet company-specific requirements. Given the difficulty of predicting the timing of such requirements (company investment decisions are often taken in an international context, and often require a quick response), the Plan identifies these sites and provides flexibility to accommodate sector-specific requirements.

**12.35** The allocation of land 'Reserved for long-term business expansion' identified in Policy 7'Employment allocations' and on the Policies Map operates as a safeguarding measure for land in specific company ownership to enable future development/expansion of their operations. These sites are not required to meet future general market needs.

**Impacts on Natura 2000 site**

**12.36** Any proposed employment uses that give rise to emissions to air will be required to demonstrate they have had regard to the requirements of the Habitats Regulations, in relation to their effect on the integrity of the Humber Estuary SAC, SPA and Ramsar site, alone or in combination with other existing or planned sources of air pollution. Planning consent will not be granted until such assessment concludes that there will be no adverse effects on

the integrity of the SAC, SPA and Ramsar site, either alone or in combination with other plans or projects.

**12.37** Sites that are located within the South Humber Bank Mitigation Zone will need to be progressed in accordance with the provisions set out in Policy 9'Habitat Mitigation - South Humber Bank'. All sites located outside of the mitigation zone have been assessed through the Local Plan's *Habitat Regulations Assessment Report* (updated December 2016) to determine their likely importance for SPA birds. ELR016a and ELR016b are identified as having high potential to support these qualifying bird species. All other sites were found to have either a low or negligible potential.

**12.38** ELR016a and ELR016b are located immediately to the south of the South Humber Bank Mitigation Zone. The South Humber Bank areas has been subjected to extensive survey effort and therefore a wealth of data exists regarding the distribution and relative importance of specific locations for SPA birds in this area. The data review conducted as part of the Habitat Regulations Assessment (HRA) for the Local Plan concludes that, despite numerous bird records from within and adjacent to these allocations, numbers of SPA birds considered significant at the Humber Estuary population level (i.e. at least on percent of the Humber population) have not been recorded.

**12.39** Whilst these employment sites are unlikely to represent an important resource for SPA birds at the Humber Estuary SPA/Ramsar population scale, SPA birds have been recorded utilising the sites. In view of this, and the habitat features that the sites possess, further site assessment is required to ensure the integrity of the Humber SPA/Ramsar will not be adversely affected as a result of development.

| Policy 7'Employment allocations' relationship to: | Links to: |
|---|---|
| National Planning Policy Framework | Paragraphs 18 to 22 |
| Local Plan Strategic Objectives | SO3 and SO5 |
| Evidence base and other key documents and strategies | • *Commercial Property Market Assessment* (2014)<br>• *Employment Land Review* (2014)<br>• *Employment Land Technical Paper* (2015)<br>• *North East Lincolnshire Economic Baseline Report* (2014)<br>• *North East Lincolnshire Economic Futures Report* (2014)<br>• *South Humber Industrial Investment Programme Technical Summary Paper* (2015) |

Table 12.2 Policy relationships

## Existing employment areas

**12.40** In addition to undeveloped land allocated for employment uses, there are other existing employment areas identified on the Policies Map. These areas are home to many successful businesses that contribute to North East Lincolnshire's economy. There will inevitably be a degree of change within these areas over the plan period as businesses form, expand, contract and close. This is a normal process and the Plan accommodates this.

### Policy 8

**Existing employment areas**

1. Existing employment areas are identified on the Policies Map and will be safeguarded for employment uses. Proposals which promote development or reuse of vacant sites located within existing employment areas for employment use will be supported subject to other relevant policies in the Plan.

2. Proposals for the development of non-employment uses on existing employment sites will be permitted where:

   A. there is evidence to show that the site/building has reached the end of its useful economic life by:

      i. demonstrating that there is no demand for the reuse of the building/site, following a minimum period of 12 months marketing for the existing use with a recognised commercial agent at a reasonable price reflecting typical local land values;
      ii. demonstrating that the physical adaption or reuse of the building is uneconomic in commercial terms; and,

   B. the non-employment use would be compatible with the operations of existing employment uses nearby.

**Justification**

**12.41** Policy 8'Existing employment areas' safeguards existing employment sites for employment uses. This approach provides support for existing business sectors that have established in the Borough. It recognises that businesses may need to expand over the plan period, depending on market conditions and working practices.

**12.42** Policy 8'Existing employment areas' also recognises that market conditions may see certain employment sites fall out of employment use. The former Birds Eye factory site in Ladysmith Road, Grimsby is one such example. There is no justification for safeguarding sites in the long-term where there is no prospect of future employment use. Such an approach is considered to be unsustainable. To promote speedy regeneration, the Policy allows for development of non-employment uses subject to specific criteria being met. These criteria relate to evidence

confirming there is no reasonable prospect of re-establishing employment use; and checks to ensure that the proposed new use is acceptable, and will not compromise the existing employment uses in the area.

**12.43** The Council acknowledges that it would be wrong to require redundant premises to be held vacant for a long time in the vain hope that they may be reoccupied. However, there needs to be a period in which the market is tested to see if it is genuinely redundant. The Council considers that a 12 month period is appropriate and consistent with the principles set out in the NPPF which allows for market signals to be taken into account whilst avoiding undue long-term protection of sites.

**12.44** The existing employment areas are set out in Table 12.3'Existing employment areas' and identified on the Policies Map.

| Existing employment areas | |
|---|---|
| **Settlement** | **Site location/description** |
| Immingham | Manby Road Industrial Estate |
| Stallingborough | Kiln Lane Industrial Estate |
| Grimsby | Europarc |
| Grimsby | Europa Park |
| Grimsby | Great Grimsby Business Park |
| Grimsby | Acorn Business Park |
| Grimsby | South Humberside Industrial Estate |
| Grimsby | Birchin Way Industrial Estate |
| Grimsby | Ladysmith Road |
| Humberston | Wilton Road Industrial Estate |
| Humberston | Hewitts Circus Business Park |

Table 12.3 Existing employment areas

| Policy 8'Existing employment areas' relationship to: | Links to: |
|---|---|
| National Planning Policy Framework | Paragraph 22 |
| Local Plan Strategic Objectives | SO3 and SO5 |
| Evidence base and other key documents and strategies | • *Employment Land Review* (2014) |

Table 12.4 Policy relationships

## South Humber Bank habitat mitigation

**12.45** The Humber Estuary is designated as a Special Area of Conservation (SAC) and Special Protection Area (SPA) under the European Habitats Directive. The *Conservation of Habitats and Species Regulations 2010* (the Habitats Regulations) require consideration of the designations as well as consideration of the wetland as being of international importance under the Ramsar Convention.

**12.46** Specifically, it requires that an 'Appropriate Assessment' is undertaken to understand the implications of the site, and that, where for reasons of 'overriding public interest', (which include issues that are social or economic in nature), proposals for development are put forward that will have a negative impact upon the integrity of the designation, any necessary compensatory provisions are secured.

**12.47** As development of the South Humber Bank has proceeded, concerns have been raised about the importance of the agricultural land. Several bird species that use the South Humber Bank for roosting and feeding are recognised as important features of sites of European and International conservation importance[(49)]. These designations afford legal and policy protection to the Estuary. Development is not acceptable in the context of the *Conservation of Habitats and Species Regulations 2010* (SI No 490), unless mitigation to address potential effects can be delivered.

**12.48** Bird survey work undertaken between 2006 and 2011, has provided a good understanding of the nature and scale of the issue. This established the importance and function of the South Humber Bank to species such as Curlew, Golden Plover and Lapwing; and provided the basic justification for considering a mitigation strategy.

**12.49** A South Humber Bank Ecology Group was formed, made up of representatives from the unitary authorities of North and North East Lincolnshire, nature conservation bodies and industry representatives. A Memorandum of Understanding was signed in 2010 between the unitary authorities and conservation bodies, which committed all to delivering a strategic mitigation solution.

**12.50** Work progressed on providing strategic mitigation which would deliver sufficient land to provide adequate habitat for birds whilst allowing for the full economic development of the remaining land to be realised. The approach is considered to be the most effective way of meeting the requirements of the Habitats Regulations and reducing the risk of one development creating problems for others. An *Initial South Humber Gateway SPA Delivery Plan* (August 2010) was agreed between the local authorities, Natural England, RSPB, Lincolnshire Wildlife Trust and the Environment Agency. This set out a number of initial mitigation principles and provided the basis for exploring mitigation sites options.

**12.51** Within North East Lincolnshire, the patchwork of existing industrial uses and patterns of existing bird usage raised particular difficulties and considerations. A site options assessment was undertaken, and an 'Agreed Area of Search' identified, within which it was agreed the mitigation could be provided. Further detailed consideration of specific sites based upon the Area of Search resulted in an 'initial Preferred Approach' being identified.

**12.52** The *Initial South Humber Gateway SPA Delivery Plan* was reviewed in 2014 to reflect the latest position regarding mitigation proposals. This culminated in the production of the *South Humber Gateway Mitigation Strategy* (2015).

**12.53** Subsequent discussions with landowners and environmental agencies have focused upon the delivery and management of the strategic

49 The Humber Special Protection Areas (SPA) and Ramsar Site.

mitigation sites and have refined the boundaries of individual sites[50]. Details of the delivery strategy are set out in the *South Humber Bank Strategic Mitigation Delivery Options* (2015). The final total gross area to be safeguarded and delivered as mitigation equates to circa 120ha. Figure 12.2'Habitat mitigation, South Humber Bank' identifies the mitigation land that has currently been identified, and is also shown on the Policies Map. An area of complimentary grassland is also protected, shown on the plan below. The land adjacent to Old Fleet Drain is protected as part of the Great Coates Business Park Site (ELR015 a&b).

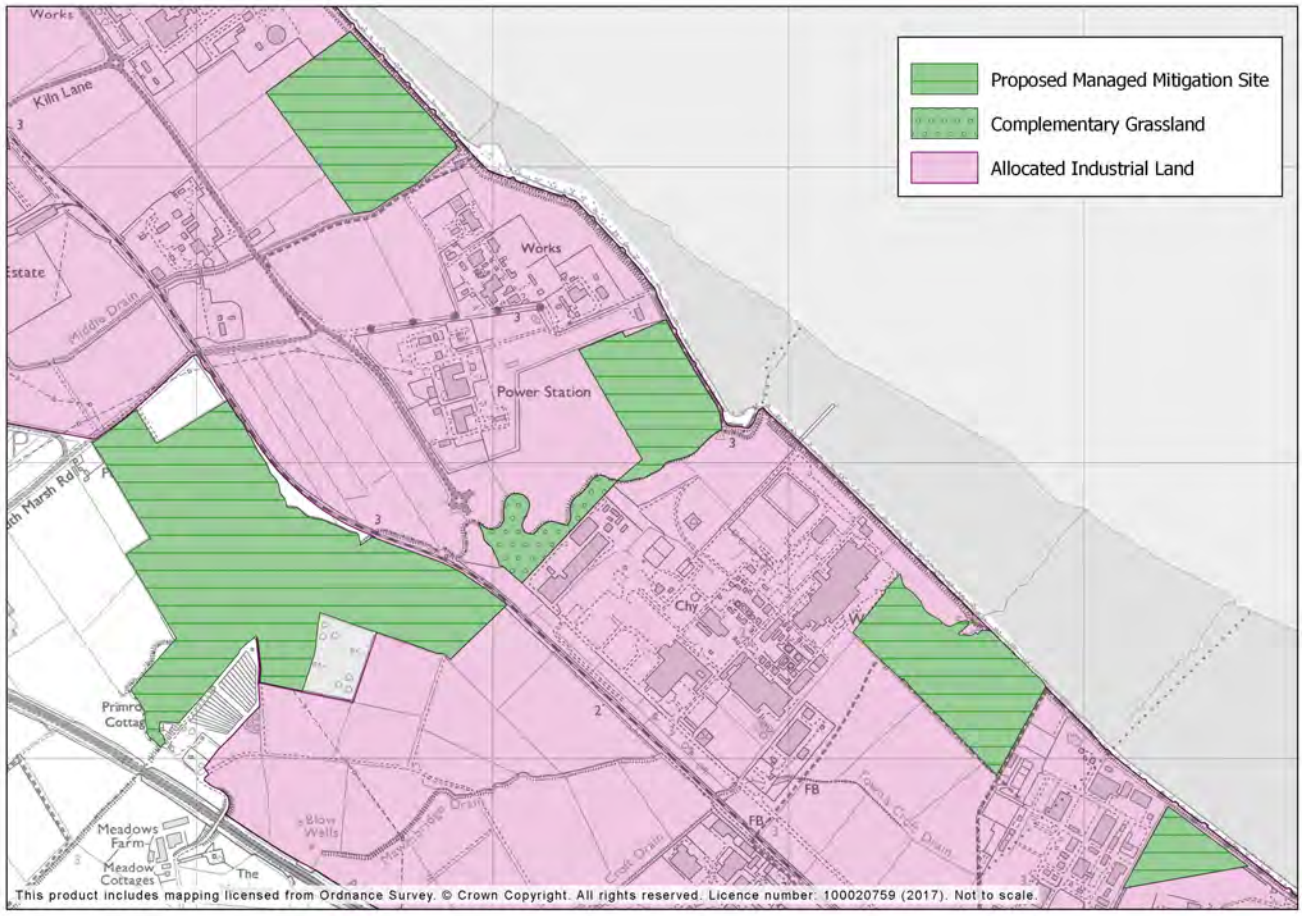



Figure 12.2 Habitat mitigation, South Humber Bank

50 As final details are confirmed there are likely to be some final adjustments to site boundaries.

## Policy 9

**Habitat Mitigation - South Humber Bank**

1. Within the Mitigation Zone identified on the Policies Map, proposals which adversely affect the Humber Estuary SPA/Ramsar site due to the loss of functionally linked land will normally be required to provide their own mitigation in order to comply with the requirements of the Habitats Regulations.

2. The Strategic Mitigation sites, circa 120ha, identified on the Policies Map, represent those sites which have been identified to deliver appropriate mitigation which will address the adverse impacts of development within the Mitigation Zone at a strategic level. The identified Mitigation Sites will be safeguarded against development, and appropriate habitat will be delivered and managed on these sites in accordance with the *North East Lincolnshire South Humber Gateway Ecological Mitigation Delivery Plan*.

3. Development proposals on greenfield land[51] within the Mitigation Zone will be required to make contributions towards the provision and management of the mitigation sites identified on the Policies Map. Where landowners have contributed to the implementation strategy through the donation of land, the required contribution will be reduced by an equivalent value.

4. The Council will secure such contributions, based on a proportional approach relating to the site area. The formula for the calculation or the relevant contribution is as follows:

***Contribution (£) = SA x (£MC/ha)***[52]

The Mitigation Contribution (£MC/ha) will be £11,580/ha. This contribution is not index linked.

The Contribution shall be paid when development commences on site, or through agreement with the Council where a phase approach to delivery is accepted by the Council.

5. All other planning requirement will also be expected to be met.

6. On an exceptional basis independent alternative mitigation proposals will be considered on sites within the identified Mitigation Zone. Proposals should be supported by evidence that demonstrates that the alternative mitigation contributes to the overall mitigation strategy and ensures that the development avoids adverse effects on the integrity of the SPA/Ramsar site, alone or in combination. It will be a requirement of any planning consent that mitigation is implemented prior to the commencement of development.

51 Exceptionally brownfield sites may be required to contribute if evidence identifies that SPA/Ramsar birds have been using the site in significant numbers.

52 Where: A = Gross site area of the development proposal, £MC/ha = Mitigation Contribution, per ha (TC/TL), TC = Total Cost of the Strategic Mitigation Scheme (for clarity including all land acquisitions and leases, costs of works, associated fees and maintenance costs), TL = Total area of the Land included in the Strategic Mitigation Scheme.

**Justification**

**12.54** The Council has worked hard over many years together with North Lincolnshire Council, nature conservation bodies and industry representatives, to develop a strategic approach that will identify and safeguard land to ensure that the integrity of the Humber Estuary Natura 2000 sites is maintained. After lengthy discussion and negotiation with landowners, industry and key conservation bodies a strategic solution has been identified.

**12.55** The approach has significant benefits for landowners/developers of sites along the South Humber Bank who seek to bring forward proposals which support the economic growth aspriations for the area, and for the birds for whom the mitigation land is provided. The identification of strategic site means that the land lost from development is minimised, is optimally sited to maximise the potential for bird use and, most importantly, provides certainty across all interests that the integrity of the Humber Estuary Natura 2000 sites has been addressed and resolved. This is considered to be an exemplar approach to delivering mitigation on a strategic basis.

**12.56** The Council has recognised that early implementation of the mitigation is vital to ensure that economic development is not delayed. Funding has been secured from the Greater Lincolnshire LEP and from the Council which will enable the early implementation of the scheme, which will then permit economic growth to be realised over the plan period[(53)]. The Council will, through delivery of the mitigation sites, ensure that sufficient mitigation land is always in place to support the development of employment sites. This approach will ensure the balance of mitigation land to developed sites on the South Humber Bank always remains effectively 'in credit'. Policy 9'Habitat Mitigation - South Humber Bank' does include a mechanism to recover costs from developers via contributions to support delivery of the mitigation and importantly support the future management of the habitat provided.

**12.57** Arrangements for the ownership and management of the mitigation areas must be secured for the lifetime of the development plan. Beyond this period, it is expected that impacts (loss of functionally linked land) will remain, and that ongoing long term management of the mitigation areas will continue to be required and must be secured. If these areas cannot be secured then sufficient alternative mitigation areas will be needed to address the impacts. This alternative mitigation will be in place and functional prior to the loss of the existing mitigation areas. Until the alternative mitigation is secured and delivered, the Council will need to identify whether there is sufficient mitigation capacity to allow further developments to be consented, in accordance with ensuring that the mitigation balance sheet remains 'in credit'.

**12.58** The Council has recognised that developers may consider an alternative approach; whilst the Policy allows for the possibility and includes wording to address all possible eventualities, in practice it would be very challenging to deliver. Participation in the scheme of strategic mitigation will be the preferred approach and is therefore recommended.

| Policy 9'Habitat Mitigation - South Humber Bank' relationship to: | Links to: |
|---|---|
| National Planning Policy Framework | Paragraph 118 |
| Local Plan Strategic Objectives | SO3, SO5 and SO6 |

53 *South Humber Industrial Investment Programme* (2015).

| Policy 9'Habitat Mitigation - South Humber Bank' relationship to: | Links to: |
|---|---|
| Evidence base and other key documents and strategies | • *South Humber Gateway Mitigation Strategy* (2015)<br>• *South Humber Gateway Mitigation Delivery Options* (2015)<br>• *South Humber Industrial Investment Programme* (2015) |

Table 12.5 Policy relationships

## Office development

**12.59** The *Economic Futures Report* (2014) indicates that there is likely to be growing demand for office accommodation (Use Class B1) in North East Lincolnshire, particularly for business-to-business services. However, the range and choice of office accommodation is currently somewhat limited, and is concentrated mostly in Grimsby town centre, at Laceby Business Park and at Europarc III. A positive approach to providing new office development is required.

**12.60** Offices make an important contribution to the vitality and viability of town centres. The people who work in offices in or near a town centre often shop there and use its other services, facilities and amenities too. Retaining and developing office accommodation in and around town centres can, therefore assist significantly in maintaining their economic and social 'health' and their physical fabric, and supporting regeneration where necessary. By contributing to the spatial concentration of a range of complementary uses, the presence of offices can encourage linked trips to the town centre, helping to minimise the number of journeys being made overall and supporting the efficient provision of public transport services (which, put simply, work best when trips are focused, rather than dispersed). Businesses operating within the professional and financial services sectors may find town centre locations particularly beneficial, but a good town centre can also provide a supportive environment for most types of office and the people who work in them.

**12.61** Against that background, it is recognised that in seeking modern office accommodation with good accessibility, operators have often looked to more peripheral locations, such as at Europarc, where provision can sometimes more easily be made for buildings that meet current specifications and have large areas of car parking associated. The *Economic Futures Report* suggests that 3.2ha of land will be required to accommodate further office growth and some of this may need to be in appropriately located sites outside the town centres.

## Policy 10

**Office development**

1. Provision of office accommodation will be encouraged within the defined town centres, as identified on the Policies Map.

2. Outside town centre boundaries, developments that include more than 500m$^2$ of floorspace for B1(a) office use will only be permitted when:

   A. a sequential test shows that there are no sites suitable to accommodate the proposed development within the town centre or on the edge of the town centre; and,

   B. an impact text demonstrates that the proposal:

      i. will not compromise existing, committed or planned investment in the town centre; and,
      ii. will not have an adverse impact upon the vitality and viability of the town centre through loss of anticipated expenditure up to five years from the date of the application, or for major schemes where the full impact will not be realised in five years, the impact should also be assessed up to ten years from the time the application is made.

   C. Developments that include office B1(a) uses that are ancillary to a B2 or B8 operation will be permitted provided that:

      i. the B1(a) element of the proposed scheme is a necessary part of the B2 or B8 operation; and,
      ii. the floorspace provided for the B1(a) element comprises no more than 10% of the total floorspace of the B2 or B8 operation; and,
      iii. where possible, the B1(a) element is physically integrated into the fabric of the building that accommodates the B2 or B8 use.

**Justification**

**12.62** The Council will apply a 'town centre first' approach in relation to B1(a) office accommodation. This will ensure that the town centres maintain their vitality and viability and that aspirations for them to fulfil their identified role in the retail hierarchy are achieved. Proposals to develop office (B1(a)) accommodation in and immediately around the defined town centres - whether through the conversion or refurbishment of existing buildings or through the construction of new ones - will generally be supported by the Council. Conversely, a more restrictive approach will be applied when considering proposals for the development of office accommodation outside the town centres.

**12.63** This approach is advocated in the NPPF, in which it is recommended that proposals to develop office accommodation above a specified size (floorspace) threshold outside town and city centres should be permitted only if impact and sequential-location tests can be satisfied. The floorspace threshold referred to in the NPPF is 2,500m$^2$ but, in the local context, it is considered that developments below that size may have an adverse impact upon town centre vitality and viability: consequently, a lower floorspace threshold is considered appropriate for North East Lincolnshire. A 500m$^2$ threshold is considered to be appropriate to the local market conditions. Most office provision delivered in the Borough is developed as an ancillary element of larger scale B2/B8 developments, or falls below the 500m$^2$ threshold. Proposals above this threshold are expected to apply a town centre first approach.

**12.64** Policy 10'Office development' recognises that there is a need for some office provision which is ancillary to B2 and B8 uses. Currently this is mostly clustered along the South Humber Bank. Policy 10'Office development' acknowledges the nature of these uses and make suitable provision to accommodate future growth.

| Policy 10'Office development' relationship to: | Links to: |
|---|---|
| National Planning Policy Framework | Paragraphs 23, Annex 2 |
| Local Plan Strategic Objectives | SO3 and SO5 |
| Evidence base and other key documents and strategies | • *Economic Futures Report* (2014) |

Table 12.6 Policy relationships

## Skills and training

**12.65** If local people are to benefit fully from future employment growth it is vital that they have the skills to match the opportunities. This is a key element of the *North East Lincolnshire Economic Strategy* (2015).

**12.66** Whilst academic institutions are yielding improving results, at a general level, the low level of skills within the workforce is identified as a key issue. The *North East Lincolnshire Sector Study* (2014) identified that a number of the key employment sectors highlighted a lack of skills within the workforce as a key barrier to future growth. This related to both trade skills and higher levels of senior/professional skills.

**12.67** The *Sector Study* identified the following specific challenges:

1. relatively low qualification profile, leading to some skills shortages in the labour market.
    a. specifically, there are higher levels of people with no qualifications (11.3%) than comparator areas, and a low proportion of the population with qualifications at NVQ Level 4 and above (20.2%) compared to other areas. Evidence suggests that this latter figure has improved since 2007, but the gap with the national average has not reduced.
2. a lack of senior managers leading to impacts including wage premiums and difficulties in recruiting senior staff.
    a. within North East Lincolnshire there is a lower proportion of managers, directors, senior officials and

professional occupations than other areas (18.1%). Conversely, there is a higher proportion of people employed in elementary occupations and process, plant and machine operatives (27.8%). Average weekly wage levels for residents is £458.70, compared to £465 within Yorkshire and the Humber, and £508 nationally (NOMIS, Dec 2013).

3. the skills base is considered to be 'reasonably well matched to future employment growth sectors, despite a relatively high proportion of low skilled workers, low wages and a general pattern of 'brain drain'.

    a. the *National Employer Skills Survey* (2011) shows that 10% of businesses have a workplace vacancy. The UK Commission DOE Employment and Skills Survey shows that only 2% of businesses have found their vacancies hard to fill, which suggests capacity within the workforce. However, despite this, a higher share of businesses than elsewhere (25%) have a skills gap in their workforce. This may reflect an underlying mismatch in skills demand relative to supply in some key industries and challenges in delivering training within business.

**12.68** Whilst it is not for the Plan specifically to address the local skills issue in terms of training provision, it can assist in recognising and accommodating the establishment and expansion of training and skills facilities such as the CATCH (Centre for Assessment of Technical Competence Humberside) at Stallingborough, the MODAL (multi-modal logistics) training centre at Immingham, and the potential development of a Humber National Offshore College.

**12.69** The Plan will also contribute indirectly. Providing attractive, good quality housing, cultural, retail and leisure opportunities all impact on the quality of life. Creating places and an overall environment that are attractive to local people and those who wish to relocate, is key to retaining skills.

## Policy 11

**Skills and training**

1. The Council will support development proposals that relate directly to the development of local skills, and training opportunities, focusing on existing facilities and town centre locations.

**Justification**

**12.70** Adult skills are key to supporting and developing the local economy and building a strong and resilient community in which residents want to stay and develop, people aspire to live and businesses are encouraged to invest. It is important that the local plan supports approaches that develop learning and skills levels ensuring local people are equipped to access future jobs and investors have confidence that a suitable workforce is available to meet their needs.

**12.71** A *19+ Skills Strategy for North East Lincolnshire* has been developed in collaboration with local education, skills and training providers. The approach set out in Policy 11'Skills and training' is intended to support the priorities set out in this strategy and the overall aims of the

*North East Lincolnshire Economic Strategy*. In that context, developers of major developments will be encouraged to contribute to local employment development, skills and training, including:

1. making best efforts to employ local contractors, subcontractors, apprentices and trainees during construction; and,
2. where appropriate, developing and implementing a business orientated 'employment and skills plan' to develop skills.

| Policy 11'Skills and training' relationship to: | Links to: |
|---|---|
| National Planning Policy Framework | Paragraph 33 |
| Local Plan Strategic Objectives | SO3 and SO5 |
| Evidence base and other key documents and strategies | • *North East Lincolnshire Sector Study* (2014)<br>• *19+ Skills Strategy 2011-2013*<br>• *North East Lincolnshire Economic Strategy* (2013) |

Table 12.7 Policy relationships

## Visitor economy

**12.72** A sustainable visitor economy helps to create a vibrant and prosperous place. The visitor economy does not just include the economic activities generated by the people who visit the area for both business and leisure, but the necessary infrastructure that collectively make it a successful visitor destination. This includes:

1. the quality of the natural environment; the beach, country parks, wetlands and open spaces and the Lincolnshire Wolds;
2. the infrastructure; including transport facilities, (road and rail), parking, signage, public space, and a good range of visitor accommodation meeting business and family needs; and,
3. the services and cultural offer that caters for visitor needs (and local residents); restaurants, bars, leisure and cultural facilities and events.

**12.73** A sustainable visitor economy brings both direct and indirect economic benefits, but can also bring less obvious cultural and health benefits associated with active and socially engaging lifestyles, with a strong overlap with sport and recreation.

**12.74** The visitor economy brings both direct and indirect economic benefits, but can also bring less obvious cultural and health benefits associated with active and socially engaging lifestyles, with a strong overlap with sport and recreation.

**12.75** The visitor economy does, however, face a number of key challenges, including the need to:

1. compete with other centres and visitor destinations, particularly those that have a wider offer at both a regional and national scale;
2. improve the image and perception of the area;
3. develop and promote the current lack of year round and all-weather facilities and activities;

4. strengthen the non-retail, evening and family offer; and,
5. ensure the provision of good quality business and family accommodation, catering for a range of needs and budgets.

**12.76** The *STEAM Final Trend Report 2009-2013*[54] showed overall that there were 11,470,000 visitor trips of all types in 2013 within North East Lincolnshire, which boosted the local economy by £493m overall. The sector employs 4,558 people directly, making it the largest employer of all the key sectors. Evidence suggests that since 2009, overall visitor numbers and income generated have been on an upward trend, following the general trend of growth within the visitor economy nationally. However, the competitive nature of the sector is such that continued investment is required in order that market share is maintained and enhanced.

**12.77** The Plan must support developments that broaden the appeal to visitors, caters for their needs, and presents an attractive environment. Current attractions within the area are primarily focused in Cleethorpes, but also include the Fishing Heritage Centre, the Auditorium, Freshney Place Shopping Centre and Leisure Centre in Grimsby and Waltham Windmill. In addition, the Lincolnshire Wolds AONB is partially located within the Borough, but extends further south into East and West Lindsey. Business visitors are also particularly important to the local visitor economy, as this underpins the seasonal flow and ensures year round income for local businesses.

**12.78** The Victorian seaside town of Cleethorpes is a key attraction for many visitors including those who visit on business, day visitors and holiday makers particularly during the summer months. The town offers a traditional seaside experience, focused on its beach stretching four and a half miles from the mainline railway station and pier at the northern end of the resort and immediately adjacent to the town centre, to the caravan and chalet parks supported by a range of out-of-centre leisure and retail facilities in the south. However, like many Victorian seaside resorts, it suffers from a lack of investment in the physical fabric and public realm, and business is seasonal.

**12.79** Cleethorpes has a distinct and individual character that it is important to maintain and promote. Sea View Street offers an attractive area of niche retail activity, attractive to visitors and residents. Recently, major national chains have invested in hotel and restaurant/bar accommodation in both the resort and town centre areas (Premier Inn, Brewers Fayre, Costa Coffee, Weatherspoons). The recent refurbishment of 'The Pier' to create a central facility offering a range of eating and drinking outlets as well as a Ballroom/Conference facility, which hosts major events, is a good example of a year round, all weather, visitor attraction. The Cleethorpes Pier was recently awarded 'Pier of the Year 2016' by the Pier Society. Its proximity to the town centre will enable opportunities for linked trips and its niche retail offer, particularly Sea View Street which provides a range of high-end niche products, sets Cleethorpes apart from other local visitor destinations. Opportunities to further integrate the town centre with the resort area by focusing on the town centre opportunity sites and investment in the public realm and Victorian building fabric will create an enhanced town centre environment and visitor destination for both visitors and residents alike. Improving the connectivity and providing an appropriate range of attractions where the town centre and resort areas converge will help sustain both the town centre and visitor economies.

**12.80** Increasing visitor and recreational activity can result in recreational pressure and potential disturbance affecting the Humber Special Area of Conservation (SCA), Special Protection Area (SPA) and Ramsar site (referred to collectively as Humber Natura 2000 sites). This has been identified as an issue in Natural England's *Site Improvement Plan for the Humber Estuary*. The

54 *STEAM Final Trend Report 2009-2013*, Global Toursim Solutions (2015).

Council is an active member of the Humber Nature Partnership, an organisation made up of statutory regulators, public sector, business sector and voluntary sector members and other Humber stakeholders. It works collectively to deliver sustainable management of the Humber Natura 2000 sites and specifically works upon:

1. delivery of the Humber Management Scheme;
2. providing ecological services to members of the partnership; and,
3. developing and implementing projects to meet the Humber Conservation Objectives.

**12.81** Visitor recreational activity is concentrated around the resort of Cleethorpes and to avoid the Humber Natura 2000 sites being adversely affected by an increase in visitor numbers appropriate management will be required. The Council will need to develop a mitigation strategy which considers potential impacts of development and incorporates improvements to visitor management as the visitor numbers increase, considering in particular the management suggestions set out in the *Footprint Ecology Desk Based Study on Recreation Disturbance to Birds on the Humber Estuary* (2010). This sets out recommendations to influence visitor flows and minimise disturbance, which includes, but is not limited to:

1. on and off-site education, highlighting the conservation importance of sites;
2. details of access points and parking, zoning etc.;
3. changing local by-laws to control access (particularly related to dogs), and zoning of particular activities through warden patrols and restricting access to parts of a site;
4. providing dedicated fenced dog exercise areas and alternative recreational facilities; and,
5. planning conditions on development in proximity to the SPA, relating to planting, screening, vehicle and pedestrian routing and access, to influence visitor flows and minimise disturbance.

**12.82** The Council is committed to a review of the *Cleethorpes Habitat Management Plan* by December 2018. This will examine the specific recreational and disturbance pressures and identify appropriate mitigation responses which will be delivered in advance of impacts and as part of an ongoing mitigation strategy from that point in time, in discussion with Natural England and RSPB, and final agreement with Natural England. The Plan will also include a framework for future monitoring of recreational impacts. In the interim, the Council will work with Natural England to review current management approaches; and will ensure that all applications for housing or tourism developments fully assess and mitigate for their recreational disturbance impacts, demonstrating compliance with the tests of the Habitats Regulations.

**12.83** The visitor economy is not just limited to activities within Cleethorpes. The *STEAM Report 2012* identified that a significant part of the visitor spend (£116m in 2012) was generated through shopping, recreation and food and drink expenditure within Grimsby. This spending underpins Grimsby's role as a sub-regional centre. However, in order for it to continue to maintain that role and attract visitors to it, further facilities will be required to be developed to overcome the challenges identified above. Opportunity sites which will assist with the development of the visitor economy in Grimsby are proposed in 'Vibrant town and local centres', as will the hosting of major events, such as the recently held World Sea Food Congress which attracted visitors from 17 different countries.

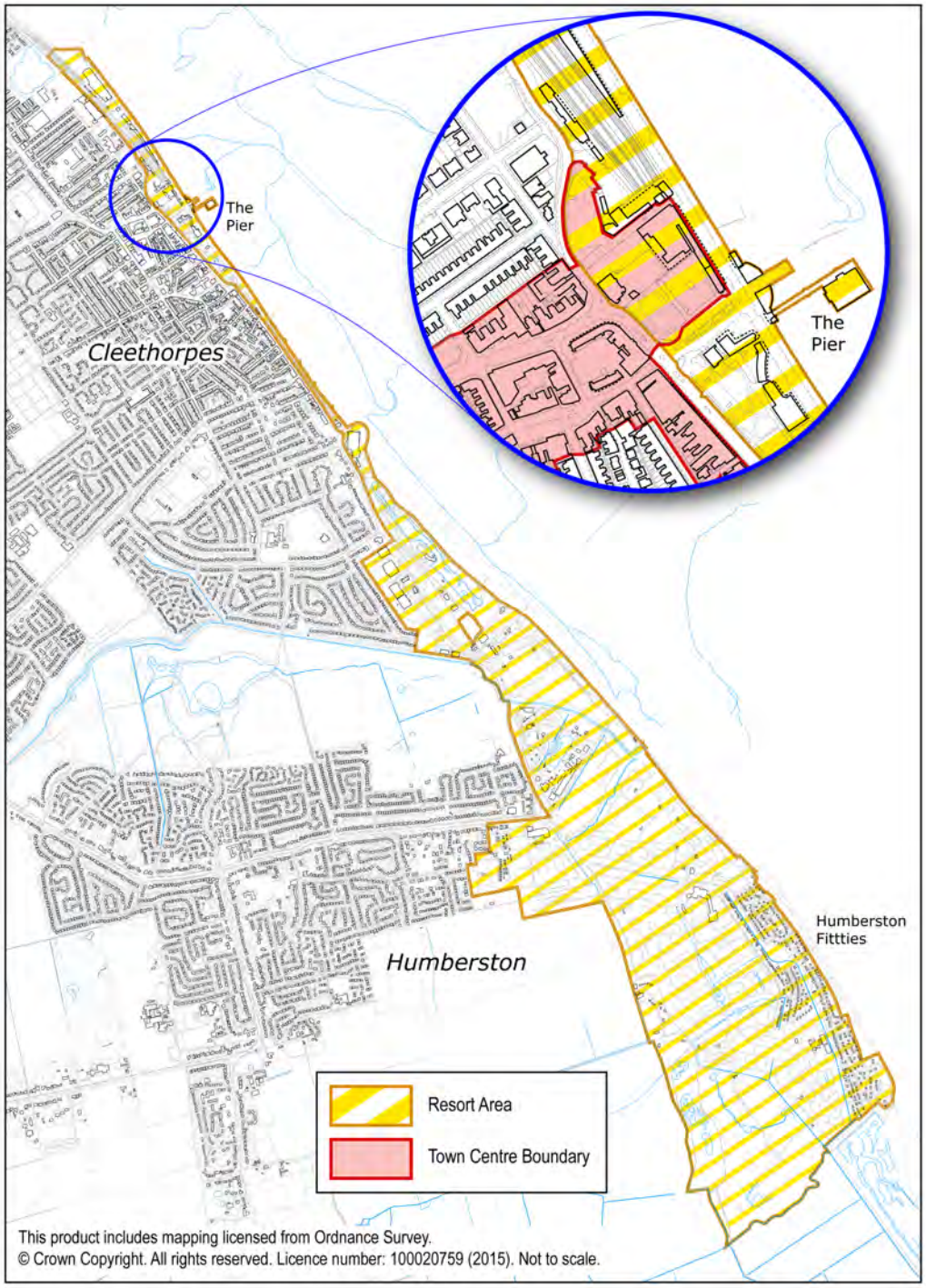



Figure 12.3 Cleethorpes resort area

**12.84** A Coastal Community Team (CCT) has been established and a *Coastal Community Plan* produced which outlines key projects contributing to specific aspects including, 'improving the night-time economy in Grimsby', and 'extending the tourism season of Cleethorpes'. The CCT has been formed by the Council and its private sector partner, Visitor Economy Services and retail Group (VESR). VESR has produced a three year strategy which is consistent with the Local Plan and the Council's *Economic Strategy* which will contribute to, and lead 'place marketing' through its recently created DiscoverNEL brand. The aim of DiscoverNEL is to raise the profile of North East Lincolnshire as a location to Work, Stay and Play, supporting the increase in job opportunities and development of new homes. An ultimate aim of VESR is to become the destination management organisation to be able to apply for additional funding.

**12.85** The Plan can support such a strategy by ensuring appropriate provision is made in the key town centres, and that appropriate support is offered for the development of visitor attractions in other appropriate locations.

## Policy 12

**Tourism and visitor economy**

1. The Council will support development that is consistent with the following principles:

   A. safeguards, supports and enhances the growth of existing and new visitor, cultural and leisure attractions that are appropriate to their location, including the resort area and town centres;

   B. supports the provision of a wide range of attractions within the town centres of Grimsby and Cleethorpes;

   C. contributes towards the development of a year round all weather visitor economy;

   D. enhances the provision of support facilities for visitors e.g. car parking, high quality accommodation, and signage;

   E. promotes rural 'green tourism' facilities and supports rural diversification where appropriate;

   F. safeguards and promotes local distinctiveness and cultural diversity;

   G. maintains the high water quality and attraction of Cleethorpes beach;

   H. maintains the integrity of the designated Humber Estuary Natura 2000 sites and features of interest associated with the Humber Estuary SSSI. Securing appropriate, effective and timely mitigation when necessary; including a commitment to further development of the *Cleethorpes Habitat Management Plan* to manage increasing recreational pressures and access to sensitive areas. Any mitigation or management measures will be implemented prior to impacts occurring;

   I. protects and enhances places of historic character and appearance;

J. protects and enhances sites of biodiversity and geodiversity importance; and,

K. raises the profile of the area at a regional and national scale, contributing to place marketing promoted through DiscoverNEL.

2. When developing within the AONB particular regard should be had to the criteria above and specifically the *Lincolnshire Wolds AONB Management Plan*.

**Justification**

**12.86** The approach seeks to optimise the area's tourism assets while protecting environmental resources that are fundamental to the tourist offer. It promotes development that would both broaden the tourism offer across the Borough, and support the long-term sustainability of the Cleethorpes resort. Tourist spending is at present, characterised by seasonality and dominated by day visitors. The challenge is to broaden the current offer to extend the season and extend visitor stays to maximise the contribution of tourism to the local economy.

**12.87** North East Lincolnshire's natural environment and ecology is also attractive to visitors and provides a different experience that complements that offered by the resort. This requires sensitive management. The Humber Estuary is designated as a Special Area of Conservation (SAC) and Special Protection Area (SPA) under the European Habitats Directive. The *Conservation of Habitats and Species Regulations 2010* (The Habitats Regulations) require consideration of the designations as well as consideration of the wetland as being of international importance under the Ramsar Convention. An area of the sand dunes is also designated as a SSSI. The Council will apply a level of protection to these sites which is commensurate with their high level of protection and recognise specifically the reasons for their designation. Tourism and visitor development within the Lincolnshire Wolds Area of Outstanding Natural Beauty should respect the national designation of this area on the basis of its landscape quality and follow the approaches set out in the AONB Management Plan.

**12.88** The Council will actively support tourism and cultural development proposals, granting approval to developments which accord with Policy 12'Tourism and visitor economy', putting in place local development orders to promote development opportunities, e.g. Grant Street Cleethorpes, and pursue heritage grant funding and other appropriate funding bids when available.

| Policy 12'Tourism and visitor economy' relationship to: | Links to: |
|---|---|
| National Planning Policy Framework | Paragraphs 17, 23, 28, 70 and 126 |
| Local Plan Strategic Objectives | SO3 and SO5 |
| Evidence base and other key documents and strategies | • *STEAM Final Trends Report 2009-2012*<br>• *Lincolnshire Wolds Area of Outstanding Natural Beauty Management Plan* (2013) |

Table 12.8 Policy relationships

Building the homes we need

Local Plan
North East Lincolnshire

Strategic Objective 'SO4 Housing' of the Plan seeks to ensure that new housing meets the needs and aspirations of the Borough's communities. The Council recognises that everyone should be given the opportunity to access a decent home, one which they can afford and is in a community where they want to live. The Plan is designed to contribute to achieving these objectives by planning for a sufficient quantity, quality and type of housing in the right locations, taking account of need and demand and seeking to improve choice.

This section of the Plan identifies the most appropriate sites to accommodate the new homes needed in the Borough and to ensure that, where available and viable, land is used efficiently by utilising previously developed land. The most sustainable locations with respect to accessibility have been identified wherever possible to allow new residents access to a full range of facilities.

Three major extensions to the urban area form strategic allocations that will make a substantial contribution to meeting the area's need for housing and Policy 14'Development of strategic housing sites' identifies particular considerations and requirements for each site. The Council's expectations for delivering housing to address the needs of residents, particularly older people, travellers, those that live in rural areas and those that cannot currently afford their own place to live are also set out within policy.

## Provision of homes in North East Lincolnshire

### Meeting North East Lincolnshire's need to housing

**13.1** This section looks at how the level of new housing required (set out in Policy 2'The housing requirement') will be delivered in North East Lincolnshire over the plan period. It outlines the sources of future land supply to meet this need and specific sites which will be needed to facilitate the required level of development.

**13.2** Since the base date of the Council's housing modelling, 1,313 net additional homes have been added to North East Lincolnshire's housing stock. Table 13.1'Housing requirement and delivery' outlines the remaining supply to be provided over the plan period, which equates to just over 8,400 homes to meet the Jobs-Led Baseline UR requirement.

| Housing requirement and delivery | |
|---|---|
| Requirement, based upon delivering the Jobs-Led Baseline - UR forecast (1 April 2013 to 31 March 2032) | 9,742 |
| Net completions (1 April 2013 to 31 March 2017) | 1,313 |
| Remaining requirement to be met (1 April 2017 to 31 March 2032) | 8,429 |

Table 13.1 Housing requirement and delivery

**13.3** Some development in the Borough is already committed and will continue to come forward from sites which have planning permission and which are under construction (as shown in Table 13.2'Sites under construction'). Further supply will be provided by the allocation of specific sites which will be expected to deliver new homes

during the plan period. It is also expected that there will be a significant contribution made to supply from small 'windfall' sites.[55]

| Sites under construction | | | |
|---|---|---|---|
| **Site reference** | **Settlement** | **Site location** | **Estimated units remaining (1 April 2017)** |
| HOU062 | Grimsby | Land to south of Cornwall Close, Diana Princess of Wales Hospital, Scartho | 84 |
| HOU076 | Grimsby | Scartho Top | 971 |
| HOU316 | Grimsby | Former Leaking Boot Public House, Grimsby Road and Suggitts Lane | 21 |
| HOU057 | Cleethorpes | Winter Gardens, Kingsway | 14 |
| HOU004 | Immingham | Land south west of Roval Drive ('Habrough Fields') | 28 |
| HOU092 and HOU147 | Humberston | Land at and rear of 184 Humberston Avenue ('Keystone Development') | 425 |
| HOU125 | Humberston | The Rose, Brooklyn Drive | 18 |
| HOU066 | Laceby | Land north of nursing home, Butt Lane | 30 |
| HOU113 | Waltham | Golf Course site, Cheapside | 1 |
| HOU101B | New Waltham | Humberston Park Golf Club ('Par 3') | 94 |
| HOU131 | Bradley | Bradley Yard | 12 |

Table 13.2 Sites under construction

**13.4** The Council has assessed historic windfall trends and found that the Urban Area and Western and Southern Arc provide a consistent source of small site windfall completions. This trend has been taken forward across the remainder of the plan period. The Estuary Zone and Rural Area completions achieved historically have been removed from the trend. It therefore presents a cautious windfall allowance meaning that further supply from this source could be expected to be achieved over the plan period. The Urban Area and Western and Southern Arc provide significant opportunity for housing to come forward in small developments, arising mainly through the change of use and conversion of buildings which are currently in non-housing uses, and the opportunity to develop small infill sites.

55 Small windfall sites are sites of nine dwellings or less.

**13.5** There is also the potential for some major windfall sites[56] to come forward during the plan period, however, no allowance has been made for these in the Council's provision from windfall figure. Historic major windfall completions show that it is not a consistent source of supply. There are however a number of large sites with the potential to come forward for housing development during the plan period. This includes Council sites brought forward through further property and land rationalisation; potential residential development included as part of town centre mixed use development, identified within the town centre opportunity sites; and regeneration of the wider Freeman Street area. Options for the redevelopment of the Freeman Street area were still being appraised when this Plan was published.

**13.6** These predicted major windfalls have been reflected upon when assessing the likely demolitions which would result in a reduction in the stock of homes and which must therefore be addressed. Shoreline Housing has current plans for the demolition of the Freeman Street tower blocks and adjacent maisonettes, a total of 638 homes. The Plan recognises these and possible future small scale demolitions. On balance the contribution from major windfalls, including further council asset rationalisation, residential development as part of mixed use town centre development, possible residential development as an element of the regeneration of the Freeman Street area, and the possible reduction in empty Shoreline properties as a consequence of stock reduction and reinvestment, will offset the predicted demolitions.

**13.7** The Council is however, as set out in Section 8'Future development requirements', committed to establishing a Plan that is capable of supporting the possible enhanced growth opportunities in the Borough and provide the opportunity to boost housing supply. Through the Plan, the Council is seeking to build upon the principles of sustainable planning and capture the benefits of growth locally. Consequently the Plan outlines a housing land supply which incorporates an effective buffer capable of supporting a rate of housing growth that aligns with the higher economic performance outlined in Jobs-Led Scenario 1 - UR. This equates to a housing land supply of at least 13,340.

| Estimated supply and delivery to 2032 | | |
|---|---|---|
| **Source of supply** | **Estimated delivery in plan period** | **Total capacity** |
| Constructed 2013 - 31 March 2017 | 1,313 | 1,313 |
| Committed sites | 4,722 | 4,722 |
| Allocations | 6,507 | 8,211 |
| Development Company sites | 803 | 803 |
| Small site windfall allowance | 1,073 | 1.073 |
| **Total** | **14,418** | **16,122** |

Table 13.3 Estimated supply and delivery to 2032

56 Sites of 10 dwellings or more which were not expected to come forward.

**13.8** Table 13.3'Estimated supply and delivery to 2032' summaries the total estimate supply identified and likely to be delivered in North East Lincolnshire over the plan period. It provides the estimated number of homes that could be delivered in the period to 2032, together with the estimated total capacity of the sites identified. A significant proportion of the future housing supply is already identified through outstanding planning permissions (included in committed sites). The overall supply is supplemented by additional sites which have been identified through the Council's property rationalisation process and are specifically being brought forward for housing development by the Council's Development Company.

**13.9** The Development Company is a wholly owned company that has been established to accelerate the delivery of high quality developments. It will bring forward housing development on a number of publicly owned sites that have been released through the property rationalisation programme. It is progressing these sites through a joint venture with a development partner procured through the Homes and Communities Agency Delivery Partner Panel 2 (DPP2).

**13.10** Table 13.4'Housing allocations' focuses on identifying new allocations. It includes a list of specific sites, including their estimated delivery over the plan period, as well as the total capacity of the site. Because of the rate of development expected, some larger sites will not be completed within the plan period and will continue to provide housing supply into the next plan period. Should delivery rates increase, these sites have the potential to deliver additional supply within the plan period. The Council will continue to monitor the number of new homes delivered and the speed at which they come forward, to ensure that North East Lincolnshire maintains a sufficient supply of sites for new homes.

**13.11** The estimated delivery is based on past trends and housing delivery rates which could increase in the future as job opportunities come online which will increase demand. Government initiatives such as the help to buy scheme and starter homes can help to further stimulate demand.

**13.12** The Council has provided further detail on the process involved in searching for and selecting appropriate and sustainable sites for allocation. This is available in the accompanying *Housing Technical Paper, Site Selection Report* and in the Council's *Sustainability Appraisal* documents.

**13.13** A range of issues were considered in the selection of sites for allocation. This includes:

1. the settlement hierarchy set out in Policy 3'Settlement hierarchy';
2. the relative sustainability of sites, as assessed through the accompanying *Sustainability Appraisal*;
3. the availability of land;
4. the suitability of land, including access and environmental constraints;
5. ensuring that the use of brownfield land is maximised to bring forward wider regeneration benefits;
6. focusing development away from areas at risk of flooding, and in particular, ensuring that greenfield sites in Flood Zones 2 and 3 are not brought forward, except where the site can be developed avoiding the areas at higher flood risk;
7. market factors, notably viability and deliverability;
8. community aspirations for development, expressed through consultation with the community, and representative bodies including parish councils;

9. orientating growth more to the north of the Borough closer to employment opportunties; and,

10. infrastructure delivery.

**13.14** A number of the allocations are for mixed use development and Policy 13'Housing allocations' highlights their contribution to meeting housing needs only. Larger strategic sites listed in this policy are subject to site-specific policies (see Policy 14'Development of strategic housing sites').

## Policy 13

### Housing allocations

1. To meet the identified housing requirement and spatial distribution, the following sites, identified on the Policies Map have been allocated for housing development. This includes a number of sites with planning permission.

| Housing allocations | | | | | | |
|---|---|---|---|---|---|---|
| **Allocation reference/ settlement** | **Site location** | **Medium/ high SPA bird potential** | **Housing market area** | **Gross site area (Ha)** | **Estimated yield to 2032** | **Total site capacity** |
| HOU017 Grimsby | Land at 71-85 Hamilton Street and Cleethorpe Road | No | Low | 0.27 | 30 | 30 |
| HOU018 Grimsby | Land at Macaulay Lane ('West Marsh Renaissance') | No | Low | 7.24 | 250 | 250 |
| HOU037 Grimsby | Land to the west of Cartergate[57] | No | Low | 0.18 | 14 | 14 |
| HOU044 Grimsby | Land at Ladysmith Road (former Birdseye site) | No | Low | 4.16 | 260 | 260 |
| HOU047 Grimsby | Claremont House, 7 Welholme Avenue[58] | No | Medium | 0.85 | 28 | 28 |
| HOU059 Grimsby | Former Cedars Office, Eastern Inway | No | Low | 0.43 | 32 | 32 |

57 Site located within the Central Grimsby conservation area, refer specifically to Policy 39'Conserving and enhancing the historic environment'.

58 Site located within the Central Grimsby conservation area, refer specifically to Policy 39'Conserving and enhancing the historic environment'.

| Housing allocations | | | | | | |
|---|---|---|---|---|---|---|
| **Allocation reference/ settlement** | **Site location** | **Medium/ high SPA bird potential** | **Housing market area** | **Gross site area (Ha)** | **Estimated yield to 2032** | **Total site capacity** |
| HOU074A, HOU074B and HOU074C Grimsby | Lane west of Humberston Road | Yes | Low/High | 48.91 | 748 | 1,708 |
| HOU118 Grimsby | Central Parade, Freshney Green (former Yarborough Estate) | No | Low | 9.95 | 165 | 165 |
| HOU119 Grimsby | Cordage Mill, Convamore Road[59] | No | Low | 3.22 | 113 | 113 |
| HOU144 Grimsby | Land off College Street[60] | No | Low | 0.43 | 13 | 13 |
| HOU150 Grimsby | Land at the south of Diana Princess of Wales Hospital[61] | No | High | 6.66 | 490 | 490 |
| HOU151 Grimsby | Land at the north west of Diana Princess of Wales Hospital | No | Low | 0.50 | 19 | 19 |
| HOU231 Grimsby | Fletchers Yard, Wellowgate[62] | No | Medium | 0.18 | 12 | 12 |
| HOU232 Grimsby | 2-4 (Hazelmere House) and 2A Welholme Avenue[63] | No | Medium | 0.26 | 14 | 14 |
| HOU249A Grimsby | Land at corner of Park Street (65) and Brereton Avenue | No | Low | 0.18 | 14 | 14 |
| HOU296 Grimsby | Land off Shaw Drive and Glebe Road | No | High | 8.01 | 160 | 160 |
| HOU302 Grimsby | 2-6 Littlefield Lane | No | Low | 0.08 | 10 | 10 |
| HOU303 Grimsby | 29-31 Chantry Lane | No | Low | 0.09 | 11 | 11 |

59 Cordage Mill is a Grade II Listed Building, refer to Policy 39'Conserving and enhancing the historic environment'.
60 Site located within Wellow conservation area, refer specifically to Policy 39'Conserving and enhancing the historic environment'.
61 Site located within Scartho conservation area, refer specifically to Policy 39'Conserving and enhancing the historic environment'.
62 Site located within Wellow conservation area, refer specifically to Policy 39'Conserving and enhancing the historic environment'.
63 Site located within Wellow conservation area, refer specifically to Policy 39'Conserving and enhancing the historic environment'.

| Housing allocations | | | | | | |
|---|---|---|---|---|---|---|
| **Allocation reference/ settlement** | **Site location** | **Medium/ high SPA bird potential** | **Housing market area** | **Gross site area (Ha)** | **Estimated yield to 2032** | **Total site capacity** |
| HOU308 Grimsby | Land at Winchester Avenue | No | Low | 0.92 | 60 | 60 |
| HOU342 Grimsby | Grimsby West Urban Extension[64] | Yes | Low/ Medium/ High | 206.70 | 2,713 | 3,337 |
| HOU357 Grimsby | Land at Orchard Drive | No | Low | 0.34 | 19 | 19 |
| HOU358 Grimsby | Land corner of Convamore Road/Eleanor Street | No | Low | 0.07 | 16 | 16 |
| HOU034A, HOU034B, and HOU034C Cleethorpes | Land at Pelham Road and Chapmans Pond | Yes | Low | 8.27 | 242 | 242 |
| HOU042 | Site of former Clifton Bingo, Grant Street[65] | No | Low | 0.21 | 80 | 80 |
| HOU359 Cleethorpes | 157 Grimsby Road | No | Low | 0.17 | 16 | 16 |
| HOU001 Immingham | Land at Waterworks Street | No | Low | 0.80 | 32 | 32 |
| HOU002 Immingham | Land to the west of Pilgrims Way | No | Medium | 5.81 | 178 | 178 |
| HOU006 Immingham | Land to the east of Stallingborough Road | Yes | Low | 22.30 | 540 | 660 |
| HOU233 Immingham | Land at Willows Farm | No | Low | 0.66 | 8 | 8 |
| HOU301 Immingham | Land at Trenchard Close | No | Low | 0.32 | 18 | 18 |
| HOU010B Healing | Land north of Grampian Avenue and west of Larkspur Avenue | Yes | High | 20.41 | 250 | 250 |

64 Site located within Great Coates conservation area, refer specifically to Policy 39'Conserving and enhancing the historic environment'.
65 Site located within Cleethorpes Seafront conservation area, refer specifically to Policy 39'Conserving and enhancing the historic environment'.

| Housing allocations | | | | | | |
|---|---|---|---|---|---|---|
| **Allocation reference/ settlement** | **Site location** | **Medium/ high SPA bird potential** | **Housing market area** | **Gross site area (Ha)** | **Estimated yield to 2032** | **Total site capacity** |
| HOU343 Healing | Land r/o 74-76 Stallingborough Road | No | High | 0.31 | 10 | 10 |
| HOU068A Laceby | Land off Blyth Way | No | High | 3.94 | 100 | 100 |
| HOU075A Laceby | Land off Field Head Road and west of Charles Avenue | No | High | 6.50 | 152 | 152 |
| HOU110 and HOU129 Waltham | Land to the west of Cheapside[(66)] | No | High | 8.76 | 230 | 230 |
| HOU111 Waltham | Land to the rear of Sandon House, Barnoldby Road and west of Brigsley Road | No | High | 8.74 | 199 | 199 |
| HOU112 Waltham | Land to the north west of Golf Course Lane and east of Cheapside | No | High | 5.14 | 95 | 95 |
| HOU288 Waltham | Land off Station Road | No | High | 2.22 | 51 | 51 |
| HOU292 Waltham | Land west of Bradley Road | No | High | 3.40 | 66 | 66 |
| HOU356 Waltham | Land south of Ings Lane | No | High | 0.99 | 10 | 10 |
| HOU095A and HOU095B New Waltham | Land west of Greenlands and north of Simpsons Fold Court | No | High | 10.57 | 216 | 216 |
| HOU104 New Waltham | Land at Louth Road | Yes | High | 16.08 | 300 | 300 |
| HOU105 New Waltham | Land west of Louth Road and south of Toll Bar School | Yes | High | 23.07 | 400 | 400 |
| HOU146 New Waltham | Land to the south of 32-66 Humberston Avenue ('Millennium Park') | Yes | High | 21.74 | 385 | 385 |
| HOU280 New Waltham | Land adjacent pumping station Hewitts Avenue | No | High | 0.68 | 13 | 13 |

66 Site located in close proximity to Grade II* Waltham Windmill, refer to Policy 39'Conserving and enhancing the historic environment'.

| Housing allocations | | | | | | |
|---|---|---|---|---|---|---|
| **Allocation reference/ settlement** | **Site location** | **Medium/ high SPA bird potential** | **Housing market area** | **Gross site area (Ha)** | **Estimated yield to 2032** | **Total site capacity** |
| HOU082 Humberston | Land at South View adjacent to Coach House Public House | No | High | 1.50 | 17 | 17 |
| HOU084A Humberston | Land at Midfield Farm south of Sinderson Road and east of Cherry Close[67] | Yes | High | 9.41 | 198 | 198 |
| HOU097 Humberston | Land north of South Sea Lane[68] | No | High | 19.88 | 31 | 31 |
| HOU124 Humberston | Land off Altyre Way | No | Medium/ High | 1.59 | 50 | 50 |
| HOU139 Humberston | Land to the north of Humberston Avenue | No | High | 14.81 | 311 | 311 |
| HOU295 Humberston | Land off Forest Way | No | High | 0.55 | 10 | 10 |
| HOU134 Habrough | Land of Station Road | Yes | Medium | 5.28 | 118 | 118 |
| HOU294 Stallingborough | Land adjacent to railway line, off Station Road | No | High | 0.59 | 25 | 25 |

Table 13.4 Housing allocations

### Development Company sites

2. Table 13.5'Housing allocations (North East Lincolnshire Development Company)' identifies sites which are being released through the Council's property rationalisation process, these are identified on the Policies Map, and will contribute to the overall housing supply.

67 Site located in close proximity to Humberston conservation area, refer specifically to Policy 39'Conserving and enhancing the historic environment'.

68 Site located in close proximity to scheduled ancient monument and three Grade II Listed Buildings at Manor Farmhouse, refer specifically to Policy 39'Conserving and enhancing the historic environment'.

**Playing pitch re-provision**

3. North East Lincolnshire Council and Sport England are currently working on the preparation of a robust playing pitch strategy along with several National Governing Bodies of Sport. A number of council sports pitches have been allocated for future housing as part of the Council's property rationalisation process. Until this strategy work is completed, the Council is committed to replacing any sports pitch sites which are allocated for alternative uses in this Plan, should the playing pitch strategy identify a shortfall in the geographic location of the allocated housing sites.

| Allocation reference/ settlement | Site location | Housing market area | Gross site area (Ha) | Estimated yield to 2032 | Estimated total site capacity |
|---|---|---|---|---|---|
| HOU128 Grimsby | Land at former Western School and to the rear of Grange Primary School, south of Cambridge Road and east of Little Coates Road | Low | 10.38 | 390 | 390 |
| HOU140A Grimsby | Weelsby Avenue Depot | Medium | 0.66 | 23 | 23 |
| HOU354 Grimsby | Duchess Street Car Park[69] | Medium | 0.60 | 80 | 80 |
| HOU355 Grimsby | Scartho Top Playing Field, Heimdal Road | Low/High | 2.55 | 100 | 100 |
| HOU056B Cleethorpes | Thrunscoe Centre, Highgate | Low | 0.96 | 30 | 30 |
| HOU141A Cleethorpes | Former Matthew Humberston School Field | Medium | 2.81 | 100 | 100 |
| HOU353 Cleethorpes | Former Lindsey Lower School Field | Medium | 2.38 | 80 | 80 |

Table 13.5 Housing allocations (North East Lincolnshire Development Company)

69 Site located within Grimsby Central conservation area, refer specifically to Policy 39'Conserving and enhancing the historic environment'.

**SPA birds**

4. Sites identified as having medium or high potential to support SPA/Ramsar birds will be required to provide an assessment for these species. This assessment should incorporate a suitable level of data collection and/or bird surveying to determine the individual and cumulative importance of the site for SPA/Ramsar species. Where the assessment identifies the potential for adverse effects resulting from the off-site habitat loss and/or disturbance, appropriate and timely measures must be taken to mitigate such impacts. Such mitigation is likely to be in the form of alternative habitat managed specifically for the affected bird species and/or contributions towards the provision of strategic mitigation sites. Any strategic mitigation provision must be additional to that provided through the South Humber Bank Strategic Mitigation which only mitigates for sites within the South Humber Bank Mitigation Zone. All such measures must be in place and operational prior to the relevant impact(s), and must be maintained for the duration of the impact(s).

**Recreational impacts**

5. The Council will track planning permissions granted on all housing sites and will identify and secure appropriate, effective and timely mitigation to manage increasing recreational pressures on the Humber Natura 2000 sites when necessary; this includes a commitment to further development of the *Cleethorpes Habitat Management Plan*. Any mitigation or management measures identified will be implemented prior to impacts occurring.

**Monitoring**

6. Housing delivery will be monitored and managed to ensure there remains an available land supply for housing over the plan period, maintaining at least a five year supply. The Council will monitor the delivery of new homes through it's Authorities Monitoring Report. The Council has made an assessment of the likely delivery of units on these sites in the period to 2032. A number of sites are not expected to complete within the plan period. The total allocated capacity of sites exceeds the Council's housing requirement and if delivery rates can be increased then these sites could provide additional supply to react to market signals.

**Justification**

**13.15** The sites allocated for housing development provide a range and choice of sites capable of meeting the future housing requirement, whilst recognising the contribution of predicted future windfalls. In allocating a site Council is establishing the principle that development of the site for housing is acceptable.

**13.16** When identifying sites the Council has considered the likely constraints and infrastructure requirements to deliver sustainable communities. If a site is not allocated, it may still be suitable for development where it does not conflict with the overall strategy of the Plan and subject to other relevant policies in the Plan.

**13.17** The quantum of new housing required is significant and there is a lack of available brownfield land to meet this need. The Council

has identified as many previously developed ('brownfield') sites as possible, however, many of the identified previously development sites are small due to their location within the built-up urban area. The Council has therefore had to identify many greenfield sites for allocation to meet the area's housing need. Overall, it is estimated that 80% of new homes will be provided on greenfield land, and 20% will be provided on previously developed land. The Council has avoided allocating greenfield sites in Flood Zones 2 and 3, unless the area of a site affected is small and can be avoided in bringing forward a development scheme.

**13.18** The Policy identifies a number of considerations that need to be applied to housing developments on allocated sites. Where a site has been identified through the site selection process as having potential to impact on an historic asset, these are highlighted and schemes will need to be designed in accordance with the requirements of Policy 39'Conserving and enhancing the historic environment'. The housing market area that sites fall within should be used to determine the affordable housing contributions required by Policy 18'Affordable housing'.

**13.19** A desk based assessment undertaken as part of the *Habitats Regulation Assessment* of the Local Plan identifies a small number of sites as having moderate potential to support SPA/Ramsar qualifying bird species. Some of these sites already benefit from planning permission and in such cases the issue has been appropriately explored and considered through the planning application process. Development proposals on all other sites will need to be supported by further assessment that confirms the individual and cumulative importance of the site for SPA/Ramsar species.

### Maintaining a five year supply of land for housing and housing trajectory 2013 to 2032

**13.20** The Policy sets out that housing delivery will be monitored, through the *Authority's Monitoring Report* (AMR) and managed to ensure that there remains an available land supply for housing over the plan period, maintaining at least a five year supply of deliverable housing land at all points in the plan period.

**13.21** An assessment of the likely delivery on these sites has been made which has identified that a number of sites are not expected to complete within the plan period. The total allocated capacity of sites therefore exceeds the Council's overall housing requirement (Jobs-Led Scenario 1 - UR), and if delivery rates can be increased then these sites could provide additional supply to react to market signals. The housing supply trajectory is set out in Figure 13.1'Housing trajectory' below.

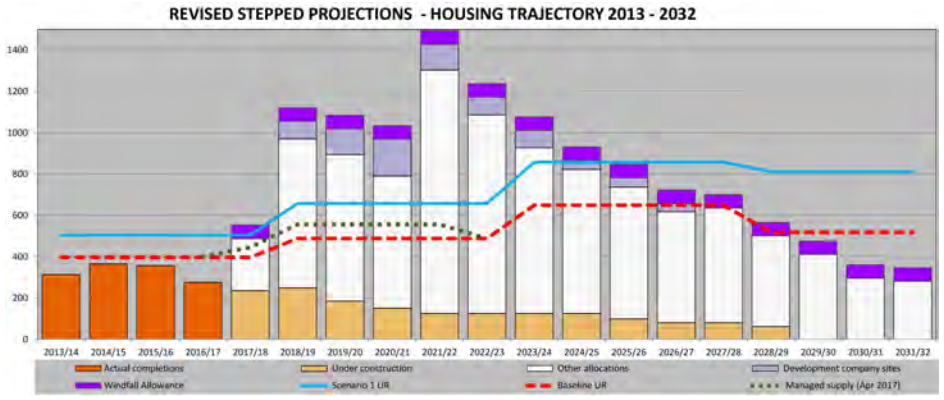



Figure 13.1 Housing trajectory

| Policy 13'Housing allocations' relationship to: | Links to: |
|---|---|
| National Planning Policy Framework | Paragraphs 47 to 55 |
| Local Plan Strategic Objectives | SO4 |
| Evidence base and other key documents and strategies | • *Strategic Housing Land Availability Assessment* (2015)<br>• *Housing Land Technical Paper* (2015)<br>• *Site Selection Report* (2016) |

Table 13.6 Policy relationships

## Development of strategic housing sites

**13.22** The strategic housing sites all represent major extensions to the current urban area. These sites will make a significant contribution to meeting the area's need for housing and are considered critical to the housing supply. Their estimated capacity and delivery expectations are set out in Table 13.7'Capacity of strategic housing sites'.

| Capacity of strategic housing sites | | | |
|---|---|---|---|
| **Site reference/ settlement** | **Strategic site location** | **Estimated delivery to 2032** | **Potential total site capacity** |
| HOU076 Grimsby | Scartho Top | 971 | 971 |
| HOU342 Grimsby | Land west of Laceby Acres and Wybers Wood, Grimsby ('Grimsby West') | 2,593 | 3,335 |
| HOU074 Grimsby | Land west of Humberston Road, Grimsby ('Humberston Road') | 748 | 1,708 |

Table 13.7 Capacity of strategic housing sites

**13.23** Scartho Top is a currently allocated and consented site which was identified in the 2003 Local Plan, and which will continue to develop over future years. An initial Masterplan has guided the development of this site to date and provides the basis for future development phases.

**13.24** The land west of Laceby Acres and Wybers Wood ('Grimsby West'), will once developed form a major strategic extension to the west of the Grimsby urban area. It will also establish a new road link between the A46 and A180, via the A1136. This overall site is considered to be strategically well placed in relation to future economic growth on the South

Humber Bank. The site offers the potential to provide a soft development edge in contrast to that which exists today, and connections and extensions to the network of green infrastructure, particularly extending the River Freshney green infrastructure corridor. The two landowners are working in partnership to promote this strategic site. A Masterplan has been developed with assistance provided by the Advisory Team for Large Applications (ATLAS), which is part of a Homes and Communities Agency (HCA).

**13.25** The land west of Humberston Road is again strategically well placed, its location within the urban area provides good accessibility to services and facilities. There is again an opportunity to soften the development edge by building on extensive areas of existing green infrastructure, whilst maintaining the principle of non-coalescence.

**13.26** Given the scale and timescale over which these strategic developments will happen, it is considered appropriate to set out the development principles that should be followed, and identify the key delivery elements.

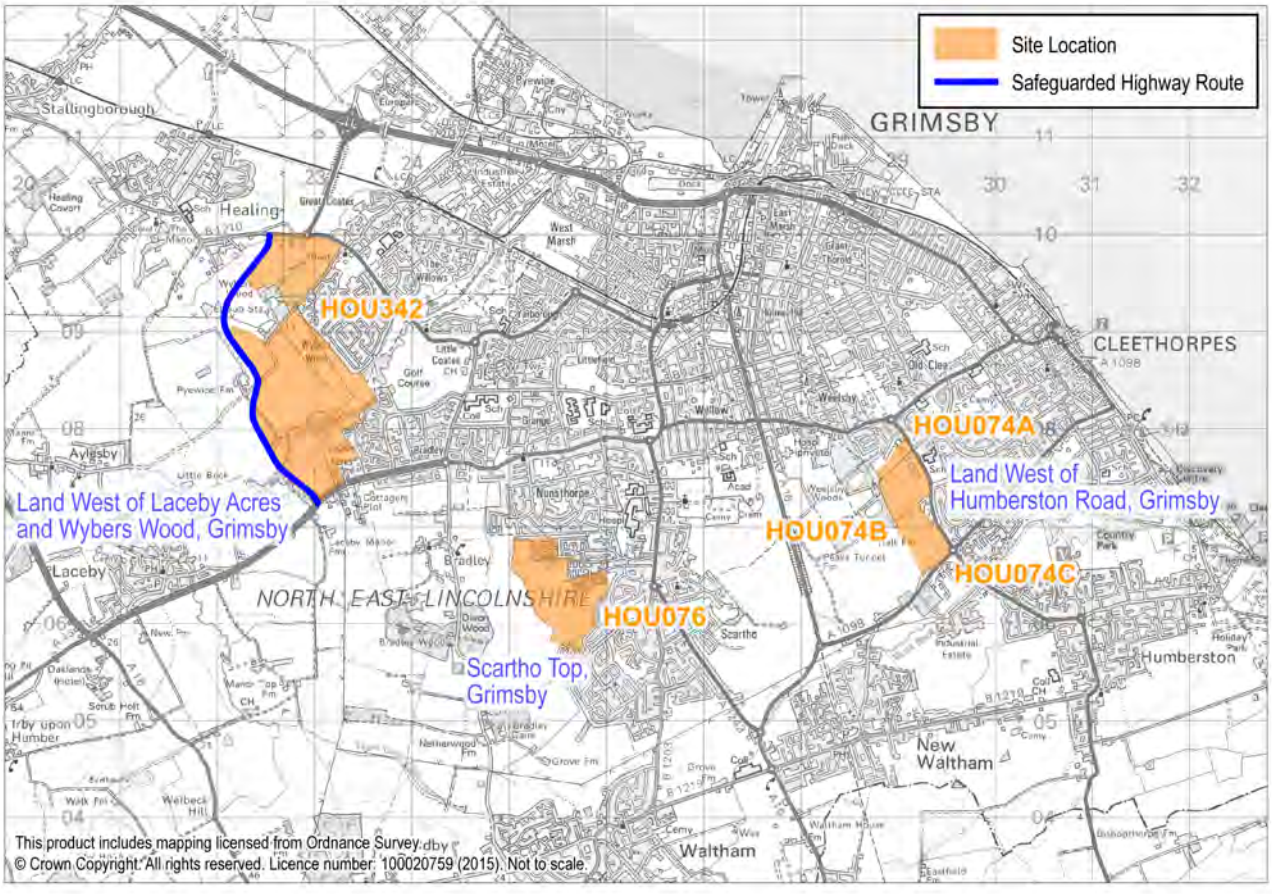



Figure 13.2 Strategic housing site locations

## Policy 14

**Development of strategic housing sites**

1. Development of all strategic sites must be planned and implemented in a coordinated way linked to the timely delivery of key infrastructure. Development will be expected to:

   A. create balanced sustainable communities through provision of a range of housing types, sizes and tenures, including general market, affordable housing and housing for the young and elderly;

   B. ensure that local infrastructure requirements for the new community are met through provision of facilities and services (schools, community facilities, local centres, play and playing pitch provision, and healthcare) in a planned and phased manner;

   C. create high standards of design that create a specific sense of place which relates well to adjoining areas, recognising important views and connections;

   D. create safe and welcoming places which promote a strong sense of community;

   E. deliver development within a framework of green infrastructure, that maximises linkage to the wider green infrastructure network, promotes healthy lifestyles, ensures rights of way are protected and enhanced, and softens development edges;

   F. maximise accessibility to sustainable travel choices, promoting walking, cycling and public transport; and address necessary improvements to the highway network, both on and off-site;

   G. deliver foul and surface water drainage infrastructure in a way that ties into green infrastructure provision, promotes a strong sense of place, and is co-ordinated with the phasing of the overall site;

   H. minimise environmental impact safeguarding and enhancing biodiversity value, incorporating identified Local Wildlife Sites (LWS) and Sites of Nature Conservation Interest (SNCI);

   I. take account of approved design guides, or other mechanisms to ensure high quality and locally distinctive design; and,

   J. explore through consultation with the community, and deliver arrangements for long-term stewardship relating to drainage infrastructure, green infrastructure, open space and social infrastructure.

2. The following provision must be made in the development of the specific sites. Delivery will be secured through planning conditions and appropriate contributions:

**A. Scartho Top**

i. secure delivery of circa 971 homes over the plan period;

ii. phased development in accordance with the agreed Scartho Top Masterplan;

iii. education contributions, (off-site delivery);

iv. open space provision and long-term stewardship arrangements;

v. social infrastructure including community facilities, convenience store and other facilities compatible with a local centre; focused in a central hub with strong connections to the wider area;

vi. affordable housing;

vii. provision for self-build/custom build homes;

viii. highways infrastructure, including public transport, cycle and pedestrian facilities; and,

ix. drainage and surface water management.

**B. Grimsby West**

i. prepare a Grimsby West Masterplan for the whole site which will provide the framework for development of the site to ensure the site is developed in a comprehensive and coordinated manner. The Masterplan is to be agreed with the Council prior to the determination of any planning applications on the site and will form a material consideration, and the basis for determining subsequent planning applications;

ii. secure delivery of circa 3,500 homes, circa 2,600 homes over the plan period;

iii. phased development in accordance with a phasing and implementation plan included in the Grimsby West Masterplan;

iv. develop a Grimsby West design guide, and deliver high quality design in accordance with the approved guide;

v. undertake a heritage impact assessment to inform the Masterplan. The heritage impact assessment will identify heritage assets including, amongst others, the Church of St Nicolas, the Old Rectory and The Grange, Great Coates Conservation Area and non-designated asset at 110 Great Coates Road and also the earthworks, assess their significance, and assess the impact of the development on their significance. Appropriate measure for mitigation and adding value should be identified

and set out in the assessment. The heritage assessment must form the basis for approaches to the layout and design of development across the site. Planning applications for the site should accord with the heritage impact assessment.

vi. education contributions, (on and off-site delivery), specifically the provision on site of a 500 place secondary school, 1.5ha of land for primary school provision and a financial contribution for off-site primary school expansion;

vii. open space play and recreation provision, specifically the provision of three equipped play areas, an area of no less than 2ha of allotments, provision of three adult sports fields including changing and parking facilities[70];

viii. green infrastructure, specifically including the expansion of the Freshney Parkway to the west to create a Freshney Valley Country Park, a network of green infrastructure that will link to the country park and the wider countryside; proposals for the softening of the western and northern boundaries to avoid the urbanising impact on the wider countryside, including the protection of Laceby Beck North LWS and Laceby Carr Plantation and Pond Candidate LWS, avoid coalescence and mark a transition between the village of Healing and the development site;

ix. social infrastructure including, community facilities, convenience store and other facilities compatible with a local centre; focused in two hubs, a central hub, and a southern hub, with strong connections to the wider development area;

x. affordable housing;

xi. provision for self-build/custom build homes;

xii. extra care and retirement homes;

xiii. drainage and surface water infrastructure;

xiv. delivery of a complete highway link between the A46 and A1136 including safeguarding capacity for the delivery of a strategic link in accordance with the indicative concept plan included in the Grimsby West Masterplan;

xv. provision of legible and permeable, public transport, cycle and pedestrian connections throughout the development, and connections to Wybers Wood, Grimsby town centre and the South Humber Bank employment area; and deliver appropriate highway infrastructure; and,

xvi. complete, a renewable energy and digital strategy, to explore the opportunities for site-wide renewable energy generation and distribution, and digital infrastructure provision and innovation, including innovation in design and build. Where the strategy demonstrates that opportunities are technically feasible and financially viable these should be delivered as part of the development.

70 Subject to possible amendment based upon up-to-date robust assessment of future open space, play and recreation needs.

**C. Humberston Road**

i. prepare a Humberston Road Masterplan for the whole site which recognises planning approvals that are in place for parts of the overall site which will provide the framework for development of the site to ensure the site is developed in a comprehensive and coordinated manner. The Masterplan is to be agreed with the Council prior to the determination of further planning applications on the site and will form a material consideration, and the basis for determining subsequent planning applications;

ii. secure delivery of circa 1,750 homes, circa 750 in the plan period;

iii. phased development in accordance with an agreed Humberston Road Masterplan;

iv. education contributions, (off-site delivery), specifically financial contributions for off-site primary and secondary provision;

v. open space and play provision, specifically the provision of two equipped children's play area, an area of no less than 0.3ha of allotments, and provision of two adult sports fields including changing and parking facilities as part of the adjacent green infrastructure[71];

vi. green infrastructure specifically including; the expansion of Weelsby Woods to the south creating a strong and extensive area of green infrastructure between Weelsby Woods and Hewitts Avenue; forming green links that will connect to the wider countryside and through the development,;including the protection of the Weelsby Field SNCI and softening of the western boundary to avoid an urbanising impact on the wider countryside;

vii. social infrastructure compatible with a local centre; focused in a central hub with strong connections to the wider development area;

viii. affordable housing;

ix. provision for self-build/custom build homes;

x. drainage and surface water infrastructure; and,

xi. provide legible and permeable, public transport, cycle and pedestrian connections throughout the development, and connecting specifically to Weelsby Woods and deliver appropriate highways infrastructure.

71 Subject to possible amendment based upon up-to-date robust assessment of future open space, play and recreation needs.

**Justification**

**13.27** The delivery of strategic housing sites will be critical to achieving the Plan's vision and objectives. If their development were not to proceed, significant additional sites would be needed to replace them. These key sites have the potential to deliver exemplar sustainable development and it is important to establish the principles that will guide their development and delivery.

**13.28** Scartho Top is a major housing development to the south west of Grimsby. It has been developing steadily over a number of years. Construction has historically been phased, with development progressing from north to south. The site was originally identified as having a total capacity of 2,100 homes, incorporating open space, and community facilities. The Council is keen to progress the 971 homes which remain to be completed, together with the development of the remaining community facilities; and is working with landowners and developers to sustain and accelerate delivery of new homes on this site through the plan period.

**13.29** The Grimsby West strategic housing site is a major housing development to the west of Grimsby. It represents a merging of three major housing sites that were originally progressed through the *Strategic Housing Land Availability Assessment*, to develop linked but individual new communities. A vision for Grimsby West has been developed with landowners which stresses that:

## Statement 2

**Grimsby West strategic housing site**

Grimsby West will be a high profile location that creates an exceptional environment to live in and access skilled employment. It will be a place for all ages to live and prosper. Its overall character will be defined by four themes:

1. **sustainable movement**; (encouraging healthy lifestyles, promotes alternatives to the private car, provide good access to employment sites and wider leisure and service needs);

2. **sustainable infrastructure**; (promoting opportunities for generating renewable energy, ensuring well-connected communities that are supported by key infrastructure);

3. **sustainable lives**; (making provision for the community to access education, training and community services they need; and providing homes and places that encourage social integration and interaction and active lifestyles);

4. **sustainable homes and place**; (developing a range of high quality homes, providing a mix of densities and styles, developing a strong sense of community and creating a strong network of green infrastructure, building upon Freshney Parkway and linking to the wider countryside beyond, and safeguarding the character and setting of the heritage assets in the vicinity).

**13.30** The Council has worked with landowners, to ensure that the expectations for each site can be delivered within an economically viable development. Further details are set out in the initial *Grimsby West Concept Masterplan* documents. The Council is keen to

ensure that the whole of the site is developed in a comprehensive and coordinated manner. The Policy sets out a specific requirement to prepare a Masterplan document that will form a material consideration, and the basis for determining subsequent planning applications. A brief for the Masterplan document shall be agreed with the Council at an early stage, the Masterplan shall be prepared in accordance with the agreed brief and the final Masterplan agreed by the Council to form a material consideration, and the basis for determining subsequent planning applications.

**13.31** The Humberston Road site provides an opportunity to build a large number of new homes within the heart of the urban area. It consists of three parcels of land in different ownership, two of which have planning consent, subject to signing of 106 agreements.[72] The third and largest parcel is a high profile site close to existing community and service facilities. There is an opportunity to incorporate and strengthen the existing network of green infrastructure to the north/west of the site (Weelsby Woods) helping to promote healthy and active lifestyles whilst also providing a soft development edge.

| Policy 14'Development of strategic housing sites' relationship to: | Links to: |
|---|---|
| National Planning Policy Framework | Paragraph 52 |
| Local Plan Strategic Objectives | SO1, SO4, SO7 and SO9 |
| Evidence base and other key documents and strategies | • *Strategic Housing Land Availability Assessment* (2015)<br>• *Grimsby West Concept Masterplan Documents* (2015) |

Table 13.8 Policy relationships

## Housing mix

**13.32** It is vital that the right types of homes are delivered to ensure all residents of the Borough can be housed adequately, irrespective of their personal circumstances. This means ensuring that there is a suitable mix of properties in terms of affordability, size and tenure; and providing for all needs, including for example, supported housing and other specific needs homes. It is also important if economic growth is to be sustained over the plan period that homes are provided to meet future needs.

**13.33** North East Lincolnshire's existing housing stock contains a significantly higher proportion of terraced properties than the national average at 33% compared to 25% nationally.[73] Consequently the proportions of semi-detached and detached properties are lower than average, and the same applies to flats and apartments. Within that overall picture, there are notable locational differences. Terraced properties are a particular feature of the urban areas of Grimsby and Cleethorpes, whereas many of the smaller villages provide a wider mix of properties and a larger concentration of detached and semi-detached properties.

72 DM/0225/14/OUT - outline permission for up to 145 dwellings, open space and associated infrastructure; DM/0059/15/OUT - outline permission for up to 63 dwellings, open space and associated infrastructure.
73 Census 2011, Office for National Statistics.

**13.34** Most homes in the Borough are owned by their occupiers, either with a mortgage (35% of all households) or outright (31% of households). At 66% of all households, home ownership is higher than the regional and national averages at 64% and 63% respectively. The private rented sector accounts of 18% of households.

**13.35** The *Strategic Housing Market Assessment* (SHMA) (2013) identified that the quality of housing stock is variable. It highlighted that 32% of private dwellings in 2011 did not meet the standard, compared to 32% nationally.

**13.36** The Council has worked hard to bring empty homes back into use; since 2007 over 613 properties have been recovered. A range of initiatives have been brought forward, which the Council has outlined in the *Empty Homes Action Plan 2017-2022* (2017) to sustain this momentum. At present (April 2015) 4.3% of the total residential dwellings in the Borough are classed as empty homes. These are not distributed evenly but clustered in urban areas displaying high levels of deprivation. The Council has set a target of bringing a further 350 long term vacant properties back into use over the next five years.

**13.37** Improving the quality of existing homes, and bringing empty properties back into use will promote and support wider regeneration initiatives, improve local health and well-being, and stimulate further investment,

**13.38** The SHMA highlights sections of the population that are likely to have specific housing requirements. In particular the population projections show an increasing number of older persons. Over the long term this will place increasing pressures on the existing housing stock and lead to a requirement for different forms of supported housing. Affordability is also an issue that has been highlighted which particularly affects younger households. This has led many to seek housing through private rented or social housing. Provision must also be made to accommodate people with specific housing needs, for example those with learning difficulties.

**13.39** The SHMA has projected a significant change in the size of future households, based upon future growth projections. Most significant is the increase of single person households, a consequence of demographic and household change. However it is important to provide for people who will be attracted to live and work locally, building attractive homes in sustainable neighbourhoods that supports a good quality of life.

**13.40** The long term aim is to deliver a balanced housing stock, which meets the identified needs of the area, recognising that on individual development schemes viability will be a key consideration.

## Policy 15

**Housing mix**

1. In developing allocated and windfall housing sites, developers will be required to adopt an approach that will establish sustainable communities, providing a choice of homes to meet an appropriate range of housing needs. A mix of housing tenures, types and sizes should be provided, appropriate to the site size, characteristics and location.

2. Support will be given to developers seeking to improve or redevelop empty or derelict properties to provide new housing opportunities.

3. On larger strategic sites developers will be required to deliver specific provision to meet key housing needs. Where strategic sites will deliver a range of community facilities, consideration should be given to providing for specific housing needs for elderly people, including aftercare and supported homes.

**Justification**

**13.41** It is important that the Plan provides enough homes to meet the needs and aspirations of local people and to attract new people to live in the area in order to support economic objectives. The quality and range of properties on offer is also a key element of capturing the benefits of economic growth as the choice of suitable homes can influence investment decisions.

**13.42** In addition to ensuring that sufficient housing is delivered overall, the Plan must ensure that the housing needs of different households are met by, providing the right types and mix of housing. Providing the right types of homes is key to ensuring that development does not compound existing housing problems, such as affordability and provides for both current and future residents' needs. It is expected that the mix of housing will vary site-by-site and will be informed by local evidence at the time.

**13.43** The Council does not wish to be prescriptive regarding the specific mix of properties to be built on sites as this is likely to be influenced by many factors, which may include viability. The Council will assess the range of housing proposed based on the local context, considering the mix of existing properties, demand for market and affordable housing, affordability and supply within the immediate vicinity . This may include reference to the SHMA supplemented by local planning and housing data.

| Policy 15'Housing mix' relationship to: | Links to: |
|---|---|
| National Planning Policy Framework | Paragraph 50 |
| Local Plan Strategic Objectives | SO1 and SO4 |
| Evidence base and other key documents and strategies | • *Joint Strategic Needs Assessment* (JSNA) (2013)<br>• *Strategic Housing Market Assessment* (SHMA) (2013) |

Table 13.9 Policy relationships

## Provision for elderly person's housing need

**13.44** North East Lincolnshire has a rapidly ageing population. This has clear implications for the future delivery of housing. It is, therefore essential that a policy is established to ensure that the needs of older people are met over the plan period. The Plan aims to give all adults that require provision of care more choice and control over where and how they live and how they receive care.

**13.45** Over the time frame 2012-2037 the 65+ age group is projected to increase from 18% of the population of 27%.[(74)] The high level of growth in this age group has significant implications for the delivery of housing and future services.

**13.46** As the population increases and ages, it will be increasingly important for homes to be adaptable to the changing needs of residents.

**13.47** There are a number of housing models that can play a part in providing specialist older persons housing. These include, extra care housing, retirement villages, registered care homes (with or without nursing care).

**13.48** In addition to measures to enable more people to live independently for longer in their existing homes, the Council is currently working with the North East Lincolnshire Clinical Commissioning Group and other partners developing Extra Care Housing schemes. This type of housing is considered to be an attractive alternative to traditional residential care. It allows people to retain their own front door and independent address whilst having easy access to the care and support they will need to keep healthy and continue living independently. The Extra Care Housing being developed is for frailer older people. The homes are being built to high standards. The first scheme to be constructed is located in Albion Street, Grimsby. Plans for further schemes are progressing.

### Policy 16

**Provision for elderly person's housing needs**

1. The Council will support the provision of housing that maximises independence and choice for older people and other people with specific needs. When assessing the suitability of sites and/or proposals for the development of residential care homes, extra care housing and continuing care retirement communities, the Council will have regard to the following:

   A. the local need for the accommodation proposed;

   B. the ability of future residents to access essential services, including public transport and shops;

   C. whether the proposal would result in an undue concentration of such provision in the area; and,

   D. impact upon the local environment and the character of the area.

74 *North East Lincolnshire Demographic Analysis and Forecasts* (2015).

2. All new specialist homes designed for older people shall be built to current Lifetime Homes Standards, (or subsequent replacements), as a minimum.

3. In addition to the provision of specialist accommodation, the Council aims to ensure that older people are able to secure and sustain ongoing independence either in their own homes or with the support of family members. To enable this, the Council will:

   A. encourage the incorporation of features within all new residential development to enable new housing to be adaptable to meet household needs over time; and,

   B. support evidence based proposals for self-contained annexes and extensions to existing dwellings in order to accommodate, for example, an elderly or disabled dependent.

4. Proposals for a self-contained annex should accommodate the functional need of the occupant(s), be proportionate in scale and remain ancillary to the main dwelling throughout the lifetime of its occupancy.

5. Where appropriate, the Council will consider the use of planning conditions to restrict occupancy and subsequent sale.

**Justification**

**13.49** Accommodating the future housing needs of an increasingly elderly population will require changes to the types and mix of housing that has typically been delivered across the Borough. With a pattern of lower birth rates, smaller families, increased divorce and increasing mobility many people will continue to face old age on their own. This can result in increased pressure on social care if homes cannot be adapted to meet the needs of older occupiers. Simple adaptations can extend the flexibility of homes to meet changing household needs over time. There will still be a growing requirement for more specialist elderly persons homes as well.

**13.50** Policy 16'Provision for elderly person's housing needs' provides support for a range of developments accommodation current and future needs of the ageing population. It recognises current approaches to delivering new homes with sufficient flexibility to accommodate changing delivery mechanisms.

**13.51** Policy 16'Provision for elderly person's housing needs' also includes specific considerations in relation to self-contained annexes to sustain ongoing independence either in a person's own home or with support from family members. The imposition of conditions to restrict occupancy and subsequent sale refers specifically to development of a self-contained annex where amenity issues could arise if the annex were to be split from the main dwelling and serve as an independent dwelling. This could be due to loss of privacy, access and parking or the nature of the construction of the annex i.e. shared corridors or facilities.

**13.52** The Government has introduced a new system of standards for new housing, rationalising many differed previous standards. Mandatory Building Regulations covering the physical security of new dwellings came into force in October 2015. Part M of the Building Regulations has also been expanded to include new enhanced levels of accessibility which can be implemented on an

optional basis where required by the planning condition, and where justified by appropriate evidence.

| Policy 16'Provision for elderly person's housing needs' relationship to: | Links to: |
|---|---|
| National Planning Policy Framework | Paragraph 50 |
| Local Plan Strategic Objectives | SO1 and SO4 |
| Evidence base and other key documents and strategies | • *Joint Strategic Needs Assessment* (JSNA) (2013)<br>• *North East Lincolnshire Demographic Analysis and Forecasts* (2015)<br>• *Strategic Housing Market Assessment* (SHMA) (2013) |

Table 13.10 Policy relationship

## Housing density

**13.53** The density of development is a consideration that generates a lot of concern amongst residents of existing communities. Consultation responses have reflected a desire for a flexible approach that respects local character. A *Residential Density Study* (2013) looked at the density and character of existing housing areas across the Borough. Unsurprisingly, the Study found that the urban areas of Grimsby, Cleethorpes and Immingham were the most dense; the Arc settlements presented lower densities and the rural villages presented very low densities, with the exception of the larger villages of Habrough and Stallingborough.

**13.54** This evidence supports a flexible approach to the consideration of development density, where the individual characteristics of the site and immediate area provide the basis for determining what is appropriate.

### Policy 17

**Housing density**

1. The Council will address density on a site-by-site basis through the development management process, utilising the information provided in design and access statements where appropriate. Sites should be developed efficiently, having regard to the generic density ranges set out that reflect existing variations in settlements.

### Justification

**13.55** The *Residential Density Study* (2013) provides clear evidence that density varies between different settlements and different character areas. It would, therefore, be inappropriate to impose a set density standard across the Borough. In broad terms, the particular characteristics of different settlements should be respected, and development densities should respond to the particular opportunities that individual sites present.

**13.56** Policy 17'Housing density' establishes the preparation of design and access statements as the basis for local considerations. It allows for optimum use of land whilst seeking to maintain the character and setting of settlements, and allows for lower density developments where this is clearly justified to maintain the character of an area.

**13.57** It is, however, considered appropriate to define generic density ranges for different settlements as a guide to reflect key distinctions in their character, and to encourage the efficient use of land. The following density ranges, informed by the data from the *Residential Density Study* will act as a guide:

| Settlements | Density range (Dwellings/ha) |
|---|---|
| Urban Area (Grimsby and Cleethorpes) | 25-50 |
| Immingham | 20-40 |
| Arc settlements (Healing, Laceby, Waltham, New Waltham, Humberston) | 15-40 |
| Rural | 10-20 |

Table 13.11 Settlement density ranges

**13.58** The specific assessment of individual sites may warrant a variation from the guide. In such cases this must be justified in the design and access statement.

| Policy 17'Housing density' relationship to: | Links to: |
|---|---|
| National Planning Policy Framework | Paragraph 58 |
| Local Plan Strategic Objectives | SO4, SO6 and SO9 |
| Evidence base and other key documents and strategies | • *Residential Density Study* (2013) |

Table 13.12 Policy relationships

## Affordable housing

**13.59** Affordable housing is provided for people who are unable to access or afford market housing. Eligibility is determined with regard to local incomes and local house prices. Provision should be made for affordable housing to remain at an affordable price for future eligible households or for the subsidy to be recycled to provide alternative affordable housing provision.[75]

**13.60** National Planning Policy lists the tenures which can be defined as affordable housing, both rented and affordable home ownership schemes. The properties are owned by local authorities and

75 *Annex 2, National Planning Policy Framework.*

private registered providers, previously known as registered social landlords.[76] Guideline target rents are determined nationally and affordable home ownership schemes are operated under the terms of the guidelines.

**13.61** Homes which do not meet these definitions, including low cost market housing, cannot be considered to be affordable housing for planning purposes. The recently published *Housing and Planning Bill 2015* does, however, introduce several measures that are likely to have a significant impact on how affordable housing is provided in North East Lincolnshire. Key amongst these are the Government's starter homes proposals which includes the redefining of affordable housing to include starter homes, defined as, market housing for first time buyers under the age of 40 bought at no more than 80% of open market value subject to a £250,000 price cap outside London. At the time of publication of this Plan the Bill is still progressing through the House of Lords, it will be kept under review to determine whether any change to policy is necessary.

**13.62** Affordable housing can also be provided through the acquisition of existing property, for example, the purchase of private stock and re-provision as affordable housing, or empty properties brought back into use and provided as affordable housing.

**13.63** The provision of affordable housing helps to ensure that there is an adequate supply of good quality housing for households who cannot afford market housing. It also assists in the creation of sustainable communities, ensures that communities are mixed, and supports economic growth by providing housing to support additional demand generated by the anticipated increase in employment opportunities.

**13.64** Providing affordable housing in North East Lincolnshire raises a number of specific challenges. The key challenges are outlined below:

1. locally, house prices are relatively low when compared to other parts of the country, but average household incomes are also relatively low;

    a. a high number of households do not have an income high enough to enable them to access market housing;

2. for the rented sector, a household is considered to be able to afford rented accommodation where the rent payable is no more that 25% of gross household income. For North East Lincolnshire, an affordable private rental level is around £300 per month for a single income household, and £500 a month for a dual income household;

    a. the gross household income profile for North East Lincolnshire demonstrates that 61% of households have a gross annual income of less than £30,000. Moreover, almost 40% of households have a gross income below £20,000 per annum, creating a high demand for affordable housing and social rented homes.

3. a household is considered to be able to afford a shared equity property where the rent and mortgage costs are no more than 30% of gross income;

    a. only seven percent of household incomes are above the top qualifying threshold (£60,000) for share ownership/rent to buy/shared equity,

76 Private Registered Provider is defined in Section 80 of the *Housing and Regeneration Act 2008*.

generating a significant demand for affordable housing and home ownership schemes;

4. changes to Local Housing Allowance and the benefits structure have further increased the demand for affordable homes;

    a. under the changes to Local Housing Allowance (LHA) three in ten homes are now affordable for people on housing benefit. This compares to the previous five in ten. The new rates mean that the housing choice available for housing benefit recipients align more closely with the choice of housing affordable to low income working households not on benefits;

5. the viability of development impacts on the delivery of affordable housing through section 106 contributions;

6. Registered Housing Providers require central government funding, plus additional gap funding and/or transfer of land to support self-funding and enable the development of new housing stock; and,

7. pressure on budgets has seen a progressive reduction in funding to support and deliver affordable housing.

**13.65** The *Strategic Housing Market Assessment* (SHMA) (2013) identified a net affordable housing need of at least 586 dwellings per annum over the next five years in order to clear the existing backlog of households in need and meet future arising household need. Future need is evidenced across each of the spatial zones. Based on this, there is currently a higher concentration of need identified in the urban area, reflecting the existing communities and availability of housing currently in the area.

**13.66** From a planning perspective, the assessment of affordable housing need should not be referred to as a requirement as the planning system will be unable to provide sufficient affordable housing to meet this overall need. It is better to consider the need in terms of a 'stock and flow approach' that recognises that the supply of homes (stock) will not match the requirements (flow) of those in affordable housing need. This is sometimes referred to in terms of a 'Bathtub analogy'.

**13.67** In this analogy, those in current need (homeless or inadequately housed) are the current level of water in the bathtub, the newly arising need in the future is the flow from the taps and the supply of new homes is the flow through the plug-hole. Where steps can be taken to improve the flow by reducing homelessness or making better use of empty homes the backlog can be reduced possible to a point where all the water in the bathtub is flowing. Alternatively, where improved economic opportunity results in higher incomes, the backlog may be reduced. Considering the schedule of identified housing allocations it is predicted that circa 2,100 new affordable homes could be delivered over the plan period from these sites. This is based upon contributions from consented sites and future contributions delivered under the terms of this Policy.[77]

**13.68** The analysis in the SHMA has shown that over the next five years, the greatest need for future affordable housing supply in North East Lincolnshire is for one and two bedroom homes. Approximately 20% will need to be larger three and four-plus affordable properties.

77 The actual contribution from allocated sites may vary from the predicted number as some sites will be granted under the terms of existing planning policy which sets out different thresholds and scales of contributions.

**13.69** Support for the delivery of new affordable homes has been made by working with Registered Providers (RPs), supporting Homes Communities Agency (HCA) and Government market development funding bids, Council top-up of section 106 contributions, utilisation of Council assets; and directly through the planning process. Delivery through the planning process has ideally been through on-site provision, but where this has not been appropriate, off-site provision of homes or commuted financial payments have been secured.

**13.70** The NPPF advises that councils should consider adjusting their housing requirement figures upward where this can help to deliver additional affordable housing. Given that a significant upward adjustment has already been made to the overall housing requirement to reflect market signals and incorporate jobs growth, it is considered that any further upward adjustment would not be grounded in realism, and would therefore be inappropriate.

## Policy 18

**Affordable housing**

1. The Council will seek, in part, to address the scale of affordable housing need identified in the *Strategic Housing Market Assessment* (2013), by increasing the provision of affordable homes through the planning system.

2. The Council will require contributions to be made in accordance with the following qualifying thresholds and requirements:

| Housing market zone | Percentage of housing units required to be affordable housing | | Housing unit threshold |
|---|---|---|---|
| | Greenfield | Brownfield | |
| High | 20 | 15 | Greater than ten units or which have a combined gross floorspace of more than 1,000m$^2$ |
| Medium | 10 | 10 | |
| Low | 0 | 0 | |

Table 13.13 Qualifying threshold and requirements for affordable housing

3. In applying these requirements the Council will consider:

   **A. the viability of site development:**

   i. in circumstances where specific site viability is raised, the developer will be required to provide a Financial Viability Statement in accordance with Policy 6'Infrastructure'.

**B. the extent of housing need in the settlement:**

i. the Council will consider the type of property and tenure in relation to identified needs.

**C. off-site contributions:**

i. where the Council considers that an off-site contribution (in total or in part) is justified, where supported by up-to-date contribution shall be of equivalent valve and will be accepted in lieu of on-site provision.

**Justification**

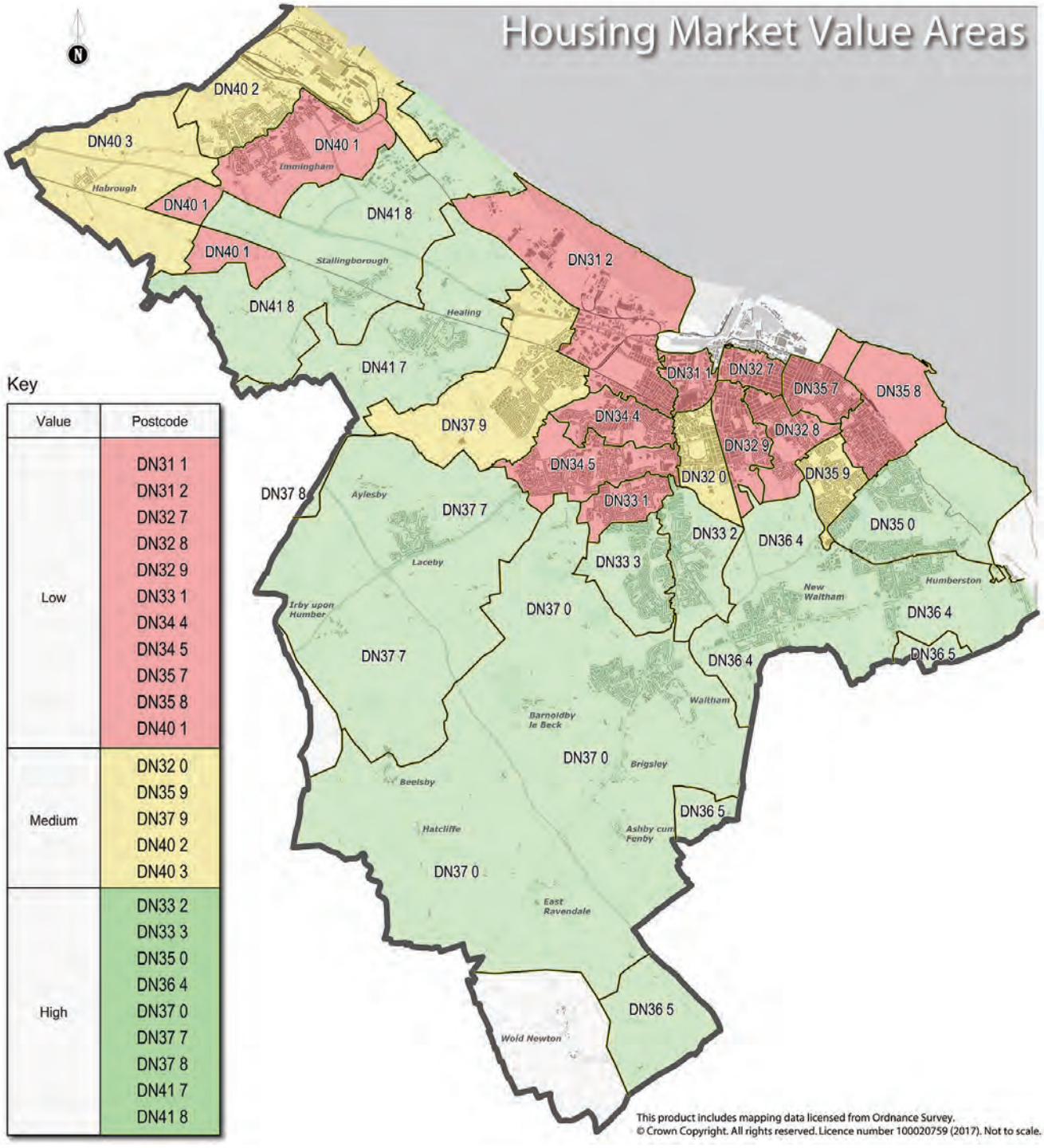
**13.71** Policy 18'Affordable housing' seeks to maximise affordable housing delivery, whilst adopting a flexible approach that also recognises that viability may be challenging and varies across different sites.

**13.72** Policy 18'Affordable housing' recognises that viability will ultimately determine the thresholds and scale of contribution sought. However, the scale of affordable housing need is significant. When combined with the pressure on other funding sources this means that the challenge of delivering affordable housing through the planning process is heightened. It is important that flexibility is maintained within the Policy to ensure that the contribution supports future growth.

**13.73** The development threshold has been set at a level which complies with the NPPF; affordable housing will not be sought from developments of ten units or less and which have a combined gross floorspace of no more than 1,000m$^2$. The Council has examined the delivery rates that this threshold is likely to generate. Evidence of past delivery over the period January 2004 to August 2015 has shown approval of 26 schemes for developments of between ten and 15 dwellings. Of these, three were specific affordable housing schemes. It is still considered appropriate to apply a greater than ten unit threshold as it would capture a contribution from the smaller scale developments that have historically not contributed to the supply of affordable housing.

**13.74** Applying a threshold of five units would bring more developments within the scope of the Policy however, it is apparent that many of those developments fell in central urban areas where there is a need to improve the existing housing mix and quality of stock. To introduce such a requirement could potentially damage or prevent the likelihood of small scale developments occurring in regeneration areas, or areas where small scale development would assist in broadening the housing tenure mix or the refurbishing of existing properties. The Council has therefore not revised the threshold to five units.

**13.75** The Council will not normally apply a less than ten unit threshold. However, where density has been reduced to specifically avoid payment of a contribution, and the proposed development is not representative of the area's character and context, the Council will consider carefully whether the development represents an efficient use of land.




Key

| Value | Postcode |
|---|---|
| Low | DN31 1 |
| | DN31 2 |
| | DN32 7 |
| | DN32 8 |
| | DN32 9 |
| | DN33 1 |
| | DN34 4 |
| | DN34 5 |
| | DN35 7 |
| | DN35 8 |
| | DN40 1 |
| Medium | DN32 0 |
| | DN35 9 |
| | DN37 9 |
| | DN40 2 |
| | DN40 3 |
| High | DN33 2 |
| | DN33 3 |
| | DN35 0 |
| | DN36 4 |
| | DN37 0 |
| | DN37 7 |
| | DN37 8 |
| | DN41 7 |
| | DN41 8 |

Figure 13.3 Housing market areas

**13.76** The Council will determine the mix of rented/intermediate affordable housing and the size and type of homes to be delivered having regard to up date evidence of housing need and discussions with registered affordable housing providers. This will ensure that delivery is well matched to local needs at the time when

development is being progressed, rather than an approach which prescribes set standards through a formulaic approach.

**13.77** The *North East Lincolnshire Viability Assessment* (2016) has highlighted that there is significant variation in viability across the Borough. This is not matched to the locations of greatest affordable need identified in the SHMA. Policy 18'Affordable housing', therefore allows for some flexibility when considering whether on-site or off-site contributions are to be provided. In taking forward this approach the Council will have to reconcile the desire to create balanced and sustainable communities with the desire to address affordable housing needs/demands across the Borough. In exceptional circumstances off-site contributions will be considered where, for example, a site would not be sustainable for low income households because of limited access to public transport and services (except where a specific local need has been identified). The variation in viability is illustrated in Figure 13.3'Housing market areas'. This identifies the housing market zones (referred to in Policy 18'Affordable housing') that provide the basis for the variations in affordable housing requirement across the Borough. Reference is also made in Policy 13'Housing allocations' to the affordable housing value area that is applicable to each allocated housing site.

| Policy 18'Affordable housing' relationship to: | Links to: |
|---|---|
| National Planning Policy Framework | Paragraphs 47, 50 and Annex 2 |
| Local Plan Strategic Objectives | SO4 and SO5 |
| Evidence base and other key documents or strategies | • *Strategic Housing Market Assessment* (2013)<br>• *North East Lincolnshire Viability Assessment* (2016) |

Table 13.14 Policy relationships

## Rural exceptions

**13.78** Rural exception sites can provide particular benefits, including supporting the provision of affordable housing which allows people to remain in their village or near family, or allowing people to take-up rural employment. They are defined in the NPPF (Annex 2) as:

*"small sites brought forward for affordable housing, in perpetuity, where sites would not normally be used for housing. Rural exception sites seek to address the needs of the local community by accommodating households who are either current residents or have an existing family or employment connection."*

**13.79** The rural area has comparatively higher average house prices than the sub-urban and urban areas of North East Lincolnshire. It may therefore be harder for families to stay together due to an inability to afford a house nearby. Retaining people in villages, who may not normally be able to afford to purchase existing homes, can help maintain the demand for services in village communities and keep them running.

**13.80** There is an identified annual need for 69 net additional affordable homes to be provided across the rural area, equating to 345 over the next five years, comprising 45 intermediate properties, and 300 social rented properties.[78] It is unlikely that this need would be met by the normal housing market.

**13.81** The NPPF (paragraph 54) specifically states that local authorities should consider whether allowing some market housing would facilitate the provision of significant additional affordable housing in rural areas to meet local needs, for example, where essential to enable the delivery of affordable units without grant funding.

## Policy 19

**Rural exceptions**

1. Exceptionally, over and above the housing supply set out in this Plan, provision for an appropriate scale and mix of affordable housing in the rural area will be permitted where the following criteria are met:

   A. there is up-to-date local survey evidence of identified need for the housing proposed;

   B. the development is within or adjacent to an existing development boundary as identified on the Policies Map;

   C. the development is of a scale and is in keeping with the form and character of the settlement; and,

   D. there are secure arrangements to ensure that all the affordable homes will be occupied by local people in need of affordable homes, and that the benefits of the low cost provision will remain affordable to local people in perpetuity.

2. The Council will permit market housing to facilitate the provision of additional affordable homes only when evidence on viability supports such a stance, there is evidence that there is a need for the affordable housing proposed, and that the benefit in providing the affordable housing clearly outweighs any adverse environment impact.

**Justification**

**13.82** It is recognised that availability of homes in rural areas often restricts people's access to an affordable home. This is a position which is compounded by the restrictions on future growth in the rural area, which, when combined with the fact that smaller properties are often extended, reduces the supply of smaller properties. Without provision to address this through an exceptions approach it is unlikely that the element of affordable rural need would be met.

**13.83** The Plan does not identify specific sites, as decisions will be based on evidence of local need, which may change over the plan period.

78 *Strategic Housing Market Assessment* (2013).

This will also allow for developments to be brought forward by local communities through the neighbourhood planning process or separately through an application process where supported by local evidence. Housing schemes promoted under Policy 19'Rural exceptions' must be genuinely designed to meet a specific need. Secure arrangements must also be in place to ensure that the scheme remains affordable both initially and in respect of successive occupiers. The precise arrangements may vary but it will be important to have the involvement of a Registered Provider of housing trust that can retain a long-term interest.

| Policy 19'Rural exceptions' relationship to: | Links to: |
|---|---|
| National Planning Policy Framework | Paragraph 54, Annex 2 |
| Local Plan Strategic Objectives | SO4 |
| Evidence base and other key documents and strategies | • *Joint Strategic Needs Assessment* (JSNA) (2013)<br>• *Strategic Housing Market Assessment* (SHMA) (2013) |

Table 13.15 Policy relationships

## Self-build and custom build homes

**13.84** Self-build and custom build both provide routes to home ownership for individuals and groups who want to play a greater role in developing their own homes. The *Self-build and Custom Housebuilding Act* (March 2015), requires councils to establish a register of individuals and community groups who have expressed an interest in acquiring land to bring forward self-build and custom build projects.[79]

**13.85** The Act states that regard to the register must be made in relation to the following functions:

1. planning;
2. housing;
3. the disposal of any land by the authority; and,
4. regeneration.

### Policy 20

**Self-build and custom build homes**

1. The Council will support the development of self-build and custom build homes to help in meeting overall housing need. In addition to 'windfall' development opportunities, landowners promoting the development of large strategic sites, in combination with development partners will be expected to make provision for 1% of homes to be delivered on site by self builders,

79 The Government has said it will build on the legislative framework provided by the Act to introduce a Right to Build under which authorities will be required to bring forward plots of land for registered custom builders in a reasonable time. Measures to take forward the Right to Build will be included in the forthcoming Housing Bill.

or through a custom build option. Plots should be made available and offered at competitive rates, to be agreed with the Council. These rates should be fairly related to the particular site and plot costs.

2. The large strategic sites to which this Policy applies are:

   A. HOU342 Grimsby West, Grimsby;
   B. HOU074 Humberston Road, Grimsby; and,
   C. HOU076 Scartho Top, Grimsby.

3. Where there is evidence that developable plots have been marketed at competitive rates for a period of more than 24 months without interest from self-build or custom builders, those plots may revert to delivery through conventional means.

**Justification**

**13.86** The definition of self-build refers to projects where someone directly organises the design and construction of their new home. This covers quite a wide range of projects. The most obvious example is a traditional 'DIY self-build' home, where the self-builder selects the design they want and then does much of the actual construction work themselves. But self-build also includes projects where the self-builder arranges for an architect/contractor to build their home for them; and those projects that are delivered by kit home companies (where the self-builder still has to find the plot, arrange for the slab to be installed and then has to organise the kit home company to build the property for them). Many community-led projects are defined as self-builds too.

**13.87** Custom build refers to developer built one-off homes or developer-led group projects where the developer organises a group and builds the homes, often leaving the self-builders to complete final finishing details.

**13.88** Policy 20'Self-build and custom build homes' makes specific provision for self-build and custom build homes as an element of the strategic sites allocated in the Plan. This will provide specific opportunities in addition to windfall sites that will come forward over the plan period through the release of surplus council assets and other windfall opportunities.

| Policy 20'Self-build and custom build homes' relationship to: | Links to: |
|---|---|
| National Planning Policy Framework | Paragraph 50 |
| Local Plan Strategic Objectives | SO4 |
| Evidence base and other key documents and strategies | • North East Lincolnshire Register of Self-Build Interest |

Table 13.16 Policy relationships

## Provision for Gypsies and Travellers

**13.89** *Planning Policy for Traveller Sites* (2015) sets out the Government's approach to planning for travelling communities. This seeks to align planning for travelling communities more closely with planning for other forms of housing provision. This includes the requirement for councils to demonstrate a five year supply of pitches against locally assessed targets.

**13.90** The *North East Lincolnshire Gypsy and Traveller Accommodation Assessment* (Accommodation Assessment) (2014) provides an objective assessment of future pitch requirements for gypsy and travellers including travelling showpeople. The assessment accords with the latest national policy assessing current unmet needs and needs likely to arise in the future. This is based upon a combination of on-site surveys, planning records, interviews and an assessment of site preferences.

**13.91** There is currently only one location providing permanent gypsy and traveller facilities in the Borough. This is a location at Habrough, identified on the Policies Map. The Accommodation Assessment undertaken in 2014 identified that there was likely to be additional household formation. A planning consent, granted in 2015 has met a substantial element of the identified need, and the site provides scope for further expansion in the future to meet additional household formation.

**13.92** In addition to permanent provision, the Accommodation Assessment considered additional requirements generated by unauthorised developments and migration patterns. The assessment identified an increase in unauthorised encampments, but more detailed analysis revealed that these encampments have been associated, in the main with two family groups who move from location to location. Most encampments occur during the Summer and are limited to a few days. The assessment highlighted the need for regular review particularly with regard to temporary pitch provision.

**13.93** Table 13.17'Future gypsy and traveller provision' provides a summary of the future pitch provision identified in the Accommodation Assessment.[80]

| Future Gypsy and Traveller Provision | 2014-2019 | 2019-2024 | 2024-2029 | Total |
|---|---|---|---|---|
| North East Lincolnshire permanent pitch provision | 9[81] | 2 | 1 | 12 |
| North East Lincolnshire temporary pitch provision | 5[82] | Future review | | 5[83] |
| North East Lincolnshire Travelling Showpeople provision | No requirement identified | | | 0 |

Table 13.17 Future gypsy and traveller provision

80 Notes have been added in the table, to reflect changes to pitch provision since the Accommodation Assessment was published, and recent trends regarding temporary encampments.

81 Planning Application DM/0362/15/FUL was granted approval on 17 June 2015. This authorised the development of a site for four residential pitches.

83 Monitoring of unauthorised encampment since the Accommodation Assessment was completed has identified that some large groups of travellers have visited the Borough. It is considered appropriate to plan for future temporary pitch provision with flexibility to accommodate future larger groups. The Council has therefore taken steps to make provision based upon analysis and assessment of sites with capacity to accommodate at least 15 pitches.

82 Monitoring of unauthorised encampment since the Accommodation Assessment was completed has identified that some large groups of travellers have visited the Borough. It is considered appropriate to plan for future temporary pitch provision with flexibility to accommodate future larger groups. The Council has therefore taken steps to make provision based upon analysis and assessment of sites with capacity to accommodate at least 15 pitches.

## Policy 21

**Provision for gypsies and travellers**

1. In determining proposals for new sites to accommodate gypsies, travellers and travelling showpeople, consideration will be given to whether:

   A. there is a proven identified need for the scale and nature of the development proposed which supports the development of, or extension to an existing gypsy, traveller or showpeople site;

   B. the development is sensitive to the character and appearance of the landscape and the amenity of neighbouring properties;

   C. the site has safe and satisfactory vehicular and pedestrian access;

   D. there are no significant constraints to development in terms of flood risk, poor drainage, land contamination, or environmental impacts;

   E. the site is suitable with regard to accessing local services and amenities; and,

   F. the site can be properly serviced and supplied with essential infrastructure, including water, power, sewerage, drainage and waste disposal.

2. The Council will identify, deliver and maintain provision of a designated stopover site to meet the needs of transient gypsies and travellers.

**Justification**

**13.94** *Planning Policy for Traveller Sites* (2015), requires that councils provide a criteria based policy in local plans. This will provide the basis for assessment of developments to address identified needs, and will also form the basis for consideration of other speculative applications that may come forward over the plan period.

**13.95** The site at Habrough provides permanent gypsy and traveller facilities capable of accommodating future pitch needs as this arises. The boundary of the gypsy/traveller site has been identified on the Policies Map and will be safeguarded.

**13.96** The Council has also sought to make provision for travelling groups who pass through the Borough and require temporary pitch provision. The Council has taken positive action to identify a suitable site for a designated stopover site. A designated stopover site is a piece of land that is used on a temporary basis for authorised short-term (less than 28 days) for all travelling communities. In the case of North East Lincolnshire the period within which the site will be in operation is likely to be from March to October.

| Policy 21'Provision for gypsies and travellers' relationship to: | Links to: |
|---|---|
| National Planning Policy Framework | *Planning Policy for Traveller Sites* (2015) |
| Local Plan Strategic Objectives | SO4 |
| Evidence base and other key documents and strategies | • *North East Lincolnshire Gypsy and Traveller Accommodation Assessment* (2014) |

Table 13.18 Policy relationships

Building the places we need

Local Plan
North East Lincolnshire

Great places are successful places. They encourage people to connect with one another and it is this interaction that builds stronger, healthier communities. The policies in this section complement the strategic framework set out in earlier parts of the Plan by covering a range of considerations for managing development and spaces, as well as the protection and enhancement of existing assets across the Borough to achieve better places for everyone to live, work, learn and play.

## Well-designed places

**14.1** Good design is a key aspect of sustainable development. It is indivisible from good planning and can contribute positively to aspects of health and well-being. Good design goes beyond the aesthetics of simple visual appearance, it involves the consideration of place and the interactions of people with the places they live, work in and visit; and requires appreciation of environmental influences and impacts.

**14.2** The Council has set out clearly its desire to lift the quality of development within the Borough and to create places that work well and are pleasant and distinctive. It recognises that new development can be the vehicle for building a strong sense of place and creating a positive impression of the Borough.

**14.3** In 2008 an Urban Design Framework and Urban Realm Strategy established the Council's long-term principles supporting the development of quality environments across the Borough. The stated aim was to:

*"re-establish the importance of locating development in the right places, through the regeneration and repair of existing urban areas to ensure that new development contributes towards the vitality of existing local services and supports existing community infrastructure and public transport provision..."*

**14.4** The Strategy identified a series of actions aimed particularly at the regeneration of urban areas, whilst setting out guiding principles to protect and enhance the sense of place and identity of other areas, such as rural villages. The Council has taken a lead by delivering key projects embracing these principles, including major public realm and development projects in Grimsby town centre.

**14.5** It is, however, important to recognise that the need for good design is not restricted to major schemes - it is equally important that smaller schemes and minor works are well-designed. Good design is a prerequisite for delivering places that work well, feel right, look good and support healthy lives.

### Policy 22

**Good design in new developments**

1. A high standard of sustainable design is required in all developments. The Council will expect the design approach of each development to be informed by:

   A. a thorough consideration of the particular site's context (built and natural environment, and social and physical characteristics);

B. the need to achieve:

i. protection and enhancement of natural assets;
ii. resource efficiency;
iii. climate change resilience;
iv. sustainable transport;
v. accessibility and social inclusion;
vi. crime and fear of crime reduction;
vii. protection and enhancement of heritage assets, including character and local distinctiveness;
viii. high quality public realm; and,
ix. efficient use of land.

C. Design guidance for North East Lincolnshire published by the Council; and,

D. where applicable and relevant:

i. the objectives and expectations of the *Lincolnshire Wolds Area of Outstanding Natural Beauty Management Plan 2013-2018* (and any subsequent updates);
ii. Landscape Character Assessment; and,
iii. Conservation Area Appraisals.

2. Where a Design and Access Statement is required, this should describe the specific considerations and rationale on which design proposals have been based.

3. Incorporation of elements of public art that serve to enrich the wider area will be encouraged in the development of sites within or adjoining prominent public locations, or sites which have significance in terms of local heritage.

4. Proposals for express consent to display advertisements will be permitted if the proposal respects the interest of amenity and public safety, taking account of cumulative impacts.

**Justification**

**14.6** Policy 22'Good design in new developments' establishes the local considerations that will apply when assessing the design quality of development proposals. There is strong emphasis on considering each site's particular context and on the important roles of high quality and inclusive design in delivering sustainable development.

**14.7** The Council considers that design review is a key element in achieving high standards of design. At a local level, the Council's Development Management team undertake design review as part of regular weekly team meetings. In this way the design rationale of schemes presented as applications and pre-application enquiries can be interrogated by a wider professional audience. At the pre-application stage developers are also encouraged to meet with members of the Council's Planning Committee following the end

of a formal meeting. This gives applicants/developers an opportunity to explain their proposals and explore any queries with the local councillors who will subsequently deliberate on the formal planning application.

**14.8** When major developments are proposed, applicants are further encouraged through the Council's *Statement of Community Involvement* to engage in meaningful dialogue with the communities close to their sites. The Council expects to see evidence that such engagement has taken place and will wish to consider the applicant's responses to the issues raised by residents, community groups and others.

**14.9** When it is considered appropriate, the Council will also continue to draw on support available via the Design Network and developers will be encouraged to have their scheme's reviewed via this process. Locally, this key activity is currently undertaken by 'Integreat Plus', the design network member covering Yorkshire and Humberside.

**14.10** The attractiveness of buildings and spaces can be enhanced through the introduction of public art. This can take many forms; for example, statues, sculptures, stained glass and murals all of which can add to the visual interest and sense of place. The approach seeks to maintain the tradition of enriching the environment through public art. This is not only important as a way of establishing local identity and instilling a sense of local pride, but can also lift the value of development and promote additional investment. Policy 22'Good design in new developments' encourages development located specifically in prominent public locations, or sites with significance in terms of local heritage to incorporate elements of public art in other schemes.

**14.11** It is also widely recognised that poorly placed advertisements can have a negative impact on the appearance of the built and natural environment. The Government advises that control over advertisements should be efficient, effective and simple in concept and operation.[84] A wide range of advertisements may be displayed with 'deemed consent', for example without the need for specific consent from the Council. Where consent is required this is generally judged on the merits of each case. In sensitive environments careful consideration is required. Policy 22'Good design in new developments' provides for consent to be granted except where the proposal would have a significant impact on amenity and/or public safety, or will lead to an over abundance of advertisements.

| Policy 22'Good design in new developments' relationship to: | Links to: |
|---|---|
| National Planning Policy Framework | Paragraphs 56 to 68 |
| Planning Practice Guidance, Requiring Good Design (2015) | Paragraph 67 |
| Local Plan Strategic Objectives | SO6 and SO9 |
| Evidence base and other key documents and strategies | • *Design, North East Lincolnshire Places and Spaces Renaissance* (2008) |

84 *Planning Practice Guidance, Requiring Good Design*, paragraph 67 (2015).

| Policy 22'Good design in new developments' relationship to: | Links to: |
|---|---|
| | • *Lincolnshire Wolds Area of Outstanding Natural Beauty Management Plan 2013 -2018* (and subsequent updates)<br>• *Landscape Character Assessment* (2015) |

Table 14.1 Policy relationships

## Vibrant town and local centres

**14.12** Modern town centres are much more than the simple retail centres they used to be. To survive, they must be the heart of the local community they serve, providing a key focus for shopping, employment, leisure, civic and cultural activities as well as urban living. North East Lincolnshire has a mix of different retail centres which provide different functions offering a varied mix of services and amenities. The three town centres within the Borough; Grimsby, Cleethorpes and Immingham, all have unique characteristics that define them. These are as follows:

### Grimsby

**14.13** Grimsby is the highest order centre in the Borough and is the sub-regional centre. Located approximated 20miles from the nearest market towns, and 30miles from any major centres (e.g. Hull, Lincoln, Scunthorpe) it benefits from limited competition and high expenditure retention rates. It provides the main comparison shopping offer for residents of the Borough offering a range of multiple retailers and a limited range of business, leisure, civic and cultural activities. Over recent years the competition from out-of-centre foodstores particularly has weakened the convenience offer, resulting in a comparison shopping focus. It also suffers from weaknesses in the range of leisure and social facilities and a limited evening economy offer, which are below what would be expected for a centre of its status. It is therefore important that development which widens the town centre offer is encouraged to ensure the town remains strong and vibrant.

**14.14** Recent investments have been implemented utilising Local Transport Programme (LTP) funding to enhance the public realm in the town. This included the relocation of the bus station from Riverhead Square and a number of streetscape improvements from which additional private sector investments have been generated. The Council has recently commenced development of the new office scheme on Cartergate, and private investment has secured a new hotel off Wellowgate. Proposals are now being progressed by the private sector which will widen the town's offer in terms of leisure and retail facilities. Such proposals are identified in the *Sustainability Appraisal* as having positive impacts generating a vibrant and viable town centre, providing job opportunities, promoting development on brownfield land and utilising sustainable transport modes.

**14.15** The Plan seeks to support the continued role of Grimsby as a sub-regional centre, and as such the Plan will seek to support the widening of the town's offer and protection from inappropriate out-of-centre development.

### Cleethorpes

**14.16** Cleethorpes is a main town centre offering a dual role in meeting the day-to-day convenience needs of its local residents, as well as providing a niche and independent offer that

is attractive to the resort's visitors. However, like most seaside towns, it has suffered from a lack of investment in its physical fabric and public realm, competition from out-of-town shopping and visitor attractions, and the seasonal nature of the visitor economy.

14.17 Opportunities exist within Cleethorpes to support the visitor experience whilst building on the town's unique character. Recent investment in the town centre by major operators such as Weatherspoons and Costa Coffee have contributed to a wide range of food and drink outlets, attracting both residents and visitors alike. The recent refurbishment of the Pier to create bars and restaurants together with a ballroom/conference centre supports the development of a year round visitor economy, and improves linkages between the town centre and the seafront. Funding has now been secured to enable further investments, these will focus on vacant/derelict sites, improvements to the public realm and heritage assets.

14.18 The strategy for Cleethorpes town centre is to promote and develop the unique offer, building on its relationship with the resort area and drawing on the features that distinguish it from Grimsby. This relates specifically to extending the range of visitor facilities, especially those that overcome current issues of seasonality, improving dwell times, and improving the range of niche/independent retailers.

**Immingham**

14.19 In contrast, Immingham town centre provides the main convenience provision for its residents. The redevelopment of the town centre has been completed, and whilst some units have opened the main unit, anticipated to be occupied by Tesco early in 2015, remains empty. In the future Immingham has the opportunity to develop its role, and broaden its town centre function, capitalising upon its proximity to the employment growth proposed along the South Humber Bank and the ABLE UK Energy Marine Park. Policies in the Plan seek to ensure that the widening of functions in Immingham can be appropriately supported.

**The scale of growth in the town centres**

14.20 A key aspect of maintaining a healthy and vibrant town centre is ensuring that provision is made to accommodate anticipated growth. The NPPF (paragraph 23) requires that local plans should identify the scale of development which needs to be accommodated, advising that:

*"Local planning authorities should therefore undertake an assessment of the need to expand town centres to ensure a sufficient supply of suitable sites".*

14.21 The *Retail, Leisure and Three Centres Study* (2013) and *Retail Floorspace Capacity Update* (2016) provides an assessment of the future quantitative capacity and qualitative need for additional retail and leisure floorsapce across North East Lincolnshire. Focusing on the town centres of Grimsby, Cleethorpes and Immingham, the report considers recent past and current trends in retailing. These include, for example, increased use of the Internet for shopping, and requirements to change the format of stores as retailers respond to evolving conditions and circumstances.

14.22 The identified requirements reflect the long-term forecasts over the full plan period and are based upon the Jobs-Led Scenario 1 - UR forecast. It should be noted that the growth is dependent on increasing available expenditure over this period. There will be a need to review the retail floorspace capacity forecasts on a regular basis.

**Convenience retailing (food)**

14.23 The Study identified that the North East Lincolnshire catchment retained 98% of the overall retail expenditure for convenience shopping meaning that the vast majority of people who live in North East Lincolnshire also do their food

shopping in the Borough. This strong retailing position is considered to be indicative of the lack of competition from other centres.

14.24 The Study notes that all the key national operators are represented within the Borough, primarily in edge-of/out-of-centre locations close to Grimsby town centre. Development of these large stores over recent times has resulted in a decline in the town centre convenience offer, particularly in Grimsby. All of the stores trade off each other, and in retail policy terms none is provided greater protection than another.

14.25 Over the plan period, it is anticipated that the developing trend towards small food stores within the town centres, and on busy transport routes, will continue. The 'Big Four' have been responding to changing consumer behaviour and expectations with additional, smaller 'Local', 'Metro' and 'Express ' stores, which can help to support town, district and local centres.

14.26 The capacity review forecast the following additional requirements for convenience floorspace over the plan period:

| Additional convenience floorspace requirement 2016 to 2032 | | | |
|---|---|---|---|
| **Convenience (mainstream food retailer)** | **2021** | **2026** | **2032** |
| Grimsby urban area | c-2,296m$^2$(net) | c-1,682m$^2$(net) | c-971m$^2$(net) |
| Grimsby urban area (inc tourist inflow) | c-568m$^2$(net) | c37m$^2$(net) | c739m$^2$(net) |
| Cleethorpes urban area | c28m$^2$(net) | c259m$^2$(net) | c525m$^2$(net) |
| Cleethorpes urban area (inc tourist inflow) | c1,331m$^2$(net) | c1,555m$^2$(net) | c1,816m$^2$(net) |
| Immingham | c-949m$^2$(net) | c-866m$^2$(net) | c-770m$^2$(net) |

Table 14.2 Additional convenience floorspace requirement 2016 to 2032

14.27 Grimsby town centre has a relatively low market share in terms of convenience retailing. The results of the analysis would normally suggest scope for qualitative and quantitative improvements in order to address local needs. However, the vitality and viability of Grimsby town centre as a whole is not sustained by convenience retailing, and there is an oversupply of out-of-centre stores serving the catchment areas (Tesco, Sainsburys and Asda in Grimsby, and Morrisons at Laceby), most of which under-perform. Consequently, there is no qualitative or quantitative need to actively plan for new convenience floorspace in Grimsby over the plan period.

14.28 Cleethorpes town centre retains a relatively small proportion of the market share of convenience retailing, this reflects its current role as a top-up food shopping centre. The main market share goes to the out-of-centre Tesco Extra at Hewitts Circus, which is mainly a car-borne destination. Potential for development of a foodstore within Cleethorpes has therefore been identified, which would result in both qualitative and quantitative benefits for the town centre. Ideally, such a store would be best located in a town centre location, but if not, a location that is sequentially preferable to that of the Tesco store at Hewitts Circus, may be acceptable. Local Growth Funds have now been secured by the

Council to assist the developer of the site adjacent to the Dolphin Hotel to bring forward a retail-led development. It is considered that such provision would ensure qualitative and quantitative improvements in the convenience offer.

**14.29** Immingham town centre currently looses convenience trade, mainly to the big convenience stores in and around Grimsby. However, the town centre has recently been redeveloped, this included provision of a new convenience store. Whilst built, it has not been opened at the time of publication of this Plan. Tesco has withdrawn from operating the store, however, on opening, by Tesco or another operator, it will address the qualitative and quantitative deficiencies identified in the Study. Consequently, the Study concludes that there is no specific need to make provision for additional convenience floorspace provision within Immingham over the plan period.

**Comparison retailing (non food)**

**14.30** Immingham offers relatively little comparison retailing, with the centre being primarily focused on convenience shopping. Most residents within the catchment look to Grimsby for comparison shopping.

**14.31** The capacity update identified the following additional requirements for comparison floorspace over the plan period:

| Additional comparison floorspace requirement 2016 to 2032 | | | |
|---|---|---|---|
| **Comparison** | **2021** | **2026** | **2032** |
| Grimsby urban area (baseline) | c2,443m$^2$(net) | c10,799m$^2$(net) | c22,921m$^2$(net) |
| Grimsby urban area (inc tourism inflow) | c3,486m$^2$(net) | c12,376m$^2$(net) | c25,236m$^2$(net) |
| Cleethorpes urban area (inc tourism inflow) | c2,085m$^2$(net) | c3,543m$^2$(net) | c5,631m$^2$(net) |
| Immingham (inc tourism inflow) | c-448m$^2$(net) | c-236m$^2$(net) | c72m$^2$(net) |

Table 14.3 Additional comparison floorspace requirement 2016 to 2032

**14.32** As the Borough's primary town centre, Grimsby performs a wider sub-regional role for comparison retailing, as well as for employment and services. It benefits from strong comparison expenditure retention (i.e. people who live in the area shop in Grimsby), particularly in fashion retailing. The main shopping offer is provided within the covered Freshney Place Shopping Centre offering a wide range of national retail outlets, which is enhanced by a range of small up-market boutique operators within the Abbey Gate development. In terms of comparison retailing, Grimsby town centre performs well, with good representation from multiple retailers and limited vacancies. However, evidence shows that it was not immune to the market pressures during the economic downturn, with a key weakness in the comparison retail offer being the high proportion of mid-range retailers.

**14.33** The *Retail, Leisure and Three Centres Study* (2013) and subsequent *Retail Floorspace Capacity Update* (2016) identified additional comparison floorspace requirements in the latter stages of the plan period. However, the mid-range nature of provision creates qualitative deficiencies which could be addressed by encouraging earlier provision by mid/high fashion retailers, improved department store provision, and niche independent retailers. Given the relatively low

level of vacancies it is considered that early provision will therefore be required through the provision of new accommodation within the town centre boundary. This will enhance current vitality and viability, ensure long-term sustainability and maintain the towns status as a regional centre.

**14.34** Planning permission has been granted for the re-modelling of part of the Freshney Place car park and provision of new retail accommodation. However, this will be insufficient to meet the identified needs for the plan period. The Garth Lane site has been identified as a site for future growth. Whilst development in this area will be supported a key principle of any development on the Garth Lane site will be the requirement to ensure that there are strong visible and accessible linkages across Frederick Ward Way and the remainder of the town centre. Whilst anticipated over a longer timescale, the opportunity to develop the currently underused land to the south of Bethlehem Street would provide a logical and natural extension to the existing shopping area.

**14.35** Cleethorpes is a secondary centre to Grimsby, with residents mostly looking to Grimsby to meet their main comparison shopping needs, and national retailers focusing on Grimsby as a result of its higher position in the retail hierarchy. Despite this, Cleethorpes is nevertheless a vibrant town centre, and is distinguished from Grimsby by its strong niche independent offer, especially the established cluster on Sea View Street which is now expanding.

**14.36** The anticipated capacity for growth identified in Table 14.3'Additional comparison floorspace requirement 2016 to 2032' above, shows that additional comparison floorspace would be required in Cleethorpes towards the end of the plan period. The growth identified, however, is insufficient to provide any significant step-change in the role of the centre, which when coupled with the main comparison focus being on Grimsby, implies no immediate need to plan for comparison retail growth within Cleethorpes.

**14.37** However, this approach supports the status quo, does not address current qualitative deficiencies, and limits the range of facilities Cleethorpes has to offer in comparison to similar destinations with which it competes. It is important that investment in the town centre is undertaken to ensure that Cleethorpes maintains its role as a resort town.

**14.38** A Local Development Order has been prepared, which is also supported by committed Local Growth Funds (LGF) which will secure the early redevelopment of the currently derelict former Clifton Bingo site on Grant Street for residential-led mixed use development including retail, food and drink and leisure uses. This, together with the timely reuse of the Dolphin Hotel site is anticipated to be a catalyst for change within the town centre. The Council currently owns a significant area of land between Sea Road and the Promenade, and anticipates that longer-term a comprehensive redevelopment of this area will also generate retail-led mixed use activity, together with public realm enhancements in order to cement the relationship between the seafront and the town centre. Complementary funding is being sought to secure investment in the town's rich heritage buildings, particularly along Alexandra Road and Sea View Street.

**14.39** Immingham town centre currently has a limited comparison offer, most needs are met travelling to the sub-regional centre at Grimsby. However, the implementation of the town centre redevelopment has brought with it improvements to the wider town centre environment. It is anticipated this will provide the stimulus to further investment, enhancing the range and quality of comparison goods available for local residents. Anticipated future needs are expected to be met through this scheme. Given the limited extent of floorspace capacity identified over the plan period, and the completion (although currently stalled) of the Tesco scheme, it is considered that there is no need to make specific provision for future comparison floorspace within the town centre.

**Office/commercial floorspace**

**14.40** Provision of commercial floorspace within each of the town centres is currently limited to mainly first floor 'second-hand' stock, primarily within Grimsby. Further provision is mostly in out-of-centre business parks, such as Acorn Business Park, Laceby Business Park and Europarc.

**14.41** The *Economic Futures Report* (2014) identifies that employment growth in key sectors is anticipated to generate new demand for business-to-business services (including legal, finance and insurance, information technology and communications, accountancy, engineering and other professional services), and considers that stimulation of the office market will potentially attract new investors and occupiers to the town centres, particularly Grimsby. Overall, the anticipated growth in the sector falling within the B1a/b use classes amounts to just over 2,000 jobs, which equates, on standard floorspace densities, to an increase in overall B1a/b fllorspace of 23,374m$^2$.

**14.42** Recent out-of-centre office developments (e.g. Europarc) have had a negative impact upon the town centre through the loss of footfall and diminution of the vibrancy that is created when a range of different uses interact in close proximity to each other. Whilst it is recognised that there will be some B1a/b operations required to support other employment development in the industrial areas, it is expected that and office accommodation intended for the provision of the range of services outlined above should be located within a town centre environment. As a result, office proposals of more than 500m$^2$ outside of the defined town centre must meet the requirements of Policy 10'Office development'.

**14.43** Given Grimsby's role as a sub-regional centre, most of the growth identified for office accommodation will be located here. The Cartergate site currently under construction will provide new town centre floorspace, and it is anticipated that this may lead to further proposals being developed in this area of the town, particularly close to St James Church, where enhanced public realm will also add to the overall quality of the environment.

**Leisure**

**14.44** The *Retain, Leisure and Three Centres Study* (2013) suggests that Grimsby is very much a secondary location to Cleethorpes from a leisure perspective. The leisure facilities at Meridian Park, Cleethorpes offer a wide range of family oriented activities, including a cinema and bowling alley. The lack of any current family oriented leisure offer within Grimsby is identified as a key deficiency, and one which does not fit with its sub-regional status.

**14.45** Recently, proposals to extend Freshney Place, and its offer to customers, were announced. The proposals comprise a multi-screen cinema, together with a range of food outlets fronting Riverhead Square. The Council has actively supported this scheme and is progressing negotiations in respect of its delivery.

**14.46** The *North East Lincolnshire Hotel Study* (2013) assessed current levels of hotel provision in the Borough, and considered the potential capacity for further development. Recent developments have seen construction of the Holiday Inn at Wellowgate and Premier Inn at Meridian Park, together with a proposed extension to the Humber Royal. Despite these three schemes generating in the region of 200 new bedrooms, the study identified that there was additional capacity for a further 100 bed hotel. The Council has actively promoted its site at Cartergate in Grimsby as its preferred location for the provision of new hotel accommodation.

**14.47** Cleethorpes' leisure offer is primarily oriented towards the visitor economy. Whilst there is a good range of pubs and restaurants in the town centre, the out-of-centre leisure facilities at Meridian Park detract from this, by meeting needs of visitors and residents alike, including those from Grimsby and Immingham. Whilst, there is no

specific, quantitative need to plan for additional leisure provision in Cleethorpes, promotion of a stronger leisure mix especially where the resort and town centre merge would be of benefit, and encourage linked trips and longer dwell times. The redevelopment of the Grant Street site, together with land at Sea Road would enhance the town centre offer, provide attractive visitor facilities and accommodate those using the beach.

14.48 Immingham town centre does not currently provide significant leisure facilities for local residents, although facilities are available close by at the Immingham Academy and Swimming Pool. Immingham will, however, be the closest town centre to the ABLE UK development located to the north of the town. It is therefore considered appropriate to ensure that opportunities can be taken to enhance Immingham's offer of social activities, including restaurants, cafés and bars, as developments like these will help to improve and sustain the town centre. A flexible approach to accommodating such uses will therefore be taken.

## Policy 23

**Retail hierarchy and town centre development**

1. Proposals for development within the defined town centres, district centres and local centres, identified on the Policies Map, will be supported where the scale and nature of the proposed development will support and enhance the individual role of the centre in accordance with the following retail hierarchy:

**A. Sub-regional centre - Grimsby**

i. development that continues to support the centre's sub-regional role, and which extends the range and quality of facilities and services offered will be encouraged;

**B. Main town centre - Cleethorpes**

i. development that supports the viability and vitality of the town centre, and strengthens the association of the commercial core and resort area will be encouraged, with the aim of broadening the town centre's appeal;

**C. Small town centre - Immingham**

i. development that supports the role of the town centre, and which extends the range and quality of facilities and services offered reflecting its location at the heart of the employment growth proposed, will be encouraged;

**D. District centre - Freeman Street, Grimsby**

i. development that supports the consolidation and redefining of the centre as a district centre will be encouraged, particularly where this broadens the range, and quality of facilities, services and cultural activities; and,

**E. Local centres**

i. development that respects the individual local scale and character of the centre will be supported.

2. Within the Grimsby, Cleethorpes and Immingham town centres, identified on the Policies Map, the Council will encourage and support mixed use development that adds to town centre vitality and viability; extends the range of offer to a broad spectrum of the population; and promotes an extension of the evening economy. Acceptable town centre uses are considered to be:

A. A1 Retail;
B. A2 Finance and Professional Services;
C. A3 Cafés and Restaurants;
D. A4 Drinking establishments;
E. A5 Hot food takeaways;
F. B1a Offices;
G. C1 Hotels;
H. C3 Dwelling houses (first floor and above);
I. D1 Non-residential institutions; and,
J. D2 Assembly and Leisure.

3. Within all centres, development will be expected to:

A. enhance the centre's attractiveness, as a place to visit, work and socialise, in line with policies relating to primary shopping frontages;

B. contribute to a mixture of mutually compatible and complementary uses;

C. maintain and sustain the quality of historic environment;

D. have particular regard to the desirability of retaining and improving traditional shop fronts;

E. ensure the installation of security grilles and shutters does not detract from the visual amenities of the street scene; and,

F. have regard to the need for careful design and placement of advertisements and signage consistent with appropriate design guidance, conservation area appraisals, and specific shop front guidance.

4. Proposals for main town centre uses, specifically retail and leisure uses comprising 200m$^2$ gross or more, in any location outside the defined primary shopping frontages, will only be acceptable if it is demonstrated that:

A. the development cannot be accommodated on a suitable site within first, the identified primary shopping frontages, then, within the defined town centre boundary, including identified opportunity sites, or finally close to, the town centre boundary (sequential test); and,

B. the proposed site is accessible and well-connected to the town centre; and,

C. development will not adversely impact upon the vitality and viability of any of the town centres, (impact test) having regard to:

i. committed, planned or proposed public and private investment in the town centres;
ii. evidence as to retail expenditure capacity which shows that the development would not adversely impact upon consumer choice and existing town centre trading levels.

5. Proposals for hot food takeaways (Use Class A5) need to demonstrate that account has been taken of:

A. the impact on the amenity of nearby residents; and,

B. the impact on highway safety; and,

C. the relationship with any school located within 400m of the proposed A5 use; and,

D. whether the proposal would result in an unacceptable concentration of A5 uses in the centre.

**Justification**

**14.49** Town centres function as the heart of local communities providing facilities and services that are essential to peoples needs. They also serve a valuable role as a community hub where people meet for social and leisure activities. The NPPF recognises this and advocates a strong town centre first approach to the development of town centre uses. Policy 23'Retail hierarchy and town centre development' reflects this approach whilst acknowledging the scope of town centre uses that make up a vibrant and attractive town centre.

**14.50** Policy 23'Retail hierarchy and town centre development' applies a sequential approach to safeguard the vitality of the town centres applying a 200m$^2$ threshold, as recommended in the *Retail, Leisure and Three Centres Study* (2013). This reflects the scale and nature of units within the town centres. The Council will robustly apply the sequential approach, seeking to avoid compounding damage that has resulted from out-of-centre development which has drawn people and trade away from town centres, causing or contributing to their decline. The *Sustainability Appraisal* considered that this approach has a number of sustainability benefits.

**14.51** The NPPF recognises the role that planning can play in better enabling people to live healthier lives. Locally, key indicators of health show that there is a need to improve health and that obesity is one of the key issues. Locating interacting uses, e.g. homes, workplaces and

shops, so that it is easy for people to walk or cycle between them, rather than depend on use of cars as part of a solution. Childhood obesity has specifically been identified as a significant threat to child health in North East Lincolnshire with additional implications for long-term adult health. Rates of child obesity at reception year in the Borough are significantly higher than the regional and national average and improving nutrition in early years is seen as one of the most effective approaches to reducing this worrying trend.

**14.52** In 2008 the Government published *Healthy Weight, Healthy Lives* which encouraged councils to use planning powers to control more carefully the rising numbers of fast food takeaways. Whilst this document is now dated, the 2013 Public Health reforms were based upon returning much of the responsibility for local public health to individual councils and health and well-being boards. There remains a clear message highlighting that local planning authorities should work with public health leads and organisations to understand and take account of the health status and needs of the local population. It is appropriate, therefore to consider what steps can be taken here. A study[85] undertaken by the Public Health team in the Council identified that around 50% of fast food takeaways were located in the five wards with the highest levels of childhood obesity in reception year pupils. A recommendation from this study states:

*"In order to tackle the proliferation and health impact of fast food takeaways within the locality, a combination of three approaches could be taken:*

- *Regulatory and planning measures could be used; fast food exclusion zones around schools have been successfully implemented by other local authorities and it is recommended by the Academy of Medical Royal Colleges that planning decisions should be subjected to a health impact assessment. Other regulations such as restricting opening times of takeaways to prevent them targeting their food at school children can also be adopted;*
- *As planning measures will not affect existing fast food takeaways, it would also be beneficial to work with the local food industry and local takeaways to help them make their food healthier: there is the potential to expand the work carried out under the Council's Healthy Choices Award;*
- *Likewise, there is also potential to work with local schools to promote healthy lifestyles and eating habits amongst children."*

**14.53** A number of councils have restricted further development of hot food takeaways close to school premises by introducing a 400m 'exclusion zone'. It is considered appropriate, given the drive to improve health in the Borough, to adopt a similar approach. The approach to controlling the proliferation of takeaways is supported by the Director of Public Health in North East Lincolnshire and sits alongside other activities to improve nutrition and physical activity inside schools. The location of the hot food takeaway will be measured from the main entrance to the school building. This consideration will carry less weight where the proposed location of the hot food takeaway is within a defined town, district or local centre boundary and would not result in an unacceptable concentration of A5 uses in the centre.

**14.54** Analysis of the current distribution of hot food takeaways in relation to school sites has highlighted that the majority of hot food takeaways are located in existing town and local centres. It has also highlighted that some schools are located within 400m of town and local centres. Consequently a number of existing hot food takeaways are located within 400m of schools. There is clearly a balance to identifying suitable locations for hot food takeaways and considering the health of school children.

85 Catteral V., Barnes G (2016) *Health on the High Street - North East Lincolnshire*. Public Health, North East Lincolnshire Council, http://www.nelincsdata.net/strategicassessment.

**14.55** The Council accepts that some A5 uses offer healthier alternative foods; however, the importance of promoting healthier lifestyles is a key local objective. Whilst the Plan cannot influence the existing location of A5 uses, or ultimately the choices made by individuals, it is considered important not to compound existing unsatisfactory relationships by allowing further hot food takeaways close to schools.

**14.56** It is acknowledged that primary school children (4 to 13 years) do not leave school grounds at lunchtime however, it is the age at which healthy eating behaviours can be influenced by the actions of their parents and carers. Additional planning control in such circumstances would be of very limited value. The Policy therefore will not apply to primary schools. Secondary school children (14 to 16 years) have much more autonomy over their food choices. The most popular time for secondary school children to purchase food is after school and some secondary schools allow children to leave school premises at lunchtime. The Policy does not apply to further education establishments and specific training facilities, these facilities serve a broad age range which is typically considered to be of 'adult' status. The Policy therefore applies to secondary schools.

**14.57** The Policy refers to consideration being given to an 'unacceptable concentration' of A5 uses. This reflects the possible detrimental impacts on the vitality and viability of the centre and potential harm to residential amenity that may result from an increasing concentration of A5 uses. When applying this consideration regard will be paid to:

1. the number of existing hot food takeaways in the area and their proximity to each other. (The Council will seek to prevent more than two hot food takeaways locating adjacent to each other, with at least two units between them.);
2. the role and character of the centre and the balance of other shops and services that would remain in the centre; and,
3. the level of vacancy and general health of the centre.

| Policy 23'Retail hierarchy and town centre development' relationship to: | Link to: |
|---|---|
| National Planning Policy Framework | Paragraphs 23 to 27 |
| Local Plan Strategic Objectives | SO8 |
| Evidence base and other key documents and strategies | • *Cleethorpes Strategic Development Framework* (2010)<br>• *Local Centres Study* (2012)<br>• *North East Lincolnshire Hotel Study* (2013)<br>• *Retail, Leisure and Three Centres Study* (2013)<br>• *Strategic Housing Market Assessment* (2013)<br>• *Grimsby and Cleethorpes Town Centres Investment Plan* (2016)<br>• *Grimsby Town Centre Parking Strategy* (2016)<br>• *Retail, Leisure and Three Centre Study, Retail Floorspace Capacity Update* (2016) |

Table 14.4 Policy relationships

## Accommodating identified town centre needs

**14.58** The needs for each town centre are highlighted in Table 14.5'Town centre requirements'. It is appropriate that sites are identified with a specific range of uses to ensure that the identified needs are being met, and many of the proposals identified which will support the various actions required for the town centres are sufficiently progressed to enable their delivery.

| Town centre requirements | | |
|---|---|---|
| **Grimsby** | **Cleethorpes** | **Immingham** |
| 25,236m$^2$ new comparison retail floorspace and c739m$^2$ new convenience floorspace (A1 use) | c5,631m$^2$ new comparison retail floorspace and 915m$^2$ new convenience retail floorspace (A1 use) | No significant needs identified (only c72m$^2$ new comparison retail floorspace) but opportunities to develop further cafés, restaurants and bars (A3 and A4 uses) |
| Up to 3.2ha Office Accommodation (B1a) | Limited improved comparison retail floorspace (A1 use) | |
| Leisure quarter including multi-screen cinema and restaurants, cafés and bars (A3 and A4 uses) | Cafes, bars and restaurants (A3 and A4 uses) | |
| 100 bed hotel | Residential (primarily first floor and above) | |
| Community facilities and opportunities for residential accommodation | | |

Table 14.5 Town centre requirements

**14.59** The Grimsby town centre boundary has been drawn tightly, but provides scope to accommodate the identified future growth. To the south, the railway, acts as a strong boundary and restricts pedestrian movements except at key crossing points. Cartergate forms the western edge, and marks the sharp transition to a residential environment. The eastern edge is formed by the Peaks Parkway, which again acts as a boundary and restricts pedestrian movements. The northern edge has been drawn so as to recognise the redevelopment potential of land adjacent to the River Freshney. This area offers great potential for future development, sitting between the Fishing Heritage Centre and Freshney Place Shopping Centre, adjacent to the Alexandra Dock.

**14.60** The Cartergate office scheme is under construction, and proposals for Riverhead Square, Garth Lane and the remainder of the Cartergate site are being progressed.

**14.61** The 2003 Local Plan town centre boundary for Cleethorpes centred around the primary retail area of St Peters Avenue, High Street, Market Street and parts of Alexandra Road. The small retail area at Sea View Street was defined as a separate Local Centre. Both of

these centres provide an attractive shopping environment primarily oriented towards the tourist market, and have a particularly strong niche and independent retail offer which contributes to the overall character of Cleethorpes. The town centre boundary has therefore been altered in order to ensure that the role of Sea View Street has as part of the wider town centre offer, although distinct from it, is recognised.

**14.62** The town centre opportunity sites for Cleethorpes are located in areas where complementary resort/visitor led development can help to sustain the town centre. Given its role, no specific proposals for office development are included for Cleethorpes. Although, the strategy provides sufficient flexibility if a specific need were to arise.

**14.63** No significant needs have been identified for Immingham, therefore no opportunity sites have been identified. The recently constructed redevelopment scheme was envisaged to meet all convenience needs for local residents, although Tesco's interest has waned. It is envisaged that an operator for the main store will be found soon, and this will readdress the balance in provision, supported by new comparison store provision.

**14.64** Whilst Immingham has a range of community facilities, it is not well served by cafés and bars, and restaurants. The development at ABLE Marine Energy and Logistics parks will generate significant business in the area. Immingham will be the closest town centre (approximately five to ten minute drive time), and the potential to attract workers and shoppers remains strong. Immingham, therefore, has the potential to offer a wider range of services than it does at present, and Policy 23'Retail hierarchy and town centre development' is supportive of further mixed use development that adds to the vitality and viability of the town centre, and extends the range of offer to a broad spectrum of the population.

## Policy 24

**Grimsby town centre opportunity sites**

1. Within the defined Grimsby town centre, land has been allocated to accommodate at least:

   A. 25,236m$^2$ new comparison retail floorspace;
   B. 739m$^2$ new convenience floorspace;
   C. 3.2ha B1 office accommodation;
   D. a new Leisure Quarter (cinema and restaurants);
   E. 100 bed hotel;
   F. community facilities; and,
   G. residential development, principally at first floor and above.

2. To meet future needs of the centre, the following opportunity sites capable of accommodating the range of uses listed, have been identified:

   A. **Garth Lane/Alexandra Dock**[86] - mixed use including retail ((A1), leisure (A3, A4, D1, D2) and office (B1a/b), with potential for some residential (C3));

   B. **Cartergate**[87] - office (B1a/b) and hotel;

   C. **Riverhead Square**[88] - cinema, leisure incorporating restaurants, bars and cafés (A3 and A4 uses);

   D. **Victoria Street South**[89] - mixed use including office (B1a/b), leisure (A3/A4) and residential (C3); and,

   E. **South of Bethlehem Street**[90] - comprehensive retail (A1), small scale mixed use including retail (A1-A4), leisure (D2) and residential (C3).

3. Development proposals on opportunity sites, identified above, and on the Policies Map, will be expected to accord with the guidelines set out in the *Town Centre Investment Plan*. Proposals will be assessed in accordance with the following criteria:

   A. meeting the requirements set out in Policy 23'Retail hierarchy and town centre development';

   B. making a positive contribution towards the improvement of the existing town centre offer;

   C. retaining/improving connectivity to the primary shopping frontages;

   D. improving town centre footfall and visitor dwell time; and,

   E. the proposal is complementary to other town centre investment plans/proposals.

86 Site located, part within Grimsby Central Conservation Area, and includes listed buildings (Haven Mill, West Haven Maltings and Garth Buildings Grade II, refer specifically to Policy 39'Conserving and enhancing the historic environment'.
87 Site located, within Grimsby Central Conservation Area, and adjacent to Grade I Listed Church of St James, refer specifically to Policy 39'Conserving and enhancing the historic environment'.
88 Site located, adjacent to Grimsby Central Conservation Area, refer specifically to Policy 39'Conserving and enhancing the historic environment'.
89 Site located, adjacent to Grimsby Central Conservation Area, refer specifically to Policy 39'Conserving and enhancing the historic environment'.
90 Site located, adjacent to Grimsby Central Conservation Area, refer specifically to Policy 39'Conserving and enhancing the historic environment'.

## Policy 25

**Cleethorpes town centre opportunity sites**

1. Within the defined Cleethorpes town centre, land has been allocated to accommodate at least:

   A. 1,816m$^2$ new convenience floorspace;
   B. 5,631m$^2$ new comparison floorspace;
   C. cafés, bars and restaurants; and,
   D. residential (principally at first floor and above).

2. To meet the future needs of the centre, the following opportunity sites capable of accommodating the range of uses listed, have been identified:

   A. **Adjacent Dolphin Hotel**[(91)] - retail (A1 (convenience), A3); and,

   B. **Grant Street/North Promenade/Sea Road**[(92)] - retail (A1, A3), leisure (D2), and residential (C3) (upper floors); and,

   C. **Central Promenade**[(93)] - retail (A1, A3), leisure (D2).

3. Development proposals on opportunity sites, identified above and on the Policies Map, will be expected to accord with the guidelines set out in the *Town Centre Investment Plan*. Proposals will be assessed in accordance with the following criteria:

   A. meeting the requirements set out in Policy 23'Retail hierarchy and town centre development';

   B. making a positive contribution towards the improvement of the existing town centre offer;

   C. retaining/improving connectivity to the primary shopping frontages;

   D. improving town centre footfall and visitor dwell time; and,

   E. the proposal is complementary to other town centre investment plans/proposals.

91 Site located, within Cleethorpes Central Seafront Conservation Area, refer specifically to Policy 39'Conserving and enhancing the historic environment'.
92 Site located, within Cleethorpes Central Seafront Conservation Area, refer specifically to Policy 39'Conserving and enhancing the historic environment'.
93 Site located, within Cleethorpes Central Seafront Conservation Area, refer specifically to Policy 39'Conserving and enhancing the historic environment'.

**Justification**

**14.65** A requirement that is common to all town centres is the need to improve them as places so that more people will want to spend more time there, more businesses will want town centre locations, and people will want to live, work, learn and enjoy cultural activities and leisure time in them. The Plan provides a policy framework, including allocating opportunity sites; from which more detailed place-making strategies and plans will be developed and implemented through co-operation between the Council, other service providers, businesses, developers, property owners and local communities. The aim is to ensure that our town centres are restored to, and continue to maintain their proper position at the heart of our communities.

| Policy 24'Grimsby town centre opportunity sites' and Policy 25'Cleethorpes town centre opportunity sites' relationship to: | Links to: |
|---|---|
| National Planning Policy Framework | Paragraphs 23 to 27 |
| Local Plan Strategic Objectives | SO8 |
| Evidence base and other key documents and strategies | • *Cleethorpes Strategic Development Framework* (2010)<br>• *Local Centres Study* (2012)<br>• *North East Lincolnshire Hotel Study* (2013)<br>• *Retail, Leisure and Three Centres Study, Retail Floorspace Capacity Study* (2016) |

Table 14.6 Policy relationships

## Primary shopping frontages

**14.66** The primary shopping frontages are defined in the NPPF Glossary as those frontages which are likely to include a high proportion of retail uses, which may include food, drinks, clothing and household goods. The NPPF requires that primary shopping ares are identified, and that the range of uses considered acceptable in such areas is also clearly defined.

**14.67** The primary shopping frontages apply to the most important retail frontages in the town centres, where the greatest pedestrian flows and concentration of A1 retail uses can be identified. Protection of such frontages is important in ensuring the vitality and viability of the shopping area, and ensuring that new non-retail uses are not introduced where they would detract from this. The area comprising these frontages is defined as the primary shopping area.

**14.68** Given the strategy of encouraging a wider range of uses within Grimsby town centre, consideration has been given to the inclusion of A4 uses, which would add to the mix and diversity of the town centre in its primary locations. It is therefore proposed that the retail uses considered appropriate for Grimsby are A1, A2, A3 and A4. Similarly, a wider approach, is proposed for Cleethorpes and Immingham in order to promote a wider range of uses within the town centre.

## Policy 26

**Primary shopping frontages**

1. Within the defined primary shopping frontages, identified on the Policies Map, non-retail development will be permitted at ground floor level only where the development would not result in more than a third of the individual units being used for non-retail uses. Retention of a display window will be required where the absence of this would otherwise have a detrimental impact on the nature and character of the shopping street.

2. The consideration of the proportion of units in Grimsby will be assessed with regard to, either:

   A. Freshney Place covered frontages; or,
   B. all other primary frontages in Grimsby town centre.

3. In Cleethorpes the consideration will be assessed with regard to, either:

   A. St Peters Avenue frontages; or,
   B. all other primary frontages in Cleethorpes town centre.

4. In Immingham the consideration will be assessed with regard to the proportion of units in all Immingham primary shopping frontages.

5. In any primary shopping frontage a cluster of non-retail uses shall not exceed three consecutive units.

6. Within Grimsby town centre, retail uses are defined as those falling within Use Class A1 (retail), A2 (finance and professional services), A3 (cafés and restaurants), A4 (drinking establishments).

7. Within Cleethorpes and Immingham town centres, retail uses are defined as those falling within Use Class A1 (retail) and A3 (cafés and restaurants).

**Justification**

14.69 The need to ensure that the Borough's town centres remain vital and viable is paramount to their long term sustainability. As a result, it is important that those parts of the towns where footfall and concentration of retail uses are the greatest are protected from inappropriate development.

14.70 There is a need to recognise the changing role of town centres, and ensure that there is sufficient flexibility to encourage a wider range of uses, particularly in relation to the provision of facilities for food and drink. Policy 26'Primary shopping frontages' recognises the variation in uses between the three centres, and will maintain the overall character of the primary retail area in each centre. The proportion of uses is based simply upon broad areas rather than individual street frontages.

**14.71** In the past the consideration of what constitutes a 'frontage' has led to some confusion, with questions raised about whether street junctions or corners represent a break in frontages. An approach based on areas is considered to be a simpler and easier to interpret, whilst still fulfilling the desired objective.

| Policy 26'Primary shopping frontages' relationship to: | Links to: |
|---|---|
| National Planing Policy Framework | Paragraph 23 |
| Local Plan Strategic Objectives | SO5 and SO8 |
| Evidence base and other key documents and strategies | • *Local Centres Study* (2012)<br>• *Retail, Leisure and Three Centres Study* (2013) |

Table 14.7 Policy relationships

## Freeman Street district centre

**14.72** Traditionally the main thoroughfare linking Grimsby Docks with the town centre, Freeman Street was once a vibrant area benefiting from its association with the docks. Over time, its retail status has changed as key nationally renown operators have moved out as a result of changes in the nature of the dock activities, and also the increasing attractiveness and status of 'Top Town' (Grimsby town centre).

**14.73** Freeman Street is now physically detached from Top Town, It is, however, now forming a new identity, building on strong links to the past such as the indoor market and a new range of diverse convenience outlets and specialist shops, including those with an ethnic focus. New sectors are emerging and beginning to grow, such as the digital hub.

**14.74** Given the nature of the outlets within Freeman Street and it s limited comparison offer, there is limited capability for it to substantially improve its offer. However, recent investment in the public realm, and the actions of the regeneration partnership with Shoreline Housing and the Enrolled Freemen of Grimsby are driving forward catalytic projects that will transform the area both physically and perceptually. Freeman Street is therefore set to continue its transition and will increasingly concentrate its focus on the immediate community it serves and reconnecting to Grimsby Docks.

**14.75** Given the area's increasingly local focus and convenience role, it is considered that the retail area is more in line with the definition of a Local Centre, although it is of more substantive scale and catchment. In recognition of this, Freeman Street is defined in the Plan as a District Centre.

**14.76** The Freeman Street district centre is anchored by the indoor market to the north and the large Asda superstore in the south. The connections between the Asda store and the district centre are currently very poor and efforts will, therefore, be made to improve these links and strengthen the new centre.

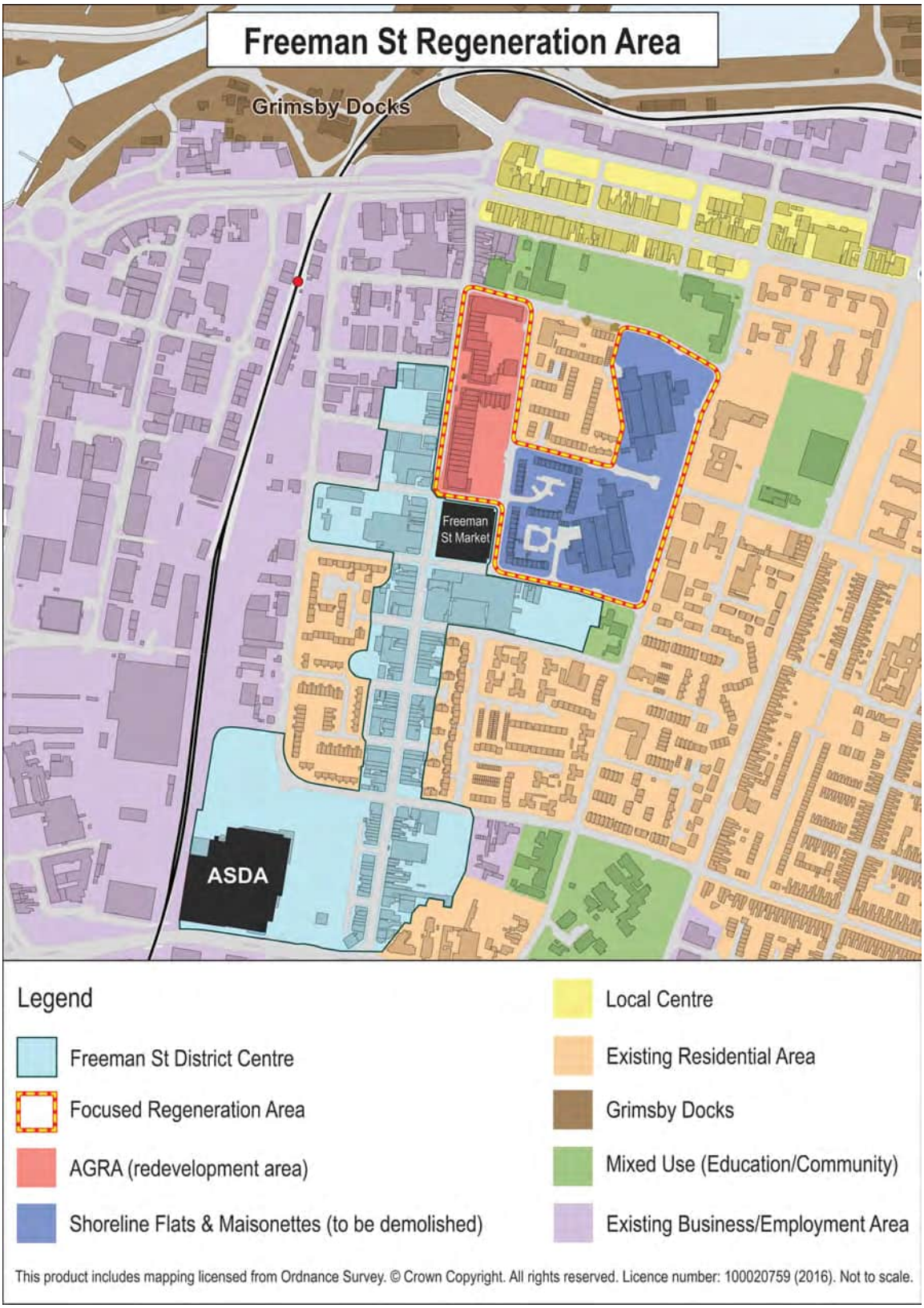



Figure 14.1 Freeman Street regeneration area

**14.77** The East Marsh area within which Freeman Street is located is an area of high deprivation that will benefit rom regeneration activities. An initial *Freeman Street, Regeneration and Development Study* (2015) has been commissioned to examine options for the redevelopment of this area.

**14.78** The Study identified the key drivers for change, and outlines the major constraints, existing land uses, connections and market conditions. It then sets out market-led and intervention-led options which, at the time of publication of this Plan, have yet to be fully evaluated. The Study does, however, highlight a number of key drivers that should influence any future development here:

1. an outward-facing approach;
    a. strengthening the relationship between the East Marsh and the wider growth opportunities presented by the port, town centre and community assets.
2. a focus on economic growth;
    a. supporting growth ambitions, improving education, training and links to new employment opportunities.
3. a flexible approach to future land use;
    a. a mixed use approach will encourage investment and encourage diversity.
4. supporting health and well-being;
    a. an approach which blends community and commercial assets in a way that supports well-being and attracts business communities to the area.
5. new perceptions through place-making;
    a. ongoing improvements and new development must support the 'rebranding' of the Freeman Street area.
6. a new definition for Freeman Street;
    a. a clear definition in terms of its role, land use and boundaries.

## Policy 27

**Freeman Street district centre**

1. Within the defined Freeman Street district centre boundary the Council will encourage and support mixed use development that adds to the vitality and viability of the town centre, and extends the range of offer to a broad spectrum of the population. The following specific uses will be acceptable, in principle:
    A. A1 Retail;
    B. A2 Finance and professional services;
    C. A3 Cafés and restaurants;
    D. A4 Drinking establishments;
    E. A5 Hot food takeaways;
    F. B1a Offices;
    G. C1 Hotels;
    H. C3 Dwelling houses (first floor and above);

I. D1 Non-residential institutions;
J. D2 Assembly and leisure.

2. The Council will support and promote approaches which seek specifically to improve pedestrian connectivity between Freeman Street and the Asda superstore.

**Justification**

**14.79** On the basis of the quantitative and qualitative assessment of Freeman Street centre set out in the *Retail, Leisure and Three Centres Study* (2013) Freeman Street has been defined as a district centre. This reflects:

1. the extent of vacancies in the existing defined centre - there is a clear requirement to physically consolidate the shopping area into a viable entity which will encourage linked trips and activity;
2. the decreasing importance of Freeman Street as a shopping destination in the Borough - the quantitative analysis in particular details that the centre performs a secondary role for comparison retail shopping in particular. The centre also has a limited services and leisure function; and,
3. its geographical separation from Top Town and the requirement to distinguish both centres in hierarchical terms so as to enable a viable centre-specific strategy to be developed for both Top Town and Freeman Street.

**14.80** The designation as a district centre better reflects the type of retail and service uses now found in the area and the strategy for future options for the wider regeneration area. The boundary reflects that recommended in the *Retail, Leisure and Three Centres Study* (2013).

**14.81** The northern section of Freeman Street, beyond the redefined district centre is seen as a mixed use development area. Further clarification regarding the development of this area will be forthcoming as the *Freeman Street, Regeneration and Development Study* (Oct 2015) is progressed.

| Policy 27'Freeman Street district centre' relationship to: | Links to: |
|---|---|
| National Planning Policy Framework | Paragraph 23 |
| Local Plan Strategic Objectives | SO8 |
| Evidence base and other key documents and strategies | • *Local Centres Study* (2012)<br>• *Retail, Leisure and Three Centres Study* (2013)<br>• *Freeman Street, Regeneration and Development Study* (2015) |

Table 14.8 Policy relationships

## Local centres

**14.82** The Borough's main town centres are supported by a network of local centres. They provide a range of day-to-day services to local walkable catchment areas. The centres play an important and vital role in meeting the day-to-day needs of local communities, particularly in respect of top-up convenience retailing. With the emphasis on local provision increasing recently local centres have been contributing substantially towards the sustainability of local communities.

**14.83** A *Local Centres Study* was undertaken in 2012. It sought to provide a clear definition of a Local Centre and assessed the compatibility of centres with that definition. Specifically, having regard to the changes in policy brought about by the NPPF, the Study defined a local centre as:

*"A group of five or more shops in one or more continuous rows serving a local catchment; largely retail based including at least one supermarket or convenience store with other retail elements and local services (hairdressers, café etc), typically including a high proportion of independent small or micro businesses."*[94]

**14.84** It is recognised that this definition may need to be interpreted more flexibly in relation to village centres, and areas with under provision, where a smaller centre might be recognised and further retail development supported.

**14.85** The Study identified 33 local centres and recommended that two centres at Convamore Road and Ladysmith Road, both in Grimsby, were included on the basis of development that had taken place since the original centres were identified. Additionally, the Study recommended the deletion of nine previously identified local centres on the basis that they were not compliant with the revised definition, and that they made no additional contribution to the coverage of provision via walk zones. As a result, the previously identified local centres at Beechwood Avenue, Carnforth Parade, Edge Avenue, Hainton Avenue, Heneage Road (all Grimsby), Fieldhouse Road (Humberston), Oxford Street (Cleethorpes), Pelham Road Central (Immingham) and Habrough were to be de-designated. Cleethorpes town centre boundary as also been reviewed and now includes Sea View Street, which was previously identified as a local centre.

**14.86** Within the local centres, small scale retail development will be acceptable, provided that this is appropriate to the scale and character of the particular centre. Retail uses will be considered to be those falling within Class A of the Use Classes Order.

**14.87** The *Retail, Leisure and Three Centres Study* (2013) identified a localised threshold of 200m$^2$ for assessing impact for development in out-of-centre locations. Given that this is intended to protect the retail operations of the town centre, it is considered appropriate to apply the same impact threshold to the local centre designations. Specifically, this will assist in retaining the integrity and purpose of the local centres, and ensure that proposed development within designated local centres does not undermine town centre vitality and viability. The specific requirements of the sequential test are set out under Policy 23'Retail hierarchy and town centre development'.

94 *Local Centres Study* (2012).

## Policy 28

**Local centres**

1. Within the defined local centres, small scale retail developments[(95)], will be acceptable provided they are appropriate to the scale and character of the particular centre.

**Justification**

14.88 The role of local centres is to provide appropriate facilities to meet the day-to-day needs of local residents based on a walking catchment area of approximately 800m. Changes need to be permitted if this role is to be sustained, but it is important that the scale of that change is appropriate to the local centre. It is considered that the use of the impact threshold will deter major redevelopment proposals which are more appropriate for town centre locations.

14.89 The local centres are set out in Table 14.9'Local centres' below and identified on the Policies Map:

| Local centre number | Name | Location/address |
|---|---|---|
| LC01 | Bradley Cross Roads, Grimsby | 462-468, 447, 451-461 Laceby Road, 200-206 Littlecoates Road, 37, 39 Brocklesby Road |
| LC02 | Chelmsford Avenue, Grimsby | 117-123, 128-134 Chelmsford Avenue, 2A-2B, 3-5 Cambridge Road |
| LC03 | Cleethorpe Road, Grimsby | 417-465 Cleethorpe Road |
| LC04 | Coniston Avenue, Grimsby | 13-23 Coniston Avenue, 18 Rydal Avenue, 17 Thirlmere Avenue |
| LC05 | Convamore Road, Grimsby | 95-103, Wilco Motorsave Convamore Road |
| LC06 | Corporation Road, Grimsby | 101-145, 136, 138 Corporation Road |
| LC07 | Cromwell Road, Grimsby | 148, 158-174, 156A, Hall at rear & adjacent club Cromwell Road |
| LC08 | Farebrother Street, Grimsby | 75-89, 88-98 Farebrother Street, 8 Patrick Street |
| LC09 | Gunners Way, Grimsby | 1-5, Costcutter Gunners Way, library Broadway |

95 Retail development involving uses within Class A1 to A5 of the Use Classes Order.

| Local centre number | Name | Location/address |
|---|---|---|
| LC10 | Ladysmith Road, Grimsby | Units 1-3, 4 & 6, 5, 7 & 8, 9 Ladysmith Business Park, Sport & Social Club, Honest Lawyer PH, former Kingsway Tyres, Grimsby Cars, former Jamie Bunten, LIDL, Periville Pharmacy, Portland Heathcare, Weelsby View Health Centre, Units 1-8 Ladysmith Road Trade Centre including: Training Centre, Direct Marble & Granite, FA Would, Amazing Glazing Laundry & Dry Cleaner |
| LC11 | Littlefield Road, Grimsby | 42-52, 97-99 Littlefield Lane |
| LC12 | Scartho Road, Grimsby | 1-43, 26 Waltham Road, 2-8, 54, 33-37 Pinfold Lane, 2-4, 23-33, 26-32 Louth Road, St Giles Church, library, St Giles Avenue |
| LC13 | Second Avenue, Grimsby | 46-60, 49-57 Second Avenue |
| LC14 | St Nicholas Drive, Grimsby | 314-350 St Nicholas Drive |
| LC15 | Sutcliffe Avenue, Grimsby | 168-190 Sutcliffe Avenue, library, Community Centre, Wooton Road |
| LC16 | Wingate Parade, Grimsby | 1-12, 14-18 Wingate Parade, 2 Crossland Road, Church of St Peter, Social Services Centre 'Bishop Edward King' Church, vicarage |
| LC17 | Yarborough Road, Grimsby | 162-172, 165-171 Yarborough Road, 2-6 Cross Coates Road |
| LC18 | Grimsby Road North, Cleethorpes | 3-189, 245-283 Grimsby Road |
| LC19 | Hardys Road, Cleethorpes | 76-86 Hardys Road |
| LC20 | Middlethorpe Road, Cleethorpes | 76A-92 Middlethorpe Road |
| LC21 | Park Street (Fiveways), Cleethorpes | 141-167, 162, 186 Park Street, 2 Queen Mary Avenue, 13 Carr Lane, 259 Durban Road |
| LC22 | Poplar Road (Grimsby Road South), Cleethorpes | 459-493 Grimsby Road |
| LC23 | Sandringham Road, Cleethorpes | 18-48 Sandringham Road, 1 Balmoral Road |
| LC24 | St Peters Avenue, Cleethorpes | 72-112, 95 St Peters Avenue |
| LC25 | Trinity Road, Cleethorpes | 44-52 Trinity Road |

| Local centre number | Name | Location/address |
|---|---|---|
| LC26 | Humberston Road, Humberston | 340-350 Humberston Road |
| LC27 | North Sea Lane, Humberston | 74-88 North Sea Lane |
| LC28 | Pelham Road (East), Immingham | 113-119, 50-78, County Hotel & County Snacks Pelham Road |
| LC29 | Pelham Road (West), Immingham | 371-405 Pelham Road |
| LC30 | Peaks Lane, New Waltham | 1A-1G, 7A, 3 Peaks Lane |
| LC31 | Station Road, New Waltham | 259-267, 278-284 Station Road |
| LC32 | Station Road, Healing | 99-105 Station Road |
| LC33 | Grimsby Road, Laceby | 2-22, 48-58 Caistor Road, PO Cemetery Road |
| LC34 | Station Road, Stallingborough | 4 Station Road |
| LC35 | High Street, Waltham | 5-81 High Street, 1-3, 2-6 Kirkgate |

Table 14.9 Local centres

| Policy 28'Local centres' relationship to: | Links to: |
|---|---|
| National Planning Policy Framework | Annex 2 Glossary |
| Local Plan Strategic Objectives | SO5 and SO8 |
| Evidence base and other key documents and strategies | • *Local Centres Study* (2012)<br>• *Retail, Leisure and Three Centres Study* (2013) |

Table 14.10 Policy relationships

## Social and cultural places

**14.90** Planning is about creating sustainable places and communities for the long-term. Social and cultural elements have been widely used in recent years to drive regeneration, build cohesive communities and in many cases change the way different areas are perceived. On a national scale events such as Liverpool's year as European City of Culture in 2008 and Hull's impending City of Culture role in 2017, mark the way major cultural projects can help to put places in the spotlight, boost economic development and regeneration and bring communities together.

**14.91** At a smaller scale cultural venues such as the Auditorium, Central Hall and Grimsby Minister; and events such as the annual Grimsby Jazz Festival, farmers markets and individual

community events can also play a part in building local confidence, instilling a sense of pride and creating a sense of well-being. These events often rely on suitable venues and spaces being available. It is, therefore, important that the Plan acknowledges and seeks to safeguard and enhance the range and quality of these spaces and venues. Whilst the buildings and places are important it must be recognised that, they are nothing without the societies, organisations and individuals who arrange and promote the social and cultural activities.

**14.92** The introduction of the *Localism Act 2011* has brought changes to social and community asset planning. Whilst empowering communities to take control of community assets it not new, *The Localism Act*[96] introduced the new 'Community Right to Bid' in relation to assets of community value. It allows communities to nominate a building or other land that they believe to be of importance for community well-being. The land and/or buildings can be in private or public ownership, and could be of cultural, recreational or sporting interest such as libraries, theatres, cinemas, pubs, or leisure facilities. When a successfully nominated asset comes up for sale, local community organisations have up to six months to exercise the right of first offer to the owner to buy it on the open market. The 'listing' of a community asset can be a material consideration in the determination of planning applications.

## Policy 29

**Social and cultural places**

1. The Council sill support existing assets of social and cultural value and support the development of new facilities and cultural places by:

   A. supporting developments to extend or broaden the appeal of social and cultural facilities, including proposals to co-locate facilities;

   B. supporting the development of new social and cultural facilities;

   C. developing and enhancing areas of public realm, providing safe and accessible venues for cultural activities;

   D. promoting development that provides opportunities for social interaction, including through mixed use development, and active street frontages; and,

   E. promoting elements of public art that serve to enrich the wider area in accordance with Policy 22'Good design in new developments'.

2. The Council will have regard to the listing of community assets under the provisions of the *Localism Act 2011* when considering planning applications.

96 Part 5, Chapter 3, assets of Community Value.

### Justification

**14.93** Policy 29'Social and cultural places' refers specifically to social and cultural places which serve as venues for social and cultural activities, support and broaden people's social and cultural experiences, and promote a sense of community pride and mental well-being. It does not relate to aspects of social care or service delivery which are addressed under Policy 6'Infrastructure'.

**14.94** Policy 29'Social and cultural places' reflects the changing nature of the provision of social and cultural facilities, reflecting both the changing council role as an enabler rather than a direct provider; and the opportunities presented by the *Localism Act 2011*. The Council will support local communities who wish to take control of community assets, whether by using existing facilities or developing new facilities.

| Policy 29'Social and cultural places' relationship to: | Links to: |
|---|---|
| National Planning Policy Framework | Paragraphs 70 and 156 |
| Local Plan Strategic Objectives | SO5 |
| Evidence base and other key documents or strategies | • http://www.discovernel.co.uk/#/[97] |

Table 14.11 Policy relationships

## Grimsby Town Football Club Community Stadium

**14.95** For many years now, Grimsby Town Football Club (The Club) have looked to relocate to a new modern stadium that would provide a sustainable future for the Club. The Council supports the Club's desire to relocate, and has acknowledged the significant role that the Club plays in the community through the football activities and more broadly through activities such as the National Citizen Service Programme (NCS).

**14.96** Whilst the Club and its supporters would be the main beneficiaries of a new stadium, there would also be wider community benefit. Success on the pitch has been proven to contribute to increased local investment and productivity, and also indirectly to an enhanced local identity and positive image. The Council has confirmed its in principle support for a community stadium in the *Grimsby Town Football Club, Social and Community Impact Study* (2015). It is also working with the Club to identify and consider possible sites where a new stadium could be located, and to understand and overcome any barriers to delivery.

**14.97** Although a site was identified and allocated in the 2003 Local Plan, it has not been possible to deliver a new stadium on that site. The viability of enabling development at the Great Coates site has changed over the years, as has the Club's commercial status.

**14.98** However, given the established benefits of a community stadium, it is important that this Plan provides flexibility and support for a future proposal, once a development package has been brought together. This needs to provide sufficient flexibility as to how the development might be

97 DiscoverNEL aims to attract (and keep) the workforce in the local area to support investment and business growth. DiscoverNEL is a sister brand to InvestNEL, see http://www.investnel.co.uk/.

funded, whilst ensuring that the development addresses the additional pressures it will have on existing infrastructure.

## Policy 30

**Grimsby Town Football Club Community Stadium**

1. The Council will support the development of a new football stadium together with necessary and appropriate enabling development, subject to:

   A. a sequential approach being followed in the selection of the stadium site; with first preference being for town centre and edge of centre sites, then commercial areas and finally, if no suitable, available site can be identified and acquired, within other locations out-of-centre;

   B. satisfactory justification for the scale of the stadium proposed, recognising that reasonable provision may be included for the stadium and associated development to grow over time dependent on the Club's commercial success;

   C. justification for associated, leisure and community facilities, including training pitches; recognising that the stadium should act as a community hub;

   D. satisfactory justification for the scale of enabling development, having regard to the need for:

      i. the scale and form of any retail and/or leisure development; to be consistent with the relevant sequential test and to avoid harmful impacts on the vitality and viability of the town centres (as set out in Policy 23'Retail hierarchy and town centre development'), and on existing and planned public and private town centre investment; and/or,
      ii. the scale, form and delivery of any housing development to be consistent with the Plan's overall spatial approach and other relevant plan policies.

2. All significant infrastructure requirements arising from the development of the stadium, associated enabling development must be addressed satisfactorily and, in addition, the developer will be expected to enter into legal agreements or meet conditions relating to the provision of:

   A. a satisfactory landscaping and planting scheme;

   B. access and parking, including measures to control off-site parking;

   C. off-site stewarding and measures to protect the amenity of neighbouring land uses

D. a satisfactory green transport plan, and appropriate measures to secure its implementation; and,

E. facilities to maximise public transport patronage.

3. Given the likely prominence of a new stadium, the Council will expect its design to be of high quality, specifically respecting the distinctive character and context of the site's location.

**Justification**

**14.99** The Council is keen to support the Club's ambitions to develop a new stadium, but must ensure that this is not at a cost to the public purse or delivered in a way that is damaging to the Borough's town centres or wider growth aspirations. Due to the need for a significant financial subsidy of the stadium building costs, the scheme, stadium and enabling development must be considered as a total package, which stands or falls together.

**14.100** To date it has not been possible to put together a package of development that is viable and acceptable. However, commercial factors, availability of funding packages and economic considerations will change over the plan period which may make the delivery of the stadium more favourable. Policy 30'Grimsby Town Football Club Community Stadium' recognises this and sets out the basis for considering specific exceptional development proposals.

**14.101** If the Club were able to put together a package for delivering a new stadium, the current stadium site, which is located off Grimsby Road, Cleethorpes within a predominantly residential area, is likely to be developed for residential development which would contribute further to the windfall housing supply.

| Policy 30'Grimsby Town Football Club Community Stadium' relationship to: | Links to: |
|---|---|
| National Planning Policy Framework | Paragraphs 23, 26 |
| Local Plan Strategic Objectives | SO5 |
| Evidence base and other key documents and strategies | • *Grimsby Town Football Club, Social and Community Impact Study* (2015) |

Table 14.12 Policy relationships

## Renewable and low carbon infrastructure

**14.102** The UK has committed to meeting a greater proportion of its future demand for energy through renewables, and this is reflected in recent legislation. EU Directive 2009/28/EC requires the UK to source 15% of its energy from renewable sources by 2020.

**14.103** The energy sector in North East Lincolnshire is not only important to both the UK and local economy, but also plays a significant role in ensuring the UK's fuel security. The Borough is already recognised as an operations and maintenance base for offshore windfarms and additional sites are very likely to be developed around the Humber during the plan period to facilitate the deployment of around 3,000 wind turbines in the southern North Sea, which are needed to meet the national energy targets.

**14.104** The presence of the port, combined with the Borough's infrastructure network associated with a long history of industry and energy production provides excellent foundations for a range of onshore renewable energy technologies to continue to be developed.

**14.105** The *Low Carbon and Renewable Energy Capacity in Yorkshire and Humber Study* (2011) specifically recognises the potential for additional large-scale biodiesel and biomass power plants to be developed. The concentration and nature of the commercial development along the South Humber Bank also presents opportunities for heat networks. These networks (often referred to as district heating schemes), supply heat from a central source directly to homes and businesses through a network of pipes. This is a more efficient method of supplying heat than individual boilers and is, therefore, considered to be low carbon technology. The *Low Carbon and Renewable Energy Capacity in Yorkshire and Humber Study* highlights the potential for the new renewable power facilities in the Borough to utilise this heat source (that would otherwise be wasted through cooling towers). The growing interest in combined heat and power (CHP) builds on the success of the Immingham Combined Heat and Power plant which, together with the nearby Humber refinery (to which the steam and electricity is supplied) is part of an ultra-low-carbon integrated energy hub.

**14.106** Other renewable energy technologies such as solar/photovoltaics and heat pumps, are expected to become more affordable and popular over the plan period and community schemes have the potential to play an increasing role in delivering renewable energy. The Borough has also been identified as one of three 'hotspots' in the UK having potential to secure geothermal energy from a vast saline aquifer that holds water underground at temperatures of between 40 and 60 degrees centigrade.

### Policy 31

**Renewable and low carbon infrastructure**

1. The Council will support opportunities to maximise renewable energy capacity within the Borough and seeks to deliver at least 75MW of installed grid-connected renewable energy by 2032.

2. Proposals for renewable and low carbon energy generating systems will be supported where any significant adverse impacts are satisfactorily minimised and the residual harm is outweighed by the public benefits of the proposal. Developments and their associated infrastructure will be assessed on their merits and subject to the following impact considerations, taking account of individual and cumulative effects:

A. the scale and nature of the impacts on landscapes and townscapes, particularly having regard to the *Landscape Character Assessment* and impact on the setting and scenic beauty of the AONB;

B. local amenity, including noise, air quality, traffic, vibration, dust and visual impact;

C. biodiversity, geodiversity and nature conservation, with regard given to the findings of the site and project specific HRA and potential impacts on SPA birds, where appropriate;

D. the historic environment, including individual and groups of heritage assets;

E. telecommunications and other networks; including the need for additional cabling to connect to the National Grid, electromagnetic production and interference, and aeronautical impacts such as on radar systems;

F. highway safety and network capacity;

G. increasing the risk of flooding; and,

H. the land, including land stability, contamination, soils resources and loss of agricultural land.

3. Where appropriate, proposals should include provision for decommissioning at the end of their operational life. Where decommissioning is necessary the site should be restored, with minimal adverse impact on amenity, landscape and biodiversity, and opportunities taken for enhancement of these features.

4. Proposals for onshore wind energy development will be permitted if:

A. the development site is located in one of the following identified broad areas:

i. **Flat Open Farmland** - south of the settlements of Humberston, New Waltham and Waltham;
ii. **Wooded Open Farmland** - east of the A18, and east and west of the A1173;
iii. **Open Farmland** - along the A180 corridor; and,
iv. **Industrial Landscape** - to the north west and south east of Immingham, and within the South Humber Bank employment zone; or,

B. located in an area that is identified as potentially suitable for wind energy development in an adopted Neighbourhood Plan; and,

C. demonstrate that the impacts identified through consultation with the local community have been satisfactorily addressed.

**Justification**

**14.107** Applications for nationally significant infrastructure, including energy developments over 50MW and offshore developments (and their associated onshore infrastructure) are not determined by the Council. They are examined by the Planning Inspectorate and determined by the Secretary of State, but the Plan is a material consideration in this decision-making process.

**14.108** Policy 31'Renewable and low carbon infrastructure' provides a positive framework for delivering sustainable energy supplies and will ensure that the Borough contributes to achieving national renewable energy generation targets. The Policy applies to proposals for all types of renewable and low carbon energy infrastructure, including biomass and biofuels technologies, energy from waste, solar, geothermal energy, wind turbines (onshore and onshore facilities required for the manufacture, commissioning, installation and servicing of offshore windfarms) hydro-power and micro-generation.

**14.109** Renewable energy assessments[98] suggest that the Borough has the potential to produce at least an additional 16MW of electricity by renewable energy (excluding onshore wind). With installed capacity already amounting to 12MW[99] and 48MW consented through applications for large-scale solar farm projects at Laceby and Bradley, the Borough is on course to meet the target figure of 75MW. However, national policy indicates that meeting the target is no reason to not grant further proposals. The target is therefore a minimum figure and will be periodically reviewed.

**14.110** Policy 31'Renewable and low carbon infrastructure' reflects *National Planning Practice Guidance* on wind energy developments, which requires local planning authorities to only permit applications if:

1. the development site is in an area identified as suitable for wind energy development in a Local or Neighbourhood Plan; and,
2. following consultation, it can be demonstrated that the planning impacts identified by affected communities have been fully addressed and therefore the proposal has their backing.

**14.111** The Council has undertaken work to identify broad areas which are potentially suitable for wind energy development. This work has focused upon the main constraints which would affect such developments, and has included consideration of:

1. landscape character and sensitivity (including the special qualities of the AONB designation);
2. residential amenity;
3. proximity to key infrastructure; and,
4. natural and historic environment designations.

**14.112** The Council is preparing a Supplementary Planning Document (SPD) that will provide additional guidance to developers and residents. It should be recognised however, that opportunities for onshore wind energy developments are considered to be limited and renewable energy capacity is most likely to be increased through further solar farm development.

**14.113** The deployment of larger scale low carbon and renewable energy schemes can have a range of positive or negative effects on nearby communities. They can provide landowners with the opportunity for rural diversification, deliver local jobs and opportunities for community based schemes and benefits. However, proposals can have a range of impacts that will vary depending on the scale of development, typed of area where the development is proposed and type of low carbon and renewable energy technology deployed.

98 *Low Carbon and Renewable Energy Capacity in Yorkshire and Humber Study* (2011).
99 *Renewable Electricity by Local Authority*, DECC (2014).

**14.114** When considering planning applications for low carbon and renewable energy, an assessment will need to take account of the impacts on landscape, townscape, natural, historical and cultural features, flood risk and areas of nature conservation interests. Proposals should also ensure that high quality design features are used to minimise the the impacts on the amenity of the area in respect of visual intrusion, noise, dust and odour and traffic generation.

**14.115** In determining the character and sensitivity of the landscape to accommodate development, the impact of the development on the historic character, sense of place, tranquility and remoteness of the landscape should be considered. Some energy developments appear industrial in nature, and where there are proposals in rural areas it will be important to ensure that any cumulative effects do not lead to a perception of industrialisation, either within a particular landscape of wider area. In assessing the capacity of the landscape to accept energy development, it will be important to consider Policy 42'Landscape' and the *Landscape Character Assessment*.

**14.116** Development can impact on biodiversity at construction, operation and decommissioning stages. This is due to emissions, waste products and physical alterations to the environment arising from the development's footprint/structure and impacts on soil, hydrology and water quality. Proposals will also be considered against link Policy 41'Biodiversity and Geodiversity' and, where possible, mitigation measures should be used to compensate and improve biodiversity. The Council will give particular consideration to the potential for any proposal to disturb or displace SPA birds caused by the loss of suitable feeding, roosting and loafing sites or have the potential for damage or distance to the Humber Estuary Special Area of Conservation (SAC).

| **Policy 31'Renewable and low carbon infrastructure' relationship to:** | **Links to:** |
|---|---|
| National Planning Policy Framework | Paragraphs 97, 98 |
| Local Plan Strategic Objectives | SO2 |
| Evidence base and other key documents and strategies | • *Landscape Character Assessment* (2015)<br>• *Low Carbon and Renewable Energy Capacity in Yorkshire and Humber Study* (2011) |

Table 14.13 Policy relationships

## Energy and low carbon living

**14.117** It is widely accepted that the burning of fossil fuels makes a significant contribution to climate change. Reducing greenhouse gas emissions is, therefore, a key part of the global response to minimising climate change.

**14.118** The requirement for North East Lincolnshire to reduce carbon emissions is set out in Government policy and legislation: the *Climate Change Act* (2008), requires an 80% reduction in greenhouse gas emissions compared to 1990 levels by 2050, with a reduction of at least 34% by 2020 as an interim step. Data released in March 2015 by the Department of Energy and Climate Change indicated that the interim target

has been met six years early. This has largely been attributed to continued reductions in energy demand and shifts to low carbon living.

14.119 Low carbon living means reducing the carbon emitted as a result of direct and indirect lifestyle choices such as avoiding car travel and purchasing locally sourced food. Whilst the UK appears to be on course to meet the greenhouse gas emissions target, continued change is needed across society and the economy. The planning system will play a key role in facilitating and delivering this process and the policies throughout this Plan are intended to work together to ensure that energy demands and usage are reduced at every opportunity.

## Policy 32

**Energy and low carbon living**

1. Where appropriate, the principles of the energy hierarchy should be followed in order to achieve energy efficient and low carbon development.

2. Design and Access Statements accompanying applications for major development should include information to demonstrate how appropriate design and construction practices have been considered and incorporated, specifically in relation to the following, and in accordance with other relevant policies in the Plan:

   A. considerations of landform, layout, building orientation, massing and landscaping;

   B. the use of materials, both in terms of embodied carbon and energy efficiency; and,

   C. the minimisation of waste and re-use of material derived from excavation and demolition.

### Justification

14.120 North East Lincolnshire is considered an inefficient carbon economy due to its high industrial density relative to the size of population. A significant proportion of households are also classified as fuel poor[(100)] and Policy 32'Energy and low carbon living' works towards ensuring that this situation is not exacerbate as new development is delivered across the Borough and promotes low carbon living.

14.121 The energy hierarchy (see Table 14.14'Energy hierarchy') prioritises different means of cutting carbon emissions. It promotes elimination and efficiency considerations, which are often also the most cost efficient and effective means of achieving carbon savings. Applying the hierarchy to development proposals should help to minimise the carbon footprint associated with new development both during construction and once in use. In turn, this should bring about energy cost savings for future occupiers.

100 *Home Energy Conservation Act, Draft HECA Report* (2013).

**14.122** Proposals will not be expected to contribute to all aspects of the hierarchy, but measures to reduce demand and promote energy efficiency (levels 1 and 2) will be encouraged.

| Energy Hierarchy | |
|---|---|
| **Level 1: Reduce energy demand** | Even renewable energy carries an embodied carbon cost so using less energy is better than using clean energy. New developments should be designed to minimise the need for energy by taking account of:<br>• the scheme's layout;<br>• the design and construction of individual buildings; and,<br>• opportunities for passive heating and cooling systems. |
| **Level 2: Use energy and resources efficiently** | Development should use sustainable materials in the construction process, avoiding products with high embodied energy content and minimise construction waste. |
| **Level 3: Supply energy from renewable and low carbon sources** | Development could provide on-site decentralised or renewable energy. |
| **Level 4: Offset carbon emissions** | Emission could be offset by providing well-designed, multi-functional woodland, grassland or fenland that is suitable habitat for the particular area (the priority habitats relevant to North East Lincolnshire and as identified in the *UK Biodiversity Action Plan* should guide this decision). |

Table 14.14 Energy hierarchy

| Policy 32'Energy and low carbon living' relationship to: | Links to: |
|---|---|
| National Planning Policy Framework | Paragraph 95 |
| Local Plan Strategic Objectives | SO2 |
| Evidence base and other key documents and strategies | • *Home Energy Conservation Act, Draft HECA Report* (2013) |

Table 14.15 Policy relationships

## Flood risk

**14.123** Flooding is a natural process that can occur at any time in a variety of locations. The severity of a flood event's impact, depends on a range of factors, including the combination of weather and rainfall patterns, sources of floodwater, local topography and patterns of development.

**14.124** With current climate change predictions pointing to the frequency, patterns and severity of flooding becoming more damaging, flood risk management is critical to protecting people and property from flooding. It is particularly important in the Borough as much of the urban area is within the high flood risk zone, including large parts of Grimsby, Cleethorpes and Immingham.

### Policy 33

**Flood risk**

1. Development proposals should have regard to the requirements of the flood risk sequential test and, if necessary, the exception test. The regeneration benefits of development in areas of high flood risk should also be considered in light of the Council's *Guidance Note on the application of the Sequential and Exception Tests in North East Lincolnshire*, and the Environment Agency's Standing Advice.

2. In order to minimise flood risk impacts and mitigate against the likely effects of climate change, development proposals should demonstrate that:

   A. where appropriate, a site specific flood risk assessment has been undertaken, which takes account of the best available information related to all potential forms of flooding;

   B. there is no unacceptable increased risk of flooding to the development site or to existing properties;

   C. the development will be safe during its lifetime;

   D. Sustainable Drainage Systems (SuDS) have been incorporated into the development unless their use has been deemed inappropriate;

   E. opportunities to provide natural flood management and mitigation through green infrastructure have been assessed and justified, based upon sound evidence, and, where appropriate, incorporated, particularly in combination with delivery of other aspects of green infrastructure in an integrated approach across the site;

   F. arrangements for the adoption, maintenance and management of any mitigation measures have been established and the necessary agreements are in place;

G. access to any watercourse or flood defence asset for maintenance, clearance, repair or replacement is not adversely affected; and,

H. the restoration, improvement or provision of additional flood defence infrastructure represents an appropriate response to local flood risk, and does not conflict with other Plan policies.

**Justification**

**14.125** The Council recognises that the Plan must strike a fine balance between providing for much needed regeneration and development activities within the urban areas (the main centres of population), and minimising the amount of new development exposed to flood risks. Where possible, development will be directed to areas at lowest risk of flooding in accordance with the sequential risk based approach required by the NPPF.

**14.126** The application of the sequential test within the Borough will be expected to follow the methodology set out in the Council's *Flood Risk Sequential and Exception Tests Guidance Note* which takes a rational approach to identifying the area of search for alternative sites with a lower probability of flooding, withing defined regeneration areas.[(101)] It essentially ensures that parts of the urban area, which are ranked as being some of the most deprived areas in the country, and therefore most in need of development, remain capable of being developed in policy terms. The guidance has been developed in collaboration with the Environment Agency and provides a robust basis for the application of the first part of the exception test, which requires the wider sustainability benefits of a proposal to outweigh the flood risk (NPPF, paragraph 102). Compliance with the second part of the exception test requires the development's safety to be demonstrated.

**14.127** The Plan's employment and housing allocations have been subject to the sequential assessment and this has ensured that no housing development has been identified on greenfield sites within Flood Risk Zones 2 or 3, unless only part of the site is affected and these areas can be avoided.

**14.128** The *Strategic Flood Risk Assessment* (2011) (SFRA), supplemented by additional flood risk data (collected by the Council as the Lead Local Flood Authority, the Environment Agency and Internal Drainage Boards (IDBs), supports the planning process and provides a better understanding of flood risk in the Borough.

**14.129** Along with the other strategies and plans identified in Table 14.16'Policy relationships', it provides the basis for flood and coastal erosion management across the Borough. These studies include a number of actions, measures and flood defence investment priorities all of which seek to protect lives and property and build resilience to future flood events. This includes the decision presented in the *Shoreline Management Plan* "to hold the line" along the south bank of the Humber, which means that the currently defended frontages are likely to require increasing investment to address climate change impacts and increased exposure to wave attack. New development must not compromise the Council's or its partners' ability to deliver the action plans and where appropriate should help to contribute to their completion.

101 Regeneration areas have been defined based on the 20% most deprived lower layer super output areas (LSOA) identified in the *Indices of Multiple Deprivation* 2015 and successor datasets.

**14.130** Surface water runoff is very likely to increase over the plan period as a result of more intense rainfall and further development across the Borough. This will place great pressure on existing drainage infrastructure and, if not carefully managed, will increase the risk of localised surface water flooding.

**14.131** Sustainable Drainage Systems (SuDs) slow the rate of surface water runoff and improve infiltration by mimicking natural drainage on a site. Developers should ensure that good SuDs principles are considered and integrated into schemes early in the design process. Examples of elements that can be incorporated into SuDs include permeable paving or road surfaces, soakaways and swales. Where possible, infiltration into the ground will always be encouraged in accordance with the drainage hierarchy. Further guidance on the design of SuDs are provided in the *North East Lincolnshire SuDs Guide* (2015).

**14.132** The provision of green infrastructure on a site can also reduce the risk of flash flooding by controlling surface water runoff. Features include green roofs, green walls and soft borders and landscaping, particularly large canopied trees.

**14.133** Pre-application discussions will be especially important as SuDs can be complex and the suitability of any proposed drainage solution will also depend on its interaction with surrounding and downstream sites.

| Policy 33'Flood risk' relationship to: | Links to: |
|---|---|
| National Planning Policy Framework | Paragraphs 94, 99 to 105 |
| Local Plan Strategic Objectives | SO2, SO5 and SO6 |
| Evidence base and other key documents and strategies | • *Flamborough Head to Gibraltar Point Shoreline Management Plan* (2010)<br>• *Grimsby and Ancholme Catchment Flood Management Plan* (2009)<br>• *Draft Humber Flood Risk Management Plan* (2014)<br>• *Humber Flood Risk Management Strategy* (2008)<br>• *Local Flood Risk Management Strategy* (2015)<br>• *North East Lincolnshire SuDs Guide* (2015)<br>• *Preliminary Flood Risk Assessment* (2011)<br>• *Strategic Flood Risk Assessment* (2011) |

Table 14.16 Policy relationships

## Water management

**14.134** The management of water resources is vital to ensure that water quantity and quality are maintained and improved throughout the Borough. Water resources include coastal waters, the internationally important Humber Estuary, rivers, streams, ponds and groundwater. They are important natural resources that provide wildlife habitats for a variety of species. They also facilitate land drainage, and many water bodies are valued tourism and recreation assets.

### Policy 34

**Water management**

1. Development proposals that have the potential to impact on surface and ground water should consider the objectives and programme of measures set out in the *Humber River Basin Management Plan*.

2. Development proposals should consider how water will be used on the site and ensure that appropriate methods for management are incorporated into the design. Development proposals should demonstrate that:

   A. adequate and sustainable water supplies are available to support the development proposed;

   B. provisions are made for the efficient use of water, including is reuse and recycling. Proposals for residential development will be expected to demonstrate that a water efficiency standard of 110 litres per person per day can be achieved; and,

   C. adequate foul water treatment already exists or can be provided in time to serve the development. Appropriate and sustainable sewerage systems should be provided for the collection and treatment of foul and surface water to ensure new development does not overload the existing sewerage infrastructure, minimising the need to discharge water into sewers, particularly combined sewers.

3. Where development is proposed within a Source Protection Zone, the potential for any risk to groundwater resources and groundwater quality must be assessed and it must be demonstrated that these would be protected throughout the construction and operational phase of development.

**Justification**

**14.135** The *European Water Frameworks Directive* was issued in 2000 to improve the quality of water bodies across the European Union. The *Humber River Basin Management Plan* (2009) was prepared to meet the requirements of this Directive, which focuses on the protection, improvement and sustainable use of water. The Council and its partners (including the Environment Agency) have a duty to ensure that these obligations are not compromised by new

development and will need to be satisfied that it does not adversely effect the status of a water body or prohibit future ecological improvement from being made. Where there are clear opportunities for a development to contribute to improvements in the ecological status of a water body this will be supported.

**14.136** Currently the supply of both potable and non-potable water in the Borough is satisfactory. The Council's growth aspirations for the next twenty years are, however, likely to generate increased demands for water, especially non-potable water. Whilst the recent investment in the Elsham Water Treatment Works has ensured that there is capacity in the short and medium term, further capacity improvements may be required depending on the scale and speed of industrial development. Development will not therefore be permitted unless existing water supplies are adequate or they can be augmented to serve the development without affecting the water environment and groundwater systems.

**14.137** North East Lincolnshire is in an area of serious water stress. Anglian Water's *Water Resource Management Plan* (2014), at the time it was produced, identified that the supply of water can be managed in the long-term by various means including metering and importing water from other sources. However, demand measures including increased water efficiency should be considered first before any supply measures such as river/groundwater extraction, water storage (reservoirs) and water transfer. From a sustainability perspective, water should still be used efficiently in order to reduce the associated energy requirements (needed to pump water, for example) and to avert adverse environmental effects such as over-abstraction. Improving water efficiency will also help to reduce the volume of wastewater that the sewer system has to accommodate. Developers of new dwellings will be required to demonstrate that appropriate measures to conserve and reuse water, such as low flow showers and kitchen taps, and provision of water butts and rain/grey water harvesting have been incorporated to achieve water efficiency working to a standard of 110 litres per person per day or better. The additional costs of meeting this target have been assessed as being as little as £9 per dwelling.[(102)]

**14.138** In most parts of the urban area rainwater drains into surface water sewers or sewers containing both surface and wastewater, these are known as 'combined sewers'. In Grimsby and Cleethorpes there are large areas served by combined sewers, mostly in the older parts of the towns.

**14.139** During periods of intense rainfall sewer flooding can occur. Flooding can also be triggered when a sewer is blocked or has insufficient capacity. There are a number of locations within Grimsby, Lacey, Humberston and New Waltham that are prone to flooding during heavy rainfall events. When this happens to combined sewers the risk of land and property flooding with water contaminated with raw sewage increases significantly.

**14.140** Given the vulnerability of the sewer systems and likelihood of rainfall amounts and frequencies increasing due to climate changes, development proposals must provide infrastructure of an acceptable standard to cope sufficiently with sewage and surface water. Foul and surface water drainage should be separated to reduce the likelihood of flooding and contamination. The use of natural sewage treatment methods, such as wetland/reed beds, will be encouraged and supported where it is practicable.

102 DCLG *Housing Standards Review* (Sept 2014).

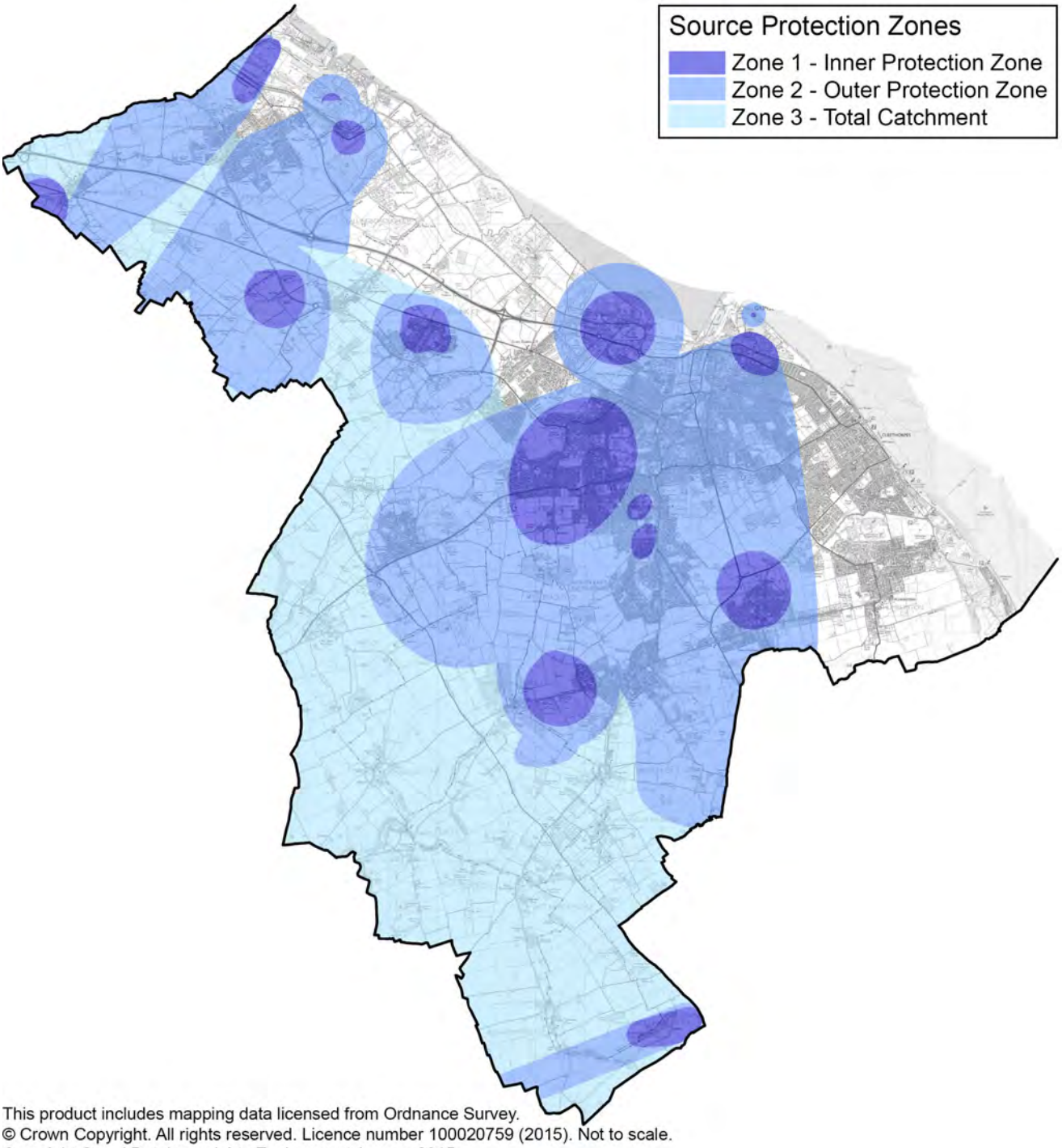





Figure 14.2 Ground water source protection zone

**14.141** Groundwater resources provide an invaluable source of water for public supply, industry, agriculture and rivers; but can be harmed by a range of activities, such as contamination from industrial uses or infilling in the urban area. The Environment Agency has identified and mapped a number of these resources according to their significance and vulnerability to pollutants.

A large area of North East Lincolnshire is designated as a Groundwater Source Protection Zone (see Figure 14.2'Ground water source protection zone'). The zones (1 to 3) show the risk of contamination from any activities that might cause pollution in the area; the closer the activity, the greater the risk. Zone 1 represents the area of greatest risk. The protection of the groundwater resources in these areas is particularly important.

**14.142** Where development potentially impacts on groundwater, relevant site investigations, risk assessments and necessary mitigation measures for source protection zones will need to be agreed with the relevant bodies. The Environment Agency advocates a risk-based approach to the protection of groundwater resources[(103)], and the Council will support this. Where potential risks to groundwater exists, especially close to water supply abstractions, the Council will consult the Environment Agency at an early stage.

**14.143** Where development or land contamination from previous use could potentially impact surface water or groundwater, a preliminary risk assessment should be undertaken to assess the potential risk posed. Relevant site investigations, risk assessments and necessary mitigation measures will need to be agreed with the relevant bodies (the Environment Agency and relevant water companies). Any investigation should be undertaken in accordance with the Environment Agency guidance document *CLR 11 Model Procedures for the Management of Land Contamination*.

| Policy 34'Water management' relationship to: | Links to: |
|---|---|
| National Planning Policy Framework | Paragraphs 99, 109, 110, 111, 120, 121 |
| Local Plan Strategic Objectives | SO2, SO6 |
| Evidence base and other key documents and strategies | • *Local Flood Risk Management Strategy* (2015)<br>• *River Basin Management Plan Humber River Basin District* (2009) |

Table 14.17 Policy relationships

## Telecommunications

**14.144** Effective telecommunications play an essential role in modern life. Mobile telecommunications and access to high speed, reliable broadband are essential to the efficient operations of modern business and to individual lifestyles. As technology advances the demand for new telecommunications infrastructure will continue to grow.

**14.145** The Northern Lincolnshire Broadband project; a partnership between North and North East Lincolnshire Councils, was established to upgrade broadband across Northern Lincolnshire. Phase 1 has seen over 31,000 premise up-graded to fibre-optic service. The second phase sees a further £1.99m being invested up to 2017 to take fibre-optic coverage to 97.3% of Northern Lincolnshire.

103 *Groundwater Protection and Practice (GP3)* Environment Agency (2013).

14.146 The Council is keen to support this growth whilst seeking to ensure that visual and environmental issues are given appropriate consideration.

## Policy 35

**Telecommunications**

1. Proposals for telecommunications development, including consideration of appropriate prior approval applications will be permitted, or determined, provided that:

   A. the development is appropriate in terms of siting and appearance, having regard to technical and operational constraints, and does not intrude into or detract from the landscape or urban character of the area;

   B. applicants demonstrate a sequential approach to show that development cannot be accommodated with less visual intrusion;

      i. on an existing building, mast or other structure; or,
      ii. on a site that already contains telecommunications equipment; before new sites can be considered;
      iii. adequate screening and/or landscape, measures are included; and,
      iv. provision is made for the removal of the facilities and reinstatement of the site as soon as reasonably practicable after it is no longer required for telecommunication purposes.

**Justification**

14.147 Access to mobile telecommunications and high speed, reliable broadband is now considered essential to the efficient operation of modern business and to individual lifestyles. Much of the urban area has good access and recent investments by Virgin in infrastructure at Habrough and Stallingborough have brought significant improvements to these rural settlements; connecting the village residents to the superfast broadband fibre-optic network. There is however, still poor broadband coverage in much of the rural area. Policy 35'Telecommunications' supports further improvements across the wider area.

14.148 Whilst most telecommunications infrastructure is unobtrusive, and often permitted development, some telecommunications infrastructure has the potential to be obtrusive, and can lead to adverse impacts on the surrounding area. Policy 35'Telecommunications' seeks to ensure that development requiring consent does not intrude into or detract from the landscape or urban character of the area, and seeks to minimise visual impacts.

**14.149** Where applicable and relevant development should have regard to:

1. the objectives and expectations of the *Lincolnshire Wolds Area of Outstanding Natural Beauty Management Plan 2013-2018* (and any subsequent updates);
2. Landscape Character Assessment; and,
3. Conservation Area Appraisals.

| Policy 35'Telecommunications' relationship to: | Links to: |
|---|---|
| National Planning Policy Framework | Paragraphs 42 to 46 |
| Local Plan Strategic Objectives | SO3 |
| Evidence base and other key documents and strategies | • *Infrastructure Delivery Plan* (2015) |

Table 14.18 Policy relationships

## Sustainable transport choices

**14.150** Transport has an important role to play in facilitating sustainable development, but also contributes to wider aspects of sustainability including health and environmental quality. Whilst behaviours, working patterns and lifestyle choices are changing transport choices, it is clear that new development will generate additional transport movements.

**14.151** The Council's approach as advocated in the *Local Transport Plan 2011-2026* (LTP3) is to address a number of key challenges designed to address economic, social and environmental priorities explicitly geared towards local priorities. The identified challenges are:

| Challenges | |
|---|---|
| Enable sustainable growth through effective transport provision | For the long-term health of the local economy growth has to be sustainable. Regeneration aspirations will rely on effective transport links to enable employees and visitors to access new homes and workplaces. Development near the Port of Immingham docks and the South Humber Bank will need appropriate road and rail links enabling the transportation of cargo. |
| Improve journey times and reliability by reducing congestion | Tackling congestion has been raised by both the public and business and an issue in North East Lincolnshire. The problem of congestion in North East Lincolnshire tends to be localised and associated with peak travel times. Through analysis of traffic data several hotspots have been identified including; Tollbar Roundabout (A16), Westgate Roundabout (A180) and Cambridge Street/Little Coates Road junction. Traffic delays also occur along the A180 entering the resort of Cleethorpes during the summer and weekends. |

| Challenges | |
|---|---|
| Support regeneration and employment by connecting people to education, training and jobs | As well as providing links to workplaces there is a need to transport people to training and education sites where they can learn and up-skill to meet the needs of new emerging local industries. In North East Lincolnshire the main strategic employment sites are focused on the two ports and the land between which is detached from the main urban area, this presents particular challenges for public transport provision. |
| Enable disadvantaged groups and/or people living in disadvantaged areas to connect with employment, health, social and leisure | Social exclusion is a significant local issue. Providing access for all at an affordable rate to education, healthcare, employment, leisure and social opportunities enables people to make the most of life. |
| Provide safe access and reduce the risk of loss, death or injury due to transport accidents or crime | The number of traffic accidents on local roads has declined significantly in recent years but is still higher than similar places elsewhere in the country. This challenge seeks to build on the progress already made and to continue to improve safety and security in the area. |
| Improve the health of individuals by encouraging and enabling more physically active travel | Overall the health of local residents in North East Lincolnshire is improving but life expectancy is lower and early deaths from preventable causes are higher than national averages. Less than one in five people are getting enough exercise each week and more than 25% of people are classed as obese. The challenge for transport is to help improve the situation and increase the physical and mental health of local people. |
| Improve the journey experience on the local transport network | This challenge supports the idea that transport is not just about getting from A to B but about the quality of the journey. Comfort, reliability, punctuality and aesthetics are important in relation to many different forms of transport. It is also acknowledged that improving journey experience is a key tool in encouraging people to use more sustainable modes of travel. |
| Ensure transport contributes to environmental excellence, improved air quality and reduced greenhouse gas emissions | Delivering economic growth in parallel with guarding and enhancing the environment is an important part of building a sustainable economy.<br><br>Since emissions from transport are a significant contributor to greenhouse gas emissions, it is important that ways are sought to reduce fossil fuel dependence. This is especially important alongside establishing North East Lincolnshire as a centre for renewable technologies. |

| Challenges | |
|---|---|
| | Whilst overall North East Lincolnshire has good air quality, there are a few key locations which exceed European guidelines and have been declared Air Quality Management Areas (AQMAs). It is important that the Council continues to manage and monitor air quality at these and other sites. |

Table 14.19

**14.152** The Council's approaches and actions set out to address these locally identified challenges.

A number of existing programmes and initiatives are in place to support sustainable transport. In addition to blue badge and concessionary bus passes, these include:

1. TravelLincs - a car sharing initiative, which puts people in touch with like minded car sharers;
2. Community Transport Services:
   a. Phone n Ride - an on demand responsive bus service;
   b. Wheels to Work - a scooter based scheme facilitating access to employment, training and education; and,
   c. Dial a Ride - a scheme providing accessible transport for those who find it difficult to use public transport due to illness or disability.

## Policy 36

**Promoting sustainable transport**

1. To reduce congestion, improve environmental quality and encourage more active and healthy lifestyles, the Council will support measures that promote more sustainable transport choices. Where appropriate, proposals should seek to:

   A. focus development which generates significant movements in locations where the need to travel will be minimised;

   B. prioritise pedestrian and cycle access to and within the site;

   C. make appropriate provision for access to public transport and other alternative means of transport to the car, adopting a 400m walk to bus stop standard;

   D. make suitable provision to accommodate the efficient delivery of goods and supplies; and,

   E. make suitable provision for electric vehicle charging, car clubs and car sharing when considering car park provision.

2. Planning permission will be granted where any development that is expected to have significant transport implications delivers necessary and cost effective mitigation measures to ensure that development has an acceptable impact on the network's functioning and safety. These measures shall be secured through conditions and/or legal agreements.

3. Where appropriate, Transport Statements, Transport Assessments and/or Travel Plans should be submitted with applications, with the precise form being dependant on the scale and nature of development and agreed through early discussion with the Council.

4. The priority areas where combinations of sustainable transport measure and highway improvements will be focused are:

   A. Grimsby town centre;
   B. Cleethorpes town and centre and resort area;
   C. A180 corridor, (urban and industrial); and,
   D. urban area congestion hotspots and defined air quality management zones.

**Justification**

**14.153** Policy 36'Promoting sustainable transport' recognises that significant benefits can be achieved by locating developments in places where the need to travel will be minimised and the option to make sustainable choices can be maximised.

**14.154** Policy 23'Retail hierarchy and town centre development', applies a sequential approach to safeguard the vitality of the town centres. As well as preventing damage to centres by out-of-centre development that would draw away trade and activity, this approach will also maximise sustainable transport opportunities and choices.

**14.155** Policy 36'Promoting sustainable transport' also seeks to prioritise pedestrian and cycle access. North East Lincolnshire is relatively compact, the main centre of population and arc settlements being within only a few kilometres of each other. This means that the majority of everyday journeys are short and concentrated on a small number of routes. There are, therefore, benefits to be derived from promoting walking, cycling and public transport options in preference to dependence on the private car. Policy 40'Developing a green infrastructure network' specifically seeks out opportunities to improve the overall connectivity of green spaces, including improvements to access to the countryside and permeability of the urban area, for pedestrians, cyclists and horse riders. There are currently 204kms of footpaths and bridleways in the Borough. The Council has prepared a *Rights of Way Improvement Plan* (ROWIP) (2008) which covers a ten year period.

**14.156** Policy 36'Promoting sustainable transport' promotes improved bus and community transport accessibility working to a maximum 400m walk to bus stop. Four hundred metres is considered to be beneficial and reasonable, greater distances tend to deter regular bus use. The Council has and will continue to invest in improved bus facilities across the Borough. Latest improvements include new bus stop facilities in Grimsby town centre and up-to-date service information at bus stops.

**14.157** Having considered and assessed the implementation of these approaches further mitigation might be required. The mitigation measures should be clearly identified in

development proposals, including within Transport Statements, Transport Assessments and Travel Plans, where these are required, and will be secured through conditions and/or legal agreements.

14.158 The Council has identified through monitoring, modelling and alignment with regeneration priorities a number of priority areas where combinations of sustainable transport measures and highway improvements will be focused. These focus on the transport hubs of Grimsby town centre and Cleethorpes town centre and resort; the strategic transport corridor formed by the A180; urban area hotspots identified through monitoring and modelling and defined air quality management zones.

| Policy 36'Promoting sustainable transport' relationship to: | Links to: |
|---|---|
| National Planning Policy Framework | Paragraphs 29 to 41 |
| Local Plan Strategic Objectives | SO7 |
| Evidence base and other key documents and strategies | • *Local Transport Plan 2011-2026* (LTP3) (2011)<br>• *Retail, Leisure and Three Centres Study* (2013) |

Table 14.20 Policy relationships

## Safeguarding transport infrastructure

14.159 In total there are about 651kms of adopted urban and rural highway in North East Lincolnshire. A proportion of this network is defined as the strategic highway network. The Borough is also served by both passenger and freight rail facilities. As future growth occurs, further investment in the transport infrastructure will be required.

14.160 The planning and construction of major new transport infrastructure can take many years, due to the time taken to evaluate and design schemes, secure land ownership and construct the final works. It is, therefore, necessary to ensure where schemes have been identified, and a level of commitment made to securing their delivery that the routes are safeguarded. This is to ensure that development that would prejudice the delivery of the schemes is not permitted. Where land is required to deliver the identified schemes the routes have been identified on the Policies Map.

14.161 Two major highway schemes commenced construction in 2015. Once complete these will provide significant improvements to the strategic highway network. The A180/A160 (dualling of the A160) upgrades the link from the A180 to the Port of Immingham. It includes improvements to the port entrance and accommodates improved access to the ABLE UK employment site at Killingholme. The second scheme is the A180/A18 link road. Once complete this link will provide a direct link for commercial traffic heading to the Port of Immingham. This will provide the opportunity to impose a weight restriction through Immingham which will transform the local environment by removing HGV traffic.

14.162 The Council will continue to work hard to maintain the direct rail link between Manchester Airport and Cleethorpes, and connectivity to core northern cities; lobby specifically for a direct rail link to London; and maintain and highlight the importance of freight connections to the Humber ports. In addition, the Council will continue to lobby for electrification of the South Humber rail line and additional improvements to enable trains to run faster.

14.163 Recent planned freight rail improvements include a scheme to improve container movements. The scheme is based around W10 and W12 rail gauge enhancements between Immingham and Doncaster. These gauge enhancements will allow 'high cube' containers to be transported out of the South Humber Ports and will result in a one third increase in capacity for containers. The scheme will allow more freight to be transported for less cost and will support the local economy. It is anticipated this scheme will be completed by mid-2016.

## Policy 37

**Safeguarding transport infrastructure**

1. The Council will safeguard the routes of, and support measures which deliver, maintain and improve, key transport infrastructure, identified on the Policies Map, namely:

   A. South Humber Bank Link Road;
   B. Grimsby West Link Road; and,
   C. Network Rail improvements, and station improvements.

**Justification**

14.164 The delivery of new transport infrastructure is critical to supporting the Council's growth ambitions. The three identified projects represent the major schemes expected to be delivered during the plan period.

14.165 The South Humber Bank Link Road has been identified in the *South Humber Industrial Investment Programme* (SHIIP). This link road between Hobson Way and Moody Lane will provide a new direct link between the Ports of Immingham and Grimsby. It will improve accessibility to potential development sites, improve business efficiency in terms of travelling times and associated costs, and reduce traffic pressures on the A180 between the Stallingborough Interchange and Pyewipe. Improvements will also be made to the standard of Moody Lane, and the whole link will be of a standard to be publicly adopted upon completion, providing a new through route with unrestricted access.

14.166 Outline planning consent for the development of Great Coates Industrial Park identified the link road (the land being within the same ownership), but suggested that it would be retained for private access for those operators on the site. Additionally, no timescale or commitment to delivery of the road was given.

14.167 Funding has however, been secured, through SHIIP, and the Greater Lincolnshire LEP, which will enable the link road to be constructed to an adoptable standard, ensuring that all businesses within that area benefit from improved access arrangements. This will also improve the attractiveness of the proposed Great Coates

Industrial Park as well as other development sites along the South Humber Bank. It is anticipated that SHIIP will forward fund the works necessary to secure early implementation of the scheme, with appropriate contributions from the adjacent developer towards the scheme's implementation.

**14.168** The Grimsby West Link Road will form an integral part of the development of the Grimsby West strategic housing site (HOU342). It is required to deliver the housing necessary to meet future requirements. It will also provide an important link in the highway network. This link will be designed as an integral element of the strategic housing site and not as a 'bypass'. Provision has been made within Policy 14'Development of strategic housing sites', referring specifically to the development of the Grimsby West site for delivery of a complete highway link between the A46 and A1136, including safeguarding the capacity for the delivery of a strategic link (identified on the Policies Map), in accordance with the indicative concept plan included in the *Grimsby West Masterplan*.

**14.169** Improvements already made to rail infrastructure have included better rail station facilities with, increased passenger comfort and information, and improved safety at rail crossings. However, there is further scope for improvements over the plan period. This is particularly relevant at Cleethorpes Station, as part of wider regeneration proposals.

| Policy 37'Safeguarding transport infrastructure' relationship to: | Links to: |
|---|---|
| National Planning Policy Framework | Paragraph 41 |
| Local Plan Strategic Objectives | SO7 |
| Evidence base and other key documents and strategies | • *Local Transport Plan* (LTP3) (2011)<br>• *Infrastructure Delivery Plan* (2015)<br>• *South Humber Industrial Investment Programme* (2015) |

Table 14.21 Policy relationships

## Parking provision

**14.170** Parking can present problems when it is not considered as part of an integrated design approach, or when too little parking is provided relative to the local site circumstances.

**14.171** Parking provision in new development must be designed to meet expected demand whilst making the most efficient use of land and maintaining the principles of sustainable development. Much evidence now exists to suggest that the over-restriction of residential parking approach taken by local authorities in response to *Planning Policy Guidance 3: Housing* (PPG3), has had a negative impact on highway safety and good urban design.

**14.172** It is important to ensure future developments provide sufficient parking that will not result in on-street parking congestion. There has to be a balance so that there is not an over provision of parking that would result in the inefficient use of land or encourage unsustainable transport choices.

14.173 The approach taken must recognise that certain factors may require deviation from any set standards, such as on-street parking levels, parking restrictions, narrow streets and other local factors. The Council must ultimately weigh up all the specific issues for each development and establish a balanced outcome.

## Policy 38

**Parking**

1. Development proposals that generate additional parking demand should ensure that appropriate vehicle, powered two wheeler and cycle parking provision is made. The form and scale of off-street parking required will be assessed against the following:

   A. the accessibility of the development;
   B. the type, mix and use of the development;
   C. the availability and frequency of public transport services; and,
   D. local car ownership levels.

2. Developers will be expected to have considered and incorporated measures to minimise parking provision without causing detriment to the functioning of the highway network, local amenity and safety.

3. Where private and/or public on-site parking for public use is to be provided at least 5% of parking bays, should be designed, set out and reserved for people with mobility impairments. Such parking bays should be located as close to the main access to the building as possible.

4. Where 100 or more parking places are to be provided to serve a commercial development, a minimum of three charging points should be provided for electric vehicles.

5. Development proposals that make provision for surface parking areas to serve more than a single household, visitor, employee, or customer, should ensure that appropriate low maintenance landscaping is integrated into the design and layout of the sites.

**Justification**

14.174 Policy 38'Parking' sets out a flexible approach outlining key considerations to be taken into account with the aim of identifying the extent to which provision of additional off-street parking space could be minimised before problems would be experienced. This would naturally lead to a situation where developments in proximity to good transport services and close to frequently used services and facilities require fewer parking facilities than those in locations without these benefits.

14.175 Policy 38'Parking' makes specific provision for people with mobility impairments. The requirement of five percent is representative of the national average of those with mobility impairments who have potential need for

parking.[104] The Policy also supports the drive towards cleaner vehicles by seeking provision of charging points for electric vehicles in larger commercial schemes. The requirement for a minimum of three charging points is considered reasonable in car parks of 100 vehicles or more, and reflects the likely increase in ownership of electric vehicles over the plan period.

**14.176** The Government remains committed to electric vehicles and supports the further take-up by subsiding the purchase cost of a vehicle and the installation of a charging point as part of its drive to reduce carbon pollution from transport and improve air quality. The lack of supporting charging infrastructure is seen as a deterrent to increased take-up and frustrates efforts to address air quality impacts.

**14.177** The Council is committed to supporting the increased take-up of electric vehicles as part of its RENEWEL programme, which includes the promotion and investment in low carbon transport alongside a package of other measures and low carbon technologies.

**14.178** The *Office of Low Emission Vehicles, Proposed transposition of EU Directive 2014/94/EU* (Alternative Fuels Infrastructure Directive) identifies the cost of providing a publicly accessible charging point is on average £2,000. The requirement to provide a minimum of three public charging points relates only to commercial developments generating a requirement for 100 or more parking places. The cost is not considered to be onerous set against the overall cost of a scheme generating this level of parking. It is consistent with the wider government and council approaches to improve the network of charging points and supports measures to improve air quality.

| Policy 38'Parking' relationship to: | Links to: |
|---|---|
| National Planning Policy Framework | Paragraphs 39, 40 |
| Local Plan Strategic Objectives | SO5, SO7 and SO9 |
| Evidence base and other key documents and strategies | • *Local Transport Plan* (LTP3) (2011) |

Table 14.22 Policy relationships

## Historic places

**14.179** North East Lincolnshire's historic environment is an asset of great social, cultural, economic and environmental value. This needs to be understood and taken fully into account as developments and changes are being planned, designed and implemented. The Council is committed to making the most of the best buildings and places inherited from previous generations, including encouraging the reuse of heritage assets where appropriate; as it seeks to meet the needs of people living here now and in the future.

**14.180** North East Lincolnshire's historic environment plays a significant role in defining the character and setting of the Borough. Heritage assets contribute to a sense of community identity and local distinctiveness, and enhance the aesthetic, social and cultural quality of life

104 In March 2012 the estimated number of Blue Badge Holders was 2.62 million. This represents five percent of the English population *DFT Blue Badge Scheme Statistics 2011/12.*

available to residents. They also make positive contributions to economic viability, environmental sustainability and regeneration, for example by attracting visitors and by providing high quality settings for commercial and cultural activities.

**14.181** The NPPF (paragraph 126), emphasises that local plans should set out a positive strategy for the conservation and enjoyment of the historic environment. This includes heritage assets most at risk through neglect, decay and other threats. In doing so, careful consideration should be given to:

- *"the desirability of sustaining and enhancing the significance of the heritage assets and putting them to viable uses consistent with their conservation;*
- *the wider social, cultural, economic and environmental benefits that conservation of the historic environment can bring;*
- *the desirability of new development making a positive contribution to local character and distinctiveness;*
- opportunities to draw on the contribution made by the historic environment to the character of a place".

**14.182** The NPPF advises that, applicants seeking planning approval should be required to describe the significance of any heritage assets affected by the development proposals, including any contribution made by their setting. The NPPF also provides guidance regarding consideration of harm and of viability.

**14.183** Within North East Lincolnshire there are currently (August 2017):

1. 222 nationally listed buildings, (196 Grade II, 13 Grade II* and 12 Grade I);
2. 11 nationally Schedule Monuments;
3. one nationally registered Park and Garden, (Peoples Park, Grimsby);
4. 16 Conservation Areas;
5. local lists of local heritage assets, comprising:
    a. a local list for Grimsby, adopted 2015, and Grimsby villages, adopted 2013;
    b. a local list for Cleethorpes, adopted 2013;
    c. a local list for Immingham and the villages, (draft).
6. in addition, there are many non-designated assets which are widely recognised as being of local heritage significance.

**14.184** In broad terms, the Council considers the following to be of particular importance for the contribution to the Borough's distinctive character and sense of place:

1. the unique legacy of buildings and structures associated with its maritime and fishing industry including the historic docks of Grimsby and Immingham (including the Dock Tower, Kasbah, Ice Factory and Smokehouses), and associated commercial and domestic architecture;
2. the seaside resort of Cleethorpes (including the Pier, promenades, and traditional seaside architecture);
3. the high quality archaeological deposits relating to the medieval town and Port of Grimsby and the settlement of Stallingborough;
4. the high quality early twentieth century domestic architecture of Grimsby, Cleethorpes and The Avenue, Healing;
5. the rural vernacular, archaeological and landscape character of traditional rural Wolds settlements (including Beelsby, Barnoldby le Beck, East Ravendale, Habrough and Wold Newton).
6. the isolated Iron Age and Roman settlements of the marshland parishes; and,
7. the rural character of Old Clee Conservation Area.

**14.185** An up tp date register of nationally protected heritage buildings and sites can be found on the National Heritage List for England

website.[105] As these records are subject to continuous review and change these assets have not been identified on the Policies Map.

## Policy 39

**Conserving and enhancing the historic environment**

1. Proposals for development will be permitted where they would sustain the cultural distinctiveness and significance of North East Lincolnshire's historic urban, rural and coastal environment by protecting, preserving and, where appropriate, enhancing the character, appearance, significance and historic value of designated and non-designated heritage assets and their settings.

2. In addition, the Council will pursue an integrated approach that:

   A. seeks to update existing Conservation Area Appraisals and Management Plans to identify the qualities and interests of each area and management guidelines to guide future development;

   B. takes a positive and proactive approach to addressing Heritage at Risk (including those assets on the national and local Heritage at Risk Registers), where necessary using statutory powers to undertake enforcement action where there is identified harm, immediate threat or serious risk to the preservation of a heritage assets;

   C. considers the use of Article 4 Directions to remove permitted development rights in all or part of conservation areas or on local list assets where there is evidence that important features are at risk of being degraded;

   D. supports the development of Listed Building Heritage Partnership Agreements, where appropriate;

   E. supports heritage-led regeneration;

   F. encourages sympathetic uses, and repair, maintenance and restoration of heritage assets; and,

   G. considers the use of Local Listed Building Consent Orders.

3. Development will be supported, and planning permission granted, where proposals:

   A. protect the significance of heritage assets, including their setting; through consideration of scale, design, materials, siting, mass, use and views;

105 The National Heritage List for England is available at: https://historicengland.org.uk.

B. conserve and, where appropriate, enhance other historic landscape and townscape features, including historic shop fronts;

C. preserve and enhance the special character and architectural appearance of Conservation Areas, especially those positive elements in any Conservation Area Appraisal;

D. conserve and, where appropriate, enhance the design, character appearance and historic significance of the Borough's only registered park and garden (Peoples Park, Grimsby);

E. make appropriate provision to record, and where possible preserve in situ features of archaeological significance; and,

F. captures opportunities to increase knowledge and access to local heritage assets and better reveal their significance.

4. Where a development proposal would affect the significance of a heritage asset (whether designated or non-designated), including any contribution made to its setting, it should be informed by proportionate historic environment assessments and evaluations (such as heritage impact assessments, desk based appraisals, field evaluation and historic building reports) that:

A. identify all heritage assets likely to be affected by the proposal;

B. explain the nature and degree of any effect on elements that contribute to their significance and demonstrating how, in order of preference, any harm will be avoided, minimised or mitigated;

C. provide a clear explanation and justification for the proposal in order for the harm to be weighed against public benefits; and,

D. demonstrate that all reasonable efforts have been made to sustain the existing use, find new uses, or mitigate the extent of the harm to the significance of the asset; and whether the works proposed are the minimum required to secure the long-term use of the asset.

5. The Council will assess each application individually in terms of the magnitude of impact of any change on the significance of the asset or the contribution that setting makes to that significance or experiencing significance. Where an impact equates to substantial loss of significance (demolition in the case of direct harm or the effective destruction of an asset's setting in the case of indirect harm), a proposal will be considered to cause substantial harm. Permission will only be granted where substantial harm to assets of the highest significance is wholly exceptional, and for all other nationally designated assets, exceptional.

**Justification**

**14.186**
Policy 39'Conserving and enhancing the historic environment' sets out a clear approach providing guidance to developers on how to safeguard and respond to the historic environment, recognising designated and non-designated heritage assets. This includes understanding, safeguarding and where possible enhancing, the character, appearance, setting and integrity of identified heritage assets. It explains what supporting information will need to be submitted with applications and details how the Council will make appropriate judgements.

**14.187** Heritage assets are an irreplaceable resource. Therefore, proposals for development should be informed by, and will be determined in line with, statutory requirements, national policy and specific relevant guidance, principles and best practice.

**14.188** The determination of planning applications will be based on the assessment of the potential harmful impact. The Council will take into account the desirability of not only sustaining the asset's significance, but also enhancing that significance and the positive contribution both conservation and well-informed new design can make to sustainability, local character and distinctiveness.

**14.189** The significance of a heritage asset can be harmed or lost through alteration or destruction of the asset or development within its setting. Any harm or loss, including cumulative impacts leading to less than substantial harm, will require clear and convincing justification to allow the harm to be balanced against any public benefits of the proposal.

**14.190** The more important the asset, the greater the presumption against harm; proposals leading to substantial harm of the most important assets would have to be wholly exceptional, and will have to demonstrate a lack of viable alternative schemes or uses, and the most substantial overriding public benefits. The Borough's scheduled monuments, Grade I and II* listed buildings and the registered park and garden, are considered to be of the greatest importance in this regard.

**14.191** However, the same expectations for proportionate assessment and the need for justification through overriding public benefits apply to other designated assets and all non-designated assets, as appropriate to their significance. Non-designated assets could be buildings, Monuments, archaeological sites, places, areas of landscapes positively identified (in the Historic Environment Record, Conservation Area Appraisals or Neighbourhood Plans, or equivalent, or through assessment within the planning processes) as having a degree of significance meriting consideration in planning decisions.

**14.192** Policy 39'Conserving and enhancing the historic environment' goes on to outline the Council's strategy for securing and facilitating conservation of the historic environment and the Borough's heritage assets, how it has and will continue to implement that strategy over the plan period.

**14.193** There is a particular challenge in finding viable uses for heritage assets particularly where they are located within those parts of the Borough, where there are particularly demanding economic and social conditions that suppress property values. The 2014 record of 'Buildings and Risk' on the national register identifies two listed buildings, two scheduled monuments and seven conservation areas at risk. In addition survey work completed by the Heritage Trust for Lincolnshire in 2015 provides information on historic buildings, war memorials, archaeological sites, historic parks and gardens and conservation areas which helps to inform the overall heritage strategy.

| Policy 39'Conserving and enhancing the historic environment' relationship to: | Links to: |
|---|---|
| National Planning Policy Framework | Paragraphs 126 to 141 |
| Local Plan Strategic Objectives | SO6 |
| Evidence base and other key documents and strategies | • Heritage at Risk Register<br>• Historic Environment Record (HER) |

Table 14.23 Policy relationships

## Green infrastructure

**14.194** Green infrastructure is a phrase used to describe 'green and blue spaces' in and around built-up areas. The elements that make up green infrastructure include, parks, playing fields, gardens, agricultural fields and woodlands. Blue infrastructure includes the estuary and wetlands, the sea and coast, water bodies, rivers, streams, and sustainable drainage systems. The terms cover all land containing these features, regardless of ownership or public access.

**14.195** In the past these green and blue spaces have generally been valued for single uses, for instance, recreational use, ecological value or simply for their aesthetic appeal. In reality, though, these spaces can deliver a number of different functions.

**14.196** Applying a green infrastructure approach (using the term to encompass both green and blue space) can recognise different functions, and importantly, can meet numerous wider objectives. The NPPF states that it is:

*"a network of multi-functional green space, urban and rural, which is capable of delivering a wide range of environmental and quality of life benefits for local communities."*

**14.197** This is an approach which the Council is keen to foster and promote.

### Policy 40

**Developing a green infrastructure network**

1. Development will be expected to maintain and improve the network of green infrastructure. Appropriate opportunities should be taken to improve the overall connectivity of green spaces, including improvements to access to the countryside and permeability of the urban area, for pedestrians, cyclists and horse riders. Recognition should also be made to the role such green infrastructure plays in mitigating the effects of recreational pressure on the Humber Estuary SAC/SPA/Ramsar, specifically designing natural green space which is attractive to walkers and dog walkers, particularly in areas where development is most likely to result in increasing visitors to the Humber Estuary SCA/SPA/Ramsar.

2. Proposals that would result in the loss or reduction in quality or existing public rights of way (PROWs) will not be permitted unless acceptable equivalent alternative provision is made. Where diversions are proposed, these should be convenient and attractive to users and not increase disturbance on protected wildlife sites.

3. The multiple value and functionality of green space should be recognised in the planning, design and implementation of developments, and particular attention should be given to planning positively for biodiversity and sustainable water management, including climate change mitigation, when considering the layout of development.

4. In pursuance of a principle of maintaining strategic gaps the Council will protect the setting and separate identity of settlements; require buffers between potentially conflicting uses; prevent coalescence of settlements; retain the openness of land; and control the nature and scale of urban and rural development. Specific protection will be afforded to the open areas between:

   A. Immingham and industrial development to the north;
   B. Stallingborough and Healing;
   C. Healing and Grimsby;
   D. Laceby and Grimsby;
   E. Waltham and Grimsby and New Waltham;
   F. New Waltham and Grimsby and Humberston; and,
   G. Humberston and Cleethorpes.

5. These predominantly open areas link with areas of formal and informal green space to form strategic green infrastructure corridors, the framework of which are identified on the Policies Map.

6. Development adjacent to defined development boundaries should pay particular regard to the nature an form of green infrastructure at or in proximity to the settlement edge. Where possible and where appropriate, development should contribute to enhancing the network of green infrastructure, respecting the relationship between countryside and the settlement built form, particularly avoiding hard settlement edges.

**Justification**

**14.198** Policy 40'Developing a green infrastructure network' acknowledges the value of promoting a green infrastructure network, providing accessible green corridors, forming healthy traffic free links, connecting formal and informal green space, softening development edges, and maintaining the independent status and perception of individual settlements. These green corridors can provide access from the heart of the urban area to the open rural environment, as well as providing additional benefits.

**14.199** Policy 40'Developing a green infrastructure network' outlines broad strategic gaps where the principle of maintaining the openness of land shall be maintained. These areas are identified to prevent the coalescence of the Grimsby/Cleethorpes urban area with the

settlements of Humberston, New Waltham and Waltham to the south and Laceby, Healing and Bradley to the west.

**14.200** These predominantly open areas, which are located between the defined development boundaries, link with areas of formal and informal green space to form strategic green infrastructure corridors. These corridors stretch between the settlements and extend into the urban area.

**14.201** The *Landscape Character Assessment* (2015) provides an important evidence base that should be used to inform future decisions. In addition to providing an independent assessment of landscape character, an assessment of the sensitivity of the landscape, and the capacity for the landscape to absorb change in the form of new development; it has identified a range of key issues that have informed the Plan preparation process. This includes, outlining principles for the siting and design of new development, including the pattern, form and scale of built development. The provision of Green Infrastructure in order to reinforce and enhance landscape character is identified. This also includes specific consideration of the potential for coalescence of settlements.

**14.202** Conflict can arise between different uses by virtue of noise, odours, dust, and light intrusion. Green infrastructure when strategically placed to serve as a buffer can limit the nuisance to sensitive uses and permits activities without the need for onerous control measures. This is most frequently the case in relation to employment and residential uses. The Council will protect areas of green infrastructure from development where the development would impact upon the value of the land as a buffer between sensitive uses.

| Policy 40'Developing a green infrastructure network' relationship to: | Links to: |
|---|---|
| National Planning Policy Framework | Paragraph 114, Annex 2 |
| Local Plan Strategic Objectives | SO2, SO5 and SO6 |
| Evidence base and other key documents and strategies | • *Landscape Character Assessment* (2015) |

Table 14.24 Policy relationships

## Biodiversity and Geodiversity

**14.203** The natural environment is extremely important in ensuring a high quality of life for all who live, work and play in North East Lincolnshire. The natural habitats and ecosystems help to sustain our lives and our standard of living (providing what are often referred to as 'ecosystems services'), including food, fuel, textiles, medicinal products, clean air and fresh water. Ecosystems, and the life they support, play an important role in regulating our environment, for example, climate regulation by absorbing carbon dioxide, purifying our water, pollinating crops and controlling floods.

**14.204** **Biodiversity** - is shorthand for biological diversity. It is a term commonly used to describe the variety of life in a particular area, including plants, animals and other living organisms. The *Convention on Biological Diversity* (CBD) defines biodiversity as:

*"the variability among living organisms from all sources including terrestrial, marine and other aquatic ecosystems, and the ecological complexes of which they are part, this includes diversity within species, between species and of ecosystems".*[106]

**14.205** **Geodiversity** - is shorthand for geological diversity. It is a term which is commonly used to describe the variety of earth materials, forms and processes that constitute and shape the Earth. This includes a variety of rocks, minerals, fossils and other geological features.

**14.206** The importance of biodiversity and geodiversity is reflected in the wealth of national and international legislation that exists to protect these assets. The NPPF also seeks to ensure that the planning system contributes to and enhances the natural and local environment. It places a requirement on local planning authorities to:

1. minimise the impact of development on biodiversity and seek to provide net gains in biodiversity where possible;
2. allocate land for development with the least environmental or amenity value and seek to reuse brownfield land where it is not of high environment value;
3. plan for biodiversity across local authority boundaries, at a landscape-scale;
4. apply criteria-based policies against which planning application affecting designated biodiversity and geodiversity sites will be judged;
5. follow a strategic approach to protecting, creating, enhancing and managing positively biodiversity and green infrastructure; and,
6. promote the preservation, restoration, and re-creation of priority habitats and the protection and recovery of priority species populations.

**14.207** The NPPF (paragraph 118) emphasises that if harm resulting from development cannot be avoided (through locating development on an alternative site with less harmful impacts), adequately mitigated or, as a last resort compensated for, then planning permission should be refused.

**14.208** North East Lincolnshire is a diverse area displaying a wide variety of natural habitats, landscape and geological/geomorphological interest. Figure 14.3'Site hierarchy' provides an overview of the hierarchy of sites relevant to the Borough. These sites are identified on the Policies Map.

**14.209** The biodiversity of the Humber Estuary is of international significance, particularly with regard to migratory and overwintering wading birds that feed on the saltmarsh and mudflats and move inland to roost. These designations are collectively referred to as Natura 2000 sites. In addition to these international designations, the Humber Estuary is also designated as, the Humber Estuary Site of Special Scientific Interest (SSSI).

**14.210** Over a number of years, surveys of local biodiversity and geodiversity sites have been carried out in the Borough. These have been funded by a number of organisations including the Council. A process is now in place where the Greater Lincolnshire Nature Partnership (GLNP) processes the data from the surveys against specified criteria for selecting local geological sites (LGSs) and Local Wildlife Sites (LWSs). Those sites which are identified as meeting the required criteria are then identified for possible designation. It is the Council which formally designates these sites.[107]

**14.211** The Council has recently undertaken a review of a number of designated sites where circumstances have changed since original

106 *Convention on Biological Diversity*, United Nations (1992).
107 There are still a number of Sites of Nature Conservation Interest (SNCIs) that were originally identified in the North East Lincolnshire Local Plan (2003) which have yet to be reviewed. These sites still maintain their original protection as local sites.

designation or where there are acknowledged development pressures. This is part of a rolling review process, which seeks to capture new sites and changes to existing sites. The review of sites utilities the GLNP process which ensure consistency across sites, and across the wider Lincolnshire geographical area. The sites which are currently designated as LGSs and LWSs have been identified on the Policies Map, together with remaining SNCIs.[108]

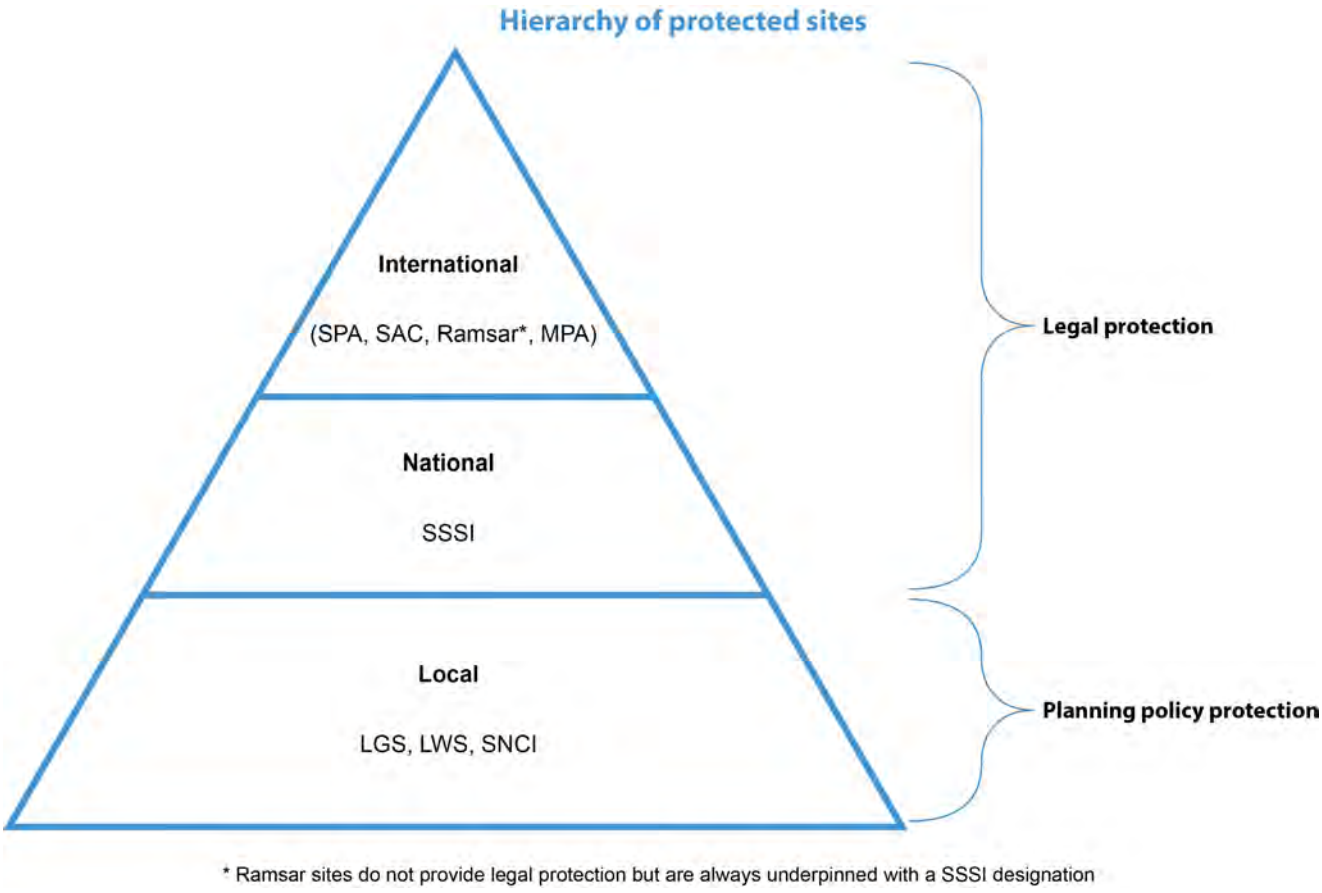



Figure 14.3 Site hierarchy

108 Applicants should check, to determine whether any changes to local designations have been made.

## Policy 41

**Biodiversity and Geodiversity**

1. The Council will have regard to biodiversity and geodiversity when considering development proposals, seeking specifically to:

   A. establish and secure appropriate management of, long-term mitigation areas within the Estuary Employment Zone, managed specifically to protect the integrity of the internationally important biodiversity sites (see Policy 9'Habitat Mitigation - South Humber Bank');

   B. designate Local Wildlife Sites (LWss) and Local Geological Sites (LGSs) in recognition of particular wildlife and geological value;

   C. protect manage and enhance international, national and local sites of biological and geological conservation importance, having regard to the hierarchy of designated sites, and the need for appropriate buffer zones;

   D. minimise the loss of biodiversity features, or where loss is unavoidable and justified ensure appropriate mitigation and compensation measures are provided;

   E. create opportunities to retain, protect, restore and enhance features of biodiversity value, including priority habitats and species; and,

   F. take opportunities to retain, protect and restore the connectivity between components of the Borough's ecological network.

2. Any development which would, either individually or cumulatively, result in significant harm to biodiversity which cannot be avoided, adequately mitigated or as a last resort compensated for, will be refused.

**Justification**

**14.212** Policy 41'Biodiversity and Geodiversity' sets out a strategic approach which positively plans for the creation, protection, enhancement and management of sites of biodiversity and geodiversity. It acknowledges the hierarchy of international, national and locally designated sites and refers specifically to the designation process for local sites, linked to processes of monitoring and review undertaken in partnership with the Greater Lincolnshire Nature Partnership.

**14.213** Recognition is made that sites identified, to compensate for adverse effects on European sites should be given the same protection as the European site. This is significant in relation to the habitat mitigation provided within the South Humber Bank.

**14.214** The Council will seek to capture opportunities to develop ecological networks, incorporating biodiversity in and around new developments through thoughtful design approaches, and will specifically support proposals which seek directly to conserve or enhance biodiversity.

**14.215** In accordance with the NPPF, if significant harm resulting from a proposed development cannot be avoided (through locating on an alternative site with less harmful effects), adequately mitigates, or as a last resort compensated for, then planning permission will be refused.

| Policy 41'Biodiversity and Geodiversity' relationship to: | Links to: |
|---|---|
| National Planning Policy Framework | Paragraphs 109, 117, 118 |
| Local Plan Strategic Objectives | SO6 |
| Evidence base and other key documents and strategies | • Natural England datasets<br>• Greater Lincolnshire Nature Partnership datasets |

Table 14.25 Policy relationships

## Landscape

**14.216** One of the core principles of the NPPF is that planning should recognise the intrinsic character and beauty of the countryside. Local plans should include strategic policies for the conservation and enhancement of the natural environment, including landscape. This includes designated landscapes such as the Lincolnshire Wolds Area of Outstanding Natural Beauty but also the non-designated wider countryside.

**14.217** A *North East Lincolnshire Landscape Character Assessment* (2015) has been prepared which provides a useful aid to understand the character and local distinctiveness of the landscape, and helps to identify the features that give it a sense of place. It also provides information regarding the sensitivity of areas, and information as to how change can be accommodated. Mapping is also available relating to the historic landscape character, which has been collated through the *Lincolnshire Historic Landscape Characterisation Project*.

**14.218** The Lincolnshire Wolds Area of Outstanding Natural Beauty (AONB) designation puts it on a par with the protection offered to National Parks. A management plan[(109)] has been prepared for the AONB identifying the value and special qualities of the designation. The management plan does not carry the same planning weight as the Local Plan, but does establish key principles. For developments within the boundaries of the Lincolnshire Wolds AONB, the management plan will be a material consideration.

**14.219** When considering landscape character and designing landscape schemes it is important to recognise the wider role that landscape performs. Whilst complementing the character and appearance of the site, landscape elements

109 *Lincolnshire Wolds Management Plan 2013-2018.*

can provide wider functional purposes. Trees and hedges can provide important shade, aid drainage and provide important biodiversity sites. Broader landscape areas can also provide a mechanism for responding to climate change and flood alleviation. It is also recognised that landscaping can be beneficial to air quality and the atmosphere. Good landscaping can also instil a feeling of confidence and sense of well-being which can promote healthy living.

## Policy 42

**Landscape**

1. Landscape character should be given due consideration in the nature, location, design and implementation of development proposals. Developers should:

   A. have regard to the landscape context and type within which the development is to be located, (as identified in the *Landscape Character Assessment*); considering the landscape guidelines and management strategies relevant to the prevalent landscape type. Priority will be given to the protection and enhancement of the landscape character and natural beauty, and setting of the Lincolnshire Wolds Area of Outstanding Natural Beauty (AONB);

   B. complete a site specific landscape appraisal, proportionate to the anticipated scale and impact of a proposal, and submit a landscaping scheme for all development where this is appropriate, which complements the character and appearance of the site, responds to landscape character, climate change and flood alleviation where appropriate, and improves local biodiversity and levels of amenity;

   C. seek opportunities, when incorporating landscape buffers to offset development impacts, to enhance landscape quality including opportunities to incorporate suitable landscape planting;

   D. retain and protect trees and hedgerows which offer value for amenity, biodiversity and landscape; and,

   E. take opportunities where appropriate, to retain, protect and restore elements that contribute to historic landscape character.

**Justification**

**14.220** Landscape plays an important role in defining the character and appearance of the environment and importantly, the settling of new development within the environment. It is important that new developments are located and designed so as to recognise existing landscape character. Where appropriate this should be through a specific landscape appraisal.

**14.221** North East Lincolnshire contains large parts of two Historic Landscape Character Areas identified by the *Lincolnshire Historic Landscape Characterisation Project*: the Northern Marshes

and The Wolds. These are largely rural areas (the Grimsby and Cleethorpes conurbation does not form part of the historic landscape character area), within which a number of zones are defined:

1. **NOM1** - The Humber Bank;
2. **NOM2** - The Immingham Coastal Marsh;
3. **NOM3** - The Grimsby Commuter Belt;
4. **WOL1** - The Brocklesby Heath (although the area relating to the Borough is too small to be of any significance); and,
5. **WOL3** - The Upper Wolds.

**14.222** The area of the Borough contained within zone WOL3 corresponds well with the area of the Borough that is part of the Lincolnshire Wolds AONB, and weight will be afforded to the impact of development on the historic landscape character that is present here. Stretching away from this area, along the course of Waithe Beck, are areas of Ancient Enclosure, a Landscape Park, and the historic settlement cores of Barnoldby le Beck, Ashby cum Fenby and Brigsley. This landscape is within the NOM3 zone and has not been assessed for significance but is considered to be of local historic interest.

**14.223** The presence and significance of mature trees and hedgerows should be recognised. Trees not only provide a living element in the environment that lasts for generations, they also provide important natural habitats, filter dust and emissions, suppress noise and form familiar landmarks. Hedgerows possess many of the qualities common to trees and are just as viable, with many also having historical significance.

**14.224** The Council will seek to protect trees and hedgerows that offer value for amenity and biodiversity. The Council has extensive powers through Tree Preservation Orders to protect trees whether they are individual specimens, groups or trees of entire woodlands. Protection can also be provided for important hedgerows which meet certain criteria under the *Hedgerow Regulations* (1997). In addition to these powers the Council will seek, through conditions to safeguard important landscape assets, this will include measures to ensure they are integrated in landscaping schemes to safeguard them through the construction period to avoid damage due to proximity of vehicle and plant manoeuvres, material storage or provision of services.

**14.225** The design of new landscaping must take into account responsibility for future maintenance and, where appropriate this should accord with the delivery mechanisms for green space set out in Policy 43'Green space and recreation'.

| Policy 42'Landscape' relationship to: | Link to: |
|---|---|
| National Planning Policy Framework | Paragraphs 113 and 115 |
| Local Plan Strategic Objectives | SO6 |
| Evidence base and other key documents and strategies | • *Landscape Character Assessment* (2015)<br>• *Lincolnshire Historic Landscape Characterisation Project* (2011) |

Table 14.26 Policy relationships

## Healthy green spaces

**14.226** Green space serves many functions and can be in either public or private ownership, together these spaces form a multi-functional network of open space. Such networks need to be planned and managed to deliver a combination of environmental and social benefits. This includes conserving and enhancing biodiversity, landscape enhancement, water management, recreation and play, social and cultural enhancement and community health and well-being. It is important that everyone, wherever they live, should have access to a range of accessible green space.

**14.227** The Council has identified the main green space assets within the Borough through a series of audits and local evidence, and assessed local provision against established national and current local standards. The audits and evidence have illustrated that there are some localised deficiencies in the provision of facilities, which can be worsened by the presence of busy roads which act as barriers particularly hindering young children free access to green space. The Council will continue to monitor provision and review standards against identified needs through the plan period. It recognises that standards should be matched to local circumstances.

**14.228** Informal natural green space is used for a variety of pursuits including walking, dog walking, exercising and casual play. Within the Borough the majority of large areas of natural green space are concentrated in areas such as Freshney Parkway and Weelsby Woods in Grimsby, Cleethorpes Country Park, Coombe Briggs Meadows in Immingham, and Bradley and Dixon Woods. The Council recognises the visual importance of these areas in addition to their obvious value for active pursuits. Such areas provide a valuable role particularly where they stretch well into the urban area.

**14.229** The Council is the main custodian of the significant areas of natural green space although this stance is shifting as the Council moves to a more integrated community based approach. In addition to the major sites it is important to recognise the value of smaller areas of informal green space that contribute to the character, visual appearance and amenity of local neighbourhoods.

**14.230** Cemeteries also provide valuable pockets of green space. The older cemeteries, such as Scartho Cemetery, provide important mature habitat within the urban core. The Scartho Road Cemetery was opened in the late 19th century and contains many mature trees dating from that time in addition to a diversity of ground flora which has evolved over the years. The combination of features has led to the designation of part of the cemetery as a Local Wildlife Site.

**14.231** Outdoor playing space comprises a mix of playing pitches, green courts, athletics tracks and children's equipped play areas. These facilities represent the formal pitch and play provision in the Borough. A number of these facilities are run by private bodies or organisations. They provide valuable facilities in the context of meeting the overall need. In rural areas many of these facilities are provided by the parish councils. In addition education sites include indoor/outdoor playing space which is increasingly being used for wider community use through the establishment of formal community use agreements. The Council has recently commissioned a new *Playing Pitch Strategy* which will examine the distribution and quality, and usage of existing facilities and examine future requirements. This Strategy and its accompanying action plan will inform the future approach to playing pitch location and future management.

**14.232** Guidance has been produced regarding 'kids play' with two main sources of information: Fields in Trust (FIA), formally NPFA, and Play England. Play England provides advice on the quality of the play space and the philosophy of children's play, whilst FIT continues to provide quantitative advice on the type and number of provision. New FIT guidelines were introduced in

August 2008 to update 'The Six Acre Standard'. The existing equipped play area sites have been identified on the Policies Map.

**14.233** The current standards identified are based upon strategies which are now considered to be in need of review. The Council has commissioned work to update these strategies providing the basis for possible revision to the standards to be applied locally.[110] It is important that the local standards identified reflect local participation rates reflected in assessments which are subject to regular review; and assess the social impact and value that each green or play space contributes to an area when making decisions about resources and funding.

**14.234** Allotments also make a valuable contribution to meeting community and leisure needs, and can bring added benefits from a health and well-being stance as well as providing added green space in built-up areas. Current house building trends are towards smaller gardens, as pressure increases to optimise building land. Those who live in flats often have no individual garden. These circumstances disadvantage those on lower incomes. Allotments provide an opportunity to redress this imbalance and have an important tole in promoting healthier life.

**14.235** The Council has prepared an Allotment Strategy[111] which sets out the Council's approach to delivering and managing allotment facilities. The Strategy examines issues such as perceived under utilisation of allotment land, alternative uses of vacant allotment land, security and vandalism on all allotment sites and includes methods of encouraging an increased number of allotment tenants. The Strategy offers long term direction to allotment provision in the Borough. It is clear that the successful implementation of the Strategy will be dependent on the ability to rationalise some sites and reinvest in improved sites. Capital receipts received from rationalisation will be used to improve allotment sites and support self-management and community improvement initiatives. The existing allotment sites are identified on the Policies Map.

**Current green space standards[112]**

| Open space type | National standard, or recognised established guidance | Local evidence | Current local standard (provision) | Current local standard (accessibility) | Contribution trigger |
|---|---|---|---|---|---|
| Natural green space | 1ha/1,000 population (ANGSt) Access to green space:<br>1. at least one 20ha site within 2km of home; | *Green Space Strategy* (2011), (review 2015) | 1ha/1,000 population (in addition, sites will be required to provide boundary landscaping where appropriate) | Informal amenity space - within 200m<br><br>Local recreational area - within 400m | All development of 10 units of more |

110 Any subsequent change to current standards will be set out in a Supplementary Planning Document following consultation and viability assessment.
111 *A Vision for Allotments. An Allotment Strategy 2011 to 2016.*
112 Standards will be reviewed and revised when evidence is reviewed taking account of development viability and management practices. Revised standards will be published in a Supplementary Planning Document.

| Current green space standards[112] | | | | | |
|---|---|---|---|---|---|
| **Open space type** | **National standard, or recognised established guidance** | **Local evidence** | **Current local standard (provision)** | **Current local standard (accessibility)** | **Contribution trigger** |
| | 2. one 100ha site within 5km of home;<br>3. one 500ha site within 10km of home. | | | District park - within 1,000m<br><br>Major park - within 3,000m | |
| Children's play | 0.8ha/1,000 population, of which 0.25ha should be designated equipped playing space[113] | *Play Strategy* (2008), (review 2015) | 0.8ha/1,000 population, of which 0.1ha should be designated equipped playing space | Within 800m | All development of 50 units of more )on or offsite) |
| Outdoor sports | 1.6ha/1,000 population | *Playing Pitch Strategy* (2011) | 1.6ha/1,000 population | Within 1,200m | All development of 250 units or more (on or offsite) |
| Allotments | 0.5ha/1,000 households (National Society of Allotment and Leisure Gardeners) | *Allotment Strategy* (2011) | 0.2ha/1,000 population | No local standard has been set | All development of 250 units or more (on or offsite) |
| Woodland | Access to woodland:<br>1. 2ha within 500m<br>2. 20ha within 4km[114] | N/A | No local standard has been set | No local standard has been set | No trigger identified |

Table 14.27 Current green space standards

112 Standards will be reviewed and revised when evidence is reviewed taking account of development viability and management practices. Revised standards will be published in a Supplementary Planning Document.
113 FIT, Fields in Trust.
114 Woodlands Trust.

| Green space delivery | | |
|---|---|---|
| **Scale of development (number of units)** | **Open space type to be delivered** | **Delivery** |
| 0 to 9 | No specific requirement | N/A |
| 10 to 49 | Natural green space | On-site or off-site if meets accessibility standards |
| 50 to 249 | Natural green space and children's play | On-site or off-site if meets accessibility standards |
| 250plus[(115)] | Natural green space, children's play, outdoor sports and allotments | On-site of off-site if meets accessibility standards |

Table 14.28 Green space delivery

**What does this mean for a developer?**

**14.236** Assuming:

1. 1,000 population equated to 455 homes based upon average occupancy rate of 2.2 people/home, across the Borough;
2. 455 homes developed at 30dph equates to 15.2ha;
3. 70% net developable area equates to gross development site area of 22ha; and,
4. local standards/1,000 population apply to a gross development site of 22ha.

**14.237** A 22ha site would therefore need to provide, based on current local standards;

1. 1ha of green space;
2. 0.8ha of children's play space of which 0.1ha should be equipped play;
3. 1.6ha of outdoor sports; and,
4. 0.2ha of allotment provision.

**14.238** Developers of smaller sites would need to provide green space based upon the identified standards and the triggers identified. The Council will discuss off-site contributions based upon location and neighbouring facilities and the strategy set out in the Council's relevant strategy documents.

115 The Council is seeking to deliver a strategy for sports pitch provision which focuses on hub sites rather than individual pitch sites which are often difficult and costly to manage.

## Policy 43

**Green space and recreation**

1. The Council will safeguard against any loss of public or private green spaces, sport and recreation and equipped play facilities in recognition of their importance to the health and well-being of residents and visitors to the Borough, and their importance to biodiversity. The green spaces, sport and recreation and equipped play facilities that are safeguarded under this Policy are identified on the Policies Map together with playing fields which form part of identified education areas, cemeteries, and allotments.

2. Loss of these areas will only be accepted where:

   A. there is evidence that the facility is surplus to green space and recreation requirements, and has been assessed in terms of biodiversity value; or,

   B. alternative replacement provision of at least equivalent size, usefulness, attractiveness and quality can be provided, meeting current standards of provision and accessibility, (recognising any subsequent review and revision).

3. Developers will be required to make provision for green space, sport and recreation facilities in accordance with the additional needs that the development generates taking account of current local standards of provision and accessibility, (recognising any subsequent review and revision). Delivery will be secured through planning conditions, obligations or charging levy as appropriate. In making this provision, recognition should be made to the role such green space plays in mitigating the effects of recreational pressure on the Humber Estuary SAC/SPA/Ramsar, specifically designing natural green space which is attractive to walkers and dog walkers, particularly in areas where development is most likely to result in increasing visitors to the Humber Estuary SAC/SPA/Ramsar.

4. Where existing facilities already meet current accessibility standards, the Council will seek a commuted sum towards the improvement and maintenance of off-site facilities, reflecting the future intensification of use of these facilities.

5. Where new green infrastructure is provided, the Council will expect proposals to include details to cover future long term maintenance. This may include, where accepted by the Council, provision of a commuted sum for maintenance, calculated on the basis of typical maintenance costs per square metre for a ten year period. Alternatively, the developer may make arrangements for the land to be maintained by a body other than the Council.

6. Where appropriate, development should enhance or otherwise accommodate the historic interest of open space sites, particularly where they contribute to the enhancement of the Borough's heritage assets.

7. Where education facilities are being developed which include playing pitch or sports facilities, provision shall be made, where feasible and appropriate, to incorporate community use.

**Justification**

**14.239** The safeguarding and provision of accessible green space is a key element in creating sustainable communities, and promoting healthy lifestyles. Good provision of recreation and open space can also have positive economic and environmental benefits. Policy 43'Green space and recreation' recognises the value of both public and private facilities, and sets out criteria to guard against the loss of facilities where they are valued.

**14.240** Developers are required to provide new open space and recreation facilities to meet the needs of new residents, based upon generic accessibility standards which are considered relevant to the Borough based upon walkable limits. Where facilities are already available within the walkable catchment of a site the Council will seek a commuted sum towards the improvement and maintenance of off-site facilities reflecting the future intensification of use of these facilities.

**14.241** Policy 43'Green space and recreation' is based around standards of provision and accessibility which are informed by local evidence of the Borough's existing provision and future requirements. Over the plan period the assessments of open space, sports and recreation, play space, and allotment provision will be subject to periodic review. The Policy recognises this and provides flexibility to accommodate variations in the standards.

**14.242** The Council will set out any revisions to standards in a Supplementary Planning Document which will be subject to consultation and viability assessment.

| Policy 43'Green space and recreation' relationship to: | Links to: |
|---|---|
| National Planning Policy Framework | Paragraph 73 |
| Local Plan Strategic Objectives | SO2, SO5 and SO6 |
| Evidence base and other key documents and strategies | • *Playing Pitch Strategy Final Assessment Report* (2011)[116]<br>• *Play Strategy Review* (2015)<br>• *Playing Pitch Strategy* (2011)[117]<br>• *Allotment Strategy* (2011) |

Table 14.29 Policy relationships

116 At the time of publication of the Plan a *Green Space Strategy Review* is in preparation.
117 At the time of the publication of the Plan a new *Playing Pitch and Built Facilities Strategy* is in preparation.

Local Plan
North East Lincolnshire

Local Plan
North East Lincolnshire

Minerals are finite natural resources which are essential to support sustainable economic growth. However, minerals can only be worked where they are found, which can cause conflict with other land uses. The role of the planning system is to ensure a sustainable supply of minerals, including aggregates, and to secure the long-term conservation of mineral resources.

The *National Planning Policy Framework* (NPPF) (paragraphs 142 to 149) outlines the national policy context. It places a number of requirements on minerals planning authorities (MPAs), including the need to identify and include policies relating to: managing the extraction of minerals resource of local and national importancs; the contribution that can be made to supply from substitute, secondary, and recycled minerals; the safeguarding of known locations of minerals resource of local and national importance; the safeguarding of minerals related infrastructure; the definition of criteria against which planning applications should be judged, including environmental criteria; and to ensure that policies are in place to reclaim land.

Additionally, MPAs are required to plan for a steady and adequate supply of aggregates, and industrial minerals. They should prepared a Local Aggregates Assessment (LAA) to consider the future need for aggregates.

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**15.1** Minerals in North East Lincolnshire fall into the following categories:

1. **Aggregate minerals** - these are necessary to support construction activity and include sand and gravel, and crushed rock;
2. **Industrial minerals** - these are necessary to support construction, and industrial and manufacturing processes, and include a wide range of mineral resources including brick clay and silica sand; and,
3. **Energy minerals** - these are used in the generation of energy and include shallow and deep-mined coal, as well as oil and gas, including 'unconventional' hydrocarbons such as shale gas.

**15.2** North East Lincolnshire is underlain by white chalk, which forms the dominant bedrock geology of the area. On the surface of this chalk, there are deposits of clay, silt, sand, and gravels. The area has mineral resources including aggregates such as sand and gravel, and silica sand, and chalk.

**15.3** There is a clear need for aggregates such as sand and gravel, and the resource is commonly used in construction. Blown sand (silica sand) occurs in limited areas and quantities, and is therefore a scarce resource. Sand, gravel, and silica sand are considered to be of local and national importance. Chalk also occurs extensively locally. However, there is no identified demand for chalk in North East Lincolnshire. It's use as a building stone is very limited locally, and therefore the resource identified in North East Lincolnshire is not considered to be of local or national importance.

**15.4** The Port of Immingham, plays a significant infrastructure role in bringing energy minerals, including coal and oil, to the UK market. In 2011, 13million tonnes of coal were imported to the UK at Immingham.[(118)]

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118 *Port of Immingham Master Plan 2010-2030* (2012).

## Safeguarding minerals and related infrastructure

**15.5** The Plan recognises important mineral resources by safeguarding them for the benefit of future generations. This recognises that while North East Lincolnshire's minerals resource is not currently extracted, a long-term approach is required to ensure that resources are not needlessly sterilised. As resources are used elsewhere and their quantity is diminished, North East Lincolnshire's resource may become viable to extract. Recognising that incompatible development close to a Minerals Safeguarding Area may lead to sterilisation of part of the resource, it is considered appropriate to extend the areas to take account of such risks. In the case of the mineral resources in North East Lincolnshire a 200m buffer is considered to be necessary.

**15.6** Safeguarding minerals resource, through the designation of 'Minerals Safeguarding Areas' (MSAs), creates no presumption that the mineral will be worked. The designation of MSAs indicates that an economic mineral resource exists in the location, this can then be taken into consideration to determine whether non-mineral development overlying, or situated close to, the mineral resource should proceed.

**15.7** The designation of MSAs does not preclude other forms of development from being permitted, but it does ensure that the presence of an important mineral resource is taken into consideration during the decision-making process.

**15.8** The Port of Immingham plays a significant infrastructure role in bringing energy minerals, including coal and oil, to the UK market. The port estate benefits from extensive permitted development rights, granted to Associated British Ports (ABP) as a statutory undertaker.

**15.9** In addition, there are three sites producing secondary and recycled aggregates in North East Lincolnshire. These are located at:

1. Brianplant - South Humberside Industrial Estate, Grimsby;
2. H. Cope & Sons - Moody Lane, Grimsby; and,
3. Stoneledge - South Humberside Industrial Estate, Grimsby.

### Policy 44

**Safeguarding minerals and related infrastructure**

1. The Council will safeguard mineral deposits of sand and gravel, and blown sand (silica sand) within the identified Minerals Safeguarding Areas identified on the Policies Map (Minerals Safeguarding Areas).

2. Prior extraction of mineral should take place, unless it is not feasible or environmentally acceptable to extract the mineral.

3. Non-mineral development proposals within, or adjacent to Minerals Safeguarding Areas which do not allow for the prior extraction, will be permitted where:

    A. the need for the development outweighs the need to safeguard the site for future mineral extraction;

B. the mineral is proven to not be present, not of a quality or quantity to justify its extraction, or too deep to allow for extraction; or

C. the proposed development is temporary in nature and would not prevent minerals extraction taking place in the future.

4. This Policy would not apply to the following:

A. applications for household development or applications to extend existing commercial premises;

B. minor developments and 'infill' schemes; or,

C. applications for Listed Buildings Consent, Advertisement Consents, Tree Works, Prior Notifications, or Certificates of Lawfulness of Existing or Proposed Use of Development.

5. Within Minerals Safeguarding Areas, non-mineral development, with the exception of the development set out above, will not be permitted until the developer has provided evidence[(119)] to the Council to determine whether the mineral is feasible and viable to extract ahead of development. Where prior extraction can be undertaken, the developer should provide an explanation of how this will be carried out as part of the overall development.

6. Significant existing and planned infrastructure identified on the Policies Map, that supports the supply of minerals in the Borough will be safeguarded against development that would unnecessarily sterilise or prejudice its use, including development of incompatible land uses nearby. This includes strategic rail freight links, sites for concrete batching, manufacture of coated materials and concrete products, and sites associated with the handling, processing, and distribution of substitute, recycled and secondary aggregate material. Development that may sterilise or prejudice the operation of the safeguarded site will not be permitted unless:

A. an alternative site is available upon which the safeguarded use can relocate to; or,

B. it can be demonstrated that the infrastructure no longer meets the current or anticipated future needs.

119 Evidence should be submitted prior to the determination of the planning application in the form of a site specific desk based mineral assessment. This should provide detail of the existing surface and solid geological and mineral resource including an estimate of economic value (for example quantity and quality, its potential for use in the forthcoming development and an assessment of whether it is feasible and viable to extract the mineral resource ahead of development).

**Justification**

**15.10** The Plan safeguards all mineral resource identified by the British Geological Survey in North East Lincolnshire which meet the NPPF's definition of 'local or national importance'. This includes deposits of sand and gravel and silica sand (blown sand).

**15.11** No provision has been made for the safeguarding of any chalk, which occurs extensively across the Lincolnshire Wolds, or coal. The coal resource underlying North East Lincolnshire is at a depth of greater than 500 metres. The Coal Authority has confirmed that there are no surface coal resources present which would need to be protected.

**15.12** Brick clay has been worked in North East Lincolnshire in the past, however, the British Geological Survey (BGS) only identify brick clay where it is actively worked. As there are no active workings in North East Lincolnshire, the resource is not identified. There are therefore no proposals to safeguard brick clay.

**15.13** There are no sources of building stone in North East Lincolnshire, and it has been of limited use in the local vernacular building construction.

| Policy 44'Safeguarding minerals and related infrastructure' relationship to: | Links to: |
|---|---|
| National Planning Policy Framework | Paragraphs 142 to 149 |
| Local Plan Strategic Objectives | SO10 |
| Evidence base and other key documents and strategies | • *Minerals Issues Paper* (2014)<br>• *Mineral Safeguarding in England Good Practice Advice* (2011) |

Table 15.1 Policy relationships

## Future mineral extraction

**15.14** North East Lincolnshire's current role in the provision of aggregates is very limited. The area does not produce aggregates from primary sources, but there are some local producers of recycled aggregates. The extraction of aggregates, chalk, and brick clay has occurred in the past, but there are no current active workings.

**15.15** The Council has worked collaboratively with neighbouring authorities to produce a *Local Aggregates Assessment* (LAA) as required by the NPPF. The draft *Humber Area Local Aggregates Assessment* (Humber Area LAA) (November 2016), provides an assessment of the need for aggregates across the Humber authorities in the period to 2030.[120]

**15.16** The Council participates in the Yorkshire and Humber Aggregate Working Party (AWP). The Humber Area LAA is due to be considered by the AWP in the near future. Until this time, there is no formal agreement between the authorities on how the future need for aggregates should be met. Historically, North East Lincolnshire did not have an apportionment under

120 The LAA sets out the current and future situation in the Humber area regarding aggregate supply and demand including sales data and aggregate apportionment levels to 2030, based on rolling average of ten year sales data, and other relevant local information.

the *Regional Spatial Strategy* (RSS), in recognition that the area does not have any sites contributing primary land-won aggregates to supply. Further discussion is required with the other Humber authorities and the Yorkshire and Humber AWP regarding North East Lincolnshire's role in future supply.

| Aggregate requirements for the Humber area from 2015 (Million Tonnes)[121] | | |
|---|---|---|
| | **Sand and Gravel** | **Crushed rock** |
| Aggregate requirement | 16.49 | 3.91 |
| Current reserves | 7.14 | 7.11 |
| Current land bank | 7.6 years | 39.4 years |

Table 15.2 Aggregate requirements for the Humber area from 2015

**15.17** There are no active sites in North East Lincolnshire contributing to primary aggregate production. The Council has written to minerals site operators in neighbouring authorities (East Riding of Yorkshire, Lincolnshire, and North Lincolnshire) and responses indicated a lack of interest in North East Lincolnshire's resource at this stage. The Council's call for sites has not identified any potential minerals sites.

**15.18** The Plan seeks to promote the use of aggregates from renewable sources, such as secondary and recycled aggregates, which minimise the need for primary extraction. The potential for an increase in the landing of marine dredged aggregates also has the potential to reduce reliance on primary sources.

**15.19** Sites within the North East Lincolnshire area have historically provided aggregates to meed demand across the joint area. At present North East Lincolnshire have yet to progress a Minerals Plan and are therefore unable to confirm that future need across the joint area would be met from sites within North Lincolnshire.

**15.20** Minerals are also used in the generation of energy. Part of the Borough is covered by a 'Petroleum Exploration and Development Licence' which is a licence issued by the Government allowing the area to be explored and developed (subject to receiving planning permission and other consents) for oik and gas. There have, however, been no discoveries of oil or gas within the area. Coal underlies North East Lincolnshire, although it is at a considerable depth.

**15.21** The Plan does recognise the possibility of future mineral extraction and therefore sets out the basis for considering such proposals.

121 *Draft Humber Area Local Aggregates Assessment* (November 2016).

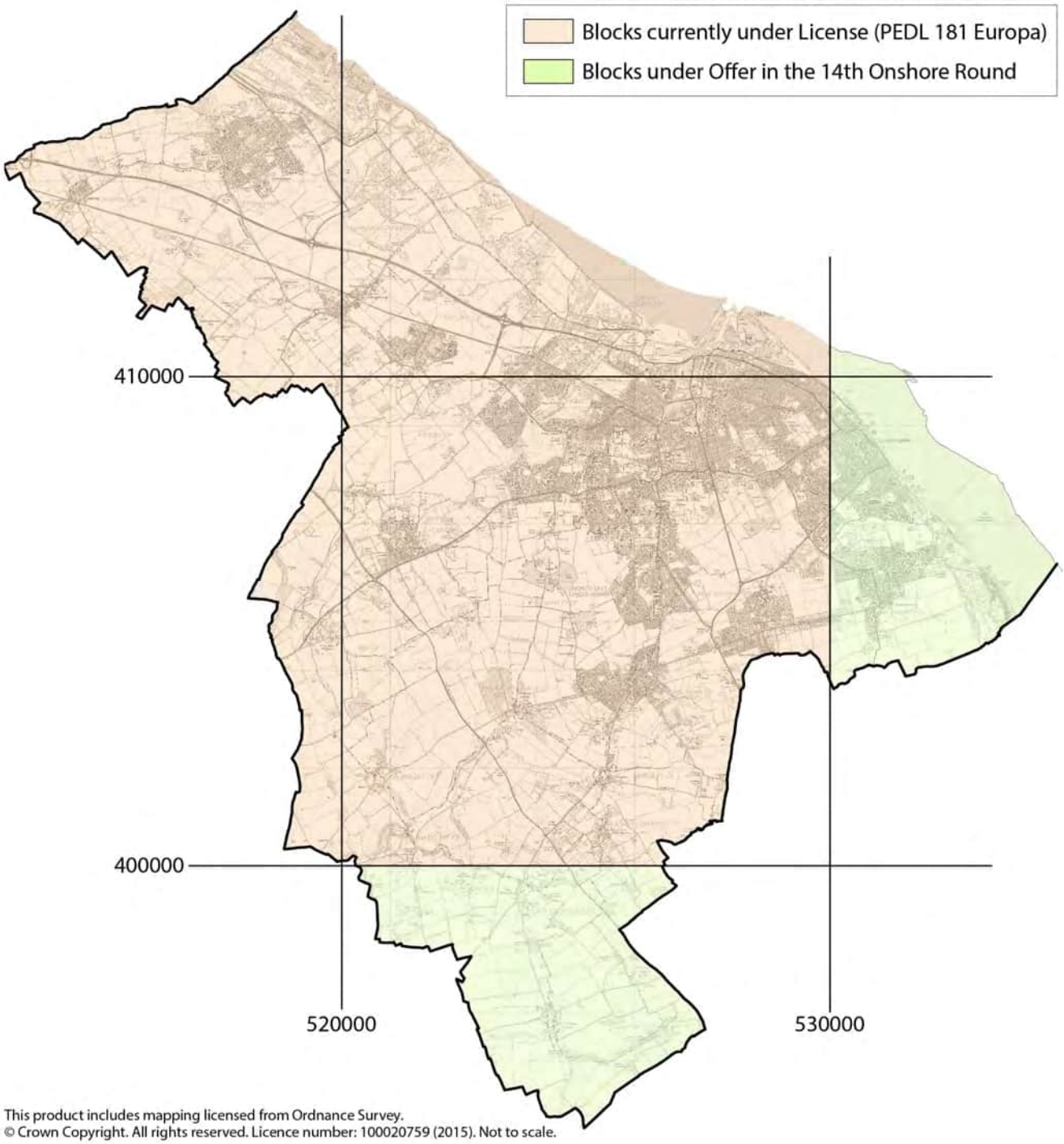




Figure 15.1 Petroleum licensed area within North East Lincolnshire

## Policy 45

**Future mineral extraction and Secondary Aggregates**

1. The Council will, in conjunction with neighbouring mineral planning authorities, work to maintain across the Humber area, an appropriate contribution towards the regional supply of aggregates, and maintenance of appropriate landbanks.

2. When considering proposals for the extraction of minerals[(122)] that would contribute to the Humber area supply, the Council will consider whether:

   A. the arrangements for the extraction and transportation of the mineral would result in unacceptable adverse impacts on the public highway, and/or to the environment and local amenities, considering:

      i. visual intrusion;
      ii. noise;
      iii. blast vibration;
      iv. dust;
      v. air emissions;
      vi. lighting;
      vii. vehicle movements;
      viii. proximity of sensitive neighbouring uses;

   B. stability of land; and,

   C. quality of groundwater supplies.

3. Proposed development located within or affecting the character and setting of the Lincolnshire Wolds Area of Outstanding Natural Beauty (AONB) will be granted planning permission in exceptional circumstances, and only where it has been demonstrated that:

   A. there is proven public interest in developing the site; and,

   B. the Humber area need cannot be served through development of alternative sites, not affecting the Lincolnshire Wolds AONB; and,

   C. the impact on the intrinsic qualities of the AONB can be satisfactorily addressed.

4. The Council will support developments that can make a contribution to secondary aggregate supplies through the processing of Construction Demolition and Excavation (CD&E) waste. Development of this nature should accord with Policy 47'Future requirements for waste facilities'.

122 The criteria set out apply to all aspects of mineral extraction including all phases of hydrocarbon extraction, exploration, appraisal (testing) and production.

**Justification**

**15.22** Mineral resources are finite, meaning they can only be worked where they lie. This can lead to conflict where the presence of particular mineral resources coincide with attractive or environmentally important landscapes. Policy 45'Future mineral extraction and Secondary Aggregates' sets out criteria to ensure that proposals for the extraction of minerals are subject to appropriate detailed assessment.

**15.23** The Council will be particularly stringent in assessing proposals to limit the amenity and environmental impacts. Developers will in appropriate cases by required to submit an Environmental Statement in accordance with the *Town and Country Planning (EIA) Regulations 2011*.

**15.24** Within, or within the setting of, the Lincolnshire Wolds great weight will be given to conserving the landscape and scenic beauty, in accordance with the NPPF (paragraph 115). The Wolds were designated in 1973 and, along with National Parks and Broads, is the highest status of protection in relation to landscape and scenic beauty. The statutory *Lincolnshire Wolds AONB Management Plan (2013-2018)*, identifies the main challenge is to ensure that the Wolds retains its unique landscape and undeniable special character, whilst maintaining and supporting its communities.

**15.25** The Council will support developments that can make a contribution to secondary aggregate supplies through the processing of Construction Demolition and Excavation (CD&E) waste. The *European Waste Framework Directive* (WFD) has set a target for 70% recycling of construction, demolition and excavation waste across Europe by 2020. Best practice in Europe has shown that recycling rates over 80% and 90% are feasible. This approach is supported by measures for recycling and recovery set out in Policy 47'Future requirements for waste facilities'.

| Policy 45'Future mineral extraction and Secondary Aggregates' relationship to: | Links to: |
|---|---|
| National Planning Policy Framework | Paragraph 142 to 149 |
| Local Plan Strategic Objectives | SO10 |
| Evidence base and other key documents and strategies | • *Humber Area Local Aggregate Assessment* (Humber Area LAA) (November 2016) |

Table 15.3 Policy relationships

## Restoration and aftercare - minerals

**15.26** Responsible restoration and aftercare of minerals sites can provide for a wide range of opportunities for enhancements and beneficial after-uses. However, opportunities for enhancement should not take precedence over the need to protect and maintain existing environmental assets.

**15.27** General principles for the restoration of minerals sites are set out in the NPPF. There are often competing interests in terms of achieving different restoration and after-use objectives. It is important to balance these competing interests

to ensure that outcomes reflect the needs and desires of the local community. Restoration should seek to maximise public and environmental benefits whilst also giving consideration to the land use context and local environmental conditions.

**15.28** After-use with the primary purpose of restoration to agriculture, forestry, economic development, and amenity purposes should seek to integrate secondary after-use aspects in order to maximise opportunities. Secondary after-use aspects may include: landscape enhancement, habitat enhancement or creation of ecological networks (contributing towards the UK Biodiversity Action Plan (BAP) targets and green infrastructure linkages), water catchment conservation, flood attenuation, enhancement of the historic environment, geodiversity, recreation, and environmental education. A mix of after-uses may be the most valuable way of restoring a piece of land and maximising opportunities.

## Policy 46

**Restoration and aftercare (minerals)**

1. All applications for mineral related development should be accompanied by detailed proposals for subsequent restoration of the entire site, which include:

   A. take account of the former use of the site;

   B. ensure land is restored at the earliest opportunity, and to a high quality recognising key biodiversity objectives;

   C. provide specific details relating to:

      i. stripping of soils and soil-making materials, and either their storage of their direct replacement on another part of the site;
      ii. storage and replacement of overburden;
      iii. achieving the landscape and landform objectives for the site, (to be agreed taking account of local topography and filling proposals);
      iv. the contribution to other multi-functional environmental gains consistent with local landscape character, informed by the latest *Landscape Character Assessment*;
      v. restoration, including soil placement, relief of compaction and provision of surface features; and,
      vi. aftercare.

   D. include a phasing plan for the restoration, which seeks to minimise local disturbance and impacts, and which represents a rolling programme of restoration and aftercare management.

**Justification**

**15.29** The restoration of a site should be considered at all stages of development and should commence at the earliest opportunity. It should be completed within an acceptable timescale, as set out in the relevant planning approval. Restoration will be expected to be phased, allowing worked land to be restored, minimising local disturbance and impacts, as development proceeds. Where phased restoration is not appropriate, all restoration works should proceed as soon as practically possible after extraction has been completed.

**15.30** Restoration should take account of the landscape of the wider area, take opportunities for mitigating climate change, re-create/enhance important habitats and seek to establish a coherent and resilient ecological network where possible. This approach will ensure the multi-functionality of the proposed restoration is fully explored and the greatest range of environmental benefits are delivered.

**15.31** Soils displaced should be adequately protected to maintain soil quality, especially if the original site qualified as best and most versatile agricultural land (grades 1, 2, and 3a). Restoration of best and most versatile agricultural land should be returned to an equivalent standard to that which existed prior to extraction, though the proposed after-use need not always be for agriculture.[123]

**15.32** The period of aftercare should be given detailed consideration. This is to maintain and improve the structure and stability of soils and allow vegetation to mature. The length of the aftercare period will normally be at least five years, negotiated on an site-by-site basis. In some cases longer-term management may be required, in such cases a management organisation will need to be identified.

| **Policy 46'Restoration and aftercare (minerals)' relationship to:** | **Links to :** |
|---|---|
| National Planning Policy Framework | Paragraphs 142 to 149 |
| Local Plan Strategic Objectives | SO10 |
| Evidence base and other key documents and strategies | • *Landscape Character Assessment* (2015) |

Table 15.4 Policy relationships

123 *NPPG, Minerals* (2014).

Providing for waste

Local Plan
North East Lincolnshire

In England, we generate around 177 million tonnes of waste every year.[124] Waste is produced in everyday activities. We all produce waste at home and at work, and this waste needs to be managed in a sustainable way which does not cause harm to the environment or human health. The management of waste is highly regulated to ensure that harm to the environment and human health does not occur.

The Government's aim is to move towards a 'zero waste economy'. This does not mean that waste will not be generated, but it does mean that all waste will be treated as a resource. This means that waste products would be reduced, reused, and recycled where possible, and that things would only be thrown away as a last resort. It means recovering value from waste by turning it into products that society needs, such as heat and electricity.

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**16.1** Waste is categorised into several 'waste streams'. The role of the Council is not to manage all of the waste generated in North East Lincolnshire, though the Council does hold contacts with operators to manage the waste that it collects from households, street sweepings, bins, and community recycling centres. The role of the planning system is to ensure that appropriate waste management facilities can come forward to provide capacity sufficient to meet the area's need for waste management capacity, when it is required, to ensure waste is managed in a sustainable manner.

**16.2** In North East Lincolnshire, waste arises in the following streams:

1. **Local Authority Collected Municipal Waste (LACMW)**[125] - this waste stream is collected by the Council, in its role as the area's waste collection authority (WCA), and is primarily composed of waste from households. It also includes waste from street cleaning and civic amenity sites;
2. **Commercial and Industrial Waste (CIW)** - this waste stream is produced by businesses. It is collected and managed on a commercial basis by private waste management companies;
3. **Construction, Demolition and Excavation Waste (CDEW)** - this waste stream is produced in the construction of new buildings and demolition of existing buildings. It is collected and managed on a commercial basis by private waste management companies. A significant proportion of this waste stream is 'inert' and can be reused on-site;
4. **Hazardous Waste** - this is the waste stream formerly referred to as 'specialist waste'. Hazardous waste is waste considered harmful, or potentially harmful, to humans or the environment. This waste stream includes items such as batteries, solvents, and products which contain harmful material or substances, such as fridges;
5. **Agricultural Waste** - this is waste produced on premises used for agriculture[126]. Some wastes produced on farms will be classified as hazardous wastes, for example, containers which have contained pesticides;
6. **Wastewater** - this waste stream includes dirty water and sewerage; and,
7. **Low Level Radioactive Water (LLRW)** - this includes items which are contaminated by radioactive particles from the non-nuclear industry, for example, waste from hospital x-ray departments.

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124 Further information is available at: https://www.gov.uk/.
125 This waste stream has previously been referred to as 'Municipal Waste'.
126 Based on the definition of agriculture provided in the *Agriculture Act 1947*.

**16.3** Waste from Mines and Quarries[127] is not considered because no primary mineral extraction takes place in North East Lincolnshire.

**16.4** The quantities of agricultural waste, and low level radioactive waste generated in North East Lincolnshire are considered to be small.

**16.5** The *Waste Management Plan for England* (2013) and *National Planning Policy for Waste* (NPPW) (2014) set out the National Planning Policy context for the management of waste. However, while the *National Planning Policy Framework* (2012) does not contain specific waste policies, it's principles are still relevant.

**16.6** The *Waste Management Plan for England* re-affirms the Government's key commitments, including meeting a series of targets, such as for at least 50% of the waste from households to be reused or recycled by 2020; and at least 70% of construction and demolition waste to be recovered by 2020.

**16.7** The NPPW (page 3) places several requirements on waste planning authorities (WPAs) when preparing local plans. In particular, there is a requirement to plan to provide waste management facilities to meet the area's need for waste management capacity, ensuring that the planned provision and its spatial distribution is based on a robust analysis of the best available data. WPAs should work collaboratively with other authorities to collect and share relevant data and information on waste arisings, and take account of waste movements between local authority areas (NPPW (Page 4)). WPAs should also have regard to any nationally identified waste management requirement, including the Government's advice on forecasts (NPPW (page 4)). WPAs are required to identify suitable sites and areas for new or enhanced waste management facilities in appropriate locations. The document provides outline criteria for assessing the suitability of waste management sites.

**16.8** Both the *Waste Management Plan for England* and NPPW outline the importance of three key principles in waste management, which were established in the European Union's *Waste Framework Directive*[128]: the waste hierarchy, the principle of self-sufficiency, and the proximity principle.

**16.9** The waste hierarchy is established in law[129], and sets out the priority order for the management of waste, and the Local Plan will need to outline how the waste hierarchy will be met. There are five stages to the hierarchy:

1. **prevention** - this involves reducing the generation of waste in the first place. This means using less material in the design and manufacture of products, and keeping products for longer and re-using them where possible. Stringent packaging regulation has been a key factor in preventing waste in recent years;
2. **reuse** - this means cleaning, repairing and refurbishing products so that they can be reused;
3. **recycling** - this means turning waste into a new product, material or substance, and includes composting;
4. **other recover** - waste can replace other materials that would otherwise have been used, for example, it can be used to generate electricity and heat. This includes recovery processes where value is recovered from waste, such as anaerobic digestion, incineration where energy is recovered, gasification and pyrolysis processes that produce energy, and some backfilling operations; and,
5. **disposal** - this is the least desirable option and should be considered only where none

127 This comprises non-valuable material produced during extraction and processing.
128 Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives.
129 *The Waste (England and Wales) Regulations 2011* (S.I. 2011/988).

of the other options is appropriate. This means the use of methods such as landfill and incineration without recovery. This is the last resort for managing waste, particularly biodegradable waste.

**16.10** The best solution for managing waste may vary by the type of waste. For some types of waste, for example, some hazardous wastes, disposal may be the only appropriate method.

**16.11** The principles of self-sufficiency and proximity require, where possible, for waste to be managed and recovered in facilities close to where it was produced, and for area's to manage the waste they produce. In requiring waste to managed close to where it was produced, these principles provide an incentive for communities to reduce the quantity of waste that they produce, by making them responsible for its management.

**16.12** However, extensive movements of waste occurs between waste planning authority areas, due to commercial contracts and the location of facilities. Many types of waste require specialist treatment, and it is not viable for every local authority area to be able to manage all of the waste it generates. Contact has been made with all authorities which receive waste from North East Lincolnshire to ascertain if there are any planning reasons why these movements can not continue to occur, which would cause a future capacity gap to arise. In particular, North East Lincolnshire's hazardous waste is exported to many other authorities for treatment.

## Future waste facilities

**16.13** Waste management, in terms of planning for facilities, is increasingly becoming similar to that for general industrial facilities, in that proposals come forward as a consequence of site finding and progression through the development control process by industry stakeholders; largely outside of the plan-making process. It is therefore not appropriate for the Plan, to attempt to identify all of the sites that will be required for waste management facilities over the full plan period. To do so would be too prescriptive and inflexible and would mean that good sites identified outside of the plan-making process could be prevented from being implemented.

**16.14** Evidence has been prepared[130] to assess the level of waste that can be expected to be generate across the plan period. An indication of the expected arisings in the plan period is provided below. Acting as waste disposal authority (WDA), the Council are also preparing a revised *Municipal Waste Management Strategy*. The Council is a member of the Yorkshire and Humber Waste Technical Advisory Body, which brings together representatives from all waste planning authorities in the Yorkshire and Humber area to address cross-boundary waste issues, in recognition that waste movements occur between authorities.

### What do we need to plan for?

**16.15** Forecasts of waste arisings in the period to 2032 have been closely aligned to key local plan evidence documents. This includes the findings for the *Strategic Housing Market Assessment* (2013), *Local Economic Assessment* (2014), and *Demographic analysis and forecast* (2015) with regards to the potential for population growth (and the resulting household growth) linked to economic growth forecasts.

**16.16** Waste in the local authority collected stream is expected to decline in the first few years of the plan period, due to a reduction in the quantity of waste produced per person. However, it is expected to increase in later years of the plan period due to the rate of population growth. North East Lincolnshire is net self-sufficient in the management of waste, in that as much waste is managed in the area as is generated.

130 *North East Lincolnshire Waste Needs Assessment* (2015).

**16.17** Some growth is expected in the commercial and industrial waste stream, due to the expansion of the commercial and particularly, the industrial sector, in North East Lincolnshire. These forecasts are aligned to jobs growth forecasts, but also incorporate adjustments for both the commercial and industrial sectors to represent resource efficiency changes. Over the plan period, the commercial and industrial waste stream is expected to grow by just over 9%. It is estimated that around 175,500 tonnes per annum is currently produces, and that arisings in this waste stream will remain static across the plan period.

**16.18** The Council's draft *Waste Needs Assessment* (2015) suggests that no additional capacity is required to meet North East Lincolnshire's waste management needs. While a shortfall of waste management capacity is identified for the hazardous waste stream, this is not significant enough to enable an economically viable facility to be brought forward. The Council will work with other regional authorities through the Yorkshire and Humber Waste Technical Advisory Body (WTAB) to identify how the identified shortfall can be met in regional facilities.

**16.19** Forecasts are not provided for agricultural waste, low level radioactive waste, and wastewater. Agricultural waste is expected to form a small component of the waste stream, and some growth in the agricultural sector is reflected in the commercial and industrial waste, and hazardous waste forecasts. Low level radioactive waste is produced primarily at healthcare premises in North East Lincolnshire, and there is not expected to be a significant increase in production requiring treatment capacity to be identified. Wastewater is planned for by Anglian Water. The Council will work with Anglian Water to establish the need for future capacity, and report on progress in the *Infrastructure Delivery Plan* (IDP).

| **Waste management requirements to 2032** | | | | | |
|---|---|---|---|---|---|
| **Waste stream** | **Tonnes to be managed per annum[131]** | | | | |
| | **Baseline** | **2016/17** | **2021/22** | **2026/27** | **2031/32** |
| Local Authority Collected Municipal Waste | 77,400 | 76,100 | 75,500 | 79,000 | 82,300 |
| Commercial and Industrial Waste | 310,200 | 314,900 | 322,900 | 331,000 | 339,300 |
| Construction, Demolition and Excavation Waste | 175,500 | 175,500 | 175,500 | 175,500 | 175,500 |
| Hazardous Waste | 76,000 | 76,000 | 76,000 | 76,000 | 76,000 |
| **Total** | **639,100** | **642,500** | **649,900** | **661,500** | **673,100** |

Table 16.1 Waste management requirement to 2032

131 All figures have been rounded to the nearest 100.

**16.20** As an increase is expected, further discussions with other authorities will continue in recognition that waste movements will continue to occur due to existing contacts remaining in place. Figure 16.1'Hazardous waste movements' provides an illustration of the scale of hazardous waste movements. It shows, on the left, where hazardous waste arises that is received at facilities in North East Lincolnshire and, on the right, the destinations of hazardous waste arisings in North East Lincolnshire.

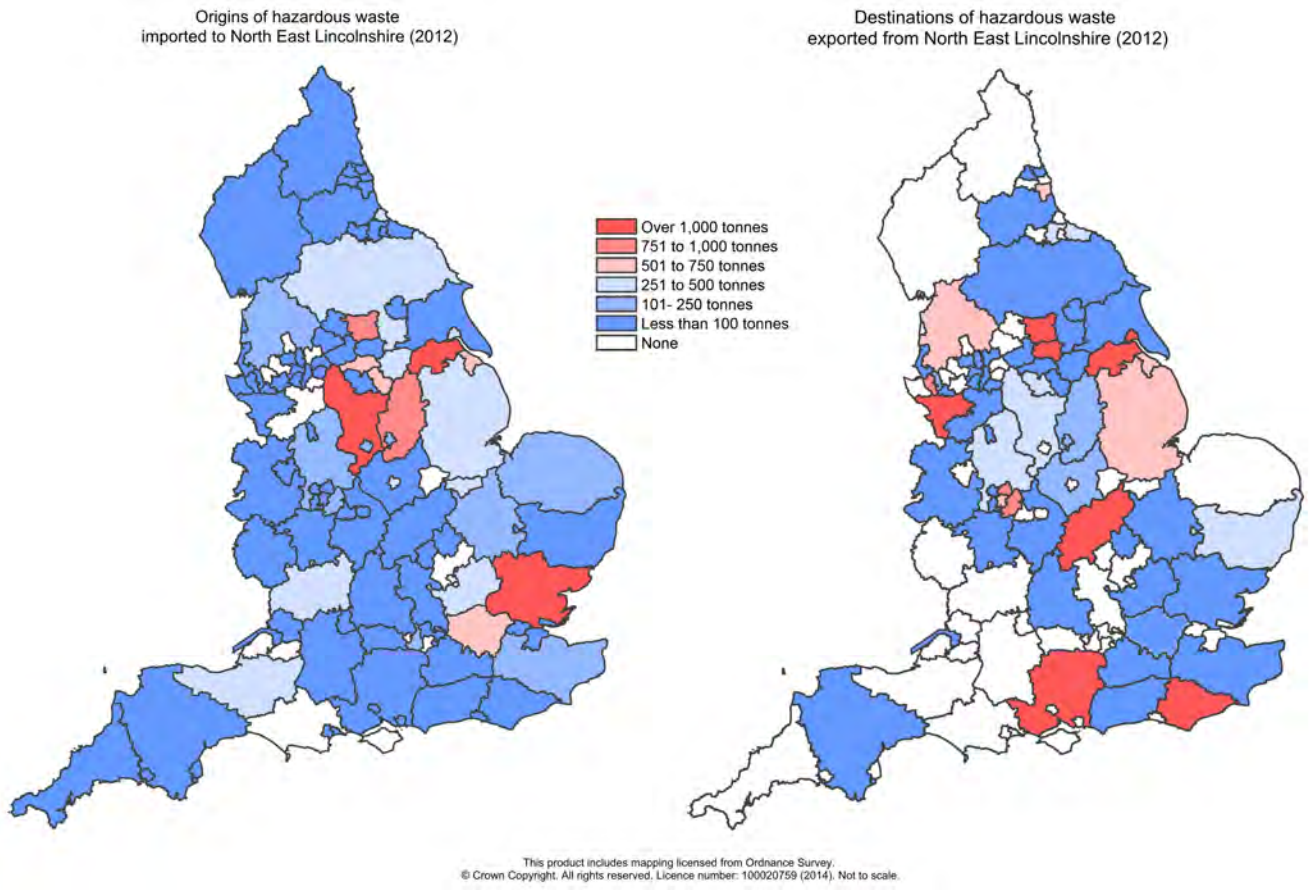


Figure 16.1 Hazardous waste movements

**16.21** The areas from which North East Lincolnshire receives the highest quantity of hazardous waste is primarily those which have a quick connection to the Borough via the motorway network. However, due to the presence of a facility in North East Lincolnshire with a large catchment area, the Borough receives small waste movements from across the country. Conversely, much of North East Lincolnshire's hazardous waste is handled elsewhere, and in particular Cheshire West and Chester, Leeds, and North Lincolnshire play significant roles.

## Policy 47

**Future requirements for waste facilities**

1. Proposals for waste management facilities should be developed on sites in accordance with the following locational criteria:

| Waste management facility | Locational preference |
|---|---|
| Materials recycling facilities<br><br>Waste transfer facilities<br><br>Civic amenity sites<br><br>Waste treatment and recovery facilities, (including energy from waste, and biological/mechanical treatment) | Existing employment land at:<br><br>1. Kiln Lane Industrial Estate, Stallingborough;<br><br>2. South Humberside Industrial Estate, Grimsby;<br><br>3. Wilton Road Industrial Estate, Humberston; or,<br><br>Allocated employment sites at:<br><br>1. ELR005 Former Huntsman Tioxide Site, Moody Lane, Grimsby;<br><br>2. ELR015 a&b Great Coates Business Park, Moody Lane, Grimsby.<br><br>Current waste management facilities.<br><br>(While the preferred location for civic amenity sites is on industrial land/employment allocations, other locations may be appropriate to allow the civic amenity site to be accessible to residential properties thereby reducing the distance travelled by residents to dispose of waste, these proposals will be considered on a site-by site basis.) |
| Outdoor composting facilities | Adjacent to current waste management facilities, or land in rural locations, where development meets the Council's criteria for developments in these locations (outlined in Policy 5'Development boundaries'). |
| Wastewater recycling facilities | Adjacent to existing sites, or new sites where it can be demonstrated that expansion of existing facilities is not feasible. |

Table 16.2 Locational criteria

2. Development should be located, designed and operated to minimise impacts, having specific regard to:

   A. visual intrusion;
   B. landscape character;
   C. noise, light and vibration;
   D. odours;
   E. air emissions, including dust;
   F. vermin and birds;
   G. litter;
   H. traffic and access;
   I. potential land use conflict;
   J. stability of land;
   K. protection of water quality and resources and flood risk management;
   L. conserving the historic environment; and,
   M. nature conservation.

3. The Council will support the co-locating of complementary waste facilities to facilitate efficiencies in waste management and transport; and the co-location of waste facilities with developments that could make use of the output of a waste facility, such as a district-heating scheme, or industrial process.

4. The Council will also seek to secure the recycling of Construction, Demolition and Excavation (CD&E) waste at the locations where waste is produced, including the temporary provision for recovery, separation and where appropriate processing of on-site materials.

**Justification**

**16.22** Policy 47'Future requirements for waste facilities' sets out precise locational criteria to ensure that proposals for waste management facilities will not cause harm to amenity or the local environment. The approach generally seeks to locate waste management facilities away from residential areas, except where there would be clear benefits to the residential communities.

**16.23** Many waste management facilities are industrial in nature and are therefore not appropriate to be located in close proximity to residential areas. Significant levels of traffic movements are also often required to transport waste to these facilities, and the location of much of the area's industrial land is within easy access for the strategic road network, particularly the A180(T). The Council has historically been successful in locating major waste facilities within the existing employment areas.

**16.24** Policy 47'Future requirements for waste facilities' also provides some flexibility, to allow specific waste developments in rural areas where they would benefit from this location, provided that they meet development management criteria outline in other sections of the Plan. This refers specifically to composting or wastewater treatment facilities.

**16.25** Policy 47'Future requirements for waste facilities' supports to co-location of facilities, to maximise efficiency and minimise adverse impacts, and promotes co-location where use of

the output of a waste facility, such as a district-heating scheme, or industrial process. The existing waste to energy plant at Stallingborough is a good example of such a joint venture. It exports steam, an output of the waste process, directly to a neighbouring chemical factory for use in their production processes. This provides operational and commercial benefits for both the waste operator and the chemical company.

| Policy 47'Future requirements for waste facilities' relationship to: | Links to: |
|---|---|
| National Planning Policy Framework | Paragraphs (see NPPF prinicples) |
| Local Plan Strategic Objectives | SO10 |
| Evidence base and other key documents and strategies | • *Municipal Waste Management Plan, Summary 2016-2019*<br>• *Municipal Waste Management Plan, Technical Plan 2016-2019*<br>• *North East Lincolnshire Waste Needs Assessment* (2015) |

Table 16.3 Policy relationships

## Safeguarding waste facilities and related infrastructure

**16.26** There is a necessity to ensure that there are sufficient waste management facilities within the Borough to meet the requirements of the area. Over time waste sites will cease to operate which could lead to a loss in overall waste management capacity. The Council has identified the current waste sites and wastewater treatment facilities on the Policies Map (Minerals and Waste) and listed the locations in Table 16.4'Licenced waste operators' and Table 16.5'Wastewater treatment facilities'. This does not include the numerous small recycling sites that are located across the Borough or sites granted a waste licence on a temporary basis related to a specific development.

### Policy 48

**Safeguarding waste facilities and related infrastructure**

1. The Council will safeguard the existing waste management facilities identified on the Policies Map (Minerals and Waste) from the encroachment of incompatible development unless the planning permission has expired and/or it can be demonstrated that the site is no longer required.

**Justification**

**16.27** The Council will seek to ensure that new development in proximity to a waste site is not incompatible with the waste management facility and will not prejudice its ongoing operation. The vast majority of waste sites and facilities (listed in Table 16.4'Licenced waste operators' and Table 16.5'Wastewater treatment facilities'[132] below) are located within employment areas. In such areas there is unlikely to be any compatibility concerns. However, waste facilities can be considered as bad neighbours where neighbouring uses are more sensitive for example, residential.

**16.28** There is no established, evidence based distance to define a 'Waste Buffer' that covers every waste facility type. Public perception concern about the risk of effects arising from waste facilities (e.g. effects on health from bio-aerosols or emissions, or noise, dust and traffic emissions), have led to a commonly referred to 250 metre suggested buffer distance between waste facilities and sensitive receptors.[133] Therefore, the buffer which the Council will apply will normally cover and extend for up to 250 metres beyond the boundary of safeguarded sites. However, each site will be considered individually, and if circumstances suggest the depth of the 250 metre zone for the edge of the site should be varied, for example due to mitigation measures proposed, then this will be taken into account.[134] Identifying the waste sites and facilities together with defining a 250m buffer, is designed to inform prospective developers and waste operators of an existing waste management operation and to ensure compatibility of adjacent new development.

| Licenced waste operators and site locations | | |
|---|---|---|
| **Ref no.** | **Operator** | **Site location** |
| WM01 | Mettalis Recycling Ltd | Mineral Quay, Immingham Docks, Immingham |
| WM02 | Immingham Storage Company Ltd | Immingham Oil Storage, West Riverside, Immingham Docks, Immingham |
| WM03 | Associated British Ports | Immingham Dock Olive Residue Storage |
| WM04 | SAR Recycling Ltd | Pelham Industrial Estate, Manby Road, Immingham |
| WM05 | Grimsby Operations Ltd | Household Waste Recycling Centre, Queens Road, Immingham |
| WM07 | Integrated Waste Management Ltd | Queens Road, Immingham |

132 These sites are derived from the Environment Agency's record of environmental permits (waste operations).

133 Health and Safety Executive (HSE) *Bioaerosol emissions form waste composting and the potential for workers' exposure* (2010). Prepared by the Health and Safety Laboratory for the Health and Safety Executive.

134 Anglian Water adopt a risk assessment process to consider any application within 400m of a wastewater treatment works or within 15m of a sewerage pumping station. While the results of the assessment will not decide the outcome of a planning application, it will inform potential developers and provide planning officers and elected councillors with evidence based findings to help inform their planning decisions. Further details are set out in *Anglian Water's Asset Encroachment Policy* (Dec 2012), or any successor document.

| Licenced waste operators and site locations | | |
|---|---|---|
| **Ref no.** | **Operator** | **Site location** |
| WM08 | Selvic Shipping Services Ltd and FBM Metals (UK) Ltd | Kiln Lane Treatment Plant, Netherlands Way, Stallingborough |
| WM09 | SJP Trading Ltd | Huckers Yard, Netherlands Way, Stallingborough |
| WM10 | BOC Ltd | Hobson Way, Stallingborough |
| WM11 | NewLincs Development Ltd | Stallingborough Transfer Station NewLincs EFW, South Marsh Road, Stallingborough |
| WM12 | Metropes (Metals) Ltd | Estate Road No 3, South Humberside Industrial Estate, Grimsby |
| WM14 | Jonathan Potts Ltd | Estate Road No 1, South Humberside Industrial Estate, Grimsby |
| WM15 | Brianplant (Humbersid0e Ltd | Estate Road No 2. South Humberside Industrial Estate, Grimsby |
| WM16 | H Cope & Sons Ltd | Moody Lane, Grimsby |
| WM17 | UK Waste Management Ltd | Gilbey Road Transfer Station, Gilbey Road, Grimsby |
| WM18 | Cleanway Ltd | Household Waste Recycling Centre, Estuary Way, Grimsby |
| | Grimsby Operations Ltd | |
| WM20 | Freshney Cargo Services Ltd | Westside Road, Royal Dock, Grimsby |
| WM21 | Brianplant (Humberside) Ltd | Rear of number's 2 & 3 Cold Stores, Wickham Road, Fish Docks, Grimsby |
| WM22 | W Bloy Ltd | King Edward Street, Grimsby |
| WM24 | Rimar Salvage | Railway Street, Grimsby |
| WM25 | North East Lincolnshire Council | Works Department, Doughty Road, Grimsby |

Table 16.4 Licenced waste operators

| Wastewater treatment facilities | | |
|---|---|---|
| **Ref no.** | **Operator** | **Site location** |
| WM06 | Anglian Water Services Ltd | Queens Road Treatment Facility, Immingham |
| WM19 | Anglian Water Services Ltd | Pyewipe Treatment Facility, Gate Way, Grimsby |
| WM26 | Anglian Water Services Ltd | Grimsby Road Treatment Facility, Laceby |
| WM27 | Anglian Water Services Ltd | East Ravendale Treatment Facility |

Table 16.5 Wastewater treatment facilities

| Policy 48'Safeguarding waste facilities and related infrastructure' relationship to: | Links to: |
|---|---|
| National Planning Policy Framework | Paragraphs (see NPPF principles) |
| Local Plan Strategic Objectives | SO10 |
| Evidence base and other key documents and strategies | • *North East Lincolnshire Waste Needs Assessment* (2015) |

Table 16.6 Policy relationships

## Restoration and aftercare - waste

**16.29** Responsible restoration and aftercare of landfill and landraise waste sites can provide for a wide range of opportunities for enhancement and beneficial after-uses. However, opportunities for enhancement should not take precedence over the need to protect and maintain existing environmental assets.

**16.30** As with minerals sites there are are often competing interests in establishing restoration and after-use objectives. It is important to balance these competing interests. Restoration should seek to maximise public and environmental benefits whilst also giving consideration to the land use context and local environmental conditions.

**16.31** After-use with the primary purpose of restoration to agriculture, forestry, economic development, and amenity purposes should seek to integrate secondary after-use aspects in order to maximise opportunities. Secondary after-use aspects may include: landscape enhancement, habitat enhancement or creation of ecological networks (contributing towards BAP targets and green infrastructure linkages), water catchment conservation, flood attenuation, enhancement of the historic environment, geodiversity, recreation, and environmental education. A mix of after-uses may be the most valuable way of restoring a piece of land and maximising opportunities.

## Policy 49

**Restoration and aftercare (waste)**

1. In exceptional cases, where it can first be demonstrated that there is a need arising within the Borough for an additional landfill/landraise operation, applications should be accompanied by detailed proposals for subsequent restoration of the site, which should:

   A. take account of the former use of the site;

   B. ensure land is reclaimed at the earliest opportunity, and to a high quality recognising key biodiversity objectives;

   C. provide specific details relating to:

      i. stripping of soils and soil-making materials, and either their storage or their direct replacement on another part of the site;
      ii. storage and replacement of overburden;
      iii. achieving the landscape and landform objectives for the site, (to be agreed taking account of local topography and filling proposals);
      iv. the contribution to other multi-functional environmental gains consistent with local landscape character, informed by the latest *Landscape Character Assessment*;
      v. restoration, including soil placement, relief of compaction and provision of surface features; and,
      vi. aftercare.

   D. include a phasing plan for restoration which seeks to minimise local disturbance and impacts, and which represents a rolling programme of restoration and aftercare management.

**Justification**

**16.32** The waste hierarchy is clear that waste disposal through means such as landfill is the least desirable waste management option and should only be considered when no other options are available. The Council will, therefore, require an application for landfill or landraise to clearly demonstrate that there is a need for such an operation. The evidence will need to show that the need arises mainly from within the Borough and that the waste could not be moved further up the waste hierarchy.

**16.33** All application will be expected to properly and thoroughly address the restoration needs of the sites. The restoration of landfill/landraise waste sites, as with mineral extraction sites, should be considered at all stages of development and should commence at the earliest opportunity. It should be completed within an acceptable timescale, as set out in the relevant planning approval. Restoration will expect to be phased, allowing worked land to be restored, minimising local distance and impacts, as development proceeds. Where phased restoration is not

appropriate, all restoration works should proceed as soon as practically possible after extraction has been completed.

**16.34** Restoration should take account of the landscape of the wider area, take opportunities for mitigating climate change, re-create/enhance important habitats and seek to establish a coherent and resilient ecological network where possible. This approach will ensure the multi-functionality of the proposed restoration is fully explored and the greatest range of environmental benefits are delivered.

**16.35** Soils displaced should be adequately protected to maintain soil quality, especially if the original site qualified as best and most versatile agricultural land (grades 1, 2 and 3a). Restoration of best and most versatile agricultural land should be returned to an equivalent standard to that which existed prior to extraction, though the proposed after-use need not always be for agriculture.

**16.36** The period of aftercare should be given detailed consideration. This is to maintain and improve the structure and stability of soils and allow vegetation to mature. The length of the aftercare period will normally be at least five years, negotiated on a site-by-site basis. In some case longer-term management may be required, in such cases a management organisation will need to be identified.

| **Policy 49'Restoration and aftercare (waste)' relationship to:** | **Links to:** |
|---|---|
| National Planning Policy Framework | Paragraphs (NPPF Principles) |
| Local Plan Strategic Objectives | SO10 |
| Evidence base and other key documents and strategies | • *North East Lincolnshire Waste Needs Assessment* (2015) |

Table 16.7 Policy relationships

Local Plan
North East Lincolnshire

Testing the viability and deliverability

Local Plan
North East Lincolnshire

**17.1** Paragraph 173 of the NPPF requires that local plans are deliverable. The sites and scale of development should not be subject to such policy obligations that their ability to be delivered is threatened, and in terms of viability the key tests should ensure competitive returns for both developers and landowners.

**17.2** In developing planning policy, the NPPF also requires that local authorities consider the likely cumulative effects of development, and seek to ensure that such requirements should not put implementation of the Plan at risk. It also advocates that Community Infrastructure Lecy (CIL) charges should also be considered at the same time.

**17.3** An initial local plan viability and CIL assessment was undertaken by GVA in 2013.[135] This considered the baseline planning obligation requirements as set out under the *North East Lincolnshire Local Plan 2003*. It indicated that there are a number of locations across the Borough, where deliverability would be challenged. It also identified that the contribution of 20% for affordable housing was unsustainable across all parts of the Borough, and identified that a CIL could be introduced at variable levels across the area.

**17.4** The *Local Plan Viability Assessment Update* (2016) has further considered the findings of the 2013 report. Specifically, it has through detailed analysis outlined a refinement of the value areas.[136] This considers current prices in respect of development costs and values, and considers the broad range of sites identified within the Plan. As a result the value areas identified differ from those identified in the earlier assessment, but this provides a more refined approach to consideration of the impact of planning obligations throughout the area. In addition, further refinement of the assumptions has been made regarding site delivery, to further add to the robustness of the assessment.

**17.5** Further testing of the policies and obligations set out in the Plan have been considered and are detailed in the *Local Plan Viability Assessment Update* (2016). This shows that development in the low value areas, specifically for housing has little potential to support any planning obligations. However, contributions can be sought on development within the medium value and high value zones to varying degrees.

**17.6** The *Local Plan Viability Assessment Update* also considered differing approaches to delivery of other planning obligations, and shows the opportunity for contributions to be obtained through the introduction to the CIL, albeit with variable contributions to reflect differing levels of viability across the area. The introduction of a possible CIL would be subject to separate consultation and adoption process.

**17.7** The proposed approach therefore seeks a variable affordable housing threshold and option for a possible CIL charging levy to ensure that appropriate infrastructure provision, as detailed in Policy 6'Infrastructure' is secured without impacting negatively on site deliverability and viability. Of particular note is the fact that, the total reduction of all obligations within the low value area is anticipated to effectively 'level the playing field' for sites in these areas, when considered against more viable sites. This should result in the delivery of urban regeneration, potentially unlocking a number of stalled sites.

**17.8** Speculative employment development is generally considered to be unviable. However, it is necessary to ensure that developers make appropriate contributions towards meeting the mitigation requirements as required by the *Habitat Regulations*. The scale of contributions seek to ensure the delivery and maintenance of habitat mitigation whilst having regard to development viability.

135 *North East Lincolnshire: Local Plan and CIL Viability Assessement* (2013).
136 The value areas are identified within the justification text to Policy 18'Affordable housing'.

**17.9** Retail and leisure development is considered to be viable, although overall will represent a small part of the overall growth anticipated in the area. They are considered to put additional requirements on infrastructure provision, and as a result will be expected to make appropriate contributions towards infrastructure provision as identified in the*Local Plan Viability Assessment Update* (2016).

Appendices

Local Plan
North East Lincolnshire

# Appendix A Monitoring framework

Local Plan
North East Lincolnshire

1. Reviewing and monitoring how well the Plan is performing is an essential element of the planning system. A set of core indicators have been proposed as the basis for future monitoring, and are set out in this appendix.
2. The monitoring framework focuses on indicators that would identify trends and provide a picture and means of assessing how the policies set out in the Plan are performing. These indicators are drawn from many different areas and may include data from the Single Data List (SDL)[137].
3. The indicators are structured around the main policy themes of the Plan. Each indicator is linked to relevant Local Plan Strategic Objectives and *Sustainability Appraisal* objectives to ensure that the monitoring process captures progress against all aspects of the Plan and, ultimately the delivery of the vision.
4. Targets for monitoring some indicators are yet to be finalised as some strategies do not identify targets or appropriate monitoring mechanisms, while others identify initial targets which are subject to periodic review. The monitoring framework should therefore be regarded as a 'live document' recognising that some indicators may change over time.
5. The *Authority's Monitoring Report* (AMR) will review the indicators as data becomes available[138], including the significant social, environmental and economic effects of the policies, and will as a minimum provide:

   A. a list of planning documents that the Council is working on, the progress being made in preparing the documents and the date of adoption or approval of the documents;
   B. a list of any local plan policies that are not being implemented with a list of supporting reasons;
   C. figures showing the number of additional homes and additional affordable homes built in the Borough;
   D. a list and details of any neighbourhood development orders or neighbourhood development plans made within the area;
   E. details of the potential implementation of a Community Infrastructure Levy (CIL), if progressed, and any charges collected; and,
   F. details of where and how the Council has worked with other local planning authorities, county councils and other public bodies under the 'Duty to Co-operate; introduced by the *Localism Act 2011.*

6. The following core indicators have been identified:

137 The Single Data List is published by the Department of Communities and Local Government (CLG) and is updated as and when new data requirements are identified, and when ongoing collections are reviewed. Further information about the Single Data List can be found on the CLG website at: https://www.gov.uk.

138 The *Authority's Monitoring Report* will be published as a minimum every 12 months, and will be made available on the Council's website at: https://www.nelincs.gov.uk.

## Monitoring framework - Strategic indicators

| Strategic indicators | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Indicator** | **Source** | **Frequency** | **Baseline (where applicable)[139]** | **Target** | **Local Plan Strategic Objectives** | **Sustainability Appraisal Objectives** | **Key agencies and partners** |
| Overall population growth | ONS | Annually | 159,804<br>*Mid-year population estimates 2015* | Increase population | SO1 | N/A | N/A |
| Demographic - age profile | ONS | Annually | 0 to 5 - 19.1%<br>16 to 64 - 61.4%<br>65+ - 9.5%<br>*Mid-year population estimates 2015* | | SO1 | N/A | N/A |
| Deprivation | DCLG | Every two or three years | North East Lincolnshire ranked 65th most deprived out of 325<br>*September 2015* | Reduce deprivation levels | SO5 | SA10 | CCG |
| Life expectancy at birth | Local authority health | Annually | Male - 77.9<br>Female - 82.1 | Increase life expectancy | SO5 | SA11 | CCG |

139 Baseline date shown in italics.

| Strategic indicators | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Indicator** | **Source** | **Frequency** | **Baseline (where applicable)[139]** | **Target** | **Local Plan Strategic Objectives** | **Sustainability Appraisal Objectives** | **Key agencies and partners** |
| | profiles (Public Health England) | | *2012-2014 baseline data* | | | | |
| Obesity rates - adults and children | Local authority health profiles (Public Health England) | Annually | Adults - 29%<br>Age 10-11 - 19%<br>*2013/14* | Reduce obesity rates | SO5 | SA11 | CCG |
| Crime - numbers reported | Humberside Police | Annually | 1,391<br>*March 2015* | Reduce crime | SO9 | SA12 | Humberside Police |
| Applications for Neighbourhood Forum designation | Local authority planning records | Annually | No applications for designation<br>*2015* | N/A | SO5, SO9 | SA13 | |
| Progress with Neighbourhood Development Plans | Local authority planning records | Annually | No designated neighbourhood forums<br>*2015* | N/A | N/A | SA13 | |

139 Baseline date shown in italics.

| Strategic indicators | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Indicator** | **Source** | **Frequency** | **Baseline (where applicable)[139]** | **Target** | **Local Plan Strategic Objectives** | **Sustainability Appraisal Objectives** | **Key agencies and partners** |
| Percentage of new development on brownfield land | Local authority planning records | Annually | 56%<br>*2014/15 baseline data* | | SO2 | SA1 | |
| Planning applications<br>*Validated and percentage permitted* | Local authority planning records | Quarterly | 731 validated<br>96.59%<br>*2014/15 baseline data* | | N/A | N/A | North East Lincolnshire Council |
| Planning appeals<br>*Lodged and percentage allowed* | Local authority planning records | Quarterly | Appeals determined - 10<br>Appeals allowed - 4 (40%0<br>*2014/15 baseline data* | | N/A | N/A | North East Lincolnshire Council |

Table I.1 Core indicators - Strategic

139 Baseline date shown in italics.

## Monitoring framework - Building the economy we need

| Economy and employment: core indicators | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Indicators** | **Source of information** | **Frequency** | **Baseline (where applicable)[140]** | **Target** | **Local Plan Strategic Objectives** | **Sustainability Appraisal Objectives** | **Key agencies and partners** |
| Total employee jobs<br><br>*Total number of jobs in North East Lincolnshire* | ONS Annual Population Survey<br><br>Nomis Official Labour Market Statistics | Annually | 65,800<br><br>*2014 baseline data* | Increase by 8,800 | SO3, SO5 | SA20, SA22 | North East Lincolnshire Council<br><br>Local, regional and national businesses<br><br>Developers<br><br>Landowners<br><br>Local Enterprise Partnerships (LEPs)<br><br>Local and regional Chambers of Trade and Commerce |
| Job density<br><br>*The level of jobs per resident aged 16 to 64* | ONS<br><br>Nomis Official Labour Market Statistics | Annually | 0.74<br><br>*2014 baseline data* | Increase job density | SO3, SO5 | SA20, SA22 | |
| Employee jobs by sector | ONS<br><br>Nomis Official Labour Market Statistics | Annually | Primary Services<br><br>(A-B) Agriculture and mining - 100 | Increase number of jobs in key sectors | SO3, SO5 | SA20, SA22 | |

140 Baseline date shown in italics.

| Economy and employment: core indicators | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Indicators** | **Source of information** | **Frequency** | **Baseline (where applicable)[140]** | **Target** | **Local Plan Strategic Objectives** | **Sustainability Appraisal Objectives** | **Key agencies and partners** |
| | | | Energy and water (D-E) - 700<br>Manufacturing (C) - 10,000<br>Construction (F) - 2,600<br>Services (G-S) - 52,500<br>Wholesale and retail including motor trades (G) - 11,700<br>Transport storage (H) - 5,200<br>Accommodation & food services (i) - 4,300<br>Information & communication (J) - 700 | | | | Service and utilities providers<br>Transport operators<br>Training and education providers including local colleges and universities |

140 Baseline date shown in italics.

| Economy and employment: core indicators | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Indicators** | **Source of information** | **Frequency** | **Baseline (where applicable)[140]** | **Target** | **Local Plan Strategic Objectives** | **Sustainability Appraisal Objectives** | **Key agencies and partners** |
| | | | Financial & other business services (K-N) - 9,100 | | | | |
| | | | Public, admin., education & health (O-Q) - 19,400 | | | | |
| | | | Other services (R-S) - 2,100 | | | | |
| Unemployment rate<br><br>*Unemployment as a percentage of the economically active population of the Borough* | ONS<br><br>Nomis Official Labour Market Statistics | Annually | 7.3%<br><br>*April 2015 - March 2016* | Reduce unemployment | SO3, SO5 | SA10, SA20, SA22 | |

140 Baseline date shown in italics.

| Economy and employment: core indicators | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Indicators** | **Source of information** | **Frequency** | **Baseline (where applicable)[140]** | **Target** | **Local Plan Strategic Objectives** | **Sustainability Appraisal Objectives** | **Key agencies and partners** |
| Employment rate<br><br>*Percentage of the economically active population of the Borough in training, education or employment* | ONS<br><br>Nomis Official Labour Market Statistics | Annually | 67.9%<br><br>*July - June 2013/14* | Increase employment | SO3, SO5 | SA10, SA20, SA22 | |
| Resident qualifications<br><br>*NVQ2 equivalent and above of residents ages 16 to 64* | ONS<br><br>Nomis Official Labour Market Statistics | Annually | 66.6%<br><br>*Jan 2015 - Dec 2015 baseline* | Increase qualifications | SO3, SO5 | SA10, SA20, SA21, SA22 | |
| Apprentices/ trainees secured | Local authority planning application records | Annually | No baseline until adoption of the Local Plan | Increase in apprentices/ trainee placements | SO3, SO5 | SA10, SA20, SA21, SA22 | |

140 Baseline date shown in italics.

| Economy and employment: core indicators | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Indicators** | **Source of information** | **Frequency** | **Baseline (where applicable)[140]** | **Target** | **Local Plan Strategic Objectives** | **Sustainability Appraisal Objectives** | **Key agencies and partners** |
| *Number of apprentices/ trainees secured through S106 and planning obligations* | | | | | | | |
| Percentage of 16 to 19 year olds not in education or training | ONS<br><br>Nomis Official Labour Market Statistics | Annually | 7.1%<br><br>*Nov - Jan (average) 2015* | | SO3, SO5 | SA21 | |
| Developed additional employment floorspace<br><br>*Additional employment floorspace by use class (B1a, B1b, B1c, B2 and B8)* | Local authority planning application and Approved Inspector and Building Control records | Biannually | B1a - 43.5<br>B1b - 0<br>B1c - 117<br>B2 - 864<br>B8 - 7,074<br>B1, B2, B8 - 189.3<br>8,420.3m$^2$ (Gross) | 123.6ha | SO3 | SA20, SA22 | |

140 Baseline date shown in italics.

| Economy and employment: core indicators | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Indicators** | **Source of information** | **Frequency** | **Baseline (where applicable)[140]** | **Target** | **Local Plan Strategic Objectives** | **Sustainability Appraisal Objectives** | **Key agencies and partners** |
| *developed within the Borough* | | | 8,278.3m$^2$ (Net)<br>*2014/15 baseline data* | | | | |
| All new employment floorspace created | Local authority planning application records | Quarterly | 8,420.3m$^2$ (Gross)<br>8,287.8m$^2$ (Net)<br>*2014/15 baseline data* | Delivery of c120ha | SO3 | SA20, SA22 | |
| Available employment land | Local authority planning application, and Approved Inspector and Building Control records | Annually | 190.5ha (B1, B2 & B8)<br>9.82ha (B1 & B8)<br>*2014/2015 baseline data* | | SO3 | SA20, SA22 | |
| Allocated employment land taken up | Local authority planning application, and Approved | Annually | | | SO3 | SA20, SA22 | |

140 Baseline date shown in italics.

| Economy and employment: core indicators | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Indicators** | **Source of information** | **Frequency** | **Baseline (where applicable)[140]** | **Target** | **Local Plan Strategic Objectives** | **Sustainability Appraisal Objectives** | **Key agencies and partners** |
| | Inspector and Building Control records | | | | | | |
| Delivery of Mitigation sites | Local authority planning application records | Annually | | Circa 120ha | | | |
| Tourism - visitor revenue<br><br>*Number of visitors and assessment of expenditure* | Scarborough Tourism Economic Activity Monitor (STEAM) | Annually | 11,470,0000 visitors<br><br>£493M expenditure<br><br>*2013 baseline data* | | SO3, SO8 | SA20, SA22 | |

Table I.2 Core indicators - Economy and employment

140 Baseline date shown in italics.

## Monitoring framework - Building the homes we need

| Core indicators for housing | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Indicator** | **Source** | **Frequency** | **Baseline (where applicable)[141]** | **Target** | **Local Plan Strategic Objectives** | **Sustainability Appraisal Objectives** | **Key agencies and partners** |
| Allocated site delivery<br><br>*Progress on delivery of individual allocation sites* | Valuation Office alterations to the Valuation List (VOA Weekly List), Approved Inspector notifications, and Building Control completion records | Annually | - | | SO1, SO4 | SA18 | North East Lincolnshire Council<br><br>Developers<br><br>Landowners<br><br>Registered Social Landlords (RSLs)<br><br>Private landlords<br><br>Public sector agencies and partners<br><br>Service and utilities providers |
| Allocated sites with planning permission of applications submitted<br><br>*Number of units approved and with planning applications submitted on allocated sites* | Local authority planning application records | Annually | 13,340 units<br><br>*2013 baseline data* | Maintaining a five year supply | SO4 | SA18 | |

141 Baseline date shown in italics.

| Core indicators for housing | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Indicator** | **Source** | **Frequency** | **Baseline (where applicable)[141]** | **Target** | **Local Plan Strategic Objectives** | **Sustainability Appraisal Objectives** | **Key agencies and partners** |
| Progress on stalled sites | Local authority planning application records | Annually | -<br>*2014/15 baseline data* | Maintaining a five year supply | SO4 | SA18 | |
| Gross number of homes delivered<br>*The total number of new homes built, including breakdown for Spatial Zones* | Valuation Office alterations to the Valuation List (VOA Weekly List), Approved Inspector notifications, and Building Control completion records | Monthly | 381<br>Urban - 277<br>Rural - 5<br>Arc - 71<br>Estuary - 28<br>*2014/15 baseline data* | N/A | SO1, SO4 | SA18 | |
| Gross number of homes delivered by type (including specific self-build and custom build homes) | Development management records | Annually | Flat/ Maisonette - 60<br>Terraced - 86<br>Semi-detached - 125<br>Detached - 110 | | SO4 | SA18 | |

141 Baseline date shown in italics.

| Core indicators for housing | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Indicator** | **Source** | **Frequency** | **Baseline (where applicable)[141]** | **Target** | **Local Plan Strategic Objectives** | **Sustainability Appraisal Objectives** | **Key agencies and partners** |
| *The mix of homes built by size and type* | | | *2014/15 baseline data* | | | | |
| Demolitions and losses<br><br>*Number of demolitions and losses in the existing housing stock* | Valuation Office alterations to the Valuation List (VOA Weekly List), Approved Inspector notifications, and Building Control completion records | Monthly | Demolition - 5<br><br>Losses to stock - 10<br><br>*2014/15 baseline data* | N/A | SO1, SO4 | SA18 | |
| Net number of homes delivered | Valuation Office alterations to the Valuation List (VOA Weekly List), Approved Inspector notifications, and Building Control completion records | Monthly | 366<br><br>2014/15 baseline data | Delivery of c13,340 new homes (2013 to 2032) | SO2 | SA18 | |

141 Baseline date shown in italics.

| Core indicators for housing | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Indicator** | **Source** | **Frequency** | **Baseline (where applicable)[141]** | **Target** | **Local Plan Strategic Objectives** | **Sustainability Appraisal Objectives** | **Key agencies and partners** |
| Gross new build homes and conversions/ change of use<br><br>*New build homes constructed, compared to the number of homes created through conversion and change of use* | Valuation Office alterations to the Valuation List (VOA Weekly List), Approved Inspector notifications, and Building Control completion records | Monthly | New build - 302<br>Conversions - 51<br>Change of use - 10<br><br>*2014/15 baseline data (gross figures)* | N/A | SO2 | SA18 | |
| Brownfield/ greenfield delivery to date<br><br>*Gross completions built on previously developed land, compared to those built on* | Valuation Office alterations to the Valuation List (VOA Weekly List), Approved Inspector notifications, and Building Control completion records; *Strategic* | Annually | Greenfield - 181<br>Previously developed land - 200<br><br>2014/15 baseline data | N/A | SO4 | SA18 | |

141 Baseline date shown in italics.

| Core indicators for housing | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Indicator** | **Source** | **Frequency** | **Baseline (where applicable)[141]** | **Target** | **Local Plan Strategic Objectives** | **Sustainability Appraisal Objectives** | **Key agencies and partners** |
| *previously undeveloped land* | *Housing Land Availability Assessment* | | | | | | |
| Small site windfall completions<br><br>*Gross and net housing windfall completions as a percentage of all completions* | Valuation Office alterations to the Valuation List (VOA Weekly List), Approved Inspector notifications, and Building Control completion records | Annually | Completions - 43<br><br>11.28% as a percentage of all completions<br><br>*2014/15 baseline data* | 1,073 (2015 to 2032) | SO4 | SA18 | |
| Large site windfall completions<br><br>*Gross and net housing windfall completions as a percentage of all completions* | Valuation Office alterations to the Valuation List (VOA Weekly List), Approved Inspector notifications, and Building Control completion records | Annually | Two no.<br><br>0.52% as a percentage of all completions<br><br>*2014/15 baseline data* | N/A. This target helps to identify additional supply brought forward above and beyond allocations | SO4 | SA18 | |

141 Baseline date shown in italics.

| Core indicators for housing | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Indicator** | **Source** | **Frequency** | **Baseline (where applicable)[141]** | **Target** | **Local Plan Strategic Objectives** | **Sustainability Appraisal Objectives** | **Key agencies and partners** |
| | | | | and predicted windfalls | | | |
| Housing transactions<br><br>*The number of housing sales made in each year* | Land Registry | Annually | 2,063<br><br>*2015 baseline data* | N/A | SO4 | SA18 | |
| Average house price | Land Registry | Annually | £119.500<br><br>*Jan - Dec 2013* | N/A | SO4 | SA18 | |
| Housing density of major housing schemes | Valuation Office alterations to the Valuation List (VOA Weekly List), Approved Inspector notifications, and Building Control completion | Annually | - | N/A | SO2 | SA18 | |

141 Baseline date shown in italics.

| Core indicators for housing | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Indicator** | **Source** | **Frequency** | **Baseline (where applicable)[141]** | **Target** | **Local Plan Strategic Objectives** | **Sustainability Appraisal Objectives** | **Key agencies and partners** |
| | records; Planning application records | | | | | | |
| Reoccupation of empty homes | Housing improvement team records | Annually | 77<br><br>*2014/15 baseline data* | 60 empty homes returned to residential use/year | SO2, SO4 | SA1, SA18 | |
| Affordable housing delivery<br><br>*The total number of affordable homes built, including breakdown for Spatial Zones* | Valuation Office alterations to the Valuation List (VOA Weekly List), Approved Inspector notifications, and Building Control completion records; Planning application records | Monthly | 47<br><br>*2014/15 baseline data* | A target has yet to be defined | SO4 | SA18 | |
| Affordable homes delivered by type | Valuation Office alterations to the Valuation List (VOA Weekly List), Approved | Monthly | Social rented - 6<br><br>Affordable rent - 31 | A target has yet to be defined | SO4 | SA18 | |

141 Baseline date shown in italics.

| Core indicators for housing | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Indicator** | **Source** | **Frequency** | **Baseline (where applicable)[141]** | **Target** | **Local Plan Strategic Objectives** | **Sustainability Appraisal Objectives** | **Key agencies and partners** |
| *Housing delivered by whether they are intermediate or social rented properties* | Inspector notifications, and Building Control completion records; Planning application records | | Shared ownership - 13<br>Rent to buy - 2<br>*2014/15 baseline data* | | | | |
| Percentage of affordable homes delivered from major housing schemes | Planning application records | Monthly | 96%<br>*2014/15 baseline data* | N/A | SO4 | SA18 | |
| Self-build housing completions | Local authority planning application records | Annually | 7<br>*2014/15 baseline data* | N/A | SO4 | SA18 | |
| Specialist housing completions | Local authority planning application records | Annually | 20<br>*2014/15 baseline data* | | SO4 | SA18 | |

141 Baseline date shown in italics.

| Core indicators for housing | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Indicator** | **Source** | **Frequency** | **Baseline (where applicable)[141]** | **Target** | **Local Plan Strategic Objectives** | **Sustainability Appraisal Objectives** | **Key agencies and partners** |
| Additional gypsy and traveller pitches | Local authority planning application records | Annually | 10<br><br>*2014/15 baseline data* | 12 permanent pitches, 15 temporary pitches | SO4 | SA18 | |
| Count to traveller caravans<br><br>*Reports on single data list indicators 013-01 to 013-03* | DCLG | Annually (collected every 6 months) | Four authorised<br><br>*2014/15 baseline data* | N/A | SO4 | SA18 | |

Table I.3 Core indicators - housing

141 Baseline date shown in italics.

## Monitoring framework - Building the places we need

| Core Indicators for town centres | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Indicators** | **Source** | **Frequency** | **Baseline (where applicable)[142]** | **Target** | **Local Plan Strategic Objectives** | **Sustainability Appraisal Objectives** | **Key agencies and partners** |
| Convenience floorspace delivery | Local authority planning application records, and Approved Inspector and Building Control records | Annually | - | Cleethorpes town centre - 915m$^2$ | SO8 | SA13 | North East Lincolnshire Council<br><br>Local, regional and national businesses<br><br>Developers<br><br>Local and regional Chambers of Trade and Commerce<br><br>Local Enterprise Partnerships (LEPs) |
| Comparison floorspace delivery | Local authority planning application records, and Approved Inspector and Building Control records | Annually | - | Grimsby town centre - 23,210m$^2$<br><br>Cleethorpes town centre - 6,150m$^2$ | SO8 | SA13 | |
| Retail development - town and defined centres | Town centre vacancy count, local authority Spatial Planning Team and Local authority planning application records | Annually | - | Increase retail development in town/ defined centre | SO8 | SA13 | |

142 Baseline date shown in italics.

| Core Indicators for town centres | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Indicators** | **Source** | **Frequency** | **Baseline (where applicable)[142]** | **Target** | **Local Plan Strategic Objectives** | **Sustainability Appraisal Objectives** | **Key agencies and partners** |
| Retail development - other locations<br><br>*The number and scale of proposals over 200m$^2$ permitted in locations outside of town centre boundaries* | Local authority planning application records | Annually | - | N/A | SO8 | SA13 | |

Table I.4 Core indicators - Town centres

| Core indicators - Social and cultural places | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Indicator** | **Source** | **Frequency** | **Baseline (where applicable)[143]** | **Target** | **Local Plan Strategic Objectives** | **Sustainability Appraisal Objectives** | **Key agencies and partners** |
| Social and cultural facilities | Local authority planning application records | Annually | - | N/A | SO8 | SA14 | North East Lincolnshire Council |

142 Baseline date shown in italics.
143 Baseline date shown in italics.

| Core indicators - Social and cultural places | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Indicator** | **Source** | **Frequency** | **Baseline (where applicable)[143]** | **Target** | **Local Plan Strategic Objectives** | **Sustainability Appraisal Objectives** | **Key agencies and partners** |
| *The number and scale of social and cultural facilities permitted (D1 and D2 uses)* | | | | | | | Local, regional and national businesses<br><br>Local Enterprise Partnerships (LEPs) |

Table I.5 Core indicators - Social and cultural places

| Core indicators - Resilient and sustainable places | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Indicator** | **Source** | **Frequency** | **Baseline (where applicable)[144]** | **Target** | **Local Plan Strategic Objectives** | **Sustainability Appraisal Objectives** | **Key agencies and partners** |
| Development in flood risk areas<br><br>*Number of planning permissions granted contrary to the advice of the Environment Agency on flooding grounds* | Local authority planning application records | Annually | Zero<br><br>*2014/15 baseline data* | Zero applications permitted contrary to advice | SO2 | SA9 | North East Lincolnshire Council<br><br>Environment Agency<br><br>Developers |

143 Baseline date shown in italics.
144 Baseline date shown in italics.

| Core indicators - Resilient and sustainable places | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Indicator** | **Source** | **Frequency** | **Baseline (where applicable)[144]** | **Target** | **Local Plan Strategic Objectives** | **Sustainability Appraisal Objectives** | **Key agencies and partners** |
| Proportion of new homes constructed by flood risk zone | Local authority planning application records | Annually | None - 283<br>Low - 42<br>Moderate - 41<br>Severe - 15<br>*2014/15 baseline data* | | SO2 | SA9 | |
| Flooding - instances and events | Lead local flood authority | Annually | Zero<br>*2014/15 baseline data* | Reduce flooding instances and events | SO2 | SA9 | |
| Development affecting water quality<br>*Planning applications granted contrary to the Environment* | Local authority planning application records | Annually | Zero<br>*2014/15 baseline data* | Zero applications permitted contrary to advice | SO2 | SA9 | |

144 Baseline date shown in italics.

| Core indicators - Resilient and sustainable places | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Indicator** | **Source** | **Frequency** | **Baseline (where applicable)[144]** | **Target** | **Local Plan Strategic Objectives** | **Sustainability Appraisal Objectives** | **Key agencies and partners** |
| *Agency advice on water quality grounds* | | | | | | | |
| SuDs (SDL) | Local authority planning application records | Annually | - | - | SO2 | SA9 | |
| Carbon emissions<br><br>*Per 1,000 capita emissions (t)* | DEFRA | Annually | 7.6t<br><br>*2014 baseline data* | Reduce emissions | SO2 | SA4 | |
| Renewable energy generation<br><br>*Schemes completed* | Local authority planning application records, Approved Inspector notifications and Building | Annually | 0.9MW<br><br>*2014/15 baseline data* | 75MW of installed grid-connected renewable energy | SO2 | SA6 | |

144 Baseline date shown in italics.

| Core indicators - Resilient and sustainable places | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Indicator** | **Source** | **Frequency** | **Baseline (where applicable)[144]** | **Target** | **Local Plan Strategic Objectives** | **Sustainability Appraisal Objectives** | **Key agencies and partners** |
| | Control completion records | | | | | | |
| Renewable energy schemes permitted | Local authority planning application records | Annually | 2.9MW<br><br>*2014/15 baseline data* | 75MW of installed grid-connected renewable energy | SO2 | SA6 | |

Table I.6 Core indicators - Resilient and sustainable places

| Core indicators - Well-connected places | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Indicator** | **Source** | **Frequency** | **Baseline (where applicable)[145]** | **Target** | **Local Plan Strategic Objectives** | **Sustainability Appraisal Objectives** | **Key agencies and partners** |
| On-site parking for people with mobility impairments<br><br>*Percentage of parking bays provided for* | Planning application records | Annually | - | 5% | SO1, SO7 | SA10 | North East Lincolnshire Council<br><br>Strategic network providers |

144 Baseline date shown in italics.
145 Baseline date shown in italics.

| Core indicators - Well-connected places | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Indicator** | **Source** | **Frequency** | **Baseline (where applicable)[145]** | **Target** | **Local Plan Strategic Objectives** | **Sustainability Appraisal Objectives** | **Key agencies and partners** |
| *people with mobility impairments in new developments which provide on-site parking* | | | | | | | Public transport operators<br>Sustrans<br>Service providers<br>Developers<br>Landowners |
| Bus patronage<br>**(146)** | Local authority records | Annually | 8,325,057<br>*2014/15 baseline data* | | SO7 | SA16 | |
| Car ownership | ONS | Census update | 69.2%<br>*2011 Census baseline data* | Increased travel by sustainable modes | SO2, SO7 | SA16 | |
| Travel to work - location | ONS<br>Nomis official labour market statistics | Census update | Work mainly at or from homes - 6.6%<br>Employed in Hull LA area - 1% | Increase self-contained commuting | SO2, SO7 | SA16 | |

145 Baseline date shown in italics.
146 The number of bus passenger journeys originating within the North East Lincolnshire boundary

| Core indicators - Well-connected places | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Indicator** | **Source** | **Frequency** | **Baseline (where applicable)[145]** | **Target** | **Local Plan Strategic Objectives** | **Sustainability Appraisal Objectives** | **Key agencies and partners** |
| | | | Employed in East Riding of Yorkshire LA area - 0.5%<br>Employed in North East Lincolnshire LA area - 70.3%<br>Employed in North Lincolnshire - 6.6%<br>Employed elsewhere in Yorkshire and Humber region - 1.2%<br>Employed elsewhere in the UK - 5.9%<br>Employed at offshore installations - 0.6%<br>No fixed place of work - 7.3%<br>Employed outside the UK - 0.2%<br>*2011 Census baseline data* | | | | |

145 Baseline date shown in italics.

| Core indicators - Well-connected places | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Indicator** | **Source** | **Frequency** | **Baseline (where applicable)[145]** | **Target** | **Local Plan Strategic Objectives** | **Sustainability Appraisal Objectives** | **Key agencies and partners** |
| Travel to work - mode of travel | ONS<br><br>Nomis official labour market statistics | Census update | Home 1,912<br>Underground/ metro/ light rail/ tram - 52<br>Train - 328<br>Bus/ minibus/ coach - 4,319<br>Taxi - 564<br>Motorcycle/ scooter/ moped - 658<br>Driving car/ van - 45,080<br>Passenger car/ van - 5,079<br>Bicycle - 3,881<br>On foot - 8,297<br>Other method - 606<br><br>*2011 - Census baseline data* | Increased travel by sustainable modes | SO2, SO7 | SA16 | |

145 Baseline date shown in italics.

| Core indicators - Well-connected places | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Indicator** | **Source** | **Frequency** | **Baseline (where applicable)[145]** | **Target** | **Local Plan Strategic Objectives** | **Sustainability Appraisal Objectives** | **Key agencies and partners** |
| Traffic flows | Local authority records | Authority | 3.28 mins/mile<br>*2012/13 baseline data* | | | | |
| Access to services (Phone-n-ride)<br>*Number of trips available per calendar year* | Local authority records | Annually | 32,804<br>*2014/15 baseline data* | Increase number of trips | | | |
| Rural footpaths<br>*The percentage of inspected public rights of way that are easy to use* | Local authority records | Annually | 76%<br>*2004/05 baseline data* | Increase percentage | SO5, SO7 | SA14, SA17 | |

145 Baseline date shown in italics.

| Core indicators - Well-connected places | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Indicator** | **Source** | **Frequency** | **Baseline (where applicable)[145]** | **Target** | **Local Plan Strategic Objectives** | **Sustainability Appraisal Objectives** | **Key agencies and partners** |
| Air Quality Management Areas<br><br>*Number of Air Quality Management Areas (AQMAs)* | Local authority records | Annually | Two AQMAs<br><br>*2014/15 baseline data* | No increase in AQMAs | SO2 | SA5 | |

Table I.7 Core indicators - Well-connected places

| Core indicators - Historic places | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Indicator** | **Source** | **Frequency** | **Baseline (where applicable)*Baseline date shown in italics.*** | **Target** | **Local Plan Strategic Objectives** | **Sustainability Appraisal Objectives** | **Key agencies and partners** |
| Conservation areas<br><br>*With an up-to-date and adopted character assessment* | Local authority records | Annually | One<br><br>*2014/15 baseline data* | | SO6, SO9 | SA2 | North East Lincolnshire Council<br><br>Developers<br><br>Landowners |

145 Baseline date shown in italics.

| Core indicators - Historic places | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Indicator** | **Source** | **Frequency** | **Baseline (where applicable)*Baseline date shown in italics.*** | **Target** | **Local Plan Strategic Objectives** | **Sustainability Appraisal Objectives** | **Key agencies and partners** |
| Conservation areas<br><br>*With an up-to-date and adopted management plan* | Local authority records | Annually | One<br><br>*2014/15 baseline data* | | SO6 | SA2 | Historic England<br><br>Grimsby, Cleethorpes and District Civic Society |
| Conservation areas<br><br>*Identified in the Heritage at Risk Register* | Historic England | Annually | Seven<br><br>*2014/15 baseline data* | Reduce the number of conservation areas on the register | SO6 | SA2 | |
| Listed buildings<br><br>*Percentage of Listed Grade I and II* buildings on the Heritage at Risk Register* | Historic England | Annually | Two<br><br>*2014/15 baseline data* | Reduce the number of buildings on the register | SO6 | SA2 | |

| Core indicators - Historic places | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Indicator** | **Source** | **Frequency** | **Baseline (where applicable)*Baseline date shown in italics.*** | **Target** | **Local Plan Strategic Objectives** | **Sustainability Appraisal Objectives** | **Key agencies and partners** |
| Scheduled Ancient Monuments (SAMs)<br><br>*Percentage of Scheduled Monuments of the Heritage at Risk Register* | Historic England | Annually | Two<br><br>*2014/15 baseline data* | Reduce the number of SAMs on the register | SO6 | SA2 | |

Table I.8 Core indicators - Historic places

| Core indicators - Natural places | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Indicator** | **Source** | **Frequency** | **Baseline (where applicable)**[147] | **Target** | **Local Plan Strategic Objectives** | **Sustainability Appraisal Objectives** | **Key agencies and partners** |
| Local Sites in positive management<br><br>*(Former National Indicator 160;00 - the proportion of sites with positive conservation management)* | Local authority records | Annually | 74%<br><br>*2014/15 baseline data* | Increase percentage of sites in positive management | SO6 | SA3, SA19 | North East Lincolnshire Council<br><br>Natural England<br><br>RSPB |

147 Baseline date shown in italics.

| Core indicators - Natural places | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Indicator** | **Source** | **Frequency** | **Baseline (where applicable)[147]** | **Target** | **Local Plan Strategic Objectives** | **Sustainability Appraisal Objectives** | **Key agencies and partners** |
| SPA, SAC and Ramsar<br><br>*Locations, areas (ha) and designation* | Natural England | On review of designations | *-Declared at 2014/15 baseline* | Maintain and enhance quality and size of SPA, SAC and Ramsar | SO6 | SA3 | Greater Lincolnshire Nature Partnership (GLNP)<br><br>Local community groups<br><br>Developers<br><br>Landowners |
| SSSI<br><br>*Locations, areas (ha) and designation* | Natural England | On review of designations | -<br><br>*Declared at 2014/15 baseline* | Maintain and enhance quality and size of SSSI | SO6 | SA3 | |
| LGS<br><br>*Locations, areas (ha) and designation* | Local authority records GLNP | Annually | Six sites<br><br>*Declared at 2014/15 baseline* | Maintain and enhance quality and size of LGS | SO6 | SA3 | |
| LWS<br><br>*Locations, areas (ha) and designation* | Local authority records | Annually | 32 sites<br><br>*Declared at 2014/15 baseline* | Maintain and enhance quality and size of LWS | SO6 | SA3 | |

147 Baseline date shown in italics.

| Core indicators - Natural places | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Indicator** | **Source** | **Frequency** | **Baseline (where applicable)[147]** | **Target** | **Local Plan Strategic Objectives** | **Sustainability Appraisal Objectives** | **Key agencies and partners** |
| SNCI<br><br>*Locations, areas (ha) and designation* | Local authority records | Annually | 40 sites<br><br>*Declared at 2014/15 baseline* | Maintain and enhance quality and size of SNCI | SO6 | SA3 | |
| Provision of play space<br><br>*The number of new or improved play sites approved* | Local authority planning application records | Annually | - | No target has been set | SO5 | SA11, SA14 | |
| Playing pitch provision<br><br>*The number of additional playing pitches approved or made available for community use* | Local authority planning application records | Annually | - | No target has been set | SO5 | SA11, SA14 | |

147 Baseline date shown in italics.

| Core indicators - Natural places | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Indicator** | **Source** | **Frequency** | **Baseline (where applicable)[147]** | **Target** | **Local Plan Strategic Objectives** | **Sustainability Appraisal Objectives** | **Key agencies and partners** |
| Green space provision<br><br>*The amount of additional green space* | Local authority planning application records | Annually | - | No target has been set | SO5, SO6 | SA3, SA11, SA14, SA19 | |
| Allotment provision<br><br>*The number of allotment plots approved* | Local authority planning application records | Annually | - | N/A | SO5 | SA3, SA11, SA14 | |

Table I.9 Core indicators - Natural places

147 Baseline date shown in italics.

## Monitoring framework - Minerals and waste

### Minerals

| Core indicators - Minerals | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Indicator** | **Source** | **Frequency** | **Baseline (where applicable)[148]** | **Target** | **Local Plan Strategic Objectives** | **Sustainability Appraisal Objectives** | **Key agencies and partners** |
| Quantity of primary aggregates produced<br><br>*Quantity of aggregates produced from primary land-won sources* | Site operators survey | Annually | Nil<br><br>*2014/15 baseline data* | N/A | SO10 | | Private operators |
| Quantity of secondary and recycled aggregates produced | Site operators survey | Annually | c31,471<br><br>*2014/15 baseline data* | N/A | SO10 | | |
| Quantity of marine landed aggregates imported through North East Lincolnshire | Site operators survey | Annually | - | N/A | SO10 | | |
| Number of applications for non-mineral development approved in Minerals Safeguarding Areas (MSAs) | Local authority planning application records | Annually | - | N/A | SO10 | | |

148 Baseline date shown in italics.

| Core indicators - Minerals | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Indicator** | **Source** | **Frequency** | **Baseline (where applicable)[148]** | **Target** | **Local Plan Strategic Objectives** | **Sustainability Appraisal Objectives** | **Key agencies and partners** |
| Number of facilities and sites gained or lost | Local authority planning application and enforcement records, Operator surveys | Annually | - | N/A | SO10 | | |

Table I.10 Core indicators - Minerals

148 Baseline date shown in italics.

## Waste

| Core indicators - Waste | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Indicator** | **Source** | **Frequency** | **Baseline (where applicable)[149]** | **Target** | **Local Plan Strategic Objectives** | **Sustainability Appraisal Objectives** | **Key agencies and partners** |
| Local authority collected waste arisings and management method | Local authority Waste Management Team | Annually | Recycling - 16.37%<br>Composted - 17.01%<br>Incinerated energy from waste - 61.29%<br>Landfill - 5.33%<br>46,451.4(t)<br>*2014/15 baseline data* | N/A | SO10 | | North East Lincolnshire Council<br>Environment Agency<br>Private operators |
| Local authority collected waste arisings per capita<br>*Quantity of waste produced per person in the Borough* | WasteDataFlow, local authority waste management team | Annually | 0.47(t)<br>*2014/15 baseline data* | N/A | SO10 | | |

149 Baseline date shown in italics.

| Core indicators - Waste | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Indicator** | **Source** | **Frequency** | **Baseline (where applicable)[149]** | **Target** | **Local Plan Strategic Objectives** | **Sustainability Appraisal Objectives** | **Key agencies and partners** |
| Quantity of hazardous waste arisings | Hazardous waste data interrogator, Environment Agency | Annually | 38,117(t)<br><br>*2013 baseline data* | N/A | SO10 | | |
| Waste managed at facilities in the Borough, and waste arisings and managed facilities outside of the Borough<br><br>*Seeks to provide an indication of the level of self-sufficiency attained in waste management* | Waste data interrogator, Environment Agency | Annually | *2013 baseline data* | N/A | SO10 | | |
| Number of facilities and sites gained or lost | Licence records, Environment Agency, Waste data interrogator, | Annually | One site lost<br><br>Six sites gained | N/A | SO10 | | |

149 Baseline date shown in italics.

| Core indicators - Waste | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Indicator** | **Source** | **Frequency** | **Baseline (where applicable)[149]** | **Target** | **Local Plan Strategic Objectives** | **Sustainability Appraisal Objectives** | **Key agencies and partners** |
| | Local planning authority planning application records | | *2013 baseline data* | | | | |

Table I.11 Core indicators - Waste

149 Baseline date shown in italics.

# Appendix B Key evidence base documents

Local Plan
North East Lincolnshire

1. The list documents below forms the evidence base which informed the preparation of this Local Plan.

| Document reference number | Document title | Short name/ Acronym | Bibliography |
|---|---|---|---|
| CD-03 | North East Lincolnshire Pre-submission Draft Local Plan Habitats Regulations Assessment Report | HRA | LUC. (2016). *North East Lincolnshire Pre-submission Draft Local Plan Habitats Regulations Assessment Report*. North East Lincolnshire Council: Grimsby, England. |
| CD-04 | North East Lincolnshire Pre-submission Local Plan Sustainability Appraisal Report (2016) | Sustainability Appraisal (SA) | LUC. (2016). *North East Lincolnshire Pre-submission Local Plan Sustainability Appraisal Report*. North East Lincolnshire Council: Grimsby, England. |
| CD-05 | North East Lincolnshire Pre-submission Draft Local Plan Sustainability Appraisal Non-Technical Summary | | LUC. (2016). *North East Lincolnshire Pre-submission Draft Local Plan Sustainability Assessment Non-Technical Summary*. North East Lincolnshire Council: Grimsby, England. |
| CD-06 | North East Lincolnshire Local Plan Infrastructure Delivery Plan (2016) | Infrastructure Delivery Plan (IDP) February 2016 | ARUP. (2016). *North East Lincolnshire Infrastructure Delivery Plan*. North East Lincolnshire Council: Grimsby, England. |
| CD-07 | Health Impact Assessment | HIA | Barnes, G. (2016). *A Health Impact Assessment of the 2016 Pre-Submission Draft Local Plan for North East Lincolnshire*. North East Lincolnshire Council: Grimsby, England. |
| CD-08 | North East Lincolnshire Equalities Impact Assessment (2016) | EqIA | NELC. (2016). *North East Lincolnshire Council Impact Assessment Tool*. North East Lincolnshire Council: Grimsby, England. |

| Document reference number | Document title | Short name/ Acronym | Bibliography |
|---|---|---|---|
| CD-14 | North East Lincolnshire Pre-submission Draft Local Plan Updated Habitats Regulations Assessment Report | HRA September update | LUC. (2016). *North East Lincolnshire Pre-submission Draft Local Plan Updated Habitats Regulations Assessment Report*. North East Lincolnshire Council: Grimsby, England. |
| CD-15 | North East Lincolnshire Local Plan: Pre-Submission Draft Sustainability Appraisal Addendum | | LUC. (2016). *North East Lincolnshire Local Plan: Pre-Submission Draft Sustainability Appraisal Addendum*. North East Lincolnshire Council: Grimsby, England. |
| CD-16 | Local Plan Viability Assessment Report Update (2016) | Viability Assessment July Update | Evolution PDF. (2016). *Local Plan Viability Assessment Update*. North East Lincolnshire Council: Grimsby, England. |
| CD-17 | North East Lincolnshire Local Plan Infrastructure Delivery Plan (2016) | Infrastructure Delivery Plan (IDP) September update | ARUP. (2016). *North East Lincolnshire Infrastructure Delivery Plan Update*. North East Lincolnshire Council: Grimsby, England. |
| CD-18 | North East Lincolnshire Pre-Submission Draft Local Plan Duty to Co-operate | Duty to Co-operate DTC | ENGIE. (2016). *North East Lincolnshire Pre-Submission Draft Local Plan Duty to Co-operate (2016) Interim Statement Update*. North East Lincolnshire Council: Grimsby, England. |
| CD-20 | North East Lincolnshire Local Plan Viability Assessment Update Report (2016) | Local Plan Viability Assessment | Evolution PDR. (2016). *North East Lincolnshire Local Plan Viability Assessment Update*. North East Lincolnshire Council: Grimsby, England. |
| CD-21 | North East Lincolnshire Pre-submission Draft Local Plan Updated Habitats Regulations Assessment Report | HRA December update | LUC. (2016). *North East Lincolnshire Pre-submission Draft Local Plan Updated Habitats Regulations Assessment Report*. North East Lincolnshire Council: Grimsby, England. |

| Document reference number | Document title | Short name/ Acronym | Bibliography |
|---|---|---|---|
| CD-22 | Memo on North East Lincolnshire Local Plan SA | | LUC. (2016). *North East Lincolnshire Local Plan SA. Response to Natural England's comments regarding consistency between the SA and HRA*. North East Lincolnshire Council: Grimsby, England. |
| CD-23 | North East Lincolnshire Pre-Submission Draft Local Plan Duty to Co-operate | Duty to Co-operate DTC December Update | ENGIE. (2016). *North East Lincolnshire Pre-Submission Draft Local Plan Duty to Co-operate (2016) Interim Statement Update*. North East Lincolnshire Council: Grimsby, England. |
| ECO-01 | Cleethorpes Strategic Development Framework (2010) | Cleethorpes Strategic Framework | Yorkshire Forward, NELC, John Thompson & Partners. (2010). *Cleethorpes Renaissance Strategic Development Framework*. North East Lincolnshire Council: Grimsby, England. |
| ECO-02 | North East Lincolnshire Retail, Leisure and Three Centres Study (2013) | Retail Study | GVA. (2013). *North East Lincolnshire Retail, Leisure and Three Centres Study*. North East Lincolnshire Council: Grimsby, England. |
| ECO-03 | Hotel Study for North East Lincolnshire (2013) | Hotel Study | Bridget Baker Consulting Ltd. (2013). *Hotel Study for North East Lincolnshire*. North East Lincolnshire Council: Grimsby, England. |
| ECO-04 | Hotel Study for North East Lincolnshire Addendum Report (2016) | | Bridget Baker Consulting Ltd. (2014). *Hotel Study for North East Lincolnshire Addendum Report*. North East Lincolnshire Council: Grimsby, England. |
| ECO-05 | North East Lincolnshire Economic Baseline (2014) | Economic Baseline | Atkins Ltd. (2014). *North East Lincolnshire Economic Baseline*. North East Lincolnshire Council: Grimsby, England. |
| ECO-06 | North East Lincolnshire Sector Study (2014) | Sector Study | Atkins Ltd. (2014). *North East Lincolnshire Sector Study*. North East Lincolnshire Council: Grimsby, England. |
| ECO-07 | Commercial Property Market Assessment (2014) | | Evolution PDR. (2014). *Commercial Property Market Assessment*. North East Lincolnshire Council: Grimsby, England. |

| Document reference number | Document title | Short name/ Acronym | Bibliography |
|---|---|---|---|
| ECO-08 | North East Lincolnshire Employment Land Review (2014) | Employment Land Review (ELR) | Atkins Ltd. (2014). *North East Lincolnshire Employment Land Review. North East Lincolnshire Council: Grimsby, England.* |
| ECO-09 | After the Towers, Freeman Street/East Marsh Regeneration and Development Study (2015) | Freeman Street Regeneration and Development Study | Gillespies Genecon. (2015). *After the Towers Freeman Street / East Marsh Regeneration and Development Study*. North East Lincolnshire Council: Grimsby, England. |
| ECO-10 | Grimsby and Cleethorpes Town Centre Investment Plan (2016) | Town Centres Investment Plan (draft) | LDA Design. (2016). *Grimsby and Cleethorpes Town Centre Investment Plan*. North East Lincolnshire Council: Grimsby, England. |
| ECO-11 | North East Lincolnshire Local Plan Employment Technical Paper (2016) | Employment Technical Paper | Evolution PDR. (2016). *North East Lincolnshire Local Plan Employment Technical Paper*. North East Lincolnshire Council: Grimsby, England. |
| ECO-12 | South Humber Industrial Investment Programme Technical Summary (2016) | | Evolution PDR. (2016). *South Humber Industrial Investment Programme Technical Summary*. North East Lincolnshire Council: Grimsby, England. |
| ECO-13 | North East Lincolnshire Economic Strategy (2015) | Economic Strategy | NELC. (2015). *North East Lincolnshire Economic Strategy*. North East Lincolnshire Council: Grimsby, England. |
| ECO-14 | Grimsby & Cleethorpes Town Centre Investment Plan (2016) | Town Centres Investment Plan | NELC. (2016). *Grimsby & Cleethorpes Town Centre Investment Plan*. North East Lincolnshire Council: Grimsby, England. |
| ECO-15 | Retail, Leisure and Three Centres Study, Retail Floorspace Capacity Update (2016) | | BiLFINGER, GVA. (2016). *Retail, Leisure and Three Centres Study Retail Floorspace Capacity Update 2016*. North East Lincolnshire Council: Grimsby, England. |

| Document reference number | Document title | Short name/ Acronym | Bibliography |
|---|---|---|---|
| ECO-16 | North East Lincolnshire Economic Futures Report (2014) | Economic Futures Report | Atkins Ltd. (2014). *North East Lincolnshire Economic Futures Report*. North East Lincolnshire Council: Grimsby, England. |
| ECO-17 | North East Lincolnshire Local Centres Study (2012) | Local Centres Study | Cofely GDF Suez. (2012). *North East Lincolnshire Local Centres Study*. North East Lincolnshire Council: Grimsby, England. |
| ENV-01 | Design North East Lincolnshire places and spaces renaissance (2008) | Urban Design Framework and Urban Realm Strategy | Gillespies. (2008). *Design north east lincolnshire places and spaces renaissance*. North East Lincolnshire Council: Grimsby, England. |
| ENV-02 | Grimsby and Ancholme Catchment Flood Management Plan (2009) | | Environment Agency. (2009). *Grimsby and Ancholme Catchment Flood Management Plan*. Environment Agency: Peterborough, England. |
| ENV-03 | Flamborough Head to Gibraltar Shoreline Management Plan (2010) | Shoreline Management Plan | Scott Wilson. (2010). *Humber Estuary Coastal Authorities Group Flamborough Head to Gibraltar Point Shoreline Management Plan*. Scott Wilson: Basingstoke, England. |
| ENV-04 | A Vision for Allotments, An Allotment Strategy (2011) | Allotment Strategy | Balfour Beatty. (2011). *A Vision for Allotments, An Allotment Strategy*. North East Lincolnshire Council: Grimsby, England. |
| ENV-05 | Lincolnshire Historic Landscape Characterisation Project (2011) | | COFELY GDF SUEZ. (2011). *Lincolnshire Historic Landscape Characterisation Project*. North East Lincolnshire Council: Grimsby, England. |
| ENV-06 | Low Carbon and Renewable Energy Capacity in Yorkshire and Humber (2011) | | AECOM, (2011). *Low Carbon and renewable energy capacity in Yorkshire and Humber Final Report*. AECOM: London, England. |
| ENV-07 | Local Transport Plan Transport Strategy (2011) | Local Transport Plan (LTP3) | Balfour Beatty. (2011). *Local Transport Plan, Transport Strategy April 2011 - March 2026*. North East Lincolnshire Council: Grimsby, England. |

| Document reference number | Document title | Short name/ Acronym | Bibliography |
|---|---|---|---|
| ENV-08 | Preliminary Flood Risk Assessment (2011) | PFRA | NELC. (2011). *Preliminary Flood Risk Assessment North East Lincolnshire (Flood Risk Regulations 2009) LLF Preliminary Assessment Report*. North East Lincolnshire Council: Grimsby, England. |
| ENV-09 | North East Lincolnshire Council Final Playing Pitch Strategy Final Assessment Report (2011) | Playing Pitch Assessment | Knight Kavanagh & Page. (2011). *North East Lincolnshire Final Playing Pitch Strategy Final Assessment Report*. North East Lincolnshire Council: Grimsby, England. |
| ENV-10 | North and North East Lincolnshire Strategic Flood Risk Assessment (2011) | Strategic Flood Risk Assessment (SFRA) | NLC and NELC. (2011). *North and North East Lincolnshire Strategic Flood Risk Assessment*. North Lincolnshire Council: Scunthorpe, England and North East Lincolnshire Council: Grimsby, England. |
| ENV-11 | North East Lincolnshire Council Final Playing Pitch Strategy (2011) | Playing Pitch Strategy | Knight Kavanagh & Page. (2011). *North East Lincolnshire Final Playing Pitch Strategy*. North East Lincolnshire Council: Grimsby, England. |
| ENV-12 | North East Lincolnshire Council Final Playing Pitch Strategy - Executive Summary (2011) | | Knight Kavanagh & Page. (2011). *North East Lincolnshire Final Playing Pitch Strategy - Executive Summary*. North East Lincolnshire Council: Grimsby, England. |
| ENV-13 | 19+ Skills Strategy for North East Lincolnshire (2011) | Skills Strategy | NELC et. al. (2011). *19+ Skills Strategy for North East Lincolnshire 2011-2013*. North East Lincolnshire Council: Grimsby, England. |
| ENV-14 | Joint Strategic Needs Assessment, the health and well-being of people in North East Lincolnshire (2013) | Joint Strategic Needs Assessment (JSNA) | NHS. (2013). *Joint Strategic Needs Assessment 2012*. North East Lincolnshire Clinical Commissioning Group: Grimsby, England. |
| ENV-15 | Lincolnshire Wolds Area of Outstanding Natural Beauty | | Lincolnshire Wolds. (2013). *Lincolnshire Wolds Area of Outstanding Natural Beauty Management Plan 2013-2018*. Lincolnshire |

| Document reference number | Document title | Short name/ Acronym | Bibliography |
|---|---|---|---|
| | Management Plan 2013-2018 | | Wolds Countryside Service and Lincolnshire Wolds Joint Advisory Committee: Louth, England. |
| ENV-16 | Home Energy Conservation Act, Draft HECA Report (2013) | HECA Report | NELC. (2013). *Home Energy Conservation Act (HECA) Draft HECA Report March 2013*. North East Lincolnshire Council: Grimsby, England. |
| ENV-17 | The Humber Estuary Flood Risk Management Strategy: Summary Strategy and Business Case (2014) | Humber Flood Risk Management Strategy | Capita Property and Infrastructure. (2014). *The Humber Estuary Flood Risk Management Strategy: Summary Strategy and Business Case*. North East Lincolnshire Council: Grimsby, England. |
| ENV-18 | Managing the risk of flooding in the Humber River Basin District (2014) (scoping report) | | Environment Agency. (2014). *Humber River Basin Managing the risk of flooding in the Humber River Basin District. What's being planned and when*. Environment Agency: Bristol, England. |
| ENV-19 | Humber River Basin District Consultation on the draft Flood Risk Management Plan (2014) | Humber Flood Risk Management Plan | Environment Agency. (2014). *Humber River Basin District Consultation on the draft Flood Risk Management Plan*. Environment Agency: Bristol, England. |
| ENV-20 | The draft flood risk management plan to the Humber River Basin District (2014) (Environmental Report) (2014) | | Environment Agency. (2014). *The draft flood risk management plan for the Humber River Basin District environmental report*. Environment Agency: Bristol, England. |
| ENV-21 | North East Lincolnshire Landscape Character Assessment, Sensitivity and Capacity Study (2014) | Landscape Character Assessment (LCA) | FPCR Environment and Design Ltd. (2014). *North East Lincolnshire Landscape Character Assessment, Sensitivity and Capacity Study*. North East Lincolnshire Council: Grimsby, England. |

| Document reference number | Document title | Short name/ Acronym | Bibliography |
|---|---|---|---|
| ENV-22 | North East Lincolnshire Local Flood Risk Management Strategy (2015) | Local Flood Risk Strategy (LFRMS) | NELC. (2015). *North East Lincolnshire Local Flood Risk Management Strategy.* North East Lincolnshire Council: Grimsby, England. |
| ENV-23 | North East Lincolnshire Local Flood Risk Management Strategy - Action Plan (2015) | | NELC. (2015). *North East Lincolnshire Local Flood Risk Management Strategy - Action Plan*. North East Lincolnshire Council: Grimsby, England. |
| ENV-24 | North East Lincolnshire SuDs Guide (2015) | SuDs Guide | NELC. (2015). *North East Lincolnshire SuDs Guide*. North East Lincolnshire Council: Grimsby, England. |
| ENV-25 | Grimsby Town Football Club, Social and Community Impact Study (2015) | | SLR Global Environmental Solutions. (2015). *Grimsby Town Football Club Community Impact and Social Value Assessment*. North East Lincolnshire Council: Grimsby, England. |
| ENV-26 | STEAM Final Trend Report 2009 - 2013 | STEAM Report | Global Tourism Solutions (UK) Ltd. (2009). *Steam Final Trend Report for 2009 - 2013 North East Lincolnshire*. North East Lincolnshire Council: Grimsby, England. |
| ENV-27 | Grimsby Town Centre Parking Strategy Modelling Report (2015) | | WSP, Parsons Brinkerhoff. (2015). *Grimsby Parking Strategy, Modelling Report*. North East Lincolnshire Council: Grimsby, England. |
| ENV-28 | North East Lincolnshire Draft Play Strategy Refresh (2015) | Play Strategy Review | JCF Limited. (2015). *North East Lincolnshire Draft Play Strategy Refresh*. North East Lincolnshire Council: Grimsby, England. |
| ENV-29 | Strategic Flood Risk Assessment Addendum (2016) | | ENGIE. (2016). *Strategic Flood Risk Assessment Addendum*. North East Lincolnshire Council: Grimsby, England. |

| Document reference number | Document title | Short name/ Acronym | Bibliography |
|---|---|---|---|
| ENV-30 | North East Lincolnshire Local Transport Plan Delivery Plan 2016-2019 (consultation draft) (2016) | | ENGIE. (2016). *North East Lincolnshire Local Transport Plan Delivery Plan 2016-2019*. North East Lincolnshire Council: Grimsby, England. |
| ENV-31 | North East Lincolnshire Local Transport Plan Highway Strategy (consultation draft) (2016) | | ENGIE. (2016). *North East Lincolnshire Local Transport Plan Highway Strategy*. North East Lincolnshire Council: Grimsby, England. |
| ENV-32 | North East Lincolnshire Local Transport Plan Transport Strategy (2016) | | ENGIE. (2016). *North East Lincolnshire Local Transport Plan Transport Strategy*. North East Lincolnshire Council: Grimsby, England. |
| ENV-33 | Flood Risk Sequential & Exception Tests - Memorandum of Understanding (2016) | | ENGIE, NELC, Environment Agency. (2016). *North East Lincolnshire Flood Risk Sequential & Exception Tests Memorandum of Understanding*. North East Lincolnshire Council: Grimsby, England. |
| ENV-34 | Flood Risk Sequential & Exception Tests - Guidance Note (2016) | | ENGIE, NELC, Environment Agency. (2016). *North East Lincolnshire Flood Risk Sequential & Exception Tests Guidance Note*. North East Lincolnshire Council: Grimsby, England. |
| ENV-35 | Flood Risk Sequential & Exception Tests Report (2016) | | ENGIE, NELC, Environment Agency. (2016). *North East Lincolnshire Flood Risk Sequential & Exception Tests Report*. North East Lincolnshire Council: Grimsby, England. |
| ENV-36 | Green Spaces Strategy 2016 - 2021 (draft) | | NELC. (2016). *Green Spaces Strategy 2016 - 2021*. North East Lincolnshire Council: Grimsby, England. |

| Document reference number | Document title | Short name/ Acronym | Bibliography |
|---|---|---|---|
| ENV-37 | South Humber Gateway Ecological Mitigation - North East Lincolnshire Delivery Plan (2016) | | Evolution PDR. (2016). *South Humber Gateway Ecological Mitigation - North East Lincolnshire Delivery Plan*. North East Lincolnshire Council: Grimsby, England. |
| ENV-38 | South Humber Gateway Ecological Mitigation - North East Lincolnshire Delivery Plan Update (2016) | | Evolution PDR. (2016). *South Humber Gateway Ecological Mitigation - North East Lincolnshire Delivery Plan Update*. North East Lincolnshire Council: Grimsby, England. |
| ENV-39 | South Humber Gateway Delivery and Management Draft MOU (2016) | | Evolution PDR. (2016). *South Humber Gateway Delivery and Management Draft MOU*. North East Lincolnshire Council: Grimsby, England. |
| ENV-40 | Natural England datasets | | Available at: https://www.gov.uk/government/organisations/natural-england |
| ENV-41 | Greater Lincolnshire Nature Partnership Dataset (2015) | | GLNP. (2015). *Greater Lincolnshire Nature Partnership Dataset - North East Lincs sites review*. Greater Lincolnshire Nature Partnership: England. Available at: http://www.glnp.co.uk/ |
| ENV-42 | Heritage at Risk Register (website) | | Available at: https://www.nelincs.gov.uk/ |
| ENV-43 | Historic Environmental Record (website) | HER | Available at: https://www.nelincs.gov.uk/ |
| ENV-44 | Discover North East Lincolnshire (website) | DiscoverNEL | VESR. (2015). *Discover North East Lincolnshire. Visitor Economy Services & Retail. Available at: http://www.discovernel.co.uk/#* |
| ENV-45 | Water for life and livelihoods Part 1: Humber river basin district river basin management plan (2015) | Humber river basin management plan | DEFRA, Environment Agency. (2015). *Water for life and livelihoods Part 1: Humber river basin district river basin management plan*. Environment Agency: Bristol, England. |

| Document reference number | Document title | Short name/ Acronym | Bibliography |
|---|---|---|---|
| ENV-46 | Cleethorpes Habitat Management Plan 2016 - 2021 | | NELC. (2016). *Cleethorpes Habitat Management Plan 2016 - 2021*. North East Lincolnshire Council: Grimsby, England. |
| ENV-47 | Desk Based Study of Recreational Disturbance to Birds on the Humber Estuary (2010) | | Footprint Ecology. (2010). *Desk Based Study on Recreational Disturbance to Birds on the Humber Estuary*. Footprint Ecology: Wareham, England. |
| ENV-48 | Results of the recreational visitor surveys across the Humber Estuary (2012) | | Footprint Ecology. (2012). *Results of the recreational visitor surveys across the Humber Estuary*. Footprint Ecology: Wareham, England. |
| HSG-01 | North East Lincolnshire Strategic Housing Market Assessment (2013) | Strategic Housing Market Assessment (SHMA) | GVA. (2013). *North East Lincolnshire Strategic Housing Market Assessment*. North East Lincolnshire Council: Grimsby, England. |
| HSG-02 | North East Lincolnshire Residential Density Study (2013) | Residential Density Study | Cofely GDF SUEZ. (2013). *North East Lincolnshire Residential Density Study*. North East Lincolnshire Council: Grimsby, England. |
| HSG-03 | Gypsy and Traveller Accommodation Assessment (2014) | Accommodation assessment | Opinion Research Services. (2014). *NE Lincolnshire Gypsy and Traveller Accommodation Assessment*. North East Lincolnshire Council: Grimsby, England. |
| HSG-04 | Strategic Housing Land Availability Assessment, incorporating Five Year Housing Land Supply Assessment (2015) | Strategic Housing Land Availability Assessment (SHLAA) | Cofely GDF SUEZ. (2015). *North East Lincolnshire Strategic Housing Land Availability Assessment Incorporating Five Year Housing Land Supply Assessment*. North East Lincolnshire Council: Grimsby, England. |
| HSG-05 | North East Lincolnshire Council Demographic analysis & forecasts (2015) | Demographic analysis | Edge Analytics. (2015). *North East Lincolnshire Demographic analysis & forecasts*. North East Lincolnshire Council: Grimsby, England. |

| Document reference number | Document title | Short name/ Acronym | Bibliography |
|---|---|---|---|
| HSG-06 | Grimsby West Concept Masterplan documents (2016) | | Signet Planning. (2016). *Grimsby West Strategic Housing Site, Concept Framework: Interim Position Statement*. North East Lincolnshire Council: Grimsby, England. |
| HSG-07 | Housing Requirement Technical Paper (2016) | Housing Technical Paper | ENGIE. (2016). *Housing Requirement Technical Paper. Translating North East Lincolnshire's full objectively assessed need for housing into a target for the Local Plan*. North East Lincolnshire Council: Grimsby, England. |
| HSG-08 | Five Year Housing Land Supply (2016) | | ENGIE. (2016). *North East Lincolnshire Five Year Housing Land Supply Assessment. Cover the five year period from 1 April 2016 to 31 March 2021*. North East Lincolnshire Council: Grimsby, England. |
| HSG-09 | North East Lincolnshire Local Plan: Site Selection Report (August 2016) | | Openplan. (2016). *North East Lincolnshire Local Plan: Site Selection Report. August 2016 Update*. North East Lincolnshire Council: Grimsby, England. |
| HSG-10 | Local Plan Affordable and non-Market Housing Delivery Review (2016) | | North East Lincolnshire Housing and Development Board. (2016). *Local Plan: Affordable and non-Market Housing Delivery Review*. North East Lincolnshire Council: Grimsby, England. |
| HSG-11 | Strategic Housing Land Availability Assessment (2016) | SHLAA | ENGIE. (2016). *North East Lincolnshire Strategic Housing Land Availability Assessment. For the period 31 March 2016 to 31 March 2032*. North East Lincolnshire Council: Grimsby, England. |
| HSG-12 | Empty Homes Action Plan (2016) | | NELC. (2016). *Draft Empty Homes Action Plan 2017 - 2022*. North East Lincolnshire Council: Grimsby, England. |
| HSG-13 | North East Lincolnshire Five Year Housing Land Supply Assessment (2016) | | ENGIE. (2016). *North East Lincolnshire Five Year Housing Land Supply Assessment. Covering the five year period from 1 October 2016 to 30 Sept 2021* North East Lincolnshire Council: Grimsby, England. |

| Document reference number | Document title | Short name/ Acronym | Bibliography |
|---|---|---|---|
| HSG-14 | North East Lincolnshire Local Plan: Site Selection Report (November 2016) | Site Selection Report November update | Openplan. (2016). *North East Lincolnshire Local Plan: Site Selection Report. November 2016 Update*. North East Lincolnshire Council: Grimsby, England. |
| HSG-15 | North East Lincolnshire Register of Self Build Register | | Further information is available on the Council's website at: https://www.nelincs.gov.uk/. |
| HSG-16 | North East Lincolnshire Settlement Accessibility Assessment (2013) | | Cofely GDF SUEZ. (2014). *North East Lincolnshire Settlement Accessibility Assessment*. North East Lincolnshire Council: Grimsby, England. |
| MW-01 | North East Lincolnshire Municipal Waste Strategy (2009) | Municipal Waste Strategy | NELC. (2009). *Municipal Waste Management Strategy*. North East Lincolnshire Council: Grimsby, England. |
| MW-02 | Mineral Safeguarding in England Good Practice Advice (2011) | | British Geological Survey, The Coal Authority. (2011). *Mineral safeguarding in England: good practice advice. Minerals and Waste Programme Open Report OR/11/046*. British Geological Survey: Nottingham, England. |
| MW-03 | Humber Area Local Aggregate Assessment (Draft) (2014) | Draft LAA | East Riding of Yorkshire Council, Hull City Council, North East Lincolnshire Council & North Lincolnshire Council. (2014). *Humber Area Local Aggregate Assessment (Draft)*. North East Lincolnshire Council: Grimsby, England. |
| MW-04 | New Local Plan Issues Paper: Minerals (2014) | Minerals Issues Paper | Cofely GDF Suez. (2014). *New Local Plan Issues Paper: Minerals*. North East Lincolnshire Council: Grimsby, England. |
| MW-05 | Waste Needs Assessment to support North East Lincolnshire Council's Local Plan (2015) | Waste Needs Assessment | BPP Consulting Waste Planning Professionals. (2015). *Waste Needs Assessment to support North East Lincolnshire Council's Local Plan*. North East Lincolnshire Council: Grimsby, England. |

| Document reference number | Document title | Short name/ Acronym | Bibliography |
|---|---|---|---|
| MW-06 | Municipal Waste Management Plan - Summary 2016 - 2019 | | NELC. (2016). *Municipal Waste Management Plan - Summary 2016 - 2019*. North East Lincolnshire Council: Grimsby, England. |
| MW-07 | Municipal Waste Management Plan - Technical Plan 2016 - 2019 | | NELC. (2016). *Municipal Waste Management Plan - Technical Plan 2016 - 2019*. North East Lincolnshire Council: Grimsby, England. |
| MW-08 | Humber Area Local Aggregate Assessment (2016) | Humber LAA | East Riding of Yorkshire Council, Hull City Council, North East Lincolnshire Council & North Lincolnshire Council. (2016). *Humber Area Local Aggregate Assessment*. North East Lincolnshire Council: Grimsby, England. |

Table II.1 Evidence base documents

# Glossary

Local Plan
North East Lincolnshire

The Plan is a technical and statutory document which is written to help local planning authorities to determine where and how future development can be achieved in a way that protects and enhances the area. Because of this, some of the language and terms used are, by necessity, technical and aimed at the informed reader. In order to make this Plan easier to understand this glossary is included, so as to explain these technical terms.

| Glossary of technical terms | | |
|---|---|---|
| **Technical term** | **Acronym** | **Explanation** |
| Accessible, accessibility | - | These terms, in relation to transport and other services, refer to both the proximity of services and the ability of the community to use those services. |
| Affordable housing | - | Housing provided with a subsidy, for people unable to resolve their housing requirements in the private sector housing market. |
| Aggregate minerals | - | Aggregate minerals are those that are used by the construction industry, for example in road building, house construction, manufacture of concrete and railway ballast. They include limestone, sandstone and sand and gravel. |
| Arc settlements | - | The 'Arc settlements' consist of the villages of Healing, Humberston, Laceby, New Waltham and Waltham. They form the Western and Southern Arc Spatial Zone. |
| Area of Outstanding Natural Beauty | AONB | Areas of land having a national landscape importance, designated under the *National Parks and Access to the Countryside Act 1949*. |
| Authorities Monitoring Report | Authority's Monitoring Report (AMR) | The process of reviewing and monitoring the development plan is crucial to the successful delivery of the development plan for an area. A document to be produced as a minimum annually showing progress in achieving the objectives of the development plan. |
| Best and most versatile agricultural land | - | Land in grades 1, 2 and 3a of the Agricultural Land Classification.<br>North East Lincolnshire does not have any grade 1 agricultural land. |
| Biodiversity | - | The whole variety of life encompassing all genetic, species and ecosystems variation. |
| Biodiversity Action Plan | - | Strategies for conserving, restoring, enhancing and creating habitats of importance for wildlife. |

| Glossary of technical terms | | |
|---|---|---|
| **Technical term** | **Acronym** | **Explanation** |
| Biomass | - | Also known as biofuels or bioenergy, is obtained from organic matter either directly from plants or indirectly from industrial, commercial, domestic or agricultural products. The use of biomass is classed as a 'carbon neutral' process because the carbon dioxide released during the generation of energy from biomass is balanced by that absorbed by plants during their growth. |
| Brownfield land | - | Land that has or had some form of built development on it. |
| Candidate Special Areas of Conservation | cSAC | Sites that have been submitted to the European Commission, but not yet formally adopted. |
| City Region | - | A term recognising that large towns and cities act as the focus for jobs, services and facilities for extensive hinterlands. North East Lincolnshire forms part of the Hull and Humber City's Region. |
| Climate change | - | A changing climate, which can be attributed directly or indirectly to human activity, which alters the composition of the global atmosphere. |
| Coastal defences | - | Refers to sea defences against flooding and erosion. Hard defences are generally expensive short-term options (often up to 30 years), such as sea walls. Soft defences are often less expensive long-term options and are usually more sustainable, such as sand dunes. |
| Code for Sustainable Homes | - | The Code for Sustainable Homes is an environmental assessment for rating the performance of new residential developments, providing a code level rating from Code Level 1 through to Code Level 6. |
| Community facilities | - | Community facilities are those used by local communities for leisure and social purposes including local shops, post offices, community centres, village halls, youth centres, sports venues, cultural buildings, cinemas, swimming pools, gymnasiums, bowling facilities, pubs and places of worship. |
| Community Infrastructure Levy | CIL | A levy allowing local authorities to raise funds from owners or developers of land undertaking new building in their area. The money can be used to fund the infrastructure needed as a result of development. |

| Glossary of technical terms | | |
|---|---|---|
| **Technical term** | **Acronym** | **Explanation** |
| Comparison goods | - | The provision of items not purchased on a frequent basis (e.g. clothing, footwear and household goods). |
| Conservation areas | - | A statutory designation made by the local planning authority for areas which are considered of special architectural or historic interest, the character of which it is desirable to preserve or enhance. |
| Convenience goods | - | The provision of everyday essential items (e.g. food, drinks and newspapers). |
| Conversions | - | In general means the change of use of a building from a particular use, classified in the Use Classes Order, to another use. The term can also mean the sub-division of residential properties into self-contained flats of maisonettes. |
| Development | - | Legally defined in Section 55 of the *Town and Country Planning Act 1990* as:<br>"the carrying out of building, engineering, mining or other operations in, on, over or under land, or the making of any material change in the use of any buildings or other land". |
| Development boundaries | - | Development boundaries provide a high degree of clarity in indicating where development will usually be acceptable, subject to meeting normal development management criteria. |
| Development plan | DPD | A development plan comprises a set of documents that set out the local authorities policies and proposals for the development and use of land in their area. |
| Duty to co-operate | | The duty to co-operate was created in the *Localism Act 2011*. It places a legal duty on local planning authorities to engage constructively, actively and on an ongoing basis to maximise the effectiveness of Local and Marine Plan preparation in the context of strategic cross-boundary matters. |
| Employment land | - | Land allocated in development plans for business, industrial and storage/distribution uses (B1, B2 and B8 use classes). |
| Employment uses | - | Any undertaking or use of land that provides paid employment (usually related to the 'B' use class). |
| Enterprise Zone | - | Enterprise Zones allow areas with economic potential to create the new business and jobs that they need, with positive benefits |

| Glossary of technical terms | | |
|---|---|---|
| **Technical term** | **Acronym** | **Explanation** |
| | | across the wider economic area. Simplified planning and business rates discounts apply in the Enterprise Zone area, giving the capacity to develop innovative ways to address specific local challenges. |
| Estuary Zone | - | The Estuary Zone is one of four Spatial Zones in North East Lincolnshire and includes the port town of Immingham and valuable land for economic development, stretching between the ports of Grimsby and Immingham. |
| Examination in Public | EiP | This is designed to test the soundness of the documents producedto form the development plan for the area. It is overseen by an independently appointed Planning Inspector and held in public. |
| Exception Test (flood risk) | - | If, following application of the Sequential Test, it is not possible for development to be located in zones with a lower probability of flooding, the Exception Test can be applied if appropriate. |
| Farm diversification | - | The development of a variety of economic activities linked to working farms, designed to support farm income and use surplus land (e.g. forestry, leisure, tourism). |
| Flood Risk Assessment | - | An assessment of the likelihood of flooding in a particular area in order that development needs and mitigation measures can be carefully considered. |
| Foul water | - | Kitchen, bathroom and trade waste that enters the sewer system. |
| Geodiversity | - | The variety of rocks, minerals, soils, fossils, landforms and natural processes. |
| Green Infrastructure | GI | The network of natural environment components and green and blue spaces, including (but not limited to): outdoor sports facilities, coastal habitat, grassland and heathland, hedges, cemeteries, churchyards and burial grounds, agricultural land, allotments, community gardens and urban farms, moorland, village greens, open spaces, degraded land, private gardens, wildlife habitats, parks, fields, open land outside settlement boundaries, woodlands, street trees, ponds, lakes and waterways. |
| Greenfield land | - | Land that has never had any built development on it. |

| Glossary of technical terms | | |
|---|---|---|
| **Technical term** | **Acronym** | **Explanation** |
| Groundwater | - | Water that exists beneath the earth's surface in underground streams and aquifers. |
| Gross Domestic Product | GDP | The monetary value of all the finished goods and services produced within a country's borders in a specific time period through GDP is usually calculated on an annual basis. |
| Gypsies and Travellers | - | As defined in *Planning Policy for Gypsies for Travellers*, 'gypsies and travellers' are persons of nomadic habit of life whatever their race or origin, including such persons who on grounds of their own or their family's or dependants' educational or health needs or old age have ceased to travel temporarily or permanently, but excluding members of an organised group of travelling showpeople or circus people travelling together as such. |
| Habitats | - | Ecological or environmental areas that are inhabited by a particular species of animal, plant or other type of organism. |
| Habitats Regulations Assessment | HRA | An assessment of any proposals in an emerging plan on their likely significant effect on sites designated as being of European (and International) importance for their wildlife and ecological value. |
| Historic Parks and Gardens | - | Sites included on the national *Register of Parks and Gardens of Special Historic Interest*, (not a statutory designation). |
| Housing land availability | - | The total amount of land reserved for residential use awaiting development. |
| Housing Needs Assessment | - | A survey that estimates the number of households within an area that are in need of affordable housing and/or housing that meets their specific requirements. |
| Infrastructure | - | Services necessary to serve development (e.g. roads and footpaths, electricity, water and sewer services). |
| Infrastructure Delivery Plan | IDP | The IDP is a supporting document to the Local Plan. Its purpose is to provide background evidence regarding the physical and social infrastructure likely to be needed to support identified development in the Borough over the plan period. It sets out a baseline assessment of existing infrastructure provision and provides an indication of the existing capacity and shortfalls of all types of infrastructure. The document will be updated and |

| Glossary of technical terms | | |
|---|---|---|
| **Technical term** | **Acronym** | **Explanation** |
| | | monitored regularly and will assist in future delivery of infrastructure requirements. |
| Inward investment | - | New business investment or expansion of an existing investment into an area from outside. |
| Issues, Options and Preferred Options | - | Stages of consultation undertaken with the objective of gaining public consensus on proposals ahead of submission of a local plan to Government for independent examination. |
| Key diagram | - | A diagram to illustrate the spatial strategy as set out in the local authority's local plan. |
| Listed buildings | - | A building of special architectural or historic interest listed by the Secretary of State for Culture, Media and Sport on the advice of English Heritage. Buildings are graded to indicate their relative importance. |
| Local Aggregates Assessment | LAA | *National Planning Policy Framework* requires mineral planning authorities (MPAs) to plan for a steady and adequate supply of aggregates by determining their own levels of aggregate provision. The LAA should be prepared annually and monitors patterns and trends in aggregate supply for an area. |
| Local Authority Collected Municipal Waste | LACMW | Refers to the previous 'municipal' element of the waste collected by local authorities. That is household waste and business waste where collected by the local authority and which is similar in nature and composition as required by the *Landfill Directive*. This is the definition that will be used for the Landfill Allowance Trading Scheme allowances (the agreed terminology arises from DEFRA's response to the 2010 consultation on meeting the *EU Landfill Diversion Targets in England*). |
| Local Authority Collected Waste | LACW | All waste collected by the local authority. This is a slightly broader concept than LACMW as it would include both this and non-municipal fractions such as construction and demolition waste. LACW is the definition that will be used in statistical publications, which previously referred to municipal waste (the agreed terminology arises from DEFRA's response to the 2010 consultation on meeting the *EU Landfill Diversion Targets in England*). |
| Local Development Framework | LDF | A LDF is the spatial planning strategy introduced in England and Wales by the *Planning and Compulsory Purchase Act 2004.* |

| Glossary of technical terms | | |
|---|---|---|
| **Technical term** | **Acronym** | **Explanation** |
| Local Development Order | LDO | An order made by a local planning authority extending permitted development rights for certain forms of development (with regard to a relevant development plan). |
| Local Development Scheme | LDS | Identifies which documents the local planning authority will prepare as part of the development plan for the area, along with a timetable for their production. |
| Local Enterprise Partnerships | LEPs | A partnership between local authorities and businesses to help determine local economic priorities and lead economic growth and job creation within its local area. They carry out some of the functions previously carried out by the regional development agencies which were abolished in March 2012.<br>North East Lincolnshire is a member of the Humber Local Enterprise Partnership and also the Greater Lincolnshire Local Enterprise Partnership. |
| Local Geological Sites | LGS | LGS (formerly known as RIGS - Regionally Important Geological and Geomorphological Sites). Sites assessed by the Greater Lincolnshire Nature Partnership as selected as being of substantive local geological interest. |
| Local Growth Fund | LGF | Growth deals provide funds (Local Growth Funds) to Local Enterprise Partnerships for projects that benefit the local area and economy. |
| Local housing needs | - | These apply when employment, social and economic consequences lead people to choose or demonstrate a need to live or remain in a locality where accommodation is not available to them. Categories of need could include:<br>1. existing residents who need separate accommodation in the area (e.g. newly married couples, people leaving tied accommodation on retirement);<br>2. people who need to live in proximity to the key local services they provide;<br>3. people who have long standing links with the local community such as the elderly, who need to be close to relatives; and,<br>4. people with the offer of a job in the locality. |
| Local Nature Reserve | LNR | Sites designated under the terms of the *National Parks and Access to the Land outside settlement boundaries Act 1949* and owned, leased or managed under agreement by local authorities. They are places with wildlife or geological features that are of special interest. |

| Glossary of technical terms | | |
|---|---|---|
| **Technical term** | **Acronym** | **Explanation** |
| Local Plan | - | A development plan prepared by district and other local planning authorities. |
| Local planning authority | LPA | The local planning authority or council that is empowered by-law to exercise planning functions in and area. |
| Local service centre | - | Towns or villages which provide a more limited range of services to the local community. |
| Local Strategic Partnership | LSP | An overall partnership of people that brings together organisations from the public, private, community and voluntary sector within a local authority area, with the objective of improving people's quality of life. |
| Local Transport Plan | LTP | A five year integrated transport strategy, prepared by local authorities in partnership with the community, seeking funding to help provide local transport projects. The plan sets out the resources predicted for delivery of the targets identified in the strategy. |
| Local Wildlife Sites | LWS | Sites assessed by the Greater Lincolnshire Nature Partnership and selected as being of substantive wildlife value. |
| Main town centre uses | - | The *National Planning Policy Framework* defines main town centre uses as:<br>"Retail development (including warehouse clubs and factory outlet centres); leisure, entertainment facilities the more intensive sport and recreation uses (including cinemas, restaurants, drive-through restaurants, bars and pub, night-clubs, casinos, health and fitness centres, indoor bowling centres, and bingo halls); offices; and arts, culture and tourism development (including theatres, museums, galleries and concert halls, hotels and conference facilities)". |

| Glossary of technical terms | | |
|---|---|---|
| **Technical term** | **Acronym** | **Explanation** |
| Major development | - | Major development as defined in the *Town and Country Planning (Development Procedure) (England) Order 2010* means development involving any one or more of the following:<br>1. the winning and working of minerals or the use of land for mineral-working deposits;<br>2. waste development;<br>3. the provision of dwelling houses where:<br>a. the number of dwelling houses to be provided is 10 or more; or,<br>b. the development is to be carried out on a site having an area of 0.5ha or more and it is not known whether the development falls within sub paragraph (c)(i);<br>4. the provision of a building or buildings where the floor space to be created by the development is 1,000m$^2$ or more; or,<br>5. development carried out on a site having an area of 1ha or more. |
| Municipal waste | MW | Previously the term 'Municipal Waste' as used in the UK was used in waste policies and nationally reported data to refer to waste as described in the *Landfill Directive* includes both household waste and that from other sources which is similar in nature and composition, which will include a significant proportion of waste generated by businesses and not collected by local authorities. In 2010, negotiations with the EU Commission and consultation with the waste community redefined national targets and the effects of this change in relation to the *EU Landfill Directive* targets. The review of waste policies will clarify any consequences for the *Landfill Allowance Trading Scheme* (LATS).<br>To remove ambiguity, in the future references to 'Municipal Waste' will refer to the new definition. Therefore there is a need to define a new term to describe the data collected by WasteDataFlow. The agreed terminology arises from DEFRA's response to the 2010 consultation on meeting the *EU Landfill Diversion Targets in England*. |
| National Planning Policy Framework | NPPF | The NPPF sets out the Government's planning policies for England and how they are expected to be applied. It is part of the development plan for an area and must be taken into account in the preparation of local and neighbourhood plans and is a material consideration in planning decisions. |

| Glossary of technical terms | | |
|---|---|---|
| **Technical term** | **Acronym** | **Explanation** |
| Nature conservation | - | The protection, management and promotion of wildlife habitats for the benefit of wild species, as well as the communities that use and enjoy them. |
| Neighbourhood Development Plans | - | A plan prepared by a Parish Council or Neighbourhood Forum for a particular neighbourhood area. |
| Open countryside | - | Area outside towns and villages. |
| Parish Plan | - | A comprehensive strategy produced by a local community setting out a vision for how the community should develop, identifying actions needed to tackle areas of concern. They have replaced village appraisals. |
| Plan, Monitor, Manage | - | An approach to housing provision involving:<br>1. Plan for an overall annual rate and distribution of housing;<br>2. Monitor the proposed provision against targets and indicators; and,<br>3. Manage the process by making adjustments to the planned provision in light of the monitoring. |
| Planning Advisory Service | PAS | An independent organisation grant funded by the Department for Communities and Local Government which provides free impartial advice, consultancy and peer support, training sessions and online resources to help local authorities understand and respond to planning reform. |
| Planning Inspectorate | PINS | The Planning Inspectorate deals with planning appeals, national infrastructure planning applications, examinations of local plans and other planning-related and specialist casework in England and Wales. |
| Planning Policy Guidance | PPG | Guidance published by the Government setting out its policy (no longer being use). |
| Planning Policy Statement | PPS | A statement published by the Government setting out its policy (superseded by the NPPF). |
| Policies map | - | A map to illustrate specific policies such as development sites for housing, employment. |
| Previously Developed Land | PDL | See Brownfield Land. |

| Glossary of technical terms | | |
|---|---|---|
| **Technical term** | **Acronym** | **Explanation** |
| Primary care | - | Medical services provided at community level, such as doctors' surgeries and community hospitals. |
| Public open space | - | Urban space, designated by a Council, where public access may or may not be formally established, but which fulfils a recreational or non-recreational role (e.g. amenity, ecological, educational, social or cultural uses). |
| Ramsar Convention | Ramsar | Wetland sites of international importance designated under the *International Convention on Wetlands or International Importance* especially as Waterfowl habitat (the Ramsar Convention). |
| Regionally Important Geological Sites | RIGs | A non-statutory designation given to sites with an identified geological importance. |
| Regional Spatial Strategy | RSS | A strategy for how a region should look in 15 to 20 years time and possibly longer. The RSS identified the scale and distribution of new housing in the region, indicates areas for regeneration, expansion or sub-regional planning and specifies priorities for the environment, transport, infrastructure, economic development, agriculture, minerals and waste treatment and disposal.<br>The *Yorkshire and Humber Regional Spatial Strategy to 2026* (2008) was partially revoked by the *Regional Strategy for Yorkshire and Humber (Partial Revocation) Order 2013* (S.I. 2013/117) on the 22 February 2013. Policies relating to the Green Belt around the City of York were retained. |
| Regional Transport Strategy | - | Part of the RSS, informing local transport plans, and providing a strategic overview of transport strategies and investment priorities. |

| Glossary of technical terms | | |
|---|---|---|
| **Technical term** | **Acronym** | **Explanation** |
| Renewable and low carbon energy | - | Includes energy for heating and cooling as well as generating electricity.<br>Renewable energy covers those energy flows that occur naturally and repeatedly in the environment, from:<br>1. the wind;<br>2. the fall of water;<br>3. the movement of the oceans;<br>4. the sun;<br>5. Biomass; and,<br>6. deep geothermal heat.<br>Low carbon technologies are those that can help reduce emissions (compared to conventional use of fossil fuels). |
| Rural Area | - | An area containing open land outside settlement boundaries and villages.<br>The Rural Area is one of four Spatial Zones in North East Lincolnshire it is characterised by its high landscape quality and a collection of small hamlets and villages. |
| Rural diversification | - | The expansion, enlargement or variation of the range of products or field of operation of a rural business (branching out from traditional farming activities, e.g. new income generating enterprise like renewable energy, tourism and food processing). |
| Saved policies of plans | - | Policies to be continued from the adopted Local Plan, that are saved for a time period during preparation of a replacement Local Plan. |
| Scheduled Monument | - | A statutory designation for structures of national archaeological importance. Designated by the Government under the *Ancient Monuments and Archaeological Areas Act 1979 (as amended by the National Heritage Act 1083*). |
| Section 106 agreement | s106 | Section 106 agreements (Section 106 of the *Town and Country Planning Act 1990*) are legal agreements between a planning authority and developer, or undertakings offered unilaterally by a developer, that ensure certain extra works related to a development are undertaken. For example, affordable housing, landscaping, school. |
| Sequential test | - | A planning principle that seeks to identify, allocate or develop certain types or locations of land before others. For example, brownfield housing sites before greenfield sites, or town centre retail sites before out-of centre sites. |

| Glossary of technical terms | | |
|---|---|---|
| **Technical term** | **Acronym** | **Explanation** |
| Sequential test (flood risk) | - | Aims to steer new development to areas with the lowest probability of flooding. |
| Serviced accommodation | - | Serviced accommodation refers to visitor accommodation and includes hotels, guest houses, B&Bs and Inns. |
| Sites of Community Importance | SCIs | Sites that have been adopted by the European Commission but not yet formally designated by the Government of each country. |
| Sites of Nature Conservation Importance | SNCI | A non-statutory area identified by the Greater Lincolnshire Nature Partnership as being of county or regional wildlife value. |
| Site of Special Scientific Interest | SSSI | Statutory designated site with national importance for wildlife, can relate to habitats or species of plants, birds, animals, insects etc. |
| Site specific allocations | SSAs | The allocation of land for a specific purpose such as housing sites, employment sites etc. The sites must be suitable and sustainable. |
| Small and medium sized enterprises | SMEs | Companies with less than 250 employees. |
| Soundness (of plan) | - | A local plan is considered sound if it is based upon good evidence and has been prepared in accordance with all the necessary procedures including the measures set out in the authority's *Statement of Community Involvement*. |
| Spatial planning | - | Spatial planning goes beyond traditional land use planning to bring together policies for the development and use of land with other programmes which influence the nature of places and how they function. |
| Spatial strategy/vision | - | The strategy that determines the broad location of development within a geographic area. Providing a brief description of how the area will be changed at the end of the plan period. |

| Glossary of technical terms | | |
|---|---|---|
| **Technical term** | **Acronym** | **Explanation** |
| Spatial Zones | - | To build on the overall vision for North East Lincolnshire four distinct zones have been identified. The zones reflect broad locations and areas of similar characteristics, and include the:<br>1. Urban Area;<br>2. Estuary Zone;<br>3. Rural Area; and,<br>4. Western and Southern Arc. |
| Special Area of Conservation | SAC | Sites that have been adopted by the European Commission and formally designated by the Government of each country in whose territory the site lies. |
| Special housing needs | - | Housing to meet the needs of groups of people who may be disadvantaged, such as the elderly, the disabled, students, young single people, the homeless, those needing hostel accommodation, key workers, travellers and occupiers of mobile homes and houseboats. |
| Special Protection Area | SPA | A site designated under the *EC Directive on the conservation of wild bird* (1979) (79/409/ECC) and strictly protected in accordance with the *EC Birds Directive*. Identified as being of international, European and national importance for rare and vulnerable birds and for regularly occurring migratory species. |
| Standard Industrial Classification of Economic Activities | SIC | SIC was first introduced in the UK in 1948 providing a framework for the collection, tabulation, presentation and analysis of data, by the type of economic activity in which they are engaged. Further information is available on the Office for National Statistics website https://www.ons.gov.uk/. |
| Statement of Community Involvement | SCI | The SCI sets out the processes to be used by the local planning authority in involving the community in the preparation, alteration and continuing review of all local plan documents and development management decisions. |
| Statement of consultation and engagement | - | A statement setting out the consultation and engagement activities undertaken during the preparation of the Local Plan, containing an overview of the activities and summary of the comments made. |
| Strategic Environmental Assessment | SEA | An assessment of the potential impacts of policies and proposals on the environment, to include proposals for the mitigation of impacts, required by European Directive (*EU Directive 2001/42/EC*). |

| Glossary of technical terms | | |
|---|---|---|
| **Technical term** | **Acronym** | **Explanation** |
| | | The environmental assessment involves the:<br>1. preparation of an environmental report;<br>2. carrying out of consultations;<br>3. taking into account of the environmental report and the results of the consultations in decision-making;<br>4. provision of information when the plan or programme is adopted; and,<br>5. showing that the results of the environment assessment have been taken into account. |
| Sub-region | - | An area covering more than one local authority area.<br>The Humber Sub-region covers an area on both sides of the River Humber and is made up of four local authority areas. These include North East Lincolnshire Council, North Lincolnshire Council, Hull City Council and the East Riding of Yorkshire Council.<br>Further information about the Humber Sub-region can be found on the local data observatory websites for each of the four councils:<br>East Riding of Yorkshire: http://dataobs.eastriding.gov.uk/<br>Kingston Upon Hull: http://109.228.11.121/IAS_Live/<br>North Lincolnshire: http://nldo.northlincs.gov.uk/IAS_Live/<br>North East Lincolnshire: http://www.nelincsdata.net/ |
| Supplementary Planning Document | SPD | A document that may cover a range of issues, thematic or site specific and includes community involvement/consultation. It provides further detail of policies and proposals set out in the Local Plan. It can not and does not set policy or allocate land. |
| Sustainability Appraisal | SA | An appraisal of the impacts of policies and proposals on economic, social and environmental issues. The Sustainability Appraisal Report incorporates the Strategic Environmental Assessment. |
| Sustainable Community Strategy (also known as the Community Strategy) | - | Prepared by the Local Strategic Partnership with the aim of improving the social, environmental and economic well-being of the local authority area, and should inform the Local Plan. |

| Glossary of technical terms | | |
|---|---|---|
| **Technical term** | **Acronym** | **Explanation** |
| Sustainable development | - | The 1987 World Commission on Environment and Development defines sustainable development as:<br>"development which meets the needs of the present without compromising the ability of future generations to meet their own needs".<br>Five guiding principles of sustainable development as set out in the *UK Sustainable Development Strategy Securing the Future* are:<br>1. living within the planet's environmental limits;<br>2. ensuring a strong, healthy and just society;<br>3. achieving a sustainable economy;<br>4. promoting good governance; and,<br>5. using sound science responsibly. |
| Sustainable Drainage Systems | SuDs | A means of controlling surface water runoff as close as possible to its origin before it enters a watercourse. |
| The Conservation of Habitats and Species Regulations 2010 | Habitats Regulations | The *Conservation of Habitats and Species Regulations 2010* transposes *European Directive 92/43/EEC* on the conservation of natural habitats and of wild flora and fauna into national law. |
| The Localism Act 2011 | - | The *Localism Act 2011* sets out a series of measures with the potential to achieve a substantial and lasting power away from central government and towards local people. |
| The Planning Act 2008 | - | The *Planning Act 2008* was intended to speed up the process for approving major new infrastructure projects. |
| The Planning and Compulsory Purchase Act 2004 | - | The *Planning and Compulsory Purchase Act 2004* updates elements of the 1990 *Town and Country Planning Act*.<br>It introduced:<br>1. a statutory system for regional planning;<br>2. a new system aimed at standardising local planning;<br>3. reforms to the development control and compulsory purchase and compensation systems; and,<br>4. the removal of crown immunity from planning controls. |
| The Town and Country Planning (Local Development) (England) Regulations 2004 | - | These regulations set out the specific local development documents which local authorities are required to prepare and how that should be done. |

| Glossary of technical terms | | |
|---|---|---|
| **Technical term** | **Acronym** | **Explanation** |
| Top tier authorities | - | A 'top tier' authority is one which provides all local authority services to the population in their area. |
| Transport assessments | - | A transport assessment is a comprehensive and systematic process which sets out transport issues relating to a proposed development. It identifies what measures will be taken to deal with the anticipated transport impacts of the scheme and to improve accessibility and safety for all modes of travel, particularly for alternatives to the car such as walking, cycling and public transport. |
| Travel Plan | - | A plan produced, normally to accompany a planning application that demonstrates how the occupiers will be encouraged or supports travel by means other than the private car. Schools and employers also produce a travel plan not related to development proposals which provide a package of measures produced by employers to encourage staff to use alternative means of transport than single occupancy car-use (e.g. car sharing schemes, improving cycle facilities, dedicated bus services or restricting car parking spaces). |
| Travelling showpeople | - | As defined in *Planning Policy for Traveller Sites*, 'travelling showpeople' are members of a group organised for the purposes of holding fairs, circuses or shows (whether or not travelling together as such). This includes such persons who on the grounds of their own or their family's or dependent's more localised pattern of trading, educational or health needs or old age have ceased to travel temporarily or permanently, but excludes Gypsies and Travellers. |
| Urban Area | - | The Urban Area is one of four Spatial Zones in North East Lincolnshire and includes that town of Grimsby and resort of Cleethorpes. |
| Village | - | A group of houses in a predominantly rural area with some community facilities and employment activity, but smaller than a town. |
| Vitality and viability | - | The factors by which the economic health of a town centre can be measured. |
| WasteDataFlow statistics | - | From 2011, statistical releases and output from WasteDataFlow will be branded as Local Authority Collected Waste. This reflects the coverage of the data collected. Previous outputs may be |

| Glossary of technical terms | | |
|---|---|---|
| **Technical term** | **Acronym** | **Explanation** |
| | | found described as 'municipal waste' but will purely reflect the old description. The data will not have changed and will only cover local authority activity (the agreed terminology arises from DEFRA's response to the 2010 consultation on *Meeting the EU Landfill Diversion Targets in England).* |
| Western and Southern Arc | - | The Western and Southern Arc is one of four Spatial Zones in North East Lincolnshire and includes a number of settlements that have grown to become Service Settlements, offering a range of key services and facilities. These settlements include: Healing; Laceby; Waltham; New Waltham and Humberston. |
| Windfall development | - | A site that becomes available for housing as a result of planning permission, granted on land which has not been previously identified within the development plan. |

Table 3.1

North East Lincolnshire Council and ENGIE, working in partnership to deliver a stronger economy and stronger communities

# Local Plan

North East Li Inshi

ENGIE

NORTH EAST LINCOLNSHIRE COUNCIL
www.nelincs.gov.uk

Working in Partnership

# Appendix 3: Thames Estuary Standard Data Form

# STANDARD DATA FORM for sites within the ‘UK national site network of European sites’

Special Protection Areas (SPAs) are classified and Special Areas of Conservation (SACs) are designated under:

- the Conservation of Habitats and Species Regulations 2017 (as amended) in England and Wales (including the adjacent territorial sea) and to a limited extent in Scotland (reserved matters) and Northern Ireland (excepted matters);
- the Conservation (Natural Habitats &c.) Regulations 1994 (as amended) in Scotland;
- the Conservation (Natural Habitats, &c) Regulations (Northern Ireland) 1995 (as amended) in Northern Ireland; and
- the Conservation of Offshore Marine Habitats and Species Regulations 2017 (as amended) in the UK offshore area.

Each SAC or SPA (forming part of the UK national site network of European sites) has its own Standard Data Form containing site-specific information. The information provided here generally follows the same documenting format for SACs and SPAs, as set out in the Official Journal of the European Union recording the Commission Implementing Decision of 11 July 2011 (2011/484/EU).

Please note that these forms contain a number of codes, all of which are explained either within the data forms themselves or in the end notes.

More general information on SPAs and SACs in the UK is available from the SPA homepage and SAC homepage on the JNCC website. These webpages also provide links to Standard Data Forms for all SAC and SPA sites in the UK.

https://jncc.gov.uk/

# NATURA 2000 - STANDARD DATA FORM

**For Special Protection Areas (SPA),**
**Proposed Sites for Community Importance (pSCI),**
**Sites of Community Importance (SCI) and**
**for Special Areas of Conservation (SAC)**

SITE **UK9020309**

SITENAME **Outer Thames Estuary**

## TABLE OF CONTENTS



## 1. SITE IDENTIFICATION

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| 1.1 Type | 1.2 Site code |
|---|---|
| A | UK9020309 |

### 1.3 Site name

Outer Thames Estuary

| 1.4 First Compilation date | 1.5 Update date |
|---|---|
| 2010-08 | 2017-11 |

### 1.6 Respondent:

| | |
|---|---|
| **Name/Organisation:** | Joint Nature Conservation Committee |
| **Address:** | Joint Nature Conservation Committee Monkstone House City Road Peterborough PE1 1JY |
| **Email:** | |

### 1.7 Site indication and designation / classification dates

| | |
|---|---|
| **Date site classified as SPA:** | 2010-08 |
| **National legal reference of SPA designation** | Regulations 12A and 13-15 of the Conservation of Habitats and Species Regulations 2010 (http://www.legislation.gov.uk/uksi/2010/490/contents/made) as amended by The Conservation of Habitats and Species (Amendment) Regulations 2011 (http://www.legislation.gov.uk/uksi/2011/625/contents/made), and Regulations 12, 16 and 17 of the Offshore Marine Conservation (Natural Habitats, &c.) Regulations 2007 (http://www.legislation.gov.uk/uksi/2007/1842/contents/made). |

## 2. SITE LOCATION

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### 2.1 Site-centre location [decimal degrees]:

| Longitude | Latitude |
|---|---|
| 1.545 | 51.916 |

### 2.2 Area [ha]:

392451.66

### 2.3 Marine area [%]

100.0

### 2.4 Sitelength [km]:

0.0

### 2.5 Administrative region code and name

| NUTS level 2 code | Region Name |
|---|---|
| UKZZ | Extra-Regio |

### 2.6 Biogeographical Region(s)

Atlantic (100.0 %)

## 3. ECOLOGICAL INFORMATION

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### 3.2 Species referred to in Article 4 of Directive 2009/147/EC and listed in Annex II of Directive 92/43/EEC and site evaluation for them

| Species | | | | | Population in the site | | | | | | Site assessment | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| G | Code | Scientific Name | S | NP | T | Size | | Unit | Cat. | D.qual. | A\|B\|C\|D | A\|B\|C | | |
| | | | | | | Min | Max | | | | Pop. | Con. | Iso. | Glo. |
| B | A001 | Gavia stellata | | | w | 6466 | 6466 | i | | G | A | | C | |
| B | A195 | Sterna albifrons | | | r | 746 | 746 | i | | G | A | | C | |
| B | A193 | Sterna hirundo | | | r | 532 | 532 | i | | G | B | | C | |

- **Group:** A = Amphibians, B = Birds, F = Fish, I = Invertebrates, M = Mammals, P = Plants, R = Reptiles
- **S:** in case that the data on species are sensitive and therefore have to be blocked for any public access enter: yes
- **NP:** in case that a species is no longer present in the site enter: x (optional)
- **Type:** p = permanent, r = reproducing, c = concentration, w = wintering (for plant and non-migratory species use permanent)
- **Unit:** i = individuals, p = pairs or other units according to the Standard list of population units and codes in accordance with Article 12 and 17 reporting (see reference portal)
- **Abundance categories (Cat.):** C = common, R = rare, V = very rare, P = present - to fill if data are deficient (DD) or in addition to population size information

- **Data quality:** G = 'Good' (e.g. based on surveys); M = 'Moderate' (e.g. based on partial data with some extrapolation); P = 'Poor' (e.g. rough estimation); VP = 'Very poor' (use this category only, if not even a rough estimation of the population size can be made, in this case the fields for population size can remain empty, but the field "Abundance categories" has to be filled in)

# 4. SITE DESCRIPTION

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## 4.1 General site character

| Habitat class | % Cover |
|---|---|
| N01 | 98.45 |
| N03 | 0.05 |
| N02 | 1.5 |
| **Total Habitat Cover** | 100 |

**Other Site Characteristics**

3 Marine: Geology: mud,sand,gravel  4 Marine: Geomorphology: range of mobile sediments,tidal current stream

## 4.2 Quality and importance

ARTICLE 4.1 QUALIFICATION (79/409/EEC) Over winter the area regularly supports: Gavia stellata (North-western Europe - wintering) - 38% of the population in Great Britain peak mean over the period 1989-2006/07 The area supports breeding populations of: Sternula albifrons (in breeding season) - 19.64% of GB population (2011 - 2015) Sterna hirundo (in breeding season) - 2.66% of GB population (2011 - 2015)

## 4.3 Threats, pressures and activities with impacts on the site

The most important impacts and activities with high effect on the site

| Negative Impacts | | | |
|---|---|---|---|
| Rank | Threats and pressures [code] | Pollution (optional) [code] | inside/outside [i\|o\|b] |
| M | D03 | | B |
| L | G04 | | b |
| H | C03 | | B |
| L | F02 | | I |
| L | H03 | | B |

| Positive Impacts | | | |
|---|---|---|---|
| Rank | Activities, management [code] | Pollution (optional) [code] | inside/outside [i\|o\|b] |

Rank: H = high, M = medium, L = low
Pollution: N = Nitrogen input, P = Phosphor/Phosphate input, A = Acid input/acidification,
T = toxic inorganic chemicals, O = toxic organic chemicals, X = Mixed pollutions
i = inside, o = outside, b = both

## 4.5 Documentation

JNCC's weblink 'http://jncc.defra.gov.uk/page-1414' provides general information on marine SPAs. The weblink 'http://jncc.defra.gov.uk/page-6895' allows access to site specific information for all marine MPAs in UK offshore waters. See the UK Approach document for more information (link via the JNCC website).

Link(s): http://jncc.defra.gov.uk/pdf/Natura2000_StandardDataForm_UKApproach_Dec2015.pdf

http://jncc.defra.gov.uk/page-1414
http://jncc.defra.gov.uk/page-6895

## 5. SITE PROTECTION STATUS (optional)

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### 5.1 Designation types at national and regional level:

| Code | Cover [%] | Code | Cover [%] | Code | Cover [%] |
|---|---|---|---|---|---|
| UK04 | 3.0 | UK00 | 93.0 | UK05 | 4.0 |

## 6. SITE MANAGEMENT

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### 6.1 Body(ies) responsible for the site management:

| | |
|---|---|
| Organisation: | Maldon Local/District Unitary Authority, Rochford Local/District Unitary Authority, Southend on Sea Local/District Unitary Authority, Swale Local/District Unitary Authority, Canterbury Local/District Unitary Authority |
| Address: | |
| Email: | |

| | |
|---|---|
| Organisation: | Crouch Harbour Authority, Port of London Authority, Peel Ports London Medway, Great Yarmouth Local/District Unitary Authority, Waveney Local/District Unitary Authority, Suffolk Coastal Local/District Unitary Authority |
| Address: | |
| Email: | |

| | |
|---|---|
| Organisation: | Southwold Harbour Authority – Waveney District Council, Ipswich Port Authority, Felixstowe Dock & Railway Company, Harwich Haven Authority, Brightlingsea Harbour Commissioners, Maldon Harbour Improvement Commissioners |
| Address: | |
| Email: | |

| | |
|---|---|
| Organisation: | For information about relevant management offshore please contact JNCC |
| Address: | |
| Email: | |

| | |
|---|---|
| Organisation: | Natural England, Marine Management Organisation, Kent and Essex Inshore Fisheries & Conservation Authority, Crown Estate, Great Yarmouth Port Authority, Lowestoft – Associated British Ports (ABP) |
| Address: | |
| Email: | |

| | |
|---|---|
| Organisation: | Thanet Local/District Unitary Authority |
| Address: | |
| Email: | |

### 6.2 Management Plan(s):

An actual management plan does exist:

- [ ] Yes
- [ ] No, but in preparation
- [X] No

### 6.3 Conservation measures (optional)

For available information on relevant conservation measures of the site, including the Conservation Objectives, see section 4.5.

## 7. MAP OF THE SITES

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INSPIRE ID:

Map delivered as PDF in electronic format (optional)

☐ Yes ☒ No

Reference(s) to the original map used for the digitalisation of the electronic boundaries (optional).

# EXPLANATION OF CODES USED IN THE SPECIAL AREA OF CONSERVATION (SAC) AND SPECIAL PROTECTION AREA (SPA) STANDARD DATA FORMS

The codes in the table below generally follow those explained in the official European Union guidelines for the Standard Data Form (also referencing the relevant page number).

1.1 Site type

| CODE | DESCRIPTION | PAGE NO |
|---|---|---|
| A | SPA (classified Special Protection Area) | 53 |
| B | cSAC, SCI or SAC (candidate Special Area of Conservation, Site of Community Importance, designated Special Area of Conservation) | 53 |
| C | SPA area/boundary is the same as the cSAC/SCI/SAC i.e. a co-classified/designated site (Note: this situation only occurs in Gibraltar) | 53 |

3.1 Habitat code

| CODE | DESCRIPTION | PAGE NO |
|---|---|---|
| 1110 | Sandbanks which are slightly covered by sea water all the time | 57 |
| 1130 | Estuaries | 57 |
| 1140 | Mudflats and sandflats not covered by seawater at low tide | 57 |
| 1150 | Coastal lagoons | 57 |
| 1160 | Large shallow inlets and bays | 57 |
| 1170 | Reefs | 57 |
| 1180 | Submarine structures made by leaking gases | 57 |
| 1210 | Annual vegetation of drift lines | 57 |
| 1220 | Perennial vegetation of stony banks | 57 |
| 1230 | Vegetated sea cliffs of the Atlantic and Baltic Coasts | 57 |
| 1310 | Salicornia and other annuals colonizing mud and sand | 57 |
| 1320 | Spartina swards (Spartinion maritimae) | 57 |
| 1330 | Atlantic salt meadows (Glauco-Puccinellietalia maritimae) | 57 |
| 1340 | Inland salt meadows | 57 |
| 1420 | Mediterranean and thermo-Atlantic halophilous scrubs (Sarcocornetea fruticosi) | 57 |
| 2110 | Embryonic shifting dunes | 57 |
| 2120 | Shifting dunes along the shoreline with Ammophila arenaria ("white dunes") | 57 |
| 2130 | Fixed coastal dunes with herbaceous vegetation ("grey dunes") | 57 |
| 2140 | Decalcified fixed dunes with Empetrum nigrum | 57 |
| 2150 | Atlantic decalcified fixed dunes (Calluno-Ulicetea) | 57 |
| 2160 | Dunes with Hippopha• rhamnoides | 57 |
| 2170 | Dunes with Salix repens ssp. argentea (Salicion arenariae) | 57 |
| 2190 | Humid dune slacks | 57 |
| 21A0 | Machairs (* in Ireland) | 57 |
| 2250 | Coastal dunes with Juniperus spp. | 57 |
| 2330 | Inland dunes with open Corynephorus and Agrostis grasslands | 57 |
| 3110 | Oligotrophic waters containing very few minerals of sandy plains (Littorelletalia uniflorae) | 57 |
| 3130 | Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or of the Isoëto-Nanojuncetea | 57 |
| 3140 | Hard oligo-mesotrophic waters with benthic vegetation of Chara spp. | 57 |
| 3150 | Natural eutrophic lakes with Magnopotamion or Hydrocharition - type vegetation | 57 |

| CODE | DESCRIPTION | PAGE NO |
|---|---|---|
| 3160 | Natural dystrophic lakes and ponds | 57 |
| 3170 | Mediterranean temporary ponds | 57 |
| 3180 | Turloughs | 57 |
| 3260 | Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation | 57 |
| 4010 | Northern Atlantic wet heaths with Erica tetralix | 57 |
| 4020 | Temperate Atlantic wet heaths with Erica ciliaris and Erica tetralix | 57 |
| 4030 | European dry heaths | 57 |
| 4040 | Dry Atlantic coastal heaths with Erica vagans | 57 |
| 4060 | Alpine and Boreal heaths | 57 |
| 4080 | Sub-Arctic Salix spp. scrub | 57 |
| 5110 | Stable xerothermophilous formations with Buxus sempervirens on rock slopes (Berberidion p.p.) | 57 |
| 5130 | Juniperus communis formations on heaths or calcareous grasslands | 57 |
| 6130 | Calaminarian grasslands of the Violetalia calaminariae | 57 |
| 6150 | Siliceous alpine and boreal grasslands | 57 |
| 6170 | Alpine and subalpine calcareous grasslands | 57 |
| 6210 | Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites) | 57 |
| 6230 | Species-rich Nardus grasslands, on silicious substrates in mountain areas (and submountain areas in Continental Europe) | 57 |
| 6410 | Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae) | 57 |
| 6430 | Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels | 57 |
| 6510 | Lowland hay meadows (Alopecurus pratensis, Sanguisorba officinalis) | 57 |
| 6520 | Mountain hay meadows | 57 |
| 7110 | Active raised bogs | 57 |
| 7120 | Degraded raised bogs still capable of natural regeneration | 57 |
| 7130 | Blanket bogs (* if active bog) | 57 |
| 7140 | Transition mires and quaking bogs | 57 |
| 7150 | Depressions on peat substrates of the Rhynchosporion | 57 |
| 7210 | Calcareous fens with Cladium mariscus and species of the Caricion davallianae | 57 |
| 7220 | Petrifying springs with tufa formation (Cratoneurion) | 57 |
| 7230 | Alkaline fens | 57 |
| 7240 | Alpine pioneer formations of the Caricion bicoloris-atrofuscae | 57 |
| 8110 | Siliceous scree of the montane to snow levels (Androsacetalia alpinae and Galeopsietalia ladani) | 57 |
| 8120 | Calcareous and calcshist screes of the montane to alpine levels (Thlaspietea rotundifolii) | 57 |
| 8210 | Calcareous rocky slopes with chasmophytic vegetation | 57 |
| 8220 | Siliceous rocky slopes with chasmophytic vegetation | 57 |
| 8240 | Limestone pavements | 57 |
| 8310 | Caves not open to the public | 57 |
| 8330 | Submerged or partially submerged sea caves | 57 |
| 9120 | Atlantic acidophilous beech forests with Ilex and sometimes also Taxus in the shrublayer (Quercion robori-petraeae or Ilici-Fagenion) | 57 |
| 9130 | Asperulo-Fagetum beech forests | 57 |
| 9160 | Sub-Atlantic and medio-European oak or oak-hornbeam forests of the Carpinion betuli | 57 |
| 9180 | Tilio-Acerion forests of slopes, screes and ravines | 57 |
| 9190 | Old acidophilous oak woods with Quercus robur on sandy plains | 57 |
| 91A0 | Old sessile oak woods with Ilex and Blechnum in the British Isles | 57 |
| 91C0 | Caledonian forest | 57 |
| 91D0 | Bog woodland | 57 |
| 91E0 | Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae) | 57 |
| 91J0 | Taxus baccata woods of the British Isles | 57 |

3.1 Habitat representativity (abbreviated to 'Representativity' in data form)

| CODE | DESCRIPTION | PAGE NO |
|---|---|---|
| A | Excellent representatively | 57 |
| B | Good representatively | 57 |
| C | Significant representatively | 57 |
| D | Non-significant presence representatively | 57 |

3.1 Relative surface

| CODE | DESCRIPTION | PAGE NO |
|---|---|---|
| A | > 15%-100% | 58 |
| B | > 2%-15% | 58 |
| C | ≤ 2% | 58 |

3.1 Degree of conservation (abbreviated to 'Conservation' in data form)

| CODE | DESCRIPTION | PAGE NO |
|---|---|---|
| A | Excellent conservation | 59 |
| B | Good conservation | 59 |
| C | Average or reduced conservation | 59 |

3.1 Global assessment (abbreviated to 'Global' in data form)

| CODE | DESCRIPTION | PAGE NO |
|---|---|---|
| A | Excellent value | 59 |
| B | Good value | 59 |
| C | Significant value | 59 |

3.2 Population (abbreviated to 'Pop.' in data form)

| CODE | DESCRIPTION | PAGE NO |
|---|---|---|
| A | > 15%-100% | 62 |
| B | > 2%-15% | 62 |
| C | ≤ 2% | 62 |
| D | Non-significant population | 62 |

3.2 Degree of conservation (abbreviated to 'Con.' in data form)

| CODE | DESCRIPTION | PAGE NO |
|---|---|---|
| A | Excellent conservation | 63 |
| B | Good conservation | 63 |
| C | Average or reduced conservation | 63 |

3.2 Isolation (abbreviated to 'Iso.' in data form)

| CODE | DESCRIPTION | PAGE NO |
|---|---|---|
| A | Population (almost) Isolated | 63 |
| B | Population not-isolated, but on margins of area of distribution | 63 |
| C | Population not-isolated within extended distribution range | 63 |

3.2 Global Grade (abbreviated to 'Glo.' or 'G.' in data form)

| CODE | DESCRIPTION | PAGE NO |
|---|---|---|
| A | Excellent value | 63 |
| B | Good value | 63 |
| C | Significant value | 63 |

3.3 Other species – essentially covers bird assemblage types

| CODE | DESCRIPTION | PAGE NO |
|---|---|---|
| WATR | Non-breeding waterbird assemblage | UK specific code |
| SBA | Breeding seabird assemblage | UK specific code |

| | | |
|---|---|---|
| BBA | Breeding bird assemblage (applies only to sites classified pre 2000) | UK specific code |

## 4.1 Habitat class code

| CODE | DESCRIPTION | PAGE NO |
|---|---|---|
| N01 | Marine areas, Sea inlets | 65 |
| N02 | Tidal rivers, Estuaries, Mud flats, Sand flats, Lagoons (including saltwork basins) | 65 |
| N03 | Salt marshes, Salt pastures, Salt steppes | 65 |
| N04 | Coastal sand dunes, Sand beaches, Machair | 65 |
| N05 | Shingle, Sea cliffs, Islets | 65 |
| N06 | Inland water bodies (Standing water, Running water) | 65 |
| N07 | Bogs, Marshes, Water fringed vegetation, Fens | 65 |
| N08 | Heath, Scrub, Maquis and Garrigue, Phygrana | 65 |
| N09 | Dry grassland, Steppes | 65 |
| N10 | Humid grassland, Mesophile grassland | 65 |
| N11 | Alpine and sub-Alpine grassland | 65 |
| N14 | Improved grassland | 65 |
| N15 | Other arable land | 65 |
| N16 | Broad-leaved deciduous woodland | 65 |
| N17 | Coniferous woodland | 65 |
| N19 | Mixed woodland | 65 |
| N21 | Non-forest areas cultivated with woody plants (including Orchards, groves, Vineyards, Dehesas) | 65 |
| N22 | Inland rocks, Screes, Sands, Permanent Snow and ice | 65 |
| N23 | Other land (including Towns, Villages, Roads, Waste places, Mines, Industrial sites) | 65 |
| N25 | Grassland and scrub habitats (general) | 65 |
| N26 | Woodland habitats (general) | 65 |

## 4.3 Threats code

| CODE | DESCRIPTION | PAGE NO |
|---|---|---|
| A01 | Cultivation | 65 |
| A02 | Modification of cultivation practices | 65 |
| A03 | Mowing / cutting of grassland | 65 |
| A04 | Grazing | 65 |
| A05 | Livestock farming and animal breeding (without grazing) | 65 |
| A06 | Annual and perennial non-timber crops | 65 |
| A07 | Use of biocides, hormones and chemicals | 65 |
| A08 | Fertilisation | 65 |
| A10 | Restructuring agricultural land holding | 65 |
| A11 | Agriculture activities not referred to above | 65 |
| B01 | Forest planting on open ground | 65 |
| B02 | Forest and Plantation management & use | 65 |
| B03 | Forest exploitation without replanting or natural regrowth | 65 |
| B04 | Use of biocides, hormones and chemicals (forestry) | 65 |
| B06 | Grazing in forests/ woodland | 65 |
| B07 | Forestry activities not referred to above | 65 |
| C01 | Mining and quarrying | 65 |
| C02 | Exploration and extraction of oil or gas | 65 |
| C03 | Renewable abiotic energy use | 65 |
| D01 | Roads, paths and railroads | 65 |
| D02 | Utility and service lines | 65 |
| D03 | Shipping lanes, ports, marine constructions | 65 |
| D04 | Airports, flightpaths | 65 |
| D05 | Improved access to site | 65 |
| E01 | Urbanised areas, human habitation | 65 |
| E02 | Industrial or commercial areas | 65 |

| CODE | DESCRIPTION | PAGE NO |
|---|---|---|
| E03 | Discharges | 65 |
| E04 | Structures, buildings in the landscape | 65 |
| E06 | Other urbanisation, industrial and similar activities | 65 |
| F01 | Marine and Freshwater Aquaculture | 65 |
| F02 | Fishing and harvesting aquatic ressources | 65 |
| F03 | Hunting and collection of wild animals (terrestrial), including damage caused by game (excessive density), and taking/removal of terrestrial animals (including collection of insects, reptiles, amphibians, birds of prey, etc., trapping, poisoning, poaching, predator control, accidental capture (e.g. due to fishing gear), etc.) | 65 |
| F04 | Taking / Removal of terrestrial plants, general | 65 |
| F05 | Illegal taking/ removal of marine fauna | 65 |
| F06 | Hunting, fishing or collecting activities not referred to above | 65 |
| G01 | Outdoor sports and leisure activities, recreational activities | 65 |
| G02 | Sport and leisure structures | 65 |
| G03 | Interpretative centres | 65 |
| G04 | Military use and civil unrest | 65 |
| G05 | Other human intrusions and disturbances | 65 |
| H01 | Pollution to surface waters (limnic & terrestrial, marine & brackish) | 65 |
| H02 | Pollution to groundwater (point sources and diffuse sources) | 65 |
| H03 | Marine water pollution | 65 |
| H04 | Air pollution, air-borne pollutants | 65 |
| H05 | Soil pollution and solid waste (excluding discharges) | 65 |
| H06 | Excess energy | 65 |
| H07 | Other forms of pollution | 65 |
| I01 | Invasive non-native species | 65 |
| I02 | Problematic native species | 65 |
| I03 | Introduced genetic material, GMO | 65 |
| J01 | Fire and fire suppression | 65 |
| J02 | Human induced changes in hydraulic conditions | 65 |
| J03 | Other ecosystem modifications | 65 |
| K01 | Abiotic (slow) natural processes | 65 |
| K02 | Biocenotic evolution, succession | 65 |
| K03 | Interspecific faunal relations | 65 |
| K04 | Interspecific floral relations | 65 |
| K05 | Reduced fecundity/ genetic depression | 65 |
| L05 | Collapse of terrain, landslide | 65 |
| L07 | Storm, cyclone | 65 |
| L08 | Inundation (natural processes) | 65 |
| L10 | Other natural catastrophes | 65 |
| M01 | Changes in abiotic conditions | 65 |
| M02 | Changes in biotic conditions | 65 |
| U | Unknown threat or pressure | 65 |
| XO | Threats and pressures from outside the Member State | 65 |

5.1 Designation type codes

| CODE | DESCRIPTION | PAGE NO |
|---|---|---|
| UK00 | No Protection Status | 67 |
| UK01 | National Nature Reserve | 67 |
| UK04 | Site of Special Scientific Interest (GB) | 67 |
| UK05 | Marine Conservation Zone | 67 |
| UK06 | Nature Conservation Marine Protected Area | 67 |
| UK86 | Special Area (Channel Islands) | 67 |
| UK98 | Area of Special Scientific Interest (NI) | 67 |
| IN00 | Ramsar Convention site | 67 |
| IN08 | Special Protection Area | 67 |
| IN09 | Special Area of Conservation | 67 |

# Appendix 4: Info Sheet Ramsar Wetlands

# Information Sheet on Ramsar Wetlands (RIS)

*Categories approved by Recommendation 4.7 (1990), as amended by Resolution VIII.13 of the 8th Conference of the Contracting Parties (2002) and Resolutions IX.1 Annex B, IX.6, IX.21 and IX. 22 of the 9th Conference of the Contracting Parties (2005).*

Notes for compilers:

1. The RIS should be completed in accordance with the attached *Explanatory Notes and Guidelines for completing the Information Sheet on Ramsar Wetlands*. Compilers are strongly advised to read this guidance before filling in the RIS.

2. Further information and guidance in support of Ramsar site designations are provided in the *Strategic Framework for the future development of the List of Wetlands of International Importance* (Ramsar Wise Use Handbook 7, 2nd edition, as amended by COP9 Resolution IX.1 Annex B). A 3rd edition of the Handbook, incorporating these amendments, is in preparation and will be available in 2006.

3. Once completed, the RIS (and accompanying map(s)) should be submitted to the Ramsar Secretariat. Compilers should provide an electronic (MS Word) copy of the RIS and, where possible, digital copies of all maps.

## 1. Name and address of the compiler of this form:

FOR OFFICE USE ONLY.

DD MM YY

Designation date | Site Reference Number

**Joint Nature Conservation Committee**
Monkstone House
City Road
Peterborough
Cambridgeshire PE1 1JY
UK
Telephone/Fax: +44 (0)1733 – 562 626 / +44 (0)1733 – 555 948
Email: RIS@JNCC.gov.uk

## 2. Date this sheet was completed/updated:

Designated: 31 August 2007

## 3. Country:

**UK (England)**

## 4. Name of the Ramsar site:

**Humber Estuary**

## 5. Designation of new Ramsar site or update of existing site:

**This RIS is for:** Updated information on an existing Ramsar site

## 6. For RIS updates only, changes to the site since its designation or earlier update:

### a) Site boundary and area:

The boundary has been extended

** Important note: If the boundary and/or area of the designated site is being restricted/reduced, the Contracting Party should have followed the procedures established by the Conference of the Parties in the Annex to COP9 Resolution IX.6 and provided a report in line with paragraph 28 of that Annex, prior to the submission of an updated RIS.

### b) Describe briefly any major changes to the ecological character of the Ramsar site, including in the application of the Criteria, since the previous RIS for the site:

## 7. Map of site included:

Refer to Annex III of the *Explanatory Notes and Guidelines*, for detailed guidance on provision of suitable maps, including digital maps.

**a) A map of the site, with clearly delineated boundaries, is included as:**

i) **hard copy** (required for inclusion of site in the Ramsar List): *yes* ✓ -or- *no* □;
ii**) an electronic format** (e.g. a JPEG or ArcView image) Yes
iii) **a GIS file providing geo-referenced site boundary vectors and attribute tables** *yes* ✓ -or- *no* □;

**b) Describe briefly the type of boundary delineation applied:**

e.g. the boundary is the same as an existing protected area (nature reserve, national park etc.), or follows a catchment boundary, or follows a geopolitical boundary such as a local government jurisdiction, follows physical boundaries such as roads, follows the shoreline of a waterbody, etc.

The site boundary is the same as, or falls within, an existing protected area.

For precise boundary details, please refer to paper map provided at designation

## 8. Geographical coordinates (latitude/longitude):

053 32 59 N 000 00 03 E

## 9. General location:

Include in which part of the country and which large administrative region(s), and the location of the nearest large town.

Nearest town/city: Kingston-upon-Hull

The Humber Estuary is located on the boundary between the East Midlands Region and the Yorkshire and the Humber Region, on the east coast of England bordering the North Sea.

**Administrative region:** City of Kingston upon Hull; East Riding of Yorkshire; Humberside; Lincolnshire; North East Lincolnshire; North Lincolnshire

## 10. Elevation (average and/or max. & min.) (metres): 11. Area (hectares): 37987.8

Min. -13
Max. 10
Mean No information available

## 12. General overview of the site:

Provide a short paragraph giving a summary description of the principal ecological characteristics and importance of the wetland.

The Humber Estuary is the largest macro-tidal estuary on the British North Sea coast. It drains a catchment of some 24,240 square kilometres and is the site of the largest single input of freshwater from Britain into the North Sea. It has the second-highest tidal range in Britain (max 7.4 m) and approximately one-third of the estuary is exposed as mud or sand flats at low tide. The inner estuary supports extensive areas of reedbed with areas of mature and developing saltmarsh backed in places by limited areas of grazing marsh in the middle and outer estuary. On the north Lincolnshire coast the saltmarsh is backed by low sand dunes with marshy slacks and brackish pools. The Estuary regularly supports internationally important numbers of waterfowl in winter and nationally important breeding populations in summer.

## 13. Ramsar Criteria:

Circle or underline each Criterion applied to the designation of the Ramsar site. See Annex II of the *Explanatory Notes and Guidelines* for the Criteria and guidelines for their application (adopted by Resolution VII.11).

**1, 3, 5, 6, 8**

## 14. Justification for the application of each Criterion listed in 13 above:

Provide justification for each Criterion in turn, clearly identifying to which Criterion the justification applies (see Annex II for guidance on acceptable forms of justification).

Ramsar criterion 1

The site is a representative example of a near-natural estuary with the following component habitats: dune systems and humid dune slacks, estuarine waters, intertidal mud and sand flats, saltmarshes, and coastal brackish/saline lagoons.

It is a large macro-tidal coastal plain estuary with high suspended sediment loads, which feed a dynamic and rapidly changing system of accreting and eroding intertidal and subtidal mudflats, sandflats, saltmarsh and reedbeds. Examples of both strandline, foredune, mobile, semi-fixed dunes, fixed dunes and dune grassland occur on both banks of the estuary and along the coast. The estuary supports a full range of saline conditions from the open coast to the limit of saline intrusion on the tidal rivers of the Ouse and Trent. Wave exposed sandy shores are found in the outer/open coast areas of the estuary. These change to the more moderately exposed sandy shores and then to sheltered muddy shores within the main body of the estuary and up into the tidal rivers. The lower saltmarsh of the Humber is dominated by common cordgrass *Spartina anglica* and annual glasswort *Salicornia* communities. Low to mid marsh communities are mostly represented by sea aster *Aster tripolium*, common saltmarsh grass *Puccinellia maritima* and sea purslane *Atriplex portulacoides* communities. The upper portion of the saltmarsh community is atypical, dominated by sea couch *Elytrigia atherica* (*Elymus pycnanthus*) saltmarsh community. In the upper reaches of the estuary, the tidal marsh community is dominated by the common reed *Phragmites australis* fen and sea club rush *Bolboschoenus maritimus* swamp with the couch grass *Elytrigia repens (Elymus repens)* saltmarsh community. Within the Humber Estuary Ramsar site there are good examples of four of the five physiographic types of saline lagoon.

Ramsar criterion 3

The Humber Estuary Ramsar site supports a breeding colony of grey seals *Halichoerus grypus* at Donna Nook. It is the second largest grey seal colony in England and the furthest south regular breeding site on the east coast. The dune slacks at Saltfleetby-Theddlethorpe on the southern extremity of the Ramsar site are the most north-easterly breeding site in Great Britain of the natterjack toad *Bufo calamita*.

Ramsar criterion 5

Assemblages of international importance:

153,934 waterfowl, non-breeding season

(5 year peak mean 1996/97-2000/2001)

Ramsar criterion 6 – species/populations occurring at levels of international importance.

Eurasian golden plover, *Pluvialis apricaria*

*altifrons* subspecies – NW Europe, W Continental Europe, NW Africa population

17,996 individuals, passage, representing an average of 2.2% of the population

(5 year peak mean 1996-2000)

Red knot, *Calidris canutus*

*islandica* subspecies

18,500 individuals, passage, representing an average of 4.1% of the population

(5 year peak mean 1996-2000)

Dunlin, *Calidris alpina*
*alpina* subspecies – Western Europe (non-breeding) population
20,269 individuals, passage, representing an average of 1.5% of the population
(5 year peak mean 1996-2000)

Black-tailed godwit, *Limosa limosa*
*islandica* subspecies
915 individuals, passage, representing and average of 2.6% of the population
(5 year peak mean 1996-2000)

Common redshank, *Tringa totanus*
*brittanica* subspecies
7,462 individuals, passage, representing an average of 5.7% of the population
(5 year peak mean 1996-2000)

Common shelduck, *Tadorna tadorna*
Northwestern Europe (breeding) population
4,464 individuals, wintering, representing an average of 1.5% of the population
(5 year peak mean 1996/7-2000/1)

Eurasian golden plover, *Pluvialis apricaria*
*altifrons* subspecies – NW Europe, W Continental Europe, NW Africa population
30,709 individuals, wintering, representing an average of 3.8% of the population
(5 year peak mean 1996/7-2000/1)

Red knot, *Calidris canutus*
*islandica* subspecies
28,165 individuals, wintering, representing an average of 6.3% of the population
(5 year peak mean 1996/7-2000/1)

Dunlin, *Calidris alpina*
*alpina* subspecies – Western Europe (non-breeding) population
22,222 individuals, wintering, representing an average of 1.7% of the population
(5 year peak mean 1996/7-2000/1)

Black-tailed godwit, *Limosa limosa*
*islandica* subspecies
1,113 individuals, wintering, representing an average of 3.2% of the population
(5 year peak mean 1996/7-2000/1)

Bar-tailed godwit , *Limosa lapponica*
*lapponica* subspecies
2,752 individuals, wintering, representing an average of 2.3% of the population
(5 year peak mean 1996/7-2000/1)

Common redshank, *Tringa totanus*
*brittanica* subspecies
4,632 individuals, wintering, representing an average of 3.6% of the population
(5 year peak mean 1996/7-2000/1)

Ramsar criterion 8
The Humber Estuary acts as an important migration route for both river lamprey *Lampetra fluviatilis* and sea lamprey *Petromyzon marinus* between coastal waters and their spawning areas.

Ramsar criterion 5

**Assemblages of international importance:**

**Species with peak counts in winter:**
153934 waterfowl (5 year peak mean 1998/99-2002/2003)

**Ramsar criterion 6 – species/populations occurring at levels of international importance.**

**Qualifying Species/populations (as identified at designation):**

**Species with peak counts in spring/autumn:**

| | |
|---|---|
| European golden plover , *Pluvialis apricaria apricaria*, P. a. altifrons Iceland & Faroes/E Atlantic | 17996 individuals, representing an average of 2.2% of the population (1996-2000) |
| Red knot , *Calidris canutus islandica*, W & Southern Africa | 18500 individuals, representing an average of 4.1% of the population (1996-2000) |
| (wintering) | |
| Dunlin , *Calidris alpina alpina*, W Siberia/W Europe | 20269 individuals, representing an average of 1.5% of the population (1996-2000) |
| Black-tailed godwit , *Limosa limosa islandica*, Iceland/W Europe | 915 individuals, representing an average of 2.6% of the population (1996-2000) |
| Common redshank , *Tringa totanus totanus*, | 7462 individuals, representing an average of 5.7% of the population (1996-2000) |

**Species with peak counts in winter:**

| | |
|---|---|
| Common shelduck , *Tadorna tadorna*, NW Europe | 4464 individuals, representing an average of 1.5% of the population (1996/7 to 2000/1) |
| European golden plover , *Pluvialis apricaria apricaria*, P. a. altifrons Iceland & Faroes/E Atlantic | 30709 individuals, representing an average of 3.8% of the population (1996/7 to 2000/1) |
| Red knot , *Calidris canutus islandica*, W & Southern Africa | 28165 individuals, representing an average of 6.3% of the population (1996/7 to 2000/1) |
| (wintering) | |
| Dunlin , *Calidris alpina alpina*, W Siberia/W Europe | 22222 individuals, representing an average of 1.7% of the population (1996/7 to 2000/1) |

| | |
|---|---|
| Black-tailed godwit , *Limosa limosa islandica*, Iceland/W Europe | 1113 individuals, representing an average of 3.2% of the population (1996/7 to 2000/1) |
| Bar-tailed godwit , *Limosa lapponica lapponica*, W Palearctic | 2752 individuals, representing an average of 2.3% of the population (1996/7 to 2000/1) |

Contemporary data and information on waterbird trends at this site and their regional (sub-national) and national contexts can be found in the Wetland Bird Survey report, which is updated annually. See www.bto.org/survey/webs/webs-alerts-index.htm.
See Sections 21/22 for details of noteworthy species
Details of bird species occuring at levels of National importance are given in Section 22

## 15. Biogeography (required when Criteria 1 and/or 3 and /or certain applications of Criterion 2 are applied to the designation):

Name the relevant biogeographic region that includes the Ramsar site, and identify the biogeographic regionalisation system that has been applied.

**a) biogeographic region:**

Atlantic

**b) biogeographic regionalisation scheme** (include reference citation):

Council Directive 92/43/EEC

## 16. Physical features of the site:

Describe, as appropriate, the geology, geomorphology; origins - natural or artificial; hydrology; soil type; water quality; water depth, water permanence; fluctuations in water level; tidal variations; downstream area; general climate, etc.

| | |
|---|---|
| Soil & geology | neutral, shingle, sand, mud, clay, alluvium, sedimentary, sandstone, sandstone/mudstone, limestone/chalk, gravel, nutrient-rich |
| Geomorphology and landscape | lowland, coastal, floodplain, shingle bar, intertidal sediments (including sandflat/mudflat), estuary, islands, cliffs |
| Nutrient status | eutrophic |
| pH | circumneutral |
| Salinity | brackish / mixosaline, fresh, saline / euhaline |
| Soil | mainly mineral |
| Water permanence | usually permanent |
| Summary of main climatic features | Annual averages (Cleethorpes, 1971–2000) (www.metoffice.com/climate/uk/averages/19712000/sites/cleethorpes.html)<br>Max. daily temperature: 13.1° C<br>Min. daily temperature: 6.4° C<br>Days of air frost: 29.0<br>Rainfall: 565.4 mm<br>Hrs. of sunshine: 1521.9 |

**General description of the Physical Features:**

The Humber estuary is approximately 70 km long from the limit of saline intrusion on the River Ouse at Boothferry to the estuary mouth at Spurn Head, where it enters the North Sea. The area of the estuary is approx. 365 km2, and it has a width of 6.6 km at the mouth.

The Humber is a macro-tidal estuary with a tidal range of 7.4 m, the second-largest range in the UK and comparable to other macro-tidal estuaries worldwide. It is a shallow and well mixed estuary, with an average depth of 6.5m rising to 13.2 m at the mouth.

The Humber is the second-largest coastal plain estuary in the UK, and the largest coastal plain estuary on the east coast of Britain. Suspended sediment concentrations are high, and are derived from a variety of sources, including marine sediments and eroding boulder clay along the Holderness coast. This is the northernmost of the English east coast estuaries whose structure and function is intimately linked with soft eroding shorelines.

Upstream from the Humber Bridge, the navigation channel undergoes major shifts from north to south banks. This section of the estuary is noteworthy for extensive mud and sand bars, which in places form semi-permanent islands.

The estuary covers the full salinity range from fully marine at the mouth of the estuary (Spurn Head) to the limit of saline intrusion on the Rivers Ouse and Trent) ). A salinity gradient from north to south bank is observed in the outer estuary, due to the incoming tide flowing along the north bank, while the fresh water keeps to the south bank as it discharges to the sea. As salinity declines upstream, reedbeds and brackish saltmarsh communities fringe the estuary..

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## 17. Physical features of the catchment area:

Describe the surface area, general geology and geomorphological features, general soil types, general land use, and climate (including climate type).

The Humber catchment covers an area of ca. 24,240 km2, more than 20% of the land area of England. Average annual precipitation in the upland areas of the catchment is as much as 1000 mm. Average freshwater flow into the Humber estuary from the rivers is 250 m3s-1, ranging from 60 m3s-1 in drier periods to 450 m3s-1 in wet periods. Peak flows of up to 1500 m3s-1 have been recorded during floods. The rivers Trent and Ouse, which provide the main fresh water flow into the Humber, drain large industrial and urban areas to the south and west (River Trent), and less densely populated agricultural areas to the north and west (River Ouse). The Trent/Ouse confluence is known as Trent Falls.

On the north bank of the Humber estuary the principal river is the river Hull, which flows through the city of Kingston-upon-Hull, and has a tidal length of 32 km, up to the Hempholme Weir. The Hull provides only about 1% of the freshwater input to the estuary. On the south bank, the River Ancholme enters the Humber at South Ferriby, but the tide is excluded by a sluice and a tidal lock. Altogether, the total tidal length of rivers and estuary is 313 km.

There are several major urban centres within the river catchments. Nottingham, Leicester, and the West Midlands/Birmingham conurbation are drained by the Trent, the Leeds-Bradford area in West Yorkshire is drained by the Aire/Calder and the Sheffield/Rotherham/Doncaster area in South Yorkshire is drained by the Don. There are also large rural regions, whose populations are currently experiencing high population growth, while the urban areas are showing a small decline. The 1992 population for the Ouse catchment was 4.1 million, and for the Trent catchment was 7.1 million. The population of Humberside, which comprises North and North-east Lincolnshire, the East Riding of Yorkshire, and Kingston-upon-Hull (Hull), was just under 0.9 million. Land use around the estuary itself is 50-98% agricultural, within only two areas of high population/ industry – the major conurbation around Kingston-upon-Hull (Hull) on the north bank, and several large industrial areas around Grimsby/ Immingham/ Cleesthorpes on the south bank.

The area around the Humber estuary is low-lying, and much land-claim of wetlands and supratidal zones, as well as parts of the intertidal zone, was carried out in the past two centuries. The mid to

outer estuary (Humber Bridge to Spurn Point) changed from a region of low water erosion in the 19th century to one of accretion in the 20th century, nonetheless a net loss of intertidal zone of some 3000 ha has taken place since the mid-19th century. Around the estuary some 894 km2 of land are below the 5 m contour, protected by extensive coastal defences. Most of the sediment entering the estuary comes from the North Sea, and a large part of it is believed to come from the continuing erosion of the Holderness Cliffs, which form the coastline to the north of the estuary mouth at Spurn Head. The estuary currently has approximately 1,775 ha of saltmarsh

## 18. Hydrological values:

Describe the functions and values of the wetland in groundwater recharge, flood control, sediment trapping, shoreline stabilization, etc.

Sediment trapping

## 19. Wetland types:

Marine/coastal wetland

| Code | Name | % Area |
|---|---|---|
| F | Estuarine waters | 66.8 |
| G | Tidal flats | 26.4 |
| H | Salt marshes | 4.7 |
| E | Sand / shingle shores (including dune systems) | 0.8 |
| 7 | Gravel / brick / clay pits | 0.5 |
| Q | Saline / brackish lakes: permanent | 0.3 |
| J | Coastal brackish / saline lagoons | 0.3 |
| Other | Other | 0.1 |
| 9 | Canals and drainage channels | 0.01 |
| Y | Freshwater springs | 0.01 |

## 20. General ecological features:

Provide further description, as appropriate, of the main habitats, vegetation types, plant and animal communities present in the Ramsar site, and the ecosystem services of the site and the benefits derived from them.

Description

Much of the intertidal area of the Humber Estuary consists of mudflats with fringing saltmarsh. There are smaller areas of intertidal sand flats, and sand dunes. The saltmarsh is both eroding and accreting; although coastal squeeze is resulting in net losses, and cord grass Spartina anglica is a major colonising species. In areas of reduced salinity such as the Upper Humber there are extensive areas of common reed Phragmites australis with some sea club-rush Bolboschoenus maritimus. Mid-level saltmarsh tends to be much more floristically diverse, and in the higher level marsh with its dendritic network of drainage channels, salt pans and borrow pits grasses dominate with thrift Armeria maritima where the marsh is grazed by cattle and sheep. Extensive areas of eel grass Zostera marina and Z. nolti have been known to occur at Spurn Bight, although in recent years records are limited. Behind the sandflats of the Cleethorpes coast the mature sand-dune vegetation contains some locally and nationally rare species including chestnut flat sedge Blysmus rufus, bulbous meadow grass Poa bulbosa and dense silky-bent Apera interrupta. The sand dunes, which cap the shingle spit that forms Spurn Peninsula are dominated by marram grass Ammophila arenaria and patches of dense sea buckthorn Hippophae rhamnoides.

Ecosystem services

Aesthetic

Education

Food

Recreation

Storm/wave protection

## 21. Noteworthy flora:

Provide additional information on particular species and why they are noteworthy (expanding as necessary on information provided in **12**. Justification for the application of the Criteria) indicating, e.g. which species/communities are unique, rare, endangered or biogeographically important, etc. *Do not include here taxonomic lists of species present – these may be supplied as supplementary information to the RIS.*

None reported

## 22. Noteworthy fauna:

Provide additional information on particular species and why they are noteworthy (expanding as necessary on information provided in **12**. Justification for the application of the Criteria) indicating, e.g. which species/communities are unique, rare, endangered or biogeographically important, etc., including count data. *Do not include here taxonomic lists of species present – these may be supplied as supplementary information to the RIS.*

**Birds**

**Species Information**

Species Information

Birds

Species currently occurring at levels of national importance:

Great bittern, *Botaurus stellaris*
*stellaris* subspecies – W Europe, NW Africa (breeding) population
2 booming males, breeding, representing an average of 10.5% of the GB population
(3 year mean 2000-2002)

Eurasian marsh harrier, *Circus aeruginosus*
Europe population
10 females, breeding, representing an average of 6.3% of the GB population
(5 year mean 1998-2002)

Pied avocet, *Recurvirostra avosetta*
Western Europe (breeding) population
64 pairs, breeding, representing an average of 8.6% of the GB population
(5 year mean 1998-2002)

Little tern, *Sterna albifrons*
*albifrons* subspecies, Western Europe (breeding) population
51 pairs, breeding, representing an average of 2.1% of the GB population
(5 year mean 1998-2002)

Dark-bellied brent goose, *Branta bernicla*
*bernicla* subspecies
2,098 individuals, wintering, representing an average of 2.1% of the GB population
(5 year peak mean 1996/7-2000/1)

Eurasian wigeon, *Anas penelope*
Northwestern Europe (non-breeding) population
5,044 individuals, wintering, representing an average of 1.2% of the GB population
(5 year peak mean 1996/7-2000/1)

Common teal, *Anas crecca*
*crecca* subspecies, Northwestern Europe (non-breeding population)
2,322 individuals, wintering, representing an average of 1.2% of the GB population

(5 year peak mean 1996/7-2000/1)

Common pochard, *Aythya ferina*
Northeastern & Northwestern Europe (non-breeding) population
719 individuals, wintering, representing an average of 1.2% of the GB population
(5 year peak mean 1996/7-2000/1)

Greater scaup, *Aythya marila*
*marila* subspecies, Western Europe (non-breeding) population
127 individuals, wintering, representing an average of 1.7% of the GB population
(5 year peak mean 1996/7-2000/1)

Common goldeneye, *Bucephala clangula*
*clangula* subspecies, Northwestern & Central Europe (non-breeding) population
467 individuals, wintering, representing an average of 1.9% of the GB population
(5 year peak mean 1996/7-2000/1)

Great bittern, *Botaurus stellaris*
*stellaris* subspecies – W Europe, NW Africa (breeding) population
4 individuals, wintering, representing an average of 4.0% of the GB population
(5 year peak mean 1998/9-2002/3)

Hen harrier, *Circus cyaneus*
Europe population
8 individuals, wintering, representing an average of 1.1% of the GB population
(5 year peak mean 1997/8-2001/2)

Eurasian oystercatcher, *Haematopus ostralegus*
*ostralegus* subspecies
3,503 individuals, wintering, representing an average of 1.1% of the GB population
(5 year peak mean 1996/7-2000/1)

Pied avocet, *Recurvirostra avosetta*
Western Europe (breeding) population
59 individuals, wintering, representing an average of 1.7% of the GB population
(5 year peak mean 1996/7-2000/1)

Great ringed plover, *Charadrius hiaticula*
*hiaticula* subspecies
403 individuals, wintering, representing an average of 1.2% of the GB population
(5 year peak mean 1996/7-2000/1)

Grey plover, *Pluvialis squatarola*
*squatarola* subspecies, Eastern Atlantic (non-breeding) population
1,704 individuals, wintering, representing an average of 3.2% of the GB population
(5 year peak mean 1996/7-2000/1)

Northern lapwing, *Vanellus vanellus*
Europe (breeding) population
22,765 individuals, wintering, representing an average of 1.1% of the GB population
(5 year peak mean 1996/7-2000/1)

Sanderling, *Calidris alba*
Eastern Atlantic (non-breeding) population

486 individuals, wintering, representing an average of 2.3% of the GB population
(5 year peak mean 1996/7-2000/1)

Curlew, *Numenius arquata*
*arquata* subspecies
3,253 individuals, wintering, representing an average of 2.2% of the GB population
(5 year peak mean 1996/7-2000/1)

Ruddy turnstone, *Arenaria interpres*
*interpres* subspecies, Northeastern Canada & Greenland (breeding) population
629 individuals, wintering, representing an average of 1.3% of the GB population
(5 year peak mean 1996/7-2000/1)

Great ringed plover, *Charadrius hiaticula*
*psammodroma* subspecies
1,766 individuals, passage, representing an average of 5.9% of the GB population
(5 year peak mean 1996-2000)

Grey plover, *Pluvialis squatarola*
*squatarola* subspecies, Eastern Atlantic (non-breeding) population
1,590 individuals, passage, representing an average of 2.3% of the GB population
(5 year peak mean 1996-2000)

Sanderling, *Calidris alba*
Eastern Atlantic (non-breeding) population
818 individuals, passage, representing an average of 2.7% of the GB population
(5 year peak mean 1996-2000)

Ruff, *Philomachus pugnax*
Western Africa (non-breeding) population
128 individuals, passage, representing an average of 1.4% of the GB population
(5 year peak mean 1996-2000)

Whimbrel, *Numenius phaeopus*
*islandicus* subspecies
113 individuals, passage, representing an average of 2.3% of the GB population
(5 year peak mean 1996-2000)

Common greenshank, *Tringa nebularia*
Northwestern Europe (breeding) population
77 individuals, passage, representing an average of 5.5% of the GB population
(5 year peak mean 1996-2000)

## 23. Social and cultural values:

Describe if the site has any general social and/or cultural values e.g. fisheries production, forestry, religious importance, archaeological sites, social relations with the wetland, etc. Distinguish between historical/archaeological/religious significance and current socio-economic values.

Aesthetic
Aquatic vegetation (e.g. reeds, willows, seaweed)
Archaeological/historical site
Environmental education/ interpretation
Fisheries production
Livestock grazing
Non-consumptive recreation

Sport fishing
Sport hunting
Tourism
Transportation/navigation

**b)** Is the site considered of international importance for holding, in addition to relevant ecological values, examples of significant cultural values, whether material or non-material, linked to its origin, conservation and/or ecological functioning? No

If Yes, describe this importance under one or more of the following categories:

i) sites which provide a model of wetland wise use, demonstrating the application of traditional knowledge and methods of management and use that maintain the ecological character of the wetland:

ii) sites which have exceptional cultural traditions or records of former civilizations that have influenced the ecological character of the wetland:

iii) sites where the ecological character of the wetland depends on the interaction with local communities or indigenous peoples:

iv) sites where relevant non-material values such as sacred sites are present and their existence is strongly linked with the maintenance of the ecological character of the wetland:

## 24. Land tenure/ownership:

| Ownership category | On-site | Off-site |
|---|---|---|
| Non-governmental organisation (NGO) | + | + |
| Local authority, municipality etc. | + | + |
| National/Crown Estate | + | + |
| Private | + | + |
| Public/communal | + | + |

## 25. Current land (including water) use:

| Activity | On-site | Off-site |
|---|---|---|
| Nature conservation | + | + |
| Tourism | + | + |
| Recreation | + | + |
| Current scientific research | + | |
| Cutting of vegetation (small-scale/subsistence) | + | |
| Fishing: commercial | + | + |
| Fishing: recreational/sport | + | + |
| Gathering of shellfish | + | + |
| Bait collection | + | + |
| Permanent arable agriculture | | + |
| Permanent pastoral agriculture | + | + |
| Hunting: recreational/sport | + | + |
| Industrial water supply | + | + |
| Industry | + | + |
| Sewage treatment/disposal | + | + |
| Harbour/port | + | + |

| | | |
|---|---|---|
| Flood control | + | + |
| Irrigation (incl. agricultural water supply) | | + |
| Mineral exploration (excl. hydrocarbons) | | + |
| Oil/gas exploration | + | + |
| Transport route | + | + |
| Domestic water supply | | + |
| Urban development | | + |
| Non-urbanised settlements | | + |
| Military activities | + | + |
| Horticulture (incl. market gardening) | | + |

## 26. Factors (past, present or potential) adversely affecting the site's ecological character, including changes in land (including water) use and development projects:

*Explanation of reporting category:*

1. *Those factors that are still operating, but it is unclear if they are under control, as there is a lag in showing the management or regulatory regime to be successful.*
2. *Those factors that are not currently being managed, or where the regulatory regime appears to have been ineffective so far.*

*NA = Not Applicable because no factors have been reported.*

| Adverse Factor Category | Reporting Category | Description of the problem (Newly reported Factors only) | On-Site | Off-Site | Major Impact? |
|---|---|---|---|---|---|
| Disturbance to vegetation through cutting / clearing | 1 | Reedbeds being cut and cleared on margins of pits associated with angling. Management agreements and enforcement to address. | + | | |
| Vegetation succession | 1 | Lack of reedbed management leading to scrub encroachment. Management agreement to address. | + | | |
| Water diversion for irrigation/domestic/industrial use | 1 | Abstraction causes reduced freshwater input. Review of consents well advanced but not yet implemented. | + | + | |
| Overfishing | 2 | Substantial lamprey by-catch in eel nets in River Ouse. | | + | |
| Pollution – domestic sewage | 1 | Reduced dissolved oxygen in River Ouse is a barrier to fish migration. Review of consents well advanced but not yet implemented. | + | + | + |
| Pollution – agricultural fertilisers | 1 | Reduced dissolved oxygen in River Ouse is a barrier to fish migration. To be addressed through Catchment Sensitive Farming Initiatives and implementation of Water Framework Directive. | + | + | + |
| Recreational/tourism disturbance (unspecified) | 1 | Particularly illegal access by motorised recreational vehicles and craft. Control through management scheme. | + | | |

| | | | | | |
|---|---|---|---|---|---|
| Other factor | 1 | Coastal squeeze causing loss of intertidal habitats and saltmarsh due to sea level rise and fixed defences. The Humber Flood Risk Management Strategy has been developed and is being implemented. | + | | + |
| | | | | | |

For category 2 factors only.
What measures have been taken / are planned / regulatory processes invoked, to mitigate the effect of these factors?
Overfishing - Overfishing – to be considered through an 'in-combination' assessment of possible factors as part of the Review of Consents exercise.

Is the site subject to adverse ecological change? YES

### 27. Conservation measures taken:

List national category and legal status of protected areas, including boundary relationships with the Ramsar site; management practices; whether an officially approved management plan exists and whether it is being implemented.

| Conservation measure | On-site | Off-site |
|---|---|---|
| Site/ Area of Special Scientific Interest (SSSI/ASSI) | + | + |
| National Nature Reserve (NNR) | + | |
| Special Protection Area (SPA) | + | |
| Land owned by a non-governmental organisation for nature conservation | + | + |
| Management agreement | + | + |
| Site management statement/plan implemented | + | |
| Area of Outstanding National Beauty (AONB) | | + |
| Special Area of Conservation (SAC) | + | |
| IUCN (1994) category IV | + | |

**b)** Describe any other current management practices:
The management of Ramsar sites in the UK is determined by either a formal management plan or through other management planning processes, and is overseen by the relevant statutory conservation agency. Details of the precise management practises are given in these documents.

### 28. Conservation measures proposed but not yet implemented:

e.g. management plan in preparation; official proposal as a legally protected area, etc.

No information available

### 29. Current scientific research and facilities:

e.g. details of current research projects, including biodiversity monitoring; existence of a field research station, etc.

**Fauna.**
Numbers of migratory and wintering wildfowl and waders are monitored annually as part of the national Wetland Birds Survey (WeBS) organised by the British Trust for Ornithology, Wildfowl & Wetlands Trust, the Royal Society for the Protection of Birds and the Joint Nature Conservation Committee.
Seal populations are monitored by the Sea Mammal Research Unit
Humber Wader Ringing Group
Spurn Bird Observatory
National Nature Reserve monitoring

**Environment.**
Institute of Estuarine & Coastal Studies, Hull: various
Industrial Concerns: monitoring on behalf of companies such as Associated British Ports and BP
Environment Agency monitoring: various
Geomorphological studies associated with shoreline management planning
National Nature Reserve monitoring

### 30. Current communications, education and public awareness (CEPA) activities related to or benefiting the site:

e.g. visitor centre, observation hides and nature trails, information booklets, facilities for school visits, etc.

There are a four National Nature Reserves with associated facilities within the Ramsar site (Spurn, Far Ings, Donna Nook and Saltfleetby – Theddlethorpe Dunes) and a number of other visitor, information and/or education centres including the Spurn Bird Observatory, the Cleethorpes Discovery Centre, Water's Edge and Far Ings. A wide range of Humber wide and area-specific information is available through a range of media (eg leaflets, displays, internet etc) including 'Humber Estuary European Marine Site Codes of Conduct' developed with a range of stakeholders to cover a range of recreational and educational activities and 'Coastal Futures' – a partnership project working with local communities affected by flood risk and associated issues including managed realignment includes proactive education work within schools.

### 31. Current recreation and tourism:

State if the wetland is used for recreation/tourism; indicate type(s) and their frequency/intensity.

**Activities, Facilities provided and Seasonality.**
Sailing: marinas at Brough, Winteringham, Hull, Grimsby and South Ferriby.

Bathing etc: Cleethorpes (some 6m visitors/yr).

Walking/Horse riding: throughout

Beach fishing, match sea-fishing, non-commercial bait digging.

Non-commercial samphire collection

Wildfowling

Tourist amusements: Cleethorpes.

Bird watching: throughout but particularly at Blacktoft Sands RSPB reserve and the four National Nature Reserves.

### 32. Jurisdiction:

Include territorial, e.g. state/region, and functional/sectoral, e.g. Dept. of Agriculture/Dept. of Environment, etc.

Head, Natura 2000 and Ramsar Team, Department for Environment, Food and Rural Affairs, European Wildlife Division, Zone 1/07, Temple Quay House, 2 The Square, Temple Quay, Bristol, BS1 6EB

### 33. Management authority:

Provide the name and address of the local office(s) of the agency(ies) or organisation(s) directly responsible for managing the wetland. Wherever possible provide also the title and/or name of the person or persons in this office with responsibility for the wetland.

Site Designations Manager, English Nature, Sites and Surveillance Team, Northminster House, Northminster Road, Peterborough, PE1 1UA, UK

### 34. Bibliographical references:

Scientific/technical references only. If biogeographic regionalisation scheme applied (see **15** above), list full reference citation for the scheme.

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Site-relevant references

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# Appendix 5: Seal Populations Management 2021

# Scientific Advice on Matters Related to the Management of Seal Populations: 2021

## Natural Environment Research Council

## Special Committee on Seals

# Executive Summary

Under the Conservation of Seals Act 1970 and the Marine (Scotland) Act 2010, the Natural Environment Research Council (NERC) has a duty to provide scientific advice to government on matters related to the management of UK seal populations. NERC has appointed a Special Committee on Seals (SCOS) to formulate this advice. Questions on a wide range of management and conservation issues are received from the UK government and devolved administrations. In 2021, thirty-six questions were received from Marine Scotland, Defra and Natural Resources Wales. SCOS's answers to these questions are provided in detail in the main Advice below and summarised here.

**Current status of British grey seals** (*Halichoerus grypus*)

Grey seal population trends are assessed from counts of pups born during the autumn breeding season, when females congregate on land to give birth. Outside of the breeding season animals may re-distribute themselves, thus, regional differences in population estimates do not necessarily reflect the abundance of animals in each region at other times of the year.

The most recent synoptic census of the principal grey seal breeding sites in Orkney, the Inner and Outer Hebrides, the Firth of Forth and sites in eastern England was carried out in 2019. The results, together with a correction for less frequently monitored sites, produce an estimate of 67,850 (approximate 95% CI: 60,500-75,100) pups born throughout the UK in 2019 (Table S1).

The pup production estimates are converted to estimates of total population size (1+ aged population at the start of the breeding season) using a mathematical model. The population model provided an estimate of **157,300** individuals (approximate 95% CI 144,600-169,400)**.** The UK currently holds approximately 35% of the world population and 82% of the European population of grey seals.

**Table S1.** Grey seal pup production by country (based on 2019 pup production estimates), and total population estimates at the start of the 2020 breeding season. Pup production numbers rounded to nearest 50 pups and total population rounded to nearest 100.

| Location | Pup production in 2019 | 2020 Population estimate |
|---|---|---|
| **England** | **11,300** | **30,700** |
| **Wales** | **2,250** | **5,200** |
| **Scotland** | **54,050** | **120,800** |
| **Northern Ireland** | **250** | **600** |
| **Total UK** | **67,850** | **157,300** |

The overall UK pup production increased by <1.5% p.a. between 2016 and 2019. Growth was mainly limited to the North Sea colonies along the east coast of Scotland and England. The combined 2019 pup production estimate in the Inner and Outer Hebrides and Orkney was 3.3% lower than the 2016 estimate, whereas the production for the North Sea colonies increased by 23% over the same period.

**Current status of British harbour seals** (*Phoca vitulina*)

Harbour seals are counted while they are on land during their August moult, giving a minimum estimate of population size. Not all areas are counted every year, but the aim is to cover the UK coast every 5 years. Due to Covid restrictions through summer 2020, no large-scale surveys of

Scottish harbour seal populations were undertaken. However, a complete survey of the East Anglian coast from Donna Nook to Scroby Sands was completed in 2020 and three further surveys of that area were carried out in August 2021.

The best estimate of the UK harbour seal population in 2020 is 43,750 (approximate 95% CI: 35,800-58,300). This is derived by scaling the most recent composite count of 31,500, (based on surveys between 2016 and 2021) by the estimated proportion hauled out during the surveys (0.72 (95% CI: 0.54-0.88)). Overall, the UK population has increased since the late 2000s and is close to the late 1990s level prior to the 2002 Phocine Distemper Virus (PDV) epizootic. However, there are significant differences in the population dynamics between regions.

Until recently, harbour seal populations along the English East coast had generally increased year on year, with those increases punctuated by major declines associated with two major PDV epizootics in 1988 and 2002. However, the 2019 count in the large Southeast England Seal Management Unit (SMU) was approximately 25% lower than the mean of the previous five years. Counts for 2020 and 2021 confirm that the population has declined. The total count for the sites between Donna Nook in Lincolnshire and Scroby Sands in Norfolk, has declined by approximately 38% compared to the mean of the previous five years (2019–2021 mean = 3080; 2014-2018 mean = 4296). This decline is a clear cause for concern and emergency funding for additional surveys has been provided by Defra. A proposed programme of research to investigate the causes of this decline is being developed.

Populations along the east coast of Scotland and in the Northern Isles have generally declined since the early 2000s. The recorded declines have differed in intensity but in all areas the current population size is at least 40% below the pre-2002 level. Populations in North Coast & Orkney SMU and in the Tay and Eden SAC are continuing to decline. Although continued declines are not evident in Shetland or the Moray Firth, there is no indication of recovery.

Populations in western Scotland are either stable or increasing. Counts in the central and northern sections of the large West Scotland SMU and the Southwest Scotland SMU have been increasing since the 1990s and in all other areas they have remained stable. In Northern Ireland, the population appeared to have declined slowly after 2002 but has been apparently stable since 2011.

**Table S2.** UK harbour seal population estimates based on counts during the moult; rounded to the nearest 100.

| Location | Most recent count (2016-2021) | Total Population estimates with 95% CIs |
|---|---|---|
| **England** | **3,600[1]** | **5,000 (95% CI 4,100-6,700)** |
| **Wales** | **<10[2]** | **<15** |
| **Scotland** | **26,800[3]** | **37,200 (95% CI 30.400-49,600)** |
| **Northern Ireland** | **1,000** | **1,400 (95% CI 1,100-1,900)** |
| **Total UK** | **31,500** | **43,750 (95% CI 36,000-58,700)** |

Knowledge of UK harbour seal demographic parameters (i.e., vital rates) is limited and therefore inferences about the population dynamics rely largely on count data from the moulting surveys.

Information on the causes of the declines in harbour seals in some Scottish SMUs is required for SCOS to advise on appropriate conservation actions. A wide range of potential causes have been discussed at previous SCOS meetings. Details of the current state of knowledge for each of the potential drivers of decline were discussed and a summary is presented in Table 9. This identifies three ultimate causes as likely drivers of the declines; prey quality and availability,

competition with other marine predators, and predation by killer whales and grey seals. Other potential contributing factors include disease and exposure to toxins from harmful algae. Importantly, several factors have been ruled out or are considered unlikely to be driving the declines, these include fisheries bycatch, deliberate killing, disturbance at haulout sites, entanglement, ingestion of micro-plastics and Persistent Organic Pollutants (POPs).

**Seal management**

Conservation orders for harbour seals are currently in place for the Western Isles, Northern Isles and down the Scottish East Coast as far as the border. SCOS discussed the requirement for continuation of the Seal Conservation Area designations in Scotland and recommended that orders for the Northern Isles and East Scotland SMUs should remain in place. However, the continued increases in the Outer Hebrides harbour seal population means that the designation could be removed. SCOS also provided advice on scientific criteria for designating and revoking Seal Conservation Area designations.

The Potential Biological Removals (PBR) is a relatively simple metric developed to provide advice on the levels of removals from a marine mammal population that would still allow the population to approach a defined target. PBR estimates for both harbour and grey seals for each seal management unit in Scotland are presented. As there were no changes to the harbour seal or grey seal summer population estimates from Scotland the values are unchanged from last year's recommendations.

The SCOS discussed the merits of altering the existing Seal Management Unit areas and concluded that there was no scientific merit in coalescing units. SCOS recognised the difficulty of managing geographically widespread threats such as bycatch but concluded that these issues can best be addressed by combining the individual SMU populations where and when appropriate.

SCOS also discussed the need to designate additional Sites of Special Scientific Interest (SSSIs) for seals and provided advice to Defra and Natural England on the most important seal sites in each SMU.

**Seal Bycatch**

The most recent estimated bycatch of seals in UK fisheries was in 2019. The total estimate was 488 animals (95% CI: 375-872). This is almost exclusively in gill net fisheries and 81% of the bycatch occurs in the southwest, in ICES area VII.

Statistical analyses have not found any strong seasonal signal to seal bycatch rate. All recorded species IDs in the southwest are of grey seals, as there are few harbour seals west of the Solent area. Most bycaught animals are small. SCOS recommend that effort should be directed towards identifying the species and if possible, the sex and age structure, and genetic information from the bycaught seals. This could be achieved by obtaining photographs of the animals and taking a skin sample.

Estimated bycatch levels in the Western Channel and Celtic Sea exceed the PBR for the combined grey seal populations of SW England, Wales, and Ireland. Despite the bycatch, grey seal populations in Wales and Ireland are probably stable, suggesting that bycaught seals include animals that may have originated from the large, adjacent breeding populations in western Scotland.

**Interactions with Fisheries**

SCOS discussed a range of topics related to seal interactions with fisheries, aquaculture, and the wider marine environment.

**Interactions with Marine Renewable Energy developments**

SCOS discussed the current state of knowledge on seal interactions with marine renewable energy devices, including recent issues of seal entrapment in underwater structures. An update on interactions between seals and marine renewables is presented along with a review of emerging technologies and methodologies that may be useful for investigating the behavioural and physiological consequences of interactions.

**Threats to UK seals**

SCOS discussed the available information on the likely impacts of climate change on UK seal populations and an updated review of likely impacts is presented together with a review of the current and potential future threats to UK seal populations. This includes available information on effects of macro- and micro-plastic pollution, entanglement, pollutants including POPs, plasticizers and pharmaceuticals, harmful algae, fisheries interactions, disturbance, infectious diseases, and predation risk.

There was considerable discussion on the likely effects of disturbance. SCOS recognise the increasing public concern over disturbance, but conclude that, while disturbance can clearly affect individual animal welfare, there is no evidence that disturbance at haulout sites is currently a concern at the population level. An extensive review of the available information on disturbance of seals is presented.

# Contents

# Scientific Advice

## Background

Under the Conservation of Seals Act 1970 and the Marine (Scotland) Act 2010, the Natural Environment Research Council (NERC) has a duty to provide scientific advice to government on matters related to the management of seal populations. NERC has appointed a Special Committee on Seals (SCOS) to formulate this advice so that it may discharge this statutory duty. Terms of Reference for SCOS and its current membership are given in Annex I.

Formal advice is given annually based on the latest scientific information provided to SCOS by the Sea Mammal Research Unit (SMRU). SMRU is an interdisciplinary research group at the University of St Andrews which receives National Capability funding from NERC to fulfil its statutory requirements and is a delivery partner of the National Oceanography Centre. SMRU also provides government with scientific reviews of licence applications to shoot seals; information and advice in response to parliamentary questions and correspondence; and responds on behalf of NERC to questions raised by government departments about the management of marine mammals in general.

This report provides scientific advice on matters related to the management of seal populations for the year 2021. It begins with some general information on British seals, gives information on their current status, and addresses specific questions raised by Marine Scotland (MS) and the Department of the Environment, Food and Rural Affairs (Defra) and Natural Resources Wales (NRW).

Briefing papers which provide additional scientific background for the advice are appended to the main report (Annex lll).

SMRU's long-term funding has recently seen a substantial reduction. This will have an impact on the frequency and types of advice that SMRU will be able to deliver and research activities are being reprioritised as necessary.

### General information on British seals

Two species of seal live and breed in UK waters: grey seals (*Halichoerus grypus*) and harbour (also called as common) seals (*Phoca vitulina*). Grey seals only occur in the North Atlantic, Barents and Baltic Sea with their main concentrations on the east coast of Canada and United States of America and in north-west Europe. Harbour seals have a circumpolar distribution in the Northern Hemisphere and are divided into five sub-species. The population in European waters represents one subspecies (*Phoca vitulina vitulina*). Other species that occasionally occur in UK coastal waters, include ringed seals (*Pusa hispida*), harp seals (*Pagophilus groenlandica*), bearded seals (*Erignathus barbatus*), hooded seals (*Cystophora cristata*) and walrus (*Odobenus rosmarus*), all of which are Arctic species.

Grey seals

Grey seals are the larger of the two resident UK seal species. Adult males can weigh over 300 kg while the females weigh around 150-200 kg. Grey seals are long-lived animals. Males may live for over 20 years and begin to breed from about age 10. Females often live for over 30 years and begin to breed at about age 5.

They are generalist feeders, foraging mainly on the seabed at depths of up to 100 m, although they are capable of feeding at all the depths found across the UK continental shelf. They take a wide variety of prey including sandeels, gadoids (cod, whiting, haddock, ling), and flatfish (plaice, sole, flounder, dab). Amongst these, sandeels are typically the predominant prey species. Diet varies seasonally and from region to region. Food requirements depend on the size of the seal and fat content (oiliness) of the prey, but an average consumption estimate for an adult is 4 to 7 kg per seal per day depending on the prey species.

Grey seals forage in the open sea and return regularly to haul out on land where they rest, moult and breed. They may range widely to forage and frequently travel over 100 km between haulout sites. Foraging trips can last anywhere between 1 and 30 days. Compared with other times of the year, grey seals in the UK spend longer hauled out during their annual moult (between December and April) and during their breeding season (between August and December). Tracking of individual seals has shown that most foraging probably occurs within 100 km of a haulout site although they can feed up to several hundred kilometres offshore. Individual grey seals based at a specific haulout site often make repeated trips to the same region offshore but will occasionally move to a new haulout site and begin foraging in a new region. Movements of grey seals between haulout sites in the North Sea and haulout sites in the Outer Hebrides have been recorded as well as movements from sites in Wales and NW France, to the Inner Hebrides.

Globally there are three centres of grey seal abundance: one in eastern Canada and the north-east USA, a second around the coast of the UK, especially in Scottish coastal waters, and a third, smaller group in the Baltic Sea. All populations are increasing, although numbers are still relatively low in the Baltic where the population was drastically reduced by human exploitation and reproductive failure, probably due to pollution. In the UK and Canadian populations, there are clear indications of a slowing down in population growth in recent years.

Approximately 36% of the world's grey seals breed in the UK and 80% of these breed at colonies in Scotland with the main concentrations in the Outer Hebrides and in Orkney. There are large and rapidly growing breeding colonies on the east coast of Scotland and England with fastest growth in the central and southern North Sea. There are also breeding colonies in Shetland, on the north and northeast coasts of mainland Britain and smaller populations in Wales and southwest England.

In the UK, grey seals typically breed on remote, uninhabited islands or coasts and in small numbers in caves. Preferred breeding locations allow females with young pups to move inland away from busy beaches and storm surges. Seals breeding on exposed, cliff-backed beaches and in caves may have limited opportunity to avoid storm surges and may experience higher levels of pup mortality as a result. Breeding colonies vary considerably in size; at the smallest only a handful of pups are born, while at the biggest, over 5,000 pups are born annually. In the past, grey seals have been highly sensitive to disturbance by humans, hence their preference for remote breeding sites. However, at one UK mainland colony at Donna Nook in Lincolnshire, seals became habituated to human disturbance in the 1990s and that tolerance of human activity has spread as the population has grown in the southern North Sea colonies. Several mainland colonies now receive tens of thousands of visitors each breeding season with no apparent impact on the number of breeding seals.

UK grey seals breed in the autumn, but there is a clockwise cline in the mean birth date around the UK. The majority of pups in SW Britain are born between August and October; in north and west Scotland pupping occurs mainly between September and late November; and in eastern England pupping occurs mainly between early November to mid-December.

Female grey seals give birth to a single white coated pup, which they suckle for 17 to 23 days. Pups moult their white natal coat (also called “lanugo”) around the time of weaning and then remain on the breeding colony for up to two or three weeks before going to sea. Mating occurs at the end of lactation and then adult females depart to sea and provide no further parental care. In general, female grey seals return to the same colony to breed in successive years and often breed at the colony in which they were born. Grey seals have a polygynous breeding system, with dominant males monopolising access to females as they come into oestrus. The degree of polygyny varies regionally and in relation to the breeding habitat. Males breeding on dense, open colonies are more able to restrict access to a larger number of females (especially where they congregate around pools) than males breeding in sparse colonies or those with restricted breeding space, such as in caves or on cliff-backed beaches.

Harbour seals

Adult harbour seals typically weigh 80-100 kg. Males are slightly larger than females. Like grey seals, harbour seals are long-lived with individuals living up to 20-30 years. They normally feed within 40-50 km around their haul out sites. They take a wide variety of prey including sandeels, gadoids, herring and sprat, flatfish, octopus and squid. Diet varies seasonally and from region to region. Because of their smaller size, harbour seals eat less food than grey seals; 3-5 kg per adult seal per day depending on the prey species.

Harbour seals come ashore in sheltered waters, often on sandbanks and in estuaries, but also in rocky areas. They give birth to their pups in June and July and moult in August. At these, as well as other times of the year, harbour seals haul out on land regularly in a pattern that is often related to the tidal cycle. Harbour seal pups are born having shed their white coat *in utero* and can swim almost immediately.

Harbour seals are found around the coasts of the North Atlantic and North Pacific from the subtropics to the Arctic. Five subspecies of harbour seal are recognized. The European subspecies, *Phoca vitulina vitulina*, ranges from northern France in the south, to Iceland in the west, to Svalbard in the north and to the Baltic Sea in the east. The largest population of harbour seals in Europe is in the Wadden Sea.

Approximately 32% of European harbour seals are found in the UK. The proportion has declined from approximately 40% in 2002 due to the more rapid recovery and higher sustained rates of increase in the Wadden Sea population. Harbour seals are widespread around the west coast of Scotland and throughout the Hebrides and Northern Isles. On the east coast, their distribution is more restricted with concentrations in the major estuaries of the Thames, The Wash, the Firths of Forth and Tay, and the Moray Firth. Scotland holds approximately 85% of the UK harbour seal population, with 12% in England and 3% in Northern Ireland.

The population along the east coast of England (mainly in The Wash) was reduced by 52% following the 1988 phocine distemper virus (PDV) epizootic. A second epizootic in 2002 resulted in a decline of 22% in The Wash but had limited impact elsewhere in Britain. Counts in the Wash and eastern England did not demonstrate any immediate recovery from the 2002 epizootic and continued to decline until 2006. The counts increased rapidly from 2006 to 2012 but appeared to have remained relatively constant since until a decline began in 2019. In contrast, the adjacent European colonies in the Wadden Sea experienced continuous rapid growth after the epizootic, but again, the counts over the last 5 years suggest that the rate of increase has slowed dramatically.

Major declines have now been documented in several harbour seal populations around Scotland, with declines since the late 1990s of 85% in Orkney, 47% in Shetland and 95% in the Firth of Tay. However, the pattern of declines is not universal. The Moray Firth count apparently declined by 50% before 2005 and has fluctuated since, showing no significant trend since 2003. The Outer Hebrides apparently declined by 35% between 1996 and 2008 but has shown no significant trend over the entire time series. The West Scotland population is now the largest population in the UK and in 2018 was approximately twice the size it was in the mid-1990s. The recorded declines are not thought to have been linked to the 2002 PDV epizootic as there was very little recorded mortality of harbour seals in Scotland in 2002.

Historical status

We have little information on the historical status of seals in UK waters. Remains have been found in some of the earliest human settlements in Scotland and they were routinely harvested for meat, skins and oil until the early 1900s. Harbour seals were heavily exploited mainly for pup skins until the early 1970s in Shetland and The Wash. Grey seal pups were taken in Orkney until the early 1980s, partly for commercial exploitation and partly as a population control measure. Large scale culls of grey seals in the North Sea, Orkney and Hebrides were carried out in the 1960s and 1970s as population control measures. Grey seal pup production monitoring started in the late 1950s and early 1960s and numbers have increased consistently since. However, in recent years, there has been a significant reduction in the rate of increase.

Boat surveys of harbour seals in Scotland in the 1970s showed numbers to be considerably lower than in the aerial surveys, which started in the late 1980s, but it is not possible to distinguish the apparent change in numbers from the effects of more efficient counting methods. After harvesting ended in the early 1970s, regular surveys of English harbour seal populations indicated a gradual recovery, punctuated by two major reductions due to PDV epizootics in 1988 and 2002 respectively.

Legislation protecting seals

The Grey Seal (Protection) Act, 1914, provided the first legal protection for any mammal in the UK because of a perception that seal populations were very low and there was a need to protect them. In the UK seals are protected under the Conservation of Seals Act 1970 (England, and Wales), the Marine (Scotland) Act 2010 and The Wildlife (Northern Ireland) Order 1985.

In Scotland, the Conservation of Seals Act was superseded by the Marine (Scotland) Act 2010. As a result, the conservation orders in Scotland have been superseded by the designation of seal conservation areas under the provisions of the Marine (Scotland) Act 2010. Conservation areas have been established for the Northern Isles, the Outer Hebrides and the East coast of Scotland. In general, seals in Scotland are afforded protection under Section 6 of the Act which prohibits the killing or taking of seals except under licence. In the original version of the Act, licences could be granted for ten specific reasons, including to conserve natural habitats, for scientific, research or educational purposes, to protect the health and welfare of farmed fish and to prevent serious damage to fisheries or fish farms' aquaculture activities. Recent legislative changes in Scotland, via the Animals and Wildlife (Penalties, Protections and Powers) (Scotland) Act 2020, have amended the Marine (Scotland) Act 2010 to remove the provision to grant licences authorising the killing or taking of seals to protect the health and welfare of farmed fish, and to prevent serious damage to fisheries or fish farms.

Similar legislative changes in England and Wales, and Northern Ireland via Schedule 9 of the Fisheries Act 2020, amends the Conservation of Seals Act 1970 and the Wildlife (Northern

Ireland) Order 1985, prohibiting the intentional or reckless killing, injuring or taking of seals and removing the provision to grant licences for the purposes of protection, promotion or development of commercial fisheries or aquaculture activities. These changes were enacted to ensure compliance with the US Marine Mammal Protection Act Import Provision Rule.

In Scotland it also is now an offence to 'intentionally or recklessly harass' seals at designated haulout sites. NERC (through SMRU) provides advice on all licence applications and haulout designations.

In Northern Ireland It is an offence to intentionally, or recklessly disturb seals at any haulout site under Article 10 of Wildlife and Natural Environment Act (Northern Ireland) 2011.

Both grey and harbour seals are listed in Annex II of the EU Habitats Directive, requiring specific areas to be designated for their protection. To date, 16 Special Areas of Conservation (SACs) have been designated specifically for seals. Seals are features of qualifying interest in seven additional SACs. The six-yearly SAC reporting cycle requires formal status assessments for these sites. These were last completed in 2019.

## Questions

## Seal Populations

| | |
|---|---|
| **1. What are the latest estimates of the number of seals in UK waters?** | **MS Q1<br>Defra Q1<br>NRW Q1** |

### Current status of British grey seals

**The total UK grey seal population of at the start of the 2020 breeding season (before pups are born) is estimated at 157,300 (approximate 95% CI 144,600-169,400). The estimate is based on the most recent pup production estimates in 2019 for aerial surveyed colonies in Orkney, the Inner and Outer Hebrides and the Firth of Forth, and from ground surveyed colonies and the colonies on the east coast of England.**

**Grey seal population trends are assessed from the counts of pups born during the autumn breeding season, when females congregate on land to give birth. Outside of the breeding season animals may re-distribute themselves, thus, regional differences in population estimates do not necessarily reflect the abundance of animals in each region at other times of the year.**

**The most recent synoptic census of the principal grey seal breeding sites in Orkney, the Inner and Outer Hebrides, the Firth of Forth and sites in eastern England was carried out in 2019. The results, together with a correction for less frequently monitored sites, produce an estimate of 67,850 (approximate 95% CI 60,500-75,100) pups born throughout the UK (Tables 1 & 2) in 2019.**

**The regional pup production estimates for 1984 to 2019 for the Inner Hebrides, Outer Hebrides and Orkney and the North Sea colonies were converted to estimates of total population size (1+ aged population, referred to as 'adult population') at the start of the 2020 breeding season, using a mathematical model of British grey seal population dynamics. The population estimate is then corrected to account for pup production at less frequently monitored colonies. The stages in the process, the fitting of the pup production model and the observed trends are described below and presented in SCOS BPs 21/05, Russell *et al.* (2019) and Thomas *et al.* (2019).**

**The overall UK pup production increased by <1.5% p.a. between 2016 and 2019. Growth was mainly limited to the North Sea colonies along the east coast of Scotland and England. The combined 2019 pup production estimate in the Inner and Outer Hebrides and Orkney was 3.3% lower than the 2016 estimate, whereas the production for the North Sea colonies increased by 23% over the same period.**

### Pup Production

The pup production estimates from 2019 aerial surveys ground counts combined with estimates from less frequently aerially surveyed colonies, indicated that approximately 67,850 (approximate 95% CI 50,250-85,400) grey seal pups were born in 2019 across all UK colonies, including the Isle of Man.

Major colonies in Scotland are now surveyed biennially (see SCOS-BP 14/01). Aerial surveys to estimate grey seal pup production were carried out in Scotland in 2019, using a digital camera system (SCOS-BP 21/01). Counts then go into a model to estimate pup production on the biennially monitored colonies around Scotland. Pup- production estimates for colonies on the East coast of England were obtained from ground counts in 2019.

**Table 1**. Grey seal pup production by country (based on 2019 pup production estimates), and total population estimates at the start of the 2020 breeding season. Numbers rounded to nearest 50 pups.

| Location | Pup production in 2019 | 2020 Population estimate*** |
|---|---|---|
| **England**** | **11,300*** | **30,700** |
| **Wales** | **2,250*** | **5,200** |
| **Scotland** | **54,050*** | **120,800** |
| **Northern Ireland** | **250*** | **600** |
| **Total UK** | **67,850** | **157,300** |

**Includes estimated production for less frequently monitored colonies, see SCOS-BP 21/01 and 20/04 for details. Populations associated with these estimates were based on the region-specific ratios of pups to total population for the regularly monitored sites, while the UK-wide average ratio was used for the less frequently monitored sites.*

*** Isle of Man count included with England*

**** Populations derived from the 2019 pup production estimates and represents the total population alive on first day of 2020 breeding season. Confidence intervals are not provided as the national populations have been derived from regional population estimates scaled by proportions of that region's pup production in each country. Estimates were rounded to nearest 100 seals.*

Regional pup production estimates in 2019 at biennially air surveyed and annually ground counted colonies (rounded to nearest 50 pups) were: 4,450 (approximate[1] 95% CI 3,300-5,600) in the Inner Hebrides, 16,100 (95% CI 12,000-20,300) in the Outer Hebrides, 22,150 (95% CI 16,400-27,900) in Orkney and 18,000 (95% CI 13,300-22,600) at the North Sea colonies (including Isle of May, Fast Castle, Farne Islands, Donna Nook, Blakeney Point and Horsey/Winterton) (SCOS-BP 21/01).

An additional 7,200 pups were estimated to have been born in Wales and at less frequently surveyed colonies in Southwest England, Northern Ireland, Shetland, and at scattered locations throughout Scotland (SCOS-BP 20/04; 21/01).

## Trends in pup production

There has been a continual increase in the total UK pup production since regular surveys began in the 1960s (Figure 1) (see SCOS-BP 18/01 & Russell *et al.* (2019) for details). This increase has continued over the last survey interval, but the overall increase is small, <1.4% p.a. and is mainly limited to the North Sea colonies along the east coast of Scotland and England. The combined 2019 pup production estimate in the Inner and Outer Hebrides and Orkney was 3.3% lower than the 2016 estimate (equivalent to a 1% p.a. decrease), whereas the production for the North Sea colonies increased by 23% over the same period (equivalent to a 7% p.a. increase) (Table 2).

[1] Approximate CIs based on the overall CI of the total pup production estimated by the population dynamics model: see SCOS-BP 18/03. This will likely overestimate the CI for individual regions

Interpretation of the trends in pup production are complicated by a transition to a digital camera system and reduced survey altitude between 2010 and 2012. This affected both the efficiency of counting and the stage classification of pup images. In all three regions where the pup production is estimated entirely from aerial survey counts there was an apparent step change coincident with this transition. For logistical and technical reasons, it has not been possible to directly cross-calibrate the two methods. However, as the new time series extends it becomes easier to estimate the magnitude and nature of these changes, and therefore to determine appropriate correction factors to be applied to obtain consistent time series.

To make it easier to compare population estimates during the August surveys and the pup production data it is suggested that the previous naming convention for grey seal population model regions should be altered to match the Seal Management Units (SMUs) in which they are found: the Inner Hebrides is equivalent to West Scotland SMU, Outer Hebrides is equivalent to Western Isles SMU, Orkney is equivalent to the North Coast and Orkney SMU and Firth of Forth colonies are equivalent to Southeast Scotland SMU. For the rest of this section the SMU names will be used.

Russell *et al.* (SCOS-BP 21/03) fitted a series of models to the pup production estimates for each SMU. For Scottish SMUs where the pup productions were estimated from SMRU aerial surveys (all except Shetland and Moray Firth), the model fitted a step increase in pup abundance between 2010 (the last film survey) and 2012 (the first digital survey) to account for any artificial increase in pup counts that resulted from the change in aerial survey method. To maximise the data available to fit this jump, all applicable SMUs were modelled within a single GAM (number of knots limited to k=5), allowing a different temporal trend for each SMU but a single adjustment for the change in survey methods. Once fitted, the single adjustment allows the trends in each SMU to be examined excluding this jump.

The final model estimating trends in grey seal pup production for aerially surveyed SMUs included an estimated 27 % jump (95% CI: 16.7 – 37.5) in pup production associated with the change from film to digital (delta AIC of -30 compared to a model without the jump).

A detailed description of the trends in pup production up to 2010, at regional and colony levels was presented in Russell *et al.* (2019) and summarised in SCOS 2020. The recent analysis extends the fitted trends through the change in methodology in 2012, allowing examination of trends through the entire time series including the past decade.

Figure numbers here refer to figures in SCOS-BP 21/03, where a full description of the model selection process and the resulting trends can be found. Briefly, pup production had levelled off in West Scotland (early to mid - 1990s; Fig 2i c SCOS-BP 21/03) and Western Isles (mid 1990s; Fig 3c SCOS-BP 21/03) (Russell *et al.,* 2019), but the 2016 and 2019 estimates were higher than the first two digital survey estimates (2012 and 2014). For the Western Isles this resulted in a slight recent increase in the mean predicted trend. This apparent increase is reflected in the Monach Islands SAC which accounts for >75% of the SMU pup production. In contrast, pup production in North Rona is continuing to decline.

In the North Coast & Orkney SMU (Fig 4c SCOS-BP 21/03), pup production has remained stable since around 2000. The Faray & Holm of Faray SAC estimates indicate that the colony may be in decline. A declining trend was fitted for Shetland (Fig 5c SCOS-BP 21/03). However, the time-series comprised a subset of colonies and was based on peak counts (which are sensitive to effort, i.e., number and timing of counts) and thus there are doubts as to how robustly these trends represent Shetland as a whole.

The Moray Firth SMU (Fig 6c SCOS-BP 21/03) estimates show pup production is increasing though it should be noted that there is a limited temporal extent to the data and pup production within this SMU is difficult to accurately estimate.

The East Scotland SMU (Fig 7c SCOS-BP 21/03) is continuing to increase rapidly (mean estimate of c. 28% between 2014 and 2019), but the two SACs that represent the vast majority of production in the SMU show differing patterns in abundance. The Isle of May SAC, which essentially held all of the SMUs pup production until the mid-1990s appears to be stable or potentially declining. In contrast, the Fast Castle colony within the Berwickshire & North Northumberland Coast SAC is showing rapidly increasing pup production.

Pup production in Northeast England, which is entirely encompassed by the Farne Islands component of the Berwickshire & North Northumberland Coast SAC, is also increasing rapidly (mean estimated increase of 53% between 2014 and 2019).

Pup production within the Southeast England SMU is continuing to increase exponentially (mean estimate c. 75% between 2014 and 2019,) but this is in large part due to increases in Blakeney Point and Horsey. The increase at Donna Nook (Humber Estuary SAC) which, up until c. 2000 accounted for the SMUs entire pup production, is now slowing.

Monitoring of grey seals in Wales is split into two areas: North Wales (Dee Estuary-Aberystwyth) and West Wales (Aberystwyth - Caldey Island). Details of the available data, data sources and derivations of pup production estimates are given in SCOS-BP 20/04.

There are no or very few grey seals in south Wales (Caldey Island – Bristol Channel). Intensive monitoring of pup production is primarily focussed at three sites: Bardsey Island, parts of Ramsey Island, and Skomer Marine Conservation Area. Other areas have been monitored more sporadically, and within a season, less intensively. North Wales wide surveys were conducted in 2001, 2002 and 2017. The latest pup production estimate for 2017 was 216. West Wales wide surveys were conducted in 1992, 1993, and 1994.

It is not possible to estimate trends in pup production on a SMU scale in Wales. Pup production at Ramsey Island indictor sites has been variable but shown little trend. There is an upward trend in pup production at Skomer MCZ, though the trend is variable. The pup production estimate for Skomer and the adjacent Marloes peninsula increased slightly from 408 in 2019 to 422 in 2020 (Wilkie & Zbijewska, 2020).

Scalars between pup production in West Wales and indicator sites (in mainland north Pembrokeshire sites, Ramsey Island, and Skomer MCZ), in 1993 and 1994, were used to generate a total pup production estimate for West Wales. It should be noted, this was generated using the most recent available estimates for indicator sites, rather than predictions from fitted trends at these sites. Combined with the most recent estimate of North Wales, and rounding up to the nearest 50, this results in a pup production estimate of c. 2,250. Almost half of the SMU estimate of pup production is from sites not surveyed since the early 1990s.

To produce a robust estimate of pup production, scalars between indicator sites and irregularly monitored colonies need to be updated. This is particularly important when there are multiple habitat types (e.g. caves, open beaches) in an area. Cryptic sites (such as caves, small coves) can often support much smaller colonies and thus their trends, especially in the longer term, may differ from more open sites that are also easier to monitor. Indeed, for North Wales, Robinson *et al.* (NRW unpublished) found that a much lower proportion of pup production was at cryptic sites than found previously (Stringell *et al.,* 2014).

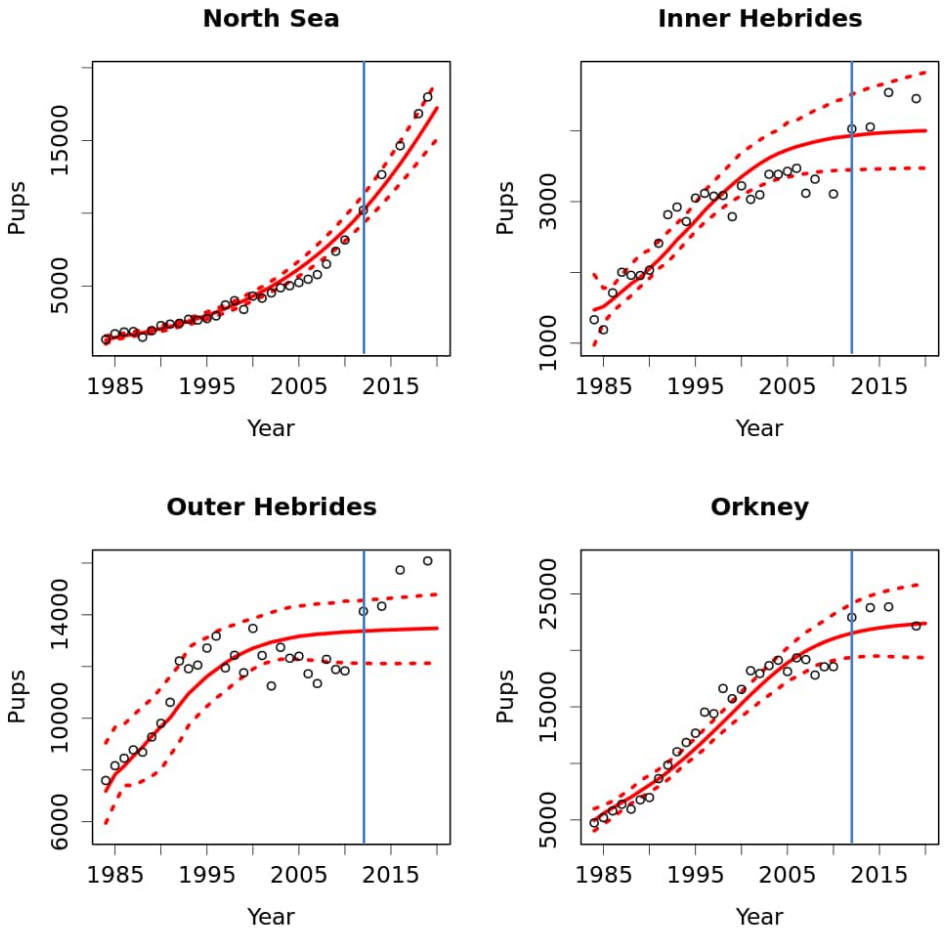


**Figure 1.** Posterior mean estimates of pup production (solid lines) and 95% Confidence Intervals (dashed lines) from the model of grey seal population dynamics, fit to pup production estimates for regularly monitored colonies (SCOS-BP 18/01 and Table 2 below), from 1984-2016 (circles) for colonies in Orkney and the Inner and Outer Hebrides, and for 1984-2018 for the colonies in the North Sea, and two independent total population estimates from 2008 and 2014 (see text for details). The vertical blue line at 2012 indicates the change to a new digital camera system.

**Table 2.** Grey seal pup production estimates from 2019 aerial surveys for the regularly monitored colonies in Orkney and the Inner and Outer Hebrides and Firth of Forth colonies and ground counts for English North Sea colonies, combined with most recent data from less regularly monitored colonies (see main text and SCOS-BP 21/01 and 20/04 for details). These estimates are compared with similar production estimates from 2016.

| Location | Pup production in 2019 | Pup production in 2016 | Average annual change 2016 to 2019 |
|---|---|---|---|
| Inner Hebrides | 4,455 | 4,541 | - 0.6% |
| Outer Hebrides | 16,083 | 15,732 | + 0.7% |
| Orkney | 22,153 | 23,849 | - 2.4% |
| Firth of Forth | 7,261 | 6,426 | + 4.2% |
| **Regularly monitored Scottish colonies** | **49,952** | **50,548** | - 0.4% |
| Other Scottish colonies [1] (incl. N & NE mainland & Shetland) | 4,112 | 4,193 | - 0.6% |
| **Total Scotland** | **54,064** | **54,741** | - 0.4% |
| Farne Islands | 2,823 | 2,295 | + 7.1% |
| Donna Nook, Blakeney, Horsey | 7,902 | 5,918 | +10.1% |
| **Annually monitored colonies in eastern England** | **10,725** | **8,213** | + 9.3% |
| SW England [1,2] | 450 | 250 | |
| Small sites in E and NW England [1,3] | 50 | 50 | |
| **Total England** | **11,225** | **8,513** | + 9.7% |
| Wales [1,4] | 2,250 | 1,650 | |
| Northern Ireland [1] | 250 | 150 | |
| **Total UK** | **67,789** | **65,054** | + 1.4% |
| Isle of Man | 69 | 84 | |

[1] Includes estimated production for colonies that are rarely monitored from different years

[2] Includes estimates for Scilly Isles, Lundy, various sites in Devon & Cornwall

[3] Includes Coquet Island, Ravenscar, Scroby Sands, South Walney

[4] Multiplier derived from indicator colonies surveyed in 2004 and 2005 and applied to other colonies last monitored in 1994 (SCOS-BP 20/04)

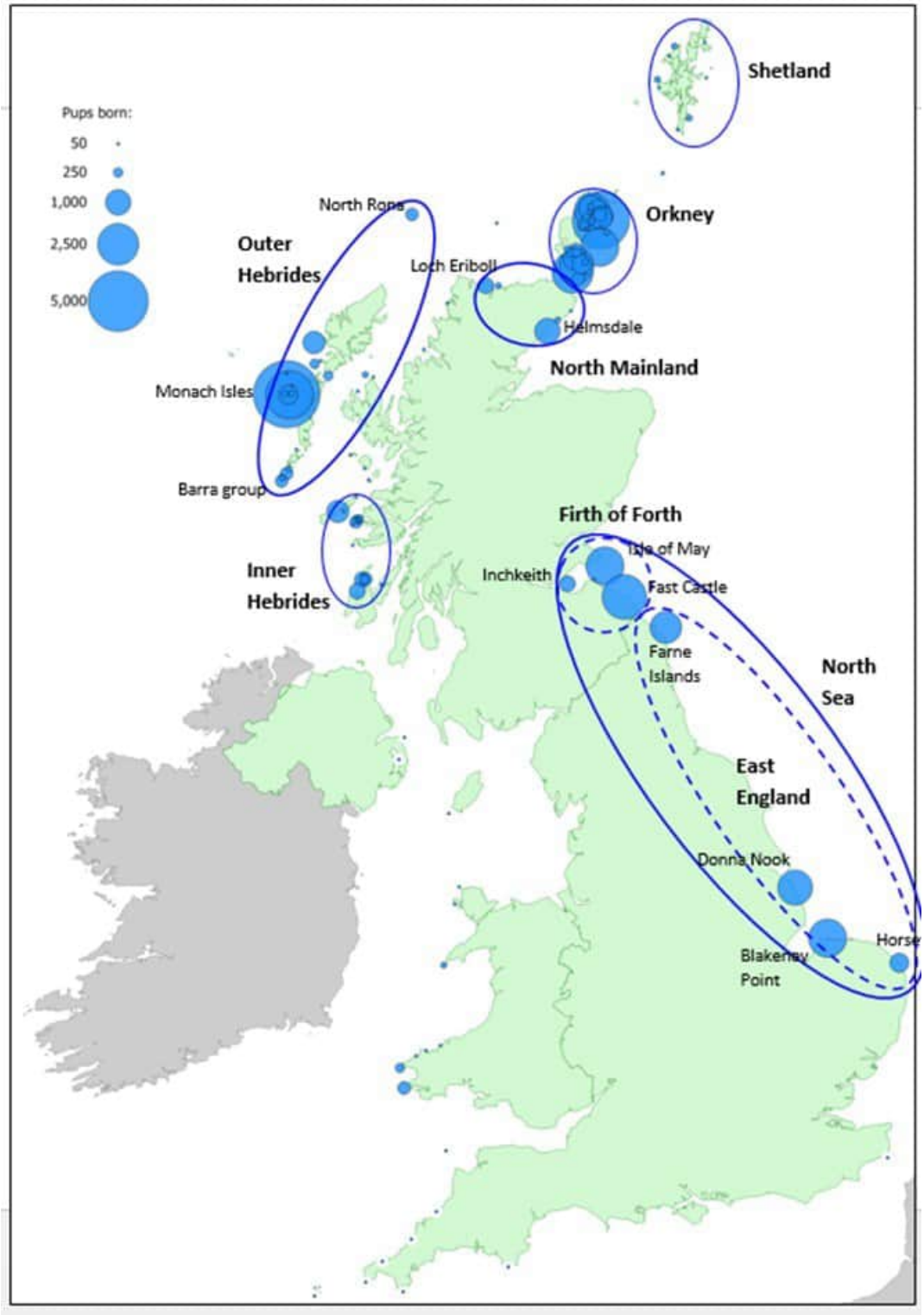


**Figure 2.** Distribution and estimated pup production of the main grey seal breeding colonies. Solid blue ovals indicate groups of regularly monitored colonies within each region, dashed ovals show sites in the north that are routinely monitored by aerial survey and those in the south that are routinely monitored by ground counts.

**Population size**

The raw data for estimating the total grey seal population are currently the region specific (Inner Hebrides, Outer Hebrides, Orkney and North Sea) pup production estimates derived from aerial surveys and ground counts at all major colonies around Scotland and eastern England.

Converting pup counts from air surveys (i.e., biennially surveyed colonies) into a total population size requires a number of steps as shown in Figure 3.

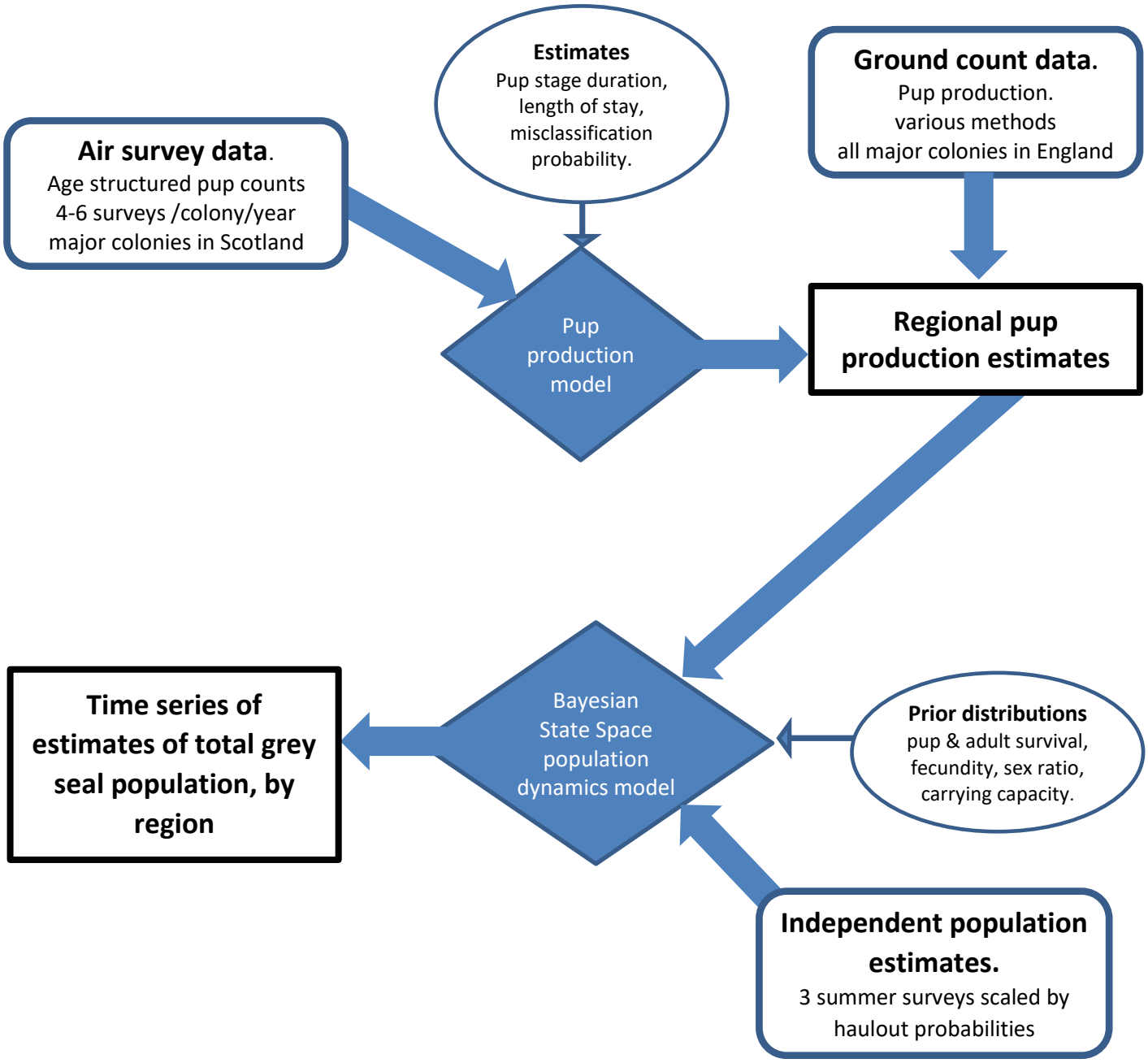


**Figure 3.** Schematic diagram of steps involved in estimating total grey seal population size from pup counts.

Using appropriate estimates of fecundity rates, both pup and non-pup survival rates and sex ratio we can convert pup production estimates into estimates of total population size. The estimate of the total population alive at the start of the breeding season depends critically on the estimates of these rates. We use a Bayesian state-space population dynamics model to estimate these demographic parameters and population size.

The time series of pup production estimates from the regularly monitored colonies indicate that from at least 1984 until the late 1990s all the regional populations grew exponentially, implying that the demographic parameters were, on average, constant over the period of data collection. Thus, estimates of the demographic parameters were available from a simple population model fitted to the entire pup production time series. Some combination of reductions in the reproductive rate or the survival rates of pups, juveniles and adults (SCOS-BPs 09/02, 10/02 and 11/02) has resulted in reduced population growth rates in the Northern and Western Isles.

To estimate the population size, a Bayesian state-space model of British grey seal population dynamics was fitted to the pup production data. Initially, alternative models with density dependence acting through either fecundity or pup survival were tested, but results indicated that the time series of pup production estimates did not contain sufficient information to quantify the relative contributions of these factors (SCOS-BPs 06/07, 09/02). In 2010 and 2011 we incorporated additional information in the form of an independent estimate of population size. This was based on counts of the numbers of grey seals hauled out during the summer and information on their haulout behaviour, which provides an estimate of the proportion of the population available to be counted during the aerial surveys (SCOS-BP 10/04 and 11/06). Between 2007 and 2009, 26,699 grey seals were counted during harbour seal moult surveys across the UK (excluding southwest UK). Using telemetry data, it was estimated that 31% (95% CIs: 15 - 50%) of the population was hauled out during the survey window and thus available to count (Lonergan *et al., 20*11a; b). Assuming 4% of the population were in southwest UK, this led to a UK independent population estimate in 2008 of 91,800 (95% CI: 78,400 - 109,900).

Inclusion of the first independent estimate in 2008 allowed us to reject the models that assumed density dependent effects operated through fecundity and all estimates were therefore based on a model incorporating density dependent pup survival. However, SCOS felt that the independent estimate appeared low relative to the pup production and its inclusion forced the model to select extremely low values of pup survival, high values of adult female survival and a heavily skewed sex ratio, with few surviving male seals.

Additional independent estimates were obtained in 2014 (SCOS-BP 16/04) and 2017 (SCOS-BP 21/02). A new analysis of haulout patterns including data from an additional 60 new deployments of improved GPS/GSM tags on grey seals is presented in SCOS-BP 21/02 and SCOS-BP 21/03.

The revised analyses resulted in an estimate of the proportion of the population hauled out during the survey window of 25.15% (95% CI: 21.45-29.07%) compared to 23.9% (95% CI: 19.2-28.6%) used previously. As per the previous analyses there was no effect of region, length of individual (regarded as a proxy for age), sex or time of day on the conversion factor/ scalar. However, observed count variability appears higher than suggested by the estimated variance of haulout probabilities. This may indicate a lack of independence in the haulout patterns between individuals. If true, this would increase the confidence intervals on the scalar.

The updated scalar resulted in slightly reduced mean population estimates for 2008 (96,028 compared to 101,196) and 2014 (138,437 compared to 145,889; Russell *et al.,* 2016; Table 2). The total count and population estimate for 2017 was 40,347 and 160,425, respectively, representing a 16% increase compared to 2014.

In 2012, SCOS discussed the priors on the model input parameters in some detail, following re-examination of the data being used and the differences made to the population estimates by changing a number of them to less informative priors (SCOS-BP 12/01 and SCOS-BP 12/02). In 2014 SCOS decided to use the results from a model run using these revised priors (SCOS-BP 12/02), and the independent estimates of total population size from the summer surveys. Work on updating these priors is continuing and an annual update is presented in SCOS-BP 21/04.

In 2014, SCOS adopted a set of revised priors, including a different prior on adult sex ratio, to generate the grey seal population estimates (SCOS-BP 14/02). The model produced unreasonably high adult survival values of more than 0.99, so it was re-run with a prior on survival constrained to what was considered to be a more reasonable range of 0.8 to 0.97. Posterior mean adult survival with this revised prior was 0.95 (SD 0.03). The upper bound of the adult survival prior was increased slightly to 0.98 in line with revised survival estimates.

The model and fitting methods used here are the same as those employed in recent years and are described in detail in Thomas *et al.* (2019 and SCOS-BP 21/05); the prior distributions on model parameters are the same as those used for the last two years (see SCOS-BP 21/04 & 21/05 for details). The data are a time series of regional pup production estimates for the regularly monitored colonies in the Inner and Outer Hebrides, Orkney, and the North Sea, for the years 1984-2016, 2018 (North Sea region only) and 2019, and three independent estimates of total population size (2008, 2014 and 2017).

The model allowed for density dependence in pup survival, using a flexible form for the density dependence function, and assumed no movement of recruiting females between regions. The same model and prior distributions for demographic rates were used, including a prior on sex ratio and a constraint on adult survival to the range 0.80-0.98. The revised prior on North Sea carrying capacity of 20,000 was used as the population produced over 14,000 pups but continues to increase rapidly, indicating that it was not close to carrying capacity. Carrying capacity is taken to mean the average population size below which numbers tend to increase and above which numbers tend to decrease due to resource limitations.

## Grey seal population estimate

From the standard model run, the estimated adult class population size (here taken to mean the total 1+ age population) in the regularly monitored colonies at the start of the 2020 breeding season was 140,700 (95% CI: 129,300-153,500). This estimate is produced by a model incorporating density dependent pup survival, using the revised priors, and including the independent estimates for 2008, 2014 and 2017 (details of this analysis and posterior estimates of the demographic parameters are given in SCOS-BP 21/05).

A comprehensive survey of data available from the less frequently monitored colonies was presented in SCOS-BP 18/01 and revised estimates for Southwest England, Wales, Northwest England, and Northern Ireland are presented in SCOS-BP 20/04 and presented in Table 1. Total pup production at these sites was estimated to be approximately 7,150. The total population associated with these sites was then estimated using the average ratio of pup production to population size estimate for all annually monitored sites in 2019. Approximate confidence intervals were estimated by assuming that they were proportionally similar to the population dynamics model confidence intervals for the standard model run. This produced a population estimate for these sites of 16,600 (approximate 95% CI: 15,300 to 17,900). This will undoubtedly under-estimate the uncertainty in the estimate, but it represents a relatively small proportion (12%) of the total.

Combining the annually monitored sites with the estimate for the less regularly monitored sites gives an estimated 2020 UK grey seal population of 157,300 (approximate 95% CI: 146,000-169,400).

The fit of the model to the pup production estimates has been poor in some regions in recent years. Whilst the model accurately captures some aspects of the observed trends in pup production in some regions, the estimated adult survival rate from the model was very high and the maximum pup survival rate was very low. This suggests some other parameters, such as inter-annual variation in fecundity or senescence could be causing a mismatch between the estimates from the model and the pup production data.

In 2018, the mode of the posterior distribution on adult survival from the population dynamics model was close to the upper bound 0.97 of the prior. In addition, mark-recpature-based estimates of adult female survival at Sable Island in Canada were higher than this upper bound (0.976, SE 0.001) (den Heyer & Bowen, 2017). Hence, the prior for adult female survival was increased to 0.98 for last and this year's model runs.

Thomas *et al. (*2019) discussed how sensitive the estimate of total population size may be to the parameter priors, and concluded that fecundity and adult male:female ratio are two parameters that strongly affect total population size but for which the prior specification is particularly influential. Hence a renewed focus on priors for these parameters may be appropriate.

In addition, the model assumes a fixed CV for the pup production estimates and obtains this value from an initial model run. Ideally, region-level estimates of pup production variance would be produced as part of fitting the pup production model to the aerial pup count data. These developments are ongoing. One factor that will require consideration is how to incorporate uncertainty in the ground counts made at some North Sea colonies. A set of four aerial surveys were carried out for each of these ground-counted North Sea colonies. Counts and comparison with the 2018 ground counts are ongoing and will be presented to SCOS 2021. A revised pup production model is being developed with the aim of re-estimating pup production for the entire count data set.

## Population trends

Model selection criteria suggest that density dependence is acting mainly on pup survival (see SCOS-BP 09/02). Fitting to the three independent population estimates confirms that the density dependent pup survival model is a better fit than a model incorporating density dependent fecundity. A corollary of this density dependent pup survival is that the overall population should closely track the pup production estimates when experiencing density dependent control, as well as during exponential growth. This is borne out by the similarities in the fitted population model trends (Figure 1) and the pup production trends (SCOS-BP 21/03). The population trend in each region/SMU will therefore follow the trends in pup production estimates described in detail above and in SCOS=-BP 21/03.

The factors influencing the dynamics of the different populations are not well known. The population dynamics model currently assumes that demographic rates are either fixed or respond to density dependent factors related simply to population size. However, it is likely that demographic parameters will be subject to environmental factors. For example, female fecundity is likely to be influenced by environmental factors regulating prey availability and seals' ability to gain fat reserves before breeding. A preliminary investigation was carried out of the relationship between fluctuations in pup production around the modelled trend and the NAO index from the previous winter, and also lagged by a further year (SCOS-BP 20/01). No association was found between NAO

and variation in pup production. However, NAO changes may not be a sensitive indicator of changes in seal prey and hence seal fecundity. Further investigations of this and other potential indices of environmental conditions should be pursued once revised estimates of pup production are available.

## UK grey seal population in a world context

The UK grey seal population represents approximately 34% of the world population on the basis of pup production estimates. The other major populations in the Baltic and the western Atlantic are also increasing (Table 3).

**Table 3**. Relative sizes and status of grey seal populations using pup production as an index of population size.

| Region | Pup Production | Year | Possible population trend |
|---|---|---|---|
| **UK** | **67,800** | 2019 | Increasing |
| Ireland | 2,100 | 2012[1] | Increasing |
| Wadden Sea | 1,750 | 2020[2] | Increasing |
| France | 70 | 2019[4] | increasing |
| Norway | 700 | 2015-20[3] | Possible decline |
| Russia | 800 | 1994 | Unknown |
| Iceland | 1,450 | 2017[8] | Declining |
| Baltic | 8,000 | 2019[4,5] | Increasing |
| **Europe excluding UK** | **14,870** | | unknown |
| Canada - Scotian shelf & Gulf of Maine | 92,300 | 2016[6] | Increasing |
| Canada - Gulf St Lawrence | 9,800 | 2016[6] | Increasing |
| USA | 6,500 | 2019[7] | Increasing |
| **WORLD TOTAL** | **191,270** | | Increasing |

[1]Ó Cadhla, O., Keena, T., Strong, D., Duck, C. and Hiby, L. 2013. Monitoring of the breeding population of grey seals in Ireland, 2009 - 2012. Irish Wildlife Manuals, No. 74. National Parks and Wildlife Service, Department of the Arts, Heritage and the Gaeltacht, Dublin, Ireland. [2] Galatius A., ,Brasseur S.,Carius F., Diederichs B., Jeß A., Körber P., Schop J., Siebert U., Teilmann J., Bie ThøstesenC.& Klöpper S. (2021,) EG-Seals - grey seal surveys in the Wadden Sea and Helgoland in 2019-2020. Common Wadden Sea Secretariat, Wilhelmshaven, Germany. [3]Nilssen, K.T. and Bjørge, A. 2017b. Status for kystsel. Anbefaling av jaktkvoter for 2018 [Status for coastal seals. Recommendation for harvest quotas for 2018]. Document to the Norwegian Marine Mammal Scientific Advisory Board, October 2017. 9 pp. [4] ICES. 2021. Working Group on Marine Mammal Ecology (WGMME). ICES Scientific Reports. 3:19. 155 pp. http://doi.org/10.17895/ices.pub.8141.
[5]Baltic pup production estimate based on mark recapture estimate of total population size (38,000) and an assumed multiplier of 4.7 HELCOM fact sheets (www.HELCOM.fi) & http://www.rktl.fi/english/news/baltic_grey_seal.html
[6] den Heyer, C.E., Bowen, W.D., Dale, J., Gosselin, J-F., Hammill, M.O., Johnston, D.W., Lang, S.L., Murray, K.T., Stenson, G.B. & Wood, S.A. (2020) Contrasting trends in gray seal (Halichoerus grypus) pup production throughout the increasing northwest Atlantic metapopulation. Marine Mammal Science, DOI: 10.1111/mms.12773. [7] Wood *et al.* 2020 Journal of Mammalogy, 101(1):121–128, 2020,DOI:10.1093/jmammal/gyz184. [8] Granquist, S.M. and Hauksson, E. 2019. Aerial census of the Icelandic grey seal (*Halichoerus grypus*) population in 2017: Pup production, population estimate, trends and current status. Marine and Freshwater Research Institution, HV 2019-02. Reykjavík 2019. 19 pp. https://www.hafogvatn.is/static/research/files/1549015805-hv2019-02pdf.

Table 3 shows the relative sizes and status of grey seal populations throughout their range. Pup production estimates are used as indices of population size because they represent a directly observable/countable section of the population, the largest populations are monitored by means of pup production surveys and because of the uncertainty in overall population estimates in

some cases. Total population estimates are derived from population dynamics models fitted to time series of pup productions in the two largest populations, i.e., Canada and the UK (Hammill *et al.*, 2017; Thomas *et al.*, 2011; 2019). However, although the models are similar, the published total population estimates are derived differently: in the Canadian population, total population refers to the number of 1+ age class animals alive at the end of the breeding season plus the total pup production for that year; in the UK, the total population is given as the total number of seals alive at the start of the breeding season, i.e., does not include any of that year's pup production. The published estimates therefore differ by around 20 to 30% for the same pup production estimate. It is not clear how the total population is derived in several populations. To avoid confusion, only the pup production values are presented here.

## Current status of British harbour seals

**Due to Covid restrictions through summer 2020 no large-scale surveys of Scottish harbour seal populations were undertaken. One survey of the Firth of Tay and Eden SAC was carried out in August 2020. In England a survey of the East Anglian coast from Donna Nook to Scroby Sands was completed in 2020. In 2020, the Firth of Tay and Eden estuary count was the same as the 2019 count and the East Anglian count was approximately 8% higher than the 2019 count. A series of three surveys of the coast from Donna Nook to Scroby Sands (by SMRU) and a single survey of the Greater Thames estuary (by the Zoological Society of London (ZSL)) were carried out in 2021 in response to observed declines in 2019 and 2020.**

**The best estimate of the UK harbour seal population in 2020 is 43,750 (approximate 95% CI: 35,800-58,300). This is derived by scaling the most recent composite count of 31,500, (based on surveys between 2016 and 2021) (Table 4) by the estimated proportion hauled out during the surveys (0.72 (95% CI: 0.54-0.88)). Overall, the UK population has increased since the late 2000s and is close to the late 1990s level prior to the 2002 PDV epizootic. However, there are significant differences in the population dynamics between regions. As reported in SCOS 2008 to 2020, there have been general declines in counts of harbour seals in several regions around Scotland, but the declines are not universal with some populations either stable or increasing.**

**Recent trends, i.e., those that incorporate the last 10 years show significant growth in both SMUs on the east coast of England up to 2018. However, the 2019 count in the large SE England SMU was approximately 25% lower than the mean of the previous 5 years. Counts for 2020 and 2021 confirm that the population has declined.**

**Populations in Orkney & North Coast SMU and in the Tay and Eden SAC are continuing to decline and in Shetland and the Moray Firth, the current population size is at least 40 % below the pre-2002 level with no indication of recovery. Populations in western Scotland are either stable or increasing. In Northern Ireland counts have declined slowly.**

Until interrupted by the Covid pandemic, SMRU have carried out surveys of harbour seals during the moult in August each year. Recent survey counts and overall estimates were summarised in SCOS-BP 20/03. Given the length of the mainly rocky coastline around north and west Scotland it is impractical to survey the whole coastline every year, but SMRU aims to survey the entire coast every five years. Where there are indications of significant changes the survey effort has been increased and some regions, e.g., Orkney and the Moray Firth, have been surveyed more frequently. The English population, and Scottish east coast populations in the Moray Firth, and the Tay and Eden estuaries are surveyed annually, except for 2020 in the Moray Firth.

Seals spend a higher proportion of their time on land during the moult than at other times, thus counts during the moult are thought to represent the highest proportion of the population with the lowest variance. Initial monitoring of the population in East Anglia in the 1960s used these maximum counts as minimum population estimates. In order to maintain the consistency of the long-term monitoring of the UK harbour seal population, the same time constraints are applied throughout, and surveys are timed to provide counts during the moult. Most regions are surveyed using combined thermographic, video and HR still aerial imagery to identify seals along the coastline. However, conventional photography is used to survey populations in the estuaries of the English and Scottish east coasts.

The estimated number of seals in a population based on these methods contains considerable levels of uncertainty. A large contribution to uncertainty is the proportion of seals not counted during the survey because they are in the water. Efforts are made to reduce the effect of environmental factors by always conducting surveys within 2 hours of low tides that occur between 10:00 and 20:00 during the first three weeks of August and only in good weather[2]. A conversion factor of 0.72 (95% CI: 0.54-0.88) to scale moult counts to total population was derived from haulout patterns of harbour seals fitted with flipper mounted ARGOS tags (n=22) in Scotland (Lonergan *et al.*, 2013)

The conversion factor used here is close to the middle of the range (0.6-0.8) of values estimated for other populations in Europe and North America (e.g., Harvey & Goley, 2011; Huber, Jeffries, Brown, DeLong & VanBlaricom, 2001; Ries, Hiby, & Reijnders, 1998; Simpkins, Withrow, Cesarone & Boveng, 2003). The conversion factor is based on a sample of only 22 seals from a single year that only represents adult seal behaviour. SCOS recommend this conversion factor should be re-investigated when resources allow to examine sex and age differences as well as potential extension to surveys outside the moult.

**Table 4.** UK harbour seal population estimates based on counts during the moult; rounded to the nearest 100.

| Location | Most recent count (2016-2021) | Total Population estimates with 95% CIs |
|---|---|---|
| **England** | **3,600[1]** | **5,000 (95% CI 4,100-6,700)** |
| **Wales** | **<10[2]** | **<15** |
| **Scotland** | **26,800[3]** | **37,200 (95% CI 30.400-49,600)** |
| **Northern Ireland** | **1,000** | **1,400 (95% CI 1,100-1,900)** |
| **Total UK** | **31,500** | **43,750 (95% CI 35,800-58,300)** |

*[1] A complete survey of SEE_SMU completed in 2021*

*[2] There are no systematic surveys for harbour seals in Wales*

*[3] Compiled from most recent surveys (2016-2019), see Table 5 for dates and details*

The most recent counts of harbour seals by region are given in Table 5 and Figures 4, 5 & 6. These are raw counts and therefore represent minimum estimates of the British harbour seal population. Results of surveys conducted in 2019 were described in more detail in SCOS-BP 20/03. It has not been possible to conduct a synoptic survey of the entire UK coast in any one year. Data from different years are grouped into recent, previous and earlier counts to illustrate, and allow comparison of, the general trends across regions.

Combining the most recent counts (2016-2019) at all sites in Scotland and 2021 counts in Southeast England, approximately 31,500 harbour seals were counted in the UK: 85.4% in Scotland; 11.4% in England; 3.2% in Northern Ireland (Tables 4 & 5). Including the 4,000 seals counted in the Republic of

[2] The diurnal timing restriction is occasionally relaxed for sites in military live firing ranges where access is only at weekends or in the evening.

Ireland produces a total count of ~35,500 harbour seals for the British Isles (i.e., the UK and Ireland). Trends in individual SMUs are described in detail in SCOS-BP 21/03 and briefly in the following section.

Breeding season aerial surveys of the harbour seal population along the east Anglian coast are attempted annually, in addition to the surveys flown during the moult in August. In 2015 and 2016 the east Anglian coast was surveyed five times during the breeding season in June and July (Thompson *et al.,* 2016). These flights confirmed that the peak number of pups ashore occurred around the beginning of July. Due to a combination of aircraft availability and poor weather conditions no breeding season surveys were flown in the UK in 2019 and covid related travel and working restrictions also prevented survey flying in 2020 and 2021. Therefore, the most recent survey was that carried out over two days, 29th June and 2nd July 2018.

**Table 5.** The most recent August counts of harbour seals at haul-out sites in the British Isles by Seal Management Unit compared with four previous periods. The grey values for SMUs 10-13 are rough estimates. Details of sources and dates of surveys used in each compiled regional total are given in SCOS-BP 20/03.

| | | Harbour seal counts | | | | |
|---|---|---|---|---|---|---|
| Seal Management Unit / Country | | 1996-1997 | 2000-2006 | 2007-2009 | 2011-2015 | **2016-2021** |
| 1 Southwest Scotland | | 929 | 623 | 923 | 1,200 | **1,709** |
| 2 West Scotland | [a] | 8,811 | 11,666 | 10,626 | 15,184 | **15,600** |
| 3 Western Isles | | 2,820 | 1,920 | 1,804 | 2,739 | **3,532** |
| 4 North Coast & Orkney | | 8,787 | 4,388 | 2,979 | 1,938 | **1,405** |
| 5 Shetland | | 5,994 | 3,038 | 3,039 | 3,369 | **3,180** |
| 6 Moray Firth | | 1,409 | 1,028 | 776 | 745 | **1,077** |
| 7 East Scotland | | 764 | 667 | 283 | 224 | **343** |
| SCOTLAND total | | 29,514 | 23,330 | 20,430 | 25,399 | **26,846** |
| 8 Northeast England | [b] | 54 | 62 | 58 | 91 | **79** |
| 9 Southeast England | [c] | 3,222 | 2,964 | 3,952 | 4,740 | **3,494** |
| 10 South England | [d] | 10 | 15 | 15 | 25 | 40 |
| 11 Southwest England | [d] | 0 | 0 | 0 | 0 | 0 |
| 12 Wales | [d] | 2 | 5 | 5 | 10 | 10 |
| 13 Northwest England | [d] | 2 | 5 | 5 | 5 | 5 |
| ENGLAND & WALES total | | 3,290 | 3,051 | 4,035 | 4,871 | **3,628** |
| NORTHERN IRELAND total | [e] | | 1,176 | 1,101 | 948 | **1,012** |
| UK total | | | 27,557 | 25,566 | 31,218 | **31,486** |
| REPUBLIC OF IRELAND total | [f] | | 2,955 | | 3,489 | **4,007** |
| BRITAIN & IRELAND total | | | 30,512 | | 34,707 | **35,493** |

For data sources see SCOS-BP 20/03.

The 2018 count was 17% higher than the 2017 count and similar to the average for the preceding 5 years. This continues the pattern of high inter annual variability (SCOS-BP 19/04). These wide fluctuations are not unusual in the long-term time series and despite the apparently wide inter-annual variation, the pup production has increased at around 5.6% p.a. since surveys began in 2001 although the rate of increase may have slowed and may be reaching an asymptote (SCOS-BP 19/04). The absence of pup survey data for the past three years in the Wash & N Norfolk SAC population is unfortunate given the scale of the declines observed in the moult survey counts. A pup survey is planned for 2022 together with three moult surveys.

The ratio of pups to the moult counts remained high in 2018 (0.41:1), close to the previous five -year average (0.45:1), and more than double the same ratio in 2001 (0.17:1). This ratio can be seen as an index of the productivity of the population. Until recently, the index for the Wash was higher than for the larger Wadden Sea population. However, the ratio has increased rapidly in the Wadden Sea population since 2008 as moult counts stopped increasing while pup counts continue to grow and the ratio is now at a similar level to the Wash population (Galatius *et al.,* 2021). Previous attempts to explain the apparently high fecundity/productivity in the Wash as being due to seasonal movements between these populations can no longer explain the increase. A population-wide increase in the fecundity index could be due to a real increase in fecundity in both the Wash and Wadden Sea populations, or to a change in the ratio between the moult counts and the total population, or in a change in the ratio of maximum pup count and the total pup production. We do not have any current or historical information to determine the extent to which these metrics may have changed. Reliable estimates of fecundity would provide the basis for identifying and quantifying future changes. Accurate estimates of pup production and of the proportion of animals hauled out during the moult surveys could provide fecundity estimates. SCOS recommends further investigation to identify the underlying changes.

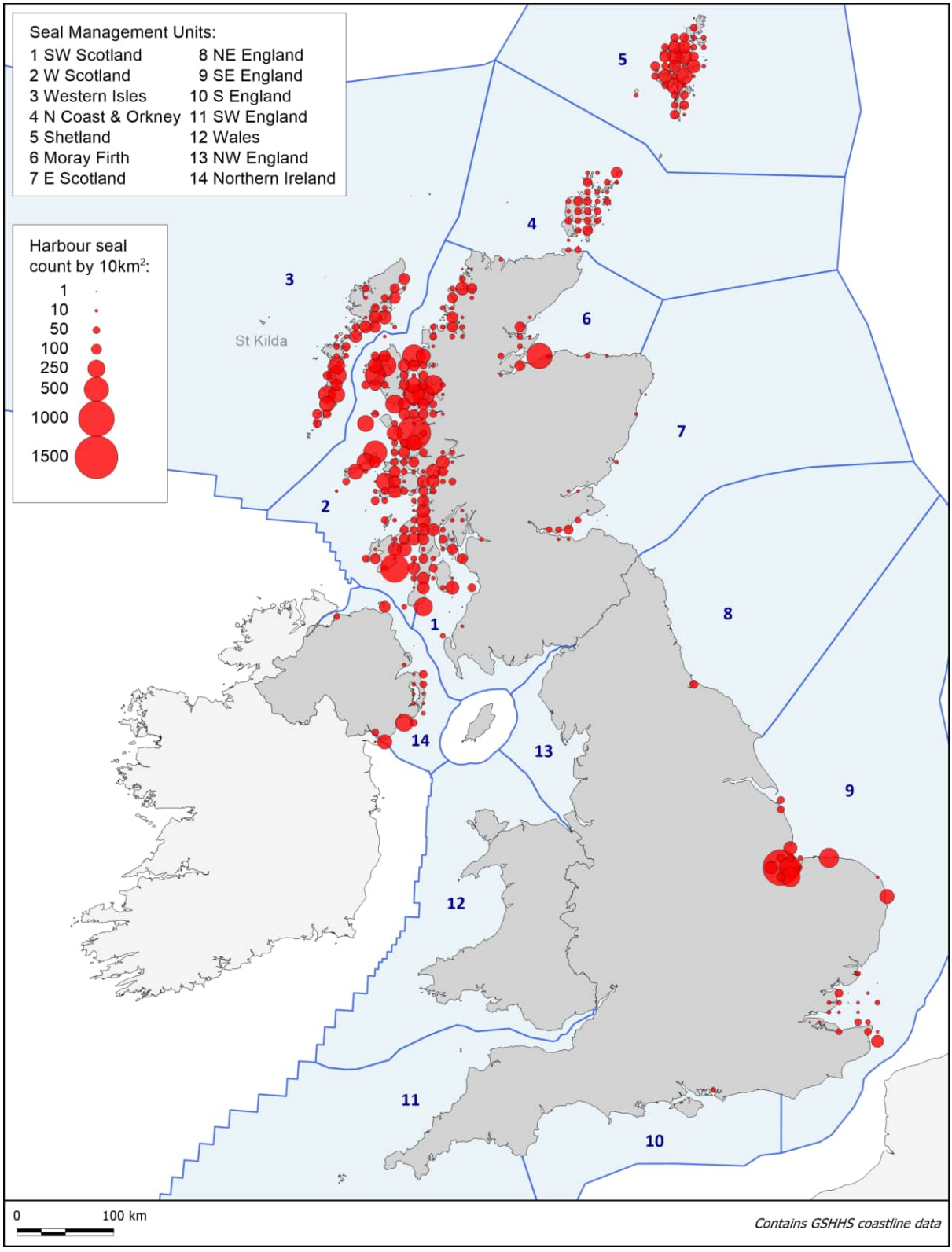


**Figure 4.** August distribution of harbour seals around the British Isles by 10km squares based on the most recent available haul-out count data collected up until 2019. Limited data available for SMUs 10-13; no data available for St Kilda.

**Table 6.** Estimates of harbour seal populations in the British Isles by Seal Management Unit. Estimates are based on the most recent August counts of harbour seals at haul-out sites scaled by the proportion of the population estimated to be hauled out during the survey window (0.72; 95% CI=0.54 – 0.88). The grey values given for SMUs 10-13 are rough estimates. Details of sources and dates of surveys used in each compiled regional total are given in SCOS-BP 20/03.

| | | | Harbour seal population | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Seal Management Unit / Country** | | | **2007-2009** | | **2011-2015** | | **2016-2021** | |
| 1 | Southwest Scotland | | **1281** | 95% C.I. (1048 - 1709) | **1666** | 95% C.I. (1363 - 2222) | **2373** | 95% C.I. (1942 - 3164) |
| 2 | West Scotland | [a] | **14758** | 95% C.I. (12075 - 19677) | **21088** | 95% C.I. (17254 - 28118) | **21666** | 95% C.I. (17727 - 28888) |
| 3 | Western Isles | | **2505** | 95% C.I. (2050 - 3340) | **3804** | 95% C.I. (3112 - 5072) | **4905** | 95% C.I. (4013 - 6540) |
| 4 | North Coast & Orkney | | **4137** | 95% C.I. (3385 - 5516) | **2691** | 95% C.I. (2202 - 3588) | **1951** | 95% C.I. (1596 - 2601) |
| 5 | Shetland | | **4220** | 95% C.I. (3453 - 5627) | **4679** | 95% C.I. (3828 - 6238) | **4416** | 95% C.I. (3613 - 5888) |
| 6 | Moray Firth | | **1077** | 95% C.I. (881 - 1437) | **1034** | 95% C.I. (846 - 1379) | **1495** | 95% C.I. (1223 - 1994) |
| 7 | East Scotland | | **393** | 95% C.I. (321 - 524) | **311** | 95% C.I. (254 - 414) | **476** | 95% C.I. (389 - 635) |
| SCOTLAND total | | | **28375** | 95% C.I. (23215 - 37833) | **35276** | 95% C.I. (28862 - 47035) | **37286** | 95% C.I. (30506 - 49714) |
| 8 | Northeast England | [b] | **80** | 95% C.I. (65 - 107) | **126** | 95% C.I. (103 - 168) | **109** | 95% C.I. (89 - 146) |
| 9 | Southeast England | [c] | **5488** | 95% C.I. (4490 - 7318) | **6583** | 95% C.I. (5386 - 8777) | **4852** | 95% C.I. (3970 - 6470) |
| 10 | South England | [d] | 20 | 95% C.I. (17 - 27) | 34 | 95% C.I. (28 - 46) | 55 | 95% C.I. (45 - 74) |
| 11 | Southwest England | [d] | | 95% C.I. (0 - 0) | | 95% C.I. (0 - 0) | | 95% C.I. (0 - 0) |
| 12 | Wales | [d] | 6 | 95% C.I. (5 - 9) | 13 | 95% C.I. (11 - 18) | 13 | 95% C.I. (11 - 18) |
| 13 | Northwest England | [d] | 6 | 95% C.I. (5 - 9) | 6 | 95% C.I. (5 - 9) | 6 | 95% C.I. (5 - 9) |
| ENGLAND & WALES total | | | **5604** | 95% C.I. (4585 - 7472) | **6765** | 95% C.I. (5535 - 9020) | **5038** | 95% C.I. (4122 - 6718) |
| NORTHERN IRELAND total | | [e] | **1529** | 95% C.I. (1251 - 2038) | **1316** | 95% C.I. (1077 - 1755) | **1405** | 95% C.I. (1150 - 1874) |
| UK total | | | **25566** | 95% C.I. (29052 - 47344) | **43358** | 95% C.I. (35475 - 57811) | **43730** | 95% C.I. (35779 - 58307) |
| REPUBLIC OF IRELAND total | | [f] | | | **4845** | 95% C.I. (3964 - 6461) | **5565** | 95% C.I. (4553 - 7420) |
| BRITAIN & IRELAND total | | | | | **48204** | 95% C.I. (39439 - 64272) | **49295** | 95% C.I. (40332 - 65727) |

## Population trends

The overall UK harbour seal population has increased over the last decade. Counts increased from 25,600 (rounded to the nearest 100) in the 2007-2009 period to 31,500 during the 2016-2021 period. As no count was available in Northern Ireland in the 1990s, a UK wide comparison is not possible, but the 2016-2021 count of 31,500 harbour seals in Great Britain (i.e., UK minus Northern Ireland) was similar to the 1996-97 count of 32,800 (Table 5). However, as reported in SCOS 2008 to 2019, patterns of changes in abundance have not been universal; although declines have been observed in several regions around Scotland some populations appear to be either stable or increasing. Details of fitted trends by MU and for SACs are given below and in SCOS-BP 21/03. To allow a simple visual comparison the raw count data for each SMU are shown in Figure 5.

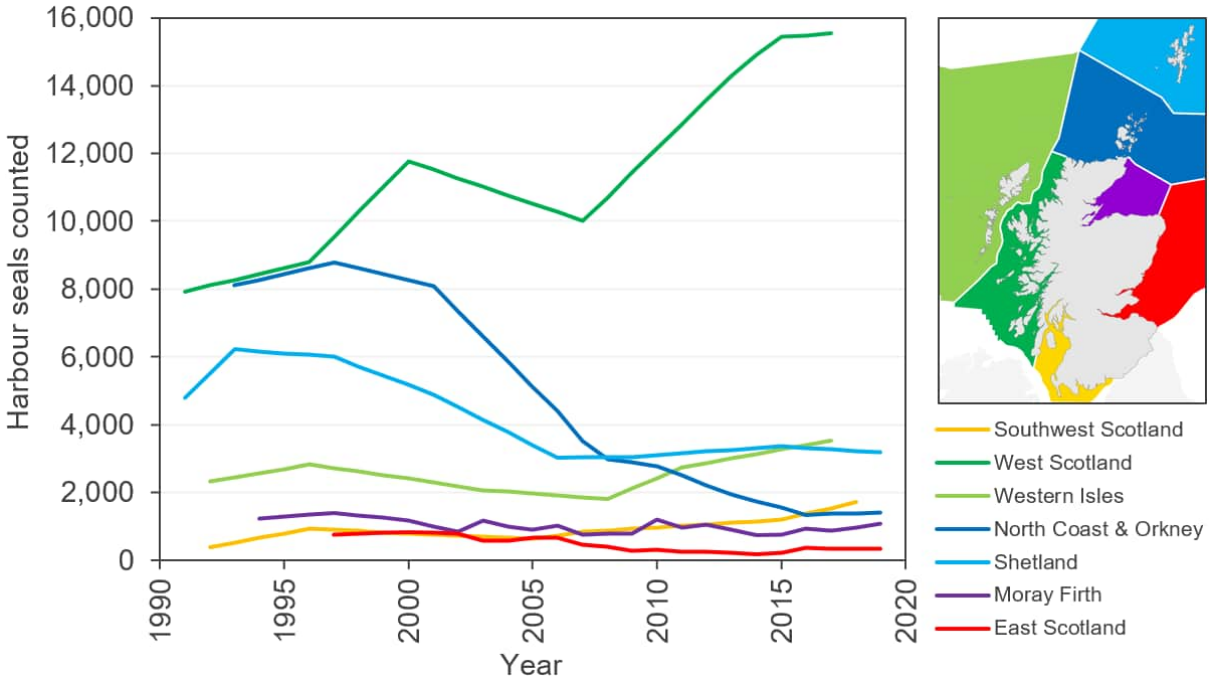


**Figure 5.** Comparison of August harbour seal counts in Scottish Seal Management Units (SMUs) from 1991 to 2019. Because SMA totals represent counts of seals distributed over large areas, individual data points may contain counts made in more than one year. Interpolated values are used for years with incomplete coverage.

## Trends by Seal Management Unit (SMU).

Details of regional and local trend analyses, and model selection for each were given in Thompson *et al. (*2019) and the results presented here are from an extension of that analysis incorporating extra data and with a change in model selection criteria from AICc to AIC. At least three models were fitted for each SMU: a stable trend i.e., an intercept-only Generalised Linear Model (GLM), an exponential year effect within a GLM, and a nonlinear smooth year effect within a GAM. Details of the analysis and figures showing fitted trends for each SMU and SAC are presented in SCOS-BP 21/03.

In the Northeast and Southeast England SMUs Phocine Distemper Virus (PDV) caused sudden declines in 1988 and 2002. Additional models with a step change in abundance and/or trends associated with 2002 were fitted in these SMUs. Although the declines in north and east Scotland SMUs were not thought to be due to PDV, there were sudden drops or declines in Shetland and

North Coast & Orkney SMUs during multi-year gaps in surveys that spanned 2002, and a sudden change in trend around 2002 in East Scotland SMU. Because of the unknown nature of these declines, additional models were also fitted for SMUs 4 – 9 that allowed any combination of stable/exponential trends prior to and following 2002 (including the same trend across the time-series) and with/out a step change associated with 2002. For details of model fitting and model selection see SCOS-BP 21/03.

*Western Isles*: A complete survey of the Western Isles SMU carried out in 2017 produced the highest recorded count for the Western Isles (3,533) which was 29.0% higher than the previous (2011) count of 2,739 and approximately 40% higher than the average between 1993 and 2011. Relaxing the model selection criteria resulted in the best model being a GAM that shows a decline from the mid-1990s to around 2005 followed by a steep increase to 2017. The revised trends analysis is the basis for a suggested relaxation of the Seal Conservation Area designated for the Western Isles SMU (Answer to Q19 below).

*West Scotland*: Parts of the West Scotland SMU (North and part of Centre) were surveyed in 2017 and the remainder was surveyed in 2018. The harbour seal count for West Scotland - North was 1,084, for West Scotland - Centre was 7,447 and for West Scotland – South was 7,053, and the overall total for the West Scotland SMU was 15,600 (Table 5).

The 2015 West Scotland harbour seal count was 43% higher than the 2009 count. The best model, selected in the trend analysis shows a continuous increase from 1990 to 2017 at approximately 4.7% p.a. Over the last five years the rate of increase is estimated to be 3.9 % p.a.

Although the West Scotland region is defined as a single management unit, it is very large geographically in terms of total coastline and contains a large proportion of the UK harbour seal population; 49% of the most recent UK total count. The trajectories of counts within north, central and south sub-divisions of this large region differ:

- In the north of the region (Figure 4), the selected model for data up to 2017 indicates that counts have increased since the early 1990s, by approximately 4.9% p.a.
- In the central sub-region (Loch Ewe to Ardnamurchan) (Figure 4) the selected model indicates that counts have increased since the early 1990s. The average rate of increase has been approximately 4.0% p.a.
- In the south sub-region (Ardnamurchan to Scarba) (Figure 4) there was no detectable trend in the overall population since the early 1990s, with counts varying between approximately 5,000 and 7,000 over the period 1990 to 2018.

*Southwest Scotland*: All of the Southwest Scotland SMU was surveyed in August 2018. A total of 1,700 harbour seals were counted compared with 1,200 in 2015 and 923 in 2009 (Table 5). This was the highest count of harbour seals for the Southwest Scotland SMU, approximately three times higher than the 1990's count. The trend analysis selected a continuous increase since 1990. The rate of increase over the past five years was approximately 3.9% p.a.

*North Coast and Orkney*: Orkney was surveyed twice during the last round-Scotland census period. In 2016, 1,240 harbour seals were counted, and 1,296 in 2019 (Table 5). These are the two lowest counts to date and represent an 85% reduction from the highest count in 1997 (8,522). The 2016 and 2019 counts were similar. Although this could indicate that the decline has slowed this cannot be confirmed without additional counts. Trend analysis (Thompson *et al.*, 2019) indicates that counts were stable until 2001, then dropped by 46% between 2001 and 2006, and have declined continuously since 2006. The average rate of decrease over the past 5 years was approximately 8.5%

p.a. The North Coast section of the SMU was not surveyed in 2019 but few harbour seals are counted on the north coast section of the SMU.

*Shetland*: A complete survey was carried out in 2019 when 3,180 harbour seals were counted compared with 3,369 in 2015. The 2019 count was close to the mean of the 2009 and 2013 counts but was 47% lower than the 1997 count of c.6,000. The selected model for counts for the whole of Shetland incorporated a step change involving a drop of approximately 40% occurring between 2001 and 2005. Counts either side of the step change (1991-2001 and 2006-2019) do not show any obvious trend, though in both cases the sample size was limited (n=4 and 4, respectively).

*Moray Firth*: The total harbour seal count for the entire Moray Firth SMU in 2019 was 1025. This was 12% higher than the 2018 count. The majority of these harbour seals (60%) were observed between Culbin and Findhorn, confirming the continued importance of these sites and the dramatic and continuing redistribution within the inner Moray Firth.

The majority of the counts in the Moray Firth are from haul outs between Loch Fleet and Findhorn, an area that held approximately 98% of the SMU total in 2016. The selected model for this area suggests that counts were decreasing between 1994 and 2000, the rate of decline slowed to around 2010 and the population may now be increasing slowly.

*East Scotland*: The harbour seal count for the Firth of Tay and Eden Estuary SAC in 2019 was 41, equal to the mean of the previous 5 years' counts for this SAC. This represents a 94% decrease from the mean counts recorded between 1990 and 2002 (641).

In the East Scotland SMU (Figure 4) the population was mainly concentrated in the Firth of Tay and Eden Estuary SAC prior to 2000. Additional groups were also present in the Firth of Forth, Montrose Basin and at coastal sites in Aberdeenshire. Counts in the Firth of Forth have been sporadic but the fitted trend suggests a decline from the late 1990s to 2016.

A more extensive data set is available for the Firth of Tay and Eden Estuary SAC. The selected model indicates that counts in the SAC remained stable between 1990 and 2002, at which time they represented approximately 85% of the total SMU count. From 2002 to 2020 the counts in the SAC declined rapidly and monotonically: over the 18-year period counts fell from approximately 680 to less than 40, representing a 95% decline. By 2016 the SAC counts represented only approximately 15% of the SMU total.

*Northern Ireland:* Only three synoptic surveys of the entire harbour seal population in Northern Ireland have been carried out in 2002, 2011 and 2018, although data from a fourth survey in 2021 will be available for SCOS 2022. However, a subset of the population from Carlingford Lough to Copeland Islands has been monitored more frequently from 2002 to 2018. This area contained 80-85% of the total in the two years with complete coverage. This subset of the population declined slowly over the period 2002 to 2011 at an average rate of 2.7% p.a. However, the 2018 survey suggests that there had been no significant change since 2011.

*Southeast England*: A detailed description of recent survey results from 2020 and 2021 are given in SCOS-BP 21/06. Briefly, the combined counts for the Southeast England SMU (Figure 6) in 2019 (3,081) was 27.6% lower than the 2012 to 2018 mean count. Additional surveys in 2020 and 2021 confirmed the decrease. The total count for the sites between Donna Nook and Scroby Sands has declined by approximately 38% compared to the mean of the previous five years (2019–2021 mean = 3080; 2014-2018 mean = 4296). The count for the Wash and North Norfolk SAC has decreased by approximately 21% (2019 – 2021 mean = 2883: 2014-2018 mean= 3658) over the same time periods while Donna Nook showed a 57% decrease and Scroby Sands showed a 73% decrease.

The fitted trend for the Wash and North Norfolk SAC (figure 6) shows that the population recovered from the 2002 PDV epizootic, reached a maximum around 2014 to 2015 and has since declined rapidly.

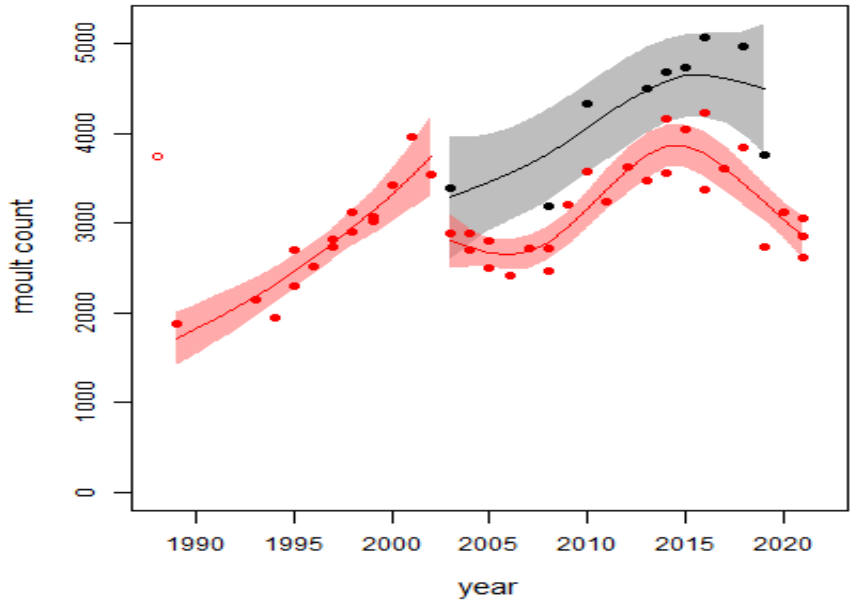


**Figure 6**. Trends in harbour seals counts in the Southeast England SMU (grey) and in The Wash and North Norfolk SAC (red), between 1988 and 2021 (shaded areas indicate the 95% confidence intervals for the fitted curves). For further explanation see text and SCOS-BPs 21/06. 2018 counts were similar to the previous 5 year's counts, but the 2019, 2020, and 2021 counts show a clear decline.

The 2018 count was the second highest ever recorded in the Wash and was consistent with the pattern of relatively stable population after 2010. However, the fitted trend suggests that the population may have been declining since 2015, but at present it is unclear whether the decrease represents a continuing decline or a step change decrease between 2018 and 2019. In the absence of any clear anthropogenic effects, this decline is dramatic. Recent counts from the rest of Southeast England Seal Management Unit (SEE_SMU) by ZSL (SCOS-BP 21/07) suggest that population may also be showing the start of a decline. Given that the survey area represents the majority of harbour seals in the SEE-SMU, including the population in the Wash & N Norfolk SAC, this likely drop in abundance is of immediate and serious concern. The SEE-SMU was the only one in the UK that was showing a sustained increase in abundance at a time when the majority of SMUs on the eastern and northern coasts had depleted or declining populations (Thompson *et al.*, 2019; SCOS-BP 21/06). SCOS recommend that research is required to determine the time course and potential causes of this reduction and recommend that SMRU should seek funding to establish an appropriate programme of research.

The Thames population, here taken to include all haulout sites between Hamford Water in Essex and Goodwin Sands off the Kent coast, have been surveyed sporadically since 2002 and annually since 2008. In August 2019, a total of 671 harbour seals were counted compared with an average of 742 for three surveys in 2016-2018, and an average of 474 for three surveys in 2013-2015. A GLM for the series of counts from 2002 to 2019 demonstrated an increase at an average of 9.0% p.a. (bootstrap 95% CI 6.8-11.2) (Cox *et al.*, 2020). No survey was carried out in 2020, but a survey in 2021 showed that the population has not grown over the past 4-5 years and may be starting to decline (SCOS-BP 21/07).

**Table 7.** Size and status of European populations of harbour seals. Data are counts of seals hauled out during the moult.

| Region | Number of seals counted[1] | Years when latest data were obtained |
|---|---|---|
| **Scotland** | **26,850** | 2016-2019 |
| **England** | **3,900** | 2019[2] |
| **Northern Ireland** | **1,000** | 2018 |
| **UK** | **31,750** | |
| Ireland | 4,000 | 2017-18 |
| France | 1,150 | 2018 |
| Wadden Sea-Germany | 17,250 | 2021 |
| Wadden Sea-Denmark | 1,350 | 2021 |
| Wadden Sea-NL | 8,250 | 2021 |
| Delta-NL | 1,200 | 2017 |
| Limfjorden | 1,050 | 2019 |
| Kattegat | 9,900 | 2019 |
| Skagerrak | 7,300 | 2019 |
| Baltic (Kalmarsund) | 1,800 | 2019 |
| Baltic Southwestern | 1,100 | 2019 |
| Norway | 6,450 | 2012-18 |
| Svalbard | 1,900 | 2010 |
| Iceland | 9,450 | 2018 |
| **Europe excluding UK** | **68,150** | |
| **Total** | **99,900** | |

[1] Counts rounded to the nearest 50. They are minimum estimates of population size as they do not account for proportion at sea and in many cases are amalgamations of several surveys.

[2] Includes an estimate of 55 seals for south England, Wales and north-west England compiled from sporadic reports

**Data sources**

ICES. 2021. Report of the Working Group on Marine Mammal Ecology (WGMME) , ICES Scientific Reports. 3:19. 155 pp. http://doi.org/10.17895/ices.pub.8141 . 120 pp; Desportes,G., Bjorge,A., Aqqalu, R-A and Waring,G.T. (2010) Harbour seals in the North Atlantic and the Baltic. NAMMCO Scientific publications Volume 8; Nilssen K, 2011. Seals – Grey and harbour seals. In: Agnalt A-L, Fossum P, Hauge M, Mangor-Jensen A, Ottersen G, Røttingen I,Sundet JH, and Sunnset BH. (eds). Havforskningsrapporten 2011. Fisken og havet, 2011(1).; Härkönen,H. and Isakson,E. 2010. Status of the harbour seal (*Phoca vitulina*) in the Baltic Proper. NAMMCO Sci Pub 8:71-76.; Olsen MT, Andersen SM, Teilmann J, Dietz R, Edren SMC, Linnet A, and Härkönen T. 2010. Status of the harbour seal (*Phoca vitulina*) in Southern Scandinavia. NAMMCO Sci Publ 8: 77-94.; Galatius A., Brackmann J., Brasseur S., Diederichs B., Jeß A., Klöpper S., Körber P., Schop J., Siebert U., Teilmann J., Thøstesen B. & Schmidt B. (2020) Trilateral surveys of Harbour Seals in the Wadden Sea and Helgoland in 2020. Common Wadden Sea Secretariat, Wilhelmshaven, Germany. ; Härkönen T, Galatius A, Bräeger S, *et al.*,HELCOM Core indicator of biodiversity Population growth rate, abundance and distribution of marine mammals, HELCOM 2013, www.helcom.fi; www.fisheries.is/main-species/marine-mammals/stock-status/; www.nefsc.noaa.gov/publications/tm/tm213/pdfs/F2009HASE.pdf; www.hafogvatn.is/en/research/harbour-seal/harbour-seal-census. www.nammco.no/webcronize/images/Nammco/976.pdf, Nilssen K and Bjørge A 2017. Seals – grey and harbor seals. In: Bakketeig IE, Gjøsæter H, Hauge M, Sunnset BH and Toft KØ (eds). Havforskningsrapporten 2014. Fisken og havet, 2014(1). Merkel,B., Lydersen,C, Yoccoz,N. & Kovacs, K. (2013)The World's Northernmost Harbour Seal Population–How Many Are There? PLOS-ONE. https://doi.org/10.1371/journal.pone.0067576

Although the Southeast England population increased after the 2002 PDV epizootic and apparently levelled off at a similar size to its pre-2002 epizootic population, it grew at a much lower rate than the Wadden Sea harbour seal population, the only other major population in the southern North Sea. Counts in the Wadden Sea increased from 10,800 in 2003 to 26,788 in 2013, equivalent to an

average annual growth rate of 9.5% over ten years. Counts since 2014 indicate that the rapid growth since the 2002 PDV epizootic has stopped (Galatius *et al.*, 2021). Although there was an influenza-A epizootic that killed at least 1600 seals in 2014, it now seems highly likely that cessation of the previously rapid increase in the Wadden Sea population indicates that it has reached its carrying capacity. The coincidence of the timing of the slowdown in the Wadden Sea and SE England is notable, but the Wadden Sea counts have not shown a decrease since 2018.

### UK harbour seal populations in a European context

The UK harbour seal population represents approximately 32% of the eastern Atlantic sub-species of harbour seal (Table 7). Since 2000, the declines in Scotland and coincident dramatic increases in the Wadden Sea mean that the relative importance of the UK harbour seal population has declined, although with the reduction in growth rates in the Wadden Sea this pattern may have stabilised.

| | |
|---|---|
| **2. Please could SCOS provide an update on the Scottish regional harbour seal declines, including current and projected trends.** | **MS Q9** |

**The most recent composite count for Scotland, for surveys in 2016 to 2019, was 6% higher than for the previous round of surveys (2011-2015) and 31% higher than the 2007-2009 composite count.**

**Trends in each SMU around Scotland and on the east coast of England are presented in answer 1 above and in detail in SCOS-BP 21/03.**

**The current UK harbour seal population is at a similar size to the estimates from the late 1990s, but there have been significant population declines in some regions and similar increases in others.**

The composite count for all of Scotland, 26850 based on recent (2016-2019) surveys was 6% higher than for the previous round of surveys (2011-2015) and 31% higher than the 2007-2009 composite counts, representing approximately 3% p.a. increase (Figure 5; Table 5) and is similar to counts in the mid-1990s.

Trends by SMU are reported in SCOS-BP/03 in detail and briefly described in answer 1 above and shown in Figure 5 for Scottish SMUs and Figure 6 for the Southeast England SMU. Briefly, the populations in the West Scotland and Southwest Scotland SMUs have increased continuously since the 1990s. The Western Isles population declined in the late 1990s but has been increasing since approximately 2005. Shetland and the Moray Firth SMUs are apparently stable after a large, rapid decline in the early 2000s, but Moray Firth counts may now be increasing. North Coast and Orkney SMU is still declining. In the East Scotland SMU the population in the Tay and Eden SAC has declined rapidly since 2002 and the decline is apparently continuing. Less frequent counts in the Firth of Forth indicate that the whole SES_SMU may also be declining.

Large changes in relative density have resulted from differences in regional population trends. E.g., in 1996-1997 the West Scotland SMU and Orkney & North Coast SMU each held 27% of the UK population but now hold 50% and 4% respectively. Recent surveys in the Northeast England SMU and particularly in the large population in the Southeast England SMU have shown a sudden rapid decline since 2018, in what was, until recently, a rapidly increasing population. The Southeast England SMU population was approximately half that of the Wadden Sea in 1980 but by 2019 the Wadden Sea count was approximately eight times larger.

Given the variable patterns in harbour seal trends and very significant declines in some management units SCOS consider it prudent and timely to undertake risk assessments regarding the viability of local populations in relevant SMUs. These should be based on available scientific knowledge (e.g., breeding data, movements, immigration, emigration) and knowledge of pressures and threats. A further consideration would be to review resourcing, to ensure that adequate monitoring resources are deployed in SMUs considered "high risk" as a result of such an assessment exercise.

Due to Covid restrictions, no Scotland based surveys were carried out in 2020, so there are no updates on the trend information in any Scottish SMUs. One survey flight of the Tay and Eden SAC population was carried out during an aircraft re-positioning flight from Dundee to Kent. The survey produced a count of 39 harbour seals. This was similar to the mean of the three previous counts and there is therefore no change to the East Scotland SMU estimate.

At present there is no predictive model capable of projecting trends for any Scottish SMU population. In the absence of revised counts and a predictive model, SCOS defers the answer to the next SCOS meeting.

The current UK harbour seal population is at a similar size to the estimates from the late 1990s, but there have been significant population declines in some regions and similar increases in others. As reported in previous SCOS reports since 2008, there have been general declines in the counts of harbour seals in several regions around Scotland, but the declines are not universal with some populations either stable or increasing. Details of trends are presented in SCOS-BP 20/03 and Thompson *et al. (*2019).

| | |
|---|---|
| **3. Are trends in common/harbour seal abundance considered to be declining in English waters and if so, what are the potential influencing factors and where is further research needed?** | **Defra Q1b** |

**Harbour seal populations in the Wash and adjacent sites have declined rapidly since 2018. Counts in the rest of the SEE_SMU are also showing signs of the start of a decline. The decline is widespread throughout The Wash and adjacent sites and coincides with a similar change in grey seal numbers at the UK's largest haulout site at Donna Nook.**

**Neither the mechanism of change (e.g., emigration, mortality, change in behaviour) nor the drivers of change are known. Grey seal abundance and the simultaneous slow down and possible decline suggest that the two population trajectories may be coupled.**

**Assigning cause to these changes will require a multi strand research programme.**

The counts of harbour seals at sites in SSE_SMU from Donna Nook to Scroby Sands during the August survey in 2019 were approximately 30% lower than the five year mean for 2014 to 2018.

The same sites were surveyed in 2020. That count was 8% higher than the 2019 count but was still 21.5% lower than the 2014-2018 mean. In response to this decrease Defra funded additional surveys in August 2021. Three surveys were carried out in 2021 and the mean harbour seal count was close to the mean of 2019 and 2020 counts and confirms that there has been a decrease.

A detailed description of the surveys, the resulting count data, and trend analyses are presented in SCOS-BP 21/6 and briefly in answer 1 above. The total count for the sites between Donna Nook and Scroby Sands has declined by approximately 30% compared to the mean of the previous five years (2019–2021 mean = 3045; 2014-2018 mean = 4296). The count for the Wash and North Norfolk SAC

has decreased by approximately 23% (2019 – 2021 mean = 2862: 2015-2018 mean= 3712) over the same time periods while Donna Nook showed a 57% decrease and Scroby Sands showed a 73% decrease. The harbour seal decline is evident at all sites and appears to have affected all sub-sections of the Wash & N Norfolk SAC.

Recent surveys of the Greater Thames estuary by ZSL have also detected the first indications of a possible decline in the remainder of the Southeast England SMU population (SCOS-BP 21/7).

Grey seal numbers have increased dramatically over the past 20 years, but the large grey seal haulout group at Donna Nook, accounting for around 65% of the SEE_SMU total shows a similar levelling off and possible decline, coincident with the harbour seal decline. Over the past five years grey seals have been expanding their haulout range within the Wash and small groups are now appearing in the sheltered tidal creeks at the southern edge of the estuary, which are important pupping sites for harbour seals.

Neither the mechanism of change (e.g., emigration, mortality, change in behaviour) nor the drivers of change are known. Grey seal abundance and the simultaneous slow down and possible decline suggest that the two population trajectories may be coupled. Assigning cause to these changes will require a multi strand research programme. Natural England and Defra have funded a preliminary assessment of available information (Russell *et al.* 2021) and a preliminary series of additional surveys. On the basis of these preliminary actions SMRU have developed proposals for such a project and are seeking extra resources.

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| **4. What is the latest information about the population structure, including mortality, age and sex structure, and carrying capacity of grey and common/harbour seals in English waters?**<br>**Is there any new evidence of grey or common/harbour seal populations or sub-populations specific to localised/regional areas?**<br>**What is the latest understanding about the population structure, including survival, reproduction and age structure, of grey and harbour seals in European and Scottish waters?** | **Defra Q2**<br><br>**MS Q2** |

SCOS are not aware of any new information on population structure, mortality, age or sex structure, or carrying capacity for harbour seals in European populations of harbour seals since the 2020 SCOS report. Other than a modelling study of survival and two published studies of breeding phenology there do not appear to be any new studies of population structure, mortality, age or sex structure, or carrying capacity for grey seals. For information the 2020 answer to these questions is included with minor additions.

## Grey seals

**There is evidence for regional differences in grey seal demographics (Smout *et al.,* 2019) but detailed information on vital rates are lacking. New resources should be identified to address questions around fecundity and first-year survival as they are likely drivers of UK grey seal population dynamics.**

**There is no new genetic information with which to assess the substructure of the breeding grey seal populations and therefore no new evidence of sub-populations specific to local areas.**

**Earlier studies indicated a degree of reproductive isolation between grey seals that breed in the south-west (Devon, Cornwall and Wales) and those breeding around Scotland, and within**

**Scotland, there were significant differences between the Isle of May and North Rona. There is therefore some indication of sub-structure within the UK grey seal population, but it is not strong.**

***Age and sex structure***

While the population was growing at a constant (i.e., exponential) rate, it was assumed that the female population size was directly proportional to the pup production. Changes in the rate of increase in pup production imply changes in age structure and/or changes in fecundity. In the absence of a population-wide sample or a robust means of identifying age-specific changes in survival or fecundity, we are unable to accurately estimate the age structure of the female population. An indirect estimate of the age structure, at least in terms of pups, immature and mature females is generated by the fitted population estimation model (SCOSBP 20/01). As currently structured the model fits single global estimates for fecundity, maximum pup survival (i.e., at low population size), and adult female survival, and fits individual carrying capacity estimates separately for each region to account for differing dynamics through density dependent pup survival.

Recently Bull *et al.*, (2021) suggested that changes in timing of births at the small grey seal colony on Skomer Island were being driven by changes in population age structure that was itself responding to changes in an index of sea surface temperature. It is not clear if this represented permanent changes in age structure, temporary immigration/emigration of breeding females of different ages or even interannual variation in fecundity. Nor is it clear whether this was a purely local effect due to movement or changes in recruitment patterns between Skomer Island and the nearby colony on the Welsh mainland. Bowen *et al.* (2020) studied phenology over a 30-year period at the much larger grey seal colony on Sable Island and showed much smaller magnitude changes. They ascribed the changes in timing of births to gradual demographic changes and showed that females of all ages responded to environmental forcing. They also concluded from their sample of 2768 pups that birth date had no impact on pup weaning mass. As weaning mass is related to pup survival, there is therefore unlikely to be a detectable link between birth date and pup survival.

***Survival and fecundity rates***

The only contemporary data that we have on fecundity and adult survival in UK grey seals has been estimated from long term studies of marked or identifiable adult females at two breeding colonies, North Rona and the Isle of May. Results of these studies together with branding studies in Canadian grey seal populations and historical shot samples from the UK and Baltic have been used to define priors for a range of demographic parameters (SCOS-BP 20/02).

***Adult female survival***: Estimates of annual adult survival in the UK, obtained by aging teeth from shot animals were between 0.93 and 0.96 (Harwood & Prime, 1978; Hewer, 1964; SCOS-BP 12/02). Capture-mark-recapture (CMR) of adult females on breeding colonies (Smout *et al.*, 2019) has been used to estimate female survival on North Rona and the Isle of May of 0.87 and 0.95 (SCOS-BP20/02 - Table 2). The population dynamics models fitted to the pup production time series, produced estimates of adult female survival close to the upper limit of that range (SCOS-BP 20/01). Interestingly, recent estimates from Sable Island suggest that adult female survival during the main reproductive age classes (4 to 24 years old) may be even higher. A Cormack-Jolly-Seber model was used to estimate age- and sex-specific adult survival from a long-term brand re-sighting programme on Sable Island (den Heyer & Bowen, 2017). Average adult female survival was estimated to be 0.976 (SE 0.001), averaged over all animals, but was higher for younger adults (0.989 with SE 0.001 for age classes 4-24) than older adults (0.904 SE 0.004 for age 25+).

Rossi et al, (2021) used the branded animal data set for Sable Island to show that survival rates were higher for females compared to males for all age classes, though differences were small for ages 1–19. Females' annual survival rates were very high (>97%) until age 25, after which survival declines by 8% between ages 25–29 and by another 9% for ages 30 and above. Males similarly maintained

high survival rates (>95%) until age 25, though declines in male survival rates in older age classes were much steeper than in female rates. The estimated survival rates imply maximum ages of about 35 years for males and 45 years for females.

In the current population estimation model density dependence acts through pup survival only, so adult survival does not vary with time or between regions. The fitted posterior value for adult survival was a constant rate of 0.96 (SE 0.01), which is consistent with the findings of Rossi *et al*. (2021).

***Fecundity*:** For the purposes of the population estimation model, fecundity is taken to be the proportion of breeding-age females (aged 6 and over) that give birth to a pup in a year (natality or birth rate). Pregnancy rates estimated from samples of seals shot in the UK (Hewer, 1964; Boyd, 1985) and Canada (Hammill & Gosselin, 1995) were similar, 0.83 to 0.94 and 0.88 to 1 respectively. However, these are pregnancy rates and may overestimate natality if there are significant numbers of abortions.

Natality rates estimated from direct observation of marked animals produce lower estimates, which may be due to abortions, but may also be due to unobserved pupping events (due to mark misidentification, tag loss, or breeding elsewhere) and may therefore under-estimate fecundity. Such studies, from Sable Island estimate fecundity to be between 0.57 and 0.83(den Heyer & Bowen, 2017; Bowen *et al., 20*06). UK estimates of fecundity rates adjusted for estimates of unobserved pupping events were higher; 0.790 (95% CI 0.766-0.812) and 0.816 (95% CI 0.787-0.841) for a declining (North Rona) and increasing (Isle of May) population respectively (Smout *et al.*, 2019).

In the current population estimation model, density dependence acts through pup survival only, so fecundity does not vary with time or between regions. The fitted posterior value for fecundity was 0.90 (SE 0.06) (SCOS-BP 20/01).

Four separate, recent studies have investigated the potential effects of environental conditions on fecundity of grey seals:

- Kauhala *et al.* (2019) used samples from seals shot in Finland to demonstrate that pregnancy rates show significant interannual variation (between c0.6 and c0.95) and are significantly related to herring (*Clupea harengus*) and sprat (*Sprattus sprattus*) quality (weight), which in turn were influenced by sprat and cod (*Gadus morhua*) abundance and zooplankton biomass. Their results suggest strong coupling over three trophic levels in the Baltic and suggest that this is likely to influence fecundity rates.
- Smout *et al.* (2019) reported a similar link between likelihood of breeding and environmental conditions during the preceding year.
- In a parallel study, Hanson *et al.* (2019) showed high levels of variation in individual postpartum maternal body composition at two grey seal breeding colonies (North Rona and Isle of May) with contrasting population dynamics. Although average composition was similar between the colonies, it increased at the Isle of May where pup production increased and declined at North Rona where pup production decreased.
- Badger *et al.* (2020) investigated the effects of increasing population density on the reproductive performance of female grey seals over a period when the population was apparently approaching its carrying capacity. Counter to expectations, reproductive performance (measured by reproductive frequency and likelihood of successfully weaning a pup) increased with population size over a period when the population was approaching carrying capacity. However, individual heterogeneity was high and the difference in performance between females identified as either robust or frail on the basis of reproductive histories, increased with population size.

All four studies suggest that fecundity or reproductive performance is influenced by prevailing environmental conditions. The consequences in terms of population level fecundity estimates are not

clear, but SCOS recommends continued investigations into the effects of environmental variation on fecundity and the potential effects of such links on population projections for UK grey seal populations.

***First year survival:*** In the context of the population estimation model, first year survival is defined as the probability that a female pup, will be alive at the start of the following breeding season. However, the model makes the simplifying assumption that annual survival from age 1 to age of recruitment into the breeding population is the same as adult survival. In practice the time series of pup production data contains no information on the pattern of mortality between birth and recruitment. This simplifying assumption means that all additional, pre-recruitment mortality is pooled into the pup survival estimate.

At present, density dependent effects in the UK grey seal population are thought to operate primarily through changes in pup survival. The currently used density-dependent pup survival population model therefore requires a prior distribution for the maximum pup survival, i.e., pup survival in the absence of any density dependent effects. The model then produces a single global posterior estimate of that parameter and region-specific estimates of the current pup survival under the effects of density dependence.

Estimates of maximum pup survival, from populations experiencing exponential growth and therefore presumed not to be subject to strong density dependent effects are given in SCOS-BP 21/04 (Table 2). Mean estimates of pup survival were between 0.54 – 0.76.

The fitted value for maximum unconstrained pup survival was 0.46 (SE 0.07) from the standard model run on the 1984-2016 dataset and data from the North Sea population in 2018 (SCOS-BP 20/01). This value increases slightly to 0.49 when the later pup production estimates were altered by changing the probability of misclassification (SCOS-BP 20/01). These values are substantially lower than estimates in the literature (SCOS-BP 21/04).

It is also possible to derive region-specific pup survival estimates, given the density dependent response to the region-specific population sizes. In the North Sea where density dependence is having little effect, the current pup survival estimate is 0.43, close to the maximum, unconstrained rate estimated by the model, but substantially lower than the published estimates (SCOSBP 21/04). In the other three regions where population growth has slowed or stopped the current estimate is much lower, being 0.11 in the Inner and Outer Hebrides and Orkney. Thomas *et al.*, (2019) estimated that pup survival for a population at carrying capacity will be around 0.1-0.14.

Investigations using the grey seal population dynamics model suggested that changes in first year survival rather than changes in fecundity are the main mechanisms through which density dependence acts on UK grey seal populations (Thomas, 2010; Thomas *et al.*, 2019). Fecundity at an increasing population at the Isle of May was only marginally higher than in a declining population at North Rona colony in Scotland, and fecundity has not changed as the Sable Island grey seal population reaches density dependent limits (den Heyer *et al.*, 2017; Smout *et al.,* 2019). Variation in fecundity may become increasingly important in areas where populations have reached carrying capacity, e.g., age of first recruitment appears to increase as populations reach carrying capacity (Bowen *et al.,* 2006; Pomeroy *et al*., 2010) and the reproductive success of individuals becomes more variable (Badger *et al.*, 2020).

Regional data on fecundity and survival rates would allow us to further examine the drivers of population trends. Such data would feed into the population dynamics model, improving confidence in model predictions and enhancing our ability to provide advice on population status. Furthermore, such data could inform effective management by identifying the relative sensitivities associated with different life stages, in terms of population dynamics. SCOS 2019 recommended that new resources should be identified to investigate regional patterns and the effects of environmental covariates on both first-year survival and fecundity in UK grey seal populations.

***Sex Ratio***: The sex ratio effectively scales up the female population estimate derived from the model fit to the pup production trajectories, to the total population size. With the inclusion of two independent estimates of total grey seal population size, the fitted values of the demographic parameters and the overall population size estimates are sensitive to the population sex ratio for which we do not have good information. The reported values are produced by a model run with a prior on the sex ratio multiplier of 1.7 (SE 0.02), i.e., a female to male sex ratio of 1:0.7 or ten females to every seven males.

den Heyer and Bowen (2017) estimated survival rates of male and female branded seals at Sable Island, Canada. The differential survival of males and females would produce an effective sex ratio of 1:0.7 if maximum age is set to 40, reducing to 1:0.69 if maximum age is set to 45. The sex ratio estimate from the Canadian population is remarkably similar to the prior used in the 2016 model runs. Rossi *et al*. (2021) produced similar sex specific survival rates from the Sable Island brand re-sightings data, but an age structure derived from the survival estimates in Rossi et al. (2021) would result in a sex ratio of approximately 1:0.8 assuming equal first year survival for male and female pups.

***Regional differences in grey seal demographics and genetics***

The difference in population trends between regions for UK grey seals suggests underlying regional differences in the current values of demographic parameters. On the basis of genetic differences there appears to be a degree of reproductive isolation between grey seals that breed in the south-west (Devon, Cornwall and Wales) and those breeding around Scotland (Walton & Stanley, 1997) and within Scotland, there are significant differences between grey seals breeding on the Isle of May and on North Rona (Allen *et al.,* 1995). There is therefore some indication of sub-structure within the UK grey seal population, but it is not strong.

Recent genetic data from the Baltic grey seals (Fietz *et al.*, 2016) suggest that a combination of previous management practices and local climate change effects may be moving the boundaries between the North Sea and Baltic subspecies of grey seal, with increasing encroachment of North Sea seals on areas previously occupied by the Baltic Sea subspecies.

The very rapid increases in pup production at colonies in the Southern North Sea in England, the Netherlands and Germany all point to large scale recruitment to those colonies from colonies in the Northern North Sea (Brasseur *et al.*, 2015). Similar immigration appears to be driving growth in southern colonies on the west side of the Atlantic. On the basis of mDNA haplotype information Wood *et al.* (2011) could not differentiate between US and Canadian grey seal populations and concluded although grey seals are regarded as philopatric, their results indicate that the genetic structure of the northwest Atlantic grey seal population is not different from the null hypothesis of panmixia.

A study led by the Galway-Mayo Institute of Technology (GMIT) is currently investigating the genetic structure of both grey and harbour seals occupying Irish haul-out sites and coastal/marine waters, to determine their relationship to wider regional populations across Western Europe (Steinmetz *et al*., in prep). New mitochondrial data from grey seals in Ireland, southwest England and the German/Danish North Sea coasts were combined with previously published data to generate a dataset including more than 2,000 individuals. Mitochondrial and nuclear diversity were high in all sub-regions. Genetic structuring results suggested that grey seals from the island of Ireland are part of a single interbreeding population. Southwest England was identified as a source of migrants to the island of Ireland. Southern North Sea populations from continental Europe were identified either as a source of migrants to the island of Ireland or as sharing a common source population. Considering these genetic findings, the authors suggest two distinct MUs are proposed for the Northeast Atlantic, comprising: (i) the Faroe Islands, Scotland and the North Sea; and (ii) the island of Ireland, southwestern UK and France. Two transition zones between these MUs are also proposed: (i)

Northwest Scotland and (ii) the English Channel/ Dutch North Sea. A similar analysis of genetic structure in grey and harbour seals in Norway is underway but at an early stage.

## Harbour seals

**Knowledge of UK harbour seal vital rates is limited and inferences about population dynamics rely on count data from moulting surveys. Information on vital rates would improve our ability to provide advice on population status but estimates for UK harbour seals are only available from one long term study at Loch Fleet in northeast Scotland. Additional studies are underway to obtain similar data from new sites in Orkney and western Scotland.**

**Indices of fecundity in both the Wash and Wadden Sea have increased suggesting that either demographic rates, or our indices of those rates, are changing and require further investigation. Recent genetic studies show that harbour seals in southeast England, north and east Scotland, and northwest Scotland form three distinct genetic clusters and population trend analyses suggest that these three groups show different population trends.**

### *Age and sex structure*

The absence of any extensive historical cull data or a detailed time series of pup production estimates means that there are no reliable data on age structure of the UK harbour seal populations. Although seals found dead during the PDV epizootics in 1988 and 2002 were aged, these were clearly biased samples that cannot be used to generate population age structures (Hall *et al.*, 2019).

### *Survival and fecundity rates*

A long-term photo-ID study of harbour seals at Loch Fleet, NE Scotland produced survival rate estimates of 0.95 (95% CI 0.91-0.97) for adult females and 0.92 (0.83-0.96) for adult males (Cordes & Thompson, 2014; Mackey *et al.*, 2008).

A study investigating first year survival in harbour seal pups, using telemetry tags was carried out in Orkney and on Lismore in 2007. Battery life of the transmitters limited the study duration, but survival was not significantly different between the two regions and expected survival to 200 days was 0.3 (Hanson *et al.*, 2013). Harding *et al.* (2005) showed that over winter survival in harbour seal young of the year was related to body mass and to water temperature. Preliminary estimates of survival of harbour seals in Orkney and Skye should be available for SCOS 2022 from the ongoing harbour seal decline project under the Marine Scotland MMSS programme.

In South-east England there is evidence for changing demographic parameters in harbour seals. The apparent fecundity, i.e., the peak count of pups (as an index of pup production) divided by the moult survey count (as an index of total population size) of the large harbour seal population in The Wash has shown large changes since the early 2000s. The rate has been approximately twice that of earlier estimates and until recently was much higher than in the larger population in the Wadden Sea (SCOSBP 20/03). The fact that apparent fecundity of the much larger population in the Wadden Sea has now also increased, suggests that this is a real effect and not due simply to movement between breeding and moulting populations in the two areas. This is a crude metric for the productivity of a population of seals and may be influenced by changes in the timing or the pattern of haulout during the moult. It does however indicate that demographic rates, or our indices of those rates, are changing and require further investigation.

### *Growth*

If harbour seal dynamics are the consequence of resource limits, e.g., because of reduced prey density or increased competition, it is likely that the growth rates of individuals would carry some signal of those effects. Resource limitations are likely to result in slower growth and later age at sexual maturity.

A comprehensive length-at-age dataset for UK harbour seals spanning 30 years, was investigated but showed no evidence for major differences, or changes over time in asymptotic length or growth parameters from fitted von-Bertalanffy growth curves, across all regions (Hall *et al.*, 2019). However, the power to detect small changes was limited by measurement uncertainty and differences in spatial and temporal sampling effort. Asymptotic lengths at maturity were slightly lower than published lengths for harbour seal populations in Europe, the Arctic and Canada, with females being on average 140.5cm (95% CI, 139.4, 141.6) and males 149.4cm (147.8, 151.1) at adulthood.

This lack of signal is in contrast to data from Danish and Swedish harbour seal populations. Comparison of somatic growth curves of 2,041 specimens with known age, length and population size at birth showed that while all populations were similar in 1988, by 2002 there were clear differences between populations (Harding *et al.*, 2018). While seals in the Kattegat showed similar asymptotic lengths as in 1988, seals in the Skagerrak were significantly shorter. Asymptotic lengths of both male and female harbour seals declined by 7 cm. The restricted growth may have been related to relative foraging densities of seals, which were three times greater in the Skagerrak compared to the Kattegat. The authors suggest that reduced growth in the Skagerrak may be an early signal of density dependence.

***Genetics***

Genetic data from a study directed toward resolving patterns of population structure of harbour seals from around the UK and adjacent European sites (Olsen *et al.*, 2017) has recently been added to (with funding from Scottish Natural Heritage) and combined with the population trend and telemetry data to investigate source-sink dynamics of harbour seal populations.

DNA samples were collected from approximately 300 harbour seals at 18 sites throughout the UK and the Wadden Sea (Olsen *et al.*, 2017) and were genotyped at 12 micro-satellite loci. Results suggested three distinct groups, one in in the south equivalent to Southeast England SMU and the Wadden Sea, and a northern cluster that was further divided into a north-western cluster equivalent to the West Scotland, Southwest Scotland and Western Isles SMUs, and a north-eastern cluster equivalent to Shetland, Orkney, Moray Firth and the East Scotland SMUs.

The UK harbour seal population can be divided into similar regional sub-divisions to those seen in the genetics data on the basis of the observed population trends. The southern UK population equivalent to the English east coast shows continual rapid increase punctuated by major declines associated with PDV epizootics in 1988 and 2002. Populations along the East coast of Scotland and in the Northern Isles have generally declined while populations in western Scotland are either stable or increasing.

Nikolic *et al.* (2020) reported an analysis of the genetic structure of the Moray Firth harbour seal population. Their analysis revealed that the Moray Firth cluster is a single genetic group, with similar levels of genetic diversity across each of the localities sampled. Their estimates of current genetic diversity and effective population size were low, but they conclude that the Moray Firth population has remained at broadly similar levels following the population bottleneck that occurred after post-glacial recolonization of the area.

Carroll *et al.* (2020) used a combination of population trends, telemetry tracking data and UK-wide, multi-generational population genetic data to investigate the dynamics of the UK harbour seal metapopulation. Their results indicate that the northern and southern groups previously identified by Olsen *et al.* (2017) represent two distinct metapopulations. Carroll *et al*. (2020) also examined the dynamics of the northern metapopulation before and after the declines in the early 2000s. They identified two putative source populations (Moray Firth North Coast and Orkney, and Northwest Scotland) which provided recruits to three sink populations (East Coast, Shetland and Northern Ireland). Their results indicated a recent metapopulation-wide disruption of migration coincident with the start of the declines.

Steinmetz *et al.,* (2021) used mitochondrial DNA from 123 harbour seals in Ireland and Northern Ireland and 289 seals from the UK and Europe to investigate population structure. They identified three genetically distinct Irish populations characterised by high genetic diversity, in North-western and Northern Ireland (NWNI), South-western Ireland (SWI) and Eastern Ireland (EI). SWI and EI populations were genetically distinct from UK/European populations, but the NWNI population was indistinguishable from the northern UK metapopulation, with evidence of significant migration from Northwest Scotland to NWNI.

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| **5. What are the latest SAC relevant count/pup production estimates for the harbour and grey seal SACs, together with an assessment of trends within the SAC relative to trends in the wider seal management unit/pup production area?** | **MS Q3** |

**The most recent survey data and descriptions of trends in harbour seal counts for all SACs in Scotland and England are presented in SCOS-BP 21/03. Grey seal pup production estimates and descriptions of trends at all SACs in Scotland and eastern England are presented in SCOS-BP 21/03. The relevant count/pup production estimates for SACs together with an assessment of potential trends (increasing, stable (i.e., flat), decreasing, and depleted (stable at a reduced level)) relative to SMU-wide trends in Scotland are shown in Table 8. SMU-wide trends in harbour seal August counts, and grey seal August counts and pup production have been estimated for Scotland (and for eastern England; see Russell *et al.* (2021)).**

**For grey seal SACs, the August and pup production trends were based on examination of the August aerial survey counts and pup production estimates, respectively.**

**Because the August counts of grey seals are inherently variable, it was not possible to assess potential trends for SACs with relatively small counts. Many grey seal SACs were designated on the basis of their breeding colonies, and do not host large haulout numbers.**

**For harbour seal SACs, potential trends were assessed on the basis of estimated trends up to 2017 (Thompson *et al.*, 2019) supplemented by more recent counts where available. The counts/pup production estimates for the SACs are displayed in Russell *et al.* (2021; Figure numbers as per the relevant SMU). A more detailed examination of harbour seal counts within both Scottish SACs and SMUs is given in Morris *et al.* (2021).**

### Harbour seals

Information on the available data, trend analyses and comparisons with survey data for adjacent areas up to 50km from the SAC together with similar data and analyses for all SMUs in Scotland form part of a report to NatureScot that will be published in 2021. For information the SAC relevant sections of that report were summarised in SCOS-BP 20/05.

Dynamics of SAC populations of harbour seals vary (see SCOS-BP 21/03, and Table 8 below and answer 1 above). Comparisons of the time series of harbour seals counted within SACs compared with numbers found within a 50km range show that SACs are not reliable indicators of trends in the wider population. This is especially evident for the Sound of Barra SAC, where harbour seal numbers have declined dramatically since the 1990s. In contrast, surrounding areas have seen a significant increase in numbers. To varying degrees, all SACs now represent a smaller proportion of the wider population than in the past.

Recent counts in the Wash and North Norfolk SAC show a dramatic reduction. The 2019 count was 27% lower than the preceding 5-year average. Preliminary results from 2020 suggest that this was a real decrease. SCOS have highlighted this population as a priority for additional research and increased monitoring.

## Grey seals

A small number of grey seal breeding sites are designated as SACs and use pup production as a condition indicator. Trends in pup production in those SACs were described by Russell *et al.* (2019) and are briefly described here.

**Treshnish Isles SAC** (Inner Hebrides) produced over a third of the pups born in the Inner Hebrides in the late 1980s. Until the mid-1990s, the trend in pup production within the Treshnish Isles SAC mirrored the regional trend, after which pup production in the SAC showed indications of a gradual decline. From 2010 to 2016, the SAC produced approximately 25% of pups born in the Inner Hebrides.

**Monach Isles SAC** (Outer Hebrides) produced 79% of the pups born in the Outer Hebrides in 2016. As a consequence, the Outer Hebrides pup production trend closely mirrors the trend seen at Monach Isles which showed an increase of 7.4% p.a. (CIs: 6.3, 8.4) between the mid-1980s and mid-1990s before levelling off as the pup production approached an asymptote.

**North Rona SAC** (Outer Hebrides) used to be the biggest colony in the Western Isles (c. 2,000 pups in 1960s and 1970s), but has declined since 1995 at a rate of 5.1% p.a. (1995- 2010: CIs: 4.2, 6.0), with fewer than 400 pups born in 2016 Many of the other historical colonies in the Outer Hebrides underwent similar decreases in pup production (e.g., Causamul: -8% p.a. (CIs: 6.8, 9.3); Haskeir: 3.3% p.a. (CIs: 2.4, 4.1)). More recently, Gasker also declined ( -4% p.a. (2000-2010; CIs: 387 2.7, 5.3)). Conversely, newly established colonies (e.g., Berneray, Mingulay and Pabbay) in the south of the region increased.

**Faray & Holm of Faray SAC** (Orkney) produced approximately 15% of the pups born in Orkney in 2016. Pup production within the Faray & Holm of Faray SAC increased at a rate of 9.4% p.a. (1987-1995; CIs: 7.5, 1.4) reaching a maximum of 3,840 pups in the late 1990s before decreasing at a rate of 2% p.a. since 2000 (CIs: 0.8, 3.2). Production in Orkney reached an asymptote of 18,000 to 19,000 pups in c.2000 and has been stable ever since.

**Isle of May SAC** (East Scotland) The pup production in the central North Sea has increased since 1987 at an average rate of 5% p.a. between 1987 and 2010 (CIs: 4.4, 5.5). However, rates of increase at the three main colonies vary. Production at the Isle of May increased exponentially at 9.9% p.a. (CIs: 7.5, 12.3), since surveys began (1979), before reaching an asymptote of c.2,000 pups in the late 1990s.

**Berwickshire and North Northumberland Coast SAC** (East Scotland & Northeast England). Pup production in the Berwickshire & North Northumberland Coast SAC is continuing to increase and does not show any indication of reaching an asymptote. However, this SAC contains two large, discrete grey seal breeding populations with different histories and different recent dynamics. The Farne Islands have been an important breeding site since the Middle Ages, while Fast Castle is a recently established breeding site first colonised in the 1990s. Pup production at the Farne Islands increased from the beginning of the surveys in the 1950s until the mid-1970s, when production fell rapidly likely due to a series of culls (Summers, 1978) between 1967 and 1985 (pre-cull pup production between 1956-1965: 7.5% p.a.; CIs: 6.5, 8.5). Production increased at a slower rate of 4.2% p.a. in recent years (2005 – 2014; 95% CIs: 3.2, 5.2).

The Fast Castle colony has continued to increase at a rate of 16.9% p.a. (CIs: 15.2, 18.7).

**Pembrokeshire Marine/ Sir Benfro Forol SAC**. Pup production at Skomer, on the Marloes Peninsula and at the monitored sites on Ramsey Island have all increased (see SCOS-BP 20/04 for details and data sources). This increase persists despite significant bycatch that exceeds current PBR estimates for the wider SW British Isles population of grey seals (see answer 11 & 14 for detailed discussion).

**Table 8.** Latest harbour (8.a.) and grey (8.b.) seal data for Special Areas of Conservation (SACs) in Scotland by Seal Management Unit (SMU). SMU numbers also refer to the relevant Figure number in Russell *et al.* (2021). The trends are potential for each SAC and estimated for each SMU.

## 8.a. Harbour seal

| SMU | | SAC | Latest August count (year) | Potential SAC trends | SMU trend |
|---|---|---|---|---|---|
| 2 | West Scotland | Ascrib, Isay and Dunvegan SAC | 712 (2017) | stable | increasing |
| | | Eileanan agus Sgeiran Lios mor SAC | 238 (2018) | stable | |
| | | South-East Islay Skerries SAC | 706 (2018) | stable | |
| 3 | Western Isles | Sound of Barra SAC | 132 (2017) | depleted/declining | increasing |
| 4 | North Coast & Orkney | Sanday SAC | 77 (2019) | declining | declining |
| 5 | Shetland | Mousa SAC | 7 (2019) | declining | depleted |
| | | Yell Sound Coast SAC | 209 (2019) | stable | |
| 6 | Moray Firth | Dornoch Firth and Morrich More SAC | 62 (2019) | declining | stable/increasing |
| 7 | East Scotland | Firth of Tay and Eden Estuary SAC | 37 (2020) | declining | limited data, likely declining |

**8.b. Grey seal**

| SMU | | SAC | August counts | | | | Pup production (latest data 2019) | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Latest count (year) | Potential SAC trends | SMU trend | | Latest estimate | Potential SAC trends | SMU trend |
| 2 | West Scotland | Treshnish Isles SAC | 160 (2018) | Not examined | increasing | | 1131 | stable | stable |
| 3 | Western Isles | Monach Islands SAC | 2701 (2017) | stable | stable | | 12511 | stable /increasing | stable /increasing |
| | | North Rona SAC | 175 (2014) | Not examined | | | 286 | declining | |
| 4 | Orkney & North coast | Faray and Holm of Faray SAC | 228 (2019) | Not examined | stable/ increasing | | 2186 | stable/ declining | stable |
| 7 | East Scotland | Isle of May SAC | 40 (2016) | Not examined | stable | | 1885 | stable/ declining | increasing |
| | | East Scotland component of Berwickshire and North Northumberland Coast SAC* | 71 (2018) | Not examined | | | 4499 | increasing | |

* The boundary of this SAC transects the Fast Castle colony. Here we have included all pup production within the total for the SAC.

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| **6. The frequency of grey seal surveys in some areas of Scotland are likely to be reduced in future years. Can SCOS advise on what a reduction in survey effort would mean in terms of the confidence of population estimates?** | **MS Q4** |

**Reducing survey frequency will likely lead to an increase in the confidence intervals but is unlikely to substantially change the mean estimates. It is considered that the effects of further reducing survey frequency should be compensated to some extent by inclusion of additional independent estimates. Although estimating the population size is important, estimating trends and detecting changes in those trends is arguably more important. Rapid detection of changes in dynamics at appropriate spatial scales is essential for effective management of anthropogenic effects. The effect of reducing survey frequency in a stable population will be less than for a rapidly changing population. Reduced survey frequency may increase the time taken to detect changes.**

**Any decision to reduce survey frequency will take into account the need to maintain a good understanding of current trends and should, where possible, include an appropriate power analysis. A revised analysis of the likely effects will be carried out as part of the planning and decision-making process before any change in survey frequency is implemented.**

Thomas & Harwood (SCOS-BP 05/3) investigated the effect of reducing the frequency of pup production estimates by re-fitting a suite of population dynamics model to a reduced data set comprising pup production estimates from 1984, 1985 and alternate years from 1987 to 2003. The predicted total population sizes for 2004 were similar to the estimates obtained using the entire dataset. However, the posterior credibility intervals were noticeably wider. In 2010 the monitoring programme was reduced to biennial surveys. Reducing the frequency further will likely lead to a further increase in the confidence intervals, but is, again, unlikely to substantially change the mean estimates.

It should be noted that the previous analysis showed only a limited impact of effectively halving the data. This was a worst-case scenario as the reduction in survey frequency only affects the later part of the time series. The models are fitting to an unbroken time series from 1984 to 2010 and biennial surveys since 2010 as well as to the future data. The model now also fits to three independent estimates of the grey seal population size, and this time series will be updated every five years. The effect of reducing survey frequency to biennial has apparently been compensated for by the inclusion of the independent estimates and by the extra data points since 2010. The approximate CV of the 2010 estimate of the overall UK population, based on pup production to 2009 and including one independent estimate was 0.12. The approximate CV of the 2018 estimate, based on pup production estimates up to 2016 (including three biennial surveys) and including two independent estimates was 0.065. This suggests that the effects of further reducing survey frequency should be compensated to some extent by inclusion of more independent estimates in future.

Although estimating the population size is important, e.g., for quantifying interactions with fisheries or industrial activities, estimating trends and detecting changes in those trends is arguably more important. Rapid detection of changes in dynamics at appropriate spatial scales is essential for effective management of anthropogenic effects. In such cases, comparisons are complicated by the fact that different populations are showing different dynamics and the effect of reducing survey frequency in a stable population will be less problematic than for a rapidly changing population. Any decision to reduce survey frequency will be an attempt to target the available survey resources more effectively, e.g., by reducing frequency of surveys in regions that are showing little change and

concentrating effort where rapid change has been observed or is expected. A revised analysis of the likely effects will be carried out as part of the planning and decision-making process before any change in survey frequency is implemented. Wherever possible such a reduction in survey frequency should be compensated with increased use of alternative information such as independent (i.e., not derived from pup production time series) estimates of population size and demographic parameters.

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| **7. Could SCOS provide advice on the most appropriate multiplier to use when estimating an all age population size from pup production in the Southwestern British Isles (including Ireland) region.** | **NRW Q3** |

**The main source of uncertainty in the Southwestern population estimate is the absence of reliable pup production data for a large proportion of the Welsh grey seal population. Any population estimates and resulting PBR values derived from the existing pup production estimates should be treated with caution.**

**In the absence of either an independent estimate of total population size, or a time series of pup production estimates for Welsh grey seals, a method is required to convert single pup production estimates to total population size. Several conversion factors could be used, but SCOS identified the ratio of pup production at regularly monitored colonies in Scotland and eastern England to a population estimate derived from a population dynamics model as the most appropriate method. For future PBR estimates, SCOS recommend a count of seals in August, to align with the rest of the UK would be the best option, if possible.**

**The scalar for estimating 1+ age population from pup production based on the population dynamics model was 2.32 (CI 2.15 – 2.50). However, this includes additional uncertainty in the recent pup production estimates. A more conservative scalar of 2.08 (CI 1.93 – 2.24), based on the 2010 ratio between pup production and population estimates, avoids this additional uncertainty.**

In the absence of data on the distribution and abundance of seals in Wales and Southwest England Seal Management Units (SMUs) outside the breeding season, a scalar has been used to generate total population and $N_{min}$ estimates from estimated pup production in those SMUs. However, there are no time series of comprehensive/reliable pup production estimates for Wales or Southwest England with which to fit a population model to predict population size. An approximate population estimate has been proposed based on a multiplier, derived from the pup production and total population estimates from the regularly monitored populations in Scotland and the North Sea. In addition, the rationale for combining the Irish population with the Welsh and Southwest English populations is unclear; these are unlikely to form either a closed or fully mixed population.

The most recent nationwide estimate for pup production in Wales and SW England is 2,700 pups. derived from counts/estimates at indicator sites and a scaling factor (approximately 2) to convert the sum of these indices to total pup production (SCOS-BP 20/04). Thus, approximately half of this estimate is based on counts from the 1990s and an assumption that those sites have increased in line with the other half for which a time series of counts are available (SCOS-BP 20/04). There does not appear to be any information to support that assumption. The most recent published estimate for Ireland is 2100 pups based on pup counts carried out between 2009 and 2012.

SCOS are concerned that pup production estimates for sites that are currently thought to hold approximately half of the total Welsh grey seal pup production are based on 30 year old counts and that pup production estimates for Ireland are based on 10 year old data. The estimated pup production should therefore be treated with extreme caution. An analysis of newer pup production and population data from Ireland covering the period 2013-2017, and for which summer haul-out

count data have also been gathered in 2017-18, is ongoing and may help to inform this subject for future SCOS deliberations.

In the absence of comprehensive summer haulout survey data SCOS recommend a scaling factor for estimating total population size from pup production using the ratio of pup production to the population estimate derived from the population dynamics model (SCOS-BP 21/05) for the rest of the UK grey seal population. Pup production for the regularly monitored colonies was 60,700 in 2019. The model generated population associated with those colonies was 140,900 (95% CI 130,600-151,600). This produces a scalar of 2.32 (CI 2.15 – 2.50).

However, this estimate includes a large uncertainty due to the step change in pup production estimates associated with the change in methodology after 2010. To avoid that additional uncertainty, using the ratio of pup production to total population estimate from 2010 would be a safer, i.e., more precautionary approach. This would produce a pup production to total population scalar of 2.08 (CI 1.93 – 2.24).

Notwithstanding the concerns over the uncertainty in pup production estimates, these scalars could be used for calculating PBRs. The same process can be used to estimate approximate scalars from pup production to $N_{min}$ equal to the lower 20$^{th}$ percentile of the distribution of the population estimate. The scalar/multiplier for pup production to $N_{min}$ derived from the current population dynamics model is approximately 2.24. Using the 2010 ratio would produce a scalar of 2.00.

However, SCOS again stress that these numbers are speculative given the absence of a comprehensive pup production estimate for over 30 years. Using the ratio between overall pup production and population size for the rest of the UK is also problematic. We do not have an estimate of the growth rate for the Welsh population and the growth rate strongly influences that ratio. As a result, SCOS again urge extreme caution when applying these all-age population estimates for seal management.

As there are no new comprehensive pup production data and no comprehensive summer survey data, SCOS recommend leaving the $F_R$ = 0.5. Although there is a perception that the Welsh population may be increasing slowly, CCW previously recommended setting the $F_R$ to 0.5 based on uncertainty in population status and the use of parameter estimates from other populations (SCOS 2016 Q9). There are detailed time series for some of the larger sites, but there is still a great degree of uncertainty because a potentially sizeable proportion of the population is effectively uncounted, so the uncertainty has not decreased.

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| **8. Are there any technologies (existing or new/emerging) that could be considered as an alternative to aerial surveys that could help meet Net Zero aspirations, or does the method currently used remain the most appropriate vehicle?** | **MS Q5** |

**New survey techniques are continually assessed for the potential to reduce the environmental costs and health and safety risks associated with SMRU's aerial survey programme. Despite improvements in resolution, satellite imagery does not have the required resolution for species differentiation and for differentiation of different classes of seal pups.**

**Unmanned Aerial Vehicles or drones are becoming more affordable and reliable and offer the potential to carry out surveys in poorer weather conditions at lower level than fixed wing aircraft or helicopters. However current limitations of battery life, payload weight and legislation limiting use to line of sight limits the extent to which drone technology could replace the current aerial survey approach. The very large extent of individual colonies, often several kilometres, the**

**number of colonies that require synoptic surveys and the large distances between them render current drone technology unsuitable. SMRU will continue to monitor the capabilities and legislation surrounding drone use. Despite this, drones have significant potential to provide data to supplement SMRU's regular monitoring and collect specific information at individual colony level.**

**Other options to reduce the environmental impact of the aerial survey programme would be to reduce the frequency of surveys and/or to have the plane used for grey seal breeding survey stationed at Dundee airport throughout the season.**

**Efforts to reduce the carbon footprint of the existing surveys continue. From 2021 all east coast harbour seal surveys will be conducted using a single engine Cessna 172 aircraft. Improved manoeuvrability at slower speeds and ability to use local grass landing strips has improved survey efficiency and reduced fuel consumption by approximately 70%.**

The Sea Mammal Research Unit continually review the capabilities of new techniques to conduct accurate, safe, efficient, and cost-effective population surveys. The need to reduce the environmental effect of research is also a driver for the investigation of new techniques.

The increasing resolution of satellite imagery has provided opportunities to assess wildlife populations from space (McMahon *et al.,*2014, Bamford *et al.,* 2020). However, satellite-derived methods have difficulty resolving smaller or camouflaged animals. The best available resolution of 30 cm per pixel makes it feasible to count individual seals on sand (Moxley *et al.,* 2017), but does not allow the differentiation of seal species or different classes of grey seal pups on sand or even the detection of seals on rocky shorelines. Even though it is possible to count individual seals on some satellite images, the frequency at which usable imagery (highest resolution image of a specific location during low tide) would become available is unknown. Figure 7 shows the recent imagery available on Google Earth for a popular grey seal haul-out site at the mouth of the Ythan estuary, north of Aberdeen. Although large numbers of grey seals are visible on all six images taken since May 2016, only the image taken on 28$^{th}$ June 2018 has a resolution that allows most individuals to be counted confidently.

Another technique that is under continual review is the development of unmanned aerial vehicles (UAV) such as quadcopters and fixed wing aircraft, also known as drones.

It has only been in the past few years that commercially available drones have become affordable and reliable for professional use, allowing researchers to conduct highly detailed aerial surveys on a routine basis (Dickens *et al.,*2021). However, these remain limited in terms of battery life, and associated flight time, and payload weight for camera equipment. Currently, consumer drones and most multi-rotors are limited to flight times of <45 min, while fixed-wing drones are limited to <2 h. For monitoring behaviours that may extend beyond battery capacity, drones require battery replacement that interrupt monitoring.

Existing legislation requires line-of-sight operation (up to a maximum horizontal distance of 500 m) which means that the operator would have to launch/operate the drone from multiple locations to cover individual large grey seal breeding colonies that extend over several kilometres. Most of the colonies would only be accessible by boat or helicopter. Biennial grey seal pup production surveys involve 4-5 repeated aerial surveys of around 70 colonies spread out over a large area across Scotland and eastern England. The area requiring coverage has recently increased, both in extent and geographical spread, to incorporate the growing colonies on the east coast of England. The size of the colonies and the distances between areas covered within a single survey campaign are too large to be covered by currently available UAV technology and within existing legislation in a cost-effective manner.

During SMRU harbour seal moult surveys, a few hundred kilometres of coastline are surveyed during a single 4h low tide window on each day. This reduces the potential for movement between haul out

sites during surveys. These surveys are often in remote and hard to reach parts of Scotland, involving convoluted and complex rocky coastlines where seals are found using a thermal imaging camera. It is not currently possible to replicate this approach with drones as this would require transport between areas by vehicle and boat or helicopter and would take many more days.

Despite these limitations, drones have significant potential to provide data to supplement SMRU's regular monitoring and would be a highly effective means to replace ground counts at individual colony level at specific locations. Drones also have potential as a technique for detailed investigation of specific research questions with methods such as photogrammetry-based estimates of body condition and size distribution, photo identification, evidence of entanglement etc.

In conclusion, whilst consumer-grade drones offer significant potential for improving our ability to monitor a number of features at individual colonies or haul-outs, there is not yet sufficient operational ability to replace the current approach of using manned aircraft to achieve the extent and scale of the current UK wide seal monitoring programme. In the foreseeable future, emissions of greenhouse gases could only be reduced by further reducing the frequency of surveys or by having the aircraft used for grey seal pup surveys based at Dundee Airport throughout the season. However, the capabilities of affordable UAVs are continually developing. Therefore, SMRU will continue to review the capabilities of UAVs and other emerging technologies to identify potential future reductions in the environmental impact and in the risk of methods implemented in the current monitoring programme.

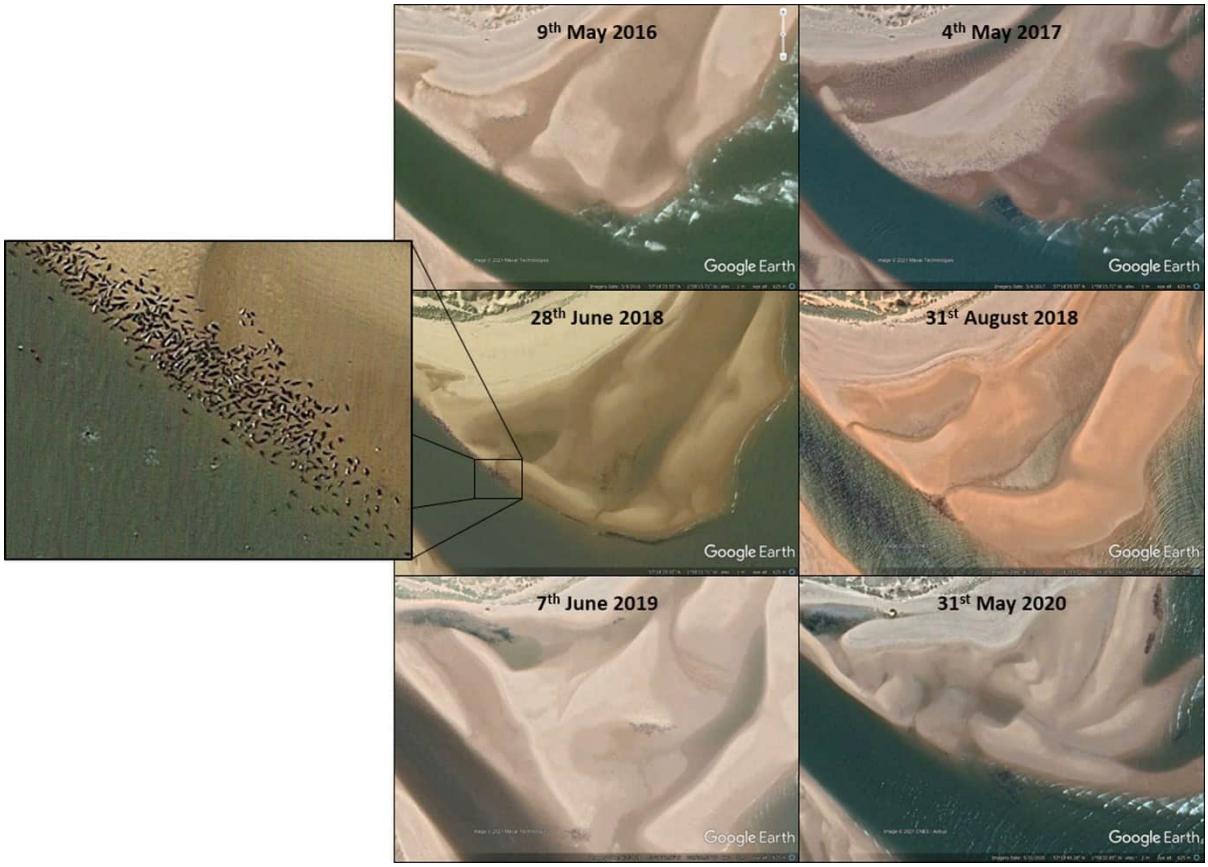


**Figure 7.** A grey seal haul-out site at the mouth of the Ythan Estuary, north of Aberdeen, shown on the six most recent satellite images available on Google Earth. Large groups of seals are visible on all images, but individual seals are only clearly identifiable on the image taken on 28th June 2018.

## Harbour Seal Decline

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| **9. In the 2020 advice, SCOS provided a view on the current potential (major) drivers of the harbour seal decline and their status. Can SCOS provide an updated assessment on these in light of ongoing work.** | **MS Q10a** |

**The causal mechanisms of the harbour seal decline have not been identified, but several factors have been rejected as primary causes of the decline, although these may remain as potential secondary causes. Table 9 contains a list of potential factors involved and the current assessment of their importance (modified from SCOS 2020). A few critical factors still remain that require further research, including reduction in prey availability, competition with grey seals for prey resources, predation by grey seals and by killer whales, and exposure to toxins from harmful algal blooms.**

The Sea Mammal Research Unit has been funded by the Scottish Government to investigate the causes of the declines. A summary of the progress and initial results of the programme was presented in SCOS-BP 20/06. Previous and recent work conducted during Phase II of this project (which was completed in early 2020) suggest that toxins from HABs may increase harbour seal mortality, based on a bio-energetic model estimating the range of likely daily toxin doses ingested by harbour seals (risk assessment model). A recent publication from Phase II describes concentrations of toxins from HABs in fish species sampled in Scotland, with the highest domoic acid (DA) concentrations measured along the east coast of Scotland and Orkney, and peaks of both DA and Paralytic Shellfish Toxins consistent with phytoplankton bloom timings (see Kershaw *et al.*, 2021). Phase III of the project aims to increase the number of prey samples during HAB events to update the risk assessment approach and compare data on toxin concentrations during and outside HAB events. Phase III of the project also continues to focus on the estimation of survival and fecundity rates at sites of contrasting population trajectories with an extended dataset (2016 to 2022 with a gap year for 2020 due to covid-19 pandemic). Two SUPER DTP funded projects started in 2019 and in 2020, which are addressing inter-species competition and the effect of grey seal predation on regional declines, and killer whale predation on harbour seals.

For information, Table 9 contains a list of potential drivers of decline (proximal and ultimate) and the current assessment of their importance (modified from SCOS 2020). A confidence level (high, medium, low) has been added to each of the potential drivers to reflect uncertainty regarding the assessment of their importance in the observed declines based on the evidence available.

It is recognised that different factors may be implicated in the declines in different SMU populations and that there is no guarantee that the list in Table 9 is comprehensive. Unidentified factors may be important in some SMUs.

**Table 9.** The current view of the potential proximate causes (9a) and ultimate causes (9b) of the observed declines in harbour seals in some areas (Orkney, East Coast, MF), with an indication of their likely importance as drivers and of the level of confidence in that assessment.

9.a.

| | Proximate Causes | Importance status | Confidence level | Evidence | Additional information |
|---|---|---|---|---|---|
| **1** | Reduced adult survival | Likely | High | No direct estimates of adult survival for declining UK harbour seal populations. In some regions, e.g., Orkney and the Firth of Tay and Eden SAC, the decline is too rapid to be solely due to reduced recruitment so adults must have been removed from the population. | Preliminary adult survival estimates for study sites in Orkney and Skye should be available for SCOS_2022 |
| **2** | Reduced pup survival | Possible | High | Hanson et al (2013) found no difference in survival between stable (West Scotland) and declining (Orkney) populations. However, reduced pup survival/recruitment is thought to be a likely driver of seal populations | |
| **3** | Reduced fecundity | Possible | High | No time series of population scale pup production estimates for any declining populations and therefore no evidence to identify changes in fecundity. Preliminary results from ongoing study suggests that pregnancy rates at a site in Orkney were lower than at Skye, Moray Firth or Pentland Firth sites but differences were non-significant[3]. | Preliminary fecundity estimates for study sites in Orkney and Skye should be available for SCOS_2022 |
| **4** | Increased juvenile dispersal | Possible | Medium | Carroll *et al*. (2020) suggest significant historical migration from the MFNCO[4] local population to Shetland and East Scotland SMUs. Study concluded that migration from Orkney and Moray Firth has reduced since the onset of the decline.<br>Telemetry data showed significant movement of pups from Orkney to adjacent SMUs[3] but no information on temporal trends in such movements. | |
| **5** | Increased adult emigration | Possible | Low | Telemetry data have little power to detect emigration. Existing data do not indicate large scale movement between SMUs (Sharples *et al*., 2012), although temporary relocation between Orkney, Moray Firth and Shetland SMUs has been observed[5]. | |

[3] Marine Mammal Scientific Support to Scottish Government. HSD 2 Annual report Year 4. http://www.smru.st-andrews.ac.uk/research-policy/reports-to-scottish-government/

[4] MFNCO is Moray Firth and North Coast local seal population and encompasses both the Moray Firth, and the North Coast and Orkney SMUs.

[5] SMRU unpublished data

9.b.

| | Ultimate Causes | Importance status | Confidence level | Evidence | Additional information |
|---|---|---|---|---|---|
| **1** | Nutritional stress | Possible | Medium | Recent analysis of body condition and nutritional health in live captured animals shows no evidence of link to population trends (Kershaw *et al.,* in press). However, samples represent survivors and may be biased, so power to detect starvation effects could be low. | |
| **1a** | Prey quality and availability | Likely | Medium | Coincidence of declines in seabird productivity in N & E Scotland thought to be due to prey abundance or availability. | |
| **1b** | Competition with marine predators | Likely | Medium | Competition for prey with the increasing grey seal population and/or other marine predators cannot be ruled out. | Ongoing SMRU based PhD project on grey seal competition. |
| **2** | Predation | Likely | Medium | Predation by grey seals (Brownlow *et al*., 2016) and killer whales (Deecke *et al*., 2011) reported at several locations. Estimates suggest that killer whale predation rates may be high in Shetland.<br>Historical monitoring data insufficient to show causal link. | 2 ongoing PhD projects currently investigating predation by grey seals and killer whales. |
| **3** | Toxins from harmful algae | Possible | Medium | No direct evidence of large-scale mortality events from strandings in areas of decline. Domoic acid, saxitoxins and okadaic acid continue to be detected in harbour seals (Jensen *et al*., 2015) and their prey (Kershaw et al., 2021). Historical data are insufficient to show correlation with the observed declines, but wide geographical scale and likely severity mean that HABs cannot be ruled out as a contributing factor | |
| **4** | Infectious disease and parasites | Possible | Low | No direct evidence of large-scale disease events from strandings or live capture data in areas of decline. Coincident onset of declines and the 2002 PDV epizootic is unexplained but could indicate some chronic effect.<br>Other disease agents (e.g., Mouth rot outbreak in Eastern England) cannot be ruled out as contributing factors. Higher mortality rates among rescued juvenile harbour seals in recent years in the SEE-SMU. | |
| **5** | Climate change: indirect effects | Possible | Medium | Changes in prey distribution and/or availability or increases in harmful algal blooms or increased disease prevalence as a consequence of climate change are likely to impact harbour seal populations in future (covered in 1,3 & 4 above) | |
| **6** | Climate change: direct effects | Unlikely | High | Observed changes in physical environment in UK waters do not exceed harbour seals' adaptive capabilities. No evidence of major changes in Scotland coincident with the observed declines. | |

| | Ultimate Causes | Importance status | Confidence level | Evidence | Additional information |
|---|---|---|---|---|---|
| **7** | Fisheries bycatch | Unlikely | High | Data from bycatch observer programmes and absence of major gillnet fisheries in regions of decline suggest that bycatch is unlikely to have been a significant factor in the declines. | |
| **8** | Persistent Organic Pollutants | Unlikely | High | Levels of persistent organic pollutants (PCBs, DDTs and PBDEs) are low in the areas of decline and highest in regions where populations have been increasing since 2002 (Hall & Thomas, 2007). | |
| **9** | Targeted killing | Unlikely | High | No evidence of targeted killing at levels that could account for observed declines. Prior to the Marine Act 2010 there was no requirement to report shooting of seals in Scotland. Although there are no comprehensive records, legal shooting of seals was not thought to be sufficient to account for the numbers of seals lost during the early stages of the declines.<br>Shooting can be ruled out in some SMUs e.g., East Scotland, but cannot be ruled out as a possible contributory factor in other SMUs. | Licensing under the Marine (Scotland) Act 2010 ensures protection of declining populations from directed takes. As a result of legislative changes in 2021, killing seals to protect fisheries or aquaculture is no longer allowed in the UK. |
| **12** | Disturbance at haulout sites | No | High | Possible local re-distribution effects. Most sites are remote and rarely disturbed. Occasional and/or localised disturbance unlikely to have significant population scale effects. Population trends at sites with high levels of tourism/military aircraft activity and offshore renewable energy developments show no signs of negative impacts at the population level. | |
| **10** | Loss of habitat | No | High | Data from aerial surveys and telemetry studies show no evidence that foraging, moulting or breeding sites have been lost. | |
| **13** | Entanglement in marine debris | No | High | Entanglement in marine debris is not a major recorded cause of mortality in stranded harbour seals in Scotland. There were no known changes in fishing practice likely to have increased entanglement coincident with declines. | |
| **14** | Macroplastics and microplastics | No | High | Data from stranded seals and faecal samples indicate that ingestion of macro- and microplastics is currently not a major issue for UK seals at the population level and can be ruled out as a driver of the observed declines. | |

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| **10. Can SCOS also advise whether the observed declines occurring in the south east of England could assist with providing answers to the Scottish position?** | **MS Q10b** |

**SCOS consider that there are some interesting parallels between the observed declines in southeast England and some areas of Scotland, but also significant differences between regions that provide both opportunities and challenges. The English population decline was noted at an earlier stage and the combination of annual time series of population estimates and pup counts for the southeast England and adjacent Wadden Sea populations may provide additional insights into the changes in trajectories.**

**In both cases, the magnitude of the declines suggests they cannot be fully explained by a decrease in fecundity and/or juvenile survival alone, and that there must be a decline in adult numbers. Some of the same potential drivers for the declines overlap between the two cases and investigation of these should provide information that will be relevant to the question of harbour seal declines throughout the UK and Europe. However, there are differences between the SMUs in Scotland and in the southeast of England regarding population trends, genetics, ecology and environment which might limit the ability to provide informative answers.**

**There are some interesting parallels, but also significant differences.** It is difficult to predict whether investigations into the apparent decline in the southeast England Seal Management Unit (SEE-SMU) will be able to inform the regional declines in Scotland. The decline in counts of harbour seals in the South East England Seal Management Unit (SEE_SMU) are as yet unexplained. SMRU are currently developing proposals and research projects to investigate the declines and it is hoped that insights derived from such studies will inform the harbour seal decline issue in several Scottish harbour seal populations (Russell *et al.,*2021). In both cases, the magnitude of the declines suggests they cannot be fully explained by a decrease in fecundity and/or juvenile survival alone, and that there must be a decline in adult numbers. There is some overlap in the potential drivers for the declines in the two regions. Investigation of diet, foraging behaviour, movements, interactions with human activities and interactions with competing predators should provide information that will be relevant to the question of harbour seal declines throughout the UK and Europe. Also, the sudden onset of the decrease in the SEE_SMU after a period of rapid growth may help identify potential drivers and/or make it easier to exclude factors that could not have caused the decrease.

However, there are differences between the SMUs in Scotland and in the southeast of England regarding population trends, genetics, ecology and environment which might either limit the ability to provide informative answers towards explaining the declines in Scotland or provide informative comparisons that help identify or exclude potential drivers.

Genetically, harbour seals in the SEE-SMU are significantly different from all other UK harbour seal SMUs and are considered as part of a different metapopulation together with continental Europe harbour seals (including those in the Wadden Sea) (Carroll *et al.*, 2020). The harbour seals in the SEE-SMU have historically undergone sustained increases in abundance, punctuated by sudden declines during the Phocine Distemper Virus (PDV) outbreaks in 1988 and 2002. These sustained increases contrast with the trends in the SMUs along the east coast of Scotland and the Northern Isles, all of which have recorded declines in harbour seal numbers differing in intensity since 2002 after generally stable population trajectories (Thompson, Duck, Morris, & Russell, 2019). A drop in adult numbers can be caused by increased adult mortality and/or emigration. Emigration is not considered as a major factor contributing to the decline in harbour seal numbers in SMUs in Scotland (SCOS, 2020). but in the case of SEE-SMU, emigration cannot be ruled out as the large size of the adjacent harbour seal population in the Wadden Sea might not allow detection of such potential immigration.

Potential causes of the apparent decline in the SSE-SMU are unknown at this point but include disease, biotoxin exposure and nutritional stress (Russell *et al.,*2021). Disease outbreak and nutritional stress have been ruled out as main factors driving the decline in Scottish SMUs given that there is no evidence of large scale mortality events from strandings data, live captures show no evidence of disease in areas of decline, and recent analysis of body condition and nutritional health in live captured animals shows no evidence in areas of decline in Scotland either (Hall *et al*., 2019; Kershaw *et al.*, in press). However, biotoxin exposure from Harmful Algae Blooms (HABs) remains as a potential driver of the declines in SMUs in Scotland too, and is currently being investigated. Russell *et al.* (2021) recommend biological sampling of harbour seal adults and juveniles from the SEE-SMU to investigate health-related drivers in the decline. This would include investigation of HAB toxin concentrations in captured seals. Any results from such investigations might inform the Scottish declines or more generally to get a better overall picture of the exposure of harbour seals to HABs in the UK.

The population trajectories and particularly the monitoring information from the SEE_SMU populations are quite different to those for Western Scotland and the Northern Isles. In the SSE_SMU the main harbour seal population has been surveyed annually since 1988 and there are annual indices of pup production for that population since the 2002 PDV epidemic. Until recently the SEE_SMU harbour seal population has shown continuous rapid growth as it recovered from the effects of severe hunting pressure in the 1960s and early 1970s, and two PDV epizootics in 1988 and 2002. Since 2000 there has been a dramatic, rapid increase in the grey seal population both in terms of the pup production and the summer foraging population throughout the SEE_SMU (16.5% p.a. increase over the last two decades; Russell *et al.*, 2019) until 2019 when it too appears to have levelled off and possibly begun to decline (SCOS-BP 21/03). The role of grey seals in the apparent harbour seal declines warrants consideration (Russell *et al.*, 2021). The high temporal resolution population data available for this region may allow identification of relationships between harbour seal population trends and changes in grey seal population trajectories or changes in other natural or anthropogenic factors.

Around Scotland, regular surveys began in the mid-1990s and are at much lower temporal resolution. Harbour seal populations were relatively stable until several populations began to decline around the turn of the century (SCOS-BP 2019/03; Thompson *et al* 2019). The grey seal populations around north and west Scotland had either already stabilised, by the mid-1990s as in the Inner and Outer Hebrides, or around 2000 in Orkney, before regular harbour seal monitoring surveys began (SCOS-BP 21/01, Russell, Morris, Duck, Thompson, & Hiby, 2019; Thomas *et al.*, 2019)). There are therefore no systematic or reliable harbour seal population estimates available before the local grey seal populations either reached or approached carrying capacity (SCOS-BP 21/03). If grey seal populations are a major driver of harbour seal dynamics it may be that density related effects were already in place before monitoring began in Scotland. The SEE_SMU time series of population data may provide an opportunity to examine this possibility.

Differences in the timing and scale of natural and anthropogenic changes in the different regions may help identify likely drivers or exclude unlikely factors. For example, the dramatic increase in the construction and operation of offshore wind farms in the SEE_SMU (SCOS-BP 21/03) predates the onset of the decline, whereas large scale construction of wind farms in Scottish waters post-dates the onset of declines in harbour seal populations and there has been no offshore wind development in the areas where the largest declines have occurred. Windfarm developments could have short term impacts on seal distribution during pile driving activity (Russell *et al.*, 2016) and the presence of structures could also impact harbour seals, although these impacts are less clear and may be complex. Assessing the potential impact of changes in the anthropogenic landscape on seal populations in SEE-SMU should benefit the understanding of the potential drivers behind the harbour seal decline.

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| **11. Can SCOS review, present and provide a view on the available evidence on the differences in genetics between the declining and the stable/increasing harbour seal populations.** | **MS Q11** |

**Carroll *et al.* (2020) reported significant genetic differentiation between most harbour seal SMUs and identified that stable/increasing regions (West Scotland and the Western Isles SMUs) were part of a different metapopulation than declining regions (North Coast and Orkney together with Moray Firth SMU). Carroll *et al* (2020) also detected a recent metapopulation-wide disruption of migration coincident with the start of the declines and concluded that the northern metapopulation appears to be in decline.**

**There are no significant differences in heterozygosity levels and inbreeding coefficients between contrasting populations in Orkney and Skye (Bhuta, 2021).**

**Ongoing work comparing harbour seal genomes globally may shed some further light on differences between populations with contrasting trends.**

Carroll *et al.* (2020) used a combination of population trends, telemetry tracking data and UK-wide, multi-generational population genetic data to investigate the dynamics of the UK harbour seal metapopulations. The data comprised microsatellite genotypes from samples collected at UK SMUs between 2003 and 2012, including samples from declining and stable/increasing SMUs, as well as a number of samples from outside the UK and described in Olsen *et al.* (2017). Their results indicated that the UK comprises two distinct metapopulations (northern and southern). The southern group comprises the Southeast England SMU (SEE-SMU) and continental Europe, and the northern group comprises all other SMUs (Northern Ireland and Scottish SMUs). These are in agreement with the two main groups previously identified by Olsen *et al.* (2017). Thus, the harbour seals from the SEE-SMU are genetically distinct from those in the Scottish SMUs, regardless of their population trend.

Within the northern metapopulation, Carroll *et al.* (2020) found significant genetic differentiation between most of the harbour seal SMUs (although not as much as between the two metapopulations). However, not all SMUs were genetically distinct from each other and some could be grouped into local populations, suggesting a total of five local populations: 1) Northern Ireland (declining); 2) Northwest (West Scotland and the Western Isles SMUs, both stable); 3) MFNCO (Moray Firth, where a continued decline is not evident but no signs of recovery to pre-2002 levels, and North Coast and Orkney SMU (declining)); 4) Shetland (continued decline not evident but no signs of recovery to pre-2002 levels); and 5) East Scotland (declining)

Carroll *et al.* (2020) also examined the dynamics of the northern metapopulation before and after the declines in the early 2000s. They identified two putative source populations (Moray Firth and North Coast and Orkney, and Northwest Scotland) apparently supporting three likely sink populations (East Coast, Shetland and Northern Ireland). They also detected a recent metapopulation-wide disruption of migration coincident with the start of the declines and concluded that the northern metapopulation appears to be in decay.

Nikolic *et al.* (2020) reported an analysis of the genetic structure of the Moray Firth harbour seal population. Their analysis suggests that the Moray Firth cluster acts as a one genetic group, with similar levels of genetic diversity across each of the localities sampled. Their estimates of current genetic diversity and effective population size were low, but they concluded that the Moray Firth population has remained at broadly similar levels following the population bottleneck that occurred after post-glacial recolonization of the area.

More recently, samples collected from live-captured harbour seals from Orkney (n = 15, declining site) and Isle of Skye (n = 15, stable/increasing site) in 2016 and 2017 were analysed as part of a Master's thesis at the University of Auckland, to conduct population genetic analysis using low-coverage whole-genome sequencing (Bhuta, 2021). The results showed that individuals from Orkney and from Isle of Skye had similar heterozygosity levels and that inbreeding coefficients were negative or low, with no significant differences between the two populations. This suggests inbreeding is not the probable cause for decline in abundance in Orkney. The analysis also confirmed the previous genetic population structure results that found the two regions were genetically distinct with a much larger suite (>100K) of genetic markers (single nucleotide polymorphisms). This work is ongoing with some further re-analysis planned.

Liu et al. (2022) compared harbour seal genomes from different world-wide locations. They showed that harbour seals evolved in the Northeast Pacific and the results have implications for harbour seal subspecies delineation, but there are no direct management implications for UK harbour seals.

## Seal Protection, Management and Conservation measures

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| **12. Can SCOS advise at what point a decline in grey or common/harbour seal abundance would trigger a change in Natural England's Conservation Objectives for SAC's from "maintain" to "restore"?** | **Defra Q1c** |

**The appropriate criteria for the magnitude of a decline that would trigger a change in conservation objectives from maintain to restore depends on a variety of factors, therefore it is difficult to determine a 'one size fits all' approach that would be applicable across all SACs. Considerations include the regularity of monitoring, the amount of historical data, the variability in previous surveys, and the trends in other parts of the population range.**

**An examination of the existing monitoring data for any particular site, in combination with trends at other sites within the region, will inform the selection of appropriate trigger points**.

**In the case of the southeast England harbour seal SAC, there has been an observed decline of 21% between the two most recent counts and counts in the preceding 5-year period (SCOS-BP 21/06). A decline of this magnitude and in light of large declines in other parts of their range, should certainly trigger a change in conservation objectives from maintain to restore.**

The overall objective for SACs designated for seals are to provide a coherent network of sites to contribute to the maintenance of the overall favourable status of the population. However, this definition is not particularly helpful in the definition of trigger points for individual SACs. For harbour seals SAC site selection has favoured sites that are important both as general haul-out sites and for moulting and pupping. The largest breeding colonies, based on pup production, have been selected for grey seals. This difference in site selection rationale may require a slightly different approach to defining any triggers for management measures. It is likely that a detectable decrease in abundance, either total abundance in the case of harbour seals or pup production in the case of grey seal sites, below some defined reference value, should trigger concern. This involves the definition of two elements: an appropriate reference value, and the magnitude of the reduction below that reference value that would indicate a concern. The duration over which a decline is observed will also have a bearing. The appropriate magnitude of decline for a trigger depends on the variability in the metric of interest and the ability of any monitoring programme to detect a change over and above levels of background variability. More regularly monitored sites are likely to allow quicker identification of declines of smaller magnitudes than less frequently monitored sites. Considerations relating to the

selection of a reference value include the size at the time of designation as well as any historical trends. For example, many seal populations in the UK are recovering from historical exploitation or from disease outbreaks. It is also important to consider the mobile nature of seals and the fact that reductions in one part of their range may be as a result of distributional shifts and therefore any concerns about local declines, and the need for management measures, must be considered in light of regional trends.

Consideration should also be given to the degree to which the population within a given SAC is genetically distinct, and the absolute size of this population relative to some assumed minimum viable population.

Given these considerations, it is not currently possible to define specific trigger points that should apply appropriately across all SACs for both species. An examination of the existing monitoring data for any particular site, in combination with trends at other sites within the region, will inform decisions to trigger further management actions. However, see the answer to Marine Scotland Q6 below for discussion of generic criteria for the designation of Seal Conservation Areas in Scotland.

In the case of the Wash and North Norfolk coast SAC for which harbour seals are a primary designated feature, there has been an observed decline of 21% between the two most recent counts and counts in the preceding 5-year period (SCOS-BP 21/06). A decline of this magnitude and in light of large declines in other parts of their range, should certainly trigger a change in conservation objectives from maintain to restore.

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| **13. Can SCOS provide advice on current analytical methods being conducted by SMRU to help inform UK led assessments for OSPAR M3 & M5 indicators?** | **Defra Q3** |

**The UK is leading the assessment for the OSPAR M3 (Seal Abundance and Distribution) and M5 (Grey seal pup production) indicators for the OSPAR Quality Status Report 2023 (QSR2023). These indicators, which were also considered in an interim assessment https://oap.ospar.org/en/ospar-assessments/intermediate-assessment-2017/), are assessed on two temporal scales: long term (since 1992 or the first year of data thereafter) and short-term (six year rolling baseline; in this case 2014-2019) at the scale of individual Assessment Units (AUs; Figure 8). Assessments for abundance and pup production are made against the following criteria: has there been a decline in seal abundance/pup production of > 25% (long-term) or >6% (short-term)? Changes in distribution are considered as a "surveillance indictor; the metrics are described, but not quantitatively assessed, against an assessment value.**

**The current assessments (for QSR2023) are led by JNCC, with the analysis being conducted by SMRU and the default approach was to follow the methods used in the interim assessment. For the interim assessment, the methods were developed at an expert workshop (2015), with contributors from most Contracting Parties (CPs), and ultimately agreed by OSPAR. The methods are detailed in Hanson and Hall (2015) and Russell, Hanson & Thomas (2016), and summarised in the assessments (https://oap.ospar.org/en/ospar-assessments/intermediate-assessment-2017/). For the current assessment, any noteworthy methodological deviations were made with the aim of increasing robustness; these were proposed by SMRU and discussed with the OSPAR Marine Mammal Expert Group (OMMEG). The methods used are largely sufficient to conduct the assessments. However, there are some key caveats that should be considered particularly with a view to increasing the robustness of future assessments.**

**Brief Summary of methods**

**M3 Indicator: abundance**

*Abundance: Harbour seals*

In the previous interim assessment, trends were fitted to a subset of the moult count data covering the period 2009-2014, to provide a short-term assessment. Generalised additive (GAMs) or linear models (GLMs) were fitted for the relevant assessment units (AUs). For the QSR2023, the same method was applied to the same AUs (Figure 8). However, this time the whole time-series of counts (up to and including 2021) was used, maximising power and robustness of the short-term assessment. Minor changes to methods included fitting more than one model type (GLM and GAM) within a single time-series, allowing models to select step changes in abundance, and improved calculation of confidence intervals.

*Abundance: grey seals*

Grey seal abundance is assessed on a single unit scale – essentially the combined AUs indicated by the colour shaded areas in Figure 8. For the interim assessment the age-structured population dynamics model used for the UK (Thomas *et al.,*2019) was extended to cover other areas (Russell, Hanson and Thomas 2016). This incorporated a time series on pup production as well as an independent estimate of population size in 2008 (independent from pup production derived estimates). While such population modelling allowed a single assessment to be conducted on the appropriate scale, it had some limitations. Briefly these are: (1) despite increasing grey seal abundance in the UK and Wadden Sea (which account for the majority of Northeast Atlantic grey seal metapopulation) the confidence intervals for the interim assessment were very wide, making robust assessment difficult, in part due to limited sample size for some areas; (2) Lack of knowledge regarding the spatial consistency of the scalar representing the proportion of total population hauled out and thus available to count (derived from UK telemetry data) required to convert summer counts to the independent estimates; (3) Limited appropriateness of the population model structure when applied beyond the UK (specifically with regard to dispersal), and (4) Reliance on the robustness of a scalar to generate pup production estimates from peak pup counts (the only data that are provided by some CPs), which is derived from counts and estimated pup production at Scottish colonies (surveyed by SMRU). These limitations meant that extending the UK pup production model across the whole AU became untenable for the current assessment.

The current assessment considered a larger spatial extent, and since the interim assessment, a jump in estimated pup production in Scotland associated with the switch from film (up to 2010) to digital (from 2012) has become evident. This presented an issue for consistency across the AU, and for generating a scalar between peak count and pup production. Furthermore, only a subset of the CPs provided August data that could be used to generate a time-series for the Independent Estimate of population size. For the current assessment, trends in haul out counts were fitted at the scale of the AUs shown in Figure 8. This was conducted within two GAMs– one for August counts (UK and Ireland) and one for spring moult counts (France, Dutch Delta, and Wadden Sea). This allowed two (one August and one moult) predicted trend lines on which to base assessment against the defined criteria.

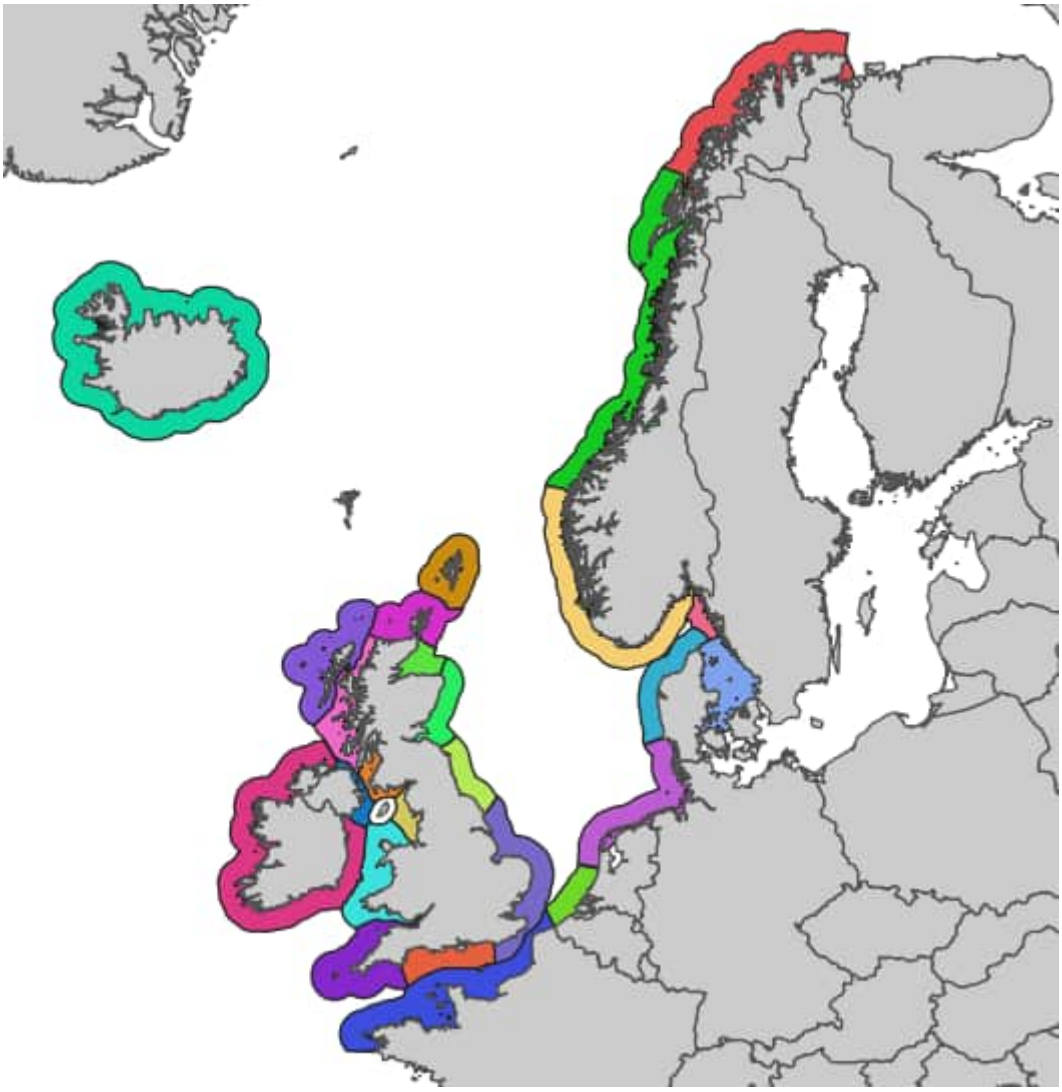

**Figure 8.** OSPAR Assessment Units used for harbour seal abundance and distribution(M3), grey seal distribution (M3) and grey seal pup production (M5). Grey seal abundance (M3) is assessed on a single spatial unit scale combining all the shaded areas shown.

*Distribution: both species*

Changes in distribution were considered as a surveillance indicator for both the intermediate and current assessment A similar set of assessment values as used for seal abundance were suggested for seal distribution, but as meaningful changes in seal distribution are currently difficult to detect and assess from abundance surveys this aspect of the indicator will be considered as a 'surveillance indicator'. Although the same metrics (see below) were considered in both the intermediate and current assessments, the spatial units considered were different; for the intermediate assessment individual CPs decided the spatial scale at which distribution should be examined for each AU whereas for the current assessment, changes in distribution (presence/absence) were assessed on a 15 km x 15 km grid (where possible). There are two metrics: (i) shift in distribution, representing the change in which specific cells are occupied, and (ii) change in range, which represents the change in the number of occupied cells. These metrics were examined on both a long-term basis with years used being 1992 vs 2019 (long-term assessment) and 2014 vs 2019 (short-term assessment). Where data were not available in the focal years, the closest possible years were used instead.

A number of changes were made to the methods of the intermediate assessment to improve the robustness of the analysis. The key differences were as follows: (1) as far as possible, distribution was considered on the same spatial scale within and across AUs; in the Intermediate assessment, the size of spatial units (i.e., the area to which counts were assigned) varied across AUs, (2) the metrics were only evaluated for years and areas for which there was consistent effort (in terms of coverage) across two periods of interest (which restricted spatial and temporal extent for some AUs); in the intermediate assessment the spatial extent was not always consistent between the two periods, (3) Changes between single years were considered rather than between periods to maximise the temporal separation of periods (e.g., short term assessment: year 1 vs year 6 compared to year 1-3 vs year 4-6 as done in the intermediate assessment).

**M5: Grey seal Pup production**

In the intermediate assessment, trends were fitted to peak pup counts or pup production (depending on what was provided by CPs), using either generalised additive or linear models. The same method is used for the current assessment except that AUs surveyed by SMRU were fitted within a single GAM (separate smooth for each AU) and a single "jump" in pup production was offered to account for the step change associated with the switch from film to digital surveys.

**Considerations**

Factors that must be considered for both the interpretation of the current assessments and the development of the methods for the next assessment, are discussed below.

*Baselines*

The use of both long-term and short-term assessments allow both long-term and rapid declines to be identified. Ideally the baseline year for the long-term assessment would represent the natural level of abundance and distribution. However, in the baseline year (1992), seal populations were recovering from exploitation (and thus potentially reduced compared to historical "natural" levels). Furthermore, a recent Phocine Distemper Virus (PDV) epidemic in 1988 means that some harbour seal populations were suppressed (e.g., Southeast England, Wadden Sea). Finally, many monitoring studies did not extend as far back as 1992 and thus there is considerable variation between AUs in the period that the long-term assessment covers. The long-term assessment for both the intermediate and current assessment compares the latest population estimates with the 1992 baseline estimate. So, the comparison for the current assessment is over a longer time period than the comparison for the intermediate assessment. As a consequence, an assessment of a 25% change equates to a slower rate of change for the current assessment compared to the intermediate assessment. A simple solution would be to compare average annual rates of change.

*Consistency of data*

Different CPs have different protocols for data collection, and for some CPs there are multiple programs and thus data contributors. This makes combining data within and across areas (e.g., for grey seal population assessment) difficult and limits the comparability of the results across AUs. For example, harbour seal moult count data provided on AU scale varied between raw counts, maximum counts and mean of multiple counts conducted within a year. The inclusion of all raw counts is preferred to appropriately represent the uncertainty around the estimated mean trend. Provision of raw counts on an AU scale is hampered by the misalignment between AUs and the scale on which data are collected; some AUs comprise data from multiple countries and monitoring programs. Furthermore, some CPs collect data more frequently for a subset of an AU which contains the

majority of seals; there is no provision for such indicator counts to be submitted for the abundance assessment.

*Assessment Units*

The scale of the Assessment Unit varies between species; there is a single unit for grey seal abundance. However, for harbour seals (and grey seal distribution and pup production) the AUs are much finer, and the degree to which unit boundaries were driven by biological relevance versus data availability varies spatially. The aim was to make these units as biologically meaningful as possible (i.e., based on the boundaries between sub-populations or haulout groups), but the area that can be covered within a single survey or year is much finer in many places. A pragmatic approach was developed for grey seal abundance for this assessment; trends were fitted at a finer scale (AUs in Figure 8.), and these trends combined, within a model, at a larger scale. However, the validity of such an approach is reliant on these smaller units representing relatively discrete groups of haulouts with little inter-annual variation in the degree of net movement between them.

SCOS consider that further discussion is needed to assess the appropriateness of a single AU for grey seals. A single AU used without clear consideration of the structure of the metapopulation and systems for monitoring and assessment at scales capable of dealing with localised population change should be re-examined. A briefing paper addressing the effects of combining all AUs for management of the grey seal metapopulation will be presented to SCOS 2022.

*Grey Seal abundance*

Grey seal abundance was assessed using counts during the harbour seal moult surveys in August (UK and Ireland) and during the grey seal moult in March/April (continental Europe). The majority of the European grey seal population is in the UK where grey seal moult surveys are not routinely conducted; such surveys during winter/spring would not be logistically or financially feasible. Furthermore, the degree to which the clockwise cline observed in breeding applies to the moult is not clear and there is no information on the proportion of seals hauled out at any time during the moult. Thus, in order to generate a single assessment of grey seal trends in abundance, counts during the August harbour seal moult for all AUs would be required. Most countries conduct surveys of harbour seals in August, and also count grey seals. CPs should be encouraged to (1) ensure all grey seal sites are covered during the harbour seal moult surveys, and (2) to report these counts on the smaller AU scale (Figure 8). As well as allowing a single trend to be estimated for all considered OSPAR regions and removing inaccuracies associated with seasonal redistribution, this would also ensure data for grey seal abundance were incorporated for additional units in continental Europe where no dedicated grey seal moult counts are conducted, but August harbour seal moult surveys are (e.g., Kattegat and Limfjord).

*Distribution*

There are multiple considerations when examining changes in distribution including: (1) minimising the impact of day-to-day variability in haulout locations, (2) variation in spatial survey effort between years, (3) size of distributional units, (4) number of spatial units, and (5) density within units. All of these also need to be considered when interpreting the metrics. For example, due to variation in the spatial extent of AUs, a change of -10% in one AU may represent an absence at just one haulout site (which may be a site not frequently used), whereas the same result may represent variation in > 10 haulout sites in another AU. Thus, any qualitative assessment should be based by reviewing the metric value and the associated maps underlying the metrics in combination. In future assessments, a weighting of distribution by density would potentially result in a more robust indicator than the current presence/absence approach. Furthermore, the size of the spatial units

used in reporting should be consistent between AUs. In particular, this analysis would be more robust if data were provided on a standardised grid, including the spatial extent of surveys where possible, such that survey effort could be appropriately accounted for. In the current assessment, the extent to which all data could be used was limited by variation in the format and spatial resolution of survey effort reported by CPs. Inconsistencies between counts and reported survey coverage meant that some data could not be used, as it was not possible to get a robust indication of presence/absence.

*Indicator Areas*

In some AUs, the whole unit is routinely covered during each survey whereas in others (many UK AUs) the complex coastline and the distribution of sites means a subset (often the most populous) gets surveyed more frequently. For AUs surveyed by SMRU in the UK, for which the time series pertaining to the whole AU was restricted in temporal extent or number of data points, a time series of a subset of the AU was generated. Trends were then fitted to this subset as an indicator of likely trends in the whole AU. Generating these subset time-series was a complex process and thus only possible because the raw data and expertise were available in-house. Although SMRU also developed AU subset time-series for France and the Dutch Delta, it was not possible for other areas (due to lack of availability of the required fine scale data or the complexity of the data). For some AUs, there were too few data points to conduct any analyses (e.g., Norway). In the next assessment, the data call should encourage submission of time-series of subsets of AUs where appropriate.

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| **14. Can SCOS review and comment on the biological management perspective of seal management units proposed by the Inter-Agency Marine Mammal Working Group (IAMMWG)?**<br><br>**Discussions are ongoing within the Inter Agency Marine Mammal Working Group (IAMMWG) to define the structure of spatial reference areas within which management might be applied to UK harbour seals and grey seals. For harbour seals, we suggest that the MU's should be based on those assessment units that are presently used by SCOS for monitoring the UK population.**<br><br>**There are broadscale challenges associated with the connectivity of grey seal metapopulations around the UK coast when it comes to considering the species for management advice and decisions. To best account for this, and still enable a reasonable level of appropriate management to be advised upon, two units reflecting an east/west divide across the Celtic and Great North Sea are proposed for grey seals. The units largely represent a reference population and management of activities within either unit may require reference to refined spatial scales using evidence on local/regional dynamics where available. What is SCOS's view on this.** | **Defra Q4** |

**The 14 current UK seal SMUs were defined initially for harbour seals on the basis of distribution of haulout sites and for pragmatic reasons including the ability to survey an SMU within one season. For grey seals the same arguments apply, without inferring discrete populations. So, for pragmatic reasons the structure was accepted for both species.**

**The IAMMWG does not propose to change the structure for harbour seals but has proposed revision of those assessment units for grey seals, splitting the UK population into two, an eastern**

**UK unit (North Sea, and Northern Isles) and west (Hebrides, West Scotland, Irish Sea, Wales and Southwest England).**

**SCOS consider that there is no strong justification for these proposed units and are concerned that this division implies that the grey seals on either side of the UK can be considered as distinct, isolated populations. There is a clear danger that such a split would provide justification for including the large, combined population for an area in assessment of or justification for activities that may have only a local effect. Although there is clear evidence of wide-ranging movements by some individual grey seals, many grey seals remain within single SMU throughout the years, so local concentrations persist and may not recover rapidly from local effects.**

**For any management issue or potential impact, the correct procedure would be to identify the SMU populations involved/at risk and use the combined population estimates available for those SMUs, weighted in an appropriate fashion.**

**The terminology used may be a factor in this debate. The terms Seal Management Unit or Seal Management Area may imply that those groupings should be managed on a stand-alone basis. This was never the intention. The false impression that these are explicit management divisions could easily be solved by renaming them as Seal Monitoring Units, with a clear understanding that these practical monitoring units can and should be combined in appropriate ways in response to the management question being addressed.**

The UK Statutory Nature Conservation Bodies (SNCBs) require an understanding of the geographical range of populations and subpopulations, in order to provide advice on the assessment of impacts and management at the most appropriate spatial scale. As part of the need to meet such requests, Natural Resources Wales commissioned work on defining management units in Welsh waters (Evans, 2012) and the Scottish Government commissioned similar work by Sea Mammal Research Unit (SMRU) for Scottish waters (Northridge, 2012). The 14 current SMUs in the UK were defined initially for harbour seals on the basis of distribution of haulout sites and for pragmatic reasons including the ability to survey an SMU within one season and the locations of jurisdictional boundaries. For grey seals the same arguments apply, without inferring discrete populations. So, for pragmatic reasons the structure was accepted for both species. These SMUs are used as a subset of the 21 SMUs used for harbour seals in the OSPAR assessments of seal management in the northeast Atlantic.

The IAMMWG have not proposed any alteration to the management structure for harbour seals. However, for grey seals there is a perception that wide ranging movements of individual seals makes the current structure unnecessarily fine structured.

For grey seals, ICES (2014) proposed two assessment units: (1) North Sea (Region II) and (2) western Britain, Ireland and western France (Regions III and part of IV). These were issued as ICES Advice to OSPAR (ICES 2014b) noting that grey seals range widely at sea such that these two units were not independent, and that grey seals visit multiple distant haul-out sites, although mature seals of both sexes are usually faithful to particular breeding sites (ICES, 2014). For the OSPAR intermediate assessment of seal abundance and distribution in 2017, a single assessment unit for the entire European area was used. This has been adopted for the UK and is the structure used in the forthcoming OSPAR assessment (see answer to Defra Q3) although sub-units equivalent to those for harbour seals are also recognised. However, it should be noted that these assessments are not designed to be used for developing specific management actions. It is not immediately apparent what management function these assessment units address other than for general/comparative assessment of population status on large geographical scales.

The IAMMWG have proposed a revision of the assessment units for grey seals based on current understanding of the presence and structure of biological populations, with divisions proposed based on ecological evidence and/or divisions used for the management of human activities. The proposed units therefore comprise partially artificial divisions of biological populations., splitting the UK population into two, an eastern UK unit (North Sea, and Northern Isles) and west (Hebrides, West Scotland, Irish Sea, Wales and Southwest England). The division, which would apply to waters within the UK EEZ, would be delineated in the north by a line running north from Cape Wrath and, in the south, by a line running across the English Channel to the east of Normandy. These units have been based on IAMMWG's understanding of the presence and structure of biological populations, with divisions proposed based on ecological evidence and/or divisions used for the management of human activities and therefore comprise partially artificial divisions of biological populations. Again, it is not immediately apparent what management function these assessment units address.

SCOS consider that there is no clear justification on grounds of biological population structure for splitting UK grey seal populations in any particular way. Where telemetry data are available, they show substantial movement between adjacent and less frequent movement between distant SMUs. The proportion of seals moving between non-adjacent SMUs is small and the majority of tracked seals remained within one SMU for the duration of the tracking. SCOS consider that there is a danger that because local concentrations of seals will likely persist, and that movement from distant SMUs is limited, anthropogenic effects may have disproportionate impacts on the local populations. Assessing such effects against pooled populations from much larger AUs is likely to underestimate their impacts on local populations.

However, if there is a pressing need to define two separate management units, then the proposed division is justifiable on the basis that movements of seals between the west (West Scotland and Western Isles SMUs) and the east (North Coast and Orkney SMU) are apparently less frequent than movements between those SMUs and adjacent SMUs to their south. However, there is likely to be significant mixing and movement between west and east SMUs around northern Scotland. Again, in the English Channel there is limited evidence of east-west movement in the limited telemetry data available.

SCOS are, however, concerned that presenting such a structure gives the impression to interested parties that the grey seals on either side of the UK can be considered as distinct, isolated populations. There is a clear danger that such a split would provide justification for including the large, combined population for an area in assessment of or justification for activities that may have a significant local effect.

SCOS do not see any particular advantage in splitting the UK population in this way. Presumably the drive for such large management units is the need to manage issues/interactions such as the bycatch of grey seals off Southwest Britain, where a mismatch between the scale of the bycatch and the available information on seal population size suggests that immigration from distant SMUs must be occurring (see answer to Q22). In this and any other case where a wider management issue is involved the correct procedure would be to identify the SMU populations involved/at risk and use the combined population estimates available for those SMUs, weighted in an appropriate fashion.

The terminology here may be a factor in this debate. The terms Seal Management Unit or Seal Management Area may imply that those groupings should be managed on a stand-alone basis. This was never the intention. The false impression that these are explicit management divisions could easily be solved by renaming the current Seal Management Units as Seal Monitoring Units, with a clear understanding that these practical monitoring units can and should be combined in appropriate ways in response to the management question being addressed.

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| **15. Could SCOS please advise on the locations of the top two breeding sites and top two haul out sites for both harbour seal and grey seal in each Seal Management Unit? Could SCOS also comment on whether the top two sites have been consistent over the last 5 years, or whether there is interannual variability?** | **Defra Q5a** |

**There is a lack of appropriate data to allow the identification of the top two breeding sites and haul out sites for both species of seal in each SMU. Whilst the available data will allow moult sites to be identified for harbour seals, breeding sites are not comprehensively monitored with counts only available for limited areas. For grey seals, breeding sites are comprehensively monitored in the main breeding sites in Scotland and on the east coast of England, but less so in the SW of England and Wales. There are no data on the moult distribution of grey seals.**

**Additional difficulties relate to the definition of 'site'. The sites covered by monitoring range in size from small groups of haulout sites through to substantial sections of coast lines.**

**An approach similar to that used to designate seal haul outs in Scotland could be used to identify the largest haulout groups in England where data exist. However, the individual sites identified by such a method do not generally match up to the scale of the current site designations for Sites of Special Scientific Interest (SSSI) or SACs, which, in general, cover much larger areas. Notwithstanding these caveats, a review of the main sites in each SMU is presented below.**

SCOS cannot answer this question in its current form for two reasons: lack of appropriate data and a clear definition of what constitutes a site. These issues are described below, together with a brief description of the current protected site designations that apply to breeding and haulout site/groups/colonies for both species.

**Insufficient data.**

*Harbour seals*

The data available for harbour seals comprises time series of counts of seals hauled out during the annual moult around the UK coast. All of the coast is covered with the exception of SW England and Wales where very small numbers of harbour seals are reported. The temporal resolution of these data range from annual surveys of the South East England SMU (SEE_SMU), the Moray Firth SMU (MF_SMU), the Firth of Tay and Eden Estuary SAC, and the Tees estuary, to a five-yearly cycle for the remaining SMUs around the coast of Scotland. Some additional surveys have been carried out where local population changes required attention (details of survey programme and the counts are presented annually to SCOS with the most recent data for South East England in SCOS-BP 21/06 and SCOS-BP 21/07 and for the whole of the UK in SCOS-BP 20/03. Notwithstanding issues with definition of 'site', these data would allow identification of and ranking of harbour seal moulting sites as requested.

Harbour seal breeding season data are limited. Counts are available for the SEE_SMU, a time series of data exist for the coast between Donna Nook and Scroby Sands for the period 2001 to 2018 (SCOS-BP 19/04) and there are two pup counts from 2011 and 2018 for the rest of the SEE_SMU. Time series of counts are also available for the MF_SMU, and the Tees Estuary, which is the only harbour seal breeding site in the NEE_SMU, for similar periods.

Surveys to assess the breeding distribution of harbour seals have not been carried out around the rocky shore coastlines of Scotland because of the cost and the practical difficulties of detecting and identifying pups on such haulout substrates. There are therefore no pup production estimates or pup counts for any other harbour seal SMU populations. It is not therefore possible to identify the most important harbour seal breeding sites anywhere outside the Moray Firth and the Wash.

*Grey seals*

There are detailed time series of pup production estimates for all the main breeding sites in the Inner and Outer Hebrides, Orkney, the Firth of Forth colonies, the mainland colonies in North Scotland and Berwickshire and colonies along the east coast of England. In Scotland, surveys were carried out annually from 1987 to 2010 and biennially since 2010. Colonies in England are surveyed annually. Sporadic counts are available for Shetland colonies. Some sites in Wales are surveyed annually, e.g., Skomer and the Marlowes MCZ, Bardsey Island, and parts of Ramsey Island, but the rest of Wales and the south-west England SMU are surveyed infrequently. Any identification of the top sites for breeding would be restricted to these regularly surveyed areas.

There are no data on distribution or abundance of grey seals during their annual moult, except for a single survey of part of Orkney in 2014 and observation data from individual sites scattered around the UK. There are detailed data on the distribution and abundance of grey seals in all areas covered during the harbour seal moult surveys in August (SCOS-BP 20/03). A series of surveys in late winter/early spring around the whole coast would be required to ascertain the distribution of moulting grey seals. It is therefore not possible to define the most important moulting sites for grey seals.

**Definition of a site**.

There is no clear or agreed definition of a “site”. At present there are two types of haulout site definition; ad hoc sites for the purposes of survey reporting and a more rigorous site definition for designating protected haulout sites in Scotland. In addition, SACs and SSSIs have been designated in all SMUs, but the sites covered range in size from small groups of haulout site through to substantial sections of coast lines.

SMRU survey sites

For the purposes of the summer surveys for harbour and grey seals a site is roughly defined as one or more discrete haulout groups in a small area. However, sites range from individual sandbanks or skerries, to small archipelagos such as the Southeast Islay SAC, up to substantial sections of coastline such as Donna Nook or the Berwick and North Northumberland Coast European Marine Site (BNNC_SAC). In practice, how haulout groups are combined is to some extent arbitrary and often based on tradition.

Helicopter and fixed wing surveys around Scotland and NE England have always assigned specific geographical coordinates to all groups of seals counted. However, for sites in the large tidal estuaries where mapping is less precise this was not possible for fixed wing surveys until recently. For example, in the Wash site names and designations were based on historical surveys from the 1960s and ‘70s when seal hunting was targeted at named sites. We have recently abandoned the allocation of seals to these named sites, and instead identify the location of each group by recording geographical co-ordinates. However, there are still arbitrary decisions on when to split groups that are found on the same sand bank or along the same tidal creek and location accuracy depends on the flight path.

Designated sites in Scotland

For the purposes of designating haulout sites for protection from harassment under the Marine (Scotland) Act 2010 (SCOS-BP 12/07), sites in Scotland were identified and classified using a fine scale distribution map. Virtual Observation Points (VOPs) were placed at 100m intervals along the coast, and sighting histories of both species for each individual VOP were calculated as the sum of all sightings that lie within 300m radii around each VOP. 300m was chosen as an appropriate buffer radius to ensure that all recorded seal sightings are contained within at least one buffer area and to account for some error in positioning of seals and sites in the GIS mapping process. To a limited extent, this also helps deal with the fact that seals don't always haul out at exactly the same spot. A Time Weighted Average (TWA) of each species for each VOP was calculated.

Sites were then defined by drawing a polygon shape by eye around parts of the coast, small islands and skerries that contained seal sightings. Again, this is a somewhat arbitrary process, and the extent of individual sites was influenced by the local distribution. E.g., in some cases, sections of coast with scattered small groups were combined into one site.

That process could be used to identify the largest haulout groups in England where data exist. However, the individual sites identified by such a method do not generally match up to the scale of the current site designations for SSSIs or SACs (European Marine Sites) where seals are qualifying features. In general, such sites in the marine and coastal habitats cover much larger areas.

Existing protected sites

Many sites in the UK are already designated as European Marine Sites/SACs (Figure 9) and/or as SSSIs for seals. There are 9 SACs where harbour seals are a primary feature and seven where grey seals are a primary feature. There are a further 26 where seals are a secondary feature/species of interest. For information we include a description of the currently designated sites in each SMU.

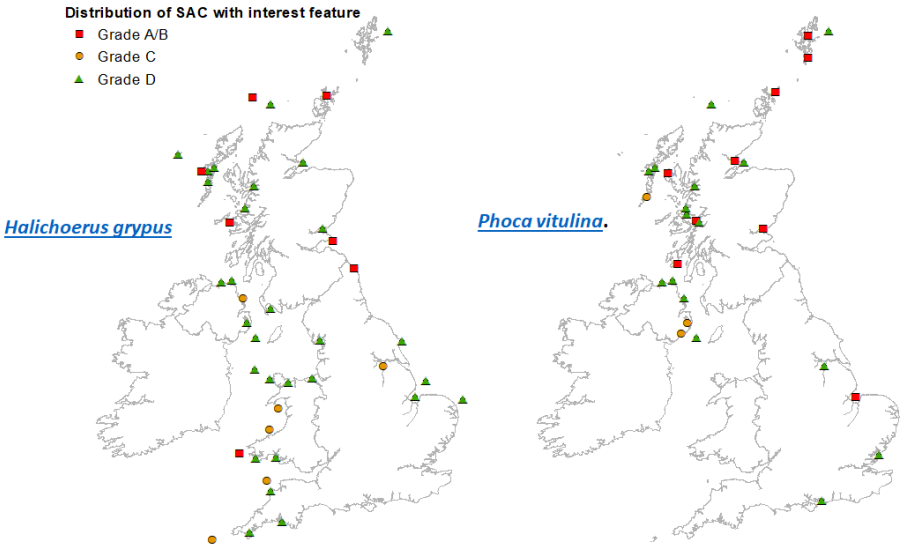


**Figure 9.** Distribution of SACs/EMSs around the UK that have seals as qualifying or additional features of interest. (JNCC 2021). Site classifications: Grade A - Outstanding examples of the feature in a European context; Grade B - Excellent examples of the feature, significantly above the threshold for SSSI/ASSI notification but of somewhat lower value than grade A sites; Grade C - Examples of the feature which are of at least national importance; Grade D - These features are not the primary reason for SACs being selected.

The following descriptions are based on the most recent surveys described in detail in SCOS_BPs 21/01 & 21/06.21/07,20/04 and 20/05

**England**

Northeast England SMU (NEE_SMU)

*Grey seals*: there is only one large grey seal breeding population in the NEE_SMU, at the Farne Islands. This lies within the BNNC SAC and is also itself designated as a National Nature Reserve (NNR) and an SSSI. There are no other significant grey seal breeding sites in the NEE_SMU.

Outside the breeding season there are major haulouts at the Farne Islands and in the Lindisfarne NNR, both of which lie within the BNNC_SAC. The only other large grey seal haulout site in the NEE_SMU is on Coquet Island. This is an RSPB managed bird reserve with no public access and is designated as an SSSI, but seals are not listed as qualifying features.

*Harbour seals:* apart from a small group at Lindisfarne, numbering less than 5 seals in recent surveys, the only significant haulout group is at Seal Sands in the Tees estuary. Harbour seals are a primary feature of the Teesmouth and Cleveland Coast SSSI.

Southeast England SMU (SEE_SMU)

*Grey seals*: there are large and rapidly increasing grey seal breeding populations at Donna Nook, Lincolnshire, and Blakeney Point and Horsey Sands in Norfolk.

- Donna Nook is a NNR, and is part of the Humber Estuary SSSI and Humber Estuary SAC.
- Blakeney is a NNR, and within the Wash and North Norfolk Coast SAC, and the North Norfolk Coast SSSI.
- Horsey Sands is an SSSI, but seals do not feature in the citation, probably because of the recent very rapid growth of the colony.

Outside the breeding season (based on summer surveys) the two haulout sites that hold the largest numbers of grey seals in the SEE_SMU are:

- Donna Nook, currently the largest grey seal haulout group in the NE Atlantic population which held around 60% of the SEE_SMU 2020 summer haulout count for grey seals.
- Scroby Sands (SCOS-BP 21/06), which has grown rapidly over the past decade. Scroby Sands is not designated as far as we are aware. The haulout groups are adjacent to and have recently spread into Scroby Sands wind farm as extensive new drying sandbanks have appeared within the farm
- Other large haulout groups occur at Blakeney Point and on sand banks in the northeast corner of the Wash, close to Gibraltar Point NNR. These sites are all within the Wash and North Norfolk coast SAC.
- There is a large grey seal haulout comprising several groups of grey seals on Goodwin Sands, off the Kent coast. The haulout sites are within the Goodwin Sands

Marine Conservation Zone (MCZ), although seals are not a qualifying feature or listed in the citation for the MCZ designation.

*Harbour seals:* If the Wash is taken as a single site, it is by far the largest harbour seal breeding site. If the Wash population is subdivided, it is likely that two of the subdivisions will be the largest pupping sites in the SEE_SMU. Only small numbers of pups are counted at Donna Nook, Blakeney or Scroby Sands. All haulout sites in the Wash and at Blakeney are within the Wash and North Norfolk Coast SAC

The most recent pup survey of the greater Thames estuary (ZSL 2019), which covers the remainder of the SEE_SMU, produced a count of 128 pups in 2018. These were scattered throughout the inshore banks and tidal creeks. The two largest groups were in Hamford Water (27 pups) and on Buxey Sands (44 pups).

Hamford Water NNR is designated as an SAC and an SSSI although seals do not appear in the citations as features or species of interest. Buxey Sands is adjacent to Foulness SSSI but does not appear to be designated.

South West England SMU (SWE_SMU).

*Grey seals:* the two largest breeding sites in the SWE_SMU are the Isles of Scilly and Lundy Island. In total the Cornish mainland produces a greater number of pups than Lundy, so the relative importance of Lundy and Cornish mainland sites will depend on the degree to which sites are combined. Grey seals are a designated feature of the Isles of Scilly SAC and much of the archipelago is within one of the 12 MCZs designated in and around the Isles of Scilly. Grey seals are a designated feature of the Lundy SAC and the island is designated as a SSSI and is part of the Lundy MCZ. Grey seals are also listed in the citations for Godrevy to St Agnes and Boscastle to Widemouth SSSIs.

Leeney *et al.* (2012) published the results of a single boat survey of the Cornish coast and Isles of Scilly. Approximately 80% of the hauled-out seals were in the Isles of Scilly. The largest groups on the mainland were recorded at Boscastle, Godrevy and Longships, but only small numbers were recorded, less than 30 seals in each group.

*Harbour seals:* we are not aware of any significant harbour seal breeding or haulout sites in the SWE_SMU.

North West England SMU (NWE_SMU).

*Grey seals:* The only known grey seal breeding site is on the mainland in the South Walney in Cumbria. Grey seals began pupping there in the mid-2010s and numbers are increasing. The two largest, and effectively the only large haulout groups in the NWE_SMU are at West Hoyle Bank (often referred to as Hilbre Island) in the Dee estuary, Cheshire, and at South Walney in Cumbria. South Walney is a local nature reserve and the breeding and haulout sites are within the South Walney and Piel Channel Flats SSSI, but seals are not mentioned in the citation. The Hilbre/West Hoyle site straddles the border between England and Wales and lies within the Dee Estuary SAC, and is an SSSI designated for grey seals. Harbour seals: we are not aware of any significant harbour seal breeding or haulout sites in the NWE_SMU.

**Scotland**

*Grey seals*: In Scotland all significant breeding sites are protected from disturbance and classed as designated haulout sites under the Marine Scotland Act 2010. In addition, some breeding sites in each SMU are within SACs or are specifically designated as SSSIs.

Outside the breeding season a large proportion of the grey seal population is protected at haulout sites that lie within SACs or SSSIs and/or are designated protected haulout sites. These sites have not been monitored during the grey seal moult but were designated on the basis of summer haulout distributions as described above. The array of protected sites has been established using several more nuanced or more flexible criteria than simply selecting the largest sites. However, notwithstanding the differences in criteria, the largest sites in each SMU are included in the listings for at least one of the categories.

*Harbour seals:* SACs where harbour seals are either the primary reason for designation or are listed as species of interest have been designated throughout Scotland: three in West Scotland_SMU, two in Shetland SMU; one each in the Western Isles SMU, South-West Scotland_SMU, Orkney and North Coast SMU, Moray Firth SMU and East Scotland SMU.

All relatively large haulout sites are designated as protected haulouts under the Marine (Scotland) Act 2010. In addition, Seal Conservation Areas have been designated for Shetland, Orkney and North Coast, Western Isles, Moray Firth, and East Scotland SMUs.

**Wales**

*Grey seals:* The largest grey seal breeding sites in Wales are on Ramsey Island, and on Skomer and the adjacent Marloes Peninsula. Both sites are in the Pembrokeshire Marine SAC. Ramsey Island is a NNR, and designated as a SSSI. Skomer and the Marloes form the Skomer MCZ. The next largest site is on Bardsey Island, which is in the Lleyn Peninsula and the Sarnau SAC, of which grey seals are listed as a qualifying feature. The large grey seal haulout site at Hilbre/West Hoyle straddles the border between England and Wales, and lies within the Dee Estuary SAC, and is an SSSI designated for grey seals.

*Harbour seals:* we are not aware of any significant harbour seal breeding or haulout sites in Wales.

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| **16. Could SCOS advise whether they consider the current guidance on designating the top two sites (as SSSIs) appropriate? Are there any SMUs where this approach would not be appropriate? If this is the case, what approach to protect seals through designated sites would SCOS recommend for these SMUs?** | **Defra Q5b(i)** |

**As discussed above, the data are lacking to allow the designation of the top two breeding and moulting sites for each species. Possible solutions include assuming harbour seal breeding season distribution is similar to the moult and for grey seals to assume that moult distribution is similar to distribution during August. This approach will be more robust if protected areas are large enough to cover several haulout sites. In practice, the network of protected sites already appears to cover the required locations.**

The current JNCC Guidance document (JNCC, 2021) states that the top two breeding and moulting sites can be designated to protect seals primarily from disturbance during the breeding and moulting seasons. However, that does not take account of the available data. The extensive surveys required to robustly assess the distribution of moulting grey seals and the breeding distribution of harbour seals would require significant additional resource and likely be prohibitively expensive.

In the absence of breeding data for most harbour seal SMUs, a possible compromise for harbour seals would be to assume that the distribution during the breeding season is similar to that during the moult. Observations in the Wash and Moray Firth suggest that pup numbers are lower on the exposed outer banks, but at a reasonably large scale the distributions of breeding and moulting sites are similar.

In the absence of moult distribution data for grey seals a possible compromise would be to assume that the distribution during the moult is similar to the distribution during August, which represents the main foraging season between moult and breeding. A survey of grey seal distribution during the moult in Ireland indicated that seals were concentrated on sheltered sites some of which were not used during the summer. A single grey seal moult survey in Orkney showed substantial changes in relative importance of sites compared to the summer distribution. However, absence of moult data for most SMUs makes this a moot point because the summer distribution is the only available information on distribution of seals on haulout sites outside the breeding season.

These assumptions will be less likely to be violated if the protected areas are large enough to incorporate several haulout sites. In practice, the network of protected sites already appears to cover the required areas/locations, but seals are not currently named as protected features of all of these sites. If possible, adding seals to the designations of these existing sites would increase the protection afforded to seals over their most populous areas.

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| **17. Does SCOS believe that notifying further SSSIs for seal populations at risk will aid in their overall protection? Does SCOS have any recommendations of other approaches to improve overall protection for populations at risk?** | **Defra Q5b(ii)** |

**SSSI designations may provide more easily targeted management of threats to seals on those specific haulout sites.**

**All grey seal populations for which there are comprehensive population monitoring data are either increasing or are at historical maximum population sizes. It is therefore not clear that any grey seal populations in the UK would be considered at risk.**

**Most UK harbour seal populations of concern are already afforded protection at various levels. e.g., the majority of the SEE_SMU harbour seal population is already protected as a qualifying feature of the Wash and North Norfolk Coast SAC and populations in the northern Isles and along the east coast of Scotland are in designated Seal Conservation Areas and important haulout sites in Scotland are protected from harassment**.

**Consideration should be given to developing individual based protection, which would avoid some of the problems with identifying appropriate site protection measures.**

SCOS considered that SSSI designations may provide more easily targeted management of threats to seals on those specific haulout sites. However, at least in Scotland, SSSIs are terrestrial site designations and of limited value in addressing marine threats. In addition, as they provide

protection at fixed locations any designated sites would have to be large enough to encompass potential local redistribution of seals.

It is not clear that any grey seal populations in the UK would currently be considered at risk. At present, all grey seal populations for which there are comprehensive population monitoring data, are either increasing or the current estimates represent all-time highs.

Harbour seal populations in the northern Isles and along the east coast of Scotland have declined or are continuing to decline. Seal Conservation Areas covering all of these SMUs have been designated and important haulout sites in Scotland are protected from harassment. It is not clear what increased protection would be provided by designating additional SSSIs within the conservation areas.

The recent declines in the SEE_SMU population may indicate that this population is at risk, but there is no clear indication of what is driving this decline. As this population is already protected as a qualifying feature of the Wash and North Norfolk Coast SAC and the majority of seals haulout within the Wash SSSI, it is not clear that notifying additional SSSIs would provide additional protection.

If additional protection was deemed necessary, considering individual based protection would avoid the problems associated with site protection such as relocation or short-term variability in use of haulout sites. Individual based protection is already afforded to seals in Northern Ireland.

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| **18. Can SCOS please advise on how best to determine the "vulnerability of sites" for seals? (with specific reference to SSSI designation).** | **Defra Q5c** |

**SCOS have difficulty in interpreting the meaning of "vulnerability of sites" in the context of SSSI designation. The current guidance does not define vulnerability. If it is an important factor in the justification for designation of SSSIs it needs to be more clearly defined.**

It's difficult to determine what is meant by the term "vulnerability of sites" in the context of SSSI designation. The concept of vulnerability is commonly used in species protection and defining conservation status but less commonly reference to site designation. "Vulnerable" is a specific threat category in the IUCN Red list which means that the species is at a high risk of extinction, so it could be interpreted as meaning that additional sites should be designated for populations at risk of extinction or decline.

In the guidance for SSSI designation it states that sites should ideally contain viable populations of the species they support but given the scale of seal populations relative to the scale of SSSI sites, this is clearly not possible. In the case of large or mobile species it is therefore recommended that the overall network of SSSIs should protect a viable population and in this context some sites may be more vulnerable than others in relation to specific threats. For example, some areas have been identified where seals hauled out are particularly vulnerable to disturbance (e.g., certain sites in Cornwall). This could lead to rationale for protecting more sites, especially if specific sites are identified as being vulnerable to a particular threat and therefore in more need of the protection offered by designation. However, this is little more than guesswork in the absence of any further guidance.

Assessment of vulnerability will require information on likelihood and potential severity of hazards as well as likelihood and time course of both response and recovery. Assessment of vulnerability should also recognise geographical and site-specific variation in the degree to which different sites

may be affected by particular threats and provide a mechanism to identify and protect additional sites which have been characterised as vulnerable**.**

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| **19. In 2019, SCOS advised that scientifically informed criteria were required to establish whether seal conservation areas should be introduced or revoked. Can SCOS advise on what such criteria should consist of? In the absence of such criteria, but noting current population trends, can SCOS advise whether the threat to seal populations still remains in current seal conservation areas, particularly the Western Isles.** | **MS Q6** |

**To date SCAs have been introduced for three different scenarios: response to a rapid decline with a clear related anthropogenic threat (Moray Firth and seal shooting for fisheries management); response to a rapid decline with unknown cause (Orkney and North Coast SMU, Shetland SMU and East Scotland SMU); and a response to a protracted decline with unknown cause (The Western Isles SMU).**

**It is clear that criteria should differ depending on the frequency of monitoring. Proposed criteria for introducing and revoking SCAs are presented below.**

**The causes of declines in the Northern Isles and along the east coast of Scotland have not been identified and there is therefore no evidence of threats having been removed. While that uncertainty remains, and there is potential vulnerability to a future PDV outbreak, SCOS recommends that existing Conservation Area designations remain in place in the Northern Isles, Moray Firth and East Scotland SMUs.**

**SCOS considers that the Conservation Area designation for the Western Isles SMU harbour seal population could be removed.**

*Historical criteria for designating Seal Conservation Areas (SCA)*

Under the Marine (Scotland) Act 2010, Scottish Ministers may designate a "seal conservation area" where they consider it necessary to do so in order to ensure the proper conservation of seals. The primary effect of such a designation is that "The Scottish Ministers must not grant a seal licence authorising the killing or taking of seals in a seal conservation area unless they are satisfied that the killing or taking authorised by the licence will not be detrimental to the maintenance of the population of any species of seal at a favourable conservation status in their natural range (within the meaning of Article 1(e) of the Habitats Directive)".

The definition of favourable conservation status is not particularly helpful in defining scientific criteria for establishing or revoking Seal Conservation Area (SCA) status. It is "defined" with respect to species by Article 1 (i) of the Directive as: "conservation status will be taken as 'favourable' when: population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, and the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long- term basis." It is therefore left to the regulator to decide on the relevant criteria for determining favourable conservation status.

Clearly the designation of an SCA is a response to a perceived decline or threat of decline in a population, that may bring it into unfavourable conservation status. To date these have been designated for three different types of decline.

- The Moray Firth order was a response to a rapid decrease in population estimates in a situation where a clear anthropogenic threat was thought to be driving the decline, in that case the threat was shooting as part of fisheries protection measures.
- The Orkney and North Coast SMU, Shetland SMU and East Scotland SMU populations were declining rapidly due to unknown causes.
- The Western Isles SMU population had shown a slow but protracted period of decline due to unknown causes.

Each of these declines was accepted as an appropriate reason for designation and the SCAs have continued in place to date. However, the question remains of what levels of declines would be needed to trigger action.

To a large extent the magnitude of decline required will or should depend on the monitoring programme in each area. In some areas such as the Moray Firth, regular frequent (annual) surveys allowed identification of a rapid decline within the first few years of the problem developing. In the rest of Scotland, the survey frequency is much lower, with surveys approximately every five years. SCOS recommends that different criteria should be flexibly applied to populations that are subjected to different monitoring programmes.

The following section describes suggested criteria for establishing and revoking SCA designations on the basis of discussion at SCOS. However, SCOS believe that the choice of values used to fix the criteria should be a matter for regulators and will depend on the level of risk that is deemed acceptable, and on the ability of the monitoring programmes to detect changes in population dynamics.

*Criteria for considering designation of Seal Conservation Areas*

SCOS recommends that a formal decision process should be adopted for designating or revoking Seal Conservation Areas. In the absence of any specific anthropogenic activity or natural factors that a decline can be attributed to, SCOS propose instigating conservation measures when observed declines exceed threshold rates of decline. This approach takes into account the frequency of the monitoring and the extent of the observed decline. Here SCOS outlines the proposed decision process but refrains from advising on specific threshold rates of decline.

The decision to designate a Seal Conservation Area should be based on the following:

1. In any situation where an identified anthropogenic activity or natural factor such as a disease event can be shown to be causing or likely to cause a decline in a population, mitigation measures should be established as quickly as possible. Such mitigation may include designation of SCAs.
2. Where there is no a priori reason to suspect a particular anthropogenic or natural threat, conservation measures should be considered when:
    - In populations with frequent/regular surveys, a decline of X% per annum maintained over a three-year period or a decline of Y% over a five-to-ten-year period has been observed.
        - Investigations to identify the cause of the decline should be instigated and SCA designation should be considered.
    - In populations with a five-year survey cycle, successive counts drop by Z%.
        - Additional survey(s) should be carried out as soon as practical to confirm the decline

and SCA designation should be considered.

- In populations with a five-year survey cycle, counts drop by W% over 3 surveys.
  - SCA designation should be considered.

The values for rates of decline that would trigger SCA designation will depend on the frequency and quality of population monitoring (i.e. on the level of confidence in our ability to detect declines), and on the acceptable level of risk for seal population management. Further discussion between scientists and regulators/managers will be required to determine appropriate values.

*Criteria for revoking/removing Seal Conservation Areas*

SCAs could be revoked or removed when a population is considered to have recovered, e.g., returned to at least its pre-decline level, and where causes of the decline have been identified as anthropogenic effects, those causes have been removed.

*Reasons for existing Seal Conservation Areas*

In 2004, in response to local declines in harbour seal numbers, the Scottish Government introduced a Seal Conservation Order (SCO) under the Conservation of Seals Act 1970, to cover harbour and grey seals in the Moray Firth SMU in response to rapid decline thought likely to be the result of shooting to control seal interactions with salmon fisheries. In 2007 additional SCOs were applied to harbour seals in the Shetland, Orkney and North Coast and the East Scotland SMUs. The latter covering the Scottish east coast between Stonehaven and Torness, including the Firths of Tay and Forth. These were in response to large scale apparently rapid declines in populations.

The Conservation of Seals Act was superseded by the Marine (Scotland) Act 2010, and existing seal Conservation Orders were converted to Seal Conservation Areas (SCA) under the Marine (Scotland) Act 2010.

In 2009 SCOS noted a long-term decline (35%) between 1996 and 2008 in the population of harbour seals in the Western Isles SMU, equivalent to a 3% p.a. decline. In response, and after consultation with stakeholders, the Minister designated a Seal Conservation Area for harbour seals in the Western Isles in 2011, with the intention that the order would remain in place until concerns about this local population are resolved.

*Assessment of the continuing requirement for existing Seal Conservation Areas*

Declines in Orkney and North Coast SMU, and in the Tay and Eden SAC have continued with no sign of recovery. Counts in Shetland fell sharply in the early 2000s and have been relatively stable since, but with no sign of recovery to pre-2000 levels. In the Moray Firth SMU, counts were decreasing at a rate of 5.6% p.a. (95% CIs: 2.5, 8.5) between 1994 and 2000, followed by a drop of c.28% occurring between 2000 and 2003. There is no significant trend in counts from 2003 to the most recent count in 2019 indicating a stable but depleted population.

There is no clear evidence that the threats to those populations have been removed and SCOS therefore recommends that existing conservation orders remain in place in the Northern Isles, Moray Firth and East Scotland SMUs, at least until new count data are available to reassess their status.

A complete survey of the Western Isles SMU, carried out in 2017, produced a count of 3,533 which was the highest recorded count for the Western Isles. The counts decreased between 1996 and 2008 at approximately 3% p.a., but the 2011 count was similar to the 1996 count and the 2017 count was

29.0% higher than the previous 2011 and was 25% higher than the count in 1996. Model selection based on AIC (SCOS BP 21/03) suggested that the survey data are best described by a GAM that indicates a decline from the late 1990s until approximately 2006 followed by a rapid increase until 2017 (Figure 10).

The SCA was designated in response to a gradual decline of 3% p.a. between the mid-1990s and 2008. Since reaching a minimum around 2006-2008 the survey counts have increased by approximately 90%, equivalent to a 7% p.a. rate of increase between 2008 and 2017. This rapid increase clearly indicates that the factors that caused the decline are no longer driving the population down.

Bearing in mind that the main protection bestowed by the Conservation Area designation is an effective ban on licenced removals, and that such removals for fisheries protection have now been banned throughout the UK, SCOS considers that the Conservation Area designation for the Western Isles SMU harbour seal population could be removed without serious risk to the harbour seal population.

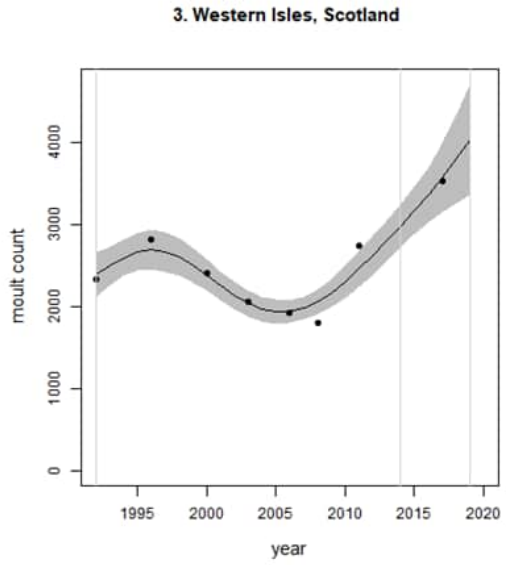


**Figure 10.** GAM fitted to harbour seal haulout counts between 1992 and 2017.

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| **20. SCOS previously advised a five yearly review cycle for designated seal haulout sites. Does SCOS consider that this is the most appropriate time frame for reviewing seal haul sites based on the survey data and rate of change in the population?** | **MS Q17** |

**Given the five-year cycle for whole of Scotland census it would not be possible to carry out a full reassessment more frequently than every five years. Counts are variable so there is a danger of changing designations as a result of survey to survey variability rather than true changes in distribution. SCOS recommends a comprehensive reassessment every ten years, but with flexibility to respond to major changes between survey cycles.**

The current monitoring programme aims to survey the entire Scottish harbour seal population every five years. Some sites have been surveyed more often; additional surveys have been carried out to assess the rate of change in the rapidly declining Orkney and N Coast SMU, and the estuarine sites in the Moray Firth SMU and the Tay and Eden SAC in the East Scotland SMU are surveyed annually. Given the 5-year cycle for whole of Scotland census it would not be possible to revise the designations, based on the overall population distribution, on anything less than a five-year schedule.

However, the counts at haulout sites are inherently variable, so a comprehensive re-assessment based on the original criteria, after each five-year survey round means that there is a danger of changing designations in response to that variability rather than to meaningful changes in distribution. SCOS recommends a comprehensive reassessment every ten years, i.e., after two survey rounds, but with inspection of the counts at designated sites after each is surveyed. This would retain the flexibility to respond to major localised changes in distribution in the shortest feasible time while avoiding over interpretation of the variability in count data. The criteria for triggering such a change would need to be defined in advance.

## Seal Licensing and PBRs

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|---|---|
| **21. Can SCOS provide updated Potential Biological Removals (PBRs) figures for 2021?** | **MS Q12** |

**Due to Covid related restrictions there are no additional surveys in 2020. The harbour seal PBR estimates reported in SCOS 2020 are therefore the most up to date estimates. The revised analysis of proportion of grey seals hauled out during the surveys has changed the scalar between counts and Nmin for grey seals (SCOS-BP 21/02). This has reduced the PBR estimates by approximately 3.5%**

**PBR estimates for both harbour and grey seals for each SMU in Scotland, together with a description of the calculations and the rationale for selection of SMU specific Recovery Factors ($F_R$) are presented in SCOS-BP 21/08. PBR values for the grey and harbour seal "populations" that haul out in each of the seven SMUs in Scotland are presented here (Tables 10 & 11), based on suggested values for the recovery factor and the latest confirmed counts in each management area.**

**Information on the alternative PBR estimates posted for UK grey and harbour seals in the NOAA data portal are provided below.**

**Table 10.** Potential Biological Removal (PBR) values for harbour seals in Scotland by SMU for 2021. The most recent population data, estimates of $N_{min}$ and the recommended $F_R$ values are shown.

| | 2016-2019 | | selected | |
|---|---|---|---|---|
| **Seal Management Unit** | **count** | **$N_{min}$** | **FR** | **PBR** |
| 1 Southwest Scotland | 1709 | 1709 | 0.7 | **71** |
| 2 West Scotland | 15600 | 15600 | 1.0 | **936** |
| 3 Western Isles | 3532 | 3532 | 0.5 | **105** |
| 4 North Coast & Orkney | 1405 | 1405 | 0.1 | **8** |
| 5 Shetland | 3180 | 3180 | 0.1 | **19** |
| 6 Moray Firth | 1077 | 1077 | 0.1 | **6** |
| 7 East Scotland | 343 | 343 | 0.1 | **2** |
| **SCOTLAND TOTAL** | 26846 | 26846 | | **1147** |

**Table11.** Potential Biological Removal (PBR) values for grey seals in Scotland by SMU for 2021. The most recent population data, estimates of $N_{min}$ and the recommended $F_R$ values are shown.

| | 2016-2019 | | selected | |
|---|---|---|---|---|
| **Seal Management Unit** | **count** | **Nmin** | **FR** | **PBR** |
| 1 Southwest Scotland | 517 | 1927 | 1.0 | **116** |
| 2 West Scotland | 4174 | 15554 | 1.0 | **933** |
| 3 Western Isles | 5773 | 21512 | 1.0 | **1291** |
| 4 North Coast & Orkney | 8599 | 32043 | 1.0 | **1923** |
| 5 Shetland | 1009 | 3760 | 1.0 | **226** |
| 6 Moray Firth | 1657 | 6175 | 1.0 | **370** |
| 7 East Scotland | 3683 | 13724 | 1.0 | **823** |
| **SCOTLAND TOTAL** | **25412** | **94695** | | **5682** |

**Alternative PBR estimates**

In addition to the PBR estimates for Scottish SMUs presented above, the JNCC entered population data and a set of UK-wide PBR estimates into the NOAA bycatch portal to comply with requirements under the USA Marine Mammal Protection Act. The values posted to NOAA differ from those presented in this and previous SCOS reports. Given that there are now two different sets of PBR calculations in the public domain it is important that the differences and the justifications for the two sets are clearly understood.

The calculations for grey and harbour seals are described separately.

**GREY SEAL**

There are significant differences between the method used to generate a grey seal PBR in the NOAA portal and the method that is currently used to generate PBRs for Scottish Seal Management Units.

*SCOS SMU specific PBRs*

The PBRs in the SCOS reports are estimated for each individual Scottish SMU and are based on the most recent summer counts of grey seals hauled out in each SMU. Several SMUs hold substantial populations during the summer foraging season but do not have large grey seal breeding sites. As most interactions with human activities and management actions are likely to occur while seals are dispersed outside the breeding season, there is a need to allocate management targets (in this case PBR estimates) appropriately across all SMUs. The best estimate of the number of seals in an SMU is the number counted, corrected for the proportion that are not hauled out and are unavailable to be counted. The grey seal counts from the August surveys are multiplied by a factor derived from telemetry data which showed that around 25.15% (95% CI: 19.2 - 28.6%) were hauled out during the survey windows (Russell *et al.,*2016 SCOS-BP 16/03). These data suggest that the Nmin (the lower 20th percentile of the estimated population size) should be 3.73 x count.

*UK-wide PBR*

The PBR estimates entered in the NOAA portal are calculated for a single UK wide grey seal population. The population value used is the most recent estimate derived from a population dynamics model fitted to the grey seal pup production data (Thomas *et al.*, 2019; SCOS BP 20/01). This number is augmented to account for pup production in a small number of areas that are not included in the regular surveys. The mean estimate and the approximate standard errors from the model are then used to derive an $N_{min}$ value.

The existing data in the NOAA portal for the UK wide PBR estimate are based on the overall UK population estimate in the SCOS 2020 report:

$N_{best}$ = 149700 (Cis 129000 – 174900)

SE = CI/1.96 The CIs are not symmetrical, but here we have used the lower CI

CV = 0.072

$N_{min}$ = 140776 the lower 20$^{th}$ percentile of the mean estimate $N_{min} = N_{best} – 0.845 * SE$

R = 0.12

$F_{R =}$ 1.0 As the regional populations of grey seals are all either at historical highs or are growing, the recommended $F_R$ value grey seals in all SMUs is 1.0, so it seems sensible to use that value for the combined UK population as well.

PBR = 8447

As recovery factors are all set to 1.0 in both methods the result of pooling all of the individual SMU PBRs should sum to the same as the single UK-wide estimate. Any discrepancy will be due to variability in the predictions of the population dynamics model and the pup production estimates on which they are based, and variability in the summer survey counts.

**HARBOUR SEAL**

Again, there are differences between the methods used to generate a single UK-wide harbour seal PBR in the NOAA portal and the method that is currently used to generate PBRs for individual Seal Management Units in Scotland.

*SMU specific PBRs*

The PBRs in the SCOS reports are estimated for each individual Scottish SMU and are based on the most recent summer counts of harbour seals hauled out in each SMU. When the PBR method was first applied to harbour seals in Scotland SCOS were concerned that the conversion factor was based on only a small sample of adult seals in one particular year (Lonergan *et al.*, 2013). Given the declines in several harbour seal populations around Scotland, SCOS recommended taking a more precautionary approach that involved using the moult count as a proxy for $N_{min}$ rather than estimating the lower 20$^{th}$ percentile of the population estimate. This means that the PBRs presented in the SCOS report are approximately 28% lower than estimates based on the lower 20$^{th}$ percentile. Given the continued declines in Orkney and North coast SMU and the Tay and Eden SAC as well as the absence of any recovery in Shetland or the Moray Firth SMUs this policy has remained in place.

*UK-wide PBR*

In the NOAA portal, the values entered are the population estimate, i.e., a composite of the most recent counts from for all SMUs corrected for the estimated proportion of seals hauled out (0.72; Cis 0.54-0.88). The confidence intervals on the proportion are used to estimate the $N_{min}$.

Based on the population estimates for harbour seals published in SCOS 2020, the values put into the NOAA portal are:

$N_{best}$ = 44100 (CIs 36100 – 58800)

CV = 0.129

$N_{min}$ = 40632

$F_R$… selecting an appropriate recovery factor for the overall population is not a simple matter. The value of 0.5 entered in the NOAA portal is derived from the separate $F_R$ values for each SMU, but it is not clear how the UK-wide recovery factor should be calculated. The UK-wide PBR estimate using $F_R$ of 0.5 would be 1,220. The values used in individual SMUs range from 0.1 for the SMUs in the Northern Isles and along the east coast of Scotland, up to 1.0 for the West Scotland SMU. The Wash population has undergone a large drop since 2018 so it may be sensible to reduce the FR for that SMU. Some form of weighted average would seem to be most appropriate. Depending on the averaging method chosen the $F_R$ could be set between 0.34 and 0.39. Replacing the existing value of 0.5 with values of 0.39 or 0.34 would reduce the PBR estimate by 22% or 32% respectively.

The use of the actual counts for harbour seals rather than the estimated $N_{min}$ is a more precautionary approach. As a result, the PBRs presented in the SCOS report are approximately 28% lower than estimates based on the lower 20th percentile. As a consequence, the UK-wide PBR estimate posted in the NOAA portal will be substantially larger than the sum of the individual SMU PBR estimates.

The PBR method was developed to manage anthropogenic impacts on discrete functional population units. The individual SMU approach violates the assumption that the populations are discrete/closed, particularly for grey seals. This is taken into account when deciding on the appropriate $F_R$ for harbour seals and is simply avoided by setting the grey seal $F_R$ to 1 in all SMUs. As widely discussed in SCOS 2020 there can be difficulties in managing wide-scale issues using the individual SMU approach. However, pooling groups of SMUs to address specific wide-scale issues should address such problems. On the other hand, using a single UK-wide PBR approach precludes fine scale management of localised issues or at least requires that the national PBR be subdivided in some appropriate way.

## Seal Bycatch

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| **22. What is the latest understanding on levels of seal bycatch across the UK? Where is seal bycatch considered to predominantly occur by region and gear type and is there any data to show any bias by seal species, sex or specific age groups?** | **Defra Q8** |
| **What are the latest bycatch estimates for grey seals in the UK, especially Southwestern British Isles, including Ireland?** | **NRW Q2** |
| **What are the latest estimates of seal (grey and harbours) bycatch across fisheries in Scotland and the wider UK? Are there particular seasonal and / or geographical hot spots of high seal bycatch? Are there any areas where it has not been possible to collect seal bycatch data?** | **MS Q16** |

**The most recent estimated bycatch of seals in UK fisheries was in 2019. The total estimate was 488 animals (95% CI 375-872). This estimate is based on bycatch in gill net/tangle net fisheries; rare and sporadic captures in trawl fisheries are discussed below. The estimated bycatch was very close to the 2018 estimate. Bycatch estimates for ICES Divisions are presented in table 12.**

**Statistical analyses have not found any strong seasonal signal to seal bycatch rate.**

**There are no data to show any bias in species; all recorded species IDs in the SW are of grey seals, as there are few harbour seals west of the Solent area. Most bycaught animals are small. Species ID is uncertain for quite a few especially where they cannot be brought on deck. SCOS recommend that effort should be directed towards identifying the species and if possible, the sex and age structure and genetic information from the bycaught seals. This could be achieved by obtaining photographs of the animals and taking a skin sample.**

**Approximately 81% of the bycatch estimate occurs in the south-west, in ICES area VII, where the UK gillnet/trammel net fishery is concentrated. The remainder occurs in area IV which covers the North Sea and waters around Shetland and Orkney with less than 1% occurring in area VI around the Hebrides and Northwest Scotland.**

**SCOS are not aware of any reasons why specific areas have not been sampled, all sampling is simply constrained by resources. A Marine Scotland funded study is currently underway examining the distribution of bycatch monitoring effort.**

**Seal bycatch estimates**

Seal bycatch estimates for the UK are made for both species of seal (grey and common/harbour) combined (Kingston *et al.*, 2021). Most seals that have been examined were young grey seals which can be hard to differentiate from harbour seals. All seals taken in gillnets were thought to be grey seals and were taken in the southwest where harbour seals are rare. The numbers of harbour seals recorded are too low to generate a useful bycatch estimate, so for expedience a single combined seal bycatch total is calculated. Although it is reasonable to assume that the majority of these bycaught animals are grey seals, for bycatch in the North Sea at least, some proportion will likely be harbour seals. There are no data to show any bias in species; all recorded species IDs in the SW are of grey seals, as there are few harbour seals west of the Solent area. Most bycaught animals are small. Species ID is uncertain for quite a few especially where they cannot be brought on deck.

SCOS recommend that effort should be directed towards identifying the species and if possible, the sex and age structure and population of origin of the bycaught seals. This could be achieved by obtaining photographs and skin samples from the animals.

The total seal bycatch estimate for UK waters in 2019 is 488 animals (CV = 0.07; 95% confidence limits 375-872) which is very close to the previous year (474). Estimates of seal bycatch have fluctuated year to year but are generally in the region of 400-600 seals per year, with no clear trend (Table 12).

Statistical analyses have not found any strong seasonal signal to seal bycatch rate. No specific hot spots have been identified in UK fisheries.

**Table 12.** Recent estimates of annual seal bycatch in UK gillnet fisheries with 95% confidence limits

| Year | Estimated number | 95% confidence interval |
|---|---|---|
| 2013 | 469 | 285-1369 |
| 2014 | 417 | 255-1312 |
| 2015 | 580 | 423-1297 |
| 2016 | 610 | 449-1262 |
| 2017 | 572 | 429-1077 |
| 2018 | 474 | 354-911 |
| 2019 | 488 | 375-872 |

Recent analysis of data from the Irish EEZ (Luck *et al.,* 2020) shows that bycatch rates are related to proximity to areas of high seal density, around haulout sites and in inshore waters in particular. That analysis suggests that bycatch estimates can be significantly biased by the distribution of sampling effort. Increased marine mammal bycatch monitoring on French, Irish and other EU registered vessels fishing in this region would be helpful. UK sampling has covered all vessel categories (inshore and offshore) in this region, though sampling from Welsh ports and in the Bristol Channel has been limited and could be increased. The potentially large takes in these fisheries mean that the bycatch rates presented above may significantly under-estimate the scale of the problem.

**Distribution of bycatch**

The published data are not presented at sufficiently high resolution to ascertain whether there are any particular local hotspots of by-catch within particular ICES areas, but we are not aware of any such persistent hotspots. Table 13 shows the estimates by ICES Division and general area. Approximately 81% of the bycatch (394 seals) was estimated to have occurred in ICES area VII, around the south and south-west of the UK and Ireland. The majority of this occurred in the Western Channel and Celtic Sea, (around 300 seals per year), largely due to the overlap of high levels of fishing effort and relatively high seal densities. Bycatch rates in the Eastern Channel are estimated at around 88 seals per year.

**Gear type**

Most of the seal bycatch recorded in 2019 was in large mesh tangle nets and trammel nets, which accounted for 91% of the estimated bycatch. Effort in these fisheries is highly focused in area VIId, e & f (61% of UK tangle net effort). Sampling has been focused mainly in VIId-g. Other areas that are under-sampled and where there is a large amount of effort, or a high density of seals, could benefit from further observational data. These would include IVa (northern North Sea), IVc (southern North Sea), VIId (eastern Channel) and VIIf (North Devon and Cornwall and South Wales).

No seal bycatch was reported from trawl fisheries in 2019. In 2018 six grey seals were reported caught in sandeel trawls. Seal bycatch records in trawl fisheries are clumped, often involving several individuals in one location, but the overall recorded mean bycatch rate is very small and will have extremely wide confidence intervals, so no estimate of trawl fishery bycatch is included in the annual bycatch estimates.

Sampling is not strictly apportioned according to effort or to gear type, and it is possible that there may be additional sources of bycatch mortality that remain unknown. Sampling under the Protected Species Bycatch Monitoring Programme is focused on static gear in those areas where effort is generally highest, notable in the SW of Britain. No formal assessment of potential biases in the sampling programme has yet been made.

**Potential consequences of bycatch**

Although the total bycatch estimate of 488 is not large compared to the entire UK grey seal population of over 150,000 animals, the local populations around the Celtic Sea, where most bycatch is known to occur are much lower. The current estimate for the combined pup production in SW England, Wales and Ireland was approximately 4800 in 2019, but has a high level of uncertainty see Q 5 above. With the same assumptions as used to derive a PBR for the Welsh grey seal populations, (i.e., that $N_{min}$ = 2.2*pup production; FR = 0.5; r = 0.12 (NRW Q2, and SCOS 2016 answer to Q9)) this pup production produces a PBR of 283 grey seals. The current estimated bycatch for UK registered vessels in ICES areas VIIa-c, e-j, was 303 (Table 13), approximately 7% greater than the conservative PBR.

The bycatch totals in table 13 are the estimates for just the UK registered vessels. This is likely to grossly underestimate the total bycatch in the Southwest. Bycatches (of unknown extent) by Irish, French, and Spanish vessels working the same areas will add to the total. Luck *et al.* (2020) estimated total bycatches of between 202 and 349 seals per year between 2011 and 2016 by all vessels within the Irish EEZ. Unfortunately, these cannot be simply added to the UK vessel bycatches as the Irish EEZ figures will include some of the UK registered vessel bycatch. Although bycatch was not broken down by country of registration, the fishing effort by French vessels (43%) was similar to the combined effort by Irish (21%) and UK (23%) registered vessels in the Irish EEZ. In addition, some

French and Irish vessels fish in UK waters and will also likely take seals as bycatch but are not included in either the Kingston et al. (2021) or Luck et al. (2020) estimates.

**Table13**. Seal bycatch estimates by ICES Division 2019 (from Kingston et al., 2021)

| Region | ICES Division | Estimated total bycatch | Two-Sided 95% LCL | Two-Sided 95% UCL | One-sided 90% UCL |
|---|---|---|---|---|---|
| **North Sea** | IVa | 29 | 24 | 35 | 33 |
| | IVb | 3 | 2 | 3 | 3 |
| | IVc | 47 | 39 | 68 | 63 |
| **West Scotland offshore** | VIb | 10 | 9 | 12 | 12 |
| **Irish Sea** | VIIa | 3 | 2 | 7 | 5 |
| | VIIc | 4 | 3 | 5 | 5 |
| **Eastern Channel** | VIId | 91 | 66 | 178 | 148 |
| **Western Channel and Celtic Sea** | VIIe | 151 | 123 | 207 | 191 |
| | VIIf | 125 | 104 | 154 | 145 |
| | VIIg | 10 | 8 | 18 | 15 |
| | VIIh | 7 | 6 | 10 | 9 |
| | VIIj | 3 | 2 | 3 | 3 |
| **Biscay** | VIIIabcd | 6 | 5 | 9 | 8 |

Despite the fact that the recorded bycatch levels are high relative to local population estimates, the grey seal pup production in the region is thought to be increasing. For example, regularly monitored colonies in Pembrokeshire are increasing by around 6% p.a. (Bull *et al.,* 2017 a, b, Lock *et al.,* 2017, Morgan *et al.,* 2018). A large proportion of the bycaught seals were assessed to be first- or second-year animals and first-year mortality is thought to be high in grey seals (SCOS-BP 20/02). If the bycatch mortality pre-dates this enhanced pup mortality it may have a relatively small effect on the dynamics of the populations. Notwithstanding such effects, the bycatch seems unlikely to be sustainable by local populations alone. That they continue to increase suggests that the removals may include or are being compensated for by immigrants. The most likely source of immigrants would be the large breeding colonies in the Hebrides where the population has been relatively stable and where post weaning juvenile survival rates are estimated to be low (SCOS-BP 21/05). As the bycatch is almost exclusively young grey seals a sample of 50 weaned grey seal pups on the Monach Isles were tagged with satellite transmitters in November 2021 to investigate early dispersal and estimate migration rates to the southwest region.

In addition to these movement studies, SCOS would recommend additional efforts to recover samples from bycaught animals to allow the analysis of genetic material to indicate the origin of these animals.

At present there are no indications that the declines in harbour seals in some seal management regions in Scotland and in southeast England are related to bycatch. English harbour seal populations have, until recently, been increasing and there do not appear to be conservation concerns associated with the observed bycatch rates of grey seals, as yet. However, given the scale of static net fisheries in the southwest, the amount of depredation that is being recorded during bycatch monitoring, the estimate of UK vessel bycatch and the existence of an unknown, but likely large foreign vessel, bycatch in the region, the western channel and Celtic Sea would seem to be an appropriate area for additional work.

SCOS are not aware of any reasons why specific areas have not been sampled, all sampling is simply constrained by resources. Observer effort is concentrated in SW and there may be requirements for increased and wider effort, work to assess these requirements is ongoing.

## Seals and Fisheries and Aquaculture

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| **23. Non-lethal seal mitigation measures in commercial fisheries:**<br>**Can SCOS provide recommendations on what the latest non-lethal mitigation devices, gear modifications and measures are to minimise seal depredation in commercial fisheries?** | **Defra Q7** |

**There has been limited progress in the development or demonstration of any measures to mitigate seal depredation in commercial fisheries since SCOS 2020.**

**There have been some additional trials of the Targeted Acoustic Startle Technology (TAST) device in handline mackerel fisheries in the northeast of Scotland with evidence of strong deterrent effects. More work is necessary to determine effects on catch weight.**

**There have been no reported developments in gear modifications or other measures.**

There have been very few additional studies on potential mitigation methods for minimizing seal depredation in commercial fisheries since SCOS 2020.

A pilot study was carried out in 2020 to assess the effectiveness of a GenusWave Targeted Acoustic Startle Technology (TAST) device (Götz & Janik 2015, 2016) in deterring seals from depredation of mackerel from handlines off northeast Scotland (Whyte *et al*., 2020b). The study revealed a strong deterrence effect of TAST on seal activity directly around fishing vessels, in which seal detections on the vessels' fish finder (sonar) decreased by 97%. Fishing metrics such as 'fishing stop duration' i.e., the length of an individual fishing bout from stopping at a site to moving on to the next site, and 'catch weights' were primarily influenced by time-of-year (seasonality). However, fishing stop duration was almost twice as long when TAST was used. As fishermen usually terminate a fishing bout when the mackerel shoal below them disperses, the authors suggest that this increased duration may be the result of a reduction in shoal dispersal caused by seals. There were insufficient data to assess whether TAST had a significant effect on catch weight. Additional trials in net and line fisheries in England are expected to start in January 2022.

SCOS is not aware of any further progress in relation to gear modifications or other approaches to reduce depredation since those reported in SCOS 2020. Practical measures applied to date include reduced net soak time and avoiding areas where previous high rates of depredation have been encountered. The effectiveness of gear modification and other approaches will vary with fishery and target species. As highlighted by Cronin *et al.* (2014) for Irish waters, a detailed review of seal control measures used internationally along with case studies to test their effectiveness in UK fisheries is required.

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| **24. Seal Depredation in commercial fisheries:**<br><br>**Can SCOS advise on the latest information available to provide evidence of seal depredation in the UK?**<br><br>**Can SCOS advise on new research that could be undertaken to best to collect robust data on this important issue of concern within UK commercial fisheries?** | **Defra Q9** |

**SCOS is not aware of any new published quantitative information on the extent, frequency, intensity, or geographical pattern of interactions between seals and fishing operations and no quantitative information on rates of removals or frequency of seal damage to fish in gear.**

**SCOS recommends that a UK wide workshop involving fisheries managers, local and national fisheries organisations and marine mammal scientists be convened to design a study, with the aim of defining the specific issues and identifying locations and timings of interactions that warrant further investigation. This would allow data requirements to be assessed, and appropriate structured monitoring programmes to be developed.**

**Examination of existing data from the UK Protected Species Bycatch Monitoring Scheme should be prioritised.**

In 2018, 2019 and 2020 Defra/MMO reported that there are increasing numbers of anecdotal accounts of seals causing considerable damage to fish that have been caught in nets and on lines at various locations on the English coast. It is clearly felt strongly by the fishing industry that impacts of seals on fishing operations has increased in recent years and that effective solutions are necessary.

A similar question was answered in the SCOS (2020) Advice and SCOS advised that an MMO sponsored workshop had discussed local seal fishery interactions, but had not resulted in the development of a formal programme of research or monitoring (MMO, 2020a,b). SCOS was not aware of any structured programme to log and assess the validity of these reports, to quantify the scale of removals or estimate the economic cost or to identify trends in these metrics. This remains the case in 2021.

As advised in SCOS (2020), SCOS recommends that a workshop involving fisheries managers and scientists, local and national fisheries organisations from the whole UK and both marine mammal and fisheries scientists would be a useful first step in defining the specific issues, locations and timings of interactions, and identifying research opportunities and potential solutions that warrant further investigation. It is likely that a structured monitoring programme using an integrated approach involving the industry is required to progress the collection and collation of robust quantitative information on the scale and extent of damage to catch and fishing gear.

The UK Protected Species Bycatch Monitoring Scheme has collected data for 20 years on the bycatch of marine mammals through on-board observations, some of which is associated with depredation. It has also collected information on seal-damaged fish recovered from nets. SCOS recommend that additional resources should be allocated to conduct a quantitative assessment of these data.

Standardised post-mortem examinations of stranded seals and recovery of bycaught seals for examination may also provide some evidence for the extent of this issue.

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| **25. Are there any parts of the wider ecosystem that are likely to experience significant impacts as a result of an increasing Scottish seal population? What are these impacts, and would they be positive or negative?** | **MS Q7** |

**SCOS noted that grey seal population increases over the past decade have been confined to the Central and Southern North Sea. So, in most of Scotland, other than the North Sea coast, grey seal populations are thought to be currently stable.**

**Harbour seal numbers have declined in some regions of Scotland, such as the Northern Isles and along the East coast, but have increased in others, such as the West of Scotland, the Western Isles and SW Scotland.**

**Overall, there has been no general increase in seal numbers in Scottish waters, although trends for both species vary regionally.**

**It is likely therefore that there will be regional differences in the level of interactions between seals and the wider ecosystem. The effects of increasing seal populations on fish prey populations were considered in detail in SCOS 2019, therefore this answer focuses more on other impacts rather than repeat that answer.**

**It is important to note that seal predation can have significant impacts on particular fish stocks, but this can vary considerably between stocks. In some areas/ecosystems seal predation has been identified as having a significant impact on recovery of specific fish stocks, whereas in others, increasing seal populations appear to have had minimal impacts. As highlighted in SCOS 2019, predicting ecosystem effects of changes in predator population size is complex and difficult and requires a multispecies ecosystem modelling approach. This requires information on fish abundance and distribution, spatial and temporal patterns of seal predation, spatial and temporal distribution of fishing effort and an understanding of multispecies functional responses. Work is underway to fill several of the data gaps highlighted in SCOS 2019.**

**Seals of both species are known to interact with aquaculture developments to prey on farmed salmonids and both species are also known to prey on wild salmonids in rivers. It has been estimated that ≤1% of the general seal population specialise in predating wild salmonids in rivers, while a small but unknown proportion of seals depredate salmonids at fish farms.**

**Even where interactions are known to occur there is limited information on current or historical predation rates at either aquaculture installations or in rivers. This limits our ability to predict the effects of increasing seal populations in areas where they overlap. Previous analyses have not been able to demonstrate a clear link between seal abundance close to rivers and levels of predation in rivers.**

**Other potentially significant effects of population increase in either or both seal species include: increased competitive interactions between the two seal species, increased predation of grey seals on both harbour seals and harbour porpoises, and increased availability of seals as prey for killer whales.**

**A number of data gaps are identified, which if were filled, would improve the ability to answer this question in future.**

Some of the issues raised in this question were addressed in SCOS 2019, in relation to effects on wild fish populations (including salmonids in rivers) and fish stocks. As a result, this answer does not

repeat the information provided previously, but focuses on the potential impacts of increasing seal populations on other aspects of the marine environment including effects on other mammal populations and aquaculture.

Although there has been continued increase in the overall UK grey seal population in terms of both pup production (SCOS-BP 21/01) and total population (SCOS-BP 21/03), the majority of the increase in pup production over the past 20 years has been at colonies in the North Sea and in the past 10 years that has been concentrated at colonies in the southern North Sea. Based on the distribution of hauled out seals during the summer, the numbers of grey seals foraging around Scotland have remained relatively stable, while in the central and southern North Sea the numbers of grey seals foraging in summer have increased at sites along the east coast of England and particularly in the southern North Sea. Harbour seal populations around the north and east of Scotland have undergone dramatic declines, whilst those on the west coast have increased. Overall, there has been no general increase in the population of seals foraging around Scotland in the past decade, although predation levels have likely increased in the areas where harbour seals are increasing on the west coast of Scotland and declined in Orkney where harbour seal populations have declined dramatically.

Understanding seal diet is key to being able to predict ecosystem effects of increasing populations and as detailed in SCOS (2019), the results of previous major studies of seal diet in the UK are described in detail in a series of recent reports to Scottish Government (Hammond & Wilson, 2016; Wilson *et al., 20*16; Wilson & Hammond, 2016 a, b). The results of the most recent study (2010/11) are summarised in Wilson and Hammond (2019), in the context of regional variation in trends in population size of both species of seal. Overall, sandeels and large gadids were the two main prey types, but results showed considerable seasonal and regional variability. SCOS note that these data are now more than 10 years old and may not provide an accurate description of seal diets in areas where fish stocks and seal populations have changed.

In terms of diet composition, in the southern North Sea, sandeel dominates grey seal diet, whereas flatfish, gadids and sandy benthic species are more important for harbour seals. In the Moray Firth, the diet of both species is dominated by sandeel. In the Northern Isles, sandeel and gadids are important in both species' diets, with pelagic prey also important for harbour seals. Gadids are the main prey of both species in the Inner Hebrides. In the Outer Hebrides, sandeel and gadids are the main prey of grey seals and pelagic species and gadid featuring in harbour seal diet (Wilson and Hammond, 2019).

UK seal population trends should be seen against a background of major long-term changes in the productivity of key ecosystem components of the North Sea, Celtic Sea and adjacent waters. The ecological changes resulting from predator population increases are likely to be highly complex and difficult to predict. Clearly predation by seals is large enough to be a potential factor in the dynamics of some fish populations (e.g., grey seal predation has been shown to be an important factor in the failure of cod stock recovery on the Scotian Shelf (Neuenhoff *et al.*, 2019), although in other cases, seals have minimal impact, e.g., harp seal consumption of cod off Newfoundland was found not to be an important driver of the northern cod stock (Buren et al., 2014), and in the Gulf of St Lawrence although harp seal consumption did affect cod dynamics it was not as important a driver as fishing or water temperature (Bousquet *et al*., 2014). However, uncertainties in several factors, e.g., fine scale variation in seal diet composition, the spatial and temporal overlap between seals and fisheries at sea and overlap between the size distribution of prey eaten by seals and selectivity of the fisheries all combine to mean that confidence in predictions of effect levels will be low. Determining the ecosystem-level impacts of an increasing seal population will require an integrated ecosystem modelling approach with inputs on the drivers of distribution for key components of the ecosystem.

A number of data gaps were identified in SCOS 2019, and work is underway on a number of projects to address these (e.g., the EcoSTAR project under the INSITE II programme is developing multispecies functional response models for seals and porpoises and integrating outputs within a North Sea ecosystem model which will allow future scenarios of change to be modelled.

The impact of increasing seal populations on the level of interactions with aquaculture is also difficult to predict, although it is well known that both harbour and grey seals depredate on salmon at fish farms, there is very little robust quantitative evidence of the nature and scale of such depredation and therefore a limited ability to understand how this will scale with any increases in population size. Northridge *et al.* (2013) found that the proximity to the nearest harbour seal haulout site made no difference to the amount of depredation occurring on fish farms, though all sites in their study were within 10 km of a harbour seal haul out. The number of harbour seals counted within 3, 5, 10 or 20 km of a fish farm site also made no difference to the amount of depredation. Northridge *et al.* (2013) also reported an unexpected positive relationship between the amount and frequency of depredation and the distance to the closest grey seal haul out. They also found that farms with grey seal hauls outs closest recorded less damage than those for which grey seal haul out sites were further away (up to 11 km). There was also less frequent damage at farm sites where there were larger numbers of grey seals counted at haul outs within a 20 km radius during August surveys than farms with fewer grey seals. Given these findings, how depredation at fish farms might scale with changes in local seal abundance and distribution is hard to predict. To predict how depredation may increase in future with further increases in seal population, a detailed study of the spatial and temporal nature of current levels of seal depredation is required. This would ideally include an updated analysis of the relationship between levels of depredation and local seal abundance. If effective physical protection can be achieved at fish farms, then an increasing seal population will have a limited effect on aquaculture.

Increases in wild salmon predation by growing seal populations has been blamed by fisheries managers for declines in salmon stocks (e.g., as detailed in Butler *et al*., 2008 in the Moray Firth) and recovering pinniped populations have been identified as a factor affecting the recovery of endangered salmon stocks in the US Pacific Northwest (see Chasco *et al*., 2017). However, direct evidence linking seal predation with declines in salmon stocks in Scotland and other parts of the world is lacking. SCOS 2019 concluded that there was unlikely to be a direct link between seal population size and the observed decline in rod and line caught salmon. Salmon are consumed by several predators including other fish, birds, seals and cetaceans and predation is one of 12 identified threats to Scottish wild salmon populations (Scottish Wild Salmon Strategy, 2021[6]). With salmon numbers in decline, and over half of assessed rivers being in poor conservation status[7], any threat is likely considered important. e.g., Photo identification and telemetry studies have indicated that individual seals representing a small proportion of the population (≤1%) specialise in using rivers (Graham *et al*., 2011). How these individuals learn and develop these predation strategies is uncertain and therefore how this proportion may scale with increasing local population size is also uncertain. Graham *et al*. (2011) concluded that the proximity to breeding and moulting sites for each species of seal may influence the observed patterns of seals in rivers. Following this logic, local increases in seal population may result in increases in the numbers of seals using rivers, although no monitoring has been in place across relevant timescales to determine this. Bioenergetic modelling by Butler et al., (2006) predicted that seal removals would result in increased catches of salmon in rivers but did not predict the result of seal increases on salmon numbers in rivers. Such modelling

[6] https://www.gov.scot/publications/scottish-wild-salmon-strategy/documents/
[7] https://www.gov.scot/publications/salmon-fishing-proposed-river-gradings-for-2022-season/

could be carried out, but it would require assumptions to be made about how river predation would scale with population size.

Understanding the relationship between seal population size and the numbers of seals involved in depredation of salmonids at fish farms or in rivers is severely limited by a lack of quantitative historical information on levels of depredation or levels of seal presence or activity in either situation.

If fish farms or salmon rivers are, as often assumed, highly attractive foraging locations and/or the seals involved are specialists that represent a small proportion of the population, it is unlikely that there will be a simple relationship between population size and predation levels. SMRU (1984) compared time series of salmon smolt survival estimates for the river North Esk and grey seal population trends. Despite the fact that the data covered a period of rapid seal population growth there was no detectable reduction in smolt survival rates. They also analysed the time series of daily reports from fixed net salmon fishing stations and found no relationships between grey seal population sizes and seal sightings rates nor reported levels of seal damage. Although these represented different situations, the results indicate that even with detailed records the relationships between overall seal population sizes and predation activity levels are unlikely to be easily identified.

Increases in seal populations of one species may also have impacts on the dynamics of the other species. Increasing grey seal populations have been hypothesised as being at least partly responsible for declines in harbour seal populations in some regions (Wilson and Hammond, 2019). This could be mediated through competition for prey, given regional similarities in prey preferences of the two species (Wilson and Hammond, 2019). Impacts could also occur as a result of direct predation by grey seals on harbour seals (Brownlow *et al*., 2016, van Neer et al., 2019). A PhD project at SMRU is investigating these interactions between grey seals and harbour seals.

Grey seals are also known to predate harbour porpoises (Leopold *et al*., 2015), so increasing grey seal populations could have implications for harbour porpoise populations. However, the extent of this behaviour and the potential for it to lead to a significant impact on harbour porpoise populations is unknown.

Killer whales are known to prey on both seal species in Scottish waters with reports of predation from the Northern and Western Isles. Such predation has been suggested as a driver of harbour seal population declines, but conversely, increased seal populations may increase the prey resource and potentially increase the reliance of killer whales on seals. Interestingly, such an increase could lead to different predation mortality rates for the two seal species depending on their regional population dynamics.

**Data gaps**

Data required to develop an understanding of the implications of increasing seal populations on fish prey populations and fisheries were outlined in SCOS (2019). Here we outline the work required to develop our understanding of how seal population increases might impact on other aspects of the marine environment, including aquaculture and salmon predation. This would require further investigation of:

- Grey seal/harbour seal interactions including competition and predation (PhD project at SMRU underway)
- Extent of grey seal predation on harbour porpoises
- Develop quantitative predictive models of factors influencing seal depredation at fish farms,

including the effect of local and regional seal abundance and distribution on levels of depredation
- Develop a better understanding of the relationships between levels of seal predation on wild salmon in rivers, and local or regional seal abundance and distribution.
- Develop models of killer whale predation on harbour seals (work underway on EcoPREDs project at SMRU and associated PhD project).

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| **26. Based on distribution and demographics of seal populations, can SCOS advise whether it would be possible predict times and locations where there may be a greater chance of interactions with the aquaculture industry? Please can SCOS advise what work would be required to achieve this.** | **MS Q8** |

**There are a number of analyses that could inform the potential for interactions between seals and aquaculture, including 'risk mapping' approaches on the basis of overlap of seal predicted density and fish farm locations, and a detailed examination of existing telemetry data to look for evidence of specific interactions at fish farm locations.**

**However, such spatial overlap analyses will only provide a crude estimate of the potential for future interactions because spatial overlap does not necessarily imply direct interactions. Research into the spatial and temporal patterns of the occurrence and magnitude of seal depredation, and the relationships with environmental covariates, farm activities and cage characteristics is required to fully understand and to develop an ability to predict the potential for future interactions.**

**SCOS recognise that there are two potential direct impacts of seal activity around aquaculture sites: predation and stress effects on fish. More information is required on both to allow assessment and predict the effects of seals on aquaculture.**

There is considerable overlap between seal distribution and areas of aquaculture production around Scotland's west coast and northern isles. Northridge *et al.* (2013) found that the proximity to the nearest harbour seal haulout site made no difference to the amount of depredation occurring on fish farms, though all sites in their study were within 10 km of a harbour seal haul out. The number of harbour seals counted with 3, 5, 10 or 20 km of a fish farm site made no difference to the amount of depredation. Northridge *et al.* (2013) also reported an unexpected positive relationship between the amount and frequency of depredation and the distance to the closest grey seal haul out. There was an unexpected positive relationship between the amount and frequency of depredation and the distance to the closest grey seal haul out site. They found that farms with grey seal hauls outs closest recorded less damage than those where grey seals haul out sites were further away (up to 11 km). There was also less frequent damage at farm sites where there were larger numbers of grey seals counted at haul outs within a 20 km radius during August surveys than farms with fewer seals.

The absence of a close link between proximity of haulout sites and predation levels may indicate that only a small proportion of the local population is involved in attacking cages, or that seals specialising in depredation at farms are not necessarily hauling out locally.

These analyses could be repeated with contemporary data from farm sites and the levels of depredation experienced, and up to date seal survey data.

It may be that at-sea density is a better predictor of interactions and an analysis of depredation in relation to predicted seal at-sea density could be carried out using the predicted seal density maps provided in Carter *et al.* (2020). Such analyses would require data on depredation events, which are often collected by fish farms but are not routinely made available or are not collected at a sufficient temporal resolution to enable analyses.

Even in the absence of detailed data on depredation, a simple 'risk mapping' approach could allow identification of the areas of highest overlap between seal distribution and aquaculture activity. This would involve the predicted seal density maps being overlain with a map of all operating fish farms. Each 5 x 5 km grid square could be applied a risk score which is derived from a combination of the predicted seal density and the number of fish farm operations within it. Although this may indicate a crude potential for the locations where interactions may occur, this may not be a reliable indication of the actual level of interactions and will not allow any prediction.

Other possibilities include an examination of existing seal telemetry data for direct overlap of seal activity with fish farm locations. There are datasets from a large number of deployments on both species of seals using GPS GSM telemetry devices in areas around Scotland where there are active fish farms. The tracks from these deployments could be examined in detail for evidence of interactions with fish farms. A recent PhD project used telemetry data from harbour seals tagged in Skye to estimate acoustic exposure of seals from ADDs at fish farms (Findlay *et al.*, in review). This study combined tracking data with maps of predicted ADD noise to quantify sound exposure and estimate the potential for auditory impairment. A similar approach could be taken with a larger sample of tracking data across a wider geographical area and could incorporate the investigation of behavioural metrics that would indicate association with fish farms.

However, these approaches may only provide crude estimates of the potential for interactions and will allow a limited predictive ability as the factors that drive levels of seal depredation at fish farms are still poorly understood. Research into the spatial and temporal patterns of the occurrence and magnitude of seal depredation, and their relationships with environmental covariates is required to fully understand and to develop an ability to predict the potential for future interactions.

An understanding of how factors such as cage/net design and operational practices influence depredation is also crucial. Better information on the residence times of seals around farm sites, the species and age classes involved, the degree to which individuals associate with specific farms, and the numbers of individuals that associate with specific farms may help to understand the motivations and behaviour of seals that habitually target farm sites and improve our predictive ability, as well as allowing the tailoring of preventative measures. These research recommendations have been made in a number of previously published reviews and should be a priority (e.g., Northridge *et al.,* 2013; Coram *et al.,* 2014, 2016, 2017). Attempts to make use of the data available from the industry has revealed that the data on depredation is not often recorded at sufficient temporal resolution to allow analysis to inform this question (e.g., Coram *et al.,* in press).

One pressing issue identified by SCOS is the need for information on the indirect effects of seal presence in the vicinity of cages, particularly on stress in farmed fish. This is important and will to a large extent determine the types of protection or seal deterrence required. If seal presence causes unacceptable stress to fish it will be necessary to exclude seals from the entire site. If seal presence does not induce high levels of stress, it will only be necessary to prevent seals gaining direct access to the fish. The former will require wide area deterrence, which may have important negative impacts on nontarget wildlife, whereas the latter will only require defence of the cages themselves.

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| **27. SCOS provided advice in 2020 on non-lethal options to address seal – fisheries / fish farm interactions. Since the 2020 advice (and in light of ongoing efforts globally to address such interactions), are SCOS aware of any further developments in other countries or emerging technologies that could be consider/applied to Scotland.** | **MS Q15** |

**The only additional work that SCOS is aware of in this area are additional studies with the TAST system including trials on fishing vessels and on fish ladders in the USA, including trials at Ballard Locks where TAST use resulted in a significant increase in fish passes relative to control periods.**

SCOS are not aware of any further developments or emerging technologies that could be considered or applied to Scotland that were not discussed in earlier advice. More studies have been carried out in the past year using the TAST in relation to fisheries and these have been described in the answer to Defra Q7 above. In addition to these TAST systems were carried out near fish ladders that suffered from seal predation in the USA. A five-week deployment of a TAST system outside the entrance to the Ballard Locks fish ladder in Seattle in 2020 resulted in an increase in fish passes by 4419 animals, an increase of 46% over control periods. Similar results were found in three other locations in Washington State and Alaska in 2020 and 2021 (Unpublished data).

## Climate change

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| **28. Can SCOS review latest scientific information available on current environmental impacts seals face due to climate change, such as acidification, sea level changes and coastal collapses and changing prey distributions.** | **Defra Q12** |

**The effects of climate change were reviewed in SCOS 2020. SCOS are not aware of any significant recent developments. The answer from SCOS 2020 is repeated below with modification where new published information is available.**

**Climate change is already having a range of effects in UK waters, including changes to water temperature and salinity and is likely to change timing and intensity of stratification and locations and timings of fronts. Such changes will influence patterns of productivity and fish distributions and will affect prey availability to seals. These changes could have either positive or negative effects on seals in the UK. Changes in air temperature may have impacts on seal behaviour and reproductive performance during time on land.**

**Predicting the population consequences of climate change for seals is difficult. There is little information on the relationships between environmental drivers and seal population dynamics. It is therefore unlikely that cause and effect will be reliably assigned to specific aspects of climate change with respect to changes in seal population dynamics. Observed trends in UK seal populations show growth mainly in southern parts of their range despite indications that distributions of currently preferred prey are shifting northwards.**

**There is uncertainty in the predicted effects of climate change on frequency and intensity of Harmful Algal Blooms (HABs) or on the effects of HABs on seals. However, the potential severity of HAB effects highlights the need for further research into HAB effects on seals.**

**Changes in sea level and resulting increased wave action on breeding beaches may reduce breeding and haulout site availability in some areas. Increased storminess in terms of maximum and average wind speeds and frequency of storm systems may lead to increased wave action on breeding sites which can increase pup mortality. Seals may be able to accommodate by moving breeding sites if alternative sites are available.**

The seas around the British Isles, have warmed faster than the global average over the past 50 years. Sea surface temperatures (SST) in the North-east Atlantic and North Sea have risen by between 0.1 and 0.5°C per decade over the past century, and the rate of warming has been particularly rapid since the 1980s (Dye *et al.,* 2013). There are a wide range of interacting factors driving population change so it is extremely difficult to disentangle their effects and identify specific causes. Albouy *et al.*, (2020) carried out an assessment of the vulnerability of all marine mammal species to global warming. They produced a ranked list of species by vulnerability to climate change effects. Grey seals (16) and harbour seals (20) appeared on a list of the top twenty most vulnerable species of marine mammals to climate change extinction risk. However, the model was driven by an index of temperature sensitivity, but the fact that none of the Atlantic ice associated seals or Antarctic seal species are listed suggest that this approach may have limited value for predicting climate effects for temperate water seals like grey and harbour seals.

Most of the research on the impact of climate change on marine mammals has focused on the Arctic, where dramatic changes in ice volume and extent are already having profound effects on habitat availability. Changes in ice availability, and timing of freeze up and ice break up are already having direct impacts on ice breeding seals., In the Gulf of St Lawrence in eastern Canada grey seals are increasingly breeding on land and the distribution of breeding sites is shifting northwards. In the Baltic, changes in timing of freeze up and ice break up are changing the breeding habitat availability and forcing seals to breed on land, causing either direct mortality or reducing lactation efficiency and pup growth rates potentially as a result of water balance issues (Jüssi *et al.,* 2008; Hammill *et al.*, 2013). Shuert *et al.* (2020) showed that high temperature and lack of access to water can reduce pup weaning mass and increase likelihood of pup abandonment in grey seals breeding at temperate sites such as the Isle of May. Bull *et al.* (2021) associated lagged SST indices with changes in pupping dates of grey seals on Skomer MCZ. A temperature increase of 2$^{o}$C was associated with an advance in pupping date of approximately seven days. They concluded that the temperature index was related to transient changes in age distribution due to "immigration" of older mothers (older mothers tend to give birth earlier in the season).

Changes in cold temperate waters, such as the seas around the UK, may also be profound and will likely impact on continental shelf marine predators such as seals. However, in UK waters, the projected changes in the physical environment, such as air and water temperatures, water depth and salinity, are not predicted to exceed the homeostatic ranges for seals. E.g., harbour seals occur in temperate coastal waters as far south as San Diego, California, and Brittany and the Wadden Sea in Europe where summer water and air temperature exceed those currently experienced by seals in southern England. Existing conditions at the southern limit of existing ranges are generally higher than projected temperatures in the UK over the next century even under high warming scenario predictions, but although harbour seals in other parts of their range experience higher summer temperatures, it is unclear what effects increased summer temperatures may have on terrestrial breeding behaviour and breeding success of harbour seals in the southern UK.

***Prediction from status quo***

Species distributions are not usually determined by physical capabilities alone. The distributions of both prey and competing predator species will influence the distribution of predators such as seals. So, the consequences of changes in the physical environment will be difficult to predict. If we could assume that competitors, prey, and other factors would maintain their current relation to variables such as water temperature and depth, we could use the current distribution patterns to predict future distributions under different climate change scenarios.

Boehme *et al.* (2012) and Zicos *et al.* (SCOS-BP 17/07) used location fixes and water temperature records from the extensive telemetry datasets for UK harbour seals, and grey seals in both the UK and Canada to derive predicted distributions based entirely on water depth and sea surface temperature in the North Atlantic. Zicos *et al.* then explored potential habitat shifts across the entire Atlantic ranges of both species under two scenarios of climate change, the lowest and highest scenarios of warming as determined for the IPCC's 2014 report.

The low warming scenario predicted an overall compression of core habitat, with slight loss of habitat in the northern and extensive habitat loss in the southern edges of distribution in the North Atlantic. In the high warming scenario, there was a general northward shift in predicted core habitat for both species. In geographical terms the predicted northern expansion of habitat would exceed the southern contraction so that both species would be predicted to have larger foraging habitat extents in the future.

***Changing prey distributions****.*

The effects of climate change on prey distributions and changing patterns of fishing activity will both likely impact the distribution and population dynamics of seals. North Sea stocks of cod, plaice and haddock have shown northward shifts (Engelhardt *et al.*, 2011 & 2014; Skinner 2009). Recently, Baudron *et al.* (2020) published an analysis of scientific survey data that provides an overview of changes in distribution for 19 northeast Atlantic fish species encompassing 73 commercial stocks over 30 years. All species experienced changes in distribution. Two thirds of the shifts in centre of gravity (CoG) displayed by northern species were northward. Baudron *et al.* (2020) concluded that the overall northward direction of the changes in distribution together with observed range contraction for northern species, and expansion of southern species ranges into UK waters, e.g., solenette (*Buglossidium luteum*), were consistent with the poleward distribution shifts expected from warming sea temperatures.

Atlantic populations of grey and harbour seals however have not followed this general northward trend. For grey seals on both sides of the Atlantic the numbers of seals in the southern parts of the range are increasing rapidly while populations in the central and northern parts of the range have stabilised leading to a southward trend in CoG. Similarly, for harbour seals in Europe, a southward shift in the CoG of the population has been recorded over the past 30 years despite the disproportionate effects of PDV epizootics in the southern North Sea.

The drivers of this redistribution are not known, but the changes in seal distribution do not simply map directly to changes in distribution of their existing prey species. Nor do they conform to the broad scale northward movement of increased air and water temperature associated with climate change.

Boveng et al (2020) recently reported preliminary results of a study of Arctic seals that included harbour seals on the Aleutian Islands, in environmental conditions similar to northern Scotland. Though harbour seal data were limited to three sampling events during 2014–2016, they observed a striking decline in body condition: an estimated annual decrease of about 45g of body mass per centimetre of length. Harbour seal populations have undergone a long-term decline in the Aleutian

Islands. The population dropped precipitously between 1980 and 1999. The decline was most dramatic in the western Aleutians, where counts dropped by 86 percent, to about 5,500 individuals. The population has not recovered since, and the cause is unknown. The estimates of recent declines in body condition represent almost a 20% decrease in body mass in two years' time. Such decreases would have serious consequences for individual and population fitness if not followed by recovery of body mass. The researchers consider that the recent declines in body condition are likely an acute response to the recent very strong North Pacific marine heat wave, presumably mediated through reduced prey availability, rather than a continued chronic response to whatever has caused the long-term decline in numbers.

***Harmful Algal Blooms (HABs)***

There is some debate about the likely future patterns of HABs in UK waters (Bresnan *et al.*, 2020). Increased water temperature will have different effects on different species, but experimental studies of growth and survival rates of a range of species have suggested that HABs are likely to increase rather than decrease in the North Sea (Peperzak, 2003). Projections of sea surface temperature also suggest that the habitat of most species will shift north and may lead to more frequent harmful blooms in the central and northern North Sea (Townhill *et al.,*2018) and increased temperature may increase toxin production (e.g., Aquino-Cruz *et al*., 2018). Gobler *et al.* (2017) investigated potential changes on a larger scale and came to similar conclusion, that increasing ocean temperatures have already facilitated the intensification of certain HABs.

However, Edwards *et al.* (2006) used long term data from the northeast Atlantic and North Sea (1960s to early 2000s) to investigate spatial variability in the frequency of HABs. Significant increases were restricted to the waters off Norway and there was a general decrease along the eastern coast of the United Kingdom. The most prominent feature in the interannual bloom frequencies over the preceding four decades was anomalously high values in the late 1980s in the northern and central North Sea areas. Dees *et al.* (2017) examined long term data sets from the Northeast Atlantic and North Sea for one toxic algal genus, *Dinophysis* and found that over the modelled period (1982–2015) and the whole Continuous Plankton Recorder time series (1958–2015), there was no statistically significant positive relationship between abundance and sea-surface temperature. They also showed that periods of large *Dinophysis* blooms in the 1970s and 1980s, were followed by a period of briefer bloom events lasting until 2014. Dees *et al.* concluded that there was no increasing trend in number or annual duration of blooms.

Given this lack of consensus on the likely patterns of HABs and the uncertainty in the rates of consumption and likely levels of toxicity in seal diets, it is not possible to reliably predict the potential effects of climate related HAB changes on UK seal populations. However, the potential for such events to cause large scale mortality events means that further investigation is warranted.

***Local oceanographic changes***

Earlier stratification of warmer water and changes in the timing of plankton blooms and secondary production blooms will likely have effects throughout the food chain (e.g., Wiltshire and Manly, 2004). Such changes have already been detected in the North Sea at several levels of the food chain. This may have knock on effects on the timing of prey availability that may impact on seal condition. Changes in flow patterns and locations of frontal systems may also impact seal foraging habitat quality. None of these possible effects have been studied in terms of their potential impacts on seals in UK waters.

***Large scale oceanographic changes***

Future predictions of marine climates around the UK will be heavily influenced by what happens to the Atlantic Meridional Overturning Circulation (AMOC). The AMOC significantly warms the northeast Atlantic and drives the general climate of northwest Europe partly through its influence on the track of the jet stream. Both direct observations (2004–2017) and sea surface temperature reconstructions, show that the AMOC has weakened since 1900 (IPCC, 2019). The data timeseries are too short to confirm that the weakening is due to anthropogenic forcing, but CMIP5 model simulations show similar weakening of AMOC as a result of anthropogenic forcing.

The AMOC is projected to weaken in the 21st century, although a collapse is very unlikely. Weakening of the AMOC is projected to cause a decrease in marine productivity in the North Atlantic and an increase in storms in Northern Europe (IPCC, 2019). Both reduced productivity and increased storminess could have potential population scale effects on UK seal populations.

***Competition with fisheries***

The climate driven changes will not only affect natural predators. The patterns of fisheries exploitation will also be affected. Current quota allocation structures will need to adapt to changes. How these changes are implemented is likely to have major implications in terms of prey availability for seals and other predators, and changes or re-distribution of fishing practices may affect issues such as bycatch.

***Ocean Acidification and Low Oxygen***

Increased atmospheric $CO_2$ is absorbed by sea water which causes a reduction in pH and may have already lowered global ocean pH by 0.1 pH units since the industrial revolution (Orr et at, 2005). North Sea pH has decreased at a rate of around 0.0035 pH units per year (Williamson *et al.*, 2017).

Ocean acidification may have direct and indirect impacts for the recruitment, growth and survival of exploited species. Effects are likely to be more important for shellfish (Pinnegar *et al.,*2017) but changes to larval fish behaviour and reduced survival and recruitment have been reported (Munday *et al.*, 2010); for example, projected ocean acidification levels (from IPCC RCP 8.5) have been shown to double daily mortality rates of cod larvae (Stiasny *et al.*, 2016). The potential impacts of ocean acidification are an active field of research and the effects on future prey availability for seals are, as yet, unknown.

Reduced oxygen concentrations in marine waters have been cited as a major cause for concern globally (Diaz & Rosenburg, 2008), and there is evidence (Queste *et al.*, 2012) that areas of low oxygen saturation have started to proliferate in the North Sea. However, the European Environment Agency (2019) suggested that hypoxic or reduced oxygen levels were mainly restricted to Scandinavian fjord waters with some reduced oxygen levels recorded on the North Sea near the Oyster grounds. To what extent these are the result of long-term climate change remains unclear and it is also unknown whether such changes will impact upon fish populations (Pinnegar *et al.*, 2017).

***Breeding habitat changes****.*

Predicted increases in sea level are small compared to the changes that grey and harbour seal populations have experienced due to sea level rise and iso-static rebound of the coastline since the last ice age. However, there is no reason to suspect that the availability of offshore islands, skerries, rocky shore or intertidal sand banks has decreased over that time or that availability will decrease, in the medium to long term, under projected sea level changes.

However, seal responses to previous sea level rises were not influenced by human activity patterns. In the face of future sea level rise it is likely that coastal defences will be maintained along large sections of coastline and particularly in estuaries. In such cases, because the upper tidal limit is fixed by sea defences, any increase in mean sea level is likely to reduce the amount of suitable intertidal habitat available to seals as haulout sites. This would affect both species, but the effects on harbour seals would be more pronounced because a substantial proportion of the UK harbour seal population pup on intertidal banks in estuaries.

The UK State of the Climate Report 2019 (Kendon *et al.*, 2019) states that there are no compelling trends in storminess when considering maximum gust speeds over the last four decades. As there are no detectable trends there have been no studies that have so far shown a link between changes in UK storminess and climate change (Kendon *et al.*, 2019). However, in the short term, rising sea levels mean that storm surges and storm waves will increase the frequency and severity of wave action on breeding beaches. This will likely lead to increased mortality as observed in Welsh grey seal pupping colonies in 2017 (Buche & Stubbings, 2017; 2019). Such mortality events will likely increase in frequency and severity as sea levels rise.

Coastal erosion leading to mortality due to landslides are rare events, we have been unable to locate any published accounts. They are also unlikely to be greatly increased by projected climate change scenarios. The majority of coastal erosion concerns are along the south and east coasts of England. We are not aware of any sites where seals haulout beneath rapidly eroding cliffs in that region. In other areas there may be particular concerns about cliff beaches, but we are not aware of any information on changes in the rates/frequencies of land slips associated with seal haulout areas.

***Novel diseases.***

An additional concern is the spread of infection into regions where organisms may not have previously been exposed or where their capacity to survive may previously have been compromised due to unfavourable environmental conditions. With climate change, marine pathogens that were previously restricted to warmer, more southerly waters might be able to become established in UK waters (Baker-Austin *et al.*, 2017). It should be noted that mass mortality events are not all related to novel infectious disease.

Sanderson & Alexander (2020) reviewed occurrence of infectious disease-induced mass mortality (ID MME) events in marine mammals between 1955 and 2018. They conclude that extrinsic factors significantly influenced ID MMEs, with seasonality linked to their frequency and severity of these events. Importantly, they showed that global yearly SST anomalies were positively correlated with occurrence of ID MMEs. With climate change forecasted to increase SSTs and the frequency of extreme seasonal weather events Sanderson & Alexander concluded that epizootics causing MMEs are likely to intensify with significant consequences for marine mammal survival.

## Renewable energy

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| **29. Scottish Government are aware of (recent) incidents involving seals becoming trapped and drowning in structures associated with fixed offshore wind developments. Are SCOS aware of such events, and if so, what structures were the cause, and can SCOS provide any information on the prevalence of these events?**<br><br>**Furthermore, based on what we know from these events, what other marine structures could pose a similar risk to seals? Can any lessons be learned from other offshore industries or other regions outside of the UK with respect to mitigating and monitoring such events?** | **MS Q13** |

**SCOS are aware of recent reports in which at least three seals have become trapped and drowned in subsea cable conduits associated with offshore wind turbines. As far as SCOS is aware there have been very few similar incidents at any other developments, although there is a single report of a seal accessing the central space inside a monopile structure via a subsea cable hole in the wall of the turbine.**

**Given the paucity of events and knowledge surrounding their occurrence, it is difficult for SCOS to recommend specific mitigation measures. It may be prudent to consider capping subsea openings that would allow seals to enter or minimising the time they are exposed.**

SCOS are aware of an incident in which 3 dead seals were found inside subsea cable conduits (J-tubes) during the subsea preparation prior to inter array cable pull-in to substructures. Following the event, the Marine Scotland Licensing Operations Team wrote to offshore renewable energy developers with a series of questions to determine whether there have been any other similar incidents at other developments. Of the responses received (15), none had recorded similar incidents at their developments.

Other reports of seals becoming trapped within offshore wind development structures are sparse. In 2016, a grey seal was observed inside one of the monopiles during grouting procedures after pile driving had taken place (Gardline 2016). After investigations, it was concluded that the most likely entrance into the monopile was a subsea cable hole through the wall of the pile; this was 340mm in diameter and was located 3.8m from the sea floor after the pile had been driven in. The seal was observed within the pile over a period of approximately 2 hours. After this, no further sightings were made and it was assumed that the seal had either managed to exit back through the cable hole or had died (Gardline, 2016).

Seals are curious and are likely to investigate any novel structures in their environment. There are frequent reports of pinnipeds entering dam races, fish ladders and power plant cooling water system (CWS) intake pipes in North America (NMFS 2008). For example, between 1989 and 2006, a total of 69 California sea lions and five harbour seals were entrained by the cooling water system at the Scattergood Generating Station, Los Angeles, US; between 1978 and 2006, a total of 11 California sea lions and five harbour seals were entrained by the cooling water system at the El Segundo Generating Station, Los Angeles, US (NMFS 2008). However, it is important to highlight that CWS pipes are generally relatively large diameter (~700mm) and exert significant negative pressure due to the pump system, which will increase the likelihood of animals being drawn into the duct.

**Table 14:** Summary of the measured axial girths (cm) of seals captured as part of research by SMRU between 1988 and 2019. It is important to highlight that the estimates of diameter presented here are approximations based on the axial girth measurements and an assumed spherical cross section.

| Species | Age class | Number of seals | Median axial girth ±95% CIs (cm) | Estimated diameter (cm) |
|---|---|---|---|---|
| Harbour seal | Pup | 90 | 67 (50 – 89) | 21 (16-28) |
| | Juvenile | 60 | 80 (71 – 93) | 26 (23-30) |
| | Adult | 807 | 106 (92 – 120) | 34 (29-38) |
| Grey seal | Pup | 122 | 93 (82 – 101) | 30 (26-32) |
| | Juvenile | 202 | 90 (76 - 118) | 29 (24-38) |
| | Adult | 615 | 133 (104 - 153) | 42 (33-49) |

Given the relative paucity of reports of similar incidents across the renewables industry, it is difficult to recommend specific mitigation measures. However, it may be prudent to consider, where appropriate, capping subsea openings which have dimensions that would allow seals to enter, or minimising the time when these are exposed. For reference, a summary of the measured axial girths of captured harbour and grey seals from the SMRU capture database is provided in Table 14. It should be noted that seals are capable of forcing their heads through smaller holes as evidenced by cases of seals with frisbees and packing bands caught around their necks.

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| **30. There are known knowledge gaps associated with seals with respect to potential impacts in relation to underwater noise and collision risk with tidal turbines, for example. With these and other knowledge gaps in mind, can SCOS provide an update on emerging technologies they are aware of that could be used for quantifying seal behaviour and/or physiology (e.g., developments in animal borne sensors such as fNIRS).** | **MS Q14** |

**There are a number of emerging technologies that may be useful for measuring the behaviour and physiology of seals. These include novel seal tag developments currently being developed to track the physiology and energetics of seals; these are likely to be important tools for measuring physiological and energetic consequences of interactions with anthropogenic activities, an important knowledge gap in being able to predict population consequences. Other developing technologies include remote and/or autonomous imaging monitoring techniques. A summary of these technologies, their applications and their current stage of development is provided.**

In response to this question, we have assumed that the knowledge gaps relate primarily to behavioural and physiological responses by seals to offshore renewable energy developments and their associated activities.

There are a number of emerging technologies that may be useful for measuring the behaviour and physiology of seals and quantifying how these may be affected by interactions with offshore renewable energy activities. Broadly, these can be divided into technologies that are deployed on the seals (tags) and those that are remote or autonomous. The seal tag technology has been further divided into those that require retrieval to access data (archival) and those that transmit data via a communications system such as the GSM or satellite network (telemetry). It is important to consider

some broad benefits and constraints associated with each of these. In particular, the use of telemetry systems mean that data can generally be retrieved safely throughout the tag deployment. However, data resolution may be limited by effective bandwidths of the telemetry systems, often resulting in relatively low-resolution data, which may make them unsuitable for investigating some renewables research questions. In contrast, data collected by archival tags is generally high resolution but the need to retrieve the tags to access the data means that they may not be a practical solution for some species and applications. A high-level summary of emerging technologies that we are aware of is provided in Table 15; it may be useful to a carry out a more detailed assessment of potential effectiveness of specific technologies to address specified priorities.

**Table 15.** Summary of emerging animal-borne technologies for measuring behaviour and physiology of seals in relation to anthropogenic activities and estimated Technology Readiness Levels (TRLs).

| Technology | Type | Description | Potential applications | TRL | Development stage details |
|---|---|---|---|---|---|
| Sound and movement tags (e.g., DTAG) | Archival tag | High resolution sound and body movement archival tag for measuring received sound levels and behaviour. | Proven tool for measuring acoustic exposure, high resolution changes in 3D movements and dive behaviour, and foraging attempts in relation to anthropogenic activities. | 9 | Proven with a range of free-ranging pinniped species including grey and harbour seals (Mikkelsen *et al.* 2019; Goulet *et al.* 2020; Vance *et al.* 2021) |
| Sonar tags | Archival tag | A miniature sonar and movement archival tag to study the biotic environment and predator-prey interactions in aquatic animals. | Potentially valuable for measuring behavioural responses and changes in foraging behaviour in relation to anthropogenic disturbance. | 9 | Proven with a range of free-ranging pinniped species (Goulet *et al.* 2019). |
| NIRS phone tag | Telemetry tag | GPS Phone telemetry tag with integrated near-infrared spectroscopy (NIRS: non-invasive biomedical imaging technique) sensors that measures movements and dive behaviour, together with tissue-specific blood oxygen saturation, heart rate, and cerebral metabolic rate. | Potentially valuable tool for assessing the short-term behavioural responses and energetic costs (e.g., dive-by-dive) of anthropogenic disturbance. | 6 | Existing phone tag technology is proven with a range of free-ranging pinniped species, and NIRS sensor technology has been proven in free-swimming seals in captivity (McKnight *et al.* 2019). Integration of the two systems is currently underway at SMRU and is expected to be complete by 2024. |
| Body density phone tag | Telemetry tag | GPS Phone telemetry tag with integrated accelerometers to measure changes in at-sea body lipid stores (through changes in their buoyancy. | Potentially valuable tool for estimating the medium-long term (days-weeks) behaviour, foraging success, and changes in body condition as a result of anthropogenic disturbance. | 6 | Existing phone tag technology is proven with a range of free-ranging pinniped species. Use of accelerometer data to track body density has been validated in elephant seals (Aoki *et al.* 2011). Investigation of its effectiveness for shallow divers (e.g., harbour and grey seals) is currently underway. |

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| Radar transponder tag | Telemetry tag | Radar transponder detected using XBAND radar to track seal surface locations and ID within a localised area of the radar (~100's m) | Potentially valuable low-cost tool for measuring localised seal interactions with anthropogenic structures/activities (e.g., radar mounted on tidal or wind turbines). | 2 | Radar transponder tags used in military applications (Pan & Narayanan 2011) and successfully used to track terrestrial species (Dore *et al.* 2020). Currently early concept only for seals. |
| ABR tag | Archival tag | Archival DTAG with an electroencephalogram (EEG) data stream to measure Auditory Brainstem Responses (ABRs) | Potentially valuable tool for measuring detection of anthropogenic sounds in combination with high resolution movements and dive behaviour. | 4 | ABRs have been measured from a stationary harbour porpoise using the prototype tag (Smith *et al.* 2021). |
| Asset recovery device | NA | Device that allows users to locate and release archival tags from seals. Emerging systems utilise a hand-held radio transceiver to trigger the recovery device. | Useful tool for the retrieval of archival tag technologies described above. | 7 | Technology proven in the lab and used successfully in a small number of pinniped studies (pers comm, Wildlife Computers). |
| Acoustic dosimeter phone tag | Telemetry tag | GPS Phone telemetry tag with integrated acoustic processing capabilities to measure long term acoustic exposure and behaviour. | Potentially valuable tool for estimating the medium-long term (days-weeks) behaviour and summary acoustic exposure from anthropogenic activities. | 4 | Existing phone tag technology is proven with a range of free-ranging pinniped species. Integration of acoustic processing capabilities is at an early design stage. |
| Electrical Impedance Tomography (EIT) | NA | Non-invasive medical imaging tool which uses surface electrodes to measure electrical conductivity, permittivity, and impedance, and create tomographic images of a localised of region the body. Provides measures of lung and cardiac function. | Potentially valuable tool for measuring the cardio-respiratory regulation of seals over days and assess the physiological responses to anthropogenic disturbance. | 3 | Has been used extensively in humans and terrestrial animals (e.g., Crivellari *et al.* 2021). There has been one validation study in diving humans (Magnani *et al.* 2018), but no application yet in marine mammals. Needs development to integrate with tags to work on free-living animals |
| Sub-THz Radar system | Remote | Radar system to provide automated detection, classification, and high-resolution tracking of seals at the water surface up to ranges of ~200m. | Potentially valuable low-cost tool for measuring localised seal interactions with anthropogenic | 5 | Radar system well proven technology. Application to detecting small marine mammals is currently underway through a collaboration |

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| | | | structures/activities (e.g., tidal or wind turbines). | | between University of St Andrews School of Physics and Astronomy and the University of Birmingham Microwave Integrated Systems Laboratory. |
| Remote camera systems | Remote | New generation of remotely accessible, autonomous HD video/infra-red to provide images of seals at remote locations. | Potentially valuable tool for measuring the abundance of seals at key locations (e.g., designated haul-outs), and movements and life history of individuals (Photo ID). | 9 | Technology well proven with a range of species. Recent increases in video and infrared image resolution, and advances in automated image processing make this a potentially attractive monitoring tool. An increasing number of seal applications. |
| High frequency imaging sonar | Remote | New generation of high frequency sonars to provide automated detection, classification, and high-resolution tracking of seals underwater up to ranges of ~50m | Useful tool for measuring the occurrence and behaviour of seals in close vicinity to infrastructure (e.g., tidal turbines or aquaculture facilities) | 9 | Technology well proven with a range of species (Hastie *et al.* 2019a; Hastie *et al.* 2019b). Recent advances in automated image processing make this a useful monitoring tool. |

| **TRL** | **Description** |
|---|---|
| 1 | Basic principles observed |
| 2 | Technology concept formulated |
| 3 | Experimental proof of concept |
| 4 | Technology validated in lab |
| 5 | Technology validated in relevant environment (industrially relevant environment in the case of key enabling technologies) |
| 6 | Technology demonstrated in relevant environment (industrially relevant environment in the case of key enabling technologies) |
| 7 | System prototype demonstration in operational environment |
| 8 | System complete and qualified |
| 9 | Actual system proven in operational environment (competitive manufacturing in the case of key enabling technologies; or in space) |

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| **31. What is the current state of knowledge on grey seal interactions with tidal energy devices?**<br><br>**Can SCOS recommend what the most appropriate avoidance rates should be in collision risk models or encounter rate models for grey seals and tidal turbines?** | **NRW Q4 & Q5** |

**There is currently no information available on grey seal interactions with tidal energy devices. All of the research to date has been on harbour seals. Evidence from these harbour seal studies indicate some avoidance of operational tidal turbines at scales of 100s to 1000s of metres. Information on fine scale behaviour and the ability to evade collisions is still lacking.**

**There is little information on grey seal behaviour in tidally energetic waters, and SCOS recommend caution is extrapolating from harbour seal studies to grey seals.**

There is currently no information available on grey seal interactions with tidal energy devices. This is a key data gap for assessing the impacts of tidal turbines on grey seals. However, as reported previously to SCOS, there are now a number of studies that report changes in harbour seals distributions in response to operational tidal turbines, including to the Strangford Lough turbine (Joy *et al.,*2018), to playbacks of tidal turbine sounds (Hastie *et al.,*2017; Robertson *et al.,*2018), and to the MeyGen turbine array (Onoufriou *et al.,*2021). Care should be taken when extrapolating from harbour seal observations as interspecific difference in foraging patterns and foraging ranges mean that potential barrier effects are likely to have less impact on grey seal. Published data on grey seal diving in tidally energetic environments is limited to a small sample of pups in a planned turbine array site in the Pentland Firth (Evers *et al.,* 2017).

Joy *et al.* (2018) analysed GPS/GSM location data from tagged harbour seals (*Phoca vitulina*) and used a Brownian Bridge movement model to develop fine scale probability density surfaces for seal density in the 3x3 $km^2$ region centred at the SeaGen tidal turbine before deployment and after installation of the turbine. Results suggested a mean spatial avoidance of 68% (95% C.I., 37%, 83%) by seals within 200 meters of the turbine, i.e., seals were 68% less likely to occupy the area within 200m of the turbine.

Hastie *et al.* (2017) carried out a series of acoustic playbacks of tidal turbine sounds (SeaGen turbine) in a narrow, tidally energetic channel on the west coast of Scotland. Results showed there was a localised impact of the turbine signal; tagged harbour seals exhibited significant spatial avoidance of the sound that resulted in a mean reduction in the usage by seals of 27% (95% C.I., 11%, 41%) at the playback location.

Robertson *et al.* (2018) studied the surface behaviour of harbour seals (measured from a land-based observation station) in response to acoustic playbacks of a tidal turbine (RivGen turbine) in Admiralty Inlet off the west coast of the US. The study reports that there were no significant differences in seal abundance or proximity to the sound source in response to the playbacks. However, the authors highlight that, due to markedly lower acoustic source levels compared to those used by Hastie *et al.* (2018), seals in their study would need to have been within 10 m of the playback location to experience similar received levels. Consequently, the authors suggest that the two studies (Hastie *et al.,*2017; Robertson *et al.,*2018) may actually be in agreement

More recently, Onoufriou *et al.* (2021) carried out a study of the behavioural responses by tagged harbour seals to the presence and operation of the MeyGen array of four tidal turbines in the Pentland Firth, Scotland. Distributions of seals were compared before and after installation of the array, and

between periods when the turbines were operating or stationary. The results showed that the presence of the turbine array did not significantly influence at-sea distribution but that the operational status of the array did. Model predictions suggested that seal presence decreased significantly up to 2 km from the turbine array during operational periods; mean change in usage within 2 km of the turbine was -27.6% (mean 95% CIs: -11% and - 49%).

In practice, these empirical changes in abundance (Hastie *et al.,*2018; Joy *et al.,*2018; Onoufriou *et al.,*2021) could be most appropriately used to scale the underlying density estimates in encounter or collision risk models. It is also important to highlight that the observed responses were to a single point source or small array and may not be appropriate for estimating the effects of large operational tidal arrays. Further, recent evidence suggests that avoidance responses to tidal turbine noise are likely to be highly context-dependent (Hastie *et al.,*2021).

Although good progress has been made in understanding how harbour seals behave in response to operating turbine at scales of 100's to 1,000's of metres, information on the fine scale underwater movements (at a scale of metres) of individual seals around operating turbines remains the critical research gap with respect to deriving avoidance/evasion rates and understanding the potential impacts of tidal devices. However, a NERC and Scottish Government funded research project is due to deploy a combined active sonar and passive acoustic tracking system alongside an operating tidal turbine in 2022. This aims to track individual seals at high resolution (metres) within 30 m of the turbine and quantify movements around the turbine. The combination of this and the results of the previous studies (Hastie *et al.,*2017; Joy *et al.,*2018; Robertson *et al.,*2018) should provide information on behaviour of seals at the range of spatial scales required to effectively derive empirical avoidance rates to operating turbines.

In summary, there is a complete lack of information on close range evasion of turbine blades by any seal species and a general lack of information on interactions between grey seals and tidal turbines. Although data exist for harbour seals, their responses appear variable (Table 16) and there does not appear to be a scientific basis on which to move away from the 'present a range of potential avoidance rates' currently recommended for estimating collision risk (Scottish Natural Heritage, 2016).

**Table 16.** Summary of the previous studies to measure the avoidance of operating turbines, or their sounds, by harbour seals. The table shows the mean change in abundance (%), the tidal turbine and location of the study, the scale that a response was measured at, and the reference for the study.

| Mean % change in abundance | Source | Scale | Reference |
|---|---|---|---|
| -68% (95% CIs: -37%, -83%) | SeaGen turbine (Strangford Lough) | Within 200m | Joy *et al.* (2018) |
| -27% (95% CIs: -11%, -41%) | Acoustic playback of turbine sounds (Kyle Rhea, Skye) | Within 500m | Hastie *et al.* (2018) |
| No significant change | Acoustic playback of turbine sounds (Puget Sound, U.S.) | Within 1000m | Robertson *et al.* (2018) |
| -28% (95% CIs: -11%, - 49%) | MeyGen turbine array (Pentland Firth) | Within 2000m | Onoufriou *et al.* (2021) |

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| **32. Please could SCOS recommend the most appropriate at sea abundance and distribution data source for use in licensing applications and planning activities (both renewables and major infrastructure). Where such data sources provide relative density, could SCOS please advise on an appropriate method to convert to absolute density.** | **MS Q18** |

**The most appropriate at-sea abundance and distribution estimates for informing licencing and planning decisions are those derived from habitat preference modelling (Carter *et al.,*2020). These are more up to date, in terms of both telemetry and haulout count data, than previous maps (Russell *et al.,*2017) and do not rely on null usage (decaying use with distance from haul out sites) for areas which lack sufficient telemetry data. However, the limitations associated with the respective methods (discussed in Russell and Carter 2020) should be considered during interpretation. Critically, for both the usage maps (Russell *et al.,*2017) and the habitat preference maps (Carter *et al.,*2020), the confidence intervals are calculated on a cell-by-cell (5 x 5 km cell) basis and thus should not be summed over multiple cells to generate lower or upper confidence intervals for a wider area (e.g., a windfarm footprint).**

**The habitat preference maps present at-sea seal density values as relative abundance (i.e,. percentage of the at-sea population of the study area estimated to be in a cell at any one time), rather than absolute abundance (i.e., number of animals per cell). This is because the conversion process from relative to absolute abundance involves certain assumptions and caveats (discussed below). Thus, relative density maps (rather than absolute) should be used whenever possible. Nevertheless, absolute abundance estimates are required for certain applications. The process for estimating absolute density is detailed below. The at-sea abundance estimates used the most recent available haulout count data up to 2018 but can be updated in the future with more up-to-date counts.**

**Currently, uncertainty around the size of the at-sea population (at individual haulout sites or overall) cannot be incorporated into the maps; the lower and upper confidence intervals for absolute density maps only represent uncertainty in the habitat preference relationships, and therefore relate to uncertainty in the spatial distribution of a fixed number of seals emanating from each haulout area.**

The predicted at-sea abundances are derived from combining the haulout counts which were used to generate the relative densities, the estimated proportion of the population hauled out and thus available to count during surveys, and the estimated proportion of the total population at sea during the main foraging season (i.e., excluding breeding and moulting). The latest at-sea maps of seal distribution (Carter *et al.,*2020) provide a relative index of density (the percentage of the total at-sea abundance, i.e., the mean maps will sum to 100% across all grid cells). Separate maps of 95% upper and lower confidence intervals associated with these mean relative density values are also provided. These confidence intervals encompass only the uncertainty in the habitat preference relationships (i.e., the latest haulout count was considered for each 5 x 5 km cell; no uncertainty in the relative weighting of haulout counts was incorporated). The density estimates (percentage of total at-sea population) presented in these maps were based on weighting the predicted at-sea distribution emanating from each 5 x 5 km haulout grid cell by its most recent August count. To convert these relative estimates to absolute estimates, the first step is to convert the total from the above-mentioned August haulout counts (36,982 and 46,763 for harbour and grey seals, respectively) into a population estimate, accounting for the seals that were at sea during the surveys. This was done using the mean estimated proportion of the population hauled out during the survey window, and thus available to count, from telemetry data: 0.72 for harbour seals (Lonergan *et al.,*2013) and 0.2515 for grey seals (SCOS-BP 21/02).

The second step is to estimate the mean total at-sea abundance during the months over which the maps represent (i.e., excluding breeding and moulting) using the proportion of the population estimated to be at sea; estimated to be is 0.8236 for harbour seals (October to May; Russell *et al.,*2015) and 0.8616 for grey seals (May to August; Russell *et al.,*2015). This results in an estimated at-sea total of 42,303 harbour and 160,203 grey seals[8]. These values could be used to calculate mean predicted absolute abundance over any number of grid cells by multiplying the percentage value in each cell of by the estimated total at-sea abundance for the species and summing this value over all grid cells of interest. Note that the proportion of the population estimated to be at sea is averaged across days and years, and thus does not account for variation in the proportion of time spent at-sea with season and state of tide. Moreover, lower and upper confidence limits for absolute density maps do not capture uncertainty related to variation in the proportion of time spent at-sea throughout the year, thus relative density maps should be used where possible.

## Other Impacts and Emerging Issues

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| **33. a. Can SCOS review and analyse whether repeated disturbance to seals (such as repeated flushing into the water) could lead to localised behavioural or welfare implications up to a wider population-level effect?**<br><br>**b. Can SCOS review current guidance for anthropogenic related seal disturbance and determine whether different categorised thresholds for land (public at beach haul outs), sea (by boat and water sports) and air (use of aerial drones), could be usefully calculated from NGO monitoring data and implemented to help reduce disturbance.**<br><br>**c. Could SCOS please advise what data should be collected, at a minimum, on disturbance events? This would help to inform a standardised approach should a nationwide reporting and threshold system for recording disturbance events be developed.** | **Defra Q6** |

***33a. The potential for individual and population-level consequences of disturbance to seals on land***

**Disturbance to hauled out seals has the potential for a range of effects from increased vigilance through to flushing seals into the water which may disrupt important rest, moult and breeding activities. Repeated disturbance is likely to exacerbate such effects and could lead to abandonment of pups, or possibly to desertion of haulout sites. Interspecific differences in sensitivity to disturbance could potentially exacerbate competition between grey and harbour seals. Little is known about the potential for human-induced disturbance of seals on land to adversely affect their ability to reproduce and survive, and therefore no information to allow estimation of population consequences. However, while disturbance can clearly affect individual animal welfare, there is no evidence that disturbance at haulout sites is currently a concern at the population level.**

**Observed responses to disturbance are very site and context specific and the impact of responses are likely to vary significantly depending on the species, time of year and life history stage of the animals involved. There are also well documented examples of both species habituating to disturbance from**

[8] Due to a review of the scalars associated with converting haulout counts into at-sea abundance estimates, these totals are different to those presented in Carter *et al.* (2020).

**land-based tourism, boats and low-flying aircraft. Lower-level stress responses may occur with no visible behavioural response.**

**Although there are concerns about localised effects of repeated disturbance in specific areas, and legitimate welfare concerns where seals have been injured when flushing from haulout sites on rocky shores, there are no known examples where current levels of disturbance have led to population level consequences at regional or national scales for UK seals.**

**A frequently expressed concern over the energetic effects on seals of being flushed into the water is unlikely to be important. Both grey and harbour seals are thermo-neutral in the water temperatures experienced in UK coastal waters and little energy will be expended in running to the water. Disturbance during the moult and breeding seasons may have more important impacts, disrupting the skin and hair renewal during the moult and potentially breaking maternal bonds and suckling behaviour during the breeding season.**

**33b. Guidance for seal disturbance and thresholds**

**There is already sufficient information to show that disturbance threshold distances are location specific. For example, seals at some sites allow very close approaches by pedestrians or boats without showing overt signs of disturbance while at other sites seals respond to the presence of observers at ranges of several hundred metres. It is also clear that types of vessels or familiarity with specific vessels can alter the reaction threshold distances. Anecdotal evidence suggests that time of year also has a large effect on the sensitivity to disturbance.**

**All existing guidance documents share a number of commonalities. They all acknowledge that the likelihood and level of response is very variable and context dependent and that at some times of year seals are more sensitive than at others. They also all put a considerable emphasis on the use of careful observation, and several provide useful information on the signs to watch out for to indicate seals are being disturbed. Clearly defined distance thresholds or buffers are rare.**

**Most published guidance relates to disturbance by land-based activities, while a smaller number address boat-based disturbances, particularly for recreational boating and wildlife tourism. Drone activity around haulout sites and resulting disturbance events are increasing but few specific guidance notes address drone flying. There have been two published studies on the responses of seals to drone overflights which could be used to develop guidance.**

***33c. Advice on data that should be collected on disturbance events***

**To understand the potential for disturbance to significantly affect UK seal populations, at local, regional and national levels, more information is required on the levels and severity of disturbance events and the behavioural responses of seals, as well as information on the potential effects of these on individual health, energetics, breeding success and survival. Of particular importance are species specific disturbance effects/responses that have the potential to influence both the frequency and the consequences of interactions between seal species. Focused effort on documenting changes in breeding success or the health/energetic status of disturbed seals will be required to predict how disturbance on land could translate to population-level effects.**

**To develop distance thresholds requires information on seal responses together with detailed information on the type, intensity and proximity of the disturbing stimulus. NGO monitoring data on seal disturbance made available to SCOS did not include records of the distances of activities to which recorded responses occurred, therefore SCOS cannot use these data to derive such thresholds.**

**Data collection requirements depend on the specific question being addressed. Monitoring the presence and severity of response in relation to different activities and approach distances at a local level could allow the development of specific localised guidance for boat operators, tourists and recreational users of the coast.**

**Detecting population level effects of disturbance using observations at haulout sites would be difficult and would require monitoring effort to be focused on understanding the extent to which disturbance could affect the survival and reproduction of individuals. This could involve monitoring of a range of metrics related to human activity and numbers of seals hauled out, metrics related to breeding – suckling behaviour, weaning mass, pup counts, also individual measures of health and condition. It will not be possible to estimate some of these metrics from simple observations, and a nationwide study of such metrics would be extremely expensive. These could better be addressed through targeted research.**

**However, if co-ordinated and standardised visual observations are done at a sufficiently large number and representative range of sites, and over several years it might enable a nationwide meta-analysis of the potential nature and extent of human disturbance to seal populations. Some of this information may already be being routinely collected by local and regional groups, e.g., NGO monitoring of haulout numbers may allow an analysis of haulout patterns to investigate possible large-scale effects of human disturbance by comparing haulout counts times when human activity is higher, e.g., at weekends, with period of generally lower activity.**

***33a. The potential for individual and population-level consequences of disturbance to seals on land***

In order to have a population-level effect, a stressor must affect the ability of individuals to survive and/or reproduce and enough individuals must be thus impacted to alter the trajectory of the population. Little is known about the potential for human-induced disturbance to seals on land to affect vital rates and therefore lead to population-level consequences. It is possible that in some circumstances, individual survival can be affected if disturbance results directly in injuries to individuals. For example, a disturbance event leading to a seal falling from height onto rocks whilst trying to reach the water resulting in severe injury or mortality, or as in a recent well-publicised case, severe injuries caused by dogs attacking seals[9]. Although these types of events are known to occur, and are a clear animal welfare concern, it is unlikely that they are currently occurring to the extent that population vital rates will be affected, and disturbance is not at present included in the list of potential population threats (see Answer 36 below).

Assessing the sub-lethal effects for individuals and the resulting population-level consequences of any stressor is a significant challenge because it requires detailed knowledge of the nature, extent and magnitude of individual responses to the stressor in question, as well as baseline knowledge of behavioural patterns, life history and demography of the population(s) in question. One common approach to the assessment of the population consequences is the Population Consequences of Disturbance Framework (PCoD) originally developed as a conceptual framework for acoustic disturbance by US National Academies of Sciences National Resource Council in 2005 (National Research Council (2005)) to evaluate how changes in behaviour caused by acoustic disturbance, may result in population effects by affecting the critical life functions of marine mammals. It was later generalised to all types of disturbance and describes a process, progressing from changes in individual behaviour and/or physiology, to changes in individual health, then vital rates, and finally to population-level effects. Much effort has been focused over the past decade on parameterising parts of this framework for a range of species and stressors (e.g., see Pirotta *et al.,*2018).

[9] https://www.bbc.co.uk/news/uk-england-london-56489147

Disturbance that occurs at sea is often assumed to affect energy balance of individual marine mammals through reduced foraging, for example as a result of displacement from foraging grounds, or as a result of increased travel cost due to avoidance of areas of disturbance and therefore the potential energetic consequences can be predicted on the basis of effects on energy balance and then on the basis of the links between energy balance and survival and reproduction. These individual based consequences can then be scaled up to population effects based on an estimate of the numbers of individuals affected. The consequences of disturbance to seals on land is harder to predict. This is partly because the drivers for seals to haul out are variable and therefore the consequences of disrupted haul out will be variable and context specific. Seals are thought to haul out for a variety of reasons; for rest, to carry out necessary physiological processes (e.g., e.g., moult, digestion), for predator avoidance and for breeding and provisioning pups. Therefore, any disturbance disrupting these activities has the potential to have a wide range of consequences which will be very context specific. There are a number of mechanisms by which chronic disturbance could be hypothesised to affect behaviour, physiology and health in a manner that could affect vital rates.

Behavioural responses of seals on land to human disturbance, such as increased alertness, movement towards water and flushing into the water, have been documented in many studies globally (e.g., e.g., Renouf & Lawson 1986, da Silva & Terhune 1988, Suryan & Harvey 1999, Strong & Morris 2010, Johnson & Acevedo-Gutierrez 2007). Changes to haul out numbers in response to disturbance and time taken for these numbers to recover to pre-disturbance metrics have also been documented in many studies (e.g., e.g., Henry & Hammill, 2001; Mathews ,2016; Paterson *et al.,* 2019). Documented responses are very variable and depend on the type of disturbance (pedestrians, dogs, kayak, powerboat, cruise ship, aerial etc.), distance of approach and location. However, there are also some clear UK examples where obvious human presence, in some cases involving close approaches to seals, is not acting as a deterrent to hauling out (e.g., e.g., Horsey) or breeding (e.g., e.g., Blakeney and Donna Nook) by grey seals. It is also apparent that hauled out seals of both species can habituate to the presence of, and tolerate close approaches by tourist boats, e.g., e.g., tourist boats at Dunvegan, the Farne Islands and Blakeney Point now regularly approach to within 20-30m of seals on haulout sites without causing apparent disturbance response. The likelihood of behavioural responses and their potential to lead to individual welfare, health and energetic consequences for individuals is clearly very location and context specific. In some areas in the UK (e.g., e.g., Cornwall, the Ythan Estuary) there are regular reports of repeated disturbance of seal haulout sites and growing concern among NGO groups that such disturbance will negatively impact individual seals and pose potential threats to the continued use of sites for hauling out and/or breeding (e.g., e.g., Cornwall Wildlife Trust, 2021).

However, the consequences of these responses for individuals are not well understood. A small number of seal telemetry studies have examined individual responses to disturbance in detail and these may be informative about the potential for such consequences. Andersen *et al.* (2014) and Paterson *et al.* (2019) indicate that harbour seals show strong site fidelity even when subject to repeated disturbance. Tagged harbour seals in Islay, Scotland would either haul out again shortly after the disturbance or would head off to sea on what appeared to be normal foraging trips. Similarly, Andersen *et al.* (2014) reported that tagged harbour seals at the Anholt seal reserve in Denmark would forage after being disturbed instead of resuming hauling out, which perhaps enabled them to minimise the cost of disturbance. Although pedestrian disturbances caused longer at sea trips than undisturbed trips, in general the extent and areas used during disturbed and undisturbed trips were comparable. Paterson *et al.* (2019) found there was no change in haul out use of harbour seals in terms of preferred sites, despite the availability of alternative nearby haul out sites so disturbed seals did not incur additional travel costs by moving to other sites, nor did abandonment of preferred sites appear to be a risk under conditions of repeated disturbance and flushing. Paterson *et al.* (2019) also found that the number of harbour seals on the haul out returned to 94% (95% CI 55–132%) of pre-disturbance numbers within 4 hr.

Data from such telemetry studies may provide suitable data on individual responses to disturbance events over appropriate time scales to use in bio-energetic simulation-based modelling approaches. Results from these simulations could be incorporated with models to predict future population trajectories and to determine whether population-level impacts are possible from observed and future projections of the extent of disturbance. However, as noted above, such an approach requires a detailed understanding of baseline abundance and demographics at appropriate scales which is not often available for many seal populations. There are no equivalent data on the individual responses of grey seals to disturbance on land to currently enable this approach for grey seals.

The effects of disturbance are also likely to vary significantly depending on the time of year or life history stage of the animals involved. For example, Andersen *et al.* (2012) observed that Anholt harbour seals left haul out sites to enter the water during the pre-breeding and post-breeding periods but were reluctant to leave the haulout during the breeding period. In addition, return times depended on the time of year with seals coming back during the hours of darkness during pre and post breeding periods but came back immediately after disturbance during the breeding period. This could indicate that the probability of a behavioural response is negatively correlated to the potential consequences of response. It is important to note therefore that a lack of response does not equal a lack of impact and conversely a response may not indicate an impact. This, of course, makes interpreting observed responses (or lack of them) very difficult.

Repeated flushing into the water could have more significant consequences during the annual moult. Both harbour and grey seals spend more time hauled out at this time to circulate blood to their skin, allowing for efficient regrowth of hair avoiding excessive heat loss to water (Ling, 1970). Repeated immersion during this period may slightly increase heat loss, but more importantly it may impede the growth of new hair, extend the moult duration, and affect the longer-term energy balance of individual seals. The magnitude of disturbance required to result in an effect on survival or breeding success as a result of this pathway is unknown.

During breeding on land, disturbance has the potential to affect survival and reproduction directly. Pups forced into the water may suffer thermoregulatory impacts and smaller pups with less insulation are at risk of hypothermia. Energy balance could be affected which might lead to lower weaning mass. Similarly, if suckling is disrupted this could result in a reduction in the energy transfer from mothers to pups during lactation also resulting in lower weaning mass. Pup weaning mass correlates with suckle bout durations during early and mid-lactation in elephant seals (Engelhard *et al.,*2002). Weaning mass and condition correlates with post-weaning survival in a number of seal species (e.g., McMahon *et al.,*2000; Hall *et al.,*2001; Harding *et al.,*2005) so this provides a potential mechanism for disturbance-induced impacts on the survival of pups.

It is unlikely that disturbance of individual suckling bouts or even repeated, short duration disruptions would have a detectable effect on overall energy transfer, as short delays in suckling are not important. Indeed, Engelhard *et al.* (2002) found that in spite of the relationship between suckling and weaning mass, there was no evidence that the presence of disturbance directly affected weaning mass in southern elephant seals. Engelhard *et al* (2001) reported that although mothers and their pups were smaller in an area of higher human activity, in proportion to their own size, females in areas of higher disturbance produced weaners of similar mass. This pattern of smaller mothers being present in more disturbed sites may have been as a result of site selection by larger, more experienced females selecting less disturbed sites. Similarly, Wilkinson and Bester (1998) found that direct onshore human disturbance (which was described as frequent and considerable) was not a factor in the decline of elephant seal numbers on Marion Island. In addition, despite frequent visits by tour boats to grey seal breeding beaches on Ramsey Island, Wales, and documented behavioural responses to the presence of human activity, no reduction in reproductive rate was recorded (Strong & Morris, 2010).

Direct disturbance could result in mother-pup separation leading to pup abandonment, however complete pup separation as a result of flushing is unlikely unless it happens very early in the lactation period due to close coordination between mums and pups and the role that vocal behaviour plays in the maintenance of the bond (McCulloch & Boness, 2000; Sauvé *et al*., 2015). Male aggressive charges at human intruders, or adult seals fleeing from human disturbance has the potential to cause direct mortality to pups.

The large numbers of harbour seal pups taken into rescue centres in the UK and the rest of Europe include a proportion of pre-weaned pups, suggesting that harbour seal mother pup bonds are susceptible to disturbance. There is little information on the levels of disturbance required to sever these bonds. Disturbance during catching and handling of harbour seal pups for studies of pup survival and pre- and post-weaning foraging patterns suggest that single disturbance events, even those involving protracted separation of the pair and extensive disturbance on the haulout site did not lead to breakdown of the mother pup bond (Bekkby, Bjorge & Bryant 2000; Bekkby & Bjorge, 2003; Hanson *et al.*,2014). Repeated captures to track the mass changes of harbour seal pups during late lactation and 40 days after weaning (Muelbert & Bowen, 1993) did not cause any pup mortality. Previous studies have shown that harbour seals can be displaced from haulout sites when exposure to anthropogenic activity is continued over several years (Becker, Press, & Allen, 2009; Becker, Press, & Allen, 2011).

There are also a number of other potential impacts as a result of disturbance including increased predation risk and stress. Disturbance leading to flushing could result in increased risk of predation. This is only likely in a limited number of areas in the UK, for example in Shetland, where seal predation by killer whales is known to occur. Effects on physiological parameters as a result of stress is much harder to determine, but it is possible that in some circumstances, high levels of chronic disturbance could lead to levels of physiological stress that could affect health status of individuals.

Although there are no examples of human disturbance leading to population level effects in the UK, there is evidence linking human disturbance to effects on vital rates and/or declines in other phocid populations. Although not the only factor, human disturbance is one of the factors thought to be responsible for the decline of both the Hawaiian and Mediterranean monk seals to critical levels. In some cases, human disturbance led to Hawaiian monk seals abandoning core habitat and moving to sub-optimal habitats where breeding success was lower (Gerodette & Gilmartin 1990). Liukkonen *et al.* (2017) showed that perinatal mortality in Saimaa seals increases significantly in areas in which the nearest building is within 800 m of a birth lair.

In the UK, although observed disturbance is clearly an animal welfare concern, and measures to reduce disturbance are a sensible approach, particularly as many local seal populations are increasing in areas where there is much human activity and interactions are likely to increase, there is currently no evidence that disturbance is affecting the numbers of seals present in any areas in a local or regional context or is affecting breeding success. Areas where the largest declines in UK harbour seal populations have been observed are the areas likely to be the least disturbed (e.g., Orkney and the North coast of Scotland) and grey seal numbers continue to increase in some of the most heavily populated areas of coast.

To conclude, while there are a number of potential mechanisms for human disturbance to affect individuals to the extent that their ability to breed successfully or survive might be reduced, to understand the potential for disturbance to significantly affect UK seal populations, at local, regional and national levels, more information is required on the levels and severity of behavioural responses and the potential effects of these on individual health, energetics and breeding success and ultimately survival. Focused effort on documenting changes in breeding success or the health/energetic status of disturbed seals will be required to predict how disturbance on land could translate to population-level effects.

***33b. Guidance for seal disturbance and thresholds***

Specific guidance on the offence of intentional or reckless harassment at designated seal haul-out sites in Scotland has been published[10]. This guidance details that the sensitivity of seals at haul-outs can be site specific and can highly variable. It also highlights that mothers with pups are more sensitive than other seals and that pups on land can be separated from their mothers. Sensitive times are described as breeding and moult seasons and greater caution is required during these times. Although careful to highlight that it is up to the courts to decide what might constitute an offence, the document offers guidance on the terms 'intentional', 'reckless' and' harassment'. Under the definition of 'harassment' the following is stated: "it would include any action that causes a significant proportion of seals on a haul-out site to leave that site either more than once or repeatedly or, in the worst cases, to abandon it permanently." A number of examples are provided that Marine Scotland may consider would constitute intentional or reckless harassment. These include "approaching too close to a designated seal haul-out from seaward (particularly in a kayak, jet ski or speed boat) that causes a significant number of seals on a designated haul-out to stampede into the water." Also: "Any other intentional or reckless action that causes a significant number of seals on a designated haul-out to stampede into the water." Note in these two cases the emphasis on the reactions of the seals rather than the actions themselves.

There are also a number of actions that are not linked to any specific consequences: "Intentionally or recklessly "buzzing" seals on a designated haul-out by repeated overflight in a fixed wing aircraft or helicopter at low level (i.e., less than 1,000 feet). Intentionally or recklessly approaching or sneaking up on seals on designated haul-outs from the landward side. Intentionally or recklessly crowding or encircling seals on designated haulouts." Specific guidance is also given on how to determine the response of seals and it is emphasised that it is important to allow the animals to decide how close is acceptable.

The same concerns of aerial disturbance will apply to drones. Recreational use of drones is expanding rapidly and there are many press reports and social media examples of disturbance of seals at haulout sites, often involving flushing of animals from haulout sites. There is little guidance directly targeted at drone flying over seal haulouts, but there is published information on the effects of drone flights on hauled out grey seals during the breeding and moulting seasons (Pomeroy *et al*., 2015; Arona *et al*.,2018)) that could be used to generate guidance.

There has been no specific monitoring of the success of the designation of seal haul outs in reducing deliberate harassment at haul outs. However, it is clear that the legal protection afforded by the seal haul out designation provides a framework for activities causing disturbance at designated haul outs to be reported and subsequently managed. The public awareness of this protection may be contributing significantly to seal protection in some locations.

Although such restrictions do not apply in the rest of the UK, guidance on general seal watching has been published by the Marine Management Organisation[11] and information notes on the evidence relating to the effects of wildlife watching and a range of different activities in relation to disturbance on seals at haulout sites in marine protected areas have been published by Natural England[12]. Guidance notes to provide advice on best practice for wildlife watchers and wildlife tourism operators have been

[10] https://consult.gov.scot/marine-environment/possible-designation-of-a-seal-haul-out-site/user_uploads/guidance-on-the-offence-of-harassment-at-seal-haul-out-sites.pdf-1

[11] https://marinedevelopments.blog.gov.uk/2016/08/11/seals-protected-illegal-touch-feed/

[12] Natural England Evidence Information Notes EIN025-37

published by both government and voluntary organisations (e.g., e.g., NatureScot[13], National Trust[14] and The Seal Alliance[15]).

All of the available guidance documents share a number of commonalities. They all acknowledge that the likelihood and level of response is very variable and context dependent, and that some times of year are more sensitive than others. They also all put a considerable emphasis on the use of careful observation, and several provide useful information on the signs to watch out for to indicate seals are being disturbed. Clearly defined distance thresholds or buffers are rare.

NGO monitoring data on seal disturbance made available to SCOS did not include records of the distances at which the reported responses occurred therefore SCOS cannot use these data to derive such thresholds. There exists a wide variety of published data on the distance at which seals respond to various activities at a range of locations but as highlighted above, these are highly variable and context specific and therefore it is difficult to determine generalised thresholds or buffer zones.

***33c. Advice on data that should be collected at disturbance events***

It is generally accepted that minimising disturbance of wildlife is beneficial, and that disturbance should be avoided wherever possible. This is particularly true for some haul-out sites along rocky coasts with high tidal range, where disturbance can directly lead to injuries. However, the majority of disturbance events do not lead to injury, and as detailed above, there is little information available for seals to assess the consequences of disturbance for individuals or populations.

Although the variation in responsiveness of seals to disturbance limits the usefulness of setting generalised threshold distances, monitoring the presence and severity of response in relation to different activities and approach distances at a local level could allow the development of specific localised guidance for boat operators, tourists and recreational users of the coast. This would require the adoption of standard definitions of response type and severity, or restricting the definition of a response to a very specific outcome, such as animals leaving the haul out, as well as a reliable way of estimating the distance of approach of each activity. Non-responses to the presence of activity are equally as important to record as responses. Carrying out behavioural observations during non-disturbed periods would also allow 'normal' activity budgets to be determined, which would allow useful comparison with behaviour in the presence of human activity and develop an understanding of the impact of the observed responses. Regular counts of haul outs in a region at an appropriate spatial scale (to be able to detect movement between haul outs in response to disturbance) would also be required to link disturbance to an effect on haul out use and local population size.

As discussed above, to address concerns about population level effects of disturbance, information about the extent to which disturbance could affect the survival and reproduction of individuals is required. This information is challenging to collect using observation alone and might be better tackled with targeted research. However, if co-ordinated and standardised visual observations are done at a sufficiently large number of representative sites, and over a sufficient period of time, the resulting information could enable a nationwide meta-analysis of the potential nature and extent of disturbance. It is likely that some of this information (for example haul out counts, activity budgets and occurrence of disturbance events) is already being collected by local groups and a co-ordinated effort to standardise and collate these datasets may be useful,  e.g., e.g., NGO monitoring of haulout numbers may allow an analysis of haulout patterns to investigate possible large-scale effects of human disturbance by

[13] https://www.nature.scot/professional-advice/land-and-sea-management/managing-coasts-and-seas/scottish-marine-wildlife-watching-code
[14] https://nt.global.ssl.fastly.net/godrevy/documents/how-to-watch-seals-responsibly-without-disturbing-them.pdf
[15] https://www.gov.uk/government/news/public-urged-to-give-seals-space

comparing haulout counts times when human activity is higher, e.g., e.g., at weekends, with period of generally lower activity. Although this would not provide information on specific disturbance events it may shed light on the scale of disturbance effects.

Two studies have examined the effects of controlled disturbance of harbour seals on haul-out sites on their short and medium-term behaviours (Andersen *et al.,*2014; Paterson *et al.,*2019). In both cases telemetry data showed that post disturbance movements and swimming behaviour were similar to behaviour after normally terminated haul-out periods. As stated above, responses will likely be context specific and different types or levels of disturbance may produce different responses. To date there have been no specific studies of the movements or swimming behaviour of grey seals in response to disturbance at haulout sites.

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| **34. If funding became available to undertake post-mortems on a limited number of seals in England, could SCOS please advise on which strandings should be the top priority to investigate? For example, which apparent causes of death, which species, age class, location etc. Could additional post-mortems be of benefit to our understanding of wider issues e.g., e.g., on the decline in The Wash harbour seal population, for example?** | **Defra Q10a** |

**There are several current policy-related research questions relating to the status of English seal populations and their management that could be usefully informed by post-mortems of seals. Examination of the cause of death and associated ecological and life history information for any stranded harbour seals in the southeast England Management Unit may help inform our understanding of drivers of the current observed decline.**

**Other areas that could be informed by seal post-mortems in general include disease surveillance, ecological factors such as diet, exposure to marine pollution (including entanglement) and evidence of interactions with fishing gear. Collection of material from bycaught grey seals for genetic analysis may help elucidate the population source of bycaught animals.**

**Stranding schemes can provide a useful means of surveillance of wildlife health and disease and SCOS would support the inclusion of seals in the national stranding scheme for England and Wales (they are already part of the SMASS in Scotland).**

**In addition to the relatively small number of seals that can be subjected to full post-mortem examination, information from detailed photographs with associated location and date/time information can provide useful data. Promoting such data collection and establishing systems for gathering and collating such reports may be a cost-effective approach to understanding the patterns and trends of seal strandings. Notwithstanding the research priorities, various physical aspects of individual stranding events will need to be taken into account when deciding whether or not to collect a specific carcass for post-mortem examination, including freshness of the carcass, location/accessibility and presence or absence of a clear cause of death, e.g., net entanglement or severe trauma.**

**In terms of structuring a general strandings sampling programme and prioritising cases, the existing strandings schemes in the UK and internationally, have developed best practices. Those schemes should inform any proposed increase in sampling effort in the UK. However, sampling schemes need to be flexible enough to respond to new and emerging problems and there are some current policy related research questions relating to the status of English seal populations that may be usefully informed by post-mortems of seals.**

It is difficult to determine which strandings (in terms of location, species and age) should be prioritised without an understanding of strandings patterns and trends – the utility of post-mortems in providing information to inform the management of a species will increase with increasing sample sizes and durations of monitoring, and it is difficult to determine this *a* priori. In terms of structuring a general strandings sampling programme, these issues have already been addressed by the existing strandings schemes in the UK and Europe, and the best practices of those schemes should inform any proposed increase in sampling effort in the UK. However, sampling schemes need to be flexible enough to respond to new and emerging problems and there are some current policy related research questions relating to the status of English seal populations and their management that may be usefully informed by post-mortems of seals.

The first of these is the recently observed decline in the harbour seal population in the southeast of England (SCOS-BP 2021/06). The drivers behind this decline are currently unknown but any recording, recovery, and post-mortem examination of dead harbour seals in this region may inform our understanding of the reasons for the decline and provide information/evidence to allow us to rule potential drivers in or out of contention. Although it is important to note the inherent bias in strandings data, in that few seals that die beyond a few km from the shore will be likely to strand, specific causes of death that may occur more offshore will likely be underrepresented in strandings. Notwithstanding this bias, identifying the major causes of death of any strandings in this region may still allow us to determine the degree to which any diseases or particular conservation threats may be having an effect, and whether they could be occurring at a magnitude that could be responsible for the observed decline. The demographics and locations of stranded animals may also be informative.

In addition to determining any emerging patterns of specific causes of death, a more detailed examination of stranded harbour seals may be useful to inform our understanding of potential ecological drivers of observed population trends. This includes investigations such as the examination of stomach contents and/or analysis of tissues for stable isotope signatures, providing information on diet, as well as the characterisation of contaminant and toxin exposure, any evidence of interspecific predation (e.g., spiral wounds typical of grey seal predation) and information on the age and reproductive status of stranded individuals. Potential biases in the animals available for sampling and problems of small sample sizes must be considered when analysing such datasets.

The UK harbour seal population experienced significant mortality from outbreaks of the Phocine Distemper Virus (PDV) in 1998 and in 2002. It is possible that another PDV epidemic will occur and given the already declining status of the southeast England harbour seal population, its effects could be catastrophic. Screening for PDV in stranded individuals may provide an early warning system for a future outbreak.

There are a number of other general policy areas that could be informed by investigations of stranded seals if it involved collation of evidence over a relatively long timescale. These include the presence and incidence of evidence of interactions with fisheries and fishing gear, ship and propeller strikes and evidence of entanglement and ingestion of micro and macro plastics. If carcasses were sufficiently fresh, the structures of the ears can be examined for evidence of hearing damage that might have been caused by anthropogenic noise.

Notwithstanding the research priorities, various physical aspects of individual stranding events will need to be taken into account when deciding whether or not to collect a specific carcass for post-mortem examination, including freshness of the carcass, location/accessibility and presence or absence of a clear cause of death e.g., net entanglement or severe trauma.

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| **35. Can SCOS advise on recent observations of 'mouth rot' (e.g., swollen muzzles; open wounds and oral ulcerations that can lead to bone exposure, bone necrosis and potentially septicaemia and death), an unknown disease that appears to be affecting harbour seal pups on the east coast of England? Specifically, what data should be recorded to enable and enhance further investigations? Do SCOS consider that this disease should be taken into account during the investigation of the harbour seal decline in the Wash?** | **Defra Q10b** |

**In order to evaluate the prevalence of mouth rot in harbour seal pups and the extent to which it poses a threat for conservation, including its potential as a contributory factor in observed regional harbour seal declines, a robust quantitative analysis of the incidence and circumstances of the disease is required. To enable this requires records of each case observed, with ancillary information recorded to provide useful covariate information (see below). Ideally this information should be provided in the context of all cases of rescue/stranded harbour seal pups to allow an evaluation This will allow an evaluation of trends and indicate any potential overall increase in pup mortality rates. This will likely involve collating data from a range of sources including rescue centres, RSPCA, SSPCA, SMASS, BDLMR and CSIP.**

**The causal agent and the extent of the problem are currently unknown, but SCOS understands that detailed investigations of the pathology, bacteriology and virology of the disease are underway by researchers at Teesside University together with British Divers Marine Life Rescue.**

SCOS are aware of recent observations of 'mouth rot' in harbour seal pups on the east coast of England because of discussions at recent Defra led-seal network meetings attended by SMRU. The causal agent and the extent of the problem are currently unknown, but SCOS understands that detailed investigations of the pathology, bacteriology and virology of the disease are underway by researchers at Teesside University together with British Divers Marine Life Rescue (BDMLR) veterinary staff, and SCOS look forward to the results of these investigations.

Based on photographs of the lesions it is apparent that 'mouth rot' is not a new issue. In 2013 several seals with similar mouth lesions were recorded in southeast England, and similar lesions were recorded in at least two harbour seals in the same region in 2002 collected during the PDV epidemic. There are also unconfirmed reports that similar 'mouth rot' cases have been observed in harbour seals on the European mainland coast.

In order to evaluate the current prevalence of this illness, and its potential population level effects, including the potential for this to be a contributory factor in the declines observed in the southeast England SMU, information is required on a number of metrics. This includes the number of cases observed, with care taken to ensure double reporting of cases is minimised or at least identifying where double reporting cannot be ruled out. The geographical location of each observed case and the outcome of each case (survival or recovery) should also be recorded. The sex, estimated age, mass and condition (length and girth measurements) of each affected seal will also provide useful covariate information in further investigation of patterns of incidence and help identify risk factors.

Data on the total numbers of seal pup rescues/call outs and their locations and outcomes will also be useful in order to place the numbers of mouth rot cases in the context of total cases. Evaluation of potential biases in reporting and recovery will also be required to assess whether the collated data are representative of the likely level of prevalence of the illness in the wider population. Details of pup stranding/rescue data in previous years on a UK wide basis will also allow an evaluation of trends and

indicate any potential overall increase in pup mortality rates. This will likely involve collating data from a range of sources including rescue centres, RSPCA, SSPCA, SMASS, BDLMR and CSIP.

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| **36. Can SCOS review and provide an update on any new studies looking into how macroplastics, microplastics, chemical pollution (including but not exclusively pharmaceutical drugs flushed into water systems), Abandoned, Lost or otherwise Discarded Fishing Gear (ALDFG), other marine pollution and Harmful Algal Blooms are affecting seal populations? What research is specifically required to help fill data gaps and evidence base in this area? How could impacts of plastic pollution be usefully picked up in part under reporting of strandings and post-mortem work by CSIP?** | **Defra Q11** |

**SCOS are not aware of any significant new information published since SCOS 2019, on the effects of macroplastics, microplastics, abandoned (ghost) fishing gear or other plastic pollution on seal populations.**

**The number of studies investigating the effect of microplastics, macroplastics, abandoned fishing gear and other forms of plastic pollution on seals is limited. There have been studies on discarded fishing gear and on the trophic transfer, retention, and excretion of microplastics and there is ongoing research on the impact of plastic contaminants and plasticizers on UK seals. However, the population consequences of these forms of marine debris have not been quantified so we do not know whether they are of concern. There are significant information gaps and current research will help shape future studies.**

**Both the CSIP and SMASS are collaborators and co-authors on recent publications on frequency of occurrence of plastics in seals. The strandings recovery and post-mortem work carried under these schemes is an essential part of ongoing studies.**

**Studies of POPs, plasticizers, and antimicrobial resistance (AMR) are continuing, with indications of widespread AMR organisms in seals in UK, Ireland, and Canada.**

**The environmental effects of pharmaceuticals entering the ocean either directly down rivers or through sewage treatment systems is a major concern. However, with the exception of recent studies on AMR, there are no published reports on the effects of pharmaceuticals on seals.**

Some of the issues raised in this question were addressed in SCOS 2019 and updated in SCOS 2020. The relevant parts of the 2020 answer are included here for completeness. Although there have been a number of published reviews and reports, SCOS is not aware of any significant developments in the field since the previous report that would materially change the general conclusions.

Nelms *et al.* (2021) reviewed conservation threats to marine mammals and included plastic pollution, chemical contaminants, and pathogen pollution as key threats to marine mammals in general. However, at present there is insufficient information to assess the population-level effects of interactions of seals with plastic (e.g., ingestion and entanglement) or other forms of pollution.

***Microplastics***

The potential impact on seals of different types of plastic marine debris at the individual and population level varies depending on their sources and physical characteristics, e.g., different size ranges. Microplastics (defined as plastic particles <5mm long) can be translocated across the gastro-intestinal membranes via endocytosis-like mechanisms (Alimba & Faggio, 2019) in invertebrates. They are also

capable of adsorbing organic contaminants (such as persistent organic pollutants (POPs)), metals and pathogens, which will add to their toxicological profile as these will be in addition to their inherent plasticizer compounds.

Nelms *et al. (*2019a) investigated the occurrence of microplastics in the gastrointestinal tracts of 50 marine mammals of 10 different species that stranded around the UK coast. Microplastics were ubiquitous: they were found in every animal examined but at relatively low numbers per animal (mean = 5.5) suggesting the particles were transitory. Stomachs contained a greater number than intestines, indicating possible temporary retention. However, only 3 grey seals and 4 harbour seals were included in this study. Nelms *et al. (*2019b) also found microplastics (1-5 pieces per gram of faeces) in 8 out of 15 grey seal scats (53%). The samples were all collected during the breeding season on Skomer Island off the Welsh coast, so they may only represent near-shore exposure.

Hernandez-Milian *et al.* (2019) recorded microplastics in 12 out of 13 grey seals drowned in bottom set trammel nets in a monkfish fishery off the south coast of Ireland and Philipp *et al.* (2020) found microplastics in all ten intestine samples and all nine faecal samples from stranded harbour and grey seals in Germany. Bravo Rebolledo *et al. (*2013) analysed 107 stomachs, 100 intestines and 125 scats of harbour seals from the Netherlands for the presence of plastics. They reported the occurrence of plastic in 11% of the stomachs, 1% of the intestines, and 0% of the scats. Hudak & Sette (2019) found anthropogenic micro debris (<500 µm) including cellophane, alkyd resin and EPDM rubber in 6% of harbour seal and 1% of grey seal scats collected at haulout sites on Cape Cod. Massachusetts, USA.

Nelms *et al. (*2018) showed that grey seals readily excrete microplastics in their faeces and feeding studies using polystyrene balls (3 mm) to determine fish otolith recovery rates, suggest that they all pass through the GIT within 6 days (Grellier and Hammond, 2006). Zantis *et al.* (2021) reviewed the literature on microplastics in marine mammals. All relevant published information from that review is included above.

Whilst microplastics may be readily excreted by seals, retention in the stomach and intestine prior to passage may facilitate the release of chemical compounds such as plasticizers during the digestive process. Toxicological impacts of microplastics for seals have not been reported in the literature at either the individual or population levels.

Senko *et al.* (2020) recently reviewed the published information on individual and population-level effects of plastic pollution on marine megafauna. They conclude that, despite increased reporting of the extent and intensity of plastic pollution in the marine environment, and the well-documented effects on individuals, the extent and magnitude of demographic impacts on marine megafauna have not been addressed.

Microplastic ingestion in unlikely to cause immediate or direct issues for animal health but may lead to sub-lethal effects. Greater understanding of what happens to ingested microplastics is needed. Nelms *et al.* (2021) identified three key knowledge gaps with respect to plastic pollution:

- Potential for sub-micron sized plastic particles to pass through the gut wall and into the blood stream, and reach organs, such as the liver or the lymphatic system.
- Extent to which plastic ingestion exposes marine mammals to chemicals on or within them compared to their usual dietary and environmental exposure.
- Effects of plastic ingestion on animal health and exposure to disease.

***Ingestion of macroplastics***

The ingestion of larger plastic debris, the macroplastics, may cause blockage in the gastrointestinal tract and injury to the gut mucosa. Macroplastic ingestion by marine mammals has been reported to have a range of effects such as causing obstruction/blockage/damage to the gastrointestinal tract (e.g., Baird and Hooker, 2000; De Stephanis *et al.*, 2013; Jacobsen *et al.*, 2010), and inflammation that can reduce feeding rates and potentially lead to malnutrition (Kühn *et al.*, 2015). However, to date these studies have all addressed effects of macroplastic ingestion by cetaceans. The prevalence of this as a cause of morbidity or mortality in UK seals is not known. It is rarely reported as a proximate or ultimate cause of death in seals by the Scottish Marine Animal Strandings Scheme (http://www.strandings.org/smass/).

Kühn and van Franeker (2020) reviewed marine mammal interaction with marine debris by either ingesting it or by getting entangled in debris. Out of 123 marine mammal species, 69 were recorded with ingested plastics. The incidence of macroplastic ingestion was reported as 4.4% in studied phocid seals, but it has not been possible to identify the relevant primary publications. It appears that plastic ingestion varies widely between marine mammal taxa, but in general seals appear less prone to plastic ingestion than cetaceans.

Ingestion of macroplastics, and subsequent impacts on health, seem to be less common in seals than other marine mammals but more data from post-mortems would be beneficial. To date, ingestion of macroplastics has not been recorded as cause of death in UK seals. However, sometimes the cause of death may be listed as an infection, but the cause of infection was an obstruction caused by a synthetic item. Making such links more explicit in reporting would help us better understand the extent of the problem.

***Abandoned, Lost or otherwise Discarded Fishing Gear (ALDFG)***

Entanglement is likely to be a key concern due to the propensity of seals to become entangled in netting, the immediate risk to health caused by entanglement-related injuries, and the welfare issues relating to these injuries (i.e., protracted and painful death). The fact that entanglements are often highly visible and distressing sights makes this a more pressing issue in public opinion.

Jepsen & de Bryn (2019) reviewed the available literature on entanglement of marine wildlife in general. They concluded that entanglement in oceanic plastic pollution poses a threat for at least 243 marine species and that most of the plastics that cause entanglements appear to be monofilament lines, ropes, and other fishing related gear.

Entanglement of seals in marine and plastic debris, particularly discarded fishing gear may increase the risk of drowning but perhaps more commonly, may restrict feeding or cause deep blubber and skin cuts and abrasions (particularly around the head and neck). Allen *et al.* (2012) used sightings records and a photo identification catalogue from a haul out site in southwest England to investigate the prevalence of entanglement in grey seals. Between 2004 and 2008 the annual mean entanglement rates varied from 3.6% to 5% (n= between 83 and 112 animals). Of the 58 entangled cases in the catalogue, 64% had injuries that were deemed serious. Of the 15 cases where the entangling debris was visible, 14 were entangled in fisheries materials.

Butterworth (2016) concluded that globally pinnipeds are at the visible end of the spectrum of animals which become entangled, snared, trapped or caught in marine debris, particularly plastics in the form of net, rope, monofilament line and packing bands, with severe consequences. This is in line with a study by Unger and Harrison (2016) who characterised beach litter based on a data set established by the Marine Conservation Society (MSC) beach-watch weekends. Debris collected around the UK was divided into three main types of debris: (1) plastic, (2) fishing, and (3) fishing related plastic and rubber on a

total of 1023 beaches. Debris attributable to fishing was identified on clusters of beaches mainly located on the coasts of Scotland and along the English Channel. They concluded that the fishing industry is responsible for a large proportion of the marine debris on UK beaches, particularly in areas with adjacent fishing grounds.

While individual effects of entanglement have been widely reported, extrapolating from such observations to estimate population scale mortality rates has not been possible. Sightings of entangled individuals, or seals with serious injuries, may not be representative of the frequency of occurrence in the population as the sightings could potentially be biased in either direction depending on whether entangled seals are more or less likely to come ashore. Likewise, strandings of seals killed by entanglement will be under-represented as seals killed more than a few kilometres offshore are unlikely likely to strand and entangled seals may be more likely to sink due to the weight of negatively buoyant netting. Although it is not clear what the population scale effects of entanglement are, there are examples where entanglement in discarded nets may have had significant effects on local populations e.g., significant pup mortality in a single ghost net at the Orkney study site of the HSD project.

In order to assess the extent and importance at a population scale we would require a large-scale monitoring programme. Allen *et al.* 2012 showed that valuable information can be collected by regular observation at specific haulout sites. Coordinating reports and images from volunteer observers and expanding such programmes through volunteer networks such as the UK seal alliance could potentially provide useful information. A structured and consistent recording methodology would need to be developed. Drone surveys of haul outs could provide an effective way to monitor entanglement rates.

Retrospective analysis of aerial survey images may provide some additional information. However, images collected to date have been for a specific purpose, i.e., to count and identify seals to species level and to identify harbour seal pups. Thus, most images will not be of sufficient resolution to reliably identify the less obvious examples of entanglement. Improvements in camera and lens technology means that it is now feasible to collect suitable images at some sites during routine survey flights. Calibration of the detection rates from aerial surveys for different types of entanglement would be required.

***Persistent organic pollutants (POPs)***

POPs are endocrine disruptors that can alter adipose tissue development, regulation and function, in addition to their well-established effects on reproductive, immune and thyroid function. Top marine predators are particularly vulnerable because they possess large fat stores that accumulate POPs. Recent results on the concentrations of organochlorine pollutants in grey seal pups from the Isle of May (SCOS BP-17/06) suggested a modest but significant decrease in polychlorinated biphenyls (PCBs) occurred between 2002 and 2015, whereas levels of the organochlorine pesticide - DDT and its metabolites (DDX) increased over the same period. In both cases, the concentrations measured were below the limits that cause immediate negative health effects in seals. Bennett *et al.* (2021) examined the impact of alterations to blubber metabolic characteristics and circulating thyroid hormone (TH) levels associated with PCBs, polybrominated diphenyl ethers (PBDEs), and DDX on suckling mass gain and weaning mass in wild grey seal pups on the Isle of May. PCBs and PBDEs appear to act antagonistically, with PCBs reducing blubber glucose uptake while PBDEs were associated with mass gain during suckling. POP impacts on whole-animal energy balance in grey seal pups appear to partially offset each other through opposing effects on different mechanisms. POP effects were generally minor, but the largest POP-induced reductions in weaning mass occurred in small pups. Since weaning mass is positively related to first-year survival, POPs may disproportionately affect smaller individuals, and could have population-level impacts even when levels are relatively low compared to historical values. The predictive power of the models in this study was low, so that although findings from these studies could inform risk assessments to estimate low level POP effects on populations, more information is

needed on how different POP classes alter fat accumulation. Blubber and liver expression of genes involved in energy balance are altered by POPs in other seal species (Brown *et al.,* 2014; 2017), but the whole animal consequences of this type of metabolic disruption, particularly for young animals, are not well understood.

Although the conditions, e.g., salinity, pollutant burdens and seal species may be different, it may be informative to examine trends in effects of POPs on seals in other regions. Sonne *et al.* (2020) recently reviewed the available information on contaminant exposure and health effects on a range of marine mammal and bird species in the Baltic during the period of general reductions in POP exposure.

Roos *et al.* (2012) showed that pregnancy rates in Baltic grey seals increased over the period 1990–2010, while the prevalence of uterine occlusions and stenosis and uterine tumours decreased. This is an ongoing tendency supported by findings that the reproductive rate of grey seals is normal at present and that birth rate in Finnish waters is 88% (mean for 2013–2018, no uterine occlusions observed) (Kauhala *et al.*, 2017). This implies that reduction in POPs has led to a decrease in negative effects, and further implies that levels of POPs in UK waters may not pose a direct threat of reduced fecundity.

The prevalence of skull lesions and skull asymmetry in Danish harbour seals increased between 1981 and 2014 (Pertoldi *et al.*, 2018). The authors hypothesise that increases could be linked to immune suppression from cumulative stress of multiple factors such as increasing PFAS (per and polyfluoroalkyl substances) concentrations and decreases in the quality and quantity of food resources (Sonne, 2010).

Colonic ulceration has continued to increase in the Baltic, but is not an issue in the North Sea or UK waters where only one case in a grey seal has been documented (Baker, 1980), and none were found in later studies (Bäcklin *et al.*, 2013, ÓNeill & Whelan, 2002).

Triosi *et al.* (2020) examined the relationships between PCB burdens and a range of sex hormones (progesterone; P4, 17α-hydroxy progesterone; 17α-OH-P4, testosterone; T4, 17β-oestradiol; E2, estrone; E3) in plasma samples from grey and ringed seals in the Baltic and at Sable Island and Svalbard. PCB concentrations were significantly higher in Baltic seals than other sampling locations and mean hormone concentrations in Baltic seals were lower than Svalbard and Sable Island seals. Regression analysis indicated significant correlations between levels of PCBs and several sex hormones. As the authors state, correlations are not necessarily evidence of cause and effect, but the fact that these reductions were detected at PCB concentrations found throughout the species ranges warrants further investigation and monitoring.

***Plasticizers***

A joint project involving Abertay University and SMRU is investigating the effects of a group of plasticisers; the phthalates (in the form of benzyl butyl phthalate or BBP) on the insulin signalling pathway, an important regulator of fat metabolism in seals that inhibits lipid release from storage (Bennett *et al.,*2015), and expression of key fat metabolism genes in blubber using a novel *in vitro* approach (Bennett *et al.,* 2017; Robinson *et al.,* 2018). The project is currently using a novel *in vitro* approach to test whether activation of one of the key enzymes in insulin signalling, known as Akt, is affected by BBP exposure. Changes to Akt levels or its activation in the presence of insulin will imply disruption of insulin signalling. Differences in fat metabolism gene expression between BBP treated and control blubber explants will indicate disrupted fat tissue function

***Pharmaceuticals in the marine environment***

Pharmaceuticals represent a major group of emerging pollutants found in freshwater and coastal waters. The occurrence of pharmaceutical substances such as contraceptives, antidepressants

(Sehonova *et al.,* 2018) and potential endocrine disruptors such as metformin (Tao *et al*., 2018) in the marine environment is of global concern and the scale of the problem and extent of their risks and impacts on human health and biota is largely unknown (Branchet *et al.*, 2021; UNESCO, 2017). So far, this topic is under reported and we are unaware of any relevant publications on the direct effects of pharmaceuticals on seals.

***Anti-microbial resistance (AMR) in seals***

AMR does not pose any significant, direct threat to individual seals in the wild and cannot therefore pose any population level threat. However, the potential role of seals as a reservoir of AMR organisms may be important in the future spread of AMR through the environment. The spread of AMR poses an existential threat to human health, and possible direct transmission of AMR organisms from seals to humans during seal rescue and rehabilitation is a potential risk.

It has long been argued that the widespread and intensive use of antibiotics in human medicine, veterinary medicine, and agriculture means that sewage (both treated and untreated), hospital waste and agricultural run-off can cause the spread of AMR to marine ecosystems (e.g., Young, 1993). AMR bacteria can be ingested with prey and the possibility of gene transfer between bacteria in the seal gut may allow AMR genes to move between harmless and disease-causing bacteria.

An ongoing PhD project at Abertay university is combining AMR information from faecal samples with tracking data from 120 seals tagged at sites around the UK by SMRU. Preliminary results show that approximately 30% of the samples exhibited presence of resistance to tetracycline, a commonly used prophylactic antibiotic in aquaculture.

Two recently published studies have documented AMR in harbour seals and harbour porpoises.

Vale *et al.* (2021) reported AMR in E.coli from faecal swabs taken from 25 rescued seals (23 harbour and 2 grey seals) in Ireland. All *E. coli* isolates investigated in this study (*n* = 39) were ampicillin resistant while 26 (66.6%) were multi-drug resistant (MDR).

Norman *et al.* (2021) recorded antibiotic-resistant bacteria in dead stranded harbour seals in the Salish Sea, British Columbia. Of the 67 harbour seals sampled successfully, 37% showed resistance to one of the 15 antibiotics tested, and 24% showed multi-drug resistance. Porpoises were significantly more likely to carry resistant organisms compared to seals. Multiple antibiotic resistance (MAR) indices suggested that the AMR results from exposure to anthropogenic pollution.

AMR may be an important issue for seals in rehabilitation/rescue centres. Stoddard *et al.* (2009) showed that duration of residence in a rehab facility increased the level of AMR in rehabilitated northern elephant seals (*Mirounga angustirostris*), even for animals that had not been treated directly with antibiotics. Interestingly they also showed that 34% of the intake from the wild carried AMR bacteria. Tight control of antibiotic use in captive animal/rehab facilities is essential to minimise the spread of AMR to wild populations.

***Harmful Algal Blooms***

Toxin exposure from harmful algal blooms (HABs) has resulted in widespread morbidity and mortality in marine life, including top marine predators. Kershaw *et al.* (2021) reported concentrations of domoic acid (DA) and saxitoxin (including Paralytic Shellfish Toxin (PST) analogues), in the viscera of 40 different fish species caught in Scotland between February and November 2012 to 2019. DA concentrations peaked in the summer/autumn months and were highest in pelagic species including Atlantic mackerel and herring, key forage fish for marine predators including seals, cetaceans, and seabirds. The highest DA concentrations were measured along the east coast of Scotland and in Orkney. PSTs showed highest

concentrations in early summer, consistent with phytoplankton bloom timings. The detection of multiple toxins in such a range of demersal, pelagic and benthic fish prey species suggests that both the fish, and by extension, piscivorous marine predators, experience multiple routes of toxin exposure. Risk assessment models to understand the impacts of exposure to HAB toxins on marine predators therefore need to consider how chronic, low-dose exposure to multiple toxins, as well as acute exposure during a bloom, could lead to potential long-term health effects ultimately contributing to mortalities.

The potential synergistic, neurotoxic, and physiological effects of long-term exposure to multiple toxins require investigation in order to appropriately assess the risks of HAB toxins to fish as well as their predators. Studies of presence and levels of harmful algae in fish from coastal waters in the east of Scotland are ongoing as part of the Marine Scotland MMSS programme.

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|---|---|
| **37. Can SCOS review and collate the latest scientific information available on current environmental impacts seals face with a best assessment of the relative levels of risk posed by each impact?** | **Defra Q13** |

**There are multiple potential threats to seal populations in the UK, although there is no evidence that grey seal populations are currently at significant risk from any threats at current levels of exposure. Several regional harbour seal populations are in decline, however, and are likely to be more vulnerable to pressures. Many of the specific threats are detailed elsewhere in this advice but an overview is provided here.**

**The principal environmental impacts with the potential to affect UK seal populations are considered below, with reference to other parts of this Advice for more detailed information on specific threats. These include: Competition between seal species; Direct predation; Fisheries interactions (direct mortality and impact on prey resource); Climate change (direct and indirect effects); Infectious diseases; Harmful Algal Blooms; Marine Pollution (entanglement, plastic ingestion, persistent organic pollution); Underwater Noise; Physical disturbance; Interaction with marine renewable energy industry (Collision with tidal turbine blades).**

**Some of these threats are local and some global, and the scales of the potential impacts and necessary interventions are also at different scales ranging from local to national and international. It is not clear what priority**

**SCOS do not consider that ranking these threats is within the scope of the meeting and will require a more extensive analysis taking into account the policy drivers that determine the priorities, e.g., the importance of specific threats in terms of national and or local/regional conservation goals, natural versus anthropogenic threats and likelihood versus severity of threats.**

**For most potential impacts, there is some information on the nature and extent of individual level effects, but studies to understand the potential for population level effects are generally lacking which makes ranking of relative risk difficult.**

The marine environment is subject to a number of pressures and many of these have the potential to impact the individual and population health of seals. A comprehensive review of all the potential impacts facing seal populations and a robust ranking of relative risk levels is a significant undertaking that has not been carried out in the time available. Not least because there is a lack of definitive quantitative information on the extent and nature of most of these threats, and a lack of understanding of vulnerability of the various seal populations to these threats. Any assessment of relative risk ideally would involve a detailed analysis of the extent of such threats (exposure potential) combined with an

understanding of the sensitivity of each species to each threat. SCOS/SMRU and Defra will discuss the requirement for a qualitative ranking of potential threats considering both the significance of possible population scale effects and the potential for management interventions to mitigate those risks. SMRU will report back to SCOS 2023.

A detailed attempt to robustly quantify these effects and rank them definitively in order of level of concern would require significant additional resource but an overview of potential current threats is provided. An assessment of relative levels of risk is critically hampered by a lack of data and knowledge on the extent and nature of most of these threats but a qualitative ranking might be possible taking account of both the level of threat/impact and the capacity to address the issues. The most prevalent threats are considered in more detail in other answers (9,22,28-33,35,36) and these are referred to below where relevant.

SCOS are also aware of an ongoing global project, the MegaMove initiative (www.megamove.org), which is currently inviting contributions from the marine megafauna research community to develop an index to evaluate the global risk of anthropogenic threats to marine megafauna. This uses the IUCN threat scoring system, which involves applying scores relating to the timing, scope of severity of particular threats. The list of threats and sub-threats being assessed in this process include many of the threats considered here. It is possible that a similar approach could be applied at a UK level, but it is possible that a lack of knowledge would also hamper such an approach.

As highlighted in the answer to Defra Q5, there is no evidence that the UK grey seal population is currently at risk of significant decline as a result of current levels of exposure to any pressures, although in some areas impacts have the potential to have localised effects. Harbour seal populations in the northern Isles and along the east coast of Scotland and in the southeast of England have declined or are continuing to decline, and therefore clearly already being impacted, although the specific drivers for these declines are unclear. Discussion around these declines and likely drivers can be found in the answers to Marine Scotland Q10 and Defra Q1.

Strandings data can be informative in understanding the relative risks posed by various threats. For example, strandings data from CSIP and SMASS provided a key source of evidence for assessing levels of vulnerability to porpoise and dolphin species to various threats during the development of the UK Dolphin and Porpoise Conservation Strategy currently under consultation. Only SMASS routinely carry out investigations into cause of death of seals and a detailed examination of results from post-mortems in recent years would help inform an assessment of current threats in Scotland. Similarly, should seal post-mortems be carried out by CSIP in future, this would provide valuable information on the incidence of various causes of death in England and Wales (see Defra Q10). In 2019, only 9.1% of all SMASS seal post-mortems were directly attributable to anthropogenic impacts (SMASS, 2019). Although indirect impacts or mortality due to cumulative effects, for example due to prey depletion or disturbance, are more difficult to ascertain. The highest proportion of deaths in 2019 were reported as being due to a variety of causes including starvation/hypothermia, maternal separation/starvation, live stranding, (possible) grey seal attack, bottlenose dolphin attack, and metabolic disease (SMASS, 2019).

The principal environmental impacts with the potential to affect UK seal populations are considered further in turn, below. For most potential impacts, there is some information on the nature and extent of individual level effects, but studies to understand the potential for population level effects are generally lacking which makes ranking of relative risk difficult. These have not been ranked and are not in any particular order.

***Competition between seal species***

Competition for prey between grey and harbour seals has been suggested as a potential driver of observed harbour seal declines. This is currently under investigation as a driver for the Scottish regional harbour seal declines. Analysis of body composition and nutritional status of adult harbour seals in regions of decline shows no evidence of nutritional stress. However, it is likely that these live caught animals represent a biased sample of survivors, which are less likely to show signs of nutritional stress. Competition with grey seals is also a putative driver for the harbour seal decline in the southeast of England, although further research is needed to investigate this.

***Direct predation***

Killer whales predate on seals in parts of the UK (Deecke *et al.*, 2011). The rates of killer whale predation on seals may be locally important in some areas, e.g., the Shetland Isles. Research on the interactions between killer whales and their seal prey in the UK is currently underway.[16]

There is considerable evidence for grey seal predation on harbour seals in several areas around the UK (Brownlow *et al.*, 2016) and increasing numbers of cases have been reported to SMASS each year with a total of eighty-nine seals with trauma consistent with spiral or corkscrew injuries recorded in 2019. This makes grey seal predation the most commonly identifiable reason for harbour seal mortality in the strandings records in Scotland. Research on this is ongoing.

***Fisheries interactions – direct mortality***

Globally, fisheries interactions are recognised as the biggest threat to seal populations (Kovacs *et al.,* 2012). The levels of seal bycatch in fishing gear are reported in answer 22 above. In the UK the largest reported bycatch rate occurs in the southwest region, with the levels of recorded grey seal bycatch likely underestimating the scale of the problem due the presence of several additional unmonitored fisheries. This is of particular concern due to the fact that reported levels of bycatch already exceed the calculated PBR for the regional grey seal population. The regional population is not thought to be in decline, therefore there must be immigration from elsewhere and this is currently under investigation. Mitigation efforts for reducing seal bycatch have had little attention, but programmes involving stakeholder participation are being developed, e.g., the Clean Catch UK initiative (https://www.cleancatchuk.com/).

Prior to recent legislative changes, licenced (and possibly unlicensed) shooting of seals interacting with aquaculture and river fisheries was a commonly reported cause of death for Scottish seals. How much unlicenced direct mortality occurs now or may occur in the future as a result of increased interactions remains unknown.

***Fisheries interactions - Change in prey availability due to fishing pressure***

There is considerable overlap in seal diet composition and fish species targeted in commercial fisheries so there is the potential for fishing induced changes in prey availability to impact on seal populations, although most research effort in this area has focussed on the impacts of seal predation on commercial fish catches. This issue is discussed further in the response to Marine Scotland Q7.

***Climate change (direct)***

As discussed in the answer to Defra Q12, projected changes in the physical environment in the UK are not expected to exceed the homeostatic ranges for UK seal species. Changes in sea level may reduce

[16] https://ecopreds.com/

breeding and haulout sites in some areas and lead to increased wave action on breeding sites which can increase pup mortality, but such changes will be gradual, and seals should be able to accommodate by moving breeding sites if alternative sites are available.

***Climate change (indirect)***

**C**hanges in prey availability as a result of climate change could significantly affect seal populations. There is some evidence that warming is responsible for disrupting the food web and altering distributions of prey species and affecting recruitment in the North Sea (Engelhard *et al.*, 2011 & 2014; Skinner 2009; Regnier *et al.*, 2019). Climate induced changes in prey availability is thought to be a driver for observed seabird declines (e.g., Mitchell *et al.*, 2020) but there is very limited evidence for effects on seals to date as seal distributional changes appear to be in the opposite direction to observed prey shifts (see Defra Q12). However, prey climate induced changes in prey availability cannot be ruled out as a potential driver of regional harbour seal declines. Increases in harmful algal blooms and increases in infectious diseases and the emergence of new diseases are also potential indirect effects of climate change that could significantly affect UK seal populations in future.

***Infectious disease***

Major epizootics of Phocine Distemper Virus (PDV) have occurred in 1988 and 2002, significantly affecting the North Sea harbour seal population. Infrequent cross-species transmission and waning immunity are believed to contribute to periodic outbreaks (Puryear *et al.*, 2021). The first documented PDV outbreak in 1988 in Europe was strongly correlated to an unusual harp seal invasion from the Arctic into the North Sea, and harp seals are thought to be a likely reservoir of the virus (Puryear *et al.*, 2021). Closely related PDV strains are thought to be circulating in multiple seal species along the coastlines of North America and Greenland and therefore further outbreaks are considered likely (Daoust *et al.*, 2020). Due to likely very low levels of immunity PDV re-introduction in European harbour seal populations are likely to cause a major epizootic with high infection rates and mortality. A further PDV outbreak at a time when harbour seal populations are already in decline may be catastrophic.

A major outbreak of H10N7 avian influenza in 2014 killed 500 harbour seals in western Sweden and eastern Denmark (Krog *et al*., 2015; Zohari *et al*., 2014), and 1,500–2,000 seals in western Denmark and in Germany and Dutch waters (Bodewes *et al*., 2015). More recently Venktesh *et al*. (2020) reported the discovery of H3N8 influenza A virus in a rescued grey seal pup. The IAV had a particular mutation indicative of mammalian adaptation of an avian virus. There is clearly an ongoing risk of further outbreaks of avian flu in UK seal populations.

Phocid herpesvirus 1 (PhHV-1) is known to infect grey seals Halichoerus grypus, Baily *et al*. (2019) found PhHV-1 in approximately 60% of 119 live grey seal pups and 56% of dead pups at the Isle of May. PhHV-1 was associated with hepatic necrosis, thymic atrophy and buccal ulceration in the dead pups. The high prevalence of PhHV-1 in grey seal pups and juveniles and the increased mixing of grey and harbour seal populations, particularly in the southern North Sea is a cause for concern for the depleted harbour seal population.

***Toxins from Harmful Algal Blooms (HABs)***

Toxin exposure from harmful algal blooms (HABs) has resulted in widespread morbidity and mortality in marine life, including top marine predators. This threat is discussed in more detail in the answer to Defra Q11. High concentrations of domoic acid (DA) and saxitoxin (including Paralytic Shellfish Toxin (PST) analogues) have been reported from 40 different fish species caught in Scotland, including key forage fish for seals (Kershaw *et al.*, 2021). The detection of multiple toxins in such a range of demersal, pelagic and benthic fish prey species suggests that both the fish, and by extension, piscivorous marine

predators, experience multiple routes of toxin exposure. The potential effects of long-term exposure to multiple toxins require investigation in order to appropriately assess the risks of HAB toxins to seal populations.

***Marine Pollution – entanglement***

Both species of seals have been recorded with evidence of entanglement in marine debris, including fishing nets and plastic hoops. This type of entanglement is common, and animals can remain entangled for many years before succumbing to the physical effects of the constriction or secondary infection. More details on entanglement in marine debris can be found in the response to Defra Q11. Entanglement of seals in marine and plastic debris, particularly discarded fishing gear may increase the risk of drowning, but, perhaps more commonly, may restrict feeding or cause deep blubber and skin cuts and abrasions (particularly around the head and neck) and lead to secondary infections. There is the possibility that strandings of seals killed by entanglement will be under-represented as seals killed more than a few kilometres offshore are unlikely likely to strand and entangled seals may be more likely to sink. More work is required to assess the extent and importance at a population scale.

***Marine Pollution – plastic ingestion***

Microplastic ingestion in unlikely to cause immediate or direct issues for animal health but may lead to sub-lethal effects. Greater understanding of what happens to ingested microplastics is needed. The ingestion of larger plastic debris, the macroplastics, may cause blockage in the gastrointestinal tract and injury to the gut mucosa. As discussed in the response to Defra Q11, it appears that plastic ingestion varies widely between marine mammal taxa, but in general seals appear less prone to plastic ingestion than cetaceans. Ingestion of macroplastics, and subsequent impacts on health, seem to be less common in seals than other marine mammals but more data from post-mortems would be beneficial.

***Marine Pollution – Persistent organic pollution (POPs)***

The evidence describing the potential effects of POPs such as polychlorinated biphenyls (PCBs) and the organochlorine pesticide DDT and metabolites (DDX) is summarised in the response to Defra Q11. There is clear evidence of individual level effects of exposure to these pollutants at concentrations encountered in the environment. Understanding the potential for population level effects will need additional work. Data from individual studies can be used in risk assessment frameworks to predict potential effects on populations.

***Physical disturbance***

See answer 33 above for more detail on this issue. There are concerns about the effects of human activity causing disturbance reactions by hauled out seals and the impacts this may have on the welfare and health of individuals that may be experiencing repeated disturbance. Whilst this is a concern in a number of locations and can clearly affect individual animal welfare, there is no evidence that this is currently a concern at the population level.

***Underwater Noise***

Underwater noise from a variety of sources is known to affect the local distribution and behaviour of seals. Noise from pile driving during construction of offshore wind farms results in localised avoidance and behaviour change (Russell *et al.*, 2016; Whyte *et al.*, 2020a). Levels of predicted exposure also has the potential to cause changes in auditory sensitivity (Hastie *et al.,* 2019; Whyte *et al.,* 2020a). Exposure to noise from vessels is also potentially a concern, with a small number of studies documenting exposure to noise from vessels and behavioural responses to vessel noise (Jones *et al.*, 2017; Trigg *et*

*al.,*2020; Mikkelsen *et al.*, 2019). Underwater explosions (e.g., from clearance of unexploded ordnance) and seismic activity have the potential to impact seals, but no data is available on this.

The operation of tidal turbines is likely to be audible to seals. Risch *et al.* (2020) recently estimated that the Atlantis AR1500 tidal turbine at the MeyGen array was likely audible to ~2km. There is also some evidence of local avoidance of turbine noise and of the MeyGen array (Hastie *et al.*, 2018; Onoufriou *et al.*, 2021). This degree of avoidance is not of concern at the current scale of tidal energy development but could increase as developments scale up to large commercial arrays.

Even if single sources of underwater noise do not result in any significant population level concerns, when multiple activities occur at the same time and over an extended period of time, and extended areas, the impact is likely to be greater; the ranges at which behavioural or physiological responses to noise occur, and the ranges at which significant masking of seal calls, predator calls and acoustic foraging cues occur will increase as source levels and numbers of sources increase.

Evidence on the cumulative population level impacts of noise is lacking. Population Consequences of Disturbance (PCoD) models have been developed to combine available information on population processes and both behavioural and physiological responses to noise, to address these uncertainties, identify important knowledge gaps and derive estimates of population consequences using best available information. Pirotta *et al*. (2018) provide a helpful overview of the process and Dunlop *et al*. (2021) describe the application of a PCoD model to investigate the effects of seismic survey noise on developed for humpback whales (*Megaptera novaeangliae*).

***Other sources of direct mortality***

There are concerns about the potential for collisions with marine renewable energy devices, although currently there are very few devices installed around the UK and limited potential for interactions. However, this could increase as the tidal energy industry scales up to large arrays, and there is a potential for impacts to be locally significant. There is some evidence of avoidance (Sparling *et al.,* 2017; Joy *et al.,* 2018; Hastie *et al.,* 2018: Onoufriou *et al.,* 2021) which may reduce the risk of collisions but detailed information on the fine scale behaviour of seals around tidal turbines is currently lacking. Although likely at a small scale, there are reports of seals becoming trapped in underwater structures (see Q 29 above). Underwater explosions related to military activity such as the bombing at coastal and offshore sites and the destruction of unexploded ordinance during clearance of offshore marine renewable sites could also cause mortality.

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| **38. at is the evidence that seals can contract COVID 19 (e.g., likely routes of transmission for wild and captive animals as well as physiological and immunological susceptibility), and can act as symptomatic or asymptomatic carriers and thus wildlife reservoirs of this disease?** | **Submitted by K. Bennett, Abertay University** |

**UK seals are likely susceptible to Covid-19. No testing of any seals has been carried out to our knowledge and no significant reports of morbidity or mortality related to respiratory illness. Despite the likely animal origin, no wildlife reservoir for the SARS-CoV-2 virus has been found and the role of wild mammals in natural transmission and reservoir capacity is speculative.**

**Covid-19 can be transmitted to the marine environment via untreated sewage, but this is unlikely to be occurring to any significant extent in the UK due to widespread secondary sewage treatment.**

**Other potential routes for transmission include when humans are handling seals. The two settings where this will occur is in scientific research and in rescue/rehab. Precautions should be taken in these settings to limit the risk of transmission. Samples could be taken from seals in these settings and analysed to provide further data on the prevalence of the virus in the wild seal population.**

UK seals are thought to be susceptible to Covid-19 (Mathavarajah *et al.,* 2021) given ACE2 gene conservation in marine mammals. ACE2 is the host receptor targeted by the virus SARS-CoV-2 (the causative agent of Covid-19), and variability in the receptor contributes to why some species are susceptible and not others (Mathavaraja & Dellaire, 2020). An examination of ACE2 genetic variability in a range of marine mammal species indicated that harbour seals are predicted to be highly susceptible. Aligning regions for the genome sequence for grey seals were not available, so grey seal susceptibility was not explicitly predicted in this study. However, it was noted that many of their mutations resemble that of the other seal species that were predicted to be highly susceptible (Mathavarajah *et al.,* 2021). This suggests that UK seal species may contract the virus if encountered in their environment. SCOS are not aware of any UK seals having been tested for SARS-CoV-2. The USGS Wildlife Health Centre has a programme of testing a range of pinniped species for SARS-CoV-2 (USGS, 2021) but at time of writing there no results were available. There have been no recent reports of morbidity of seals in captivity or in the wild in relation to any respiratory illnesses.

SARS-CoV-2 has been detected animals exposed to infected humans or challenged experimentally. These include domesticated cats, dogs, and ferrets, and captive-managed mink, lions, and tigers (Mahdy *et al.,* 2020, O'Connor *et al.*, 2020, Shi *et al.,* 2021). In addition, there is clear evidence that SARS-CoV-2 is widespread in wild deer populations in the USA and that several transmission events have occurred (Chandler *et al*., 2021). These studies do suggest that there is a possibility of the involvement of multiple species in SARS-CoV-2 circulation and persistence, but few studies have been completed thus far and no confirmed cases of natural transmission from animals to humans have been confirmed. The role of wild mammals in general in Covid-19 transmission and reservoir capacity is speculative. Comparative genomic analysis has suggested that SARS-CoV-2 evolved naturally with bats as the likely origin, being closely related to two SARS-like CoV sequences that were isolated in bats during 2015-2017 (Zhang *et al.,* 2020) with the human SARS-CoV-2 sharing a recent common ancestor. So far, to our knowledge, no natural animal reservoir for SARS-CoV-2 has been identified (Haider *et al.*, 2020), although pangolins, mink and ferrets have all been suggested as the most likely intermediate hosts for SARS-CoV-2 (Fenollar *et al.,* 2021, Royce, 2021).

It has been proposed that the virus can be transmitted to the marine environment via sewage effluent, and this could provide a pathway for transmissions to seals (Mathavarajah *et al.*, 2021). Although the RNA of SARS-CoV-2 has been detected in untreated sewage in the UK[17] , most UK sewage treatment involves secondary treatment which significantly reduces the possibility of virus exposure via treated effluent (Peccia *et al.*, 2020). However, there are a very small number of areas in the UK where only primary treatment occurs (including Kirkwall, Lerwick and Stornoway) and any problematic sewage overflow could lead to exposure in the marine environment for vulnerable species.

The other potential routes of transmission between humans and seals include situations where humans handle seals, including rehabilitation and research. SMRU is the only research group in the UK with a Home Office licence to capture and handle wild seals and there have been very limited fieldwork activities involving seal handling since the beginning of the pandemic. The only seal handling that has been carried out since the beginning of the pandemic was a recent trip to tag grey seal weaned pups at the Monachs in the Outer Hebrides at the end of October 2021. All SMRU personnel underwent regular testing before the field trip to ensure they were negative for the virus and no members of the team

[17] https://informatics.sepa.org.uk/RNAmonitoring/

were knowingly exposed to coronavirus during the trip. Samples were taken from the tagged seals (n=50) for other purposes that could allow screening for the presence of SARS-CoV-2. Similarly, samples could be taken in future seal catching trips planned in 2022.

Several animal welfare organisations routinely bring seals into rehabilitation centres, particularly during and following the breeding season when seal pups are found by members of the public. The historical risk of influenza transmission means that such sites should already have protocols in place to prevent transmission of respiratory viruses. It may be prudent to ensure that protocols are in place to reduce the risk of transmission and to swab any handled animals for subsequent testing to provide further data on the prevalence of the virus in the wild seal population.

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**ANNEX I Terms of Reference**
**NERC Special Committee on Seals**

Terms of Reference
1. To undertake, on behalf of Council, the provision of scientific advice to the Scottish Government and the Home Office on questions relating to the status of grey and harbour seals in British waters and to their management, as required under the Conservation of Seals Act 1970, Marine Coastal and Access Act 2009 and the Marine (Scotland) Act 2010.
2. To comment on SMRU's core strategic research programme and other commissioned research, and to provide a wider perspective on scientific issues of importance, with respect to the provision of advice under Term of Reference 1.
3. To report to Council through the NERC Chief Executive.

**Current membership**

| | |
|---|---|
| Dr M. Hammill (Chair) | Maurice Lamontagne Institute, Canada. |
| Dr C.E. Sparling | Sea Mammal Research Unit, University of St Andrews. |
| Dr J. Wilson | Marine Scotland, Science, Aberdeen. |
| Dr M. Biuw | Institute of Marine Research in Norway. Tromso. |
| Dr G. Engelhard | Centre for Environment Fisheries and Aquaculture Science, Lowestoft |
| Professor B. Wilson | Scottish Association for Marine Science, Dunstaffnage, Oban |
| Dr J. London | National Marine Mammal Lab. Seattle. |
| Dr K. Bennett | Abertay University, Dundee. |
| Dr O. Ó Cadhla | National Parks and Wildlife Service, Ireland. |
| Dr K. Frior (Secretary) | UKRI Natural Environment Research Council, Swindon. |

**ANNEX II Questions to SCOS.**

## Questions from Marine Scotland

Organisation: *Scottish Government*

**Scottish Government Questions – Special Committee on Seals – 2021**

| Question No. | Question | Driver/rational behind question(1-2 sentences) |
|---|---|---|
| | **Advice on the status of seal populations in Scotland** | |
| 1 | What are the latest estimates of the number of grey and harbour seals in Scottish waters? | General update on the estimated numbers of grey seals and harbour seals in Scottish waters. |
| 2 | What is the latest understanding about the population structure, including survival, reproduction and age structure, of grey and harbour seals in European and Scottish waters? | Information about the structure or make up of these populations that might assist management measures. |
| 3 | What are the latest SAC relevant count/pup production estimates for the harbour and grey seal SACs, together with an assessment of trends within the SAC relative to trends in the wider seal management unit/pup production area? | To provide current SAC specific estimates/trends for consideration in HRA assessments. |
| 4 | The frequency of grey seal surveys in some areas of Scotland are likely to be reduced in future years. Can SCOS advise on what a reduction in survey effort would mean in terms of the confidence of population estimates? | Information on what a reduction in grey seal surveys will mean for population estimates. |
| 5 | Are there any technologies (existing or new/emerging) that could be considered as an alternative to aerial surveys that could help meet Net Zero aspirations, or does the method currently used remain the most appropriate vehicle? | Considering whether lower impact vehicles could be used to survey seal populations. |
| 6 | In 2019, SCOS advised that scientifically informed criteria where required to establish whether seal conservation areas should be introduced or revoked. Can SCOS advise on what such criteria should consist? | Scientific information to review the current protection measures for harbour seals (seal conservation areas). |

| | | |
|---|---|---|
| | In the absence of such criteria, but noting current population trends, can SCOS advise whether the threat to seal populations still remains in current seal conservation areas, particularly the Western Isles. | |
| 7 | Are there any parts of the wider ecosystem that are likely to experience significant impacts as a result of an increasing Scottish seal population? What are these impacts and would they be positive or negative? | To inform consideration of the potential impacts of grey and harbour seals on the wider ecosystem, and marine industries including aquaculture. |
| 8 | Based on distribution and demographics of seal populations, can SCOS advise whether it would be possible predict times and locations where there may be a greater chance of interactions with the aquaculture industry? Please can SCOS advise what work would be required to achieve this. | Seal populations in Scotland are increasing, resulting in greater interactions with marine users. It is possible predict where the greatest issues (interactions) may occur? |
| | **Harbour seal decline** | |
| 9 | Please could SCOS provide an update on the regional harbour seal declines, including current and projected trends. | Information on the latest trends in local harbour seal populations around Scotland to inform management measures. |
| 10 | In the 2020 advice, SCOS provide a view on the current potential (major) drivers of the harbour seal decline and their status. Can SCOS provide an updated assessment in light of ongoing work?<br><br>Furthermore, could SCOS provide a view on whether the observed declines occurring in the south east of England could assist with providing answers to the situation in Scotland? | Seeking clarity on the potential drivers that require further effort, in order to consider the need for any conservation and management measures |
| 11 | Can SCOS review, present and provide a view on the available evidence on the differences in genetics between the declining and the stable/increasing harbour seal populations. | As above. |
| | **Potential Biological Removal** | |
| 12 | Please provide updated Potential Biological Removals (PBRs) figures for 2021? | This seeks an update on the PBR figures to inform licensing decisions. |
| | **Marine Renewable Energy** | |
| 13 | Scottish Government are aware of (recent) incidents involving seals becoming trapped and drowning in structures associated with fixed offshore wind developments. Are SCOS aware of such events, and if so, | To determine the occurrence and potential cause of seal mortality in tubes at offshore renewable installations and the potential for other marine installations (e.g., oil and gas and renewable energy structures) to pose a similar risk. |

| | | |
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| | what structures were the cause, and can SCOS provide any information on the prevalence of these events?<br>Furthermore, based on what we know from these events, what other marine structures could pose a similar risk to seals? Can any lessons be learned from other offshore industries or other regions outside of the UK with respect to mitigating and monitoring such events? | |
| 14 | There are known knowledge gaps associated with seals with respect to potential impacts in relation to underwater noise and collision risk with tidal turbines, for example. With these and other knowledge gaps in mind, can SCOS provide an update on emerging technologies they are aware of that could be used for quantifying seal behaviour and/or physiology (e.g., developments in animal borne sensors such as fNIRS). | Whether there are any other emerging technologies that could be used to quantify seal behaviour. Information should include a summary of the aims and capabilities of the technology, Technology Readiness Levels and timelines for commercialisation if not already on the market, estimated costs and constraints, and logistical considerations. |
| | **Seal – fisheries interactions** | |
| 15 | SCOS provided advice in 2020 on non-lethal options to address seal – fisheries / fish farm interactions. Since the 2020 advice (and in light of ongoing efforts globally to address such interactions), are SCOS aware of any further developments in other countries or emerging technologies that could be consider/applied to Scotland. | Seeking an update on whether there are any emerging seal control technologies since the 2020 advice that we can advise industry to consider using for seal control in the absence of lethal measures. |
| 16 | What are the latest estimates of seal (grey and harbours) bycatch across fisheries in Scotland and the wider UK? Are there particular seasonal and / or geographical hot spots of high seal bycatch? Are there any areas where it has not been possible to collect seal population/bycatch data, but where there is a potential risk? | To understand the potential for impact of bycatch on seal populations and inform any future requirement for monitoring. |
| | **Seal haul out sites** | |
| 17 | SCOS previously advised a five year cycle for reviewing the list of designated haul out sites. Does SCOS consider that this is the most appropriate time frame for reviewing seal haul sites based on the survey data and rate of change in the population? | To assist with reviewing the seal haul out sites, we need to consider the most appropriate time frame which will be determined by the survey data. |
| | **Seal usage maps** | |
| 18 | Please could SCOS recommend the most appropriate at sea abundance and distribution data source for use in licensing applications and planning activities (both renewables and major infrastructure). Where such data | The updated usage maps only provide relative densities, but absolute densities are required for use in licensing casework. |

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| | sources provide relative density, could SCOS please advise on an appropriate method to convert to absolute density. | |

**Questions supplied by Defra & compiled by Lara Turtle &** ***Victoria Bendall (Defra), Ophelie Humphrey & Claire Ludgate (NE), Roma Banga (JNCC) and Rachel Wright (MMO).***

| Question No. | Seal Population & Management Questions: Required by policy and conservation advisors to be reviewed, summarised & updated annually if new information available. | Policy Driver/rational behind question: |
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| **1** | **Seal Population Estimates:**<br>What are the latest estimates of the number of grey and common/harbour seals in English waters and what are the latest figures based upon (e.g., level of coverage, timings, and occurrences of aerial surveys)?<br><br>Are trends in common/harbour seal abundance considered to be declining in English waters and if so, what are the potential influencing factors and where is further research needed?<br><br>Can SCOS advise at what point a decline in grey or common/harbour seal abundance would trigger a change in Natural England's Conservation Objectives for SAC's from "maintain" to "restore"? | General update on information regularly provided by the Committee in previous years but relating to seals in English waters.<br><br>Counts of the harbour seal population in The Wash from 2019-2020 have revealed a 20-30% decline. Natural England need to ensure that their advice reflects the most recent scientific evidence on the population. |
| **2** | **Seal Population Structure:**<br>What is the latest information about the population structure, including mortality, age and sex structure, and carrying capacity of grey and common/harbour seals in English waters?<br>Is there any new evidence of grey or common/harbour seal populations or sub-populations specific to localised/regional areas? | General update on information regularly provided by the Committee in previous years relating to seals in English waters. There is a need for greater understanding in occurrences of localised/regional populations, to allow for more targeted conservation and management measures.<br>Defra would therefore be interested to learn more on recent population DNA research studies to highlight Conservation Management Areas (e.g., PhD research project by Kristina Steinmetz) |
| **3** | **OSPAR Population Indicators:**<br>Can SCOS provide advice on current analytical methods being conducted by SMRU to help inform UK assessments for OSPAR M3 & M5 indicators? | For the UK, the assessments require monitoring grey seal pup production, estimating total grey seal population size from the |

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| | | pup production data and monitoring harbour seal abundance during the annual moult.<br>Defra and JNCC are aware that SMRU are currently analysing these assessments which will be reviewed by OSPAR's Biodiversity Committee (BDC) in 2022 before being integrated into the OSPAR Quality Status Report (QSR2023) and subsequent MSFD Biodiversity Descriptor reporting.<br>We are therefore keen to gain understanding by SCOS on current analytical methods being used to help inform future assessments. |
| **4** | **Seal Management Units (MUs):**<br>Can SCOS review and comment on the biological management perspective of seal management units proposed by the Inter-Agency Marine Mammal Working Group (IAMMWG)? | JNCC are undertaking a review of cetacean and seal MUs in 2020-2021. These units are presently being reviewed internally by JNCC based on previous 2019 SCOS advice and are due to be finalised for the IAMMWG at the end of June 2021.<br>As far as possible, the management units defined have been based on the presence of known populations, with divisions proposed on the basis of ecological evidence and/or divisions used for the management of human activities. Therefore, whilst being consistent with the best biological understanding, a MU refers to the animals of a particular species in a geographical area to which management of human activities is also applied. As such, these MUs comprise partially artificial divisions of biological populations. |
| **Question No.** | **Seal Protection & Conservation Questions:**<br>**Required by policy and conservation advisors to be reviewed, summarised & updated annually if new information available.** | **Policy Driver/rational behind question:** |
| **5** | **Seal SSSI Guidance:**<br>Could SCOS please advise on the locations of the top two breeding sites and top two haul out sites for both harbour seal and grey seal in each Seal Management Unit? Could SCOS also comment on whether the top two sites have been consistent over the last 5 years, or whether there is interannual variability? | The current guidance for notifying SSSIs for seals states that the top two breeding sites and the top two haulout sites in each 'stock' (now SMU) can be notified as a SSSI.<br>Defra and Natural England are currently reviewing the possibility of notifying further SSSIs for seals, to improve seal protection and reduce disturbance at important seal sites. |

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| | Does SCOS have any recommendations of other approaches to improve overall protection for populations at risk through the use of SSSI's?<br>Can SCOS please advise on how best to determine the "vulnerability of sites" for seals? | We appreciate that there may be caveats to the answer, for example where SMUs populations are too small, where local organisations may hold the data, or colonies where counts have not been counted annually etc. |
| **6** | **Population-level consequences of disturbance in seals**<br>Can SCOS advise whether repeated disturbance to seals (such as repeated flushing into the water) could potentially lead to a population-level effect?<br><br>Can SCOS review current guidance for anthropogenic related seal disturbance and determine whether different categorised thresholds for land (public at beach haul outs), sea (by boat and water sports) and air (use of aerial drones), could be usefully calculated from NGO monitoring data and implemented to help reduce disturbance.<br><br>Could SCOS please advise what data should be collected, at a minimum, on disturbance events? This would help to inform a standardised approach should a nationwide reporting and threshold system for recording disturbance events be developed. | Defra and Natural England are aware of datasets held by some regional NGO's on the frequency of disturbance events to seals.<br><br>Similar data may be held by other organisations and could be collated and analysed. Having thresholds would help to determine whether disturbance was an issue and required further attention.<br><br>[In response to a request in 2020, SCOS noted that there was no formal or co-ordinated nationwide reporting system for recording disturbance events. They then note that local site managers and NGOs have developed their own guidance and, in some cases, monitor disturbance events. ] |
| **Question No.** | **Fisheries Interaction Questions:<br>Required by policy and conservation advisors based upon latest emerging issues for seals** | **Policy Driver/rational behind question:** |
| **7** | **Non-lethal seal mitigation measures in commercial fisheries:**<br>Can SCOS provide recommendations on what the latest non-lethal mitigation devices, gear modifications and measures are to minimise seal depredation in commercial fisheries? | Based upon recent government action to prevent the intentional or reckless killing of seals in English, Welsh and Northern Irish waters as a result of commercial fishing under Fisheries Act 2020, which became effective from 1st March 2021.<br>Defra and MMO are looking to work with industry on non-lethal seal deterrents which warrant further research and development for UK fisheries during 2021 - 2022.<br>Defra and MMO are proposing to extend previous studies undertaken in 2019 (MMO report on non-lethal seal |

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| | | deterrents) by testing Acoustic Startle Devices in other areas/with other gears.<br>We therefore require SCOS to help identify any new device(s) and/or practises that we can advise industry to use for non-lethal seal control. |
| **8** | **Seal Bycatch monitoring requirements:**<br>What is the latest understanding on levels of seal bycatch across the UK? Where is seal bycatch considered to predominantly occur by region and gear type and is there any data to show any bias be seal species, sex or specific age groups? | Understanding levels of incidental wildlife bycatch in commercial fisheries is vital for improved clean catch fisheries management measures. It is important that we understand the scale and distribution of the problem so we can look at appropriate mitigating measures, if needed, particularly in light of recent amendments under Fisheries Act 2020.<br>Defra are currently working with industry, scientists and eNGOs on "Clean Catch UK: Joint Action to Reduce Wildlife Bycatch", a forward-looking national approach to monitoring and mitigating bycatch in the UK – driven by the Fisheries Act 2020 and new National Plans of Action for reducing bycatch of sensitive species.<br>As of 1st April 2021, Defra also let a new 10-year contract to the Cetacean Strandings Investigation Programme (CSIP) to annually report on threats to cetaceans through carrying out post-mortems with the aim of broadening it's the scope to other vulnerable marine species such as grey and common/harbour seals.<br>We therefore require SCOS to help identify what the current gaps in scientific knowledge are for seal bycatch and how best to collect additional information to provide valuable evidence of the current issue in commercial fisheries. |
| **9** | **Seal Depredation in commercial fisheries:**<br>Can SCOS advise on the latest information available to provide evidence of seal depredation in the UK?<br>Can SCOS advise on new research that could be undertaken to best to collect robust data on this important issue of concern within UK commercial fisheries? | We have seen increasing complaints from the fishing industry of seal depredation for large percentages of catch reported.<br>There are now heightened animal welfare concerns around such interactions between fishers and seals and any intentional or reckless killing of seals by fishers, in light of recent Fisheries |

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| | | Act 2020 amendments to remove the 'Netsman's Defence' and ability to apply for a licence to shoot seals. |
| **Question No.** | **Emerging Issues Questions: Required by policy and conservation advisors based upon latest emerging issues for seals** | **Policy Driver/rational behind question:** |
| **10** | **Post-mortems of seals:**<br>If funding became available to undertake post-mortems on a limited number of seals in England, could SCOS please advise on which strandings should be the top priority to investigate? For example, which apparent causes of death, which species, age class, location etc. Could additional post-mortems be of benefit to our understanding of wider issues e.g., on the decline in The Wash harbour seal population, for example?<br><br>Can SCOS advice on recent observations of 'mouth rot' (e.g., swollen muzzles; open wounds and oral ulcerations that can lead to bone exposure, bone necrosis and potentially septicaemia and death), an unknown disease that appears to be affecting harbour seal pups on the east coast of England? Specifically, what data should be recorded to enable and enhance further investigations? Do SCOS consider that this disease should be taken into account during the investigation of the harbour seal decline in the Wash? | Defra and Natural England have received a proposal outlining the indicative costs of undertaking a limited number of post-mortems on seals. Necropsies could be a useful source of information on wider issues e.g., the decline in The Wash population of harbour seals, or physiological effects of repeated disturbance in the southwest.<br><br>Data on cases of the 'mouth rot' disease have not been routinely collected to date and it would be beneficial to ensure the right data is collected going forward to ensure appropriate investigations can be undertaken. It would also be useful to know if this may be a contributory factor to the decline of harbour seals in the Wash. |
| **11** | **Impacts on seals from plastic and other marine pollution:**<br>Can SCOS review and provide an update on any new studies looking into how macroplastics, microplastics, chemical pollution (including but not exclusively pharmaceutical drugs flushed into water systems), Abandoned, Lost or otherwise Discarded Fishing Gear (ALDFG) and other marine pollution are affecting seal populations? What research is specifically required to help fill data gaps and evidence base in this area? How could impacts of plastic pollution be usefully picked up in part under reporting of strandings and post-mortem work by CSIP? | Due to various microplastics, macroplastics, chemical and other pollutants having a significant negative effect on marine life, it is important to understand how such pollution has and is affecting seal populations.<br>Defra policy requests SCOS recommendations on how to increase our understanding and improve monitoring within this area. |
| **12** | **Impacts on Seals through climate change:**<br>Can SCOS review latest scientific information available on current environmental impacts seals face due to climate change, such as acidification, sea level changes and coastal collapses and changing prey distributions. | Due to climate change having a significant negative effect on marine life, it would be important to understand how climate change has and is affecting seal populations. |

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| | | Defra policy requests SCOS recommendations on how to increase our understanding and improve monitoring within this area. |
| **13** | **Holistic review of factors impacting health and welfare of seals:**<br>Can SCOS review and collate the latest scientific information available on current environmental impacts seals face with a best assessment of the relative levels of risk posed by each impact? | As the marine environment is being impacted by multiple issues that also act cumulatively, it is important to be aware of the big picture context within which seals exist and are impacted. Understanding the relative importance of each impact can help drive future policy priorities.<br>Defra policy requests SCOS recommendations on how to increase our understanding and improve monitoring within this area. |

**Questions supplied by Natural Resources Wales**

| Question No. | Question | Driver/rational behind question(1-2 sentences) |
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| 1 | What are the latest estimates and trends for grey seals in the UK? | Please provide the estimated pup production by region and the resulting population size for grey seals, including in Wales and south western British Isles, including Ireland. Also see question 3. |
| 2 | What are the latest bycatch estimates for grey seals in the UK, especially Southwestern British Isles, including Ireland? | Understanding the level of bycatch is necessary for NRW to provide up-to-date advice to marine planning authorities and developers on the likely effects of potential seal collisions and other anthropogenic removals, in relation to the PBR for grey seals in SW British Isles. NRW use a wide spatial scale to represent a biologically and management appropriate grey seal management unit and encompasses the Celtic Sea, Irish Sea and English Channel and includes Southwestern and eastern Irish waters and the sea area off North West France. Knowledge of bycatch estimates in these areas is required. |
| 3 | Could SCOS provide advice on the most appropriate multiplier to use when estimating an all age population size from pup production in the Southwestern British Isles (including Ireland) region. | It is often desirable to estimate total population size of grey seals in the region (SW British Isles and adjacent Seas – inc. Ireland) from pup production estimates using a simple multiplier eg Hewer (1964) life tables, ratio of pups to adults in monitored colonies/well parameterised models etc. However, the multipliers used in the literature related to this geographical region ranges from a 2.5 to 4.5. (see Baines *et al* 1995; Cronin *et al* 2007; O'Cadhla *et al* 2013; Stringell *et al* 2014)<br><br>Baines M.E., Earl S.J., Pierpoint C.J.L. and Poole J. (1995) The west Wales grey seal census. CCW Contract Science Report, no. 131, 238 pp.<br><br>Cronin M.A., Duck C.D. and O'Cadhla O. (2007) Aerial surveying of grey seal breeding colonies on the Blasket Islands, Co. Kerry, the Inishkea Group, Co. Mayo and the Donegal Coast, Ireland. Journal for Nature Conservation 15, 73–83.<br><br>Ó Cadhla, O., Keena, T., Strong, D., Duck, C. and Hiby, L. (2013) Monitoring of the breeding population of grey seals in Ireland, 2009 - 2012. Irish Wildlife Manuals, No. 74. National Parks and Wildlife Service, Department of the Arts, Heritage and the Gaeltacht, Dublin, Ireland.<br><br>Stringell TB, Millar CP, Sanderson WG, Westcott SM, McMath MJ. (2014). When aerial surveys will not do: grey seal pup production in cryptic habitats of Wales. Journal of the Marine Biological Association of the United Kingdom. 94 (6): 1155-1159. |

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| 4 | What is the current state of knowledge on grey seal interactions with tidal energy devices? | Knowledge of the latest information about interactions and behaviours of grey seals around operational tidal stream installations is key to assessing consenting risk for the tidal industry in Wales. Please can SCOS highlight any new information and summarise the status of present empirical knowledge on grey seal interactions with tidal turbines. |
| 5 | Can SCOS recommend what the most appropriate avoidance rates should be in collision risk models or encounter rate models for grey seals and tidal turbines? | When assessing the predicted risk of collisions with tidal turbines through encounter rate or collision risk modelling, a single avoidance rate/factor is applied, which ranges from 0 to 100%. This single factor typically incorporates near-field evasion and far-field avoidance. For marine birds, an avoidance rate of 98% is often used. Given the lack of empirical information on avoidance rates in marine mammals, existing guidance (SNH 2016) recommends a range of avoidance rates are used to generate a range of estimates. Can SCOS recommend what the most appropriate avoidance rate should be for grey seals around tidal turbines?<br><br>Scottish Natural Heritage (2016) 'Assessing collision risk between underwater turbines and marine wildlife'. SNH guidance note. Guidance Note - Assessing collision risk between underwater turbines and marine wildlife.pdf (nature.scot) |

## ANNEX III Briefing Papers for SCOS

The following briefing papers are included to ensure that the science underpinning the SCOS Advice is available in sufficient detail. Briefing papers provide up-to-date information from the scientists involved in the research and are attributed to those scientists. Briefing papers do not replace fully published papers. Instead, they are an opportunity for SCOS to consider both completed work and work in progress. It is also intended that briefing papers should represent a record of work that can be carried forward to future meetings of SCOS.

**List of briefing papers**

# Grey seal pup production in Britain in 2019

Chris D. Morris, Nick Riddoch and Callan D. Duck

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**Abstract**

In the 2019 grey seal breeding season, SMRU successfully surveyed over 65 of the main grey seal breeding colonies in Scotland. Grey seal pups born at four colonies in England were ground-counted by staff from the National Trust, Lincolnshire Wildlife Trust and Natural England.

Using the standard pup production model run (0.9 for proportion of moulters correctly classified, 23.0 days for mean time to fully moulted and 31.5 days for mean time to leave), pup production at the Inner Hebrides colonies was estimated to be **4,455**, slightly lower than the 2016 estimate of 4,541. Pup production at colonies in the Outer Hebrides was **16,083** (15,732 in 2016), in Orkney production was **22,153** (23,849 in 2016), in the Firth of Forth production was **7,261** (6,426 in 2016). Total pup production at all of these regularly monitored colonies in Scotland was **49,952** (50,548 in 2016)**.**

At the four main English North Sea colonies, pup production in 2019 was **10,725** compared with 8,213 in 2016 and 6,795 in 2014. Pup production at Blakeney Point continued to increase with an estimated **3,399** pups born in 2019 compared with 2,403 born in 2016. Production at Horsey, East Norfolk has also increased with **2,316** born in 2019 compared with 1,526 born in 2016.

Combining with an estimated additional **4,592** pups born at other colonies in Scotland and England, an estimated **2,250** pups born in Wales, and an estimated **250** pups born in Northern Ireland, the total grey seal pup production for the UK in 2019 was estimated to be **67,789**.

## Introduction

Grey seals breed at traditional colonies, with females frequently returning to the same colony to breed in successive years (Pomeroy *et al*. 2001). Some females return to breed at the colony at which they were born. Habitual use by grey seals of specific breeding colonies, combined with knowledge of the location of those colonies, provides opportunity for the numbers of pups born at the colonies to be monitored.

While grey seals breed all around the UK coast, most (approximately 80%) breed at colonies in Scotland (Figure 1). Other main breeding colonies are along the east coast of England, in south-west England and in Wales. Most colonies in Scotland and north-east England are on remote coasts or remote off-lying islands. Breeding colonies in south-west England and in Wales are either at the foot of steep cliffs or in caves and are therefore extremely difficult to monitor.

Until 2010, SMRU conducted annual aerial surveys of the major grey seal breeding colonies in Scotland to determine the number of pups born. Reductions in funding, combined with increasing aerial survey costs, have resulted in SMRU reducing monitoring the main Scottish grey seal breeding colonies from an annual to a biennial regime. The number of pups born at colonies along the east coast of England has been monitored annually through ground counting by different organisations: National Trust staff count pups born at the Farne Islands (Northumberland) and at Blakeney Point (Norfolk); staff from Lincolnshire Wildlife Trust count pups born at Donna Nook and staff from Natural England (plus volunteers) count pups born at Horsey/Winterton, on the east Norfolk coast.

Due to the increasing in size of these colonies making ground counting more difficult, they were surveyed aerially buy SMRU in 2018 and again in 2021. Scottish Natural Heritage (SNH) staff ground counted grey seal pups born in Shetland.

Restrictions due to COVID-19 precluded any surveying in 2020.

In 2012, SMRU replaced the film-based large-format Linhof AeroTechnika system used since 1985 with a new digital camera system, funded by NERC. Increased numbers of images acquired during a full aerial survey season (approx. 30,000 digital images compared with 6,000 frames) resulted in a delay in completing estimating pup production at all 60+ Scottish colonies.

This Briefing Paper reports on the estimated pup production in 2019 at the main grey seal breeding colonies in the UK.

**Materials and Methods**

SMRU aerially surveys the main breeding colonies around Scotland. Grey seal pups born at colonies in England and Shetland are counted from the ground annually by staff from the National Trust (Farne Islands and Blakeney Point), Lincolnshire Wildlife Trust (Donna Nook) and Natural England (Horsey/Winterton) and by SNH (Shetland).

The numbers of pups born (pup production) at the aerially surveyed colonies in Scotland are estimated from a series of 3 to 6 counts derived from aerial images, using a model of the birth process and the development of pups (Russell *et al.*, 2019). The method used to obtain pup production estimates for 2019 was similar to that used in previous years. A lognormal distribution was fitted to colonies surveyed four or more times and a normal distribution to colonies surveyed three times.

SMRU successfully surveyed all the main grey seal breeding colonies in Scotland (excl. Shetland) between September and December 2016. Four to six surveys of all colonies in the Inner Hebrides, Outer Hebrides, the north coast of Scotland, Orkney, north-east mainland Scotland, and the Firth of Forth were completed.

Paired digital images were obtained from two Hasselblad H4D 40MP cameras mounted at opposing angles of 12 degrees from vertical in SMRU's modified Image Motion Compensating cradle (Figure 2). As previously, a series of transects were flown over each breeding colony, ensuring that all areas used by pups were photographed (Figures 3 and 4). Images were recorded directly onto hard drives, one for each camera. Images on hard drives were downloaded and backed up after each day's survey.

All images were first adjusted for brightness and sharpness using Hasselblad's image processing software, Phocus®. Individual images were then stretched from rectangular to trapezoid to closely match the ground area covered by oblique photographs taken at an angle of 12 degrees (Figure 3). All perspective-corrected images covering one survey of a particular colony were then stitched together to create a single digital image of the entire colony, up to 15GB in size. Images were stitched and exported as PSB files using Microsoft's Image Composite Editor v1.4.4. In a few cases where the stitching software could not stitch all images, such as with images of areas with large differences in ground elevation, images were stitched or adjusted manually using Adobe Photoshop CS5. The final composites were then saved as LZW compressed TIFF files (large images were split if TIFF's 4GB maximum file size was exceeded) and imported into Manifold GIS 8.0 for counting. The imported images were compressed within Manifold to reduce file size without losing too much

image detail. The images were scanned visually in Manifold by an expert and individual pups were marked on a separate layer and classified as whitecoat or moulted pup (Figures 5 and 6).

The pup production model allows different misclassification proportions to be incorporated. Previously, because there was a significant risk of misclassifying moulted pups as whitecoats on the large format film photographs, the pup production model used a fixed value of 50% for the proportion of correctly classified moulted pups. Pups spend a lot of time lying on their back or side and, depending on light conditions during a survey, it is possible to misclassify a moulted pup exposing its white belly as a whitecoat. Misclassification of a whitecoat as a moulted pup is generally less likely.

In Shetland, where pups are counted from the tops of cliffs and misclassification of moulted pups is likely to be low, a correctly classified proportion of 90% was used (SCOS-BP 05/01). Since 2012, the digital images were of sufficient quality to reduce the probability of misclassification, so a proportion of 90% was used as standard for all production estimates since 2012. In line with previous years, the standard mean time to moult of 23.0 days and mean time to leave of 31.5 days were also incorporated into the pup production model.

**Results & Discussion**

The locations of the main grey seal breeding colonies in the UK are shown in Figure 1. In 2019, pup production at the main biennially monitored breeding colonies in Scotland was estimated to be **49,952** compared with 50,548 in 2016, an average annual decline of -0.4% (Table 1).

In 2019, pup production at the annually monitored colonies in England was estimated to be **10,725** compared with 8,213 in 2016, an average annual increase of +9.3% (Table 1). Total pup production estimates since 1960, for the four regions used in the grey seal population model, are given in Table 2 and are plotted in Figure 7.

Including **4,112** pups born at other colonies in Scotland (Table 3), an estimated **450** pups born in south-west England, an estimated **50** pups at smaller sites in east and north-west England, an estimated **2,250** pup born in Wales, and an estimated **250** pups born in Northern Ireland, the total grey seal pup production for the UK in 2019 was estimated to be **67,789** (Table 1).

The plots shown for the Scottish colonies monitored by aerial surveys indicate that there has been a general step increase in the pup production estimates since 2012 when the large format film camera was replaced by two digital cameras.

**Pup production at colonies in the Inner Hebrides**

In 2019, grey seal pup production at 13 colonies the Inner Hebrides was estimated to be **4,455** compared with 4,541 in 2016, an average annual decline of -0.6% (Table 1). Grouped colonies from different parts of the Inner Hebrides show slightly different production trajectories (Figure 8). Breeding colonies in the Inner Hebrides have only been surveyed since the late 1980s, so it is not possible to group them by age of colony.

**Pup production at colonies in the Outer Hebrides**

At 16 colonies in the Outer Hebrides, pup production in 2019 was **16,083** compared with 15,732 in 2016, an average annual increase of +0.7% (Table 1). Grouping colonies in the Outer Hebrides by location and age, reveals different pup production trajectories (Figure 9). Production at older, long

established colonies around the Sound of Harris is declining while production at colonies in the Monach Isles and new colonies at the southern end of the Outer Hebrides has increased.

**Pup production at colonies in Orkney**

At 28 colonies in Orkney, pup production was **22,153** in 2019 compared with 23,849 in 2016, an average annual decline of -2.4% (Table 1). Grouping colonies of similar ages showed that production at the long-established colonies is slowly declining, while several colonies established much later are still increasing slowly (Figure 10).

**Pup production at colonies in the Firth of Forth**

At 4 colonies in the Firth of Forth, pup production in 2019 was **7,261** compared with 6,426 in 2016, an average annual increase of +4.2% (Table 1). Production at Fast Castle continues to increase and it is now the biggest colony in the North Sea (Figure 11). This rapid increase is due to expansion to the south-east towards St Abbs Head and westwards towards Siccar Point.

**Pup production at colonies on the north and north-east coast of Scotland**

At 6 colonies on the north mainland coast of Scotland, pup production in 2019 was **2,465**, compared with an estimated 2,665 born in 2016 (included in 4,192 for other colonies, Table 1). These colonies lie between Helmsdale and Duncansby head in the Moray Firth and at Loch Eriboll and Eilean nan Ron on the north coast of Scotland (Figure 1). The latter two are very close to an active RAF bombing range and access for aerial survey can be restricted when the range is busy.

**Pup production at colonies in east England**

In England in 2019, **10,725** pups were born at the annually monitored colonies on the east coast compared with 8,213 born in 2016, an average annual increase of +9.3% (Table 1). All four colonies have been increasing over the past years, and especially rapidly at Horsey and at Blakeney Point, which remains the biggest colony in England (Figure 12).

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**Table 1**. Grey seal pup production estimates from 2019 compared with production estimates from 2016.

| Location | Pup production in 2019 | Pup production in 2016 | Average annual change 2016 to 2019 |
|---|---|---|---|
| Inner Hebrides | 4,455 | 4,541 | - 0.6% |
| Outer Hebrides | 16,083 | 15,732 | + 0.7% |
| Orkney | 22,153 | 23,849 | - 2.4% |
| Firth of Forth | 7,261 | 6,426 | + 4.2% |
| **Regularly monitored Scottish colonies** | **49,952** | **50,548** | - 0.4% |
| Other Scottish colonies [1] (incl. N & NE mainland & Shetland) | 4,112 | 4,193 | - 0.6% |
| **Total Scotland** | **54,064** | **54,741** | - 0.4% |
| Farne Islands | 2,823 | 2,295 | + 7.1% |
| Donna Nook, Blakeney, Horsey | 7,902 | 5,918 | +10.1% |
| **Annually monitored colonies in eastern England** | **10,725** | **8,213** | + 9.3% |
| SW England [1,2] | 450 | 250 | |
| Small sites in E and NW England [1,3] | 50 | 50 | |
| **Total England** | **11,225** | **8,513** | + 9.7% |
| Wales [1,4] | 2,250 | 1,650 | |
| Northern Ireland [1] | 250 | 150 | |
| **Total UK** | **67,789** | **65,054** | + 1.4% |
| Isle of Man | 69 | 84 | |

[1] Includes estimated production for colonies that are rarely monitored from different years
[2] Includes estimates for Scilly Isles, Lundy, various sites in Devon & Cornwall
[3] Includes Coquet Island, Ravenscar, Scroby Sands, South Walney
[4] Multiplier derived from indicator colonies surveyed in 2004 and 2005 and applied to other colonies last monitored in 1994

**Table 2**. Estimates of grey seal pup production from annually surveyed colonies in the Inner and Outer Hebrides, Orkney and in the North Sea between 1960 and 2016.

| YEAR | Inner Hebrides | Outer Hebrides | Orkney | North Sea | Total |
|---|---|---|---|---|---|
| 1960 | | | 2,048 | 1,020 | |
| 1961 | | 3,142 | 1,846 | 1,141 | |
| 1962 | | | | 1,118 | |
| 1963 | | | | 1,259 | |
| 1964 | | | 2,048 | 1,439 | |
| 1965 | | | 2,191 | 1,404 | |
| 1966 | | 3,311 | 2,287 | 1,728 | 7,326 |
| 1967 | | 3,265 | 2,390 | 1,779 | 7,434 |
| 1968 | | 3,421 | 2,570 | 1,800 | 7,791 |
| 1969 | | | 2,316 | 1,919 | |
| 1970 | | 5,070 | 2,535 | 2,002 | 9,607 |
| 1971 | | | 2,766 | 2,042 | |
| 1972 | | 4,933 | | 1,617 | |
| 1973 | | | 2,581 | 1,678 | |
| 1974 | | 6,173 | 2,700 | 1,668 | 10,541 |
| 1975 | | 6,946 | 2,679 | 1,617 | 11,242 |
| 1976 | | 7,147 | 3,247 | 1,426 | 11,820 |
| 1977 | | | 3,364 | 1,243 | |
| 1978 | | 6,243 | 3,778 | 1,162 | 11,183 |
| 1979 | | 6,670 | 3,971 | 1,620 | 12,261 |
| 1980 | | 8,026 | 4,476 | 1,617 | 14,119 |
| 1981 | | 8,086 | 5,064 | 1,531 | 14,681 |
| 1982 | | 7,763 | 5,241 | 1,637 | 14,641 |
| 1983 | | | | 1,238 | |
| 1984 | 1,332 | 7,594 | 4,741 | 1,325 | 14,992 |
| 1985 | 1,190 | 8,165 | 5,199 | 1,711 | 16,265 |
| 1986 | 1,711 | 8,455 | 5,796 | 1,834 | 17,796 |
| 1987 | 2,002 | 8,777 | 6,389 | 1,867 | 19,035 |
| 1988 | 1,960 | 8,689 | 5,948 | 1,474 | 18,071 |
| 1989 | 1,956 | 9,275 | 6,773 | 1,922 | 19,926 |
| 1990 | 2,032 | 9,801 | 6,982 | 2,278 | 21,093 |
| 1991 | 2,411 | 10,617 | 8,653 | 2,375 | 24,056 |
| 1992 | 2,816 | 12,215 | 9,854 | 2,436 | 27,321 |
| 1993 | 2,923 | 11,915 | 11,034 | 2,710 | 28,582 |
| 1994 | 2,719 | 12,054 | 11,851 | 2,652 | 29,276 |
| 1995 | 3,050 | 12,713 | 12,670 | 2,757 | 31,190 |
| 1996 | 3,117 | 13,176 | 14,531 | 2,938 | 33,762 |
| 1997 | 3,076 | 11,946 | 14,395 | 3,698 | 33,115 |
| 1998 | 3,087 | 12,434 | 16,625 | 3,989 | 36,135 |
| 1999 | 2,787 | 11,759 | 15,720 | 3,380 | 33,646 |
| 2000 | 3,223 | 13,472 | 16,546 | 4,303 | 37,544 |
| 2001 | 3,032 | 12,427 | 18,196 | 4,159 | 37,814 |
| 2002 | 3,096 | 11,248 | 17,952 | 4,520 | 36,816 |

| YEAR | Inner Hebrides | Outer Hebrides | Orkney | North Sea | Total |
|---|---|---|---|---|---|
| 2003 | 3,386 | 12,741 | 18,652 | 4,870 | 39,649 |
| 2004 | 3,385 | 12,319 | 19,123 | 5,015 | 39,842 |
| 2005 | 3,427 | 12,397 | 18,126 | 5,232 | 39,182 |
| 2006 | 3,501 | 11,719 | 19,335 | 5,463 | 40,018 |
| 2007 | 3,118 | 11,342 | 19,184 | 5,780 | 39,424 |
| 2008 | 3,317 | 12,279 | 17,813 | 6,501 | 39,910 |
| 2009 | | 11,887* | 18,548 | 7,384 | 41,136 |
| 2010 | 3,108 | 11,831 | 18,562 | 8,160 | 41,661 |
| 2011 | | | | | |
| 2012 | 4,088 | 14,134 | 22,920 | 10,205 | 51,347 |
| 2013 | | | | | |
| 2014 | 4,054 | 14,331 | 23,777 | 12,655 | 54,817 |
| 2015 | | | | | |
| 2016 | 4,541 | 15,732 | 23,849 | 14,639 | 58,761 |
| 2017 | | | | | |
| 2018 | | | | 16,845 | |
| 2019 | 4,455 | 16,083 | 22,153 | 17,986 | 60,677 |

*2008 production estimates were used as a proxy for seven colonies in the Outer Hebrides for which new production estimates could not be derived in 2009.

The following new colonies were first included in the regional total in the year given in parentheses:

*Inner Hebrides*: Oronsay (2001); Oronsay Strand (2005); Soa (Coll) (2012)

*Outer Hebrides*: Berneray & Fiaray (1998); Mingulay (2003); Pabbay (2005); Sandray W (2010); Sandray NE&SE (2019)

*Orkney*: South Ronaldsay E&W (1991); Calf of Eday & Copinsay (1993); Stronsay Sty Taing (1994); Calf of Flotta (1996); Sule Skerry (1997); Fara (1999); N Flotta & Westray S (2003); Rothiesholm Head (2005); NE Hoy (2008); Hacks Ness (2016)

*North Sea*: Fast Castle (1997); Inchkeith (2003); Craigleith (2004)

**Table 3**. Estimates of grey seal pup production from irregularly surveyed colonies around Scotland.

| Region | Location | Survey method | Last surveyed | Most recent count |
|---|---|---|---|---|
| **Inner Hebrides** | LochTarbert, Jura | SMRU visual | 2007 | 4 |
| | Treshnish small islands & Dutchman's | SMRU photo & vis | 2010 | ~20 |
| | Staffa | SMRU visual | 2008 | ~5 |
| | Little Colonsay, by Ulva | SMRU visual | 2008 | 6 |
| | Meisgeir, Mull | SMRU visual | 2008 | 1 |
| | Craig Inish, Tiree | SMRU photo | 2005 | 2 |
| | Cairns of Coll | SMRU photo | 2008 | 10 |
| | Muck | SMRU photo | 2005 | 18 |
| | Rum | SNH ground | 2013 | 15 |
| | Canna | SMRU photo | 2005 | 25 |
| | Ascrib Islands, Skye | SMRU photo | 2008 | 64 |
| | Fladda Chuain, North Skye | SMRU photo | 2019 | 262 |
| | Trodday, NE Skye | SMRU photo | 2008 | 55 |
| | Summer Isles | SMRU photo | 2010 | ~60 |
| | Islands close to Handa | SMRU visual | 2009 | 10 |
| **Outer Hebrides** | Sound of Harris islands | SMRU photo | 2008 | 296 |
| | St Kilda | NTS reports | rare | ~5 |
| **North Mainland** | Loch Eriboll & Whiten Head | SMRU photo | 2019 | 536 |
| | Eilean nan Ron, Tongue | SMRU photo | 2019 | 73 |
| **Orkney** | Fers Ness, Eday | SMRU photo | 2019 | 21 |
| **Shetland** | Various sites | SNH ground | 2012 | 761 |
| **NE Mainland** | Duncansby Head to Helmsdale | SMRU photo | 2019 | 1,856 |
| **Firth of Forth** | Inchcolm | Fife Seal Group | 2019 | 7 |
| **Total** | **Other Scottish colonies** | | **to 2019** | **4,112** |

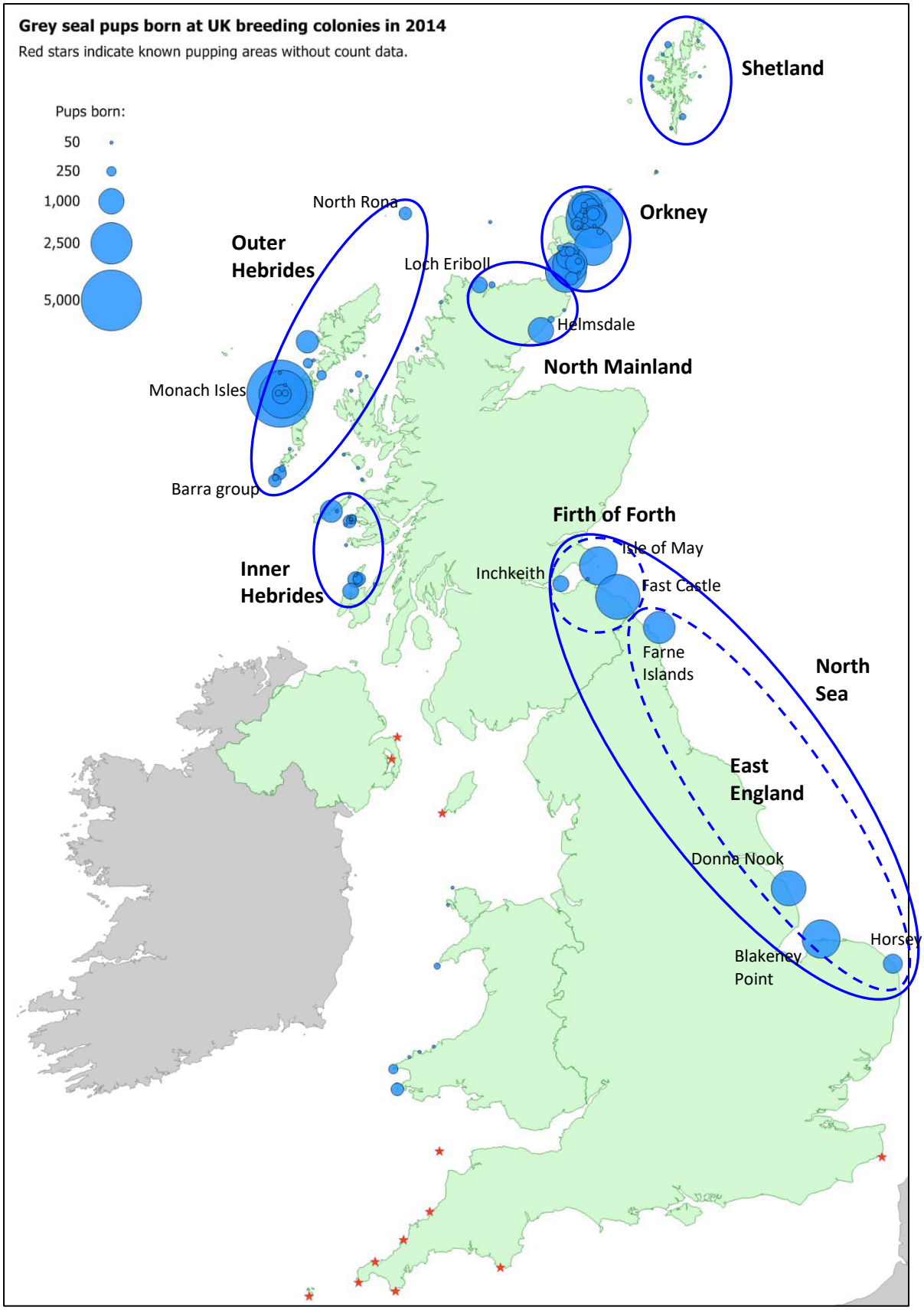


**Figure 1**. Pup production at the main grey seal breeding colonies in the UK in 2014. Smaller numbers of grey seals will breed at locations other than those indicated here, including in caves.

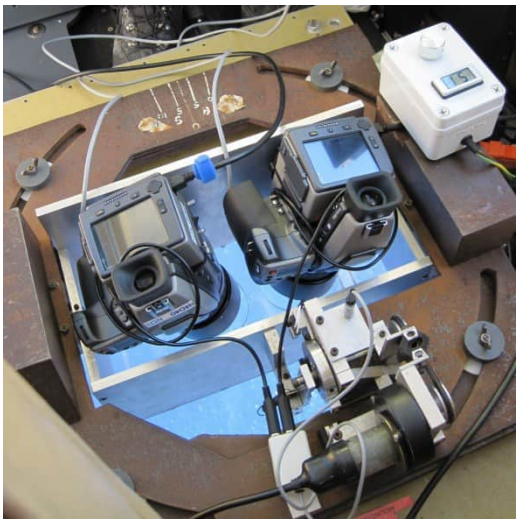

**Figure 2**. Two Hasselblad H4D-40 medium format cameras fitted in SMRU's Image Motion Compensation (IMC) mount. Each camera is set at an angle of 12 degrees to increase strip width. The cradle holding the cameras rocks backwards and forwards during photo runs. Rocking speed is set depending on the altitude and the ground speed of the aircraft. The camera shutters are automatically triggered and an image captured every time the cameras pass through the vertical position on each front-to-back pass. Images are saved directly to a computer as 60MB Hasselblad raw files and can be instantly viewed and checked using a small LED screen. The H4D-40 can take up to 40 frames per minute allowing for ground speeds of up to 130kts at 1100ft (providing 20% overlap between consecutive frames). The resulting ground sampling distance is approximately 2.5 cm/pixel.

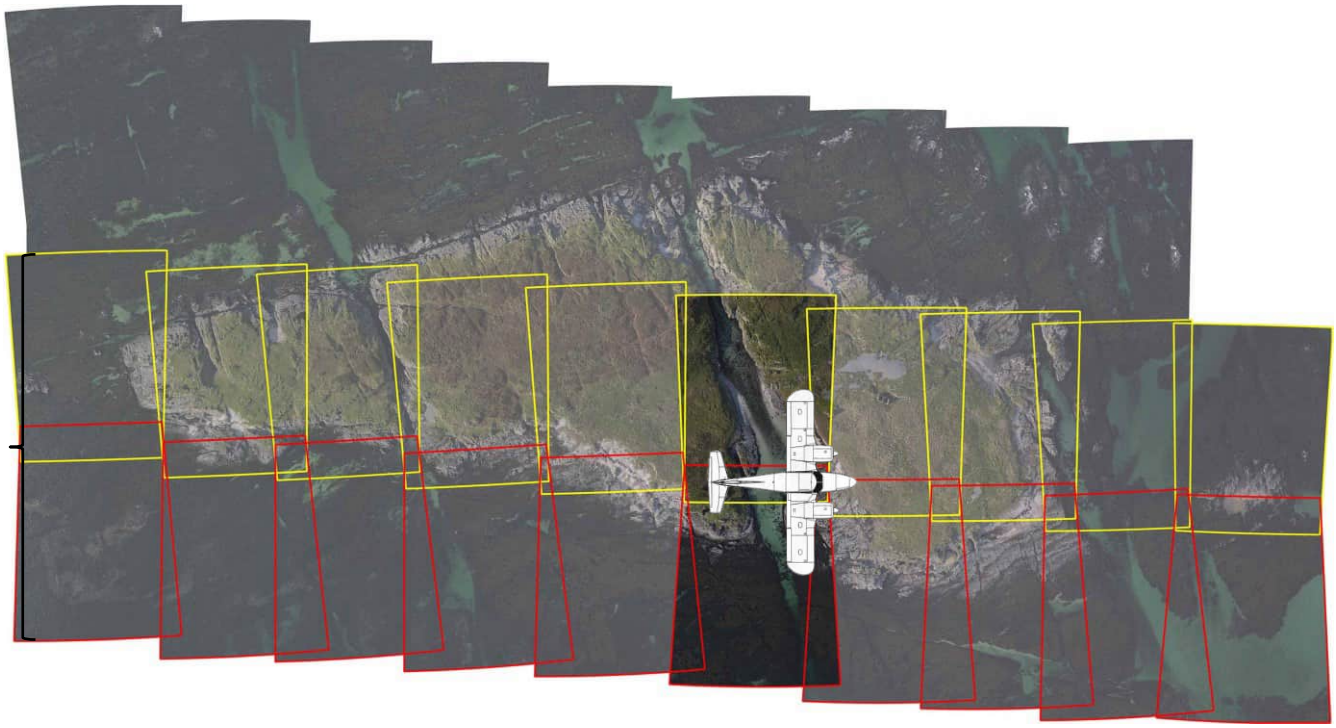

**Figure 3**. The individual footprints of each pair of photographs taken on a run over Eilean nan Ron, off Oronsay in the Inner Hebrides, flying at 1,100ft (red: left-hand camera; yellow: right-hand camera).

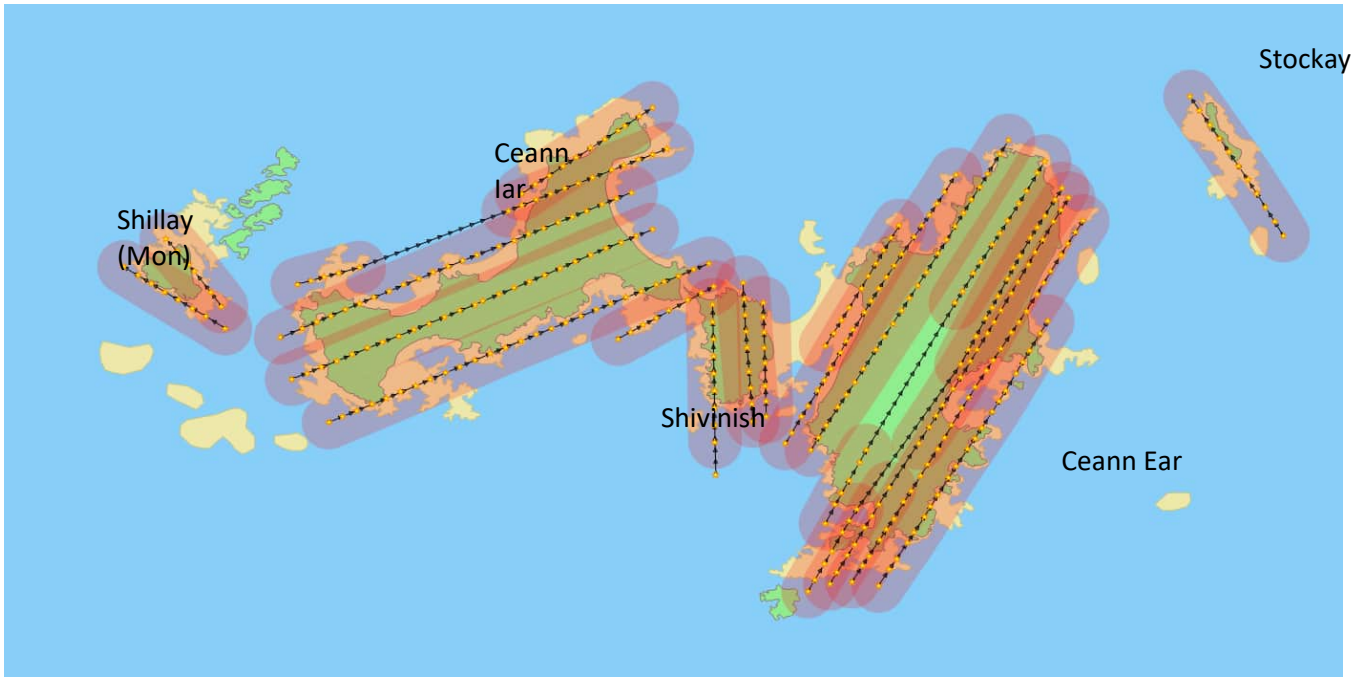


**Figure 4**. Survey runs and approximate camera trigger locations (yellow dots) for five colonies in the Monach Isles in the Outer Hebrides on 26 October 2012.

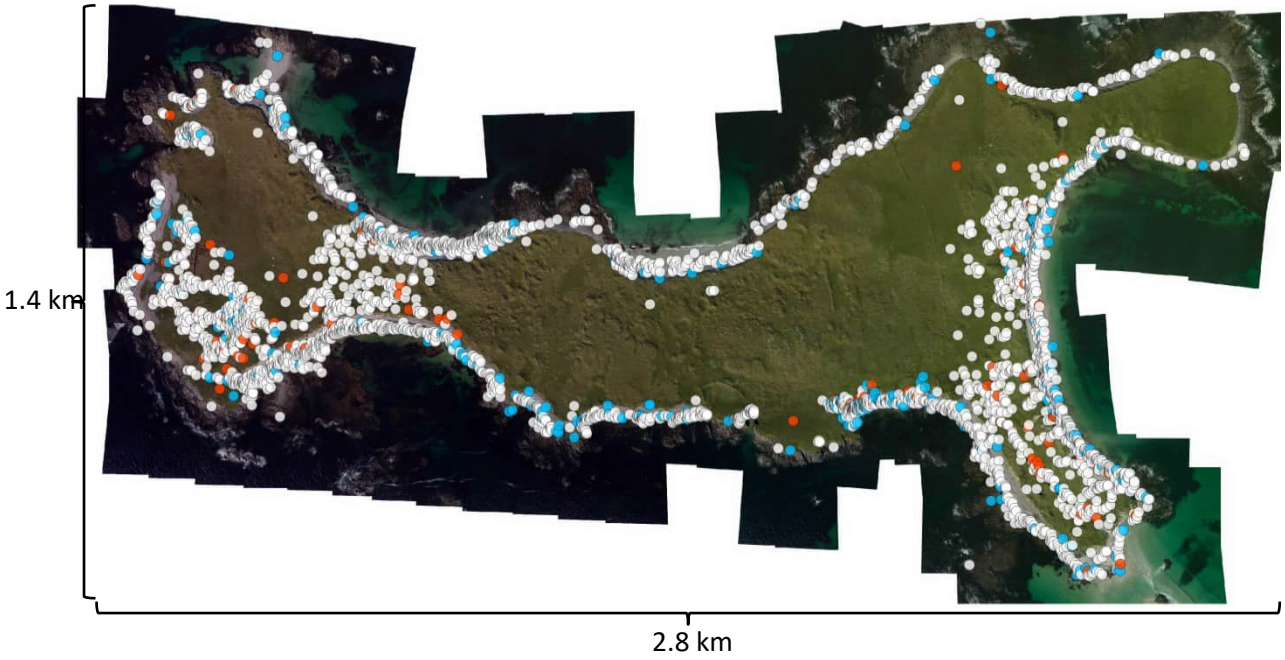


**Figure 5**. Ceann Iar, the second biggest of the Monach Isles in the Outer Hebrides, is the largest grey seal breeding colony in Europe (ca. 6,000 pups are born each year). This screenshot shows white-coated (white), moulted (blue) and dead pups (red) counted from approximately 200 stitched photographs taken on 7 October 2012. The composite image was stitched together and exported using Microsoft's Image Composite Editor v1.4.4®. The resulting 7.2 gigapixel PSB file (15 GB) was split into 30,000x30,000 pix TIFF tiles using Adobe Photoshop CS5®. These were then imported into Manifold GIS 8.0® for counting.

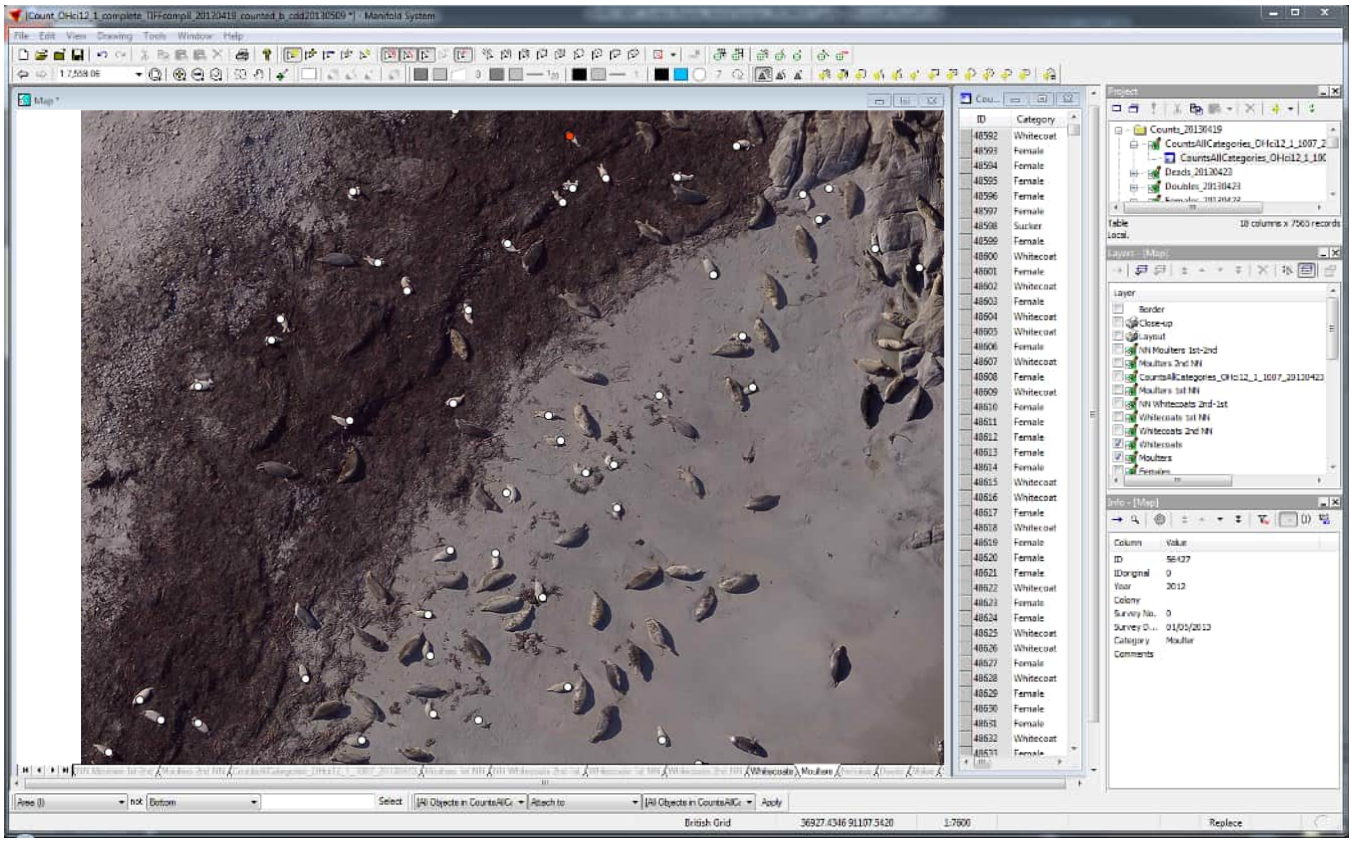

**Figure 6**. Manifold GIS 8.0® screenshot showing grey seal pups counted on Ceann Iar. Pups are marked and classified as whitecoats or moulted pups (and as dead if evident). The images are not geo-referenced but there is the potential for further processing, thus obtaining approximate coordinates for every pup counted on a small number of images.

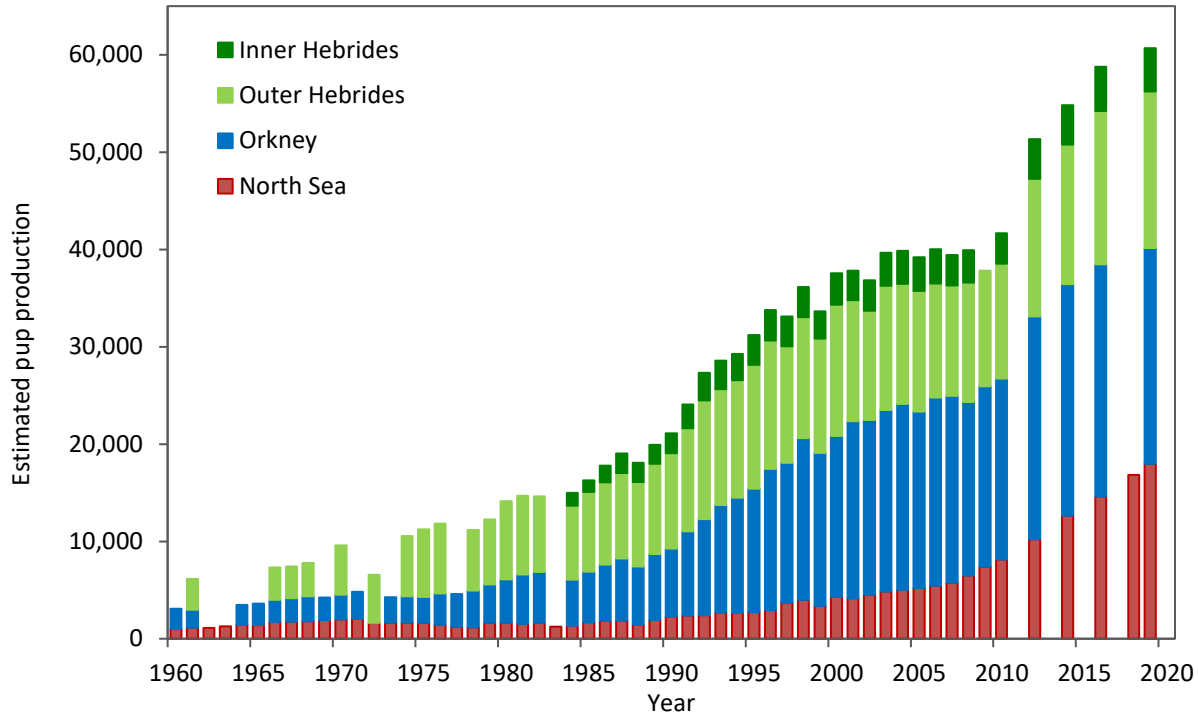


**Figure 7**. Grey seal pup production at routinely surveyed breeding colonies in Scotland and England from 1960 to 2019. These four regions are used in the grey seal total population model.

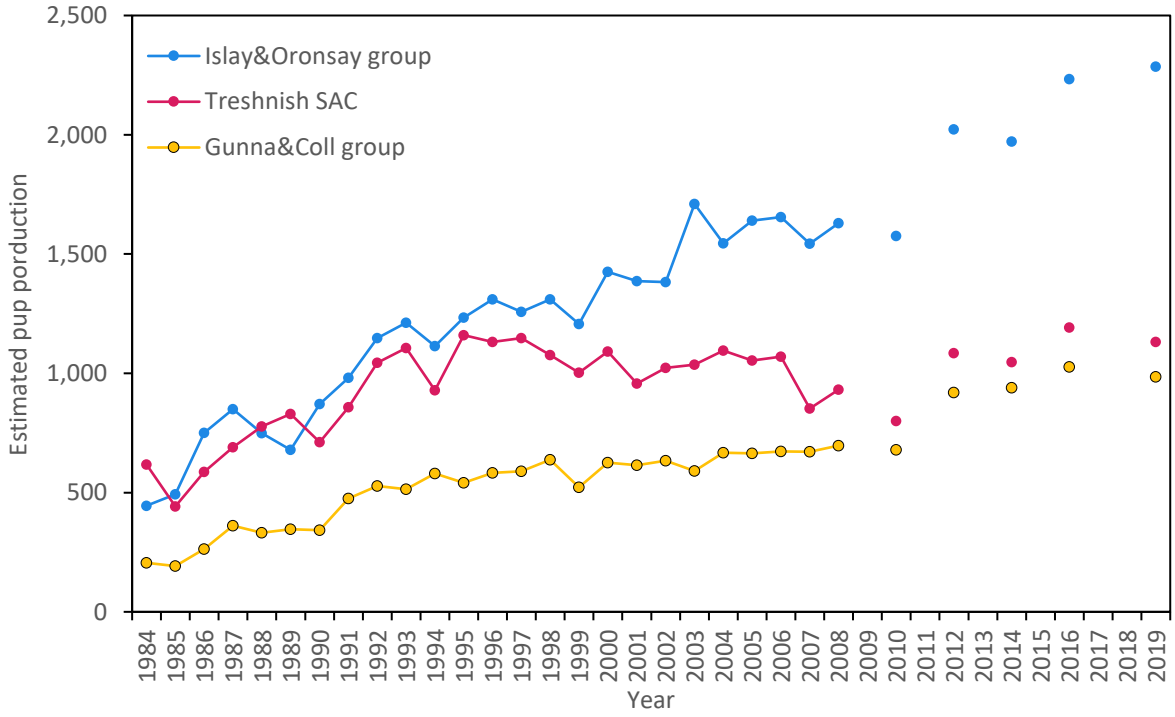


**Figure 8**. Grey seal pup production in the Inner Hebrides, grouped by location. The change in methodology from film to digital is likely to be responsible for a step increase between 2010 and 2012.

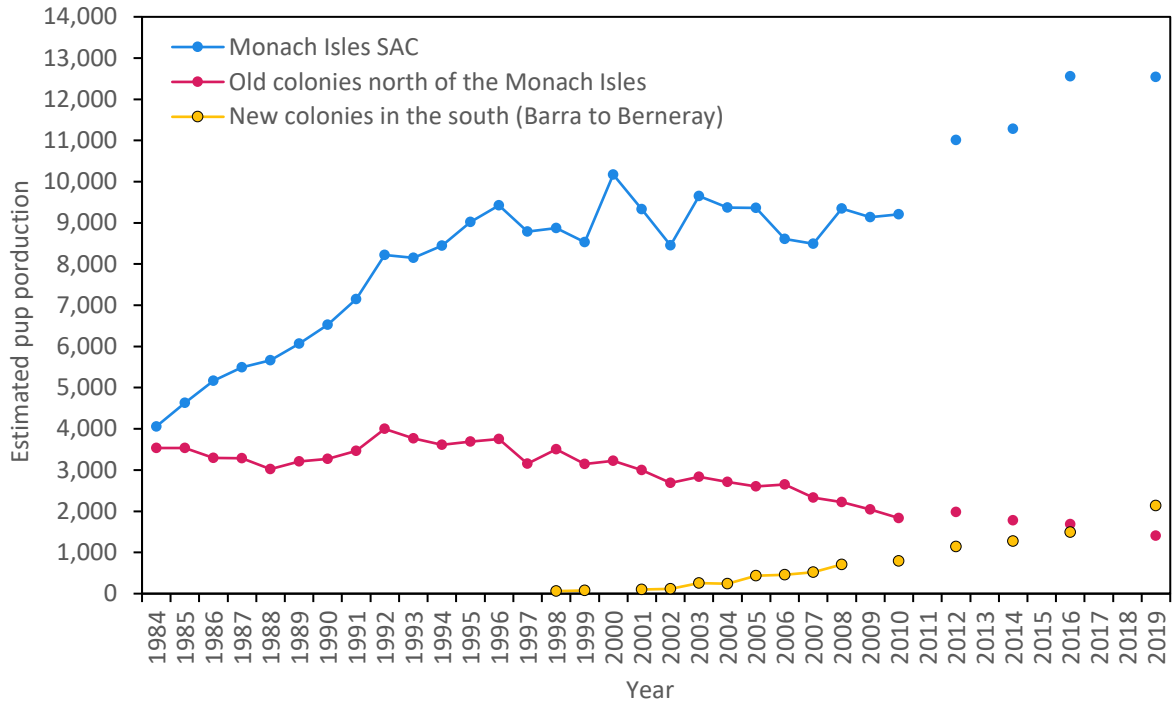


**Figure 9**. Grey seal pup production in the Outer Hebrides, comparing breeding colonies on the Monach Isles, long established (old) colonies, and newly established colonies. The change in methodology from film to digital is likely to be responsible for a step increase between 2010 and 2012.

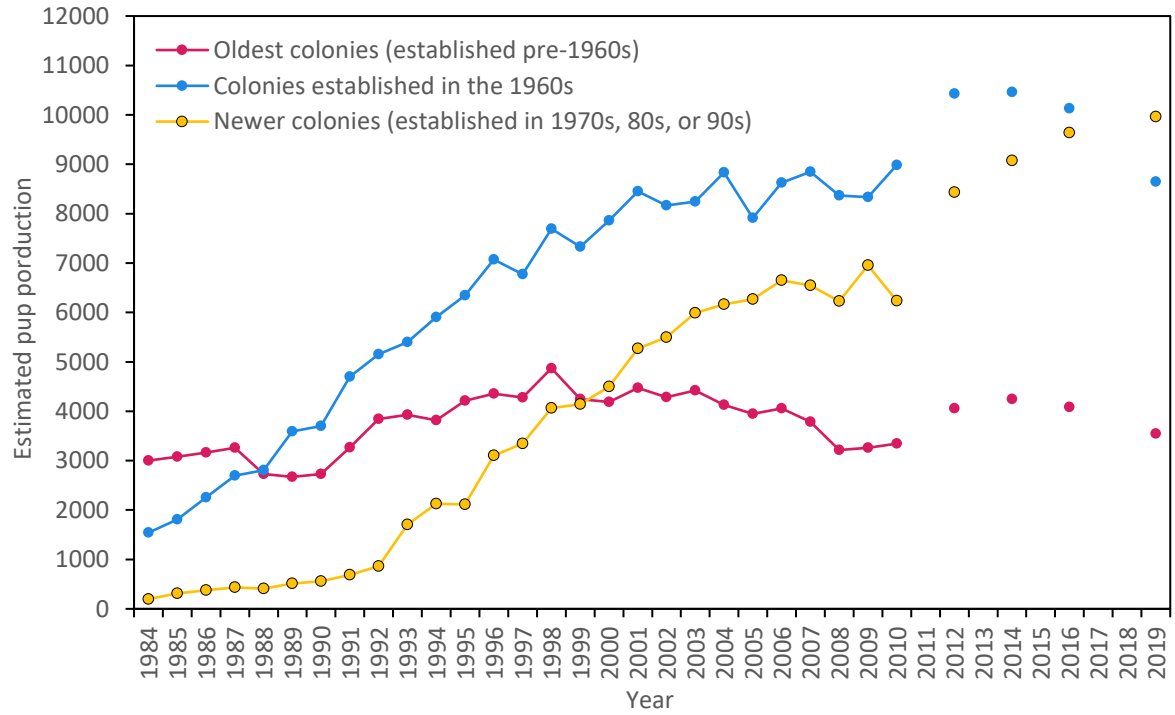


**Figure 10**. Grey seal pup production at colonies in Orkney, comparing colonies well established before the 1960s, colonies established during the 1960s and colonies established more recently. The change in methodology from film to digital is likely to be responsible for a step increase between 2010 and 2012.

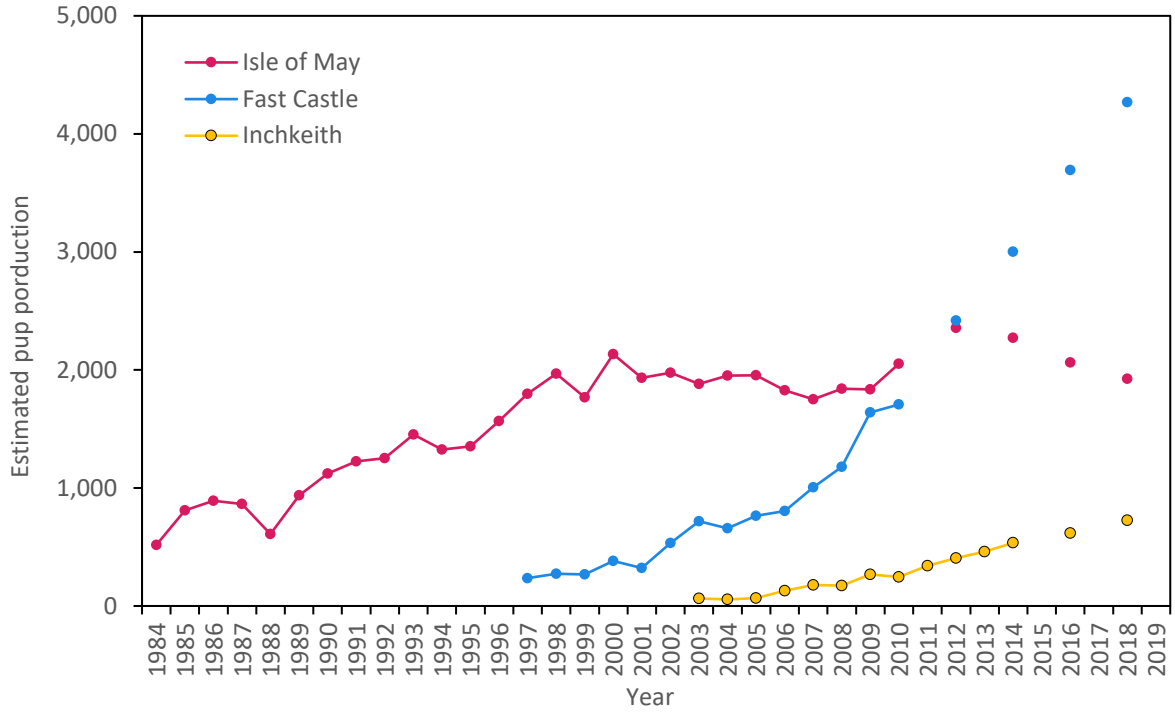


**Figure 11**. Grey seal pup production at the main colonies in the Firth of Forth. The change in methodology from film to digital is likely to be responsible for a step increase between 2010 and 2012.

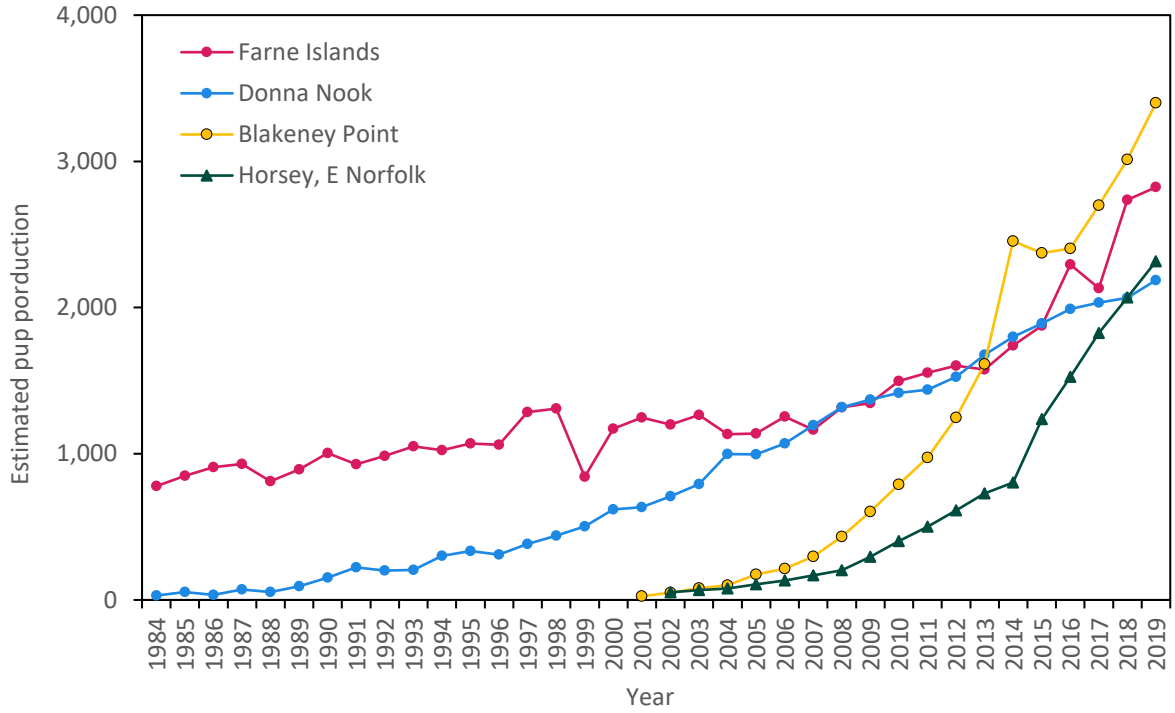


**Figure 12**. Grey seal pup production at colonies in East England. These colonies have been ground counted by the National Trust (Farne Islands and Blakeney Point), the Lincolnshire Wildlife Trust (Donna Nook), Natural England (Horsey, up to 2011), and Friends of Horsey Seals (Horsey, since 2012).

## Grey seal independent estimate scalar: converting counts to population estimates

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**Abstract**

A key component of the grey seal population model is an estimate of population size based on counts of grey seals hauled out during the harbour seal moult surveys in August. These counts are converted to an estimate of total population size using a scalar based on the estimated proportion of time grey seals spend hauled out during the aerial survey window (i.e. 2 h either side of low tide in August between 10:00 – 18:00), derived from telemetry data. Previous research using low resolution Argos tags gave a mean estimate of 31% (95% CI: 15-50%) (Lonergan et al., 2011). Subsequent preliminary analysis using high resolution data from 25 GPS tags showed that Argos data is unlikely to be appropriate, and gave a revised estimate of 23.9% (95% CI: 19.2-28.6%), resulting in a change in the 2008 population estimate of ~30% (Russell et al. 2016). Since that preliminary analysis, a large grey seal tagging programme has resulted in a dramatic increase in sample size (n=60), allowing the analysis to be revisited. This study provides a new mean estimate of the percentage of the population hauled out of 25.15% (95% CI: 21.45-29.07%). In addition to the revision of the scalar, this study examined the influence of biotic (body length, sex) and abiotic (region, days from spring tide, day of August, time of low tide, weekend vs weekday, weather, quarter of survey window) covariates on the proportion of time spent hauled out during the aerial survey windows. A small effect of quarter of survey window was detected, but confidence intervals overlapped, and it was not deemed appropriate to incorporate this into the scalar estimate. None of the other covariates were found to influence the probability of seals being hauled out. A qualitative examination of the width of the scalar confidence intervals and the variation in counts for a constant population size (i.e. multiple August counts in the same area and year) indicated that although the confidence intervals likely encompass the mean scalar over the month of August there is substantial day-to-day variation in the mean proportion hauled out which the confidence intervals do not incorporate. The reasons and implications of this are discussed.

## Introduction

A robust estimate of grey seal population size and trends is fundamental for their effective management. For the UK, estimates are generated using a Bayesian state-space model (SCOS-BP 21/05), incorporating: (i) a time-series of pup production estimates, (ii) knowledge of life-history parameters, and (iii) estimates of population size (2008, 2014, 2017) which are independent from the pup production data (hereafter independent estimates). These independent estimates of UK population size are derived from counts of grey seals hauled out on land during the harbour seal moult surveys in August. Translating these counts into an independent estimate of grey seal population size requires estimates of proportion of the overall population expected to be hauled out during the aerial survey window (2h either side of low tide in August, where low tide falls between 10:00 – 18:00), and thus available for count. The reliability of population estimates is dependent on the reliability of the scalar (inverse of the proportion of the population hauled out). Proportion of time hauled out is estimated from locational and behavioural data (e.g. haulout information) from animal-borne tags which are glued to the fur on the back of the neck (falling off by or during the annual moult).

There have been two previous estimates of the proportion of the population hauled out during the survey window. Lonergan *et al.* (2011) estimated that 31% (95% CI: 15-50%) of the population would be hauled out during a survey window, based on analysis of the available telemetry data

(predominantly low-resolution Argos tags with <12 locations per day and spatial error probabilities often exceeding 2.5 km). Subsequent analysis comparing the Argos data with high-resolution data from GPS/GSM tags (>50 locations per day with spatial errors typically <50 m) revealed that the spatial and temporal resolution of Argos data is likely to be inadequate to estimate a robust scalar (Russell *et al.* 2016). Indeed, based on GPS/GSM data, Russell *et al.* (2016) generated a lower estimate of the proportion of time spent hauled out during the survey window: 23.9% (95% CI: 19.2-28.6%). This resulted in an increase in the 2008 population estimate of >13,000 seals (~30%) over that of Lonergan *et al.* (2011). However, Russell *et al.* (2016) comprised a preliminary study based on a relatively small sample size (n = 25) and spatial extent (seals tagged in East Scotland and Southeast England).

Since Russell *et al.* (2016), a large-scale deployment of GPS/GSM tags on grey seals, funded by the UK Government Department for Business, Energy and Industrial Strategy (BEIS), has generated a comprehensive dataset of grey seal movements from haulout sites around the UK (Carter *et al*., 2020). Such a dataset, combined with the GPS/GSM data used in Russell *et al.* (2016), provided an opportunity to re-examine the scalar and also the impact of biotic and abiotic drivers on the probability of seals being hauled out during the survey window. As well as sex and length of the tagged individuals, the following abiotic covariates were considered: region, weekday/weekend, time of day, day of August, days from spring tide, weather (daily mean rainfall and windspeed, maximum daily temperature), quarter of the 4 h tidal window. These covariates were chosen because of a perceived potential influence on grey seal haul out behaviour, in line with Lonergan *et al.* (2011). No evidence of influence of these covariates on the probability of seals hauling out was found in Lonergan *et al.* (2011), though as discussed above there are concerns regarding the robustness of the conclusions of that study given the data resolution. Of the above covariates, sex, region and time of day were considered in a study of factors influencing seal activity budgets (Russell *et al.*, 2015). Significant effects on the proportion of time hauled out were found for grey seals, but this was at a comparatively coarse temporal resolution (six-hours) and was not specific to August.

Quantifying the impact of covariates on the proportion of time hauled out during the survey window is critical in generating a robust scalar. Any covariate effects would require the following considerations to be made: (1) count-specific scalars could be applied where appropriate (e.g. by region, week, time of day, day of August); (2) any sex/age impacts would require an adjustment of the scalar to reflect the estimated age/sex composition of the population (compared to the composition of tagged seals); (3) environmental conditions in the August tagging data should approximate conditions during the August survey season, but surveys are not conducted in adverse weather (rain, high winds), thus the tagging data may encapsulate conditions that are not reflected in the count data; (4) although generating a specific scalar for different weather conditions is unlikely to be feasible, an understanding of any impact of weather would allow the generation of robust standard errors that take into account variation in probability of hauling out resulting from the condition-mediated non-independence of individuals.

## Methods

*Telemetry Data*

*Individuals Considered*

Telemetry data were restricted to tags that transmitted data throughout the whole of August (Russell *et al.,* 2016). Seal behaviour may be anomalous for a short time after tagging (e.g. a week), thus tags that were deployed in late July or any time in August (n=4) were excluded. Tags may stop transmitting for a number of reasons related to device failure, or animal death. Individuals may exhibit anomalous behaviour prior to death, thus tags that stopped transmitting during August (n=4)

were also excluded. Telemetry data were also restricted to haulout events in Seal Management Units (SMUs) that are covered by UK aerial surveys (Scotland and Eastern England). Finally, the remaining tag data were quality checked to ensure adequate data resolution for the analysis. This process resulted in a final sample size for analysis of 60 tags (Table 1); the original 25 tags (2005-2015) analysed by Russell et al. (2016) and 35 from the more recent tag deployments (2017-2019). The spatial distribution of haulout events recorded from these tags is shown in Figure 1.

**Table 1:** Number of GPS tags used for this analysis by deployment year, location, Seal Management Unit and sex.

| Deployment | Year | Deployment Location | SMU | M | F |
|---|---|---|---|---|---|
| pv14 | 2005 | Abertay Sands / | East Scotland | 1 | 1 |
| gp13 | 2008 | Tentsmuir | | 2 | 4 |
| hg48/hg48a | 2015 | Blakeney Point / Donna Nook | Southeast England | 6 | 11 |
| hg53 | 2017 | Orkney | North Coast & | 2 | 3 |
| hg59 | 2018 | | Orkney | 2 | 0 |
| hg54 | 2017 | Islay / Oronsay | West Scotland | 1 | 4 |
| hg65 | 2019 | | | 2 | 1 |
| hg55 | 2017 | Monach Isles | Western Isles | 2 | 5 |
| hg64 | 2019 | | | 2 | 3 |
| hg60 | 2018 | Findhorn / Dornoch | Moray Firth | 2 | 6 |
| | | | **TOTAL** | **22** | **38** |
| | | | | **60** | |

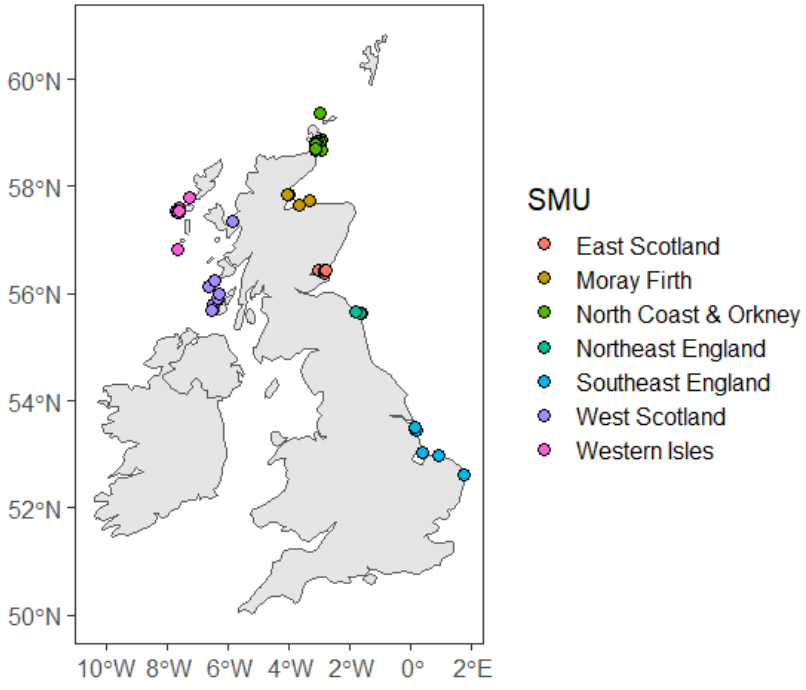


**Figure 1:** Locations associated with grey seal haulout events during the August aerial survey window, colour-coded by Seal Management Unit.

*Defining haulout events*

The GPS/GSM tags record and transmit haulout events; these occur if the tag has been dry for over 10 minutes (with the start then adjusted to incorporate these 10 minutes) and end if the tag has been wet for 40 seconds. There was an issue with the definition of haulout events on tags deployed prior to 2017; haulout data from these tags had to be manually adjusted (see Russell et al. 2016 for details). Tags occasionally record a haulout event even though the seal is in the water. This likely happens when the seal is at the surface with part, or all, of the tag exposed to the air, and the wet/dry sensor (located on the leading edge of the tag) remains below the "wetness" threshold for long enough to trigger a haulout event. Seals often spend prolonged periods at the surface, both offshore during foraging trips and nearshore while waiting for a tidal haulout site to be exposed. If possible, such haulout events should be removed; including at-sea haulouts within the analysis would artificially inflate the proportion of time seals are estimated to be hauled out during the survey windows.

As a first step, a protocol was developed to assign haulout events, as reported by the tags, (n =3491) to land or sea. Haulout events with concurrent location data within the limits of a georeferenced mean low tide layer were assumed to be onshore haulouts (true haulouts; n = 2279; 65%), as were those with no concurrent location data (i.e. interpolated locations; n=142; 4%). Haulout events occurring offshore (>1 km from the mean low tide boundary) with concurrent location data were classed as at-sea haulouts and were removed (n = 544; 16%). However, determining the status (onshore vs at-sea) of haulout events that were nearshore (outwith the mean low tide boundary but < 1 km of the coast; n = 362 observed and 70 interpolated (combined = 12%)); or were offshore but had interpolated locations (n = 94; 3%) was not straightforward. This was complicated by location error (for observed locations and resulting from interpolation) and error in the low tide maps (due to limited spatial resolution and changes in the shape and distribution of sandbars through time).

The status of nearshore haulout events was investigated further using (a) additional wet-dry data transmitted by a subset of tags, and (b) through manual exploration of the data. To investigate how to distinguish between onshore and at-sea haulouts, a subset of the tags deployed during the BEIS project (n=23) were programmed to transmit additional data from the wet/dry sensor (number of 4 s intervals above the "wetness" threshold), and mean duration of wet periods (successive 4 s intervals above the "wetness" threshold). Using these two parameters, and the start and end times of haulout events, these data were examined for a signal that might allow inference of which haulout events occur at-sea versus on land. This investigation indicated that such data may be useful in distinguishing at-sea haulout events from true haulouts using a threshold of 30% of 4 sec intervals during the event above the "wetness" threshold (< 30% being classed as onshore, and > 30% as at-sea). However, a greater sample size is required to determine the robustness of this finding. To address the issues of lack of accuracy in the low tide maps, nearshore haulout events within 100 m of low tide for which there were concurrent location data (n = 284) were examined in Google Earth using historical satellite images taken at, or close to low tide, and, for areas with dynamic coastlines (e.g. sandbars), if possible from years concurrent with seal telemetry data. As a result, 211 (74%) of these 284 nearshore haulout events could be confidently assigned to the intertidal zone (i.e. true haulouts). This resulted in 2632 true haulouts, and 315 for which the status was uncertain (nearshore with concurrent locations or without observed locations). Using this corrected dataset, a sensitivity analysis was conducted to investigate the impact on the scalar of various different treatment rules for classifying haulout events of unknown status.

In the analysis conducted by Russell et al. (2016), a protocol for assigning haulouts as on land or at-sea was developed. Haulouts with concurrent location data >1 km from low tide were treated as at-sea haulouts and those <1 km from low tide were treated as true haulouts. Haulouts without concurrent location data were treated as true haulouts if the interpolated location fell within 1 km of low tide. Haulouts without concurrent location data were treated as at-sea or "unknown" (they did not contribute to analysis of proportion of time hauled out vs at-sea) on the basis of the distance

from the interpolated location to the coast and the amount of time between the surrounding observed locations; i.e. at-sea if the seal could not have feasibly been hauled out and have such an interpolated location, and "unknown" otherwise. Specifically haulout events were flagged as at-sea if any of the following applied in terms of the distance of the interpolated location from the mean low tide and time between the surrounding observed locations: >10 km & <2 h; >5 km & <1 h, or >1 km & <0.5 h. Haulout events were flagged as unknown if >10 km & >2 h; >5 km & <10 km & >1 h; and >1 km & <5 km & >0.5 h. Applying these rules from Russell et al. (2016) to the dataset used here gave a mean estimated proportion of time hauled out of 0.2609 (95% CIs 0.2248-0.299). We examined the impact of six realistic alternative treatments for haulouts of uncertain status (onshore vs at-sea) on the mean estimated proportion of time hauled out. In general, there was little impact of different treatments (range of mean estimate 0.2453 - 0.2609). Based on these findings, and close scrutiny of these nearshore haulout events with concurrent location data, a threshold of 20 m was selected above which haulouts with concurrent location data were treated as at-sea. There was no change in the treatment of haulouts without concurrent location data compared to that of Russell et al. (2016) described above. For the final dataset 2744 haulouts were considered. This approach minimises the risk of artificially inflating the proportion of time hauled out due to at-sea haulouts, while still allowing some margin for GPS positional error and variation in spatial extent of haulout area due to spring low tide.

*Covariate data*

Covariate data were sourced as follows. Low tide data were extracted for each haulout location from Poltips (The Proudman Oceanographic Laboratory, National Oceanography Centre). Weather-related covariates (wind speed, rainfall and temperature) were extracted from the Met Office Integrated Data Archive System (MIDAS) for UK land surface stations https://catalogue.ceda.ac.uk/uuid/dbd451271eb04662beade68da43546e1, which provides daily mean, maximum and minimum estimates. Values were extracted for the nearest weather station to the seal location data (mean distance = 18 km +/- 13.5 km SD). Days from spring tide was calculated in R (R Core Team, 2020) using the "lunar" package (Lazaridis, 2014).

*Modelling framework*

The response variable (proportion of 4 h survey window spent hauled-out) was modelled as a function of abiotic and biotic covariates (binomial error distribution) using generalised additive models (GAMs) in a generalised estimating equation (GEE) framework (GEE-GAMs) using the packages "geepack" and "splines" (Halekoh et al., 2006) in R. Covariates (see Introduction) were input as factors (categorical) and smooth (continuous) terms. The GAM approach allowed the inclusion of smoothed terms to investigate non-linear relationships with the response variable while the GEE framework ensured prediction of the population mean with associated standard errors robust to any residual non-independence within individuals (Zuur et al. 2009). The most parsimonious model was found by backwards selection using model information criterion score from a full model (containing all possible covariates). Quasi Information Criterion (QIC) was used, as maximum likelihood based alternatives (e.g. Akaike Information Criterion) are not applicable to GEEs (Cui and Qian, 2007). Threshold for covariate removal $\Delta QIC<2$ (Burnham and Anderson, 2002). Within-individual non-independence is a potential feature of this dataset, as the probability of a seal being hauled out in a given survey window is likely to be dependent on the activity of the seal in previous survey windows. The use of GEEs with individual seal ID as a blocking factor allows residual correlation within an individual and standard errors to be adjusted accordingly (Zuur et al., 2009). Two individuals recorded few (<10) observations (i.e. known haulout status data during a 4 h low tide survey window) due to missing data. However, removing these individuals from the dataset had no impact on model selection results, or subsequent plots of model output, so they were kept in the dataset.

Three analyses were conducted: (i) testing of weather covariates (rainfall, windspeed and temperature), (ii) testing of the effect of quarter of the survey window, and (iii) testing of key biotic and abiotic (excluding weather) covariates. This three-phase approach was taken as, for investigation of weather effects, the data had to be restricted to exclude observations (4 h tidal survey windows for which there are haulout data for an individual seal) that were >10 km of the coast (n=57), since conditions at the haulout will presumably not affect the probability of hauling-out if the seal is far offshore. Furthermore, observations where windspeed was > 40 kmh were excluded as there were very few data points (n=20; 1.9% of data) and aerial surveys are not conducted in such conditions. This resulted in a final dataset of 1043 observations. To investigate the impact of quarter of survey window, the data needed to be considered at a 1 h resolution (compared to a survey window (4 h) resolution). The main analysis (phase iii) was conducted using all individuals and survey windows in the dataset (n=1153 observations). In addition to the models, a non-parametric bootstrap by individual (with replacement; N=500,000) was used to estimate the uncertainty around the population mean.

## Results

*(i) Weather covariates*

There was no evidence of an effect of weather on the probability of seals being hauled out during the survey window in this analysis; none of the weather covariates considered (daily rainfall, maximum daily temperature, or mean windspeed) were retained in the minimal adequate model.

*(i) Quarter of survey window*

There was evidence of an effect of quarter of survey window on the proportion of time seals spent hauled out. Quarter of the survey window was retained in the minimal adequate model. The probability of being hauled out was greatest closer to low tide (Q2 and Q3), but confidence intervals overlapped (Fig. 2).

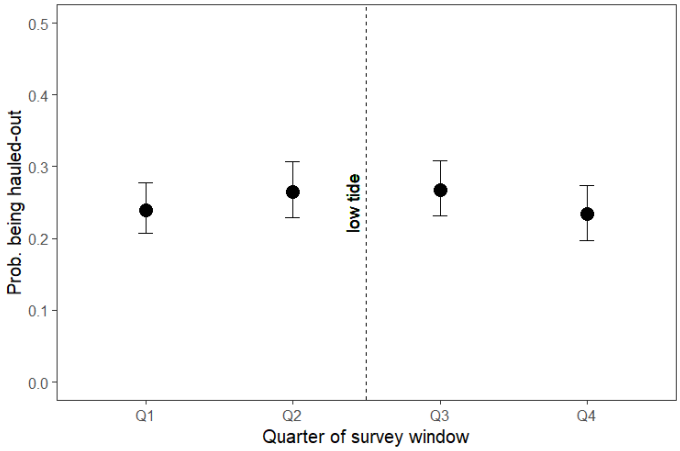


**Figure 2.** Model-predicted effect of quarter of the survey window on probability of being hauled out during the August survey window. Dots show the population mean, lines reflect the upper and lower 95% confidence limits.

*(ii) Key biotic and abiotic covariates*

None of the covariates tested were retained in the minimal adequate model. Day of August had a small effect on probability of being hauled-out, but the delta QIC value (1.03) was not enough to

justify retaining it in the final model (see Discussion). Eight seals in the database were missing seal length records (17 observations). Model selection was initially performed excluding these individuals. However, seal length was dropped on the first round of model selection (ΔQIC = -10.01), so the full dataset was used for the rest of model selection. The results from the GEE (intercept only) revealed a mean proportion of 0.2514 (0.2171-0.2907 lower and upper 95% confidence intervals) which was similar to that generated from bootstrapping: mean: 0.2515.

## Discussion

The revised proportion of the population hauled out (0.2515; 95% CI 0.2145 – 0.2907), resulting in a population scalar (i.e. $\frac{1}{prop.hauled-out}$) of 3.98 (95% CI 3.44 – 4.66), is slightly higher than that reported in Russell et al. (2016); 0.238, giving a scalar of 4.18 (95% CI: 3.50 – 5.21), which was derived from data from just under half of the tags analysed here. This result provides further support for a higher mean scalar than was derived from the Argos tags (3.23; Lonergan *et al*., 2011).

*At-sea haulout treatment protocol*

The sensitivity analysis conducted here suggests that a threshold of 20 m from mean low tide is appropriate to classify nearshore haulouts with concurrent location data as true haulouts. This threshold allows margin for GPS location error, and variation in the available haulout area due to spring tides, while minimising the risk of artificially inflating the proportion of time hauled out through inclusion of at-sea haulouts. The assumption made here is that haulouts occurring within 20 m of mean low tide are not the result of seals resting at the surface. This behaviour is unlikely to occur so close to shore during low tide. However, given the fact that changing the data treatment protocol from that of Russell et al (2016), where the threshold was set at 1 km, resulted in a reduction in the mean estimate of 0.0094 (equivalent to an increase in the 2014 population estimate of 12,395 seals), and that the status (onshore vs at-sea) of haulouts without concurrent location data (9% of all haulouts; n = 306) still remains uncertain, the problem of defining at-sea haulouts warrants further research. Ideally, concurrent accelerometer data is required to determine the body orientation of the seal during such haulout events, and distinguish between a seal lying prone on a haulout or resting at the surface in a vertical position (i.e. bottling). However, accelerometer data are not currently transmitted by the GPS/GSM tags due to the large size of associated data packets. With further research, an algorithm could be developed to abstract these data into a simple indicator of body position during haulout events which could be readily transmitted alongside the haulout records.

*Impact of covariates*

The only covariate retained in model selection was quarter of survey window. This covariate was not considered in the overall analyses (iii) or when generating the bootstrapped estimates for proportion of time hauled out because (1) the effect size was relatively small and the confidence intervals overlapped, (2) conducting the main analyses on that scale would have likely caused complex correlation relationships within the residuals (within survey window, within individual), (3) there were not enough data to determine whether or not this relationship was temporally and spatially constant (in terms of the impact of tidal extent or region), (4) generating and combining quarter-specific scaled population estimates (with associated confidence intervals) for the independent estimates would be challenging.

Although quarter of survey window was the only covariate retained during model selection, this does not allow us to conclude that the other covariates have no impact. The sample size of 60, although relatively large in the context of studies using telemetry data, meant that there was limited

power to detect impacts, especially given there was such high variability in haulout patterns, and a maximum of 31 data points per individual. There may be drivers of haulout behaviour acting on multiple spatial scales associated with habitat (e.g. availability of haulout sites, trip duration and weather conditions), and thus detecting the impact of individual covariates is difficult and interactions between variables are precluded by limited sample size. Furthermore, the weather data was amalgamated over the whole day and was from the nearest weather station which was between 1 and 62 km from the haulout site. Both in the UK and on the continent, observers have highlighted the link between very hot weather and relatively low August aerial survey counts. Such weather conditions are not common and would not be detectable within the telemetry data, but can have a considerable impact on the counts, and thus population estimates. For example, a count of 196 on a particularly hot day (with >100 visible in shallow waters adjacent to the haulout site) was recorded for the Monach Isles in 2011, whereas in surrounding years the counts were ≥1,350. Moreover, the impact of weather is dependent on both recent and current conditions. For example, larger haulout numbers are often associated with a dry day that follows a long period of wet weather compared to a one within a period of dry weather.

*Scalar uncertainty*

The scalar uncertainty does take into account inter-individual variation in haul out patterns (via nonparametric bootstrapping). There is considerable variation among individuals; some individuals make short foraging trips, hauling-out every day, while others make prolonged trips offshore, then return to haul out on land for multiple days at a time. For example, one individual in the dataset spent a mean proportion of time hauled out >0.5 across all survey windows. There was no evidence for anomalous data within the track (e.g. tag issues or early breeding behaviour). The individual hauled out in 15 out of 20 survey windows, making frequent short foraging trips within Scapa Flow, Orkney, throughout the whole duration of the track (including August). In contrast, some (but not all) individuals tagged in the Western Isles travelled to the self-edge (Carter et al. 2020), spending only 17% of time hauled out on average during the August windows. Such individuals often spend multiple successive survey windows hauled out, followed by many days (often weeks) at-sea. Such long trips punctuated by long haulout events may have a disproportionate impact on the analysis, depending on where the individuals are in their trip - haulout cycle at the start of the time series (e.g. an individual already on a long foraging trip at the start of August may only record one haulout event during the time series, but an individual hauled out at the start of the time series may record three haulout events). Furthermore, the proportion of time individuals haul out for may impact the probability that they are encountered for tagging in the first place (i.e. individuals that make long trips may be less likely to be tagged), resulting in an overestimate of the mean proportion of time spent hauled out for that site.

The confidence intervals surrounding the scalar pertain to the population mean for all August survey windows. It was necessary to temporally aggregate all the data to generate the average scalar across the whole month of August. As such, the uncertainty does not incorporate day-to-day variation in the proportion of time hauled out during the survey window. Caution should be used when applying this scalar to survey data from individual haulout counts to generate abundance estimates. The scalar does not account for movement between haulout sites; such movement, especially for haulout sites used by a limited number of individuals will result in additional variation in counts. Stochasticity also becomes important when considering small counts. For a relatively large spatial scale (minimal influence of movement) and large counts, if the probability of a seal hauling out is independent of other seals and abiotic/biotic covariates then the confidence intervals generated should encompass the true scalar. However, given our limited ability to detect impacts of covariates (see above) we cannot be confident that the confidence intervals are appropriate. Influences such as weather, or a propensity to haul out with others would likely be acting on a relatively fine spatial scale. Thus, ideally we would explore the day-to-day variation in the proportion of tagged individuals

hauled out within an SMU. However, the limited sample size and the limited number of windows meant that the lower confidence interval then incorporated 0.

*Other sources of information on uncertainty*

The survey data provide another opportunity to examine variation in haul out probability. However, most areas are surveyed infrequently (at most annually), and examination of variation in haulout probability is often confounded by the trends in abundance and limited spatial extent of individual surveys (see above regarding seal movements). The Southeast England SMU provides a unique opportunity to examine variation in counts. Surveys are often conducted more than once a year which allows examination of the variation for a given abundance and although there is some interchange with northern UK and also the continent, day-to-day variation in the proportion of seals moving to or from these other regions is assumed to be minimal (see Russell (2016)). The surveys often cover only a proportion of the Southeast England SMU and thus we examined the variation on multiple spatial scales with a focus on the three largest haulout sites (Donna Nook, Wash and Blakeney). These haulouts represented 74% of the SMU in 2019 (Russell et al. BP *seal trends bp), and in ten years there have been two counts (three in 2021) in August. Excluding one of those years (one of the counts was so low, it was assumed they had just been disturbed), the coefficient of variation (CV) of the two (three in 2021) counts in each year ranged from 0.003 to 0.72 (median 0.067). In three of the nine years (including 2021), the confidence intervals surrounding the resulting population estimates from each count did not overlap. In 2021, the confidence intervals from the two later counts overlapped, but not with the first count. Although these haulouts do not represent a closed population, high counts in one haulout area (e.g. Donna Nook) are generally associated with high counts in neighbouring areas indicating that high numbers are not due to local redistribution. Indeed, in 2021, of the two surveys covering five key haulout areas (Donna Nook, The Wash, Blakeney Point, Horsey and Scroby Sands), the count was higher in the second survey for all sites. In 2021, the first Donna Nook count was over 60% higher than the mean of the other two surveys resulting in a population estimate of 20,867 (95% CI: 18,059 – 24,455) compared to estimates from the other two surveys of 12,346 (95% CI: 10,685 – 14,469) and 13,276 (95% CI: 11,490 – 15,559). These findings indicate that there is substantial day-to-day variation in the proportion of the population hauled out, and that the confidence intervals of the scalar generated from telemetry data are not representative of the true variation in the proportion of the population hauled out in a given survey window.

Overall, the estimated proportion of the population hauled out is likely to be a reasonable estimate of the August-wide mean proportion of the population hauled out during survey windows. However, as discussed above the apparent day-to-day variability in haul out probability means the width of the confidence intervals is underestimated. The scalars and associated uncertainty are applied to aerial survey counts to generate population estimates independent from the pup production estimates (hereafter independent estimates). Realistic confidence limits surrounding the scalars is important for robust estimates of population size and trends; the relative CVs surrounding the independent and pup production estimates essentially weight the importance of the estimates (small CV, higher weight). Each independent estimate includes counts for multiple years, with the majority of counts collected within a three-year period. Within these periods, where more than one count is available, the counts are combined to generate a mean count. In areas like the Southeast England SMU where a minimum of three counts are used to provide an averaged count, the confidence intervals around the scalar will be more representative than in areas where a single count is available. An alternative to the three independent estimates would be to scale estimated mean counts from fitted trends (SCOS BP 21/03) to abundance estimates which would incorporate both uncertainty from the scalar and the uncertainty in the mean count prediction. This alternative should be considered and, if appropriate, applied in future years.

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**Trends in seal abundance and grey seal pup production**

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## Abstract

Scotland and eastern England (SMUs 1-9) hold the majority of the UK populations of grey and harbour seals. The key method of monitoring harbour seal trends in these areas are through aerial survey counts during their August moult (covering all areas in a 5-year cycle). Estimates of harbour trends are essential for effective conservation and management. Such estimates based on data up until 2017 were provided in Thompson *et al.* (2019). An update of these estimates is required, especially given the recent low counts in harbour seals in the Southeast England Sea Management Unit (SMU) which had previously been the only large SMU showing a sustained increases in abundance.

For grey seals, population estimates and trends in grey seal abundance are estimated within an age-specific population dynamics model (Thomas 2021) using data from four regions: Inner & Outer Hebrides, Orkney, and North Sea; the first three regions are equivalent to the West Scotland, Western Isles and North Coast & Orkney SMUs respectively, and the North Sea region is an aggregation of East Scotland, Northeast & Southeast England SMUs. The data considered in the population model are pup production estimates from regularly monitored breeding colonies and independent estimates of population size. These independent estimates are generated using grey seal count data from August surveys and a telemetry-derived scalar to account for seals not hauled out during surveys, and are termed independent because they are independent from those derived from pup production data.

The population model provides population estimates on the scale of the four regions and is based on the distribution during the breeding season. It is critical to understand spatial variation in abundance and trends therein, on an SMU scale, during the foraging season (the majority of the year) which is when seals are most likely to be impacted at-sea processes (e.g. anthropogenic activities, prey availability), and also when they are most likely to impact harbour seals. In addition, an analyses of pup production data is required for an understanding of trends for SMUs and trends in the context of SACs while accounting for, and quantifying, the jump in pup production associated with the change in survey methods (film to digital).

Here we fit trends to the available data for the above-described three metrics (harbour and grey seal August counts, and grey seal pup production) by Seal Management Unit (SMU). As well as illustrating these trends, we overlay the relevant counts/production estimates for Special Areas of Conservation (SACs). In addition, we use the August grey seal count data to generate a third independent estimate for use in the population model (Thomas *et al.* 2021), as well as adjusting the second and third estimate (using an updated scalar; Russell & Carter 2021). Finally, we combine trends in August counts of grey seals across SMUs to provide a single trend in counts for SMUs 1-9, and highlight the potential future utility of such a prediction.

The results in this BP are a preliminary extension of the analyses currently being conducted for the upcoming OSPAR Assessment.

## Introduction

Scotland and eastern England (SMUs 1-9) hold the majority of the UK populations of grey and harbour seals. The key method of monitoring harbour seal trends in these areas are through aerial survey counts during their August moult (covering all areas in a 5-year cycle). Estimates of harbour seal trends are essential for effective conservation and management. Such estimates based on data up until 2017 were provided in Thompson *et al.* (2019). An update of these estimates is required, especially given the recent low counts in harbour seals in the Southeast England Sea Management Unit (SMU) which had previously been the only large SMU showing sustained increases in abundance.

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The population model provides population estimates on the scale of the four regions, and is based on the distribution during the breeding season. It is critical to understand spatial variation in abundance and trends on an SMU scale, during the foraging season (the majority of the year) which is when seals are most likely to be impacted by at-sea processes (e.g. anthropogenic activities, prey availability), and also when they are most likely to have an effect on harbour seals. In addition, an analysis of pup production data that accounts for, and quantifies, the jump in pup production associated with the change in survey methods (film to digital), is required for an understanding of trends for SMUs and trends in SACs.

## Methods

*August surveys*

All data were based on counts made during the annual harbour seal moult in August (2 hours either side of low tide). Almost all data are from aerial surveys conducted by SMRU, augmented by data from fixed wing aerial surveys of the Thames estuary, conducted by Zoological Society London (aerial survey; Cox *et al.* 2020; SCOS-BP 21/07) and ground surveys in the Tees estuary, conducted by Industry Nature Conservation Association (Bond 2020). Surveys of rocky shores were conducted by helicopter using a thermal imaging camera whereas surveys of sandbanks (much of the UK east coast) were predominantly conducted by fixed-wing aircraft. For details on survey methods, refer to Thompson *et al.* (2019). Where possible, entire SMUs were surveyed synoptically (i.e. within a single August survey season). However, in some cases that was not possible and so counts had to be combined across multiple years; the resulting count was assigned to the year that encompassed the majority of the total (focal year). Furthermore, some areas, particularly the offshore islands (e.g. North Rona and Sula Sgeir) which grey seals haul out on, are surveyed less frequently and thus their associated counts are used in multiple years (trend analyses) and multiple independent estimates.

For the trend analyses, where the limited number of years with counts prohibited robust model fitting for a particular SMU, the largest subset of sites within it (i.e. the subset of haulout sites with the largest proportion of the SMU total), for which the monitoring was frequent enough to allow

**Table 1.** For each SMU (and any associated subsets/proxies) the latest count/pup production estimates (year; percentage of the SMU for proxies) are shown. Note that non-named subsets may not be consistent areas between metrics.

| SMU number | Name | Harbour seal August counts | Grey seal August counts | Grey seal pup production |
|---|---|---|---|---|
| 1 | Southwest Scotland | 1709 (2018) | 517 (2018) | No known colonies |
| 2 | West Scotland | 15600 (2018) | 4174 (2018) | c. 5030 |
| | West Scotland subset | NA | NA | 4455 (2019; 87%) |
| 3 | Western Isles | 3532 (2017) | 4038 (2011) | c. 16400 |
| | Western Isles subset | NA | 5478 (2017; 93% in 2011) | 16083 (2019; 98%) |
| 4 | North Coast & Orkney | 1405 (2019) | 8599 (2019) | 22944 (2019) |
| | North Coast & Orkney subset | NA | NA | 22153 (2019; 97%) |
| 5 | Shetland | 3180 (2019) | 1009 (2019) | 761 |
| | Shetland subset | NA | NA | 495 (2018; peak count; 56%) |
| 6 | Moray Firth | 1077 (2019) | 2513 (2019) | 1865 (2019) |
| | Moray Firth subset: Loch Fleet to Findhorn | 1008 (2019; 94% of SMU) | NA | NA |
| 7 | East Scotland | 356 (2016) | 3782 (2016) | 7261* (2019) |
| | East Scotland subset: Firth of Tay and Eden Estuary SAC | 37 (2020; 14% of SMU in 2016) | NA | NA |
| 8 | Northeast England | 79 (2019) | 4660 (2020) | 2823* (2019) |
| | Northeast England subset | 76 (2019; 96% of SMU) | NA | NA |
| 9 | Southeast England | 3752 (2019) | 8667 (2019) | 7902 (2019) |
| | Southeast England subset: The Wash and North Norfolk Coast SAC | 2859, 2626, 3058 (2021; 73% of SMU in 2019) | 6605, 4176, 4787 (2021; 74% in 2019) | NA |

* Excludes between 10 and 20 pups estimated to be born at other sites within the SMU.

model fitting, was used as a proxy for the SMU. Table 1 reports the latest count for each SMU and subset. For some SMUs, trends for the whole SMU and a proxy were fitted (if the proxy represented a higher sample size). The relationship between the SMU and subset counts in years when the whole area was surveyed can be used to assess how representative the subset trends are of the regional trends.

*Analyses*

All analyses were conducted in R (R Core Team 2021).

*Harbour seal analyses*

Counts were modelled as a function of year assuming negative binomial errors broadly following methods described in Thompson *et al.* 2019. Updated counts were available for all but one SMU (Western Isles; Table 1). For some SMUs, the limited number of data points resulted in problems estimating the theta parameter for the negative binomial distribution. In these cases, a Poisson distribution was assumed. Please note that, in contrast to Lonergan *et al.* (2013) and Thompson *et al.* (2019), AIC rather than AICc was used for model selection. For all datasets, at least three models were fitted: an intercept-only GLM (null model; i.e. a stable trend), an exponential (linear on the link scale) year effect within a GLM, and a nonlinear smooth year effect within a GAM (restricted to 5 knots).

Phocine Distemper Virus (PDV) caused sudden declines in the Northeast and Southeast England SMUs in 1988 and 2002, and thus additional models were fitted with a step change in abundance and/or trends associated with 2002 (PDV epidemic; data were not available for the entire SMUs prior to the 1988 PDV epidemic). Although the declines in north and east Scotland SMUs were not thought to be due to PDV, there were sudden drops or declines in Shetland and North Coast & Orkney SMUs during multi-year gaps in surveys that spanned 2002 and a sudden change in trend around 2002 in East Scotland SMU. Because of the unknown nature of these declines, additional models were also fitted for these SMUs. Specifically, additional models were fitted for SMUs 4 – 9 that allowed any combination of stable/exponential trends prior to and following 2002 (including the same trend across the time-series) and with/out a step change associated with 2002. In some SMUs there was evidence of a non-linear trend in the final period (2002 onwards), thus for this final period GAMs (smooth trends) were used, if preferred by AIC.

*Grey seal analyses (August counts)*

Changes in grey seal August counts were examined at two temporal and spatial scales. The coarse scale refers to the independent population estimates (Russell et al. 2016; Table 2) for Scotland and eastern England (SMUs 1-9). The underlying counts are surveys conducted over multiple years; most of the counts are from a block of three years (survey block), with the population estimate assigned to the middle year (focal year). For the 2008 population estimate, 97% of seals were counted between 2007 and 2009; the remaining 3% were counted in 2005 and 2006. For 2014 estimate, 93% were counted between 2013 and 2015; with the remaining 7% counted in 2011 and 2016. Here we generated counts for the third independent (2017) estimate using the same protocol as for the first two (Table 1 in Russell et al. 2016). The focal year was 2017; 96 % were counted within the three-year survey block (2016-2018), with 1% from 2014 and 3% from 2019. Where multiple surveys were conducted within the survey block (e.g. Southeast England), the means of these counts are used to minimise day-to-day variation in counts (see Russell and Carter 2021). The updated scalar (SCOS-BP 21/02), based on the telemetry-derived estimates of the proportion of the population hauled out during survey windows, was used to generate estimations of population size from the three counts.

On the scale of individual year, counts for each SMU were modelled as a function of year assuming negative binomial errors within a single GAM. The models allowed a different temporal trend for each SMU. A combined trend was predicted (with confidence intervals) using parametric bootstrapping.

*Grey seals - pup production*

Pup production estimates (SCOS-BP 21/01) used for SMUs 2-4 and 6-7 (see Russell *et al.* 2019) were almost entirely derived from aerial survey data; these were estimated using probabilities of correctly classifying a moulted pup (PMoult) values of 0.5 and 0.9 for film and digital surveys, respectively; all other parameters were kept constant throughout the time series and as reported in Russell et al (2019). Some counts of Inchkeith, East Scotland, were provided by Fife Seal Group. The values used for the remaining SMUs (5, 8 – 9) were based on ground counts: Shetland (peak counts; NatureScot), Northeast England (production; National Trust) and Southeast England (production; National Trust, Lincs Wildlife Trust, and Friends of Horsey Seals). Note there are no known established breeding colonies in the Southwest Scotland SMU. The latest pup production estimates for each SMU and any proxies are reported in Table 1.

The production estimates used here as proxies for West Scotland, Western Isles and North Coast & Orkney match those used in the population model (regularly monitored colonies in Inner Hebrides, Outer Hebrides, and Orkney, respectively), and represent c. 87, 98 and 97% of production in those SMUs (Table 1). The estimates for East Scotland, Northeast England and Southeast England sum to the totals used for the North Sea region in SCOS-BP 21/05. Shetland and Moray Firth SMU data are not incorporated in the population model.

Pup production (peak count for Shetland; SCOS-BP 21/01) was modelled as a function of year assuming negative binomial errors (see Russell *et al.* 2019 for details). For Scottish SMUs surveyed by SMRU (all except Shetland), a step increase in pup abundance was offered between 2010 (the last film survey) and 2012 (the first digital survey) to account for any artificial increase in pups associated with the change in aerial survey method, thus allowing the trends to be examined excluding this jump. To maximise the data available to fit this jump, all applicable SMUs were modelled within a single GAM (limited to k=5), allowing a different temporal trend for each SMU but a single adjustment for the change in survey methods.

For SMUs where the data were derived from ground surveys, three models were fitted: an intercept-only GLM (null model), an exponential (linear on the link scale) year effect within a GLM, and a nonlinear smooth year effect within a GAM (restricted to K=5).

Limited flexibility for the smooths represented a pragmatic approach aimed to estimate trends on the appropriate temporal scale. For consistency the same approach was used across SMUs; occasionally this resulted in a potentially suboptimal fit for periods of time (i.e. Moray Firth; Fig 6).

## Results & Discussion

*Harbour seals*

There are a number of key differences compared to the results of Thompson et al. (2019). An increasing trend (Fig 1a – 3a) was fitted to the three western SMUs (stable trend in Thompson et al. 2019). There was one additional data point for Southwest Scotland and West Scotland but for Western Isles the change was driven solely by the change in selection method (AIC vs AICc). The estimated trend for the Western Isles (Fig 3a) shows a decline to c. 2005 followed by an increase. The data points for the Sound of Barra SAC (not included in Thompson et al. (2019) because harbour

seals are not a primary feature) indicates that the abundance in the SAC is depleted (compared to in the 1990s). The component areas of West Scotland SMU show the same trend as in Thompson et al. (2019): a stable trend in the southern area of the SMU (Fig 2ii a) but increases in the central (Fig 2iii a) and north (no additional data; (Fig 2iv a) areas. Although trends in SACs were not fitted here, the additional data point for the SACs in the southern area (Fig 2ii a; Eileanan agus Sgeiran Lios mor and Southeast Islay SACs) did not suggest a deviation from the stable trend reported for the SACs in Thompson et al. (2019). There were no additional data for the Ascrib, Isay and Dunvegan SAC in the central region; in contrast to the area as whole, this SAC shows a stable trend (Thompson et al. 2019). For the northern SMUs there was an additional data point from a survey in 2019 but no discernible change in the estimated trends compared to Thompson et al. (2019). For North Coast & Orkney (Fig 4a), counts were stable until 2001; the next count in 2006 was c. 45% lower and counts have been declining ever since. However, the most recent count (2019) for the North Coast and Orkney was higher (1405) than the previous count in 2016 (1349) and thus the decline may be slowing. The 2019 count for the Sanday SAC was also slightly higher than in 2016; the Sanday SAC showed a similar trend to the SMU (Thompson et al. 2019). Shetland shows a stable trend either side of a drop of c.40% between 2001 and 2005 (Fig 5a) The 2019 counts for the Shetland SACs appear to follow the trends estimated in Thompson et al. (2019): stable and declining for Yell Sound Coast and Mousa SACs, respectively.

The trends in the Moray Firth SMU (Fig 6a; represented by Loch Fleet to Findhorn - c. 94% of harbour seals in the SMU), which included two additional counts, were similar to that fitted in Thompson *et al.* (2019) but a GAM, rather than a decline to 2002 and stable thereafter, was preferred by model selection. A declining trend was fitted in Thompson *et al.* (2019) for the Dornoch Firth and Morrich More SAC and given the high variability of counts around the trend, the two most recent counts are not contradictory to that trend.

There are only five counts available for East Scotland SMU (Fig 7a) as a whole (and no additional counts since Thompson *et al.* 2019). However, given the decreased suitability of the Firth of Tay and Eden SAC as a proxy for the SMU (14% of the count in 2016 compared to > 90% in the early 2000s) a trend was fitted to both the SMU and the SAC. Although there is evidence of a declining trend, it is clear that there has been a redistribution within the SMU with the catastrophic declines (95% since 2002) restricted to the SAC. A GAM was preferred for the SAC (compared to stable until 2002 and a decline thereafter in Thompson *et al.* 2019). Indeed, there is evidence that the decline may be slowing.

The eastern England SMUs represent the only SMUs which have shown sustained increases in abundance (punctuated by PDV-mediated declines in 1988 and 2002; Thompson *et al.* 2019). Northeast England (Fig 8a) hosts a small number of harbour seals (max count < 100 seals) and the last two counts (2018 and 2019) are c. 14% lower than the three previous counts (highest of the time series). Counts in harbour seals in The Wash and North Norfolk SAC (c. 75% of harbour seals in the SMU) are around 1,000 seals (c. 25%) lower in recent years (five counts; 2019 – 2021) compared to the mean in the previous five years. It is unclear whether this drop represents a step change or the beginning of a rapid decline. See SCOS-BP 21/06 for more detailed examination of the data and associated Discussion.

*Grey seal August counts*

*Independent Estimates* (Table 2, Fig 10)

The updated scalar resulted in slightly reduced mean population estimates for 2008 (96,028 compared to 101,196) and 2014 (138,437 compared to 145,889; Russell *et al.* 2016; Table 2). The

total count and population estimate for 2017 was 40,347 and 169,060, respectively, representing a 16% increase compared to 2014.

These three independent estimates are input into the population model (Thomas 2021) after downscaling to make them comparable with the pup production estimates for the appropriate year; only production estimates from the regularly monitored colonies in SMUs 1-9 are incorporated in the population model (c. 92.33, 93.37 and 93.33% for the three independent estimate blocks respectively).

*Grey seal August trends*

Grey seal trends in August were estimated to be stable in three SMUs (Western Isles, Shetland and East Scotland) and increasing in the other six considered here (Southwest Scotland, West Scotland, North Coast & Orkney, Moray Firth, Northeast England and Southeast England).

In two of the SMUs for which a stable trend was selected, Western Isles (Fig 3b) and East Scotland (Fig 7b), the most recent count is the highest of the time series. There were limited data to fit a robust trend in East Scotland (n=5), and for the Western Isles the counts are variable with two periods of increasing counts. Thus Shetland (Fig 5b) is the only SMU for which there is a real possibility of recent declines; an exceptionally low count at the start of the time series precludes the fitting of a robust trend to current data.

Slight increasing trends (with considerable uncertainty) were estimated for West Scotland and its component areas (Fig 2b; only the subareas were included in the combine across SMU trend) as well as North Coast & Orkney (Fig 4b). There was considerable uncertainty around the trend for Northeast England (Fig 8b), indeed it is not clear whether or not the last three counts represent a step increase in abundance or a continuing trend. For Southeast England SMU, the trend was fitted to the three of the five largest haulouts (Donna Nook, The Wash and Blakeney Point; c. 74% of the grey seal abundance in the SMU; Fig 9b). These three haulouts represent the most comprehensive time-series but there are indications that Donna Nook (Humber Estuary SAC) is now in decline (Fig 9b; Thompson and Russell 2021). The more recent popular haulout sites are likely to show different trajectories; data is lacking for Horsey but numbers at Sroby Sands are rapidly increasing (Thompson and Russell 2021).

Some grey seal SACs are designated on the basis of their breeding colonies and have relatively low numbers in August and thus patterns in the August counts are not examined: Treshnish Isles SAC (West Scotland), North Rona (Western Isles), Isle of May (East Scotland). Counts for Faray & Holm of Faray SAC (North Coast & Orkney) have been variable around an average of 375 with no discernable temporal pattern. The remaining SACs (Monachs SACs, the Farnes component of the Berwickshire & North Northumberland Coast SAC, and the Humber Estuary SAC) have significant numbers during both August and breeding. There is no indication of a pattern in the counts for the Monach Islands SAC (Fig 3b; average around 1500; range 1250 - 1991) but the last count was considerably higher (2701). The Farnes component of the Berwickshire and North Northumberland SAC (Fig 8b) used to be the whole count for the Northeast England SAC, it still accounts for >90% and thus the trends will mirror those of the SMU. As mentioned above the Humber Estuary SAC (Fig 9b; Donna Nook) comprises a decreasing proportion of the Southeast England SMU.

**Table 2.** The three independent estimates for grey seal population (SMUs 1-9) and associated counts.

| | | Count | | | Population estimate (and 95% CIs) | | |
|---|---|---|---|---|---|---|---|
| Region | SMUs | 2007-2009 | 2013-2015 | 2016-2018 | 2008 | 2014 | 2017 |
| Western Isles | 3 | 3,808 | 4,065 | 5,773 | 15,141 (13,099 - 17,753) | 16,163 (13,983 - 18,951) | 22,954 (19,859 - 26,914) |
| Western Scotland | 1 & 2 | 2,773 | 5,438 | 4,691 | 11,026 ( 9,539 - 12,928) | 21,622 (18,707 - 25,352) | 18,652 (16,137 - 21,869) |
| North Coast, Orkney & Shetland | 4 & 5 | 10,061 | 9,664 | 10,723 | 40,004 (34,610 - 46,904) | 38,425 (33,244 - 45,054) | 42,636 (36,887 - 49,991) |
| North Sea | 6 - 9 | 7,509 | 15,650 | 19,160 | 29,857 (25,831 - 35,007) | 62,227 (53,836 - 72,960) | 76,183 (65,910 - 89,324) |
| Surveyed regions | | 24,151 | 34,817 | 40,347 | 96,028 (83,079 - 112,592) | 138,437 (119,770 - 162317) | 160,425 (138,793 - 188,098) |

The combined trend across all SMUs (Fig 10) indicates that although the trend is increasing, the increase may be slowing. In contrast to this trend, the counts underlying the independent estimate comprise counts for all haulouts. It would thus be expected that the points would be above the trend line (Fig 10). These counts do not follow the same trajectory as the estimated trend. This may be because the proxies used to fit the SMU trends (Table 1) were based on the availability of a time series of data, and thus did not include some of the more recently established haulout sites which be increasing at a faster rate than the SMU-wide trends (as in the case in Southeast England). Thus, further work is required to determine to what degree the apparent slowing may be an artifact of the proxies used to fit the SMU-wide trends (particularly in Southeast England). However, following such investigation, if it is possible to upscale from proxies to SMU-wide trends, the combined trend could be used as the basis of a time series of independent estimates of population size for the population model. Such an approach would have a number of advantages over the current method which relies on scaling up raw counts (see above). It would increase the amount of data available to the population model (time-series vs three independent estimates); essentially decrease the influence of the day-to-day variability in counts (see Russell & Carter 2021); negate the need for counts over multiple year (3-year survey blocks) to be assigned to a single focal year (potentially masking changes in these years); and the uncertainty around the trends could be propagated into the estimates of population size.

*Grey seals pups*

The final model estimating trends in grey seal pup production for aerially surveyed SMUs included an estimated of 27 % jump (95% CI: 16.7 – 37.5) in pup production associated with the change from film to digital (delta AIC of -30 compared to a model within the jump). The plots show the pup production trends (and associated confidence intervals) for each SMU if no jump had occurred; in essence, once the jump has been taken into account, the estimates based on both the film and digital surveys are used to fit the trends. The dashed line through the digital surveys shows the same trend but at the higher level of the estimates associated with the digital surveys. For the SMUs which comprise ground-counted colonies, a GAM was selected for Northeast and Southeast England, and a GLM with a declining trend for Shetland.

Although pup production had levelled off in West Scotland (early to mid-1990s; Fig 2i c) and Western Isles (mid 1990s; Fig 3c) (Russell *et al.* 2019, the 2016 and 2019 estimates were higher than the first two digital survey estimates (2012 and 2014), which for the Western Isles has resulted in a slight recent increase in the mean predicted trend. This apparent increase is reflected in the Monach Islands SAC which accounts for > 75% of the SMU pup production. In contrast, pup production in North Rona is continuing to decline. In the North Coast & Orkney SMU (Fig 4c), pup production has remined stable since around 2000. The Faray & Holm of Faray SACs indicate that the colony may be in decline. A declining trend was fitted for Shetland (Fig 5c); however, the time-series comprised a subset of colonies and was based on peak counts (which are sensitive to effort, i.e., number and timing of counts) and thus there are doubts as to how robustly these trends represent Shetland as a whole. The Moray Firth SMU (Fig 6c) shows indication that pup production is increasing though it should be noted that there is a limited temporal extent to the data and pup production within this SMU is difficult to accurately estimate. The East Scotland SMU (Fig 7c) is continuing to increase rapidly (mean estimate of c. 28 % between 2014 and 2019), but the two SACs which represent the vast majority of production in the SMU show differing patterns in abundance. The Isle of May SAC, which essentially held the SMUs pup production until the mid 1995s looks to be stable or potentially reduced. In contrast the Fast Castle colony, Berwickshire & North Northumberland Coast SAC, is showing rapidly increasing pup production. Note that although the SAC boundary transects the Fast Castle colony, here all pup production is assigned to the SAC. Pup production in Northeast England, which is entirely encompassed by the Farne Islands component of the Berwickshire & North Northumberland Coast SAC, is also increasing rapidly (mean estimated increase of 53% between

2014 and 2019). Finally, pup production within the Southeast England SMU is continuing to increase exponentially (mean estimate c. 75% between 2014 and 2019) but this is in a large part due to increases in Blakeney Point and Horsey, while the increase at Donna Nook (Humber Estuary SAC) which, up until c. 2000 accounted for the SMUs pup production is now slowing, and thus represents a decreasing proportion of the SMU's pup production.

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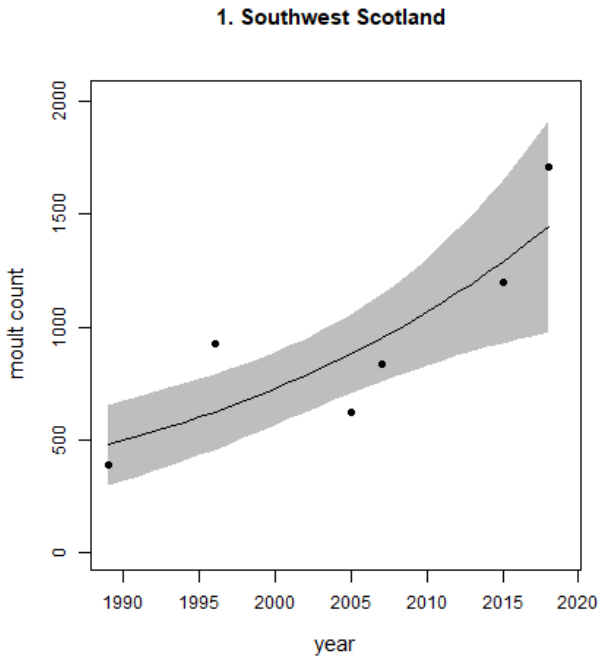
(a)




(b)

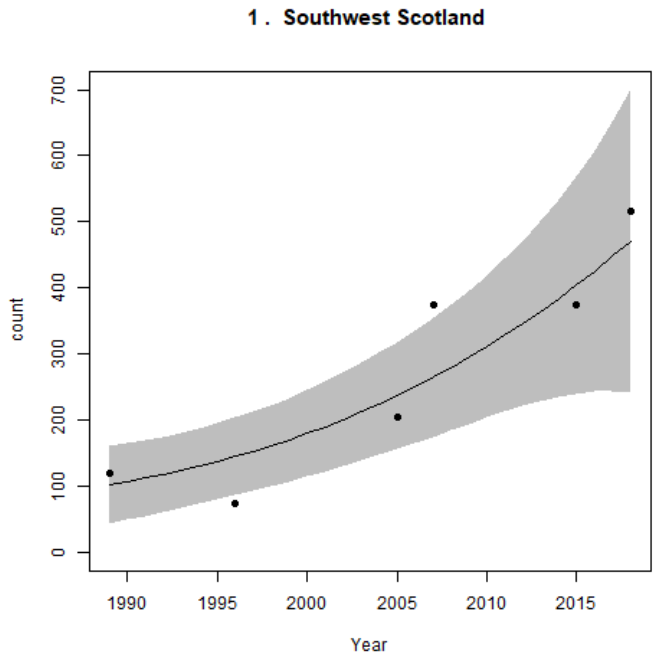
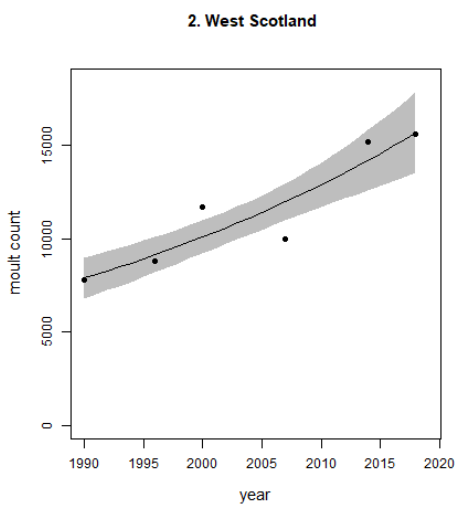



Figure 1. The predicted trend and associated 95% confidence intervals for harbour (a) and grey (b) seal August counts in the Southwest Scotland SMU. The filled circles are the values used to fit the trends.

(a)

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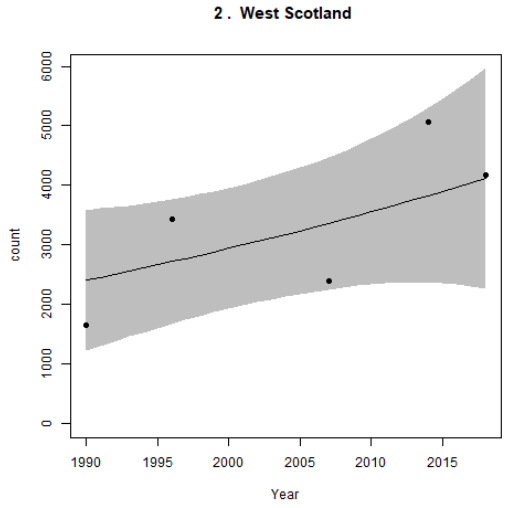



(c)

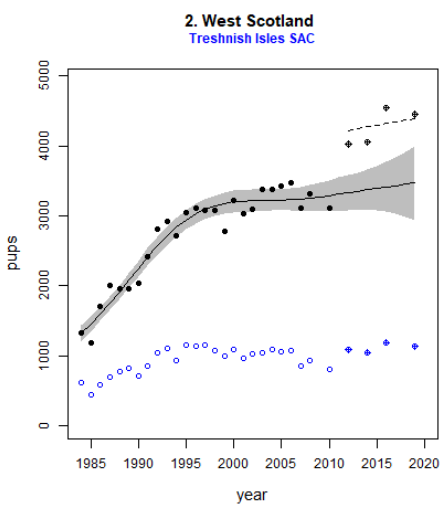
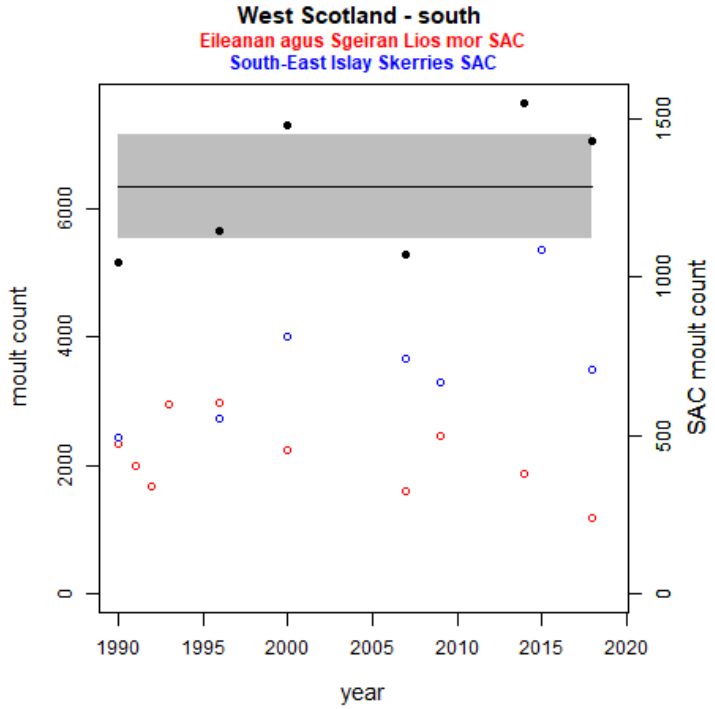



Figure 2i. The predicted trend and associated 95% confidence intervals for harbour (a) and grey (b) seal August counts, and grey seal pup production (c) in the West Scotland SMU. The filled (and crossed; c) black circles are the counts used to fit the SMU trends. The dashed line in (c) shows the same trend as the solid line but at the level of pup production predicted for digital survey estimate (crossed circles). The open and crossed coloured circles (c) indicate the SAC estimates for the film and digital surveys, respectively.

(a)

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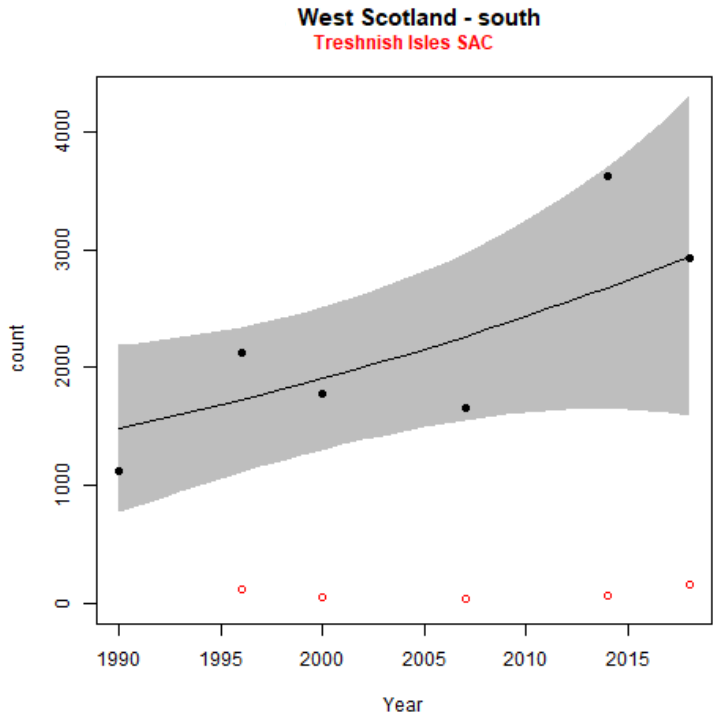
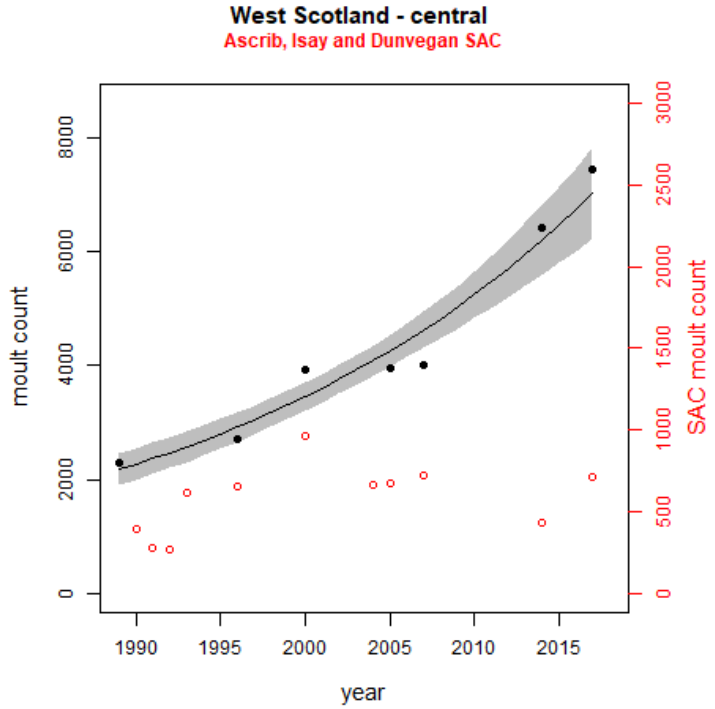



Figure 2ii. The predicted trend and associated 95% confidence intervals for harbour (a) and grey (b) seal August counts in the southern area of the West Scotland SMU. The filled black circles are the values used to fit the SMU trends. The open coloured circles indicate the SAC counts.

(a)

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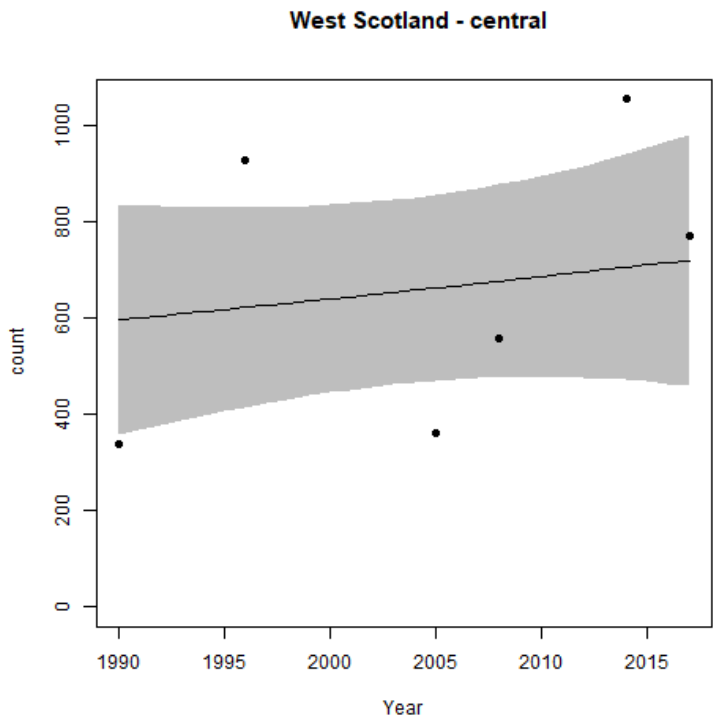
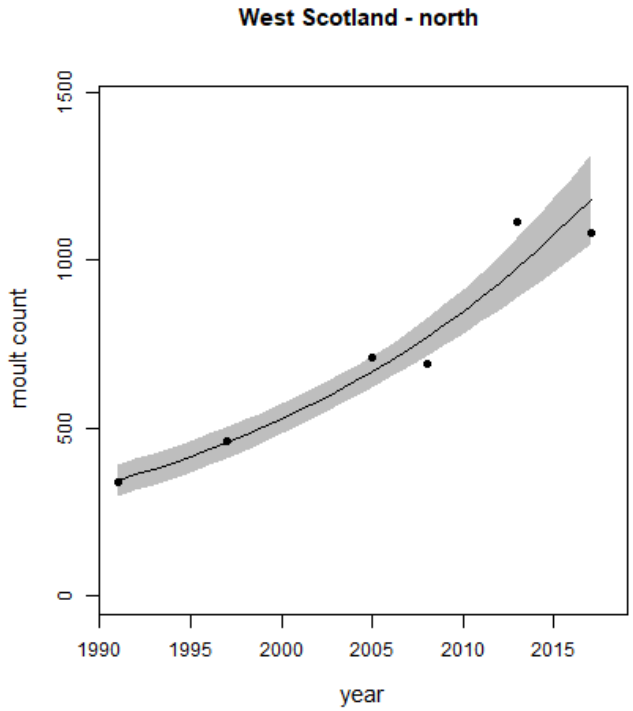



Figure 2iii. The predicted trend and associated 95% confidence intervals for harbour (a) and grey (b) seal August counts in the central area of the West Scotland SMU. The filled black circles are the values used to fit the SMU trends. The open circles indicate the SAC counts. The open coloured circles indicate the SAC counts. Note the different axes for the SAC in (a).

(a)




(b)

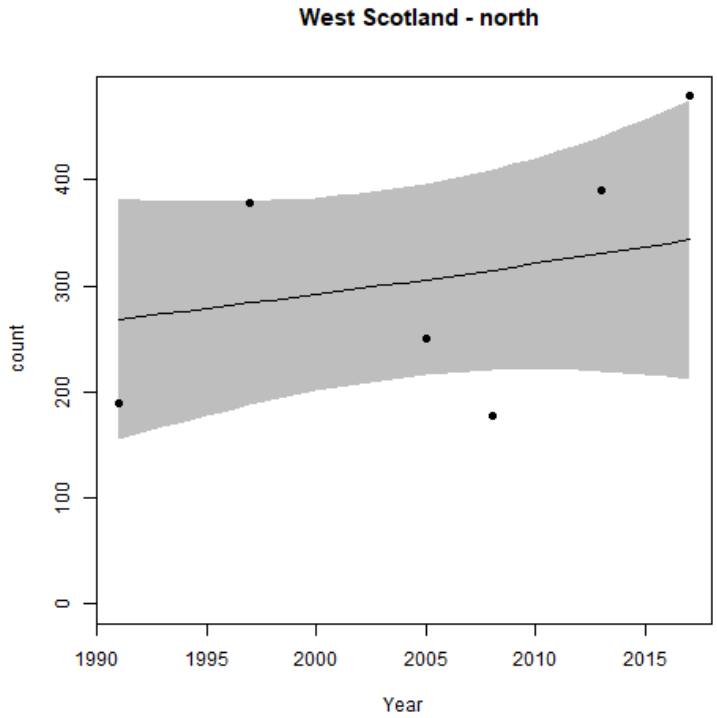



Figure2iv. The predicted trend and associated 95% confidence intervals for harbour (a) and grey (b) seal August counts in the southern area of the West Scotland SMU. The filled black circles are the values used to fit the SMU trends.

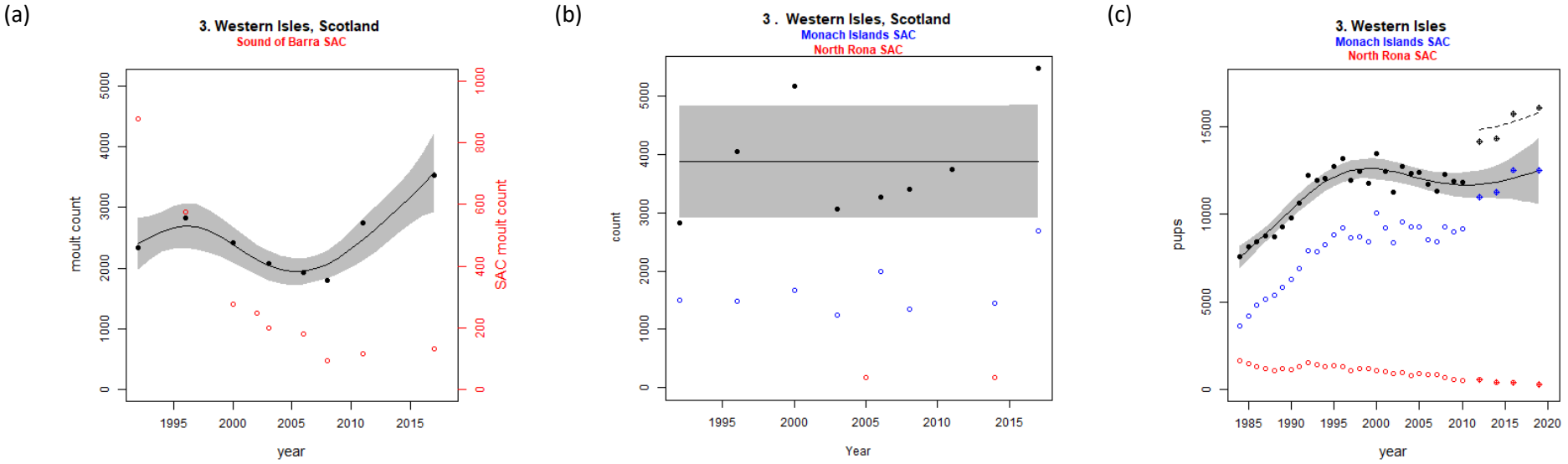
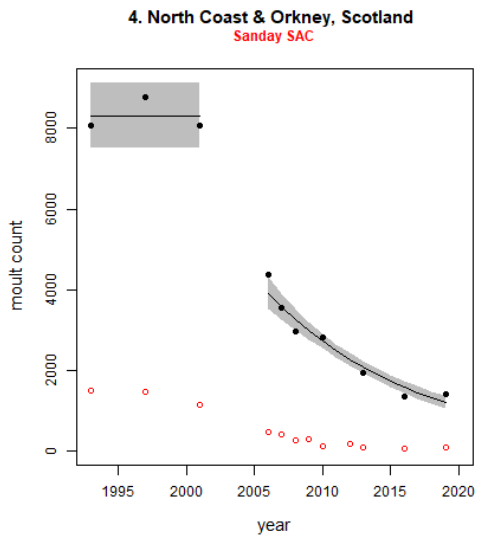
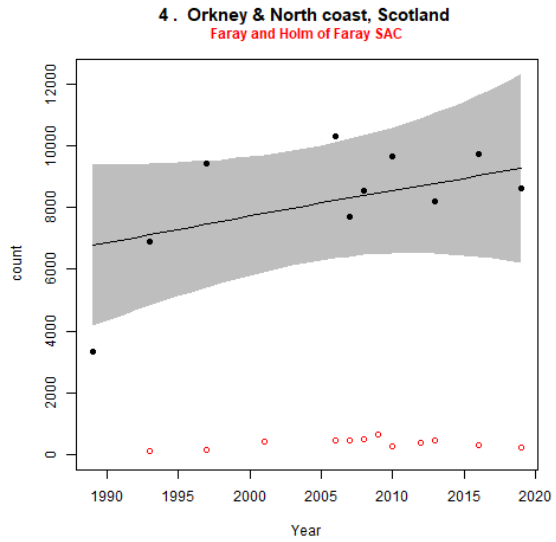



Figure 3. The predicted trend and associated 95% confidence intervals for harbour (a) and grey (b) seal August counts, and grey seal pup production (c) in the Western Isles SMU. The closed (and crossed; c) black points are the values used to fit the SMU trends. The dashed line in (c) shows the same trend as the solid line but at the level of pup production predicted for digital survey estimate (crossed circles). The open coloured circles in (a) and (b) indicate the SAC counts. The open and crossed coloured circles (c) indicate the SAC estimates for the film and digital surveys, respectively. Note the different axes for the SAC in (a).

(a)




(b)




(c)

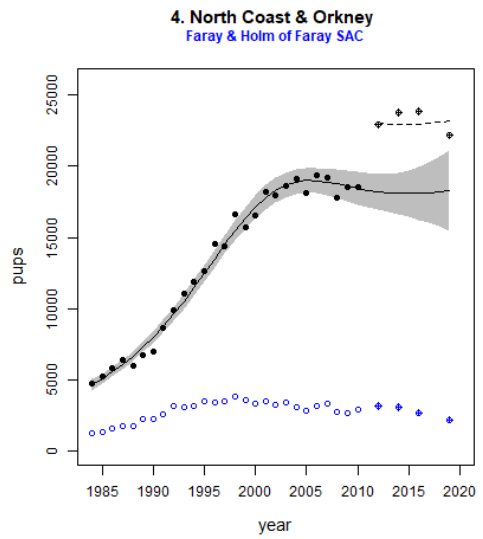
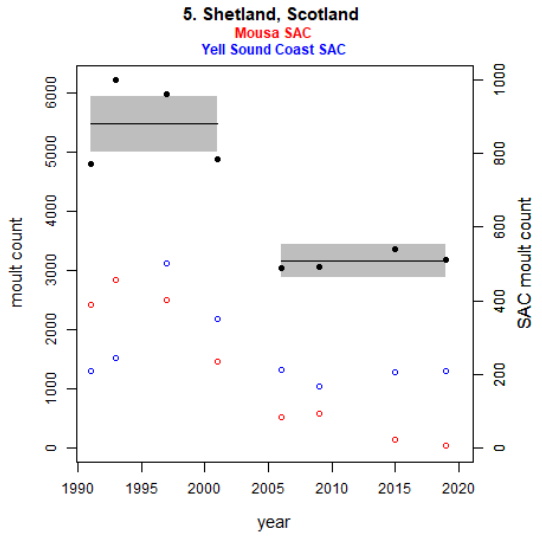
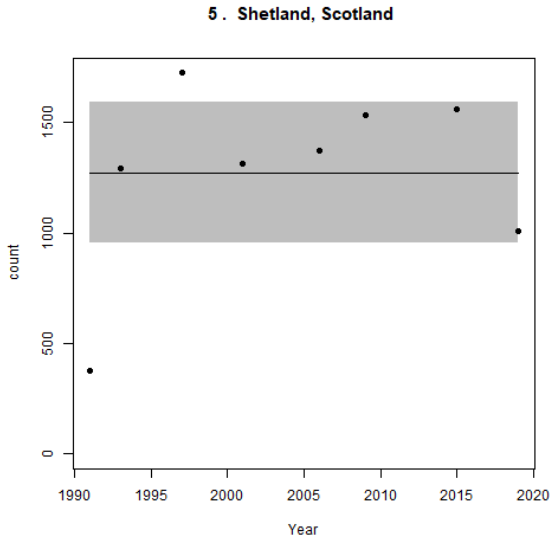



Figure 4. The predicted trend and associated 95% confidence intervals for harbour (a) and grey (b) seal August counts, and grey seal pup production (c) in the North Coast & Orkney SMU. The dashed line in (c) shows the same trend as the solid line but at the level of pup production predicted for digital survey estimate (crossed circles). The filled (and crossed; c) black circles are the values used to fit the SMU trends. The open coloured circles in (a) and (b) indicate the SAC counts. The open and crossed coloured circles (c) indicate the SAC estimates for the film and digital surveys, respectively.

(a)




(b)




(c)

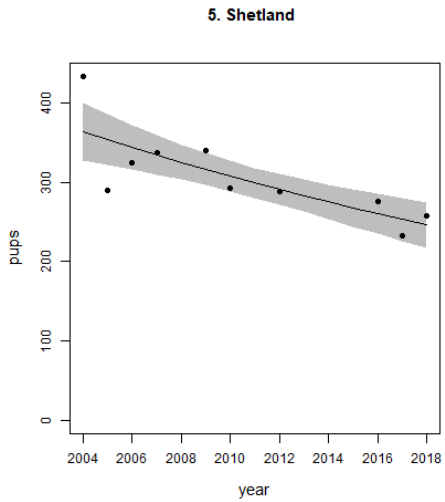
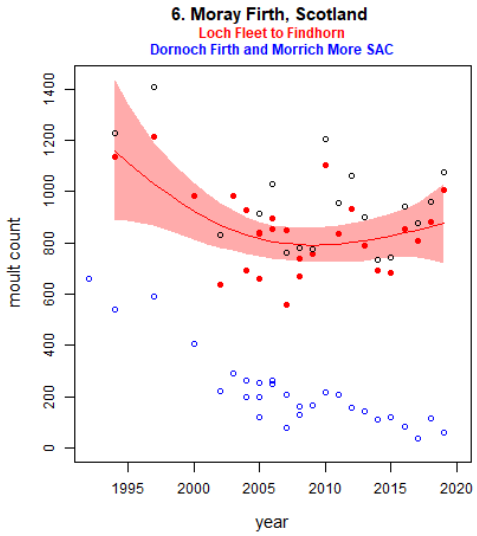
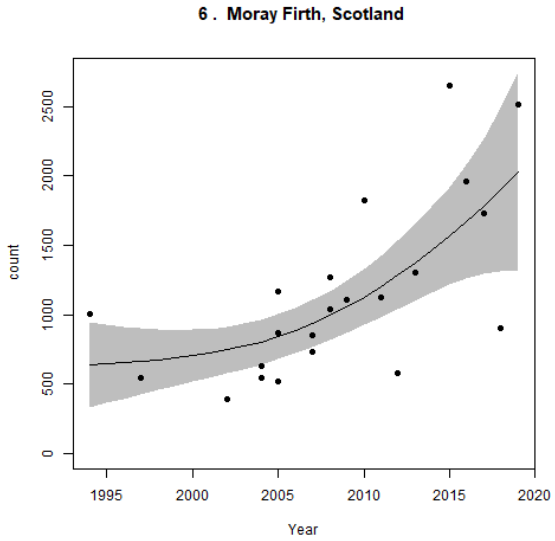



Figure 5. The predicted trend and associated 95% confidence intervals for harbour (a) and grey (b) seal August counts, and grey seal peak pup numbers (c) in the Shetland SMU. The filled black circles are the values used to fit the SMU trends. The open coloured circles indicate the SAC counts. Note the different axes for the SACs (a).

(a)




(b)




(c)

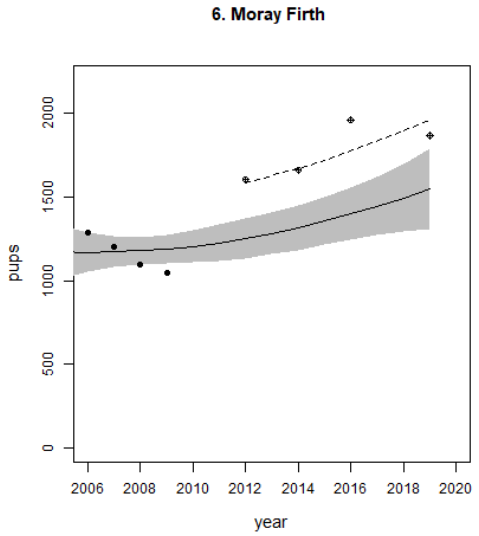
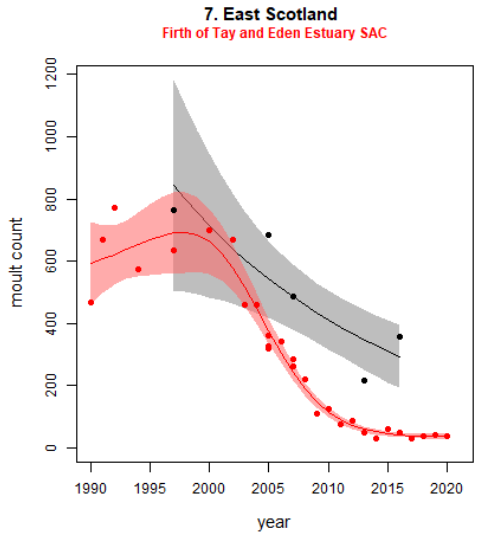
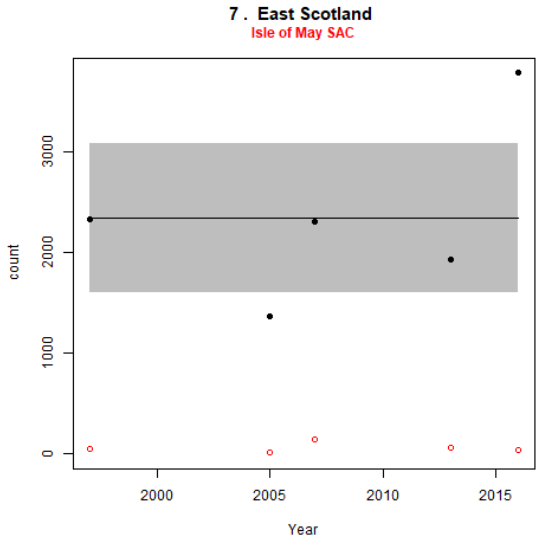



Figure 6. The predicted trend and associated 95% confidence intervals for harbour (a) and grey (b) seal August counts, and grey seal pup production (c) in the Moray Firth SMU (subset for a). The open black circles (a) illustrate the SMU-wide counts and were not used for model fitting. The filled (and crossed; c) points are the values used to fit the trends. The dashed line in (c) shows the same trend as the solid line but at the level of pup production predicted for digital survey estimate (crossed circles).

(a)




(b)




(c)

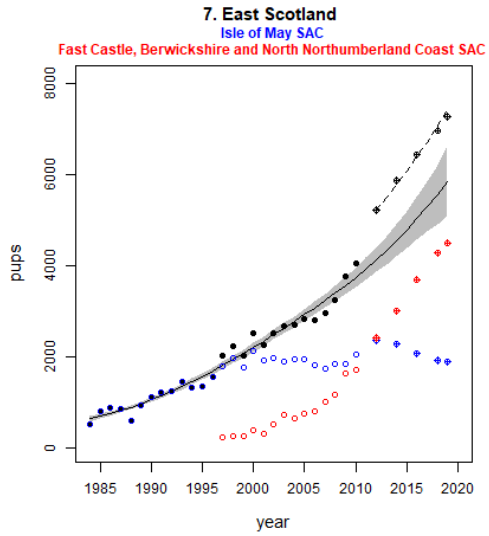
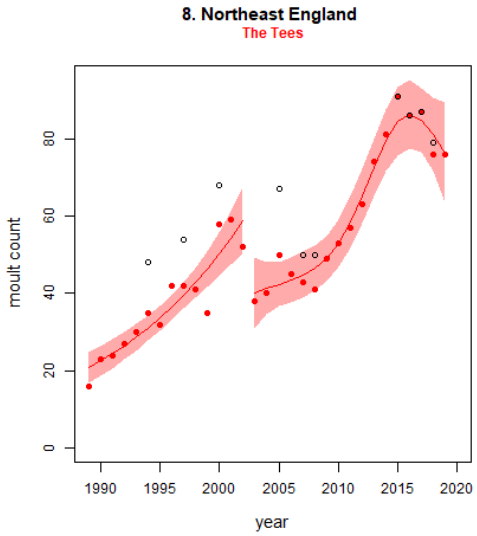
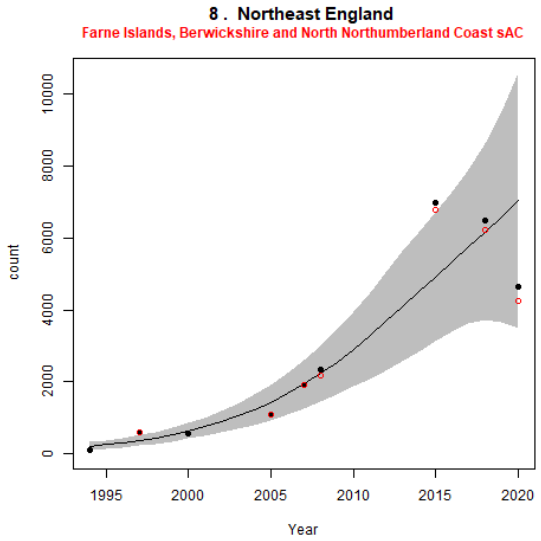



Figure 7. The predicted trend and associated 95% confidence intervals for harbour (a) and grey (b) seal August counts, and grey seal pup production (c) in the East Scotland SMU (and the SAC in a). The filled (and crossed; c) black and red points are the values used to fit the trends (b). The dashed line in (c) shows the same trend as the solid line but at the level of pup production predicted for digital survey estimate (crossed circles). The open coloured circles in (b) indicate the SAC counts. The open and crossed coloured circles (c) indicate the SAC estimates for the film and digital surveys, respectively.

(a)




(b)




(c)

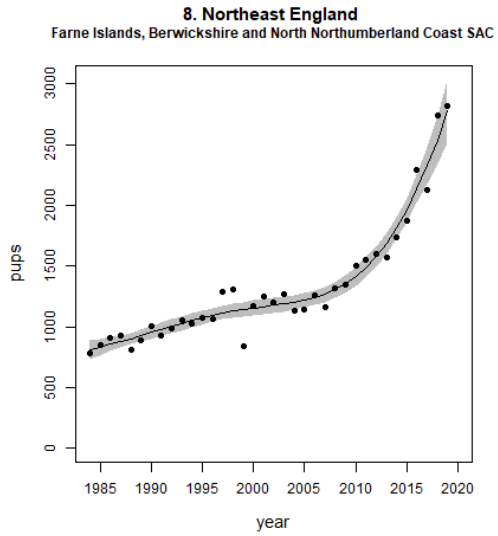
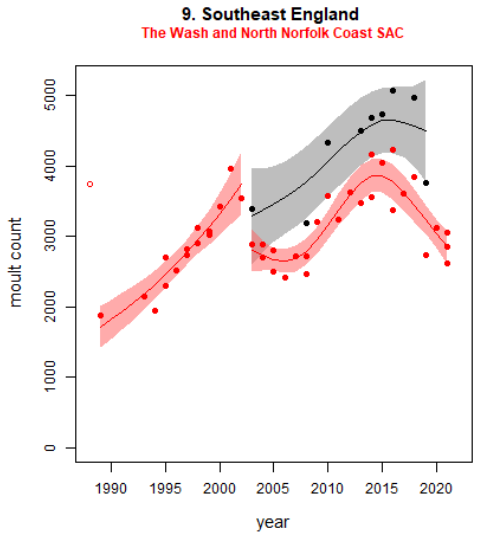
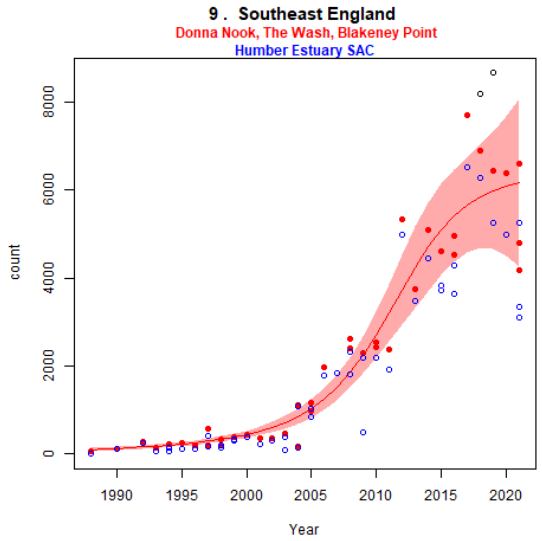



Figure 8. The predicted trend and associated 95% confidence intervals for harbour (a) and grey (b) seal August counts, and grey seal pup production (c) in the Northeast England SMU (subset for a). The filled black and red circles are the values used to fit the trends. The open black circles (a) illustrate the SMU-wide counts and were not used for model fitting. The open red circles (b) illustrate the SAC counts.

(a)




(b)




(c)

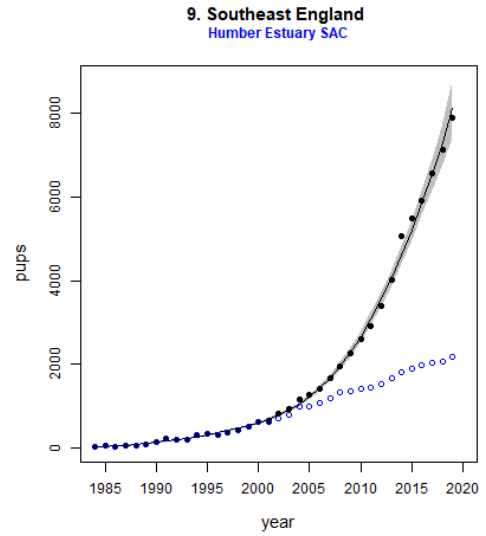



Figure 9. The predicted trend and associated 95% confidence intervals for harbour (a) and grey (b) seal August counts, and grey seal pup production (c) in the Southeast England SMU (and SAC in (a); subset only in (b)). The filled black and red circles are the values used to fit the trends. In (a) the open red circle indicates the single pre-1988 epidemic count (not used for model fitting). The open black circles (b) indicate the SMRU-wide counts and were not used for model fitting. The open blue circles are the counts (b) and production estimates (c) for the grey seal SAC.

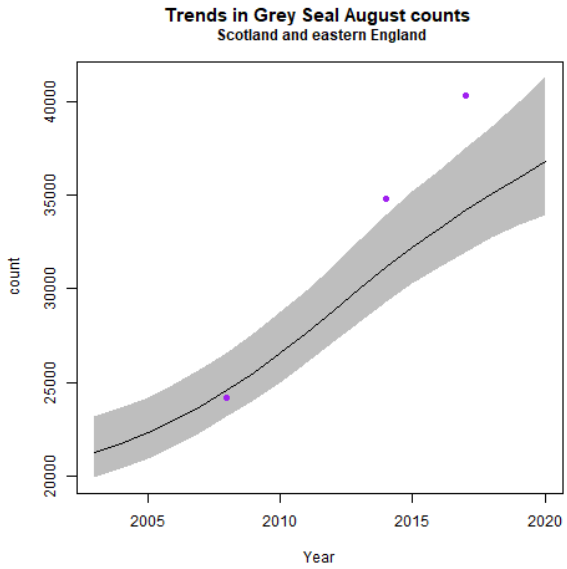



Figure 10. The predicted trend and associated 95% confidence intervals for grey seal August counts for SMUs 1-9. Note that as proxies were used to fit the trend in some SMUs, the predictions do not represent predictions of total counts across the SMUs. In contrast the purple circles, which represent the three counts underlying the independent estimates, are for the entire study area (SMUs 1-9).

# Annual review of priors for grey seal population model 2021

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**Summary**

Prior distributions (Table 1) for the grey seal population model (SCOS-BP 21/05) are required for the following model parameters: adult female survival $\phi_a$, maximum pup survival $\phi_{p\max}$, fecundity $\alpha$, shape of density dependence acting on pup survival $\rho$, region-specific carrying capacity (in terms of pup production) $\chi_{1-4}$, number of adults per female $\omega$, and precision of the pup production estimates $\psi$. The data used to inform these priors are presented below and in Tables 2 and 3. The resulting prior distributions are shown in Figure 1 and Table 1. These distributions are identical to those used in the previous year's analysis (SCOS-BP 21/05). Further discussion of previous and current prior selection is given in Lonergan (2012; 2014), and Russell (2017). Recent data, and any implications for the current priors, are highlighted. For study sites for which there are multiple estimates for a parameter, only the most comprehensive study is presented. This briefing paper is based on Supporting Information in Thomas et al. (2019).

**Table 1.** Prior parameter distributions input in Thomas (2021 SCOS-BP 21/05). Be and Ga denote beta and gamma distributions, respectively. Carrying capacity subscripts 1 to 4 refer to North Sea, Inner Hebrides, Outer Hebrides and Orkney regions.

| Parameter | Prior distribution | Prior mean (SD) |
|---|---|---|
| adult survival $\boldsymbol{\phi_a}$ | 0.8+0.18*Be(1.79,1.53) | 0.90 (0.04) |
| pup survival $\boldsymbol{\phi_{p\max}}$ | Be(2.87,1.78) | 0.62 (0.20) |
| fecundity $\boldsymbol{\alpha}$ | 0.6+0.4*Be(2,1.5) | 0.83 (0.09) |
| dens. dep. shape $\boldsymbol{\rho}$ | Ga(4,2.5) | 10 (5) |
| carrying capacity $\boldsymbol{\chi_1}$ | Ga(4,5000) | 20000 (10000) |
| carrying capacity $\boldsymbol{\chi_2}$ | Ga(4,1250) | 5000 (2500) |
| carrying capacity $\boldsymbol{\chi_3}$ | Ga(4,3750) | 15000 (7500) |
| carrying capacity $\boldsymbol{\chi_4}$ | Ga(4,10000) | 40000 (20000) |
| observation precision $\boldsymbol{\psi}$ | Ga(2.1,66.67) | 140 (96.61) |
| sex ratio $\boldsymbol{\omega}$ | 1.6+Ga(28.08, 3.70E-3) | 1.7 (0.02) |

**Parameters**

*Adult female survival* $\boldsymbol{\phi_a}$

Relevant studies are summarized in Table 2. Estimates of annual adult survival in the UK, obtained by aging teeth from shot animals are between 0.935 and 0.96 (Harwood & Prime, 1978; Hewer, 1964; Lonergan, 2012). Capture-mark-recapture (CMR) of adult females on breeding colonies can be used to estimate female survival but may produce underestimates as they are dependent on the assumption that females not returning to the study colony have died. Using capture-mark-recapture (CMR), adult survival was estimated to be between 0.87 and 0.95 (Smout, King & Pomeroy, 2019; see Table 2 for more details). Based on the above data, and the fact that the lower limit on adult survival cannot be lower than 0.8 (Lonergan, 2012), the prior on adult female survival was specified to allow non-zero probability density only between 0.8 and 0.97 (Thomas 2018). However, recent estimates from Sable Island suggest adult female survival may be above this upper bound.

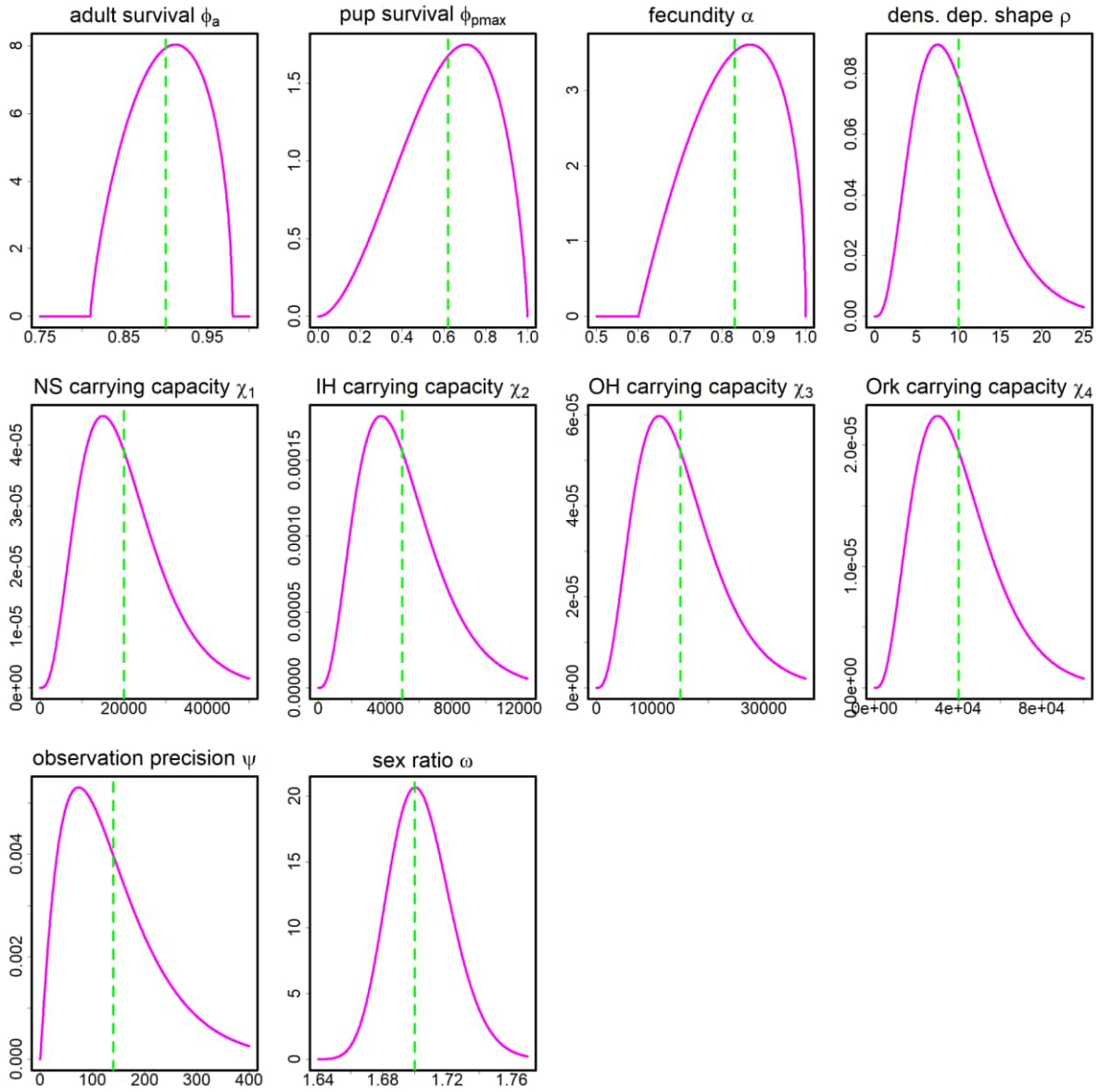


**Figure 1.** Prior probability density functions for each model parameter input in Thomas (2020), drawn from the distributions specified in Table 1. Carrying capacity subscripts 1 to 4 refer to North Sea, Inner Hebrides, Outer Hebrides and Orkney regions, respectively. Prior means are shown as green dashed vertical lines.

den Heyer & Bowen (2017) used a Cormack-Jolly-Seber model to estimate age- and sex-specific adult survival from a long-term brand re-sighting programme on Sable Island. Average female adult survival was estimated to be 0.976 (SE 0.001), averaged over all animals, but was higher for younger adults (0.989 with SE 0.001 for age classes 4-24) than older adults (0.904 SE 0.004 for age 25+). Rossi et al., ( 2021) found that females on Sable Island maintained very high annual survival rates (>97%) until age 25, after which survival declines by 8% between ages 25–29 and by another 9% for ages 30+. Males similarly maintained high survival rates (>95%) until age 25, though declines in male survival rates in older age classes were much steeper than in female rates. Thus, as agreed by SCOS in 2018, the upper limit has been increased to 0.98; the resulting distribution is a beta distribution Be(1.79, 1.53) which is scaled (multiplied by 0.18 and added to 0.8) to allow non-zero probability density only between 0.8 and 0.98. The resulting distribution has mean 0.90 and SD 0.04.

*Maximum pup survival* $\boldsymbol{\phi_{pmax}}$

Relevant studies are summarized in Table 2. Data from populations that were growing rapidly and therefore apparently not constrained by density dependence acting on pup survival were required to inform this prior. There are various published estimates of first-year survival during periods of exponential growth (Table 2). Mean estimates of pup surival were between 0.54 – 0.76. On the basis of these estimates, the prior on maximum female pup survival is defined as a diffuse beta distribution Be(2.87, 1.78) which has mean of 0.62 (SD 0.20). Note that Pomeroy, Smout, Moss, Twiss, & King (2010) found high inter-annual variation in pup survival, which is not currently incorporated in the model.

*Fecundity* $\boldsymbol{\alpha}$

Relevant studies are summarized in Table 3. For the purposes of this model, fecundity refers to the proportion of breeding-age females (aged 6 and over) that give birth to a pup in a year (natality or birth rate). For the most part, studies have measured pregnancy rather than natality rates. The resulting estimates are thus maxima in terms of fecundity as abortions will cause pregnancy rates to exceed birth rates. Mean estimated adult female pregnancy rates from examination of shot animals were between 0.83 and 0.94 in the UK (Boyd, 1985; Hewer, 1964), and between 0.88 and 1 at Sable Island, Canada (Hammill & Gosselin, 1995). A recent study in Finland (Kauhala *et al.* 2019; Kauhala and Kurkilahti 2020) based on shot animals showed pregancy rate can fluctuate significantly (between c.0.6 and c.95) in relation to the environment (prey quality). CMR studies report lower estimates, which may be a result of unobserved pupping events (due to mark misidentification, tag loss, or breeding elsewhere), but also because such estimates represent births rather than pregnancy. Such studies, from Sable Island estimate fecundity to be between 0.57 and 0.83 (Bowen, Iverson, McMillan, & Boness, 2006; den Heyer & Bowen, 2017). A recent study from Sable Island demonstared that fecundity varied as a function of your breeding status in the previous year: non-breeder, first-time breeder, and breeder (in order of lowest to highest). UK estimates of fecundity rates for populations of marked study animals, adjusted for estimates of unobserved pupping events were 0.79 (95% CI 0.77-0.81) and 0.82 (95% CI 0.79-0.84) for a declining (North Rona) and increasing (Isle of May) population, respectively (Smout et al., 2019). Based on the available data, the prior on fecundity (α) is specified as a beta distribution Be(2, 1.5) which is scaled (multiplied by 0.4 and added to 0.6) to only allow probability density between 0.6 and 1. The resulting distribution has mean 0.83 and SD 0.09.

*Shape of density dependence acting on pup survival* $\boldsymbol{\rho}$

Pup survival at carrying capacity is not dependent on this parameter, and hence carrying capacity also does not depend on it. Instead, the parameter influences the shape of the population growth trajectory, by determining the shape of the relationship between pup survival and pup production. Fowler (1981) used both theory and empirical data to suggest that most density-dependent change in vital rates happens close to carrying capacity for species with life history strategy typical of large mammals (i.e., long lived and low reproductive rate). Empirical examples (their Figure 4) show relationships consistent with values of $\rho$ in the range 5-10. To avoid being too prescriptive, a diffuse distribution was specified: a Gamma distribution Ga(4, 2.5), which has a mean of 10 and SD 5.

*Region-specific carrying capacity* $\boldsymbol{\chi_{1-4}}$

No independent information was available about carrying capacity, and so the priors were specified with a variance wide enough to make their influence on population size estimates negligible. Truly non-informative priors (e.g., improper priors with infinite variance) make the particle filtering algorithm extremely inefficient, since most simulated trajectories are infeasible given the data, hence a trade-off is required between a prior with a large enough variance to be non-informative, but not too large so as to make the algorithm prohibitively inefficient. Having the initial rejection control step in the algorithm helped to some extent in this regard. Gamma distributions with a SD:mean ratio of 1:2, with the mean set subjectively based on expert opinion (Table 1) were found to meet these criteria.

*Number of adults per adult female* $\boldsymbol{\omega}$

This parameter is also referred to as the sex ratio, although strictly the ratio of males:females is given by $\omega - 1$. Relevant studies (on sex-specific survival rates) are summarized in Table 2. A sex ratio of 0.73:1 was derived from shot samples (Harwood & Prime, 1978). This was based on the following assumptions: that the shot males were a representative sample of the breeding population (≥10 years old); that female survival was 0.935; and that survival was the same between the sexes up until age 10. Using telemetry tags and "hat tag" re-sighting data (taking into account detection probability inferred by telemetry data), sex-specific pup survival was estimated (Lonergan 2014; Table 2). Although there were no significant differences in survival between males and females, the mean male survival was lower than females. Combined with data from Hewer (1964), the resulting sex ratio would be between 0.66:1 and 0.68:1 (Lonergan, 2014). Also considered were pup survival estimates derived from shot samples from the Baltic (Kauhala, Ahola, & Kunnasranta, 2012). For Sable Island, Male survival post sexual maturity has been estimated to be 0.98 (SE 0.003) ( Brusa et al. 2020 - based on data from Manske et al. 2002). The estimated the sex ratio on Sable was estimated to be 0.69:1 based on estimates of age and sex-specific survival, and assuming a stationary age distribution (Hammill, den Heyer, Bowen, & Lang, 2017). Based on these findings, the prior used was a highly informative scaled Gamma distribution Ga(4, 2.5) + 1.6. This results in a prior mean of 1.7 (SD 0.02); 90% of the prior probability density is between 1.68 and 1.73.

*Precision of the pup production estimates* $\boldsymbol{\psi}$

The pup production estimates at colony level from aerial survey data generally have a coefficient of variation of 10% or less. Uncertainty in the ground count estimates is not quantified. The resulting uncertainty in pup production at the region level is hard to predict – if the colony estimates were independent it would be smaller, but they are not independent since they share some parameters. Hence a moderately diffuse prior was specified on $\psi$ (Ga(2.1,66.67), implying a prior on CV of pup production (which is $1/\psi$) of 10% with SD 5 (i.e., with 90% of the prior probability density between 5% and 20%).

**Table 2.** Survival data used to inform the survival and sex ratio priors. CMR refers to Capture-Mark-Recapture studies and can be based on brands (permanent but can be misidentified), passive tagging (can be lost or misidentified), active tagging (can be lost), Photo-ID (can be misidentified). Except for active tagging, estimates of survival depend on the accuracy of re-sighting probabilities and, if appropriate, tag loss. If sex-specific sample sizes are not reported then total *n* is given.

| Age class | females | | | males | | | Total n | Time period | Data | Location | Considerations | Source |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | mean | uncertainty | n | mean | uncertainty | n | | | | | | |
| **Pup** | 0.66 | | 1036 | 0.66 | | 294 | | 1972, 1975 | Aged shot individuals | Farne Islands, UK | Accounted for effect of previous culls on sample structure. Based on life tables. | Harwood & Prime 1978 |
| **Pup** | 0.65 | 95% CIs: 0.39 - 0.85 | 180 | 0.50 | 95% CIs: 0.25 – 0.75 | 182 | | 1997 - 1999 | CMR (hat tag) | Isle of May and Farne Islands, UK | Tag loss accounted for. Telemetry data used to inform re-sighting probability | Reanalysis of data from Hall, McConnell & Barker 2001; Hall, McConnell & Barker 2002; grey pup seal telemetry data (Carter et al., 2017) |
| **Pup** | 0.54 | 95% CIs: 0.18 - 0.86 | 27 | 0.43 | 95% CIs: 0.11 – 0.82 | 28 | | 2002 | CMR (telemetry data) | Isle of May, UK | Tag loss accounted for | Reanalysis of data from Hall, Thomas & McConnell 2009 |
| **Pup** | 0.76<br>0.55 | | | 0.38<br>0.53 | | | 1185<br>2295 | 2000 - 2004<br>2005 - 2009 | Aged shot individuals | Baltic | Samples assumed representative. Based on life tables | Kauhala, Ahola & Kunnasranta 2012 |
| **≤ 4** | 0.735<br>0.331 | SE = 0.016<br>SE = 0.024 | 1700<br>1182 | | | | | 1985 - 1989<br>1998 - 2002 | CMR (brand) | Sable Island, Canada | Includes the data from Schwarz & Stobo (2000) | den Heyer, Bowen & Mcmillan 2014 |
| **Adult** | 0.95 | | 239 | | | | | 1956 - 1966 | Aged shot individuals | UK | Samples assumed representative. Based on life tables | Data from Hewer 1974, analysed by Lonergan 2012 |
| **≥ 10** | | | | 0.80 | | 294 | | 1972, 1975 | Aged shot individuals | Farne Islands, UK | Accounted for population trajectory. Assumed samples are representative within focal age class. | Harwood & Prime 1978 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **≥ 7** | 0.935 (0.90-0.96) | | 1036 | | | | 1972, 1975 | Aged shot individuals | Farne Islands, UK | As above | Harwood & Prime 1978 (reanalysed by Lonergan 2012) |
| **Adult** | 0.94 | 95% CIs: 0.93 - 0.95 | 273 | | | | 1987 - 2014 | CMR (brand, flipper tag, photo ID) | Isle of May | Tag loss and differential sighting probability accounted for. Survival confounded with permanent emigration | Smout, King & Pomeroy, 2019 |
| **Adult** | 0.896 | 95% CIs: 0.87 - 0.90 | 584 | | | | 1993 - 2013 | As above | North Rona, UK | As above | As above |
| **≥4** | 0.976 | SE = 0.001 | 3178 | | | 1727 | 1969 - 2002 | CMR (brand) | Sable Island, Canada | Tagged as pups. Confounded with permanent emigration (rare) | den Heyer & Bowen 2017 |
| **4-24** | 0.989 | SE = 0.001 | As above | 0.970 | SE = 0.002 | As above | As above | As above | As above | As above | As above |
| **≥25** | 0.904 | SE = 0.004 | As above | 0.77 | SE = 0.01 | As above | As above | As above | As above | As above | As above |
| **Adult** | 0.976 | SE = 0.001 | As above | 0.943 | SE = 0.003 | As above | As above | As above) | As above | As above | As above |

**Table 3.** Fecundity data used to inform the fecundity priors. CMR refers to Capture-Mark-Recapture studies and can be based on brands (permanent but can be misidentified), passive tagging (can be lost or misidentified), Photo-ID (can be misidentified). Estimates of fecundity depend on the accuracy of re-sighting probabilities and, if appropriate, tag loss.

| Rate | Mean | Uncertainty | n | Time period | Data | Location | Considerations | Source |
|---|---|---|---|---|---|---|---|---|
| **Pregnancy** | 0.93 | | 79 | 1956 - 1963 | Shot samples | | | Hewer 1964 |
| **Pregnancy** | 0.94 | 95% CIs: 0.89 - 0.97 | 140 | 1979 - 1981 | Shot samples | Farne Islands, UK | | Boyd 1985 |
| **Pregnancy** | 0.83 | 95% CIs: 0.74 - 0.89 | 88 | 1978 | Shot samples | Outer Hebrides, UK | | Boyd 1985 |
| **Pregnancy** | 0.88-1 | | 526 | 1968 - 1992 | Shot samples | Canada | Aged ≥ 6 years old | Hammill & Gosselin 1995 |
| **Birth** | 0.73 | 0.015 | 174 | 1983 - 2005 | CMR (brand) | Sable Island, Canada | Aged 4-15 years. Unobserved pupping not considered (likely rare) | Bowen *et al.* 2006 |
| **Birth** | 0.83 | 0.034 | 32 | 1983 - 2005 | As above | As above | Aged 16-25 year Unobserved pupping not considered (likely rare) | As above |
| **Birth** | 0.57 | 0.03 | 39 | 1983 - 2005 | As above | As above | Aged 26-35 years Unobserved pupping not considered (likely rare) | As above |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Birth** | 0.790 | 95% CIs: 0.77 - 0.82 | 584 | 1993 - 2013 | CMR (brand, flipper tag, photo ID) | North Rona, UK | Accounted for unobserved pupping | Smout *et al.* 2019 |
| **Birth** | 0.82 | 95% CIs: 0.79 - 0.84 | 273 | 1987 - 2014 | CMR (brand, flipper tag, photo ID) | Isle of May, UK | As above | As above |
| **Birth** | 0.79 | | 1727 | 1992 - 2002 | CMR (brand) | Sable Island, Canada | Estimated transitions: unobserved to breeder = 0.41 - 0.64, breeder to breeder = 0.76 – 0.89 | den Heyer & Bowen 2017 |
| **Birth** | 0.56 | | 66 | 2001-2018 | Shot/bycatch samples | Finland | Age 5-6 years old | Kauhala and Kurkilahti 2020 |
| **Birth** | 0.79 | | 460 | 2001-2018 | Shot/bycatch samples | Finland | Age 7-24 years old | Kauhala and Kurkilahti 2020 |

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# Estimating the size of the UK grey seal population between 1984 and 2020.

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## Abstract

We fitted a Bayesian state-space model of British grey seal population dynamics to two sources of data: (1) regional estimates of pup production from 1984-2016, 2018 (North Sea region only) and 2019, and (2) independent estimates assumed to be of total population size just before the breeding season in 2008, 2014 and 2017. The model allowed for density dependence in pup survival, using a flexible form for the density dependence function, and assumed no movement of recruiting females between regions. This model and prior distributions are identical to those used to provide last year's advice; the data include the new 2019 pup production estimates and 2017 estimate of total population size, as well as slightly revised total population estimates from 2008 and 2014.

Estimated population size in regularly monitored colonies in 2020 was 140,700 (95% CI 129,300-153,500). The population overall is estimated to be increasing at a rate of 1.7% per year.

In a supplementary run, we used an alternative set of pup production estimates derived by making a different assumption about the probability of correctly classifying moulted pups from aerial digital images. The estimate of total population size was almost identical. However, a previous analyses has shown that assumptions made in the pup production model can affect estimates of total population size, so the result obtained here should not be generalized.

Historically one constraint on our ability to investigate and extend the model has been the time taken to fit it using the particle filtering algorithm developed by Thomas and colleagues in 2005. We have recently developed new algorithms that are significantly faster and are undertaking a simulation-based evaluation of the model as well as model extensions. We expect to report our findings at next year's meeting.

## Introduction

This paper presents estimates of British grey seal population size and related demographic parameters, obtained using a Bayesian state-space model of population dynamics fitted to pup production estimates (from aerial surveys of breeding colonies) and independent estimates of total population size (from haul-out counts). The model and fitting methods are the same as those employed in recent years and are described in detail in Thomas et al. (2019); the prior distributions on model parameters are the same as those used for the last two years (see Russell et al. (2021) for justification). The data are a time series of regional pup production estimates (1984-2016; 2018 North Sea region only; 2019) of which the 2019 estimates are new for this briefing paper, and independent estimates of total population size (2008, 2014 and 2017) of which the 2017 estimates are new.

We present estimates of population size at the start of the 2020 breeding system (i.e., projected forward one year from the last pup production estimates). Note that all estimates of population size relate to seals associated with the regularly monitored colonies. A multiplier is required to account for the 6-8% of seals that breed outside these colonies.

The pup production estimation method is currently undergoing a revision, and one aspect of estimation that is being examined is the probability of correctly classifying a moulted pup from the film and digital aerial survey images ("PMoult"[18]). In the main run, the pup production estimates are based on a PMoult of 0.5 for film and 0.9 for digital images. The change to 0.9 was based on the increased quality of the digital images, compared to the film; this is the value used in previous briefing papers. However, work presented at the SCOS meeting in 2019 suggested that the improvement in correct classification with digital images is substantially less, and so a value less than 0.9 was warranted. To provide a sensitivity analysis, as with the 2020 briefing paper, we present results from a supplementary run of the population model using pup production estimates of 0.5 for both film and digital images.

## Methods

*Main run*

Full details of the population dynamics model, data and fitting methods are given in Thomas et al. (2019). In summary, an age-structured population dynamics model is specified for each of four regions (North Sea, Inner Hebrides, Outer Hebrides and Orkney), with 7 ages included in the model: pups, age 1-5 females (assumed not to reproduce) and age 6+ females (which may breed). The model assumes constant adult (age 1+) survival (indexed by a parameter $\phi_a$), constant fecundity (probability that an age 6+ female will birth a pup, $\alpha$) and density-dependent pup survival with separate carrying capacity in each region (carrying capacity parameters $\chi_1 - \chi_4$ and common parameters for maximum pup survival $\phi_{p\max}$ and shape of the density dependence function $\rho$). The modelled pup production is linked to the data by assuming the data follow a normal distribution centred on true pup production and with precision parameter $\psi$. Adult males are not tracked explicitly in the population model, but instead, the total population size (of males and females) is derived by multiplying estimated adult females by a parameter $\omega$ that represents the ratio of total adults to adult females (sometimes called "sex ratio" as shorthand, although sex ratio is actually given by $\omega - 1$). The modelled total population size (age 1+ animals) is linked to the independent estimates using the empirically derived uncertainty on the independent estimates. Informative prior distributions are used on model parameters, as justified in Russell et al. (2021) and summarised in Table 1 (detailed justification for prior distributions is given in Supporting Information of Thomas et al. 2019).

Input data were pup production estimates for 1984-2016, the North Sea region estimate for 2018, and for all regions in 2019 (Russell et al. 2021). The estimates for 1984-2016 are identical to those used in last year's briefing paper (Thomas 2020); the estimate for the North Sea region in 2018 is almost identical (18,845 vs the previous 16,778). The other source of data is the independent estimates of total population size from 2008, 2014 and, for the first time, 2017 (Russell et al. 2021). The estimates for 2008 and 2014 are approximately 5% lower than those used in previous briefing papers because an updated scaling factor has been used in converting from hauled-out seals counted to population estimate (Russell and Carter 2021). Note that the total population size estimates are assumed independent of one another, when in reality they are based on the same scaling factor. We return to this in the Discussion.

Model fitting, as in previous reports, used a stochastic simulation-based procedure called a particle filter (Thomas et al. 2019). Reliability of reported results depends on the number of simulations. Here, 4.6 billion simulations were used, which gave results accurate to 2-3 significant figures.

[18] To be precise, this parameter is the probability of correctly classifying a light-coated pup as a moulted pup; the pup production model contains an assumption about the proportion of moulted pups that are dark-coated.

*Supplementary run*

As described earlier, one important parameter in pup production estimation is the probability of correctly classifying moulted pups from the images, PMoult (Russell et al. 2019). This probability has been set at 0.9 for the digital images collected since 2012. As part of an ongoing review of pup production estimation, it was desired to assess the effect of setting PMoult for digital images to 0.5. This results in lower pup production estimates for the digital survey years (post 2010), except in the North Sea region where the majority of pup production estimates are derived from ground counts. A supplementary run of the population model was performed (using 2.2 billion simulations) with these alternative pup production estimates.

## Results

***Main run***

Estimated pup production by region from the model matches the observed values reasonably well although it is clear that the pup production estimates for Inner and Outer Hebrides and Orkney are substantially higher after the advent of digital surveys in 2012 and that this affects the fit: residuals for several years before this are all negative and after are all positive, except for Orkney in 2019 (Figure 1). In the case of Inner and Outer Hebrides, the post-2012 estimates are considerably higher than predicted. A similar tendency is seen in North Sea, but to a much lesser extent. Overall, pup production is estimated to be increasing strongly in North Sea, have stabilized in the decade after 1995 in Inner and Outer Hebrides, and be stabilizing in Orkney (Figure 1).

Total population size estimated using pup production data alone (Figure 2, blue lines) is somewhat larger but considerably less precise than that when the three independent estimates are added (Figure 2, red lines). In both cases, population size is estimated to have grown steadily, although at a slightly decreasing rate. When pup production data and independent estimates are both used (red lines in Figure 2), population size is estimated to have been larger than the independent estimate from 2008 and smaller than that from 2014 and 2017. Posterior mean population size in regularly monitored colonies in 2020 was 140,700 with 95% credible interval (CI) 129,300-153,500. Estimates by region are given in Table 2 and estimates for all years 1984-2020 are given in Appendix 1 (Table A1). The estimated growth in population size between 2019 and 2020 is 1.7%.

Posterior parameter distributions are shown in Figure 3, with numerical summaries in Table 1. The estimates are a little different from those reported by Thomas (2020), likely because of the additional independent estimate. Adult survival is estimated to be slightly higher and pup survival lower (the two are strongly negatively correlated, Thomas et al. 2019); the density dependent shape parameter is somewhat lower and carrying capacity higher. Three regions (Inner Hebrides, Outer Hebrides and Orkney) are estimated to be close to carrying capacity (i.e., posterior mean on carrying capacity parameter close to the pup production), while North Sea is at approximately 60% of carrying capacity (although that estimate is quite imprecise with SE/mean=0.3). Estimated sex ratio is, as previously, unchanged from the prior.

*Supplementary run*

Despite lower pup production estimates in Inner and Outer Hebrides and Orkney going into the model, the resulting estimates of total population size were very slightly (about 1%) larger (Table 2, last column). The difference is largely caused by a higher population estimate in North Sea, where pup production was least decreased; it is perhaps caused by the slightly lower fecundity estimate (Table 1), although the difference in population estimate is too small to deserve an in-depth examination.

## Discussion

Estimated population size in the main run is approximately 3% higher than that reported in last year's briefing paper (Thomas 2020) for comparable years – for example the total population size estimate in 2019 from Thomas (2019) was 133,900 (95% CI 115,300-156,500) while here the estimate for the same year 138,300 (95% CI 127,700-150,500). There have been several updates to the input dataset, but likely the biggest contributor to the change is the introduction of the 2017 independent estimate of total population size, which was larger than the value predicted by the model and hence likely drew the estimates upward. It should be noted that (a) such small changes happen commonly as the data is updated – for example, minor changes to the data used in the 2020 briefing paper produced estimates that were approximately 4% lower than those produced the year before (see Thomas 2020), and (b) all of these changes are well within the estimated credible intervals on total population size.

In this analysis, the three independent estimates of total population size, from 2008, 2014 and 2017, are assumed to be statistically independent of one another. Although they are based on separate aerial surveys of hauled-out seals, in scaling up from counts of seals hauled out to total population size both rely on the same estimate of the proportion of seals hauled out (Russell and Carter 2021). This year, we investigated an approach to deal with this using an observation model that allows each annual haul-out count to follow a binomial distribution with the underlying haul-out probability assumed common across all three counts and following a beta distribution (Appendix 2). However, this model prooved to be too restrictive, strongly penalizing population trajectories that do not closely follow the ~6% per-year population growth implied by the values of the three haul-out counts. This growth rate is not supported by the population model fitted to pup production estimates. The new observation model assumes seals haul out independently and that haul-out probability is constant between years – we believe one or more of these assumptions needs to be relaxed before this model will be of use in the population modelling process. Hence, for this briefing paper, we have elected to stick with the assumption used in previous years that the total population estimates come from independent shifted gamma distributions.

Thomas et al. (2019) discuss how sensitive the estimate of total population size may be to the parameter priors, and conclude that fecundity and adult:female ratio are two parameters that strongly affect total population size but for which the prior specification is particularly influential. Hence a renewed focus on priors for these parameters may be appropriate.

In our supplementary analysis, we found very little (1%) change to population size estimates from alternative assumption on pup production estimation. However, we also note that additional analyses undertaken by Thomas (2019) showed that small changes in pup production estimates did influence the total population estimates, so we caution our result here should not be generalized. As noted above, the independent estimates of population size may have been overly dominant in this analysis, and that will change in the future.

One constraint on making inferences from this model has been the time taken to fit it using the particle filtering algorithm used, which was first developed by Thomas et al. (2005) and Newman et al. (2006). The main run presented here was based on runs of 4.6 billion simulations, which took approximately 40 hours computer time, running on 40 processors in parallel. Such run times make it prohibitive to investigate aspects of model performance via simulation and to extend the model to include biologically-relevant factors such as time-varying fecundity. Over the past three years, PhD student Fanny Empacher has been researching alternative more efficient algorithms, and she has been joined in the past year by PhD student Cal Fagard-Jenkin who is working on highly parallel algorithms using Graphics Processing Units (GPUs). Both have made considerable progress and we

anticipate over the next year we will be able to undertake some simulation studies of the model, and also switch estimation to the new algorithms.

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**Table 1.** Prior parameter distributions and summary of posterior distributions. Be denotes beta distribution, Ga Gamma distribution (with parameters shape and scale, respectively). Analysis uses 1984-2016 and 2018 (North Sea only) pup production estimates, and the 2008 and 2014 total population estimates. Posterior estimates are shown for two runs: a main run, assuming probability of correct classification of moulted pups from digital aerial images is 0.9, and a supplementary run when where this probability is assumed to be 0.5.

| Parameter | Prior distribution | Prior mean (SD) | Posterior mean (SD) | |
|---|---|---|---|---|
| | | | Main run | Suppl. run |
| adult survival $\phi_a$ | 0.8+0.17*Be(1.79,1.53) | 0.90 (0.04) | 0.97 (0.01) | 0.96 (0.01) |
| pup survival $\phi_{pmax}$ | Be(2.87,1.78) | 0.62 (0.20) | 0.42 (0.07) | 0.49 (0.08) |
| Fecundity $\alpha$ | 0.6+0.4*Be(2,1.5) | 0.83 (0.09) | 0.91 (0.05) | 0.90 (0.06) |
| dens. dep. $\rho$ | Ga(4,2.5) | 10 (5) | 3.3 (0.78) | 3.81 (1.24) |
| NS carrying cap. $\chi_1$ | Ga(4,5000) | 20000 (10000) | 33200 (9700) | 32100 (10300) |
| IH carrying cap. $\chi_2$ | Ga(4,1250) | 5000 (2500) | 4110 (457) | 3670 (347) |
| OH carrying cap. $\chi_3$ | Ga(4,3750) | 15000 (7500) | 14000 (1180) | 13000 (794) |
| Ork carrying cap. $\chi_4$ | Ga(4,10000) | 40000 (20000) | 23700 (4290) | 20600 (2350) |
| observation prec. $\psi$ | Ga(2.1,66.67) | 140 (96.6) | 67.4 (20.7) | 74 (20.4) |
| sex ratio $\omega$ | 1.6+Ga(28.08, 3.70E-3) | 1.7 (0.02) | 1.7 (0.02) | 1.7 (0.02) |

**Table 2.** Estimated size, in thousands, of the British grey seal population at the start of the 2020 breeding season, derived from a model fit to pup production data from 1984-2016, 2018 (North Sea only) and 2019, and the additional total population estimates from 2008, 2014 and 2017. Estimates from two runs are shown: a main run, assuming probability of correct classification of moulted pups from digital aerial images is 0.9, and a supplementary run when where this probability is assumed to be 0.5. Values in the table are posterior means with 95% credible intervals in brackets.

| | Estimated population size in thousands (95% CI) | |
|---|---|---|
| | Main run | Supplementary run |
| North Sea | 49.3 (38.1 62.7) | 54.0 (41.1 68.9) |
| Inner Hebrides | 9.1 (7.7 11) | 8.7 (7.3 10.4) |
| Outer Hebrides | 31 (27.1 35.7) | 31 (27 34.7) |
| Orkney | 51.3 (43.9 62.6) | 48.7 (41.8 57.3 |
| Total | 140.7 (129.3 153.5) | 142.5 (129 156.5) |

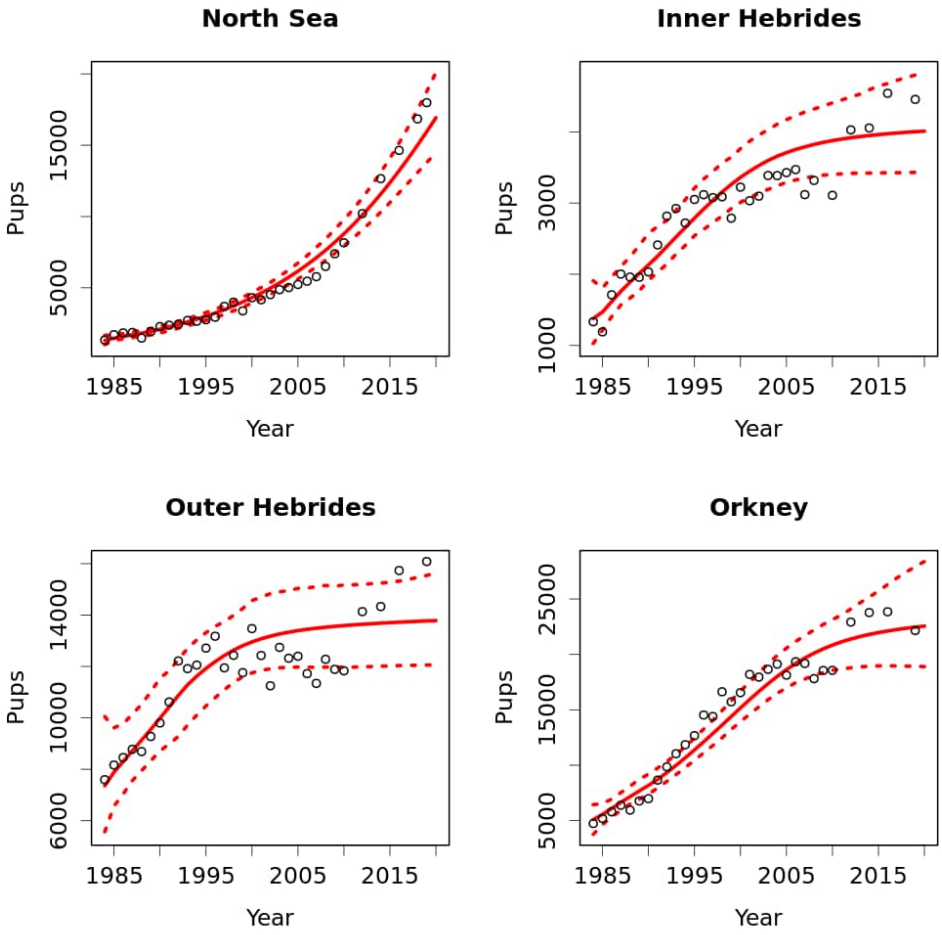


**Figure 1.** Posterior mean estimates of pup production (solid lines) and 95%CI (dashed lines) from the model of grey seal population dynamics, fitted to pup production estimates from 1984-2016, 2018 (North Sea only) and 2019 (circles) and the total population estimates from 2008, 2014 and 2017.

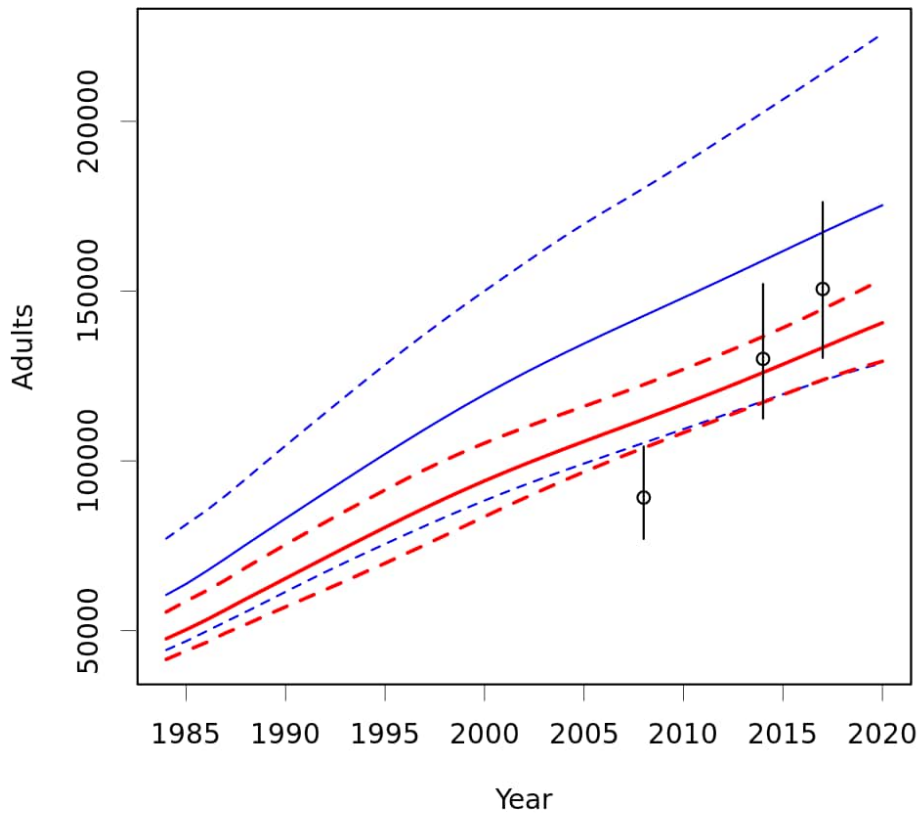


**Figure 2.** Posterior mean estimates (solid lines) and 95%CI (dashed lines) of total population size in 1984-2019 from the model of grey seal population dynamics, fit to pup production estimates from 1984-2016, 2018 (North Sea only) and 2019, and total population estimates from 2008, 2014 and 2017 (circles, with vertical lines indicating 95% confidence interval on the estimates). Blue lines show fit to pup production data alone, red lines show fit to pup production data and independent estimates.

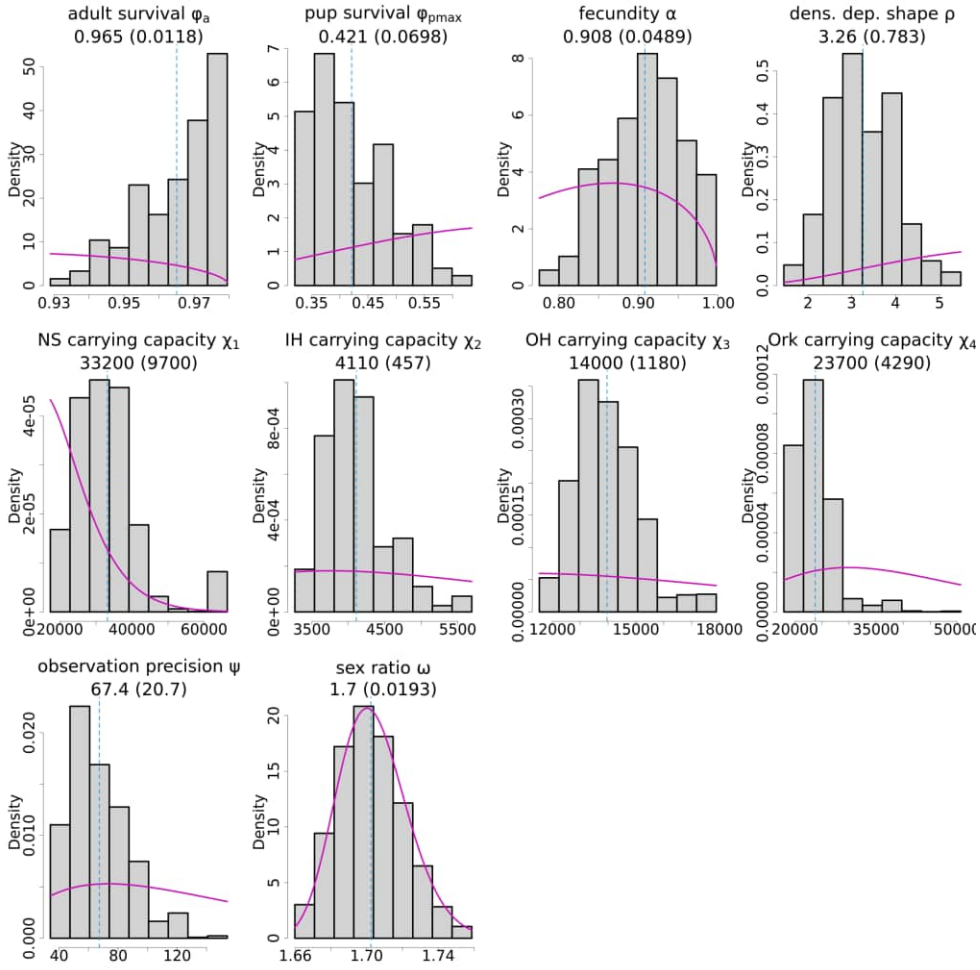


**Figure 3.** Posterior parameter distributions (histograms) and priors (solid lines) for the model of grey seal population dynamics, fit to pup production estimates from 1984-2016, 2018 (North Sea only) and 2019, and total populations estimate from 2008, 2014 and 2017. The vertical dashed line shows the posterior mean; its value is given in the title of each plot after the parameter name, with the associated standard error in parentheses.

## Appendix 1

**Table A1.** Estimates of total population size, in thousands, at the beginning of each breeding season from 1984-2020, made using the model of British grey seal population dynamics fit to pup production estimates from 1984-2016, 2018 (North Sea only) and 2019, and total population estimates from 2008, 2014 and 2017. Numbers are posterior means followed by 95% credible intervals in brackets.

| Year | North Sea | Inner Hebrides | Outer Hebrides | Orkney | Total |
|---|---|---|---|---|---|
| 1984 | 4.4 (3.7 5.1) | 4.5 (3.9 5.5) | 21.5 (17.9 26) | 17.2 (14.5 20.4) | 47.6 (41.5 55.5) |
| 1985 | 4.7 (4 5.4) | 4.8 (4.1 5.8) | 22.4 (18.7 27.3) | 18.4 (15.7 21.7) | 50.3 (44.1 58.7) |
| 1986 | 5.1 (4.4 5.8) | 5.1 (4.3 6.1) | 23.4 (19.5 28.4) | 19.6 (16.9 23) | 53.1 (46.5 61.7) |
| 1987 | 5.4 (4.8 6.2) | 5.4 (4.6 6.4) | 24.4 (20.4 29.4) | 21 (18.1 24.5) | 56.2 (49.4 65) |
| 1988 | 5.8 (5.2 6.7) | 5.7 (4.9 6.8) | 25.4 (21.2 30.5) | 22.4 (19.3 26.3) | 59.3 (51.8 68.6) |
| 1989 | 6.3 (5.6 7.2) | 6 (5.1 7.1) | 26.1 (22.1 31.3) | 24 (20.5 28) | 62.3 (54.4 72) |
| 1990 | 6.8 (6 7.7) | 6.3 (5.3 7.5) | 26.8 (22.8 32) | 25.6 (21.8 29.8) | 65.4 (57 75.4) |
| 1991 | 7.3 (6.4 8.3) | 6.6 (5.5 7.8) | 27.4 (23.4 32.5) | 27.2 (23.1 31.7) | 68.4 (59.5 78.7) |
| 1992 | 7.8 (6.9 8.9) | 6.8 (5.7 8.1) | 27.9 (23.9 32.9) | 28.9 (24.5 33.6) | 71.5 (62.1 82) |
| 1993 | 8.4 (7.4 9.6) | 7.1 (5.9 8.4) | 28.4 (24.4 33.2) | 30.6 (26 35.6) | 74.5 (64.6 85.2) |
| 1994 | 9 (8 10.3) | 7.3 (6 8.7) | 28.8 (24.9 33.5) | 32.3 (27.4 37.5) | 77.5 (67.3 88.3) |
| 1995 | 9.7 (8.5 11) | 7.6 (6.2 9) | 29.1 (25.3 33.7) | 34.1 (28.9 39.6) | 80.4 (69.8 91.4) |
| 1996 | 10.4 (9.1 11.8) | 7.8 (6.3 9.3) | 29.4 (25.6 33.9) | 35.8 (30.4 41.6) | 83.3 (72.6 94.5) |
| 1997 | 11.2 (9.8 12.7) | 7.9 (6.5 9.5) | 29.6 (25.9 34.1) | 37.4 (31.9 43.5) | 86.1 (75.2 97.4) |
| 1998 | 12 (10.5 13.7) | 8.1 (6.6 9.7) | 29.8 (26.1 34.2) | 39 (33.5 45.2) | 88.9 (78 100.2) |
| 1999 | 12.9 (11.2 14.7) | 8.2 (6.7 9.9) | 30 (26.3 34.3) | 40.5 (35 46.7) | 91.6 (80.8 102.8) |
| 2000 | 13.9 (12 15.8) | 8.3 (6.9 10) | 30.1 (26.5 34.4) | 41.8 (36.5 48.1) | 94.1 (83.6 105.2) |
| 2001 | 14.9 (12.9 17) | 8.4 (7 10.1) | 30.2 (26.7 34.5) | 43.1 (37.9 49.3) | 96.6 (86.3 107.6) |
| 2002 | 16 (13.8 18.3) | 8.5 (7.1 10.2) | 30.3 (26.7 34.5) | 44.2 (39.1 50.4) | 99 (89 109.8) |
| 2003 | 17.1 (14.8 19.7) | 8.6 (7.2 10.3) | 30.4 (26.8 34.6) | 45.2 (40 51.4) | 101.3 (91.7 111.9) |
| 2004 | 18.4 (15.8 21.2) | 8.7 (7.3 10.4) | 30.4 (26.8 34.6) | 46 (40.8 52.2) | 103.5 (94.3 114) |
| 2005 | 19.7 (16.9 22.7) | 8.7 (7.3 10.4) | 30.5 (26.9 34.7) | 46.8 (41.4 53) | 105.7 (96.8 116.1) |
| 2006 | 21.2 (18 24.4) | 8.8 (7.4 10.4) | 30.6 (26.9 34.7) | 47.4 (41.9 53.7) | 107.9 (99.2 118.2) |
| 2007 | 22.7 (19.2 26.3) | 8.8 (7.5 10.5) | 30.6 (26.9 34.8) | 48 (42.3 54.3) | 110.1 (101.5 120.3) |
| 2008 | 24.3 (20.5 28.2) | 8.8 (7.5 10.5) | 30.7 (26.9 34.8) | 48.5 (42.6 55) | 112.2 (103.8 122.4) |
| 2009 | 26 (21.9 30.3) | 8.9 (7.5 10.6) | 30.7 (27 34.9) | 48.9 (42.9 55.6) | 114.4 (106.1 124.7) |
| 2010 | 27.8 (23.2 32.6) | 8.9 (7.6 10.6) | 30.7 (27 35) | 49.2 (43.2 56.2) | 116.7 (108.3 127) |
| 2011 | 29.7 (24.7 35) | 8.9 (7.6 10.6) | 30.8 (27 35) | 49.6 (43.4 56.7) | 118.9 (110.5 129.3) |
| 2012 | 31.7 (26.1 37.7) | 8.9 (7.6 10.7) | 30.8 (27.1 35.1) | 49.8 (43.5 57.3) | 121.3 (112.7 131.7) |
| 2013 | 33.7 (27.6 40.4) | 9 (7.7 10.7) | 30.9 (27.1 35.1) | 50.1 (43.6 57.9) | 123.6 (115 134.1) |
| 2014 | 35.8 (29.2 43.2) | 9 (7.7 10.8) | 30.9 (27.1 35.2) | 50.3 (43.7 58.7) | 126 (117.2 136.6) |
| 2015 | 38 (30.7 46.3) | 9 (7.7 10.8) | 30.9 (27.1 35.3) | 50.5 (43.8 59.4) | 128.5 (119.5 139.2) |
| 2016 | 40.3 (32.3 49.4) | 9 (7.7 10.8) | 30.9 (27.1 35.3) | 50.7 (43.9 60) | 130.9 (121.7 141.9) |
| 2017 | 42.5 (33.9 52.7) | 9 (7.7 10.9) | 31 (27.1 35.4) | 50.8 (43.9 60.7) | 133.4 (123.9 144.7) |
| 2018 | 44.8 (35.4 56.1) | 9 (7.7 10.9) | 31 (27.1 35.5) | 51 (43.9 61.3) | 135.8 (125.9 147.6) |
| 2019 | 47.1 (36.8 59.4) | 9 (7.7 10.9) | 31 (27.1 35.6) | 51.1 (43.9 61.9) | 138.3 (127.7 150.5) |
| 2020 | 49.3 (38.1 62.7) | 9.1 (7.7 11) | 31 (27.1 35.7) | 51.3 (43.9 62.6) | 140.7 (129.3 153.5) |

**Appendix 2.** Alternative observation model for independent estimates.

Let $y_t$ be the count of hauled-out adult (i.e., non-pup) grey seals in year $t$, where $t = 1,2,3$ corresponds to the three years 2008, 2014 and 2016. Let $n_t$ be the total population size of adult grey seals from regularly-monitored colonies in year $t$. We assume seals haul out independently of one another, and that the probability a seal hauls out, $p$, is constant between years. Hence, the number hauled out is a binomial random variable

$$y_t \sim \mathrm{Bin}(n_t, p)$$

The haul out probability is not known, and we assume uncertainty in $p$ is described by a beta distribution with parameters $a$ and $b$. We estimate these parameters by fitting a beta distribution to a non-parametric bootstrap sample of haul-out probabilities derived from the analysis of Russell and Carter (2021). The likelihood for observed haul-out counts $\mathbf{y} = \{y_1, y_2, y_3\}'$ given $a$, $b$ and $\mathbf{n} = \{n_1, n_2, n_3\}'$ is obtained by integrating over the unknown $p$:

$$\mathcal{L}(\mathbf{y}|\mathbf{n}; a, b) = \int_{p=0}^{1} \left( \prod_{t=1}^{3} f_y\,(y_t|n_t, p) \right) f_p(p|a, b)dp$$

where $f_y()$ denotes the binomial probability mass function and $f_p()$ the beta probability density function.

# Recent changes in status of harbour seals in the Wash and North Norfolk SAC and adjacent sites.

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**Abstract**

The counts of harbour seals at sites from Donna Nook to Scroby Sands, within the Southeast England Seal Management Unit (SSE SMU), during the August survey in 2019 were approximately 27.5% lower than the five year mean for 2014 to 2018.

The same sites were surveyed in 2020. That count was 8% higher than the 2019 count but was still 21.5% lower than the 2014-2018 mean. Three surveys were carried out in 2021 and the mean harbour seal count was close to the mean of 2019 and 2020 counts and confirms that there has been a decrease.

The total count for the sites between Donna Nook and Scroby Sands has declined by approximately 38% compared to the mean of the previous five years (2019–2021 mean = 3080; 2014-2018 mean = 4296). The count for the Wash and North Norfolk SAC has decreased by approximately 21% (2019 – 2021 mean = 2883: 2014-2018 mean= 3658) over the same time periods while Donna Nook showed a 57% decrease and Scroby Sands showed a 73% decrease.

The harbour seal decline is evident at all sites within the SMU and appears to have affected all sub-sections of the Wash & North Norfolk SAC.

Grey seal numbers have increased within the SMU, but the largest grey seal haulout group at Donna Nook shows a similar levelling off and possible decline, coincident with the harbour seal decline.

Grey seals are expanding their haulout range within the Wash and small groups are now appearing in the sheltered tidal creeks at the southern edge of the estuary where large numbers of harbour seals haulout.

## Introduction

This is a preliminary note about recent changes in the aerial survey counts of harbour and grey seals in the Wash and North Norfolk SAC and adjacent sites (within the Southeast England Seal Management Unit (SEE SMU). Counts of the survey images for 2021 have only recently been completed, so the descriptions of trends in the data should be regarded as preliminary estimates and treated with caution. A full analysis of the trend data will be completed in early 2022 and additional surveys are again planned for August 2022.

## Methods

Surveys of the coastline between Donna Nook in Lincolnshire and Scroby Sands in Norfolk were conducted by fixed-wing aircraft using hand-held oblique photography (see Thompson *et al*., 2019 for detailed methods).

To maximise the counts of seals on shore and to minimise the effects of environmental variables, surveys are restricted to within two hours before and two hours after the time of local low tides

(derived from POLTIPS, National Oceanographic Centre, NERC) and good weather, i.e. good visibility, no rain.

**Results**

**1. 2020 survey**

At SCOS 2020 we reported that the count of harbour seals in The Wash and adjacent sites (Donna Nook, Blakeney and Scroby Sands) in 2019 was approximately 27.5% lower than the mean of the previous 5 years (2014-2018). Despite the restrictions due to the Covid 19 pandemic a survey of the coast between Donna Nook, Lincolnshire and Scroby Sands, Norfolk was carried in August 2020. The 2020 count was 8% higher than the 2019 count but was still 21.5% lower than the 2014-2018 mean

Notwithstanding the variability associated with the proportion of the population hauled out and thus available to count, it was thought likely that these lower counts represented a real decrease. The level of decrease and trajectory was unclear, but the data indicated a potential step change decrease of around 25% between 2018 and 2019. Given that the survey area represents the majority of harbour seals in the SEE SMU and encompasses the population in the Wash & North Norfolk SAC, this likely drop in abundance is of immediate and serious concern. This SMU had shown a sustained increase in abundance (punctuated by sudden drops associated with the Phocine Distemper Epizootics) while most SMUs on the eastern and northern coasts had depleted or declining populations (Thompson *et al.*, 2019; SCOS, 2020).

**2. 2021 surveys**

In response to the perceived decline, funds were provided by Defra and Natural England to supplement the NERC funding and allow additional surveys of the coast between Donna Nook and Scroby Sands. Due to a combination of Covid related travel restrictions and the last-minute collapse of the contracted aerial survey company we were unable to carry out a planned pup census for the area. However, three surveys were carried out during the harbour seal moult, on 12th, 22nd and 23rd August 2021; two covered the entire coastline between Donna Nook and Scroby Sands and one covered the coast between Donna Nook and Blakeney. All three surveys covered the Wash and North Norfolk SAC.

**Table 9.** counts of harbour seals at Donna Nook, the Wash, Blakeney and Scroby sands during August between 2016 and 2021. n/s = not surveyed

| Date | 12/08/ 2021 | 22/08/ 2021 | 23/08/ 2021 | 22/08/ 2020 | 11/08/ 2019 | 11/08/ 2018 | 11/08/ 2017 | 21/08/ 2016 | 5/8/ 2016 |
|---|---|---|---|---|---|---|---|---|---|
| **Wash** | **2724** | **2439** | **2837** | 2866 | 2415 | 3632 | 3210 | 2992 | 3762 |
| **Donna Nook** | **153** | **75** | **139** | 157 | 128 | 146 | 290 | 275 | 462 |
| **Blakeney** | **135** | **187** | **221** | 258 | 329 | 218 | 271 | 388 | 460 |
| **Horsey** | **N/S** | **9** | **15** | 1 | 16 | 17 | N/S | N/S | N/S |
| **Scroby Sands** | **N/S** | **24** | **25** | 45 | 193 | 210 | 399 | 184 | 211 |
| **Total** | **3012[1]** | **2734** | **3237** | 3327 | 3081 | 4223 | 4170 | 3839 | 4895 |

- [1]Total does not include Scroby Sands or Horsey which held ~ 1% of the harbour seals in the other 2021 and the 2020 counts.

### 3. harbour seals

Counts of harbour seals from surveys between 2016 and 2021 are shown in table 1. The mean harbour seal count for 2021 (2995) was 7% lower than the mean of 2019 and 2020 counts (3206) and confirms that there has been a decrease. The total count for the sites between Donna Nook and Scroby Sands has declined by approximately 38% compared to the mean of the previous five years (2019–2021 mean = 3080; 2014-2018 mean = 4296). The count for the Wash and North Norfolk SAC (i.e. the Wash + Blakeney) has decreased by approximately 21% (2019 – 2021 mean = 2883: 2014-2018 mean= 3658) over the same time periods, while Donna Nook showed a 57% decrease and Scroby Sands showed a 73% decrease. Fitted trends indicate that the Wash & North Norfolk SAC population recovered after the 2002 PDV epidemic, reached a maximum around 2015 at a level close to the pre-epidemic maximum and has declined sharply since then. However, the nature of this decline is still uncertain in terms of whether it represents the beginning of a sustained decline or a step change (similar to those seen in response to the PDV epidemics in the SEE SMU and for unknown reasons in the Shetland SMU. As the Wash and Blakeney counts represent the majority of the SEE SMU population, a similar trajectory is shown by the overall SMU counts.

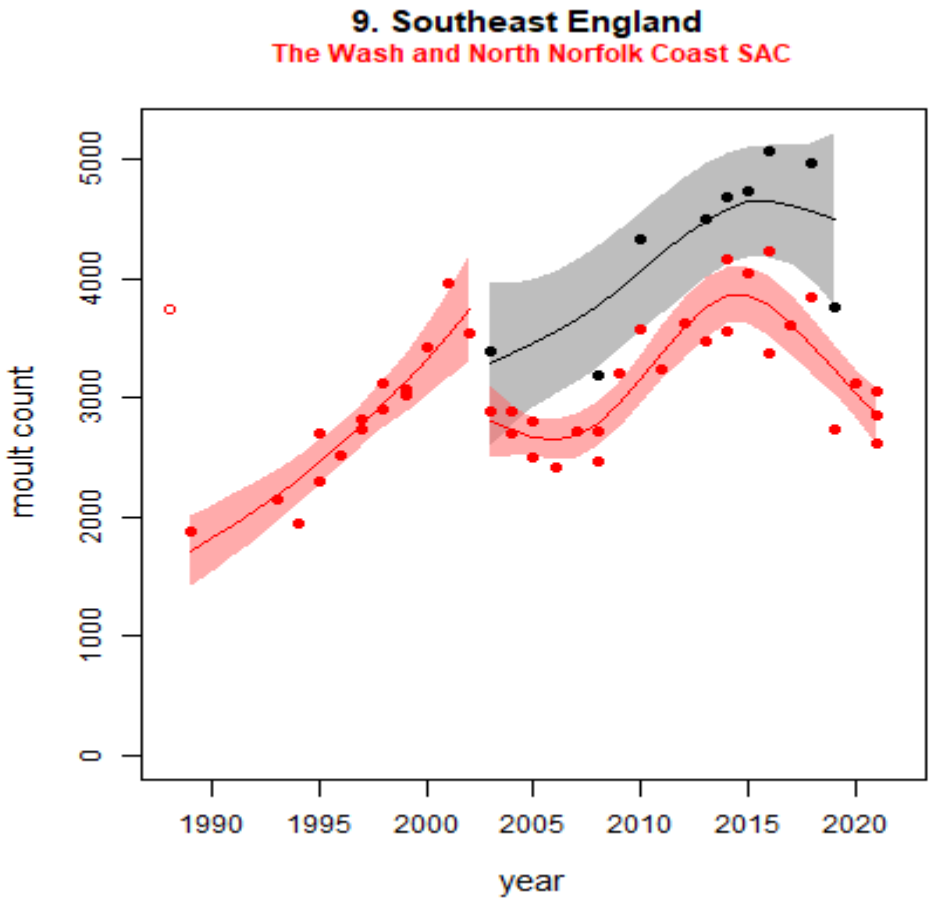


**Figure 11.** Counts of harbour seals in the Wash and North Norfolk SAC (red) and the total for the Southeast England SMU (grey) during the harbour seal moult in August, between 1988 and 2021, showing the changes in counts after the 1988 and 2002 PDV epidemics. Separate trend lines are fitted were selected (see Russell et al. 2021) to the 1989-2002 counts and post 2002 counts showing recoveries from the two PDV epidemics. Red lines illustrate the mean trend in harbour seal counts (and associated 95 % confidence intervals) for The Wash and North Norfolk SAC and the grey lines show the same for the SMU as a whole (between Donna Nook in Lincolnshire and Goodwin Sands off the Kent coast).

Overall, the harbour seal population in the study area has decreased by approximately 30% since 2018, and the decline appears to be widespread across the area. Comparing counts at the four main haulout areas, The Wash and the adjacent haulout areas at Donna Nook, Blakeney and Scroby Sands, all four areas have declined over the past four years. The patterns differ between sites, with the Wash, and possibly Scroby Sands, showing increases from around 2004 to 2016-18 followed by sharp declines, while at Blakeney there appears to have been a gradual decline over the entire period (2002 – 2021) and at Donna Nook the harbour seal counts were relatively stable until 2018 before declining sharply (figure 2). Counts divided into four subsections of the Wash show that the decrease in harbour seal counts since 2018 has occurred throughout the Wash and does not appear to be localised.

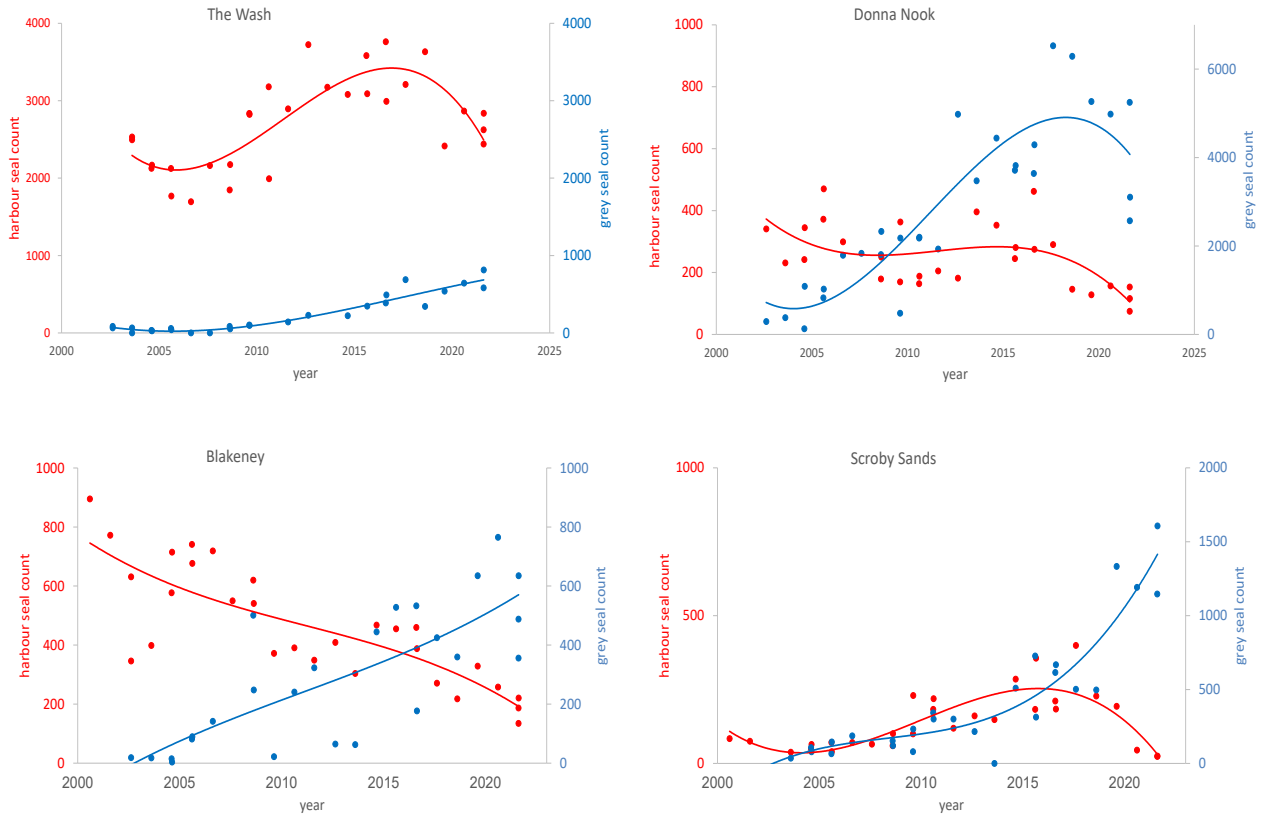


**Figure 12**. Counts of harbour seals (red) and grey seals (blue) for the period 2002 to 2021, in The Wash, at Donna Nook, Blakeney Point and Scroby Sands. Cubic polynomial lines have been fitted to the count data to illustrate the general patterns. A more formal model fitting procedure will be carried out in due course.

## 4. Grey seals

Counts of grey seals from surveys between 2017 and 2021 are shown in table 2. Figure 3 shows the trends in grey seal counts in the Humber Estuary SAC (i.e. Donna Nook) and along the coast from Donna Nook to Blakeney point, which are the grey seal haulouts within and adjacent to the Wash and North Norfolk SAC.

**Table 10.** Counts of grey seals at Donna Nook, the Wash, Blakeney and Scroby sands during August between 2016 and 2021

| Date | 12/08/ 2021 | 22/08/ 2021 | 23/08/ 2021 | 22/08/ 2020 | 11/08/ 2019 | 11/08/ 2018 | 11/08/ 2017 | 21/08/ 2016 | 5/8/ 2016 |
|---|---|---|---|---|---|---|---|---|---|
| **Wash** | 1001 | 583 | 813 | 644 | 540 | 253 | 688 | 491 | 387 |
| **Donna Nook** | 5248 | 3105 | 3339 | 4982 | 5265 | 6288 | 6526 | 4288 | 3640 |
| **Blakeney** | 356 | 488 | 635 | 765 | 635 | 360 | 425 | 177 | 533 |
| **Horsey** | N/S | 391 | 368 | 504 | 119 | 205 | N/S | N/S | N/S |
| **Scroby Sands** | N/S | 1146 | 1607 | 1191 | 1333 | 497 | 502 | 668 | 615 |
| **Total Donna Nook to Blakeney** | 6605 | 5713 | 6762 | 8086 | 6440 | 6901 | 7639 | 4956 | 4560 |

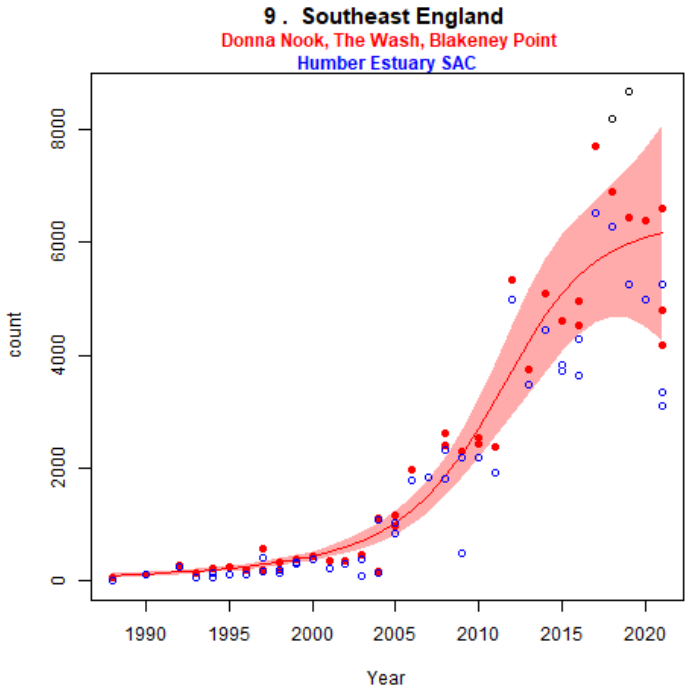


**Figure 3.** Counts of grey seals on the coast between Donna Nook (blue) and along the coast between Donna Nook and Blakeney (red) during the August surveys between 1988 and 2021. The red trend line (and associated 95% confidence intervals) represent the counts from Donna Nook to Blakeney (see Russell et al. 2021 for more details). The two black open circles indicate the available counts for the SMU as a whole.

The fitted trend (Fig 3) shows that the number of grey seals hauling out in the area has increased dramatically since the 2002 PDV epidemic (note that PDV epidemics are not associated with mortality events in grey seals), but that the rate of increase has clearly slowed and may have stopped over the past three to four years. The counts at Donna Nook, which held around 60% of the SEE SMU grey seal count in 2020 have declined, similar to the pattern seen in the harbour seal population for the Wash & North Norfolk SAC.

The grey seal trends differ between sites (Figs 2 & 3). At Blakeney, Scroby and in The Wash the counts have increased throughout the period.

The distribution of grey seals within the Wash has expanded since the late 2000s (Fig 4) and that expansion has been most pronounced in the last 5 years. During the 2008 and 2011 surveys, grey seals were observed on only five sites within the Wash. During the 2021 surveys grey seals were identified on 21 sites. Importantly, the most recent surveys show that grey seals are now present in small numbers on the sheltered sites in the creeks along the inner (southern) edge of the Wash (Figs 4 & 5).

Although most of the increase in numbers of grey seals has been at the sites on the outer banks at the Northeast corner of the Wash (Fig 5), grey seals are now extending into key harbour seal sites. Indeed, large groups are now found at sites along the edges of the deep channels between the inner banks. Small groups of 1 to 5 individual grey seals are now appearing on sites in the upper reaches of the tidal creeks used by harbour seals. To date, harbour seals still appear to use all the sites now also used by grey seals. Grey seals now outnumber harbour seals on the banks in the Northeast corner of the Wash and on the traditionally large harbour seal sites on Toft and Seal sands in the inner Wash.

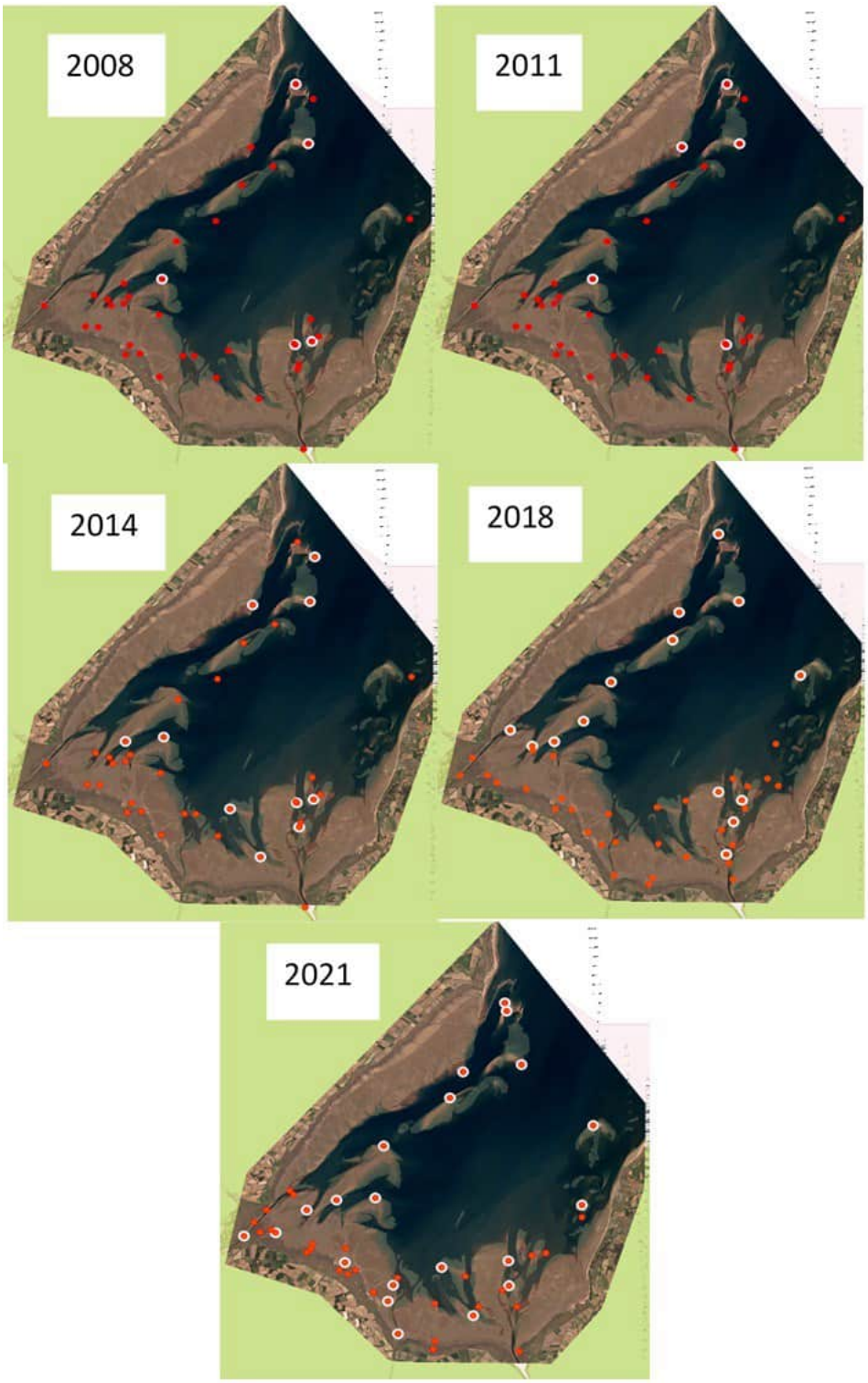


**Figure 4.** Distribution of harbour (red) and grey (white) seal haulout groups. For clarity the group size has been omitted (see fig 6 below).

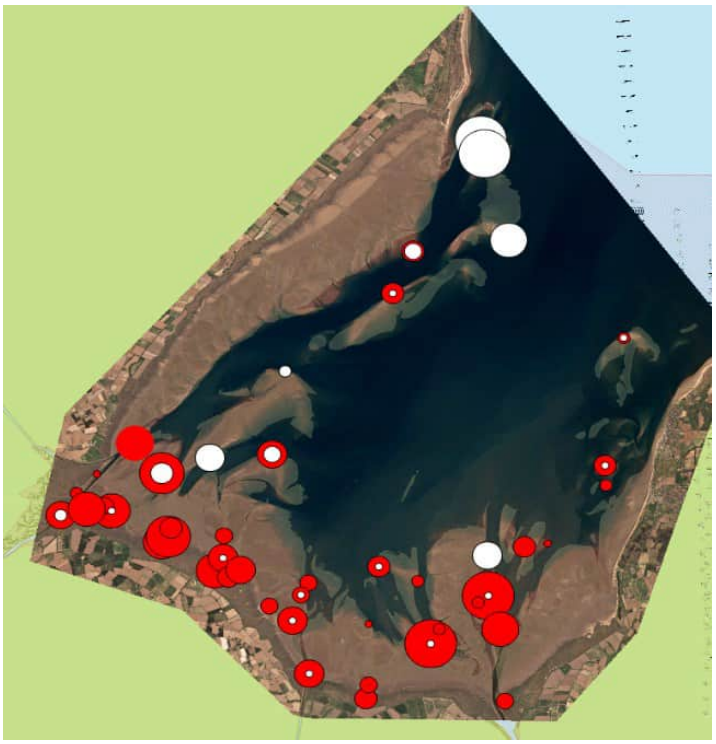

**Figure 5**. Distribution of harbour seal (red) and grey seal (white) haulout groups in the Wash during the 2021 moult surveys. Group size is indicated by the dot size (max). Grey seal points are superimposed on harbour seal points. All six of the pure white symbols represent sites where grey seal numbers now equal or exceed harbour seal numbers.

On visual inspection, the trends in grey and harbour seal counts by haulout group within the Wash (Fig. 2) does not indicate that the rate of harbour seal decline is closely related to the number of grey seals hauling out in the local area. Further investigation at a finer spatial scale is required, as there are indications that numbers of grey seals may have influenced harbour seal numbers at a limited number of specific sites.

**Discussion**

The 2020 and 2021 survey results confirm that there has been a significant decline in numbers of harbour seals along the coast between Donna Nook and Scroby Sands. The population appears to have reached a maximum around 2015 and has declined sharply since. The decline is widespread, with counts in all sub-sections of the SMU declining over the same period.

The recent counts suggest a decline of similar magnitude to that caused by the 2002 PDV epidemic. There are no reports of any disease event of sufficient magnitude to explain the drop in numbers, though un-documented/un-observed mortality from disease cannot be ruled out as a possible factor.

The results also indicate that the rapid increase in the numbers of grey seals in the same region has slowed and the numbers may have begun to decrease. Unlike the harbour seals, this change is currently localised to Donna Nook, the largest and most northerly haulout group. Counts of grey seals in the Wash, Blakeney and Scroby Sands have continued to increase.

The grey seal count has grown rapidly since the 2002 PDV epidemic. The magnitude of this change is dramatic; and when scaled up from counts to population it suggests that in 1988 harbour seals outnumbered grey seals ten to one, by 2020, grey seals outnumbered harbour seals by ten to one. Over the same period the total biomass of grey seals associated with these east coast haulout sites increased by at least a factor of 10. Grey and harbour seals generally exploit similar prey resources (Hammond &

Wilson 2016; Wilson & Hammond, 2016,2019), and grey seals are known predators of harbour seals (Brownlow et al. 2016), so it is possible that the increasing grey seal population is significantly affecting harbour seal population dynamics.

The distribution of grey seals in the Wash is expanding. Although most of the increase in numbers is accounted for by growth at sites on banks in the outer part of the Wash, there has also been a continual increase in the number of sites with grey seals. Importantly greys are appearing at sheltered sites in the tidal creeks in the inner Wash. These are important areas for harbour seal pupping. Unfortunately, there are no pup survey data for 2019,2020 or 2021 so no information on the locations of grey seals at the harbour seal breeding sites during the period of decline.

On visual inspection of the August counts, there is no clear indication that the numbers of grey seals hauling out within an area influences the harbour seal trend. Sub-sections of the Wash with widely differing grey seal numbers all show similar declines in harbour seal numbers.

Grey seals could potentially influence harbour seal haulout numbers by depressing the population through direct competition for prey or through direct predation. In addition, the risk of direct predation could directly influence the choice of haulout site or reduce the frequency of hauling out by harbour seals. We do not have any information with which to assess the likelihood of short-term changes in haulout frequency. The widespread nature of the decline discounts the possibility of local re-distribution being the cause of the observed declines. If redistribution were the cause, it would require movement out of the area. Preliminary results from recent surveys in the Thames (SCOS_BP_21/07; Cox *et al*., 2020) also suggest a decrease in harbour seal counts in 2021. Any redistribution would therefore entail emigration from the SEE SMU probably into the European mainland population. The adjacent European population in the Wadden Sea has also levelled off and has remained apparently stable since 2013 (Wadden Sea 2021). However, because the Wadden Sea population is 6 to 8 times larger it is unlikely that the immigration of 30% of the SEE SMU population would have been detected.

The coincident levelling-off of the summer grey seal counts in Donna Nook may indicate that the overall seal population is approaching or has reached the SMU's carrying capacity. If that is the case, the future trajectory of the harbour seal population will be determined by the intensity of and mechanisms of competition. The extent and severity of such effects are unknown, but the magnitude of and coincident timing of the changes means that grey seals must be considered likely drivers of the observed harbour seal population trends.

Over the same period, i.e., since the 2002 PDV epidemic, there has been a rapid increase in construction of offshore wind farms. Figure 6 shows the trend in installed offshore wind generation capacity in the southern North Sea superimposed on the grey and harbour seal population trajectories. Clearly the trends in grey seal populations and wind farm developments are similar. With current information it is not be possible to differentiate between the potential effects of these two stressors, but for conservation and management it is essential that their relative importance can be assessed. It is possible or perhaps likely that more than one natural and/or anthropogenic factor may be implicated in the decline.

Figures 4 highlights another potentially important issue. The 1988 PDV epidemic was unprecedented, but that may be simply a consequence of a lack of historical information. However, the recurrence of PDV in 2002 suggests that the virus may either be in circulation or may be sporadically introduced to the North Sea, e.g., as a result of influxes of Arctic seals. Irrespective of the source, we know that the current European harbour seal population is almost entirely comprised of susceptible animals and another major epidemic is probably imminent (Härkönen & Harding, 2010).

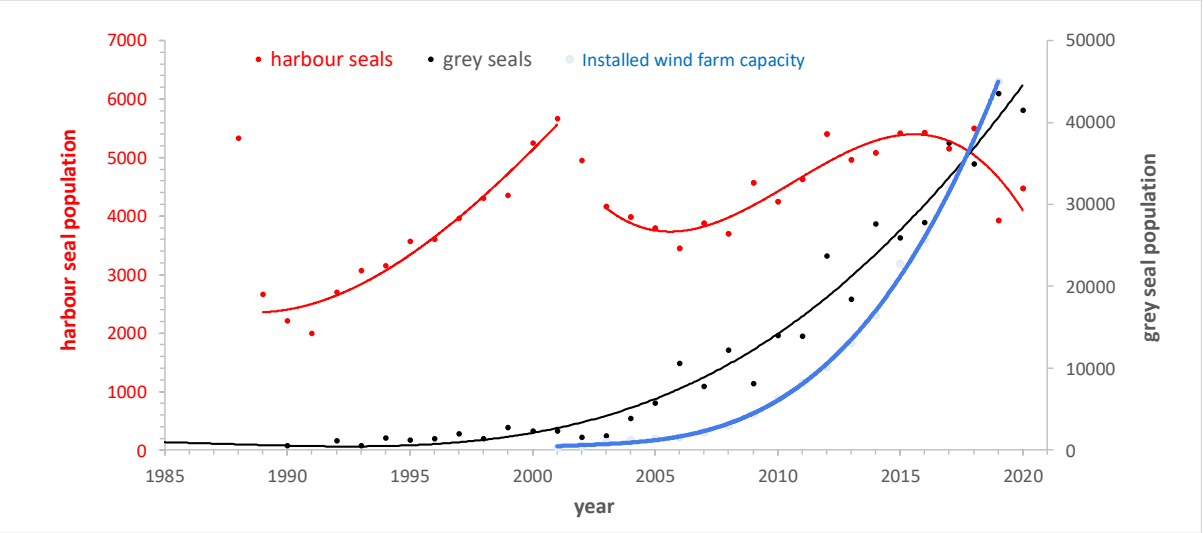


**Figure 6**. Population estimates of harbour seals (red) and grey seals (black) associated with haulout sites on the coast between Donna Nook and Scroby Sands during the summer between 1988 and 2020 and the trend in installed offshore wind generation capacity (blue). Fitted lines are polynomials for illustration.

The recovery from the 1988 epidemic was a continuous increase until the next epidemic (Figure 1). The recovery from the 2002 epidemic was much slower and the population reached an asymptote prior to the recent decline. The post 2002 recovery coincided with the rapid growth of grey seal numbers and predated the rapid increase in offshore wind farm construction. If a third PDV outbreak occurs soon, the harbour seal population will have to recover in a significantly different environment, with a much larger population of potentially competing grey seals, We do not know what impact the grey seal population will have on the ability of harbour seals to recover.

The variability in the proportion of the population hauled out, and thus variability in counts, means that multiple counts within a year will be required to robustly estimate the scale of the decline and track its trajectory. Therefore in 2022, we plan to carry out a series of three or four complete August surveys between Donna Nook and Scroby Sands and at least one survey during the harbour seal breeding season to estimate pup production.

A report commissioned by Natural England outlined potential future avenues of research and reviewed the current seal telemetry, diet, and health data, which in addition to the survey data, would form the basis for such future work (Russell *et al.* 2021). In brief, there is a clear and pressing need for additional research in the short to medium term to:

- Reliably assess the scale and timing of the decline and monitor its progress
- identify and if possible, rule out as many potential anthropogenic impacts as possible, especially given the rapidly changes anthropogenic landscape
- identify the mechanisms, scale and intensity of competition between grey and harbour seals in the southern North Sea
- establish the likely impact of grey seals on harbour seal populations and to predict the likely consequences of future grey seal population trends
- to investigate the likely impacts of a recurrence of PDV on harbour seal populations in the southern North Sea.

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# Report on 2021 Seal Surveys in the Greater Thames Estuary

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## Introduction

There are two species of seal that are resident in the UK, both of which are found in the Greater Thames Estuary – the harbour (or common) seal (*Phoca vitulina*) and the grey seal (*Halichoerus grypus*). The southern North Sea grey seal population has been increasing, and until more recently, harbour seal populations on the east coast of England had also generally been increasing (punctuated by major declines due to phocine distemper virus (PDV) outbreaks in 1988 and 2002) (SCOS, 2020). Consistent with other parts of the east coast of England, the Greater Thames Estuary seal populations have seen an increase in numbers, with both harbour and grey seal populations demonstrating high annual growth rates (8.99% pa, bootstrap 95% CI 6.79-11.19 for harbour seals; and 12.62% pa, bootstrap 95% CI 7.71-17.52 for grey seals) (Cox et al., 2020). More recent counts by the Sea Mammal Research Unit (SMRU) in the south-east England Seal Management Unit (SMU), however, may indicate the start of a decline in the harbour seal population of the Wash, North Norfolk Special Area of Conservation (SAC) (SCOS, 2020). The trajectory of other harbour seal populations around the UK coast is variable; generally, populations on the east coast of Scotland and Northern Isles are declining,and those in western Scotland are stable or increasing. With this national context in mind, there is a clear need to continue monitoring the trends in abundance of the Greater Thames Estuary harbour and grey seals.

Surveys of the area were carried out by SMRU and Bramley Associates between 2004 and 2012 (Bramley and Lewis, 2004; Bramley Associates 2005, 2007 and 2010 survey data, unpublished; Bramley Associates, 2012; SCOS, 2020) and ZSL began annual surveys in 2013 (Cox et al., 2020). Harbour seal pup surveys were also carried out in 2011 (SMRU) and 2018 (ZSL). This report presents the latest counts for the Greater Thames Estuary as well as results from the third pup survey of the area (both the population and harbour seal pup surveys had been postponed in 2020 because of the Covid-19 pandemic). In addition, this report presents the findings from an additional aerial survey which was conducted to better understand seal movement and the impact of the multi-day survey methodology used by ZSL.

## Methodology

Population and pup surveys were carried out from a light fixed-wing aircraft (Rallye model), based at Southend airport.

The harbour seal pup survey is timed to coincide with when the peak number of pups are expected and the population survey takes place over the harbour seal moult period, which follows whelping. Typically, on the east coast of England, pupping takes place at the end of June-start of July and the

moult occurs over the first two weeks of August. The surveys take place within two hours either side of low tide. To minimise environmental variability, surveys should also ideally happen between 12:00and 19:00 (SCOS, 2020). However, where Ministry of Defence (MoD) Danger Areas exist, and airspace

restrictions are in place (as in the Greater Thames Estuary) this rule is relaxed. Surveys of coastline and sandbanks that overlap with MoD Danger Areas take place over the weekend, subject to agreement from MoD Range Control.

The pup surveys were scheduled to take place 1st July 2021 – 3rd July 2021. Surveys were successfully completed on 1st and 2nd July, however, weather warnings prevented aircraft flying on 3rd July. Despite efforts, it was not possible to reschedule the 3rd July survey of the Southend area of the Greater Thames Estuary. A total pup estimate for the Greater Thames Estuary is therefore not provided in the results, however, the number and location where pups were recorded in the remainder of the estuaryis included.

The population surveys took place on 7th, 8th, and 10th August 2021. Typically, the survey would happen over three consecutive days, however, storms on 9th August prevented this.

A repeat survey of the coastline and sandbanks covered on the 10th was carried out on 11th August. ZSL aim to conduct the seal counts over three consecutive days because the survey team have not found it possible to survey all the coastline and sandbanks of the Thames estuary within a single four-hour window, two hours either side of low tide. The estuary is broadly divided into three 'sections' – Margate, Felixstowe, and Southend – and each section covered on a different day. It has been assumed that the movement of seals between these different sections is limited and therefore the risk of double counting or missing seals that move between survey days is low. A repeat survey was carried out for the first time this year to better understand the impact of multi-day surveys on the counts.

The location of seals was recorded using a Garmin eTrex10 handheld GPS unit. The same unit was usedto record the path of the aircraft. Hauled out seals were photographed using a Canon EOS 250D bodyand Canon EF 100-400mm f/4.5-5.6 L IS USM lens. After the survey, the photos are used to count seal numbers and species at each haul-out site. This is done independently by two people, their counts are compared, any disparities discussed, and a final count agreed.

## Results – Pup Survey

On 1st and 2nd July, a total of 1,135 seals were counted, this included 21 harbour seal pups (assumed to be born this year based on size and proximity to an adult harbour seal, presumed to be the mother),230 harbour seals (all age classes excluding pups) and 99 grey seals (all age classes). There were 785 seals counted that were not identified to species level or age class (pup vs. older). These seals were attwo locations in the Estuary – Kentish Knock sandbanks and the Goodwin Sands. A wind farm constructed near the Kentish Knock sandbanks prevented the aircraft flying near enough to the sealsto capture photos from which species could be determined with reasonable confidence. Likewise, airspace restrictions over the Goodwin Sands prevented the aircraft flying close enough for the photosneeded (except for one location – Goodwin Knoll).

The aerial survey effort that was possible is presented in **Fig. 1**. The distribution and count of harbour seal pups that were seen is presented in **Fig. 2**. Pups were seen across five locations – Margate Sands, Pegwell Bay, Goodwin Knoll, the Blackwater, and Hamford Water. **Fig. 3** shows the distribution and count of harbour and grey seals, for which species identification was possible (all age classes for both species), as well as seals not identified to species level.

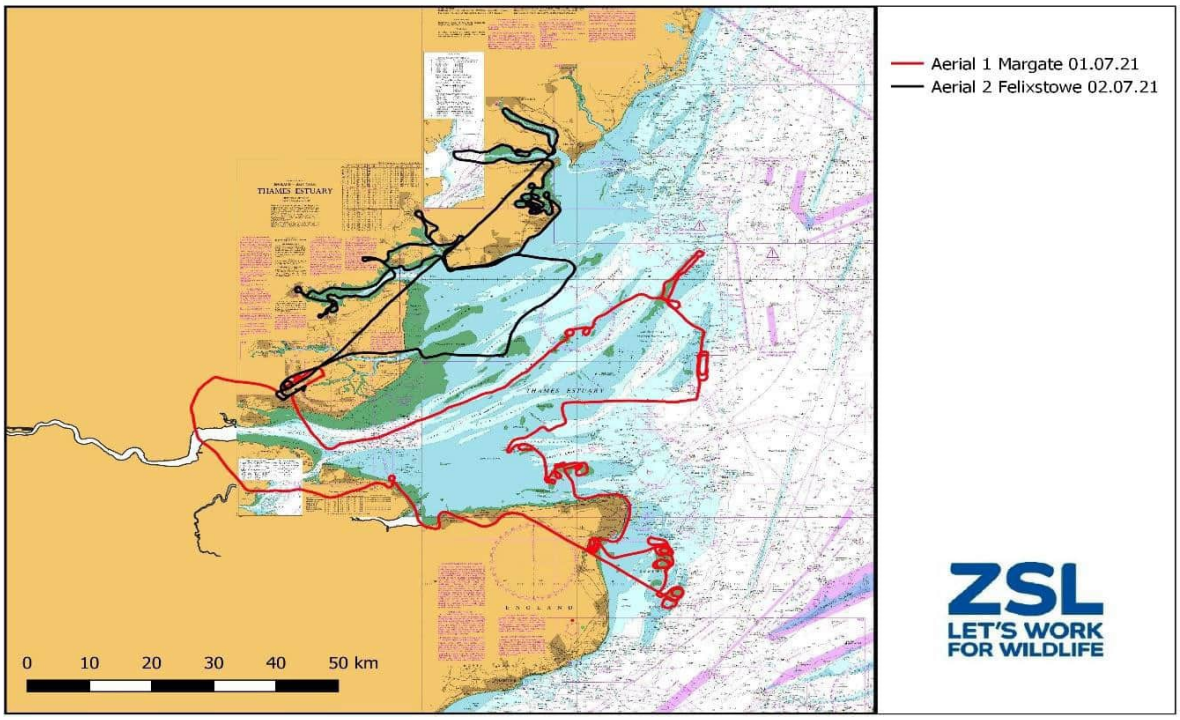


**Fig. 1 – Aerial survey effort for pup count, 2021 © Crown Copyright, 2021. All rights reserved. License No. EK00120130801**

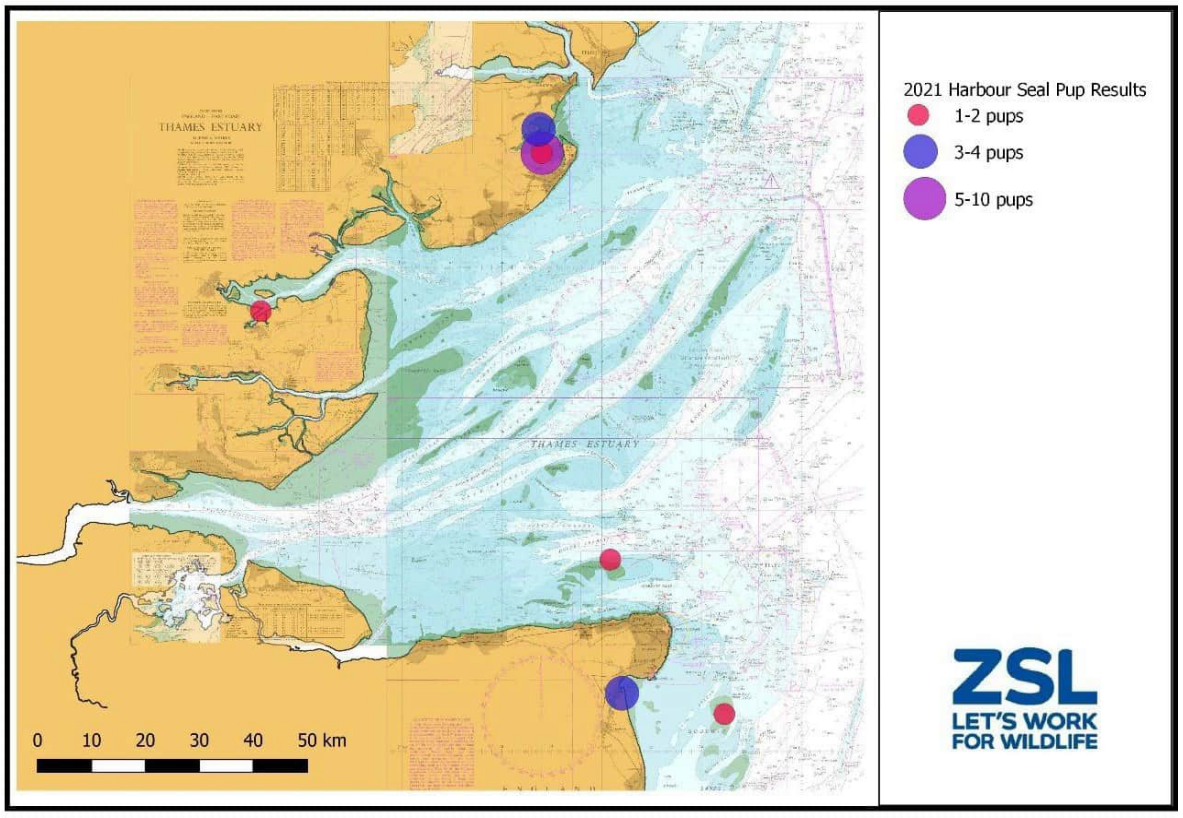


**Fig. 2 – Counts of harbour seal pups, 2021 © Crown Copyright, 2021. All rights reserved. License No. EK00120130801**

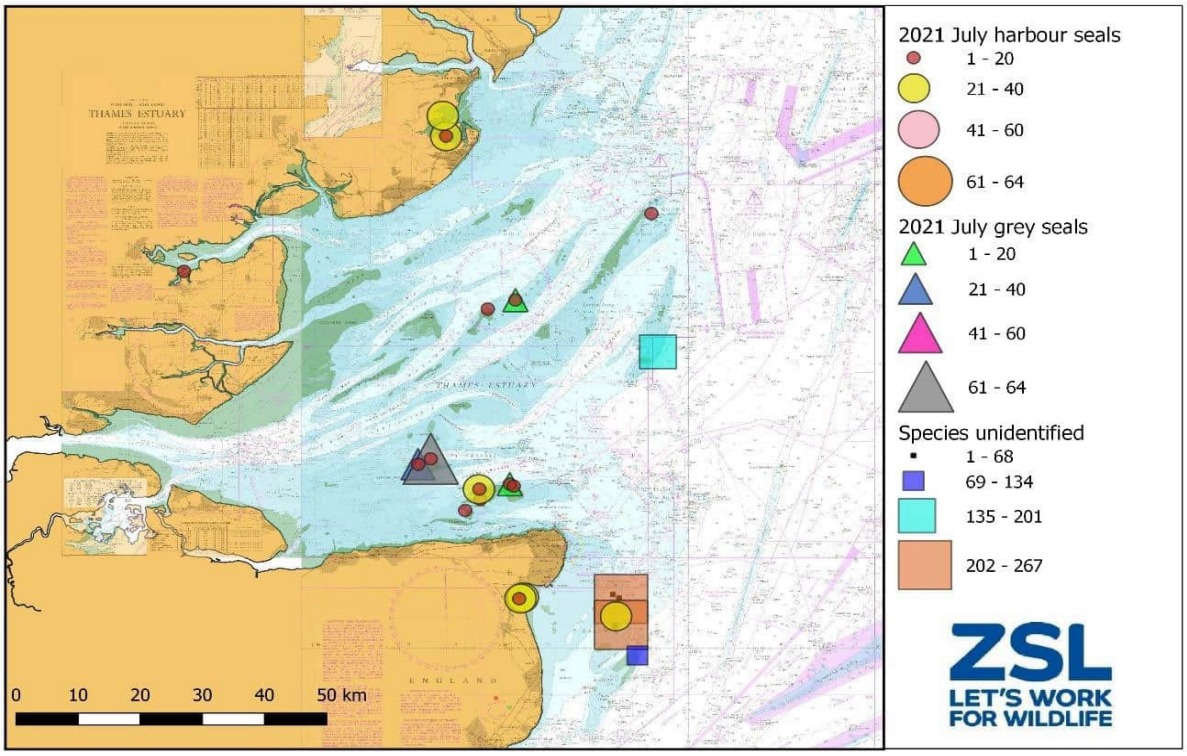


**Fig. 3 – Counts of harbour seals, grey seals, and seals (not ID-ed to species) (all age classes), 2021**



## Results – Population Survey

A map of the aerial effort for the population survey is presented in **Fig. 4**. No boat surveys or land-based surveys were conducted in 2021 as it was possible to cover the entire estuary by aircraft.

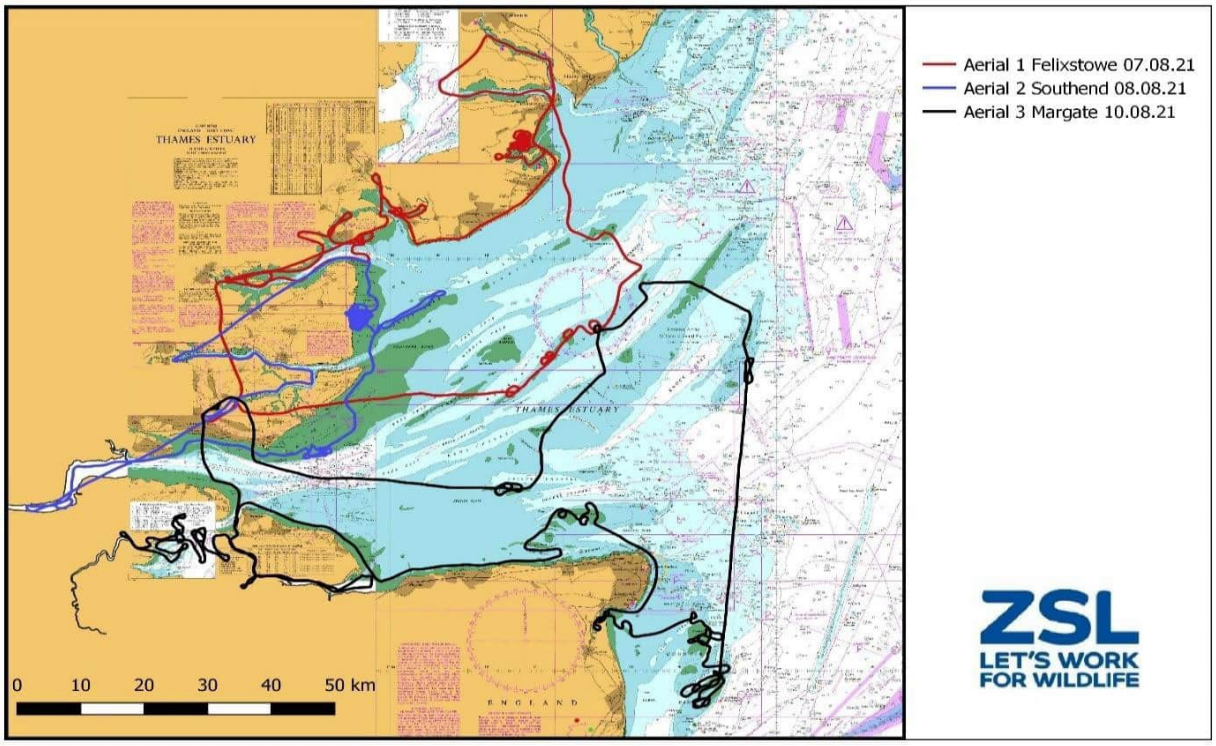

**Fig. 4 – Aerial survey effort for population count, 2021 © Crown Copyright, 2021. All rights reserved. License No. EK00120130801**

Counts and estimated harbour and grey seal population size for the Thames is presented in **Table 1** below – the latest counts are shown in bold. Populations are estimated by a scaling up of count numbers. This is based on the estimated proportion hauled out during surveys – for harbour seals, thisis 72% (0.72, 95% confidence intervals (CI): 0.54-0.88), and for grey seals, this is 23.9% (0.239, 95% CI:

0.192-0.286) (Lonergan et al., 2013; SCOS-BP-16/03).

**Table 1: Counts and harbour and grey seal population estimates for the Thames**

| | 2013 | 2014 | 2015 | 2016 | 2017 | 2018* | 2019 | 2021** |
|---|---|---|---|---|---|---|---|---|
| **Harbour seal count** | 482 | 489 | 451 | 694 | 795 | 738 | 671 | **498*** ** |
| **Harbour seal population estimate (95% CI)** | 669 (548-893) | 679 (556-906) | 626 (513-835) | 964 (789-1285) | 1104 (903-1472) | 1026 (840-1369) | 932 (763-1243) | 692 (566-922) |
| **Grey seal count** | 203 | 449 | 454 | 481 | 575 | 596 | 775 | **749*** ** |
| **Grey seal population estimate (95% CI)** | 849 (710-1057) | 1879 (1570-2339) | 1900 (1587-2365) | 2013 (1682-2505) | 2406 (2010-2995) | 2490 (2080-3099) | 3243 (2710-4036) | 3134 (2619-3901) |
| **Total seal count** | 685 | 938 | 905 | 1175 | 1370 | 1334 | 1446 | 1247 |

*Count completed by SMRU

**Count not completed in 2020 due to Covid-19 restrictions

***Counts updated post press release in September 2021

This year's count excludes seals observed on Kentish Knock sandbanks. As noted above for the pup survey, proximity of the sandbanks to the wind farm meant it was not possible to fly close enough to the seals to take photos from which a total count could be taken, or species identified. Based on observation during the flight, it is estimated that there were ~200 hauled out seals; and based on previous surveys, it is expected to be a mixed species group dominated by grey seals. Airspace restrictions over Goodwin Sands were temporarily lifted to allow those sandbanks to be surveyed for the population count, therefore numbers above include those haul-out sites.

**Fig. 5** below shows the distribution and counts of harbour and grey seals in the Thames in 2021. **Fig. 6** below shows the change in harbour and grey seal counts in the Thames since surveys began in 2003 (Cox et al., 2020).

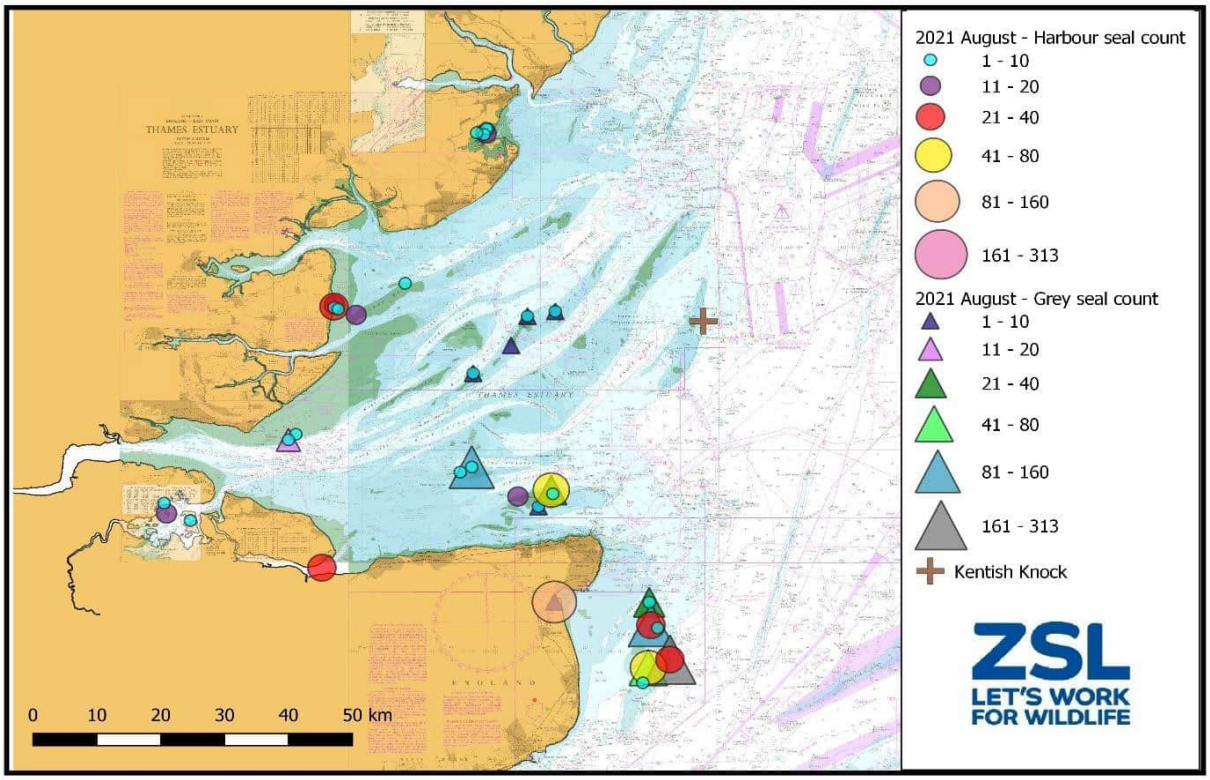


**Fig. 5 – Counts of harbour seals and grey seals, 2021 © Crown Copyright, 2021. All rights reserved. License No. EK00120130801**

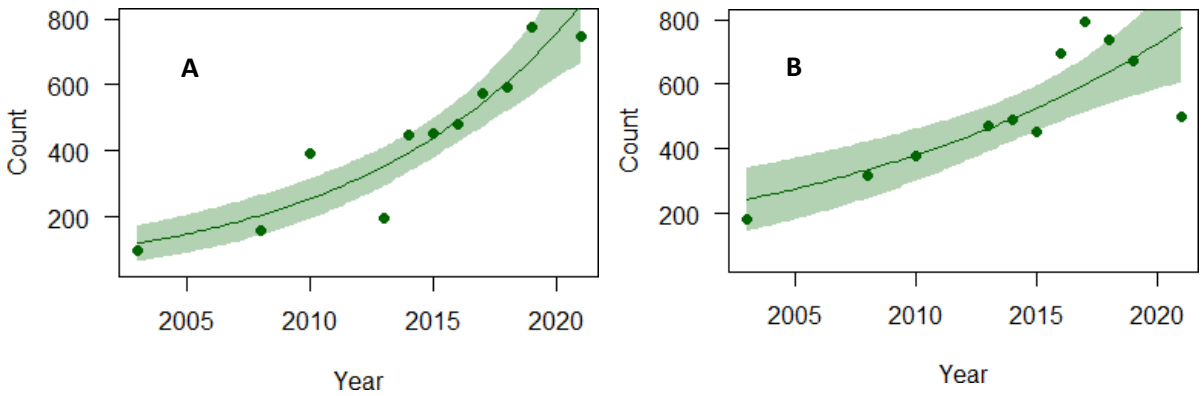


**Fig. 6 – Counts and fitted trend for Thames grey seals (A) and harbour seals (B), 2003-2021, 95% CI shown, by SMRU, Bramley Associates and ZSL (see Cox et al., 2020)**

## Results – Repeat Survey

On 11th August, 398 harbour seals and 635 grey seals were counted (total of 1,033). This count excludes Kentish Knock sandbanks, for the reason explained above. This was a repeat of 10th August flight (same areas surveyed in the same order), during which 352 harbour seals and 714 grey seals were counted, totalling 1,066 seals (similarly excluding Kentish Knock sandbanks). See **Fig. 7** for survey route (which can be compared to the 'Margate route' in **Fig. 4**) and **Fig. 8** for the distribution and countof seals. **Table 2** shows a direct comparison of locations (sometimes combined multiple haul-out sitesto represent sandbanks/one location) and seal counts for the two days.

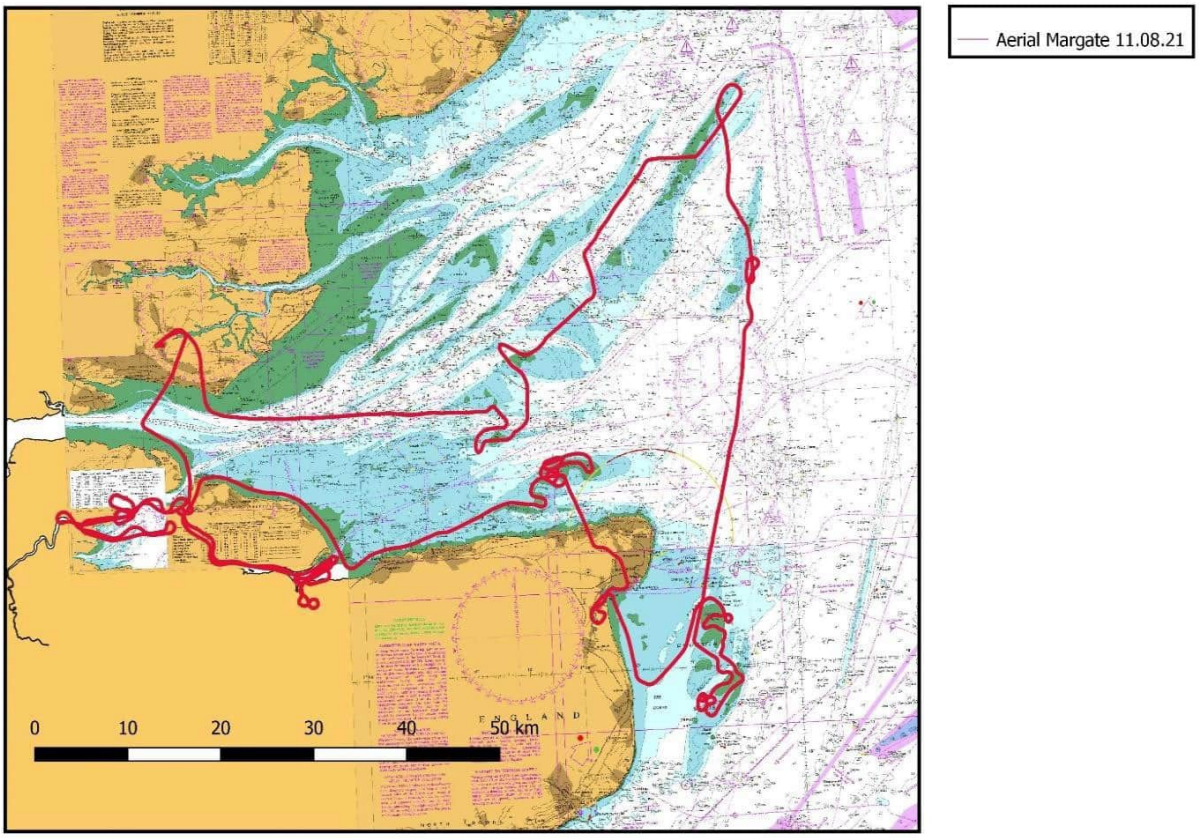


**Fig. 7 – Aerial survey effort for repeat count, 11 August 2021 © Crown Copyright, 2021. All rights reserved. License No. EK00120130801**

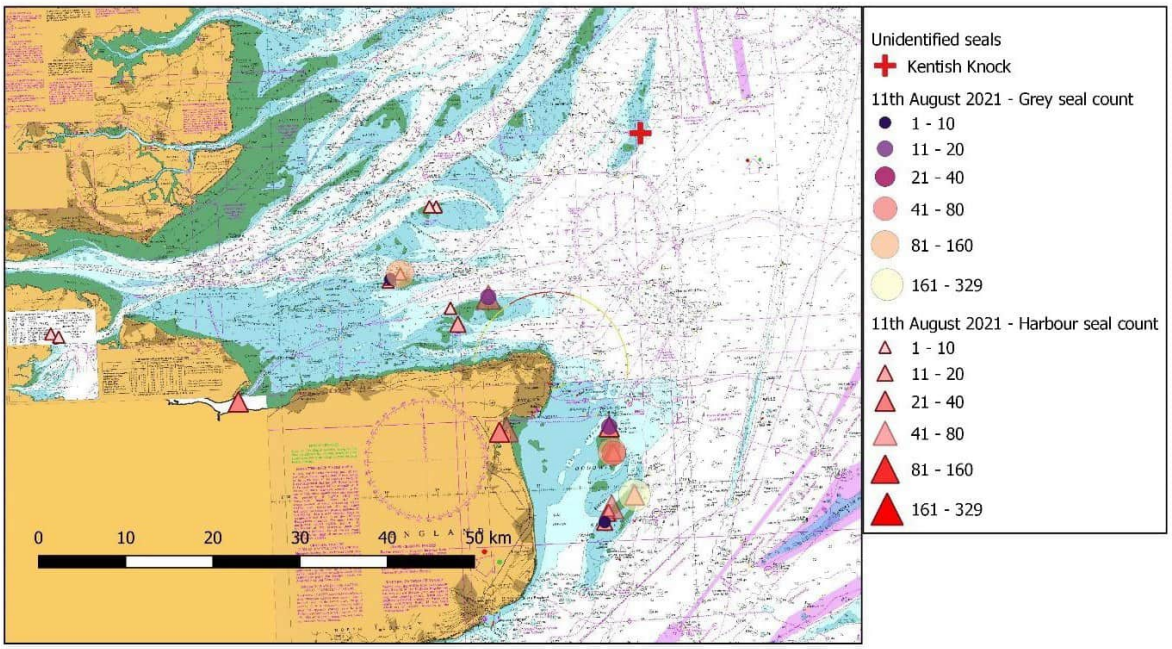


**Fig. 8 – Count of harbour seals and grey seals, 11 August 2021 © Crown Copyright, 2021. All rights reserved. License No. EK00120130801**

**Table 2 – Comparison of counts on 10th and 11th August 2021**

| Location | No. of harbour seals on 10th | No. of harbour seals on 11th | No. of grey seals on 10th | No. of grey seals on 11th |
|---|---|---|---|---|
| Medway | 21 | 17 | 0 | 0 |
| Swale | 26 | 31 | 0 | 0 |
| Margate Sands | 70 | 71 | 28 | 20 |
| Pegwell Bay | 97 | 97 | 3 | 0 |
| Goodwin Sands | 118 | 160 | 574 | 494 |
| Shingles Patch | 0 | 2 | 0 | 0 |
| Pan Sand Ridge | 20 | 20 | 109 | 121 |
| **Total** | **352** | **398** | **714** | **635** |

## Discussion

In August 2021, a total of 498 harbour seals were counted, compared with an average of 735 for three surveys in 2017-2019, and an average of 545 for three surveys in 2014-2016. There has been an increase in harbour seal counts since surveys began in 2013 to 2017, and since then there appears to have been a gradual decline. Some variability year-to-year is to be expected, associated with the proportion of the population hauled out and available to count. However, the change in counts since 2017 could also reflect a true decline in harbour seal numbers and requires ongoing monitoring. Considering changes observed in the Wash (the 2019 count was ~27.5% lower than the mean of the previous five years, 2014-2018) and declines elsewhere in the UK, this could be of concern.

In August 2021, a total of 749 grey seals were counted. There has been a sustained increase in grey seal counts in the Thames year-on-year, consistent with the rest of the east coast of England, up until this year. It is suspected that the lower count this year reflects the missed Kentish Knock sandbanks rather than a true decline - a large group of seals were observed at Kentish Knock but could not be photographed and which is typically grey seal dominated. The long-term trend will become clearer with continued monitoring.

Whilst a total pup count for the Thames in 2021 cannot be provided, the survey results show that the Thames estuary is important harbour seal pupping habitat. Further surveys of the entire estuary will be important to build on pup surveys in 2011 and 2018 and monitor trends, especially in determiningthe cause of any change in population size.

*Repeat survey*

A comparison of **Figs. 5** and **8** and **Table 2** shows that seals, of both species, were largely seen at the same locations on the Margate route over both days, and in similar numbers, suggesting that there is not a large amount of movement of seals in this short period of time. Overall, there is a +13.1% changein harbour seal counts on 10th and 11th, and -11.1% change in grey seal counts on the same dates. The numbers of each species at each haul-out site do not match exactly though, with the largest difference being at Goodwin Sands (harbour seals +35.6% and grey seals -13.9%), therefore it is possible that there is some level of seal movement within and, most importantly, outside of the Margate 'section'. This therefore means there could be some risk of double counting or missing seals. The difference in numbers between the days could also be due to other reasons though: such as, missed seals/observer bias, errors in photo analysis or environmental factors such as differences in tidal state (although the timing of the surveys is such to minimise this kind of variability). Whilst further, more-resource intensive, research would be needed to fully understand seal movement patterns in the estuary, these results, except for harbour seals at Goodwin Sands, do suggest low level of movement of seals between areas across the 3-day survey period and gives us more confidence that seals are not missedor double counted in large numbers because of multi-day surveys.

*Limitations*

The surveys conducted in the Thames follow the recognised methodology for harbour seal moult counts in sandy/muddy estuaries, however, there are uncertainties associated with it and limitationsof the 2021 survey specifically. These are outlined below:

- When possible, ZSL surveys are timed to coincide with a spring low tide to maximise the timefor which coastline and sandbanks are exposed, and therefore available to be surveyed. However, with other constraints on survey dates, such as airspace restrictions, etc., this is notalways possible, as was the case this year. As such, certain sandbanks were covered over at the time of surveying – the Barrows, Gunfleet, Long Sands and Knock John.

- Whilst the surveys only took place in fine weather, the conditions in the days around the surveys were unsettled with heavy rain. The third day of the pup survey had to be cancelled and the third day of the population survey postponed by one day because of this. It is possiblethat the unsettled weather could have affected haul-out behaviour (SCOS, 2020) and therefore the seals available to count.

- Population estimates made from counts do contain considerable uncertainty (SCOS, 2020). During their annual moult, harbour seals spend longer hauled out and the highest proportionof the population is available to count. Some seals will still be at sea though. There is just oneUK study that estimates the proportion of harbours seals hauled out during the moult (0.72, 95% CI 0.54-0.88) (Lonergan et al., 2013) and it is this figure that is used to calculate a population estimate. Furthermore, whilst environmental variability is reduced by consistent timing of surveys, the conversion/scaling up factor only represents adult seals – haul-out behaviour could vary with age and sex and the age structure and sex ratio will change over time. The age-sex composition for the Thames population is not known. As such, counts should be considered the minimum number of harbour seals in each area, and population estimates from scaled up counts should be treated with a certain level of caution.

- Counts and especially species ID depend on the quality of the aerial photography and ideallycapturing images of the animal's faces/heads. Every effort is made to ensure this but especially where the group of seals is particularly large it is not possible to get a photograph of every animal's face, therefore some assumptions must be made based on other seals in the photographs, position on the shore, position relative to each other, size, etc.

**Acknowledgments**

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# Provisional Regional PBR values for Scottish seals in 2022

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## Abstract

This document estimates PBR values for the grey and harbour seal "populations" that haul out in each of the seven Seal Management Areas in Scotland. Sets of possible values are tabulated for each area using the equation in Wade (1998) with different values of that equation's recovery factor. A value is suggested for this parameter in each population, the resulting PBR is highlighted, and a rationale is provided for each suggestion. The PBR values are calculated using the latest confirmed counts in each management area.

Changes since last year:

- ]Harbour seals: except for a single count in part of the East Scotland SMU there are no additional count data, so all SMU population estimates, Nmin values and PBRs are the same as last year.
- Grey seals: a new analysis of the proportion of grey seals hauled out and counted during surveys has reduced the grey seal population estimates by 5.2%. The $N_{min}$ value and the resulting PBRs have been reduced by approximately 3.5%.

### Introduction

Potential Biological Removal is a widely used way of calculating whether current levels of anthropogenic mortality are consistent with reaching or exceeding a specific target population, chosen to be the Optimum Sustainable Population. It is explicitly given, in an amendment to the US Marine Mammal Protection Act, as the method to be used for assessing anthropogenic impacts in the waters around that country. The method has been supported by simulations demonstrating its performance under certain assumptions (Wade 1998). The formulation of the equation allows for small anthropogenic takes from any population, however much it is depleted or fast it is declining.

Scottish Government uses PBR to estimate permissible anthropogenic takes for each of the ten seal management regions and uses this information to assess licence applications for seal control and for other licensable marine activities.

### Materials and Methods

## The PBR calculation:

$$PBR = N_{min}.(R_{max}/2).F_R$$

where:

**PBR** is a number of animals considered safely removable from the population.

**$N_{min}$** is a minimum population estimate (usually the 20th percentile of a distribution.

**$R_{max}$** is the population growth rate at low densities (by default set 0.12 for pinnipeds), this is halved to give an estimate of the growth rate at higher populations. This estimate should be conservative for most populations at their OSP.

**$F_R$** is a recovery factor, usually in the range 0.1 to 1. Low recovery factors give some protection from stochastic effects and overestimation of the other parameters. They also increase the expected equilibrium population size under the PBR.

The approach and calculation is discussed in detail in Wade (1998).

## Data used in these calculations:

**$N_{min}$** values used in these calculations are from the most recent summer surveys of each area, for both species:

- Harbour seals: The surveys took place during the harbour seal moult, when the majority of this species will be hauled out, so the counts are used directly as values for $N_{min}$. (An alternative approach, closer to that suggested by Wade (1998), would be to rescale these counts into abundance estimates and take the 20th centile of the resulting distributions. Results of a recent telemetry study in Orkney (Lonergan et al., 2012) suggest that would increase the PBRs by between 8%, if the populations are predominantly female, and 37%, if most of the animals are male.)

- Grey seals: A revised analysis of GPS/GSM telemetry data from 60 grey seals tagged between 2005 and 2018, allowed more accurate identification of haulout times (SCOS-BP 21/02). The revised estimate of proportion of seals hauled out during the survey window was 25.2% (95% CI: 21.5 – 29.1%), compared with the previous estimate of 23.9% (95% CI: 19.2 - 28.6%) (Russell et al. 2016 SCOS-BP 16/03). The 20th centile of the distribution of scalars from counts to abundances derived from the revised estimate is 3.73, approximately 3.5% lower than the previous scalar.

**$R_{max}$** is set at 0.12, the default value for pinnipeds, since very little information relevant to this parameter is available for Scottish seals. A lower value could be argued for, on the basis that the fastest recorded growth rate for the East Anglian harbour seal population has been below 10% (Lonergan et al. 2007), though that in the Wadden Sea has been consistently growing at slightly over 12% p.a. (Reijnders et al. 2010).

Regional pup production estimates for the UK grey seal population have also had maximum growth rates in the range 5-10% p.a. (Lonergan et al. 2011b). However, the large grey seal population at Sable Island in Canada has grown at nearly 13% p.a. for long periods (Bowen et al. 2003).

**$F_R$** needs to be chosen from the range [0.1, 1]. Estimated PBR values for the entire range of $F_R$ values are presented. A recommended $F_R$ value is indicated for each species in each region, together with a justification for the recommended value.

**Areas used in the calculations:**

Figure 1 and Table 1 shows the boundaries of the Seal Management Areas.

Particularly for grey seals, there will probably be substantial movement of animals between these areas. The division is a pragmatic compromise that attempts to balance current biological knowledge, distances between major haul-outs, environmental conditions, the spatial structure of existing data, practical constraints on future data collection and management requirements

**Rationale for the suggested recovery factors**

The original PBR methodology leaves the setting of the recovery factor as a subjective choice for managers. Factors such as the amount of information available about the population (and in particular its maximum annual growth rate), recent trends in local abundance, and the connections to neighbouring populations are relevant to setting this. The main factors affecting the value suggested for each species in each area are given below:

**Harbour seals**

1) Shetland, Orkney + North Coast, and Eastern Scotland ($F_R$= 0.1)

$F_R$ set to minimum because populations are experiencing prolonged declines and have not shown any signs of recovery.

2) Western Isles ($F_R$ = 0.5) **this may be revised after discussion of the SCA designation for the Western Isles SMU)*

Population was apparently undergoing a protracted but gradual decline during the 2000s, but the 2011 count was close to the pre-decline numbers and a trend analysis suggested no significant change since 1992. The population is only partly closed being close to the relatively much larger population in the Western Scotland region, and the $R_{max}$ parameter is derived from other seal populations. The most recent count for the Western Isles was 25% higher than the previous count. On that basis there may be an argument for increasing the recovery factor to bring it in line with the other western Scottish management areas. However, there is an existing conservation order in place for the management unit and it is therefore recommended that the recovery factor is left at 0.5 and reviewed again when a new count is available for the larger, adjacent West Scotland region.

3) West Scotland ($F_R$ = 1.0)

The population is largely closed, likely to have limited interchange with much smaller adjacent populations. The most recent count was the highest ever recorded and the population is apparently stable or increasing.

4) South West Scotland ($F_R$ = 0.7)

The population is apparently stable, is closed to the south and the adjacent population to the north is apparently stable or increasing. The intrinsic population growth rate is taken from other similar populations.

5) Moray Firth ($F_R$= 0.1)

Counts for 2019 in the Moray Firth were similar to the previous 5 years, confirming the absence of any overall trend over the past 15 years. The neighbouring Orkney and Tay populations are continuing to undergo unexplained, rapid and catastrophic declines in abundance. Data available from tracking studies suggest there is movement between these three areas. In the absence of a sustained increase in the Moray Firth counts it is recommended that the $F_R$ should be left at its previously recommended value of 0.1.

**Grey seals**

All regions ($F_R$ = 1.0)

There has been sustained growth in the numbers of pups born in all areas over the last 30 years. All UK populations are either increasing or apparently stable at the maximum levels ever recorded and therefore assumed to be at or close to their carrying capacities (Lonergan et al., 2011b; Thomas et al., 2019; Russell et al., 2019). Available telemetry data and the differences in the regional patterns of pup production and summer haul-out counts (Lonergan et al. 2011a) also suggest substantial long-distance movements of individuals.

**Table 1:** Boundaries of the Seal Management Areas in Scotland.

| | Seal Management Area | Area Covered |
|---|---|---|
| 1 | Southwest Scotland | English border to Mull of Kintyre |
| 2 | West Scotland | Mull of Kintyre to Cape Wrath |
| 3 | Western Isles | Western Isles incl. Flannan Isles, North Rona |
| 4 | North Coast & Orkney | North mainland coast & Orkney |
| 5 | Shetland | Shetland incl. Foula & Fair Isle |
| 6 | Moray Firth | Duncansby Head to Fraserburgh |
| 7 | East Scotland | Fraserburgh to English border |

## Results

PBR values for grey and harbour seals for each Seal Management Area for with the full range of $F_R$ values from 0.1 to 1.0 are given in table 1 for harbour seals and table 2 for grey seals. In each table the value corresponding to the recommended $F_R$ is highlighted

**Table 1.** Potential Biological Removal (PBR) values for harbour seals in Scotland by Seal Management Unit for the year 2021. Recommended $F_R$ values are highlighted in grey cells.

| | 2016-2019 | | PBRs based on recovery factors $F_R$ ranging from 0.1 to 1.0 | | | | | | | | | | selected | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Seal Management Area** | **count** | **$N_{min}$** | **0.1** | **0.2** | **0.3** | **0.4** | **0.5** | **0.6** | **0.7** | **0.8** | **0.9** | **1.0** | **FR** | **PBR** |
| 1 Southwest Scotland | 1709 | 1709 | 10 | 20 | 30 | 41 | 51 | 61 | **71** | 82 | 92 | 102 | 0.7 | **71** |
| 2 West Scotland | 15600 | 15600 | 93 | 187 | 280 | 374 | 468 | 561 | 655 | 748 | 842 | **936** | 1.0 | **936** |
| 3 Western Isles | 3532 | 3532 | 21 | 42 | 63 | 84 | **105** | 127 | 148 | 169 | 190 | 211 | 0.5 | **105** |
| 4 North Coast & Orkney | 1405 | 1405 | **8** | 16 | 25 | 33 | 42 | 50 | 59 | 67 | 75 | 84 | 0.1 | **8** |
| 5 Shetland | 3180 | 3180 | **19** | 38 | 57 | 76 | 95 | 114 | 133 | 152 | 171 | 190 | 0.1 | **19** |
| 6 Moray Firth | 1077 | 1077 | **6** | 12 | 19 | 25 | 32 | 38 | 45 | 51 | 58 | 64 | 0.1 | **6** |
| 7 East Scotland | 343 | 343 | **2** | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 0.1 | **2** |
| **SCOTLAND TOTAL** | 26846 | 26846 | 159 | 319 | 480 | 641 | 803 | 963 | 1125 | 1285 | 1446 | 1607 | | **1147** |

**Table 2.** Potential Biological Removal (PBR) values for grey seals in Scotland by Seal Management Unit for the year 2021. Recommended $F_R$ values are highlighted in grey cells.

| | 2016-2019 | | PBRs based on recovery factors $F_R$ ranging from 0.1 to 1.0 | | | | | | | | | | selected | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Seal Management Area** | **count** | **Nmin** | **0.1** | **0.2** | **0.3** | **0.4** | **0.5** | **0.6** | **0.7** | **0.8** | **0.9** | **1.0** | **FR** | **PBR** |
| 1 Southwest Scotland | 517 | 1927 | 12 | 23 | 35 | 46 | 58 | 69 | 81 | 92 | 104 | 116 | 1.0 | **116** |
| 2 West Scotland | 4174 | 15554 | 93 | 187 | 280 | 373 | 467 | 560 | 653 | 747 | 840 | 933 | 1.0 | **933** |
| 3 Western Isles | 5773 | 21512 | 129 | 258 | 387 | 516 | 645 | 774 | 904 | 1033 | 1162 | 1291 | 1.0 | **1291** |
| 4 North Coast & Orkney | 8599 | 32043 | 192 | 385 | 577 | 769 | 961 | 1154 | 1346 | 1538 | 1730 | 1923 | 1.0 | **1923** |
| 5 Shetland | 1009 | 3760 | 23 | 45 | 68 | 90 | 113 | 135 | 158 | 180 | 203 | 226 | 1.0 | **226** |
| 6 Moray Firth | 1657 | 6175 | 37 | 74 | 111 | 148 | 185 | 222 | 259 | 296 | 333 | 370 | 1.0 | **370** |
| 7 East Scotland | 3683 | 13724 | 82 | 165 | 247 | 329 | 412 | 494 | 576 | 659 | 741 | 823 | 1.0 | **823** |
| **SCOTLAND TOTAL** | **25412** | **94695** | 568 | 1136 | 1705 | 2273 | 2841 | 3409 | 3977 | 4545 | 5114 | 5682 | | **5682** |

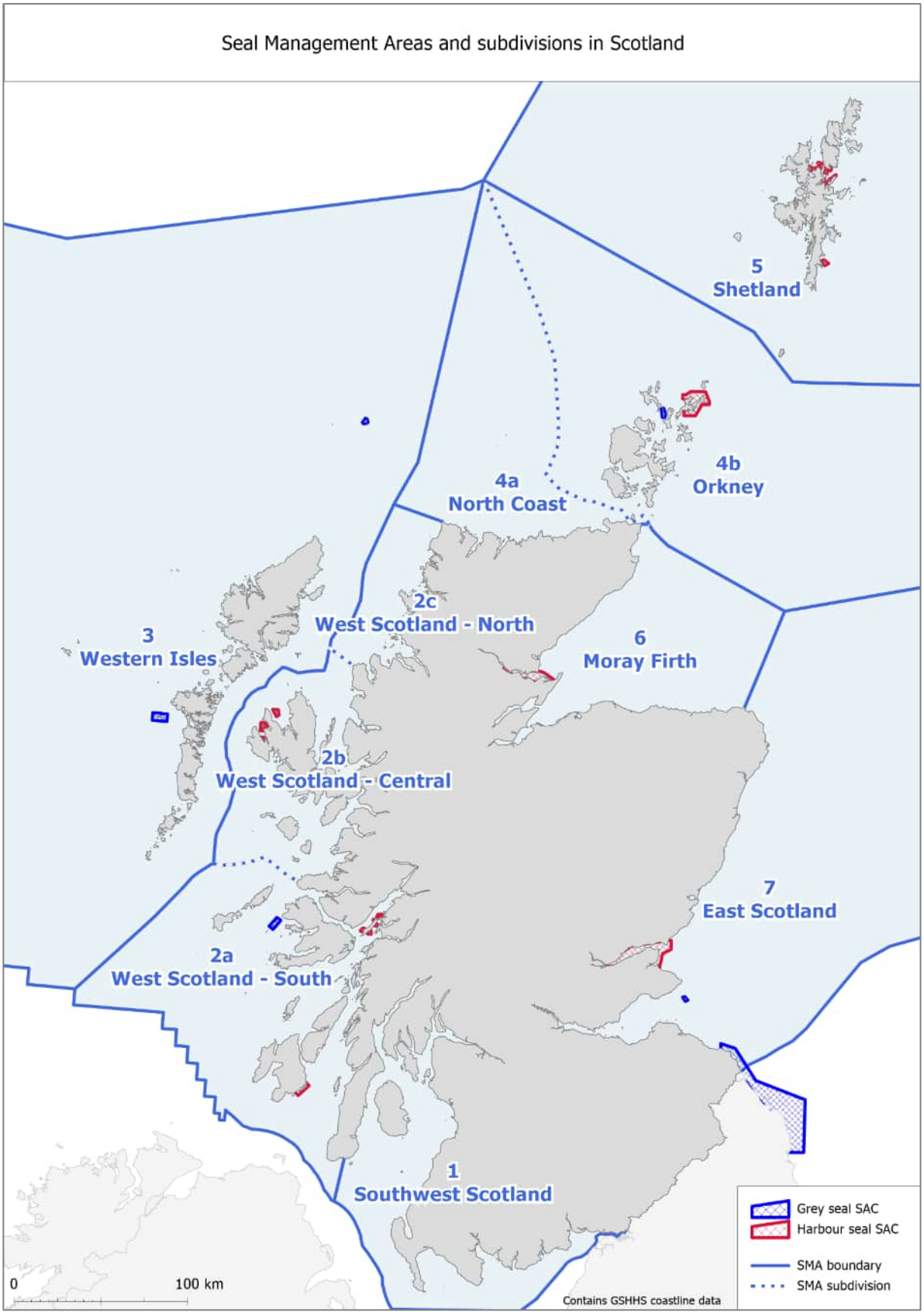


**Figure 1**. Seal management areas in Scotland. For purposes of PBR calculations West Scotland is treated as a single management unit.

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# Appendix 6: Seal Population Management 2017

# Scientific Advice on Matters Related to the Management of Seal Populations: 2017

## Contents

# Executive Summary

**Executive Summary**

Under the Conservation of Seals Act 1970 and the Marine (Scotland) Act 2010, the Natural Environment Research Council (NERC) has a duty to provide scientific advice to government on matters related to the management of seal populations. NERC has appointed a Special Committee on Seals (SCOS) to formulate this advice. Questions on a wide range of management and conservation issues are received from the UK government and devolved administrations. In 2017, 30 questions were received from Marine Scotland, Defra and Natural Resources Wales. SCOS's answers to these questions are provided in detail in the main Advice below and summarised here.

**Current status of British grey seals (*Halichoerus grypus*)**

Grey seal population trends are assessed from the counts of pups born during the autumn breeding season, when females congregate on land to give birth. Outside of the breeding season animals may re-distribute themselves, thus, regional differences in population estimates do not necessarily reflect the abundance of animals in each region at other times of the year.

The most recent surveys of the principal Scottish grey seal breeding sites were flown in 2016. The image processing and counting is not yet complete but the data will be available for SCOS 2018. The most recent results from the 2014 surveys together with the 2014 estimates from the annually ground counted sites in eastern England, produced a pup production estimate of 54,600. Adding in an additional 5,900 pups estimated to have been born at less frequently surveyed colonies in Shetland and Wales as well as other scattered locations throughout Scotland, Northern Ireland and South west England, resulted in an estimate of 60,500 (95% CI 53,900-66,900, rounded to the nearest 100) pups (Table s1).

The pup production estimates are converted to estimates of total population size (1+ aged population) using a mathematical model and projected forward to 2016. The stages in the process (pup production → mathematical model → total population size) and the trends observed at each stage are presented in detail in SCOS BP 16/01 and SCOS-BP 16/02 and SCOS-BP 17/01. The pup production model is currently under review and being updated.

The population model provided an estimate of 139,800 (approximate 95% CI 116,500-167,100) UK grey seals (1+ aged population) in 2015. Projecting the model forward one year, using the same pup production time series and prior distributions for the demographic parameters provided an estimate of 141,000 (approximate 95% CI 117,500-168,500) in 2016 (SCOS-BP 17/01).

Summary *Table s1.* ***Grey seal pup production estimates in 2014****.*

| Location | Pup production in 2014 |
|---|---|
| **England** | **6,900** |
| **Wales** | **1,600** |
| **Scotland** | **51,900** |
| **Northern Ireland** | **100** |
| **Total UK** | **60,500** |

There is evidence for regional differences in grey seal demographics but detailed information on vital rates are lacking. Regional information on fecundity and survival rates would improve our ability to provide advice on population status. However, this would require considerable new investment in resources.

**Current status of British harbour seals (*Phoca vitulina*)**

Harbour seals are counted while they are on land during their August moult, giving a minimum estimate of population size. Not all areas are counted every year but the aim is to cover the UK coast every 5 years. Combining the most recent counts (2008-2016) gives a total of 31,300 counted in the UK (Table s2). Scaling this by the estimated proportion hauled out (0.72 (95% CI: 0.54-0.88)) produced an estimated total population for the UK in 2016 of 43,500 (approximate 95% CI: 35,600-58,000).

Overall, the UK population has increased since the late 2000s and is close to the 1990s level. However, there are significant differences in the population dynamics between regions. As reported in SCOS 2008 to 2016, there have been general declines in counts of harbour seals in several regions around Scotland but the declines are not universal with some populations either stable or increasing.

Harbour seal counts were stable or increasing in all regions until around 2000. Since then there have been rapid declines in Orkney (down 85% between 1997 and 2016), and along the East coast of Scotland (down 52% between 1997 and 2016). Shetland declined by 30% between 2000 and 2009, but then increased by 10% between 2009 and 2015. The most recent counts for the West Scotland region (2013 to 2015) and for the Western Isles (2011) were 43% and 50% respectively higher than the previous estimates (2007 to 2009). The most recent composite count for Scotland for 2011 to 2016 is 25% higher than the equivalent estimate for 2007-2009.

Counts for the East coast of England also appear stable, although the 2016 count was approximately 10% higher than in 2015, driven mainly by a doubling of the count from Essex and Kent.

*Summary Table s2.* ***UK harbour seal minimum population estimates based on counts during the moult.***

| Location | Most recent count (2008-2016) |
|---|---|
| **England** | **5,200** |
| **Wales** | **<50** |
| **Scotland** | **25,150** |
| **Northern Ireland** | **950** |
| **Total UK** | **31,300** |

Knowledge of UK harbour seal demographic parameters (i.e. vital rates) is limited and therefore inferences about the population dynamics rely largely on count data from moulting surveys. Information on vital rates would improve our ability to provide advice on population status. At present vital rate estimates for UK harbour seals are only available from a long term study of the Loch Fleet population in the Moray Firth. However, studies are underway to obtain similar data from new sites in Orkney and western Scotland.

Information on the causes of the declines in harbour seals in some Scottish regions is required for SCOS to give advice on appropriate conservation actions. A wide range of potential causes have been discussed at previous SCOS meetings. Causal mechanisms have not been identified, but several factors can now be

ruled out as primary causes and research efforts are currently focussed on interactions with grey seals and exposure to toxins from harmful algae.

Conservation orders are currently in place for the Western Isles, Northern Isles and down the east coast as far as the border. On the basis of continued declines or lack of increases in all affected areas SCOS recommended that the measures to protect vulnerable harbour seal populations should remain in place, but no new conservation measures were proposed.

SCOS recommended that there should be a requirement for mandatory reporting of seals killed. From both scientific and management perspectives the absence of any requirement to record and report on numbers of seals killed in England and Wales is a major omission that prevents any assessment of the effects of seal shooting.

**Potential biological Removals (PBR).**
The Potential Biological Removals (PBR) is a relatively simple metric developed to provide advice on the levels of removals from a marine mammal population that would still allow the population to approach a defined target. Provisional regional values for PBR for Scottish seals for 2018 were calculated and are presented below. The PBR for harbour seals in Orkney has been reduced by approximately 30% due to recent survey results. Regional PBRs for grey seals have increased by 50-67% due to revised population estimates and local population increases.

**Interactions with Marine Renewable Energy developments**
SCOS discussed potential interactions between seals and marine renewable developments and discussed the use of Acoustic Deterrent Devices as mitigation measures. A summary of the most recent information on these topics is presented.

**Interactions with Fisheries**
SCOS discussed the current state of knowledge on interactions between seals and salmon fisheries. Work is continuing in Scotland focused mainly on the use of acoustic deterrent devices and capture and removal of problem seals. Modifications to coastal (stake) salmon nets and the use of acoustic deterrent devices have been shown to be effective in limiting if not eliminating depredation.

The issue of seal bycatch in commercial fisheries was discussed. The most recent estimate of seal bycatch in UK fisheries is 610 animals (95% CI 449-1262). However, this is based on assumptions about observed bycatch rates from sampling that is predominantly in the Western Channel and Celtic Sea, where most gillnet effort is located. Sampling levels are too low in other areas to provide reliable area-specific estimates.

Estimated bycatch levels in the Celtic Sea exceed a PBR for the combined grey seal population of SW England, Wales and Ireland. An additional but un-recorded number of seals are bycaught by Irish and French boats operating in the Celtic Sea. Despite the bycatch, grey seal populations in Wales and Ireland are increasing, suggesting that some of the bycaught seals are immigrants from Scottish populations.

**Seal monitoring strategy**
The current monitoring of seals (abundance, distribution, bycatch and strandings) and the legislative drivers for this work, as well as enhanced monitoring options, were discussed. A number of long term research projects were highlighted that could form the basis of future options, particularly to identify population pressures, including: estimating population demography metrics; pathogen, contaminant and toxin analyses; monitoring seal diet; and at-sea seal distribution. Considerable further work would be required in order to design and carry out robust and appropriate monitoring programmes.

**Competition between grey and harbour seals**

Grey seals may have a detrimental effect on the abundance of harbour seals through competition and or direct predation.

An I.C.E.S. workshop was held in 2017 focused on predatory behaviour of grey seals towards other grey seals, harbour seals and harbour porpoises (Phocoena phocoena) in European waters. Reported cases of grey seal predation events have been detected throughout much of the grey seal range, although information is lacking from some key areas. Seasonal trends of predation on pinnipeds peaked during their respective pupping/mating seasons while cases of predation on harbour porpoises peaked in spring months. A total of 737 cases have been reported, peaking in 2016.

The incidence of grey seal predation on other marine mammals steadily increased over the last 10 years although it is not known if this represents a true increase in prevalence, reflects the steady increase in European grey seal numbers over the same period or is due to an increase in effort and reporting. It was noted that if previously high rates of harbour seal mortality due to grey seal predation were sustained, they could potentially account for observed declines in some populations. Coupled with the rise in European grey seal numbers, this could become the most important driver of local harbour seal extinctions in already depressed populations.

**Climate change**

Ongoing work suggests that both grey and harbour are at risk of range contraction at the southern end of their range under predicted climate changes in both the lowest and highest warming scenarios presented by the IPCC. However, these predictions contain considerable uncertainty in part because the scenarios do not take account of potential prey re-distributions.

# Scientific Advice

## Background

Under the Conservation of Seals Act 1970 and the Marine (Scotland) Act 2010, the Natural Environment Research Council (NERC) has a duty to provide scientific advice to government on matters related to the management of seal populations. NERC has appointed a Special Committee on Seals (SCOS) to formulate this advice so that it may discharge this statutory duty. Terms of Reference for SCOS and its current membership are given in Annex I.

Formal advice is given annually based on the latest scientific information provided to SCOS by the Sea Mammal Research Unit (SMRU). SMRU is an interdisciplinary research group at the University of St Andrews which receives National Capability funding from NERC to fulfil its statutory requirements and is a delivery partner of the National Oceanography Centre. SMRU also provides government with scientific reviews of licence applications to shoot seals; information and advice in response to parliamentary questions and correspondence; and responds on behalf of NERC to questions raised by government departments about the management of marine mammals in general.

This report provides scientific advice on matters related to the management of seal populations for the year 2017. It begins with some general information on British seals, gives information on their current status, and addresses specific questions raised by the Marine Scotland (MS) and the Department of the Environment, Food and Rural Affairs (Defra) and Natural Resources Wales (NRW).

Appended to the main report are briefing papers which provide additional scientific background for the advice.

SMRU's long-term funding has recently seen a substantial reduction which will continue into the foreseeable future. This will have an impact on the frequency and types of advice that SMRU will be able to deliver and research activities are being reprioritised as necessary.

## General information on British seals

Two species of seal live and breed in UK waters: grey seals (*Halichoerus grypus*) and harbour (also called common) seals (*Phoca vitulina*). Grey seals only occur in the North Atlantic, Barents and Baltic Sea with their main concentrations on the east coast of Canada and United States of America and in north-west Europe. Harbour seals have a circumpolar distribution in the Northern Hemisphere and are divided into five sub-species. The population in European waters represents one subspecies (*Phoca vitulina vitulina*). Other species that occasionally occur in UK coastal waters, include ringed seals (*Phoca hispida*), harp seals (*Phoca groenlandica*), bearded seals (*Erignathus barbatus*) and hooded seals (*Cystophora crystata*), all of which are Arctic species.

### *Grey seals*

Grey seals are the larger of the two resident UK seal species. Adult males can weigh over 300kg while the females weigh around 150-200kg. Grey seals are long-lived animals. Males may live for over 20 years and begin to breed from about age 10. Females often live for over 30 years and begin to breed at about age 5.

They are generalist feeders, foraging mainly on the sea bed at depths of up to 100m although they are probably capable of feeding at all the depths found across the UK continental shelf. They take a wide variety of prey including sandeels, gadoids (cod, whiting, haddock, ling), and flatfish (plaice, sole, flounder, dab). Amongst these, sandeels are typically the predominant prey species. Diet varies seasonally and from

region to region. Food requirements depend on the size of the seal and fat content (oiliness) of the prey, but an average consumption estimate of an adult is 4 to 7 kg per seal per day depending on the prey species.

Grey seals forage in the open sea and return regularly to haul out on land where they rest, moult and breed. They may range widely to forage and frequently travel over 100km between haulout sites. Foraging trips can last anywhere between 1 and 30 days. Compared with other times of the year, grey seals in the UK spend longer hauled out during their annual moult (between December and April) and during their breeding season (between August and December). Tracking of individual seals has shown that most foraging probably occurs within 100km of a haulout site although they can feed up to several hundred kilometres offshore. Individual grey seals based at a specific haulout site often make repeated trips to the same region offshore, but will occasionally move to a new haulout site and begin foraging in a new region. Movements of grey seals between haulout sites in the North Sea and haulout sites in the Outer Hebrides have been recorded as well as movements from sites in Wales and NW France to sites in the Inner Hebrides

Globally there are three centres of grey seal abundance; one in eastern Canada and the north-east USA, a second around the coast of the UK, especially in Scottish coastal waters, and a third, smaller group in the Baltic Sea. All populations are increasing, although numbers are still relatively low in the Baltic where the population was drastically reduced by human exploitation and reproductive failure, probably due to pollution. In the UK and Canadian populations, there are clear indications of a slowing down in population growth in recent years.

Approximately 38% of the world's grey seals breed in the UK and 88% of these breed at colonies in Scotland with the main concentrations in the Outer Hebrides and in Orkney. There are also breeding colonies in Shetland, on the north and east coasts of mainland Britain and in SW England and Wales. Although the number of pups throughout Britain has grown steadily since the 1960s when records began, there is clear evidence that the population growth is levelling off in all areas except the central and southern North Sea where growth rates remain high. The numbers born in the Hebrides have remained approximately constant since 1992 and growth has been levelling off in Orkney since the late 1990s.

In the UK, grey seals typically breed on remote uninhabited islands or coasts and in small numbers in caves. Preferred breeding locations allow females with young pups to move inland away from busy beaches and storm surges. Seals breeding on exposed, cliff-backed beaches and in caves may have limited opportunity to avoid storm surges and may experience higher levels of pup mortality as a result. Breeding colonies vary considerably in size; at the smallest only a handful of pups are born, while at the biggest, over 5,000 pups are born annually. In the past grey seals have been highly sensitive to disturbance by humans, hence their preference for remote breeding sites. However, at one UK mainland colony at Donna Nook in Lincolnshire, seals have become habituated to human disturbance and over 70,000 people visit this colony during the breeding season with no apparent impact on the breeding seals.

UK grey seals breed in the autumn, but there is a clockwise cline in the mean birth date around the UK. The majority of pups in SW Britain are born between August and September, in north and west Scotland pupping occurs mainly between September and late November and eastern England pupping occurs mainly between early November to mid-December.

Female grey seals give birth to a single white coated pup which they suckle for 17 to 23 days. Pups moult their white natal coat (also called "lanugo") around the time of weaning and then remain on the breeding colony for up to two or three weeks before going to sea. Mating occurs at the end of lactation and then adult females depart to sea and provide no further parental care. In general, female grey seals return to the same colony to breed in successive years and often breed at the colony in which they were born. Grey

seals have a polygynous breeding system, with dominant males monopolising access to females as they come into oestrus. The degree of polygyny varies regionally and in relation to the breeding habitat. Males breeding on dense, open colonies are more able to restrict access to a larger number of females (especially where they congregate around pools) than males breeding in sparse colonies or those with restricted breeding space, such as in caves or on cliff-backed beaches.

***Harbour seals***

Adult harbour seals typically weigh 80-100 kg. Males are slightly larger than females. Like grey seals, harbour seals are long-lived with individuals living up to 20-30 years.

Harbour seals normally feed within 40-50 km around their haul out sites. They take a wide variety of prey including sandeels, gadoids, herring and sprat, flatfish, octopus and squid. Diet varies seasonally and from region to region. Because of their smaller size, harbour seals eat less food than grey seals; 3-5 kg per adult seal per day depending on the prey species.

Harbour seals come ashore in sheltered waters, often on sandbanks and in estuaries, but also in rocky areas. They give birth to their pups in June and July and moult in August. At these, as well as other times of the year, harbour seals haul out on land regularly in a pattern that is often related to the tidal cycle. Harbour seal pups are born having shed their white coat *in utero* and can swim almost immediately.

Harbour seals are found around the coasts of the North Atlantic and North Pacific from the subtropics to the Arctic. Five subspecies of harbour seal are recognized. The European subspecies, *Phoca vitulina vitulina*, ranges from northern France in the south, to Iceland in the west, to Svalbard in the north and to the Baltic Sea in the east. The largest population of harbour seals in Europe is in the Wadden Sea.

Approximately 30% of European harbour seals are found in the UK; this proportion has declined from approximately 40% in 2002 due to the more rapid recovery and higher sustained rates of increase in the Wadden Sea population. Harbour seals are widespread around the west coast of Scotland and throughout the Hebrides and Northern Isles. On the east coast, their distribution is more restricted with concentrations in the major estuaries of the Thames, The Wash and the Moray Firth. Scotland holds approximately 79% of the UK harbour seal population, with 16% in England and 5% in Northern Ireland.

The population along the east coast of England (mainly in The Wash) was reduced by 52% following the 1988 phocine distemper virus (PDV) epidemic. A second epidemic in 2002 resulted in a decline of 22% in The Wash, but had limited impact elsewhere in Britain. Counts in the Wash and eastern England did not demonstrate any immediate recovery from the 2002 epidemic and continued to decline until 2006. The counts increased rapidly from 2006 to 2012 but have remained relatively constant since. In contrast, the adjacent European colonies in the Wadden Sea experienced continuous rapid growth after the epidemic, but again, the counts over the last 5 years suggest that the rate of increase has slowed dramatically.

Major declines have now been documented in several harbour seal populations around Scotland, with declines since 2001 of 76% in Orkney, 30% in Shetland between 2000 and 2009, and 92% between 2002 and 2013 in the Firth of Tay. However the pattern of declines is not universal. The Moray Firth count apparently declined by 50% before 2005, remained reasonably stable for 4 years, then increased by 40% in 2010 and has fluctuated since, showing no significant trend since 2000. The Outer Hebrides apparently declined by 35% between 1996 and 2008 but the 2011 count was >50% higher than the 2008 count. The recorded declines are not thought to have been linked to the 2002 PDV epidemic that seems to have had little effect on harbour seals in Scotland.

## Historical status

We have little information on the historical status of seals in UK waters. Remains have been found in some of the earliest human settlements in Scotland and they were routinely harvested for meat, skins and oil until the early 1900s. There are no reliable records of historical population size. Harbour seals were heavily exploited mainly for pup skins until the early 1970s in Shetland and The Wash. Grey seal pups were taken in Orkney until the early 1980s, partly for commercial exploitation and partly as a population control measure. Large scale culls of grey seals in the North Sea, Orkney and Hebrides were carried out in the 1960s and 1970s as population control measures. Grey seal pup production monitoring started in the late 1950s and early 1960s and numbers have increased consistently since. However, in recent years, there has been a significant reduction in the rate of increase.

Boat surveys of harbour seals in Scotland in the 1970s showed numbers to be considerably lower than in the aerial surveys, which started in the late 1980s, but it is not possible to distinguish the apparent change in numbers from the effects of more efficient counting methods. After harvesting ended in the early 1970s, regular surveys of English harbour seal populations indicated a gradual recovery, punctuated by two major reductions due to PDV epidemics in 1988 and 2002 respectively.

## Legislation protecting seals

The Grey Seal (Protection) Act, 1914, provided the first legal protection for any mammal in the UK because of a perception that seal populations were very low and there was a need to protect them. In the UK seals are protected under the Conservation of Seals Act 1970 (England, and Wales), the Marine (Scotland) Act 2010 and The Wildlife (Northern Ireland) Order 1985.

The Conservation of Seals Act prohibits taking seals during a close season (01/09 to 31/12 for grey seals and 01/06 to 31/08 for harbour seals) except under licence issued by the Marine Management Organisation (MMO). The Act also allows for specific Conservation Orders to extend the close season to protect vulnerable populations. After consultation with NERC, three such orders were established providing year round protection to grey and harbour seals on the east coast of England and in the Moray Firth and to harbour seals in the Outer Hebrides, Shetland, Orkney and the east coast of Scotland between Stonehaven and Dunbar (effectively protecting all harbour seals along the east coasts of Scotland and England).

The conservation orders in Scotland have been superceded by the designation of seal conservation areas under the provisions of the Marine (Scotland) Act 2010. Conservation areas have been established for the Northern Isles, the Outer Hebrides and the East coast of Scotland. In general, seals in Scotland are afforded protection under Section 6 of the Act which prohibits the taking of seals except under licence. Licences can be granted for the protection of fisheries, for scientific and welfare reasons and for the protection of aquaculture activities. In addition, in Scotland it is now an offence to disturb seals at designated haulout sites. NERC (through SMRU) provides advice on all licence applications and haulout designations.

The Wildlife (Northern Ireland) Order 1985 provides complete protection for both grey and harbour seals and prohibits the killing of seals except under licence. It is an offence to intentionally or recklessly disturb seals at any haulout site under Article 10 of Wildlife and Natural Environment Act (Northern Ireland) 2011.

Both grey and harbour seals are listed in Annex II of the EU Habitats Directive, requiring specific areas to be designated for their protection. To date, 16 Special Areas of Conservation (SACs) have been designated specifically for seals. Seals are features of qualifying interest in seven additional SACs. The six-yearly SAC reporting cycle required formal status assessments for these sites and these were completed in 2013.

# Questions from Marine Scotland, Department for Environment, Food and Rural Affairs and Natural Resources Wales.

Questions for SCOS 2017 were received from the three mainland administrations (Marine Scotland, MS; Department for Environment, Food and Rural Affairs, Defra; Natural Resources Wales, NRW) and are listed in Annex II. Some of these questions were essentially the same, requiring regionally specific responses in addition to a UK wide perspective. These very similar questions were therefore amalgamated, with the relevant regional differences in response being given in the tables and text. The question numbers by administration are shown in the boxes for cross reference. The remaining questions were regionally unique, requiring responses that focussed on the issue for a given area. The questions are grouped under topic headings, in the order and as they were given from the administrations.

| | |
|---|---|
| **1. What are the latest estimates of the number of seals in UK waters?** | MS Q1;<br>Defra Q1;<br>NRW Q1 |

## Current status of British grey seals

**Grey seal population trends are assessed from the counts of pups born during the autumn breeding season, when females congregate on land to give birth. Outside of the breeding season animals may re-distribute themselves, thus, regional differences in population estimates do not necessarily reflect the abundance of animals in each region at other times of the year.**

**The most recent surveys of the principal Scottish grey seal breeding sites were flown in 2016. The image processing and counting is not yet complete but the data will be available for SCOS 2018. The most recent results from the 2014 surveys together with the 2014 estimates from the annually ground counted sites in eastern England, produced a pup production estimate of 54,600. Adding in an additional 5,900 pups estimated to have been born at less frequently surveyed colonies in Shetland and Wales as well as other scattered locations throughout Scotland, Northern Ireland and South-west England, resulted in an estimate of 60,500 (95% CI 53,900-66,900, rounded to the nearest 100) pups (Table 1).**

**The pup production estimates are converted to estimates of total population size (1+ aged population) using a mathematical model and projected forward to 2016. The stages in the process (pup production → mathematical model → total population size) and the trends observed at each stage are briefly described below and presented in detail in SCOS-BP 16/01 and SCOS-BP 16/02 and SCOS-BP 17/01. The pup production model is currently under review and being updated.**

**The population model provided an estimate of 139,800 (approximate 95% CI 116,500-167,100) UK grey seals (1+ aged population) in 2015. Projecting the model forward one year, using the same pup production time series and prior distributions for the demographic parameters provided an estimate of 141,000 (approximate 95% CI 117,500-168,500) in 2016 (SCOS-BP 17/01).**

*Table 1.* ***Grey seal pup production estimates in 2014****.*

| Location | Pup production in 2014 |
|---|---|
| **England** | **6,877** |
| **Wales** | **1,650*** |
| **Scotland** | **51,863** |
| **Northern Ireland** | **100*** |
| **Total UK** | **60,490** |

*Estimated production for less frequently monitored colonies, see Table 2 for details.

***Pup Production***

Major colonies in Scotland are now surveyed biennially (see SCOS-BP 14/01). Aerial surveys to estimate grey seal pup production were carried out in Scotland in 2016, using a digital camera system for the third time. Counts of seal pups on these surveys will be completed by late 2017 and will be available for a new population estimation round for SCOS 2018. The most recent available pup production estimates are from the complete surveys carried out in October-December 2014. These data, combined with estimates from less frequently monitored colonies, indicate that the total number of pups born in 2014 at all UK colonies was approximately 60,500 (approximate 95% CI 53,900-66,900).

Regional estimates at biennially surveyed colonies were 4,100 (95% CI 3,200-4,900) in the Inner Hebrides, 14,300 (95% CI 11,300-17,300) in the Outer Hebrides, 23,800 (95% CI 18,800-28,700) in Orkney and 12,700 (95% CI 10,800-14,600) at the North Sea colonies (including Isle of May, Fast Castle, Farne Islands, Donna Nook, Blakeney Point and Horsey/Winterton). An additional 5,500 pups were estimated to have been born at less frequently surveyed colonies in Shetland and Wales as well as other scattered locations throughout Scotland, Northern Ireland and South-west England, producing a total UK pup production of 60,500.

***Trends in pup production***

There has been a continual increase in the total UK pup production since regular surveys began in the 1960s (Figure 1) (see SCOS-BP 16/01 for details). In both the Inner and Outer Hebrides, the estimated pup production in 2014 was similar to the 2012 estimate, with annual percentage changes of less than 1% p.a. Production had been relatively constant between the mid-1990s and 2010, but between 2010 and 2012 showed an annual increase of ~10 and ~5% respectively, the first substantial increase since the 1990s although this may have been partly due to improved survey methods introduced at the time. In Orkney, the estimated 2014 pup production was again similar to the 2012 estimate, representing an annual increase of 1.8% p.a. As in the Hebrides, the rate of increase in Orkney has been low since 2000, with pup production increasing at around 1.8% p.a. between 2000 and 2009. However, again the rate increased to ~6% p.a. between 2009 and 2012.

Pup production at colonies in the North Sea continued to increase rapidly up to 2014 (Table 2). These show an annual increase of 10.8% p.a. between 2012 and 2014, similar to the rate of increase between 2010 and 2012. The majority of the increase up to 2014 was due to the continued rapid expansion of newer colonies on the mainland coasts in Berwickshire, Lincolnshire, Norfolk and Suffolk. Interestingly, these colonies are all at easily accessible sites on the mainland, where grey seals have probably not bred in

significant numbers since the last ice age. Although there was little change at the Farne Islands, the more southerly mainland colonies increased by an average of >22% p.a. between 2010 and 2014. Estimates are available for the ground counted colonies on the English east coast (Farne Islands, Donna Nook, Blakeney and Horsey) in 2015 and 2016. The 2015 counts suggest a much lower annual increase for the English mainland colonies, with the largest colony at Blakeney showing a slight decrease after 12 years of extremely rapid (>30% p.a.) increase. The same slowdown in the rate of increase has been observed at both Donna Nook and Horsey. At the Farne islands the pup production estimate increased by 28% between 2014 and 2016, after a period of little change since 2000.

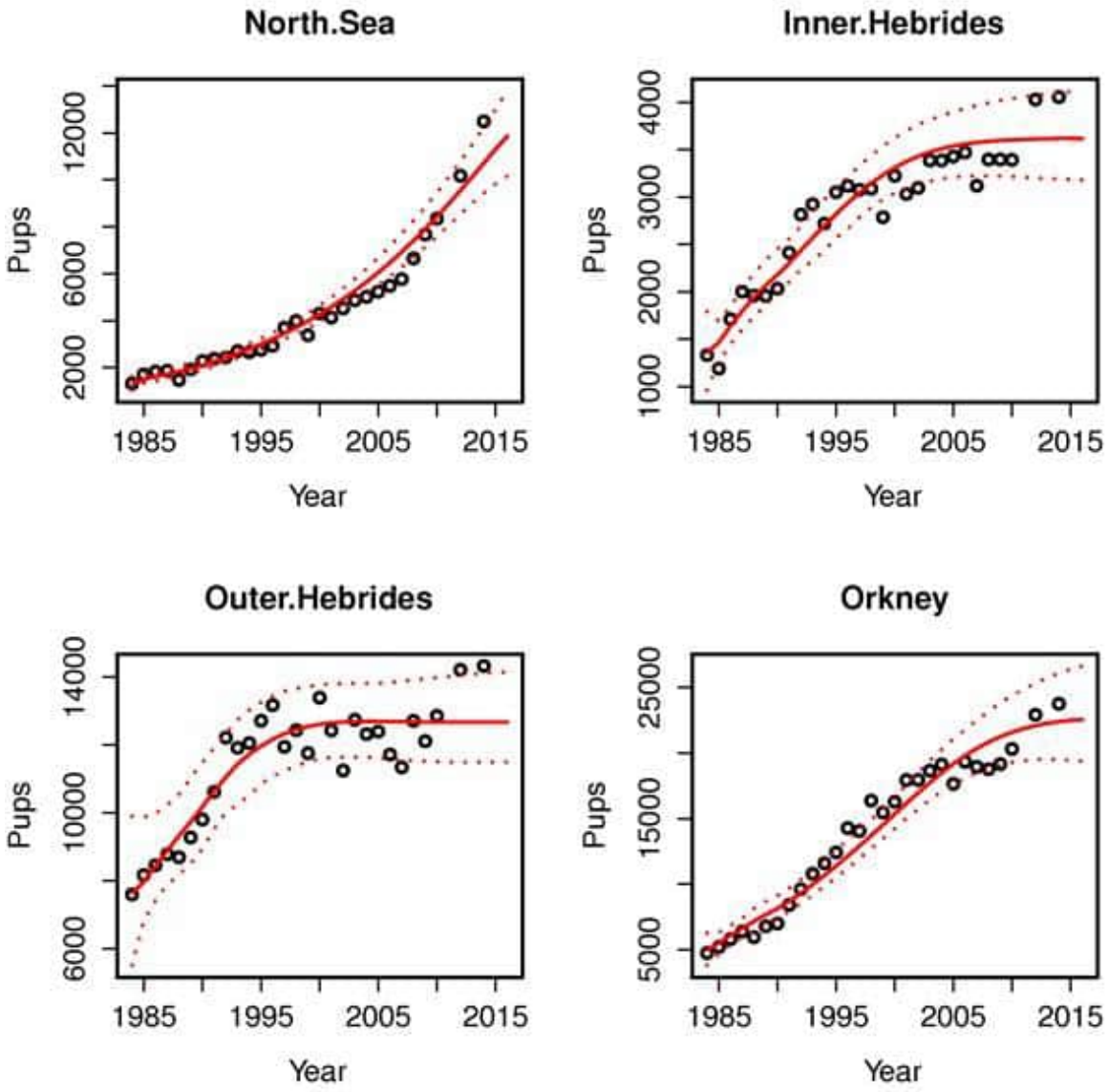



***Figure 1.*** *Mean estimates of pup production (solid lines) and 95% Confidence Intervals (dashed lines) from the model of grey seal population dynamics, fit to pup production estimates from 1984-2014 (circles) and two independent total population estimates from 2008 and 2015.*

*Table 2.* ***Grey seal pup production estimates for the UK from 2014 compared with production estimates from 2012 and preceding six-year intervals.***

| Location | Pup production in **2014** | Pup production in 2012 | Average annual change 2012 to **2014** | Average annual change 2002 to 2008 | Average annual change 2008 to **2014** |
|---|---|---|---|---|---|
| Inner Hebrides | 4,054 | 4,088 | -0.4% | +0.5% | +3.8% |
| Outer Hebrides | 14,316 | 14,136 | +0.6% | +0.3% | +2.7% |
| Orkney | 23,758 | 22,926 | +1.8% | +0.6% | +4.4% |
| Firth of Forth | 5,860 | 5,210 | +6.1% | +4.2% | +9.2% |
| **Main annually monitored Scottish island groups** | **47,988** | **46,360** | **+1.7%** | **+1.5%** | **+3.9%** |
| Other Scottish colonies [1] (incl. Shetland & mainland) | 3,875 [1] | 3,665 [1] | +2.8% | | |
| **Total Scotland** | **51,863** | **50,025** | +1.8% | **+0.8%** | **+4.3%** |
| Donna Nook +East Anglia | 5,027 | 3,360 | +22.3% | +15.2% | +16.4% |
| Farne Islands | 1,600 | 1,603 | -0.1% | +0.8% | +3.5% |
| **Annually monitored colonies in England** | **6,627** | **4,963** | **+15.6%** | **+15.2%** | **+12.0%** |
| SW England [3] (last surveyed 1994) | 250 [3] | 250 [3] | | | |
| Wales [2,3] | 1,650 [3] | 1,650 [3] | | | |
| **Total England & Wales** | **8,527** | **6,863** | **+11.5%** | | |
| Northern Ireland [3] | 100 [3] | 100 [3] | | | |
| **Total UK** | **60,490** | **56,988** | **+3.0%** | | |

[1] Estimates derived from data collected in different years

[2] Multiplier derived from indicator colonies surveyed in 2004 and 2005 and applied to other colonies last monitored in 1994

[3] Estimated production for colonies that are rarely monitored

The most recent data for pup production from the major breeding sites in Wales are estimates of 96 pups in North Wales[1]; 465 pups in North Pembrokeshire in 2005[2] and 379 pups born on Skomer and adjacent mainland sites in 2015.[3] The relative size of pup production at the different breeding colonies by region is shown in Figure 2.

[1]Stringell, T., Millar, C., Sanderson, W., Westcott, S. & McMath, A. 2014. When aerial surveys won't do: grey seal pup production in cryptic habitats of Wales. *Journal of the Marine Biological Association of the United Kingdom*, 94, 1155-1159.

[2]Strong, P.G., Lerwill, J., Morris, S.R., & Stringell, T.B. (2006). Pembrokeshire marine SAC grey seal monitoring 2005. *CCW Marine Monitoring Report No: 26*; unabridged version (restricted under licence), 54pp.

[3]https://www.welshwildlife.org/wp-content/uploads/2014/07/Seal-Report-2014-final-.pdf

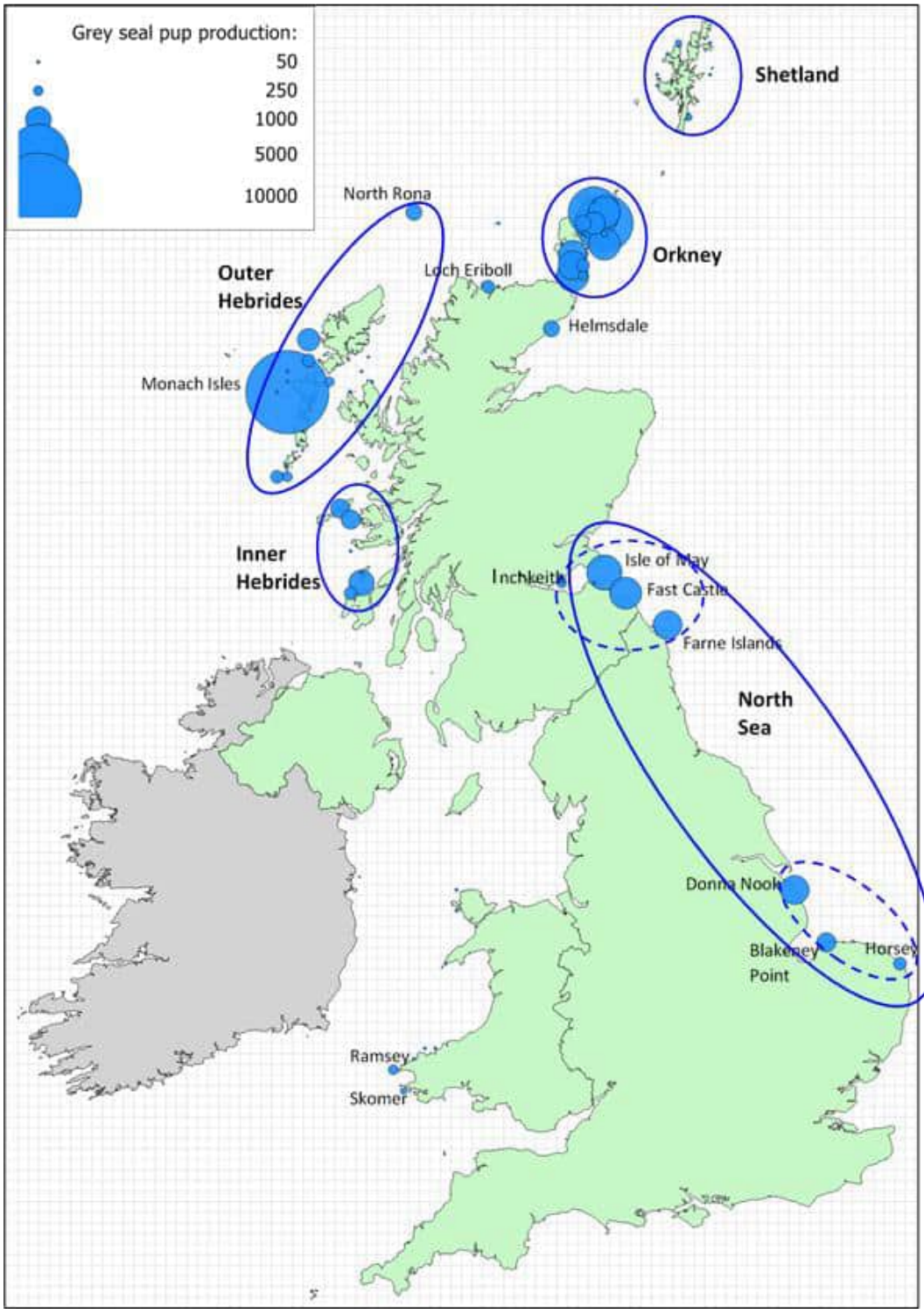



***Figure 2**. Distribution and size of the main grey seal breeding colonies. Blue ovals indicate groups of colonies within each region.*

***Population size***

Converting pup counts from air surveys (i.e. biennially surveyed colonies) into a total population size requires a number of steps as shown in Figure 3.

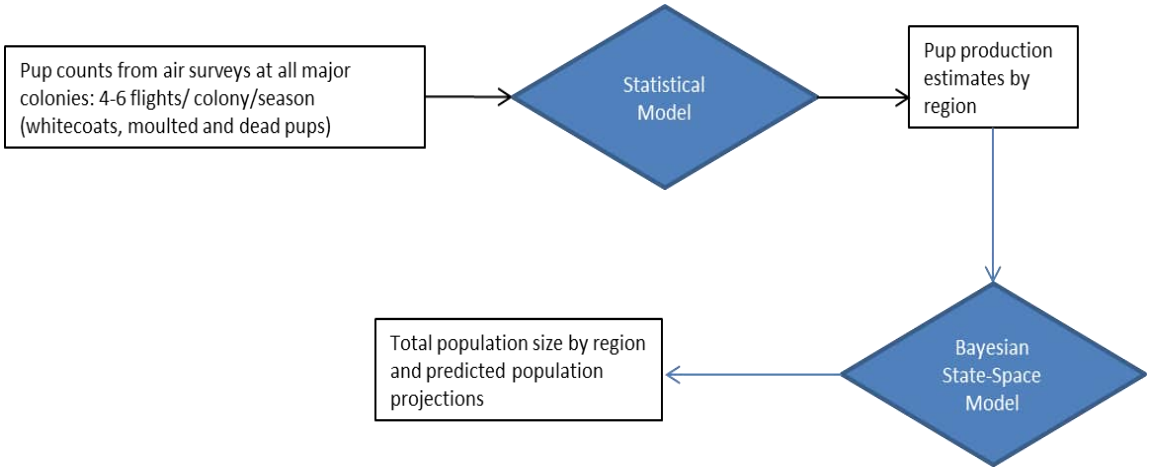



***Figure 3.*** *Schematic diagram of steps involved in estimating total population size from pup counts (see also SCOS BP-09/02, SCOS BP-10/02).*

Using appropriate estimates of fecundity rates, both pup and non-pup survival rates and sex ratio we can convert pup production estimates into estimates of total population size. The estimate of the total population alive at the start of the breeding season depends critically on the estimates of these rates. We use a Bayesian state-space population dynamics model to estimate these rates.

Until the late 1990s all the regional populations grew exponentially, implying that the demographic parameters were, on average, constant over the period of data collection. Thus, estimates of the demographic parameters were available from a simple population model fitted to the entire pup production time series. Some combination of reductions in the reproductive rate or the survival rates of pups, juveniles and adults (SCOS-BPs 09/02, 10/02 and 11/02) has resulted in reduced population growth rates in the Northern and Western Isles.

To estimate the population size we fitted a Bayesian state-space model of British grey seal population dynamics. Initially, alternative models with density dependence acting through either fecundity or pup survival were tested, but results indicated that the time series of pup production estimates did not contain sufficient information to allow us to quantify the relative contributions of these factors (SCOS-BPs 06/07, 09/02). In 2010 and 2011, we incorporated additional information in the form of an independent estimate of population size based on counts of the numbers of grey seals hauled out during the summer and information on their haulout behaviour (SCOS-BP 10/04 and 11/06). Between 2007 and 2009, 26,699 grey seals were counted during harbour seal moult surveys across the UK (excluding southwest UK). Using telemetry data, it was estimated that 31% (95% CIs: 15 - 50%) of the population was hauled out during the

survey window and thus available to count[4]. Assuming 4% of the population were in southwest UK, this led to a UK independent population estimate in 2008 of 91,800 (95% CI: 78,400 - 109,900).

Inclusion of the independent estimate allowed us to reject the models that assumed density dependent effects operated through fecundity and all estimates were therefore based on a model incorporating density dependent pup survival. However, SCOS felt that the independent estimate appeared low relative to the pup production and its inclusion forced the model to select extremely low values of pup survival, high values of adult female survival and a heavily skewed sex ratio, with few surviving male seals.

In 2016, an in-depth re-analysis of the telemetry data underlying the estimate of haulout probability within the aerial survey window highlighted a series of inter-related problems with the haulout designation in the data. These have been corrected and a description of the analyses and the corrections applied to the data were presented in SCOS-BP 16/03.

The new analyses resulted in a revised estimate of the proportion of the population hauled out during the survey window of 23.9% (95% CI: 19.2 - 28.6%). As per the analyses of the previous haulout correction factor, no effect of region, length of individual (regarded as a proxy for age), sex or time of day was found.

The new estimate of the proportion of time hauled out resulted in a revised UK population estimate of 116,348 for 2008 (95% CI: 97,059 - 144,662). Between 2013 and 2015, another round of aerial surveys covered the UK grey seal haulout sites (excluding southwest UK); 34,758 individuals were counted. Using the revised scalar, the total population estimate for 2014 was 151,467 (95% CI: 126,356 - 188,327), again assuming (as in 2008) that 4% of the population were in the southwest UK. Note that this increase has major implications for assessing the potential biological removal (PBR) for the grey seal population (see Q7 and SCOS-BP 17/05).

In 2012, SCOS discussed the priors on the model input parameters in some detail, following re-examination of the data being used and the differences made to the population estimates by changing a number of them to less informative priors (SCOS-BP 12/01 and SCOS-BP 12/02). In 2014 SCOS decided to use the results from a model run using these revised priors (SCOS-BP 12/02) and incorporating a prior based on a distribution for the ratio of males to females in the population (see SCOS-BP 14/02 for details) and the independent estimate of total population size from the summer surveys. Work on updating these priors is continuing. A re-analysis of all the combined data available from pup tagging studies (hat tags, phone tags and GPS/GSM tags) suggested that there was no significant sex-specific differences in first year pup survival.

In 2014, SCOS adopted a set of revised priors, including a different prior on adult sex ratio, to generate the grey seal population estimates. The model produced unreasonably high adult survival values of more than 0.99, so it was re-run with a prior on survival constrained to a more reasonable range of 0.8 to 0.97. Posterior mean adult survival with this revised prior was 0.95 (SD 0.03).

For 2015, an identical model to that used to provide 2014's advice was fitted to two sources of data: (1) regional estimates of pup production from 1984 to 2014, and (2) two independent estimates assumed to be of total population size just before the 2008 and 2014 breeding seasons. The model allowed for density dependence in pup survival, using a flexible form for the density dependence function, and assumed no movement of recruiting females between regions. The same model and an identical set of prior

[4]Lonergan, M., C. D. Duck, D. Thompson, S. Moss, & B. McConnell. 2011. British grey seal (*Halichoerus grypus*) abundance in 2008: an assessment based on aerial counts and satellite telemetry. *ICES Journal of Marine Science* 68 (10):2201-2209.

distributions for demographic rates was used, including a prior on sex ratio and a constraint on adult survival to the range 0.80-0.97 for estimating the 2015 population and projecting forward to 2016.

The estimated adult population size in the regularly monitored colonies in 2015 was 127,100 (95% CI 105,900-151,900) for the model incorporating density dependent pup survival, using the revised priors and including the independent estimates for 2008 and 2015 (details of this analysis and posterior estimates of the demographic parameters are given in SCOS-BP 16/02 and SCOS-BP 16/03). A comprehensive survey of data available from the less frequently monitored colonies was presented in SCOS-BP 11/01 and updated in 2015 (SCOS-BP 15/01). Total pup production at these sites was estimated to be approximately 5,500. The total population associated with these sites was then estimated using the average ratio of 2014 pup production to 2015 population size estimate for all annually monitored sites. Confidence intervals were estimated by assuming that they were proportionally similar to the pup survival model confidence intervals. This produced a population estimate for these sites of 12,700 (approximate 95% CI 10,600 to 15,200). Combining this with the annually monitored sites gives an estimated 2015 UK grey seal population of 139,800 (approximate 95% CI 116,500-167,100). Projecting the model forward one year, using the same pup production time series and prior distributions for the demographic parameters provided an estimate of 128,200 (95% CI 106,200-154,400) for the annually monitored colonies (SCOS-BP 17/01). Including the less frequently monitored colonies produces an estimate of 141,000 (approximate 95%CI 117,500-168,500) grey seals aged >1y at the start of the 2016 breeding season.

The estimated population in 2015 was approximately 20% higher than that reported for the models run in 2014. Most of that increase (14%) was apparently due to the higher, recent independent estimate and to changes in the 2008 independent estimate resulting from the new estimate of the proportion of animals hauled out during the survey window; the other 6% was presumably caused by the high 2014 pup count (SCOS-BP 16/02). Projecting the population model forward to 2016 produced a small, <1% annual increase in total population estimate.

The fit of the model to the pup production estimates has been poor in some regions in recent years. Whilst the model accurately captures some aspects of the observed trends in pup production in some regions, the estimated adult survival rate from the model was very high and the maximum pup survival rate was very low. This suggests some other parameters, such as inter-annual variation in fecundity or survival senescence could be causing a mismatch between the estimates from the model and the pup production data. Interestingly, recent analyses of the long-term brand-resight data from the grey seal population breeding at Sable Island, Canada, suggests that the extremely high adult survival rates generated by the model are within the range of observed survival rates. The Sable Island data support the assumption that density dependence is operating mostly through changes in pup survival. Fecundity has remained high there throughout a period of slowing down in rates of population increase. Pup survival has declined dramatically over the same period, although the maximal pup survival rates estimated from the brand data are much higher than the model estimates (SCOS-BP 17/02).

The selection of which parameter estimates are fitted and which are fixed in the pup production model may have a significant effect on the pup production estimates. The effect of this selection process on the estimates is being investigated and preliminary results were presented at SCOS 2015 (SCOS-BP 15/03). This work is continuing.

In addition, the model assumes a fixed coefficient of variation (CV) for the pup production estimates and obtains this value from an initial model run. Ideally, region-level estimates of pup production variance would be produced as part of fitting the pup production model to the aerial pup count data; we plan to investigate this in the coming year. One factor that will require consideration is how to incorporate uncertainty in the ground counts made at some North Sea colonies. A revised pup production model will

therefore be developed to estimate pup production with the counts from the most recent set of surveys carried out over the 2016 breeding season.

***Population trends***

Model selection criteria suggest that density dependence is acting mainly on pup survival (see SCOS-BP 09/02). The independent population estimate from 2008 was consistent with this conclusion. Although the 2015 independent estimate and revised 2008 estimate have allowed the model to fit a higher trajectory, they are still consistent with the density dependent pup survival model. This also implies that the overall population should closely track the pup production estimates when experiencing density dependent control, as well as during exponential growth. The model estimated that total population sizes for the biennially monitored colonies have increased by approximately 1% p.a. (SCOS-BP 16/02) between 2012 and 2016. All of this is due to a continuing 4% p.a. increase in the North Sea population; the Orkney and Hebridean populations are effectively stationary, increasing at <0.1% p.a. since 2010.

Even within the North Sea the pattern of increase is not evenly spread. The colonies on offshore islands in the central North Sea have been relatively stable for the past 6 years, while at the colonies on the mainland coast and especially in the southern North Sea, the rates of increase in pup production from 2010 to 2015 have been extremely high (>22% p.a.). This strongly suggests that there must have been some immigration from colonies further north.

***UK grey seal population in a world context***

The UK grey seal population represents approximately 34% of the world population on the basis of pup production estimates. The other major populations in the Baltic and the western Atlantic are also increasing (Table 3).

*Table 3.* ***Relative sizes and status of grey seal populations using pup production as an index of population size. Pup production estimates are used because the largest populations are monitored by means of pup production surveys and because of the uncertainty in overall population estimates.***

| Region | Pup Production | Year | Possible population trend |
|---|---|---|---|
| **UK** | **60,500** | 2014 | Increasing |
| Ireland | 2,100 | 2012[1] | Increasing |
| Wadden Sea | 1,300 | 2016[2] | Increasing |
| Norway | 1,300 | 2008[3] | Increasing |
| Russia | 800 | 1994 | Unknown |
| Iceland | 1,200 | 2012[8] | Declining |
| Baltic | 6,400 | 2013[4,5] | Increasing |
| **Europe excluding UK** | **13,100** | | Increasing |
| Canada - Scotian shelf | 88,200 | 2016[6] | Increasing |
| Canada - Gulf St Lawrence | 10,500 | 2016[6] | Increasing |
| USA | 3,600 | 2014[7] | Increasing |
| **WORLD TOTAL** | **175,900** | | Increasing |

[1]Ó Cadhla, O., Keena, T., Strong, D., Duck, C. and Hiby, L. 2013. Monitoring of the breeding population of grey seals in Ireland, 2009 - 2012. Irish Wildlife Manuals, No. 74. National Parks and Wildlife Service, Department of the Arts, Heritage and the Gaeltacht, Dublin, Ireland.

[2] http://www.waddensea-secretariat.org/sites/default/files/downloads/tmap/MarineMammals/GreySeals/grey_seal_report_2017.pdf.

[3]Øigård, T.A., Frie, A.K., Nilssen, K.T., Hammill, M.O., 2012. Modelling the abundance of grey seals (*Halichoerus grypus*) along the Norwegian coast. ICES Journal of Marine Science: Journal du Conseil, 69(8) 1436-1447.

[4]Data summarised in*: Grey seals of the North Atlantic and the Baltic*. 2007. Eds: T. Haug, M. Hammill & D. Olafsdottir. NAMMCO Scientific Publications, Vol. 6.

[5]Baltic pup production estimate based on mark recapture estimate of total population size and an assumed multiplier of 4.7 HELCOM fact sheets (www.HELCOM.fi) & http://www.rktl.fi/english/news/baltic_grey_seal.html

[6] M.O. Hammill, den Heyer, C.E., Bowen, W.D., and Lang, S.L.C. 2017. Grey Seal Population Trends in Canadian Waters, 1960-2016 and harvest advice. DFO Can. Sci. Advis. Sec. Res. Doc. 2017.

[7]NOAA (2009) http://www.nefsc.noaa.gov/publications/tm/tm238/247_f2015_grayseal.pdf

[8]Erlingur Hauksson pers. com https://www.hafogvatn.is/static/research/files/skra_0069286pdf.

**Current status of British harbour seals**

**Harbour seals are counted while they are on land during their August moult, giving a minimum estimate of population size. Not all areas are counted every year but the aim is to cover the UK coast every 5 years. Combining the most recent counts (2008-2016) gives a total of 31,300 counted in the UK (Table 4). Scaling this by the estimated proportion hauled out (0.72 (95% CI: 0.54-0.88)) produced an estimated total population for the UK in 2016 of 43,500 (approximate 95% CI: 35,600-58,000). Overall, the UK population has increased since the late 2000s and is close to the 1990s level. However, there are significant differences in the population dynamics between regions. As reported in SCOS 2008 to 2016, there have been general declines in counts of harbour seals in several regions around Scotland but the declines are not universal with some populations either stable or increasing.**

**Harbour seal counts were stable or increasing in all regions until around 2000 when declines were seen in Orkney (down 85% between 1997-2016), the East coast (down 52% between 1997 and 2016, but primarily driven by the decline in the Firth of Tay, down 92% between 2000-2016) and Shetland (which declined by 30% between 2000-2009). However, the 2015 count in Shetland was 10% higher than the 2009 count. The most recent counts for the West Scotland region (2013 to 2015) and for the Western Isles (2011) were 43% and 50% respectively higher than the previous estimates (2007 to 2009). Counts along the English east coast were approximately 10% higher than in 2015, driven mainly by a doubling of the count from Essex and Kent.**

*Table 4.* ***UK harbour seal minimum population estimates based on counts during the moult.***

| Location | Most recent count (2008-2016) |
|---|---|
| England | 5,200 |
| Wales | <50[1] |
| Scotland | 25,150[2] |
| Northern Ireland | 950 |
| Total UK | 31,300[3] |

[1] *There are no systematic surveys for harbour seals in Wales*
[2] *Compiled from most recent surveys, see Table 5 for dates and details*
[3] *This does not include the unknown small number in Wales*

Each year SMRU carries out surveys of harbour seals during the moult in August. Recent survey counts and overall estimates are summarised in SCOS-BP 17/03. Given the length of the mainly rocky coastline around north and west Scotland it is impractical to survey the whole coastline every year but SMRU aims to survey the entire coast across 5 consecutive years. However, in response to the observed declines around the UK the survey effort has been increased and some regions, e.g. Orkney and the Moray Firth have been surveyed more frequently. The majority of the English and Scottish east coast populations are surveyed annually.

Seals spend a higher proportion of their time on land during the moult than at other times and counts during the moult are thought to represent the highest proportion of the population with the lowest

variance. Initial monitoring of the population in East Anglia in the 1960s used these maximum counts as minimum population estimates. In order to maintain the consistency of the long term monitoring of the UK harbour seal population, the same time constraints are applied throughout and surveys are timed to provide counts during the moult. Most regions are surveyed using thermographic aerial imagery to identify seals along the coastline. However, conventional photography is used to survey populations in the estuaries of the English and Scottish east coasts.

The estimated number of seals in a population based on these methods contains considerable levels of uncertainty. A large contribution to uncertainty is the proportion of seals not counted during the survey because they are in the water. Efforts are made to reduce the effect of environmental factors by always conducting surveys within 2 hours of low tides that occur between 10:00 and 20:00 during the first three weeks of August and only in good weather. A conversion factor of 0.72 (95% CI: 0.54-0.88) to scale moult counts to total population was derived from haulout patterns of harbour seals fitted with flipper mounted ARGOS tags (n=22) in Scotland[5].

The most recent counts of harbour seals by region are given in Table 5 and Figure 4. These are minimum estimates of the British harbour seal population. Results of surveys conducted in 2016 are described in more detail in SCOS-BP 17/03. It has not been possible to conduct a synoptic survey of the entire UK coast in any one year. Data from different years have therefore been grouped into recent, previous and earlier counts to illustrate, and allow comparison of, the general trends across regions.

Combining the most recent counts (2011-2016) at all sites, approximately 31,300 harbour seals were counted in the UK: 81% in Scotland; 16% in England; 3% in Northern Ireland (Table 5). Including the 3,500 seals counted in the Republic of Ireland produces a total count of ~35,000 harbour seals for the British Isles (i.e. the UK and Ireland).

Apart from the population in The Wash, harbour seal populations in the UK were relatively unaffected by phocine distemper virus (PDV) in 1988. The overall effect of the 2002 PDV epidemic on the UK population was even less pronounced. However, again the English east coast populations were most affected, but the decrease was more gradual than in 1988, and the counts continued to decline for four years after the epidemic. Between 2006 and 2012 the counts approximately doubled in The Wash and increased by 50% for East Anglia as a whole. Since 2012 the counts have been almost constant.

Breeding season aerial surveys of the harbour seal population along the east Anglian coast are flown annually, in addition to the large range wide surveys flown during the moult in August. As in 2015, the east Anglian coast was surveyed five times during the breeding season in June and July[6]. The 2016 peak count was 17% higher than in 2015, which was substantially lower (22%) than the 2014 equivalent count. These wide fluctuations are not unusual in the long term time series and despite the apparently wide inter-annual variation, the pup production has increased at around 7.4% p.a. since surveys began in 2001.

The ratio of pups to the moult counts remained high in 2016, more than double the same ratio in 2001 and substantially higher than the same metric in the larger Wadden Sea population. This ratio can be seen as an index of the productivity of the population. Interestingly, an increase in this apparent fecundity index has recently been noted in the Wadden Sea population.

[5]Lonergan, M, C. Duck, S. Moss, C. Morris, & D. Thompson. 2013. Rescaling of aerial survey data with information from small numbers of telemetry tags to estimate the size of a declining harbour seal population. *Aquatic Conservation-Marine and Freshwater Ecosystems* 23 (1):135-144.
[6]Thompson, D., Onoufriou, J. and Patterson, W. 2016. Report on the distribution and abundance of harbour seals (*Phoca vitulina*) during the 2015 and 2016 breeding seasons in the Wash. *Report number SMRUC-DOW-2016-06*, December 2016. http://www.smru.st-andrews.ac.uk/reports/

*Table 5.* ***The most recent August counts of harbour seals at haulout sites in Britain and Ireland by seal management unit compared with three previous periods: 1996-1997, 2000-2006 & 2007-2009.*** *Details of sources and dates of surveys used in each compiled regional total are given in* SCOS-BP 17/03.

| Seal Management Unit / Country | Harbour seal counts | | | |
|---|---|---|---|---|
| | 2011-2016 | 2007-2009 | 2000-2006 | 1996-1997 |
| 1 Southwest Scotland | 1,200 | 923 | 623 | 929 |
| 2 West Scotland | 15,184 | 10,626 | 11,702 | 8,811 |
| 3 Western Isles | 2,739 | 1,804 | 1,981 | 2,820 |
| 4 North Coast & Orkney | 1,349 | 2,979 | 4,384 | 8,787 |
| 5 Shetland | 3,369 | 3,039 | 3,038 | 5,994 |
| 6 Moray Firth | 940 | 776 | 1,028 | 1,409 |
| 7 East Scotland | 368 | 283 | 667 | 764 |
| **SCOTLAND TOTAL** | **25,149** | **20,430** | **23,423** | **29,514** |
| 8 Northeast England | 86 | 58 | 62 | 54 |
| 9 Southeast England | 5,061 | 3,952 | 2,964 | 3,222 |
| 10 South England | 23 | 13 | 13 | 5 |
| 11 Southwest England | 0 | 0 | 0 | 0 |
| 12 Wales | 5 | 4 | 4 | 2 |
| 13 Northwest England | 10 | 5 | 5 | 2 |
| **ENGLAND & WALES TOTAL** | **5,185** | **4,032** | **3,048** | **3,280** |
| **BRITAIN TOTAL** | **30,334** | **24,462** | **26,471** | **32,794** |
| **NORTHERN IRELAND TOTAL** | **948** | **1,101** | **1,176** | |
| **UK TOTAL** | **31,282** | **25,563** | **27,648** | |
| **REPUBLIC OF IRELAND TOTAL** | **3,489** | **2,955** | **2,955** | |
| **BRITAIN & IRELAND TOTAL** | **34,771** | **28,518** | **30,603** | |

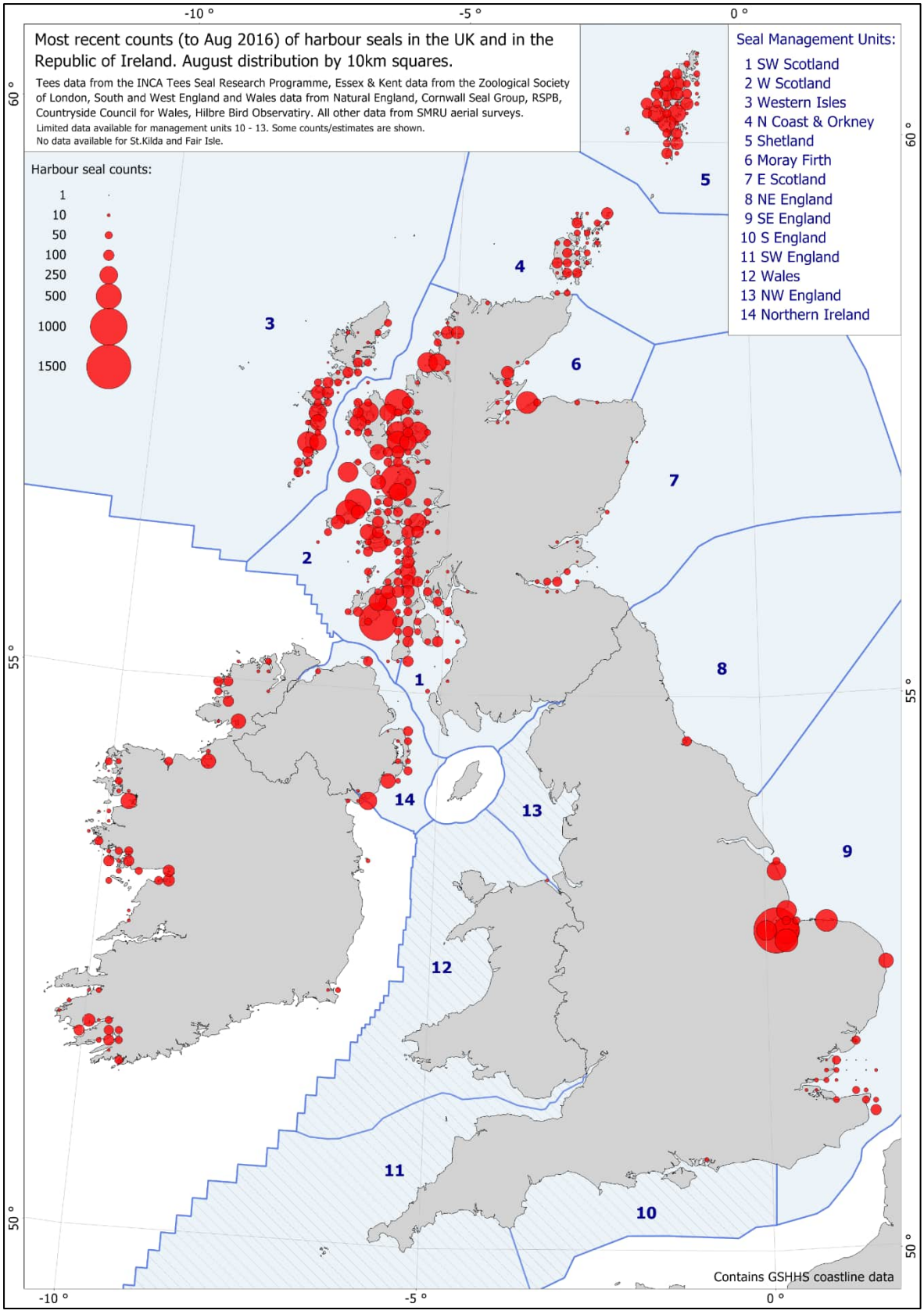



***Figure 4***. *August distribution of harbour seals around the British Isles. Very small numbers of harbour seals (<50) are anecdotally but increasingly reported for the West England & Wales management unit, but are not included on this map. Estimates are composites of the most recent survey counts in each region between 2008 and 2016.*

***Population trends***

Overall, the harbour seal population has increased from 25,600 (rounded to the nearest 100) in the 2007-09 period to 31,400 animals during the 2013-2016 period, but remain slightly below the 1996-97 level of 32,800 (Table 5). However, as reported in SCOS 2008 to 2016, patterns of changes in abundance have not been universal; although declines have been observed in several regions around Scotland some populations appear to be either stable or increasing. Details are given in (Figure 5, SCOS-BP 17/03).

A complete survey of Orkney and the North coast was carried out in 2016. **1,349** harbour seals were counted compared with 1,938 in 2013, 3000 in 2008-2009 and 8,800 in 1997 (Table 5, SCOS-BP 17/03). This is a decrease of >30% over three years, equivalent to an average annual decrease of 10%. The latest survey results therefore confirm that the rapid decline in the Orkney harbour seal population since 1997 is continuing.

All of the Southwest Scotland management region was surveyed in August 2015. A total of **1,200** harbour seals were counted compared with 923 counted in 2007 and 2009 (Table 5). This was the highest count of harbour seals for the Southwest Scotland Seal Management Area.

The most recent count of harbour seals in the large West Scotland Management Area is **15,184** from surveys carried out between 2013 and 2015 compared with 10,626 from the previous survey period of 2007-2009 and counts of 8,811 from 1996-1997 period (Table 5). The West Scotland harbour seal count increased by 43% between 2009 and 2015, equivalent to an average annual increase of 5.3%. The most recent estimate available for the Western Isles is the 2011 count. The region was surveyed in 2017 and a new estimate will be presented to SCOS 2018.

A complete survey of Shetland was carried out in 2015. **3,369** harbour seals were counted compared with 3,039 in 2009 and 5,994 in 1997 (Table 5). This is an increase of 12% over six years and is equivalent to an average annual increase of 1.7%. The 2015 Shetland harbour seal count shows the first increase since 1993 following a period of decline[7].

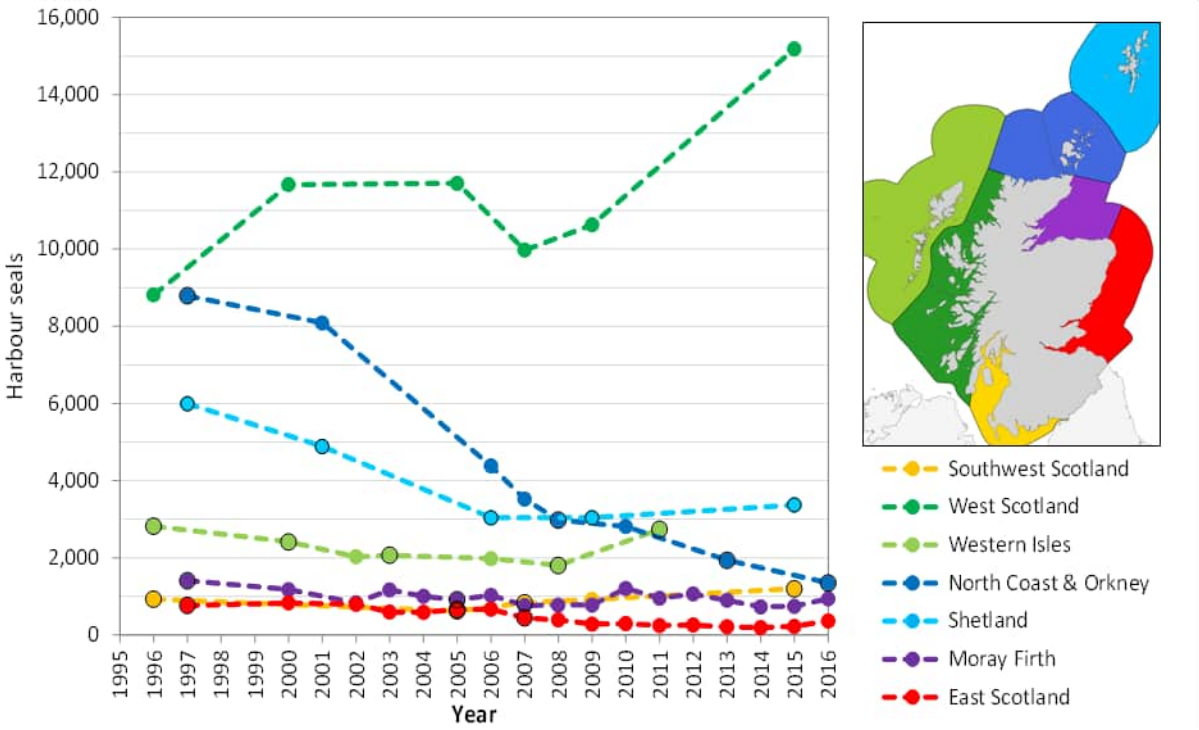
In the Moray Firth, the overall total counts in 2016 were 26% higher than the previous two years and although the count is significantly lower than the 1996-97 counts there does not appear to have been a clear trend since 2000. Within the Moray Firth, the counts in the inner Firths have continued to decline while counts at Culbin Sands and Findhorn have continued to increase rapidly, suggesting substantial re-distribution within the area.

The 2016 harbour seal moult count for the Firth of Tay and Eden Estuary Special Area of Conservation (SAC) (51) was similar to that in 2015 (SCOS-BP 17/03). The 2016 count represents a 90% decrease from the mean counts recorded between 1990 and 2002 (641). The low numbers of harbour seals in this area are of sufficient concern that Marine Scotland has not issued any licences to shoot harbour seals within the East Scotland Management Area since 2010.

The combined count for the Southeast England management unit in 2016 (5,199) was 10% higher than the 2014 and 2015 counts. Although the Southeast England population has returned to its pre-2002 epidemic levels, it is still lagging behind the rapid recovery of the harbour seal population in the Wadden Sea where counts have increased from 10,800 in 2003 to 26,788 in 2013, equivalent to an average annual growth rate of 9.5% over ten years. Interestingly, the 2014, 2015 and preliminary 2016 counts in the Wadden Sea showed a slight decrease that may be related to the effects of an influenza A epidemic but may also be an indication that the rapid growth since the PDV epidemic has slowed or even stopped.

[7] Lonergan, M., C. D. Duck, D. Thompson, B. L. Mackey, L. Cunningham, & I. L. Boyd. (2007). Using sparse survey data to investigate the declining abundance of British harbour seals. *Journal of Zoology* 271 (3):261-269.

a.




b.

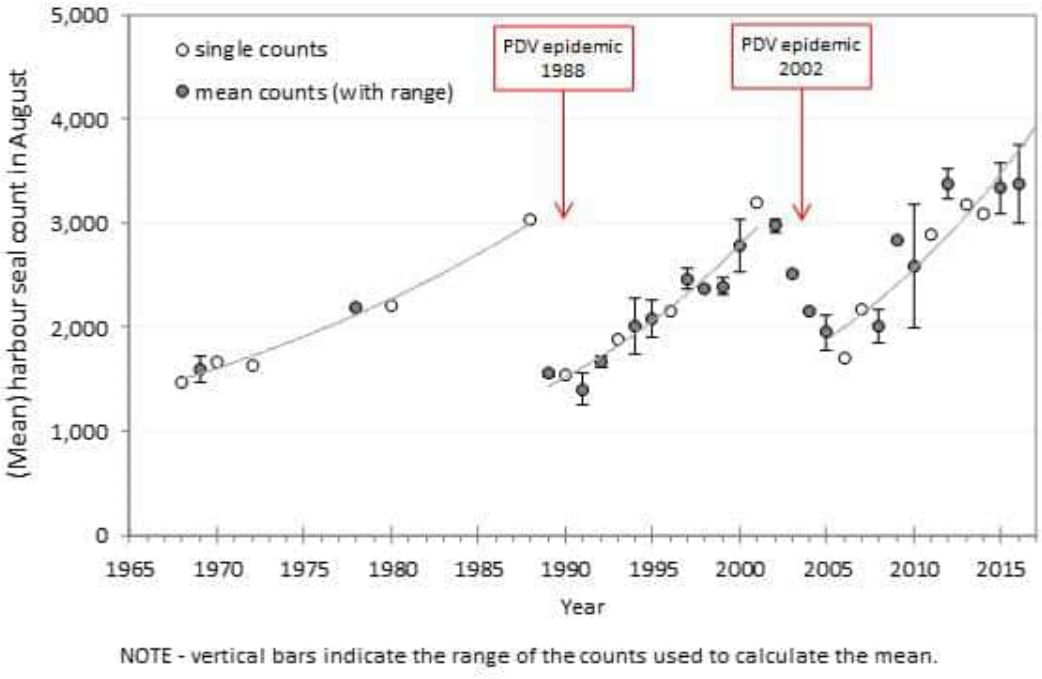



***Figure 5.*** *Recent trends in numbers of harbour seals: a. counted in different Scottish seal management areas, 1996-2016 (black circled points indicate a single count in that year, plain points represent means of multiple counts); b. counted in The Wash, southeast England, 1967-2016 (grey filled points indicate means of multiple counts) (SCOS-BP 17/03).*

***UK harbour seal populations in a European context***

The UK harbour seal population represents approximately 30% of the eastern Atlantic sub-species of harbour seal (Table 6). The declines in Scotland and coincident dramatic increases in the Wadden Sea mean that the relative importance of the UK population is declining.

*Table 6.* ***Size and status of European populations of harbour seals. Data are counts of seals hauled out during the moult.***

| Region | Number of seals counted[1] | Years when latest data was obtained |
|---|---|---|
| **Scotland** | **25,100** | 2011-2016 |
| **England** | **5,200** | 2016 |
| **Northern Ireland** | **900** | 2011 |
| **UK** | **31,200** | |
| Ireland | 3,500 | 2011-12 |
| Wadden Sea-Germany | 15,900 | 2015[2] |
| Wadden Sea-NL | 7,700 | 2015[2] |
| Wadden Sea-Denmark | 2,800 | 2015[2] |
| Limfjorden | 1,500 | 2016 |
| Kattegat | 9,400 | 2016 |
| Skagerrak | 2,600 | 2007 |
| Baltic proper | 1,000 | 2013 |
| Baltic Southwestern | 1,000 | 2016 |
| Norway | 7,100 | 2013 |
| Iceland | 7,000 | 2016 |
| Barents Sea | 1,900 | 2010 |
| **Europe excluding UK** | **61,400** | |
| **Total** | **92,600** | |

[1]Counts rounded to the nearest 100. They are minimum estimates of population size as they do not account for proportion at sea and in many cases are amalgamations of several surveys.
[2]A partial count of the Wadden Sea was obtained out in 2016, giving preliminary estimates of 2,150 in Denmark, 14,000 in Germany and 8,200 in The Netherlands.

Data sources: ICES Report of the Working Group on Marine Mammal Ecology 2014; Desportes,G., Bjorge,A., Aqqalu, R-A and Waring,G.T. (2010) Harbour seals in the North Atlantic and the Baltic. NAMMCO Scientific publications Volume 8; Nilssen K, 2011. Seals – Grey and harbour seals. In: Agnalt A-L, Fossum P, Hauge M, Mangor-Jensen A, Ottersen G, Røttingen I,Sundet JH, and Sunnset BH. (eds). Havforskningsrapporten 2011. Fisken og havet, 2011(1).; Härkönen,H. and Isakson,E. 2010. Status of the harbour seal (*Phoca vitulina*) in the Baltic Proper. NAMMCO Sci Pub 8:71-76.; Olsen MT, Andersen SM, Teilmann J, Dietz R, Edren SMC, Linnet A, and Härkönen T. 2010. Status of the harbour seal (*Phoca vitulina*) in Southern Scandinavia. NAMMCO Sci Publ 8: 77-94.; Galatius A, Brasseur, S, Czeck R et al, 2016, Aerial surveys of harbour seals in the Wadden Sea in 2016, http://www.waddensea-secretariat.org; Härkönen T, Galatius A, Bräeger S, et al HELCOM Core indicator of biodiversity Population growth rate, abundance and distribution of marine mammals, HELCOM 2013, www.helcom.fi; http://www.fisheries.is/main-species/marine-mammals/stock-status/; http://www.nefsc.noaa.gov/publications/tm/tm213/pdfs/F2009HASE.pdf; https://www.hafogvatn.is/en/research/harbour-seal/harbour-seal-census. http://www.nammco.no/webcronize/images/Nammco/976.pdf, Nilssen K and Bjørge A 2014. Seals – grey and harbor seals. In: Bakketeig IE, Gjøsæter H, Hauge M, Sunnset BH and Toft KØ (eds). Havforskningsrapporten 2014. Fisken og havet, 2014(1). Jonas Teilmann pers com.

| | |
|---|---|
| **2. What is latest information about the population structure, including survival, fecundity and age structure of grey and harbour seals in UK and European waters? Is there any new evidence of populations or sub-populations specific to local areas?** | MS Q2;<br>Defra Q2; |

## Grey seals

**There is evidence for regional differences in grey seal demographics but detailed information on vital rates are lacking. Regional information on fecundity and survival rates would improve our ability to provide advice on population status. However, this would require considerable new investment in resources.**

**There is no new information with which to assess the substructure of the grey or harbour seal populations and therefore no new evidence of sub-populations specific to local areas.**

***Age and sex structure***

While the population was growing at a constant (i.e. exponential) rate, the female population size was directly proportional to the pup production. Changes in pup production growth rates imply changes in age structure. In the absence of a population-wide sample or a robust means of identifying age-specific changes in survival or fecundity, we are unable to accurately estimate the age structure of the female population.

An indirect estimate of the age structure, at least in terms of pups, immature and mature females is generated by the fitted population estimation model. The model takes information from the field studies described below as priors (SCOS-BP 17/02) and generates posterior distributions for the main demographic parameters; fecundity, pup survival and estimates of adult female (1+ age classes) and sex ratio (SCOS-BP 17/01). As currently structured the model fits a single global estimate for each of these parameters and fits individual carrying capacity estimates for each region to account for differing dynamics through density dependent pup survival.

***Survival and fecundity rates***

The only contemporary data that we have on fecundity and adult survival in UK grey seals has been estimated from long term studies of marked or identifiable adult females at two breeding colonies, North Rona and the Isle of May. Results of these studies together with branding studies in Canadian grey seal populations and historical shot samples from the UK and Baltic have been used to define priors for a range of demographic parameters (SCOS-BP 17/02).

In the model used to generate the 2015 and 2016 estimates, density dependence acts through pup survival only, so the fitted values are an estimated fecundity of 0.9 (standard error (SE) 0.06), a constant adult female survival rate of 0.95 (SE 0.01) and a maximum pup survival rate of 0.51 (SE 0.08), i.e. the pup survival rate in the absence of any density dependent control. The fitted values of the demographic parameters are sensitive to the population sex ratio for which we do not have good information. The reported values are produced by a model run with a prior on the sex ratio multiplier of 1.7 (SE 0.02), i.e. seven males to every ten females.

The fitted global parameter estimates are strikingly similar to estimates derived from a long term study of branded grey seals in Canada. In a preliminary study of re-sightings of seals branded as pups on Sable Island, adult female survival was estimated to be 0.92, 0.91, and 0.88 for pups marked

in 1985, 1986 and 1987, respectively[8]. Den Heyer and Bowen[9] used a Cormack-Jolly-Seber model to estimate age- and sex-specific adult survival from a long term brand re-sighting programme on Sable Island, effectively an expanded and greatly extended version of the data used by Schwarz and Stobo[6]. Average adult survival was high (male=0.943, SE=0.03; female=0.976, SE=0.01), but male grey seals had lower survival at all ages. The survival rate estimate for adult females is above the upper limit of the prior used in the 2016 model runs. In fact, the Sable data suggests that adult female survival between 4-24 years is 0.989 and then decreases to 0.904 for ages 25+. For males the equivalent rates are 0.97 and 0.77.

Den Heyer and Bowen[7] estimated survival rates of male and female branded seals at Sable Island. The differential survival of males and females would produce an effective sex ratio of 1:0.7 if maximum age is set to 40, reducing to 1:0.69 if maximum age is set to 45. This estimate is remarkably similar to the prior used in the 2016 model runs.

Survival rates and fecundity estimates for adult female grey seals breeding at North Rona and the Isle of May have been estimated from re-sightings of permanently marked animals[10]. Estimates of fecundity rates for populations of marked study animals, adjusted for estimates of unobserved pupping events were 0.79 (95% CI: 0.76 - 0.81) and 0.82 (95% CI: 0.79 - 0.84) for North Rona and the Isle of May, respectively.

***Regional differences in grey seal demographics and genetics***

The difference in population trends between regions for UK grey seals suggests underlying regional differences in demographics. On the basis of genetic differences there appears to be a degree of reproductive isolation between grey seals that breed in the south-west (Devon, Cornwall and Wales) and those breeding around Scotland[11] and within Scotland, there are significant differences between grey seals breeding on the Isle of May and on North Rona[12]. Recent telemetry data suggest that there may be significant mixing between these populations outwith the breeding season[13] e.g. observed movements of adult seals between summer haulout sites in Northern France and both the Scottish east coast and Inner Hebrides and between the Wadden Sea and Orkney.

The very rapid increases in pup production at colonies in the Southern North Sea in England, the Netherlands and Germany all point to large scale recruitment to those colonies from colonies in the Northern North Sea[14].

## Harbour seals

**Knowledge of UK harbour seal demographic parameters (i.e. vital rates) is limited and therefore inferences about the population dynamics rely largely on count data from moulting surveys. Information on vital rates would improve our ability to provide advice on population status. At present vital rate estimates for UK harbour seals are only available from a long term study of the**

[8]Schwarz, C.J. & Stobo, W.T. 2000. Estimation of juvenile survival, adult survival, and age-specific pupping probabilities for the female grey seal (*Halichoerus grypus*) on Sable Island from capture-recapture data. *Canadian Journal of Fisheries and Aquatic Sciences*, 57, 247-253.
[9]Den Heyer, C. E., and W. D. Bowen,. 2016. Estimating changes in vital rates of Sable Island grey seals using mark-recapture analysis. *DFO Can. Sci. Advis. Sec. Res. Doc*. 2016/nnn. vi + xx p.
[10]Smout, S., King R., Pomeroy P. Submitted. Environment, body mass and vital rates in a marine top predator. Proceedings of the Royal Society.
[11]Walton, M. & Stanley, H.F. 1997. Population structure of some grey seal breeding colonies around the UK and Norway. European Research on Cetaceans. *Proceedings 11th Annual Conference of European Cetacean Society*. 293-296.
[12]Allen, P.J., Amos, W., Pomeroy, P. & Twiss S.D. 1995. Microsatellite variation in grey seals (*Halichoerus grypus*) shows evidence of genetic differentiation between two British breeding colonies. *Molecular Ecology* 4(6): 653-662.
[13]Russell, D. J. F., B. McConnell, D. Thompson, C. Duck, C. Morris, J. Harwood, & J. Matthiopoulos. 2013. Uncovering the links between foraging and breeding regions in a highly mobile mammal. *Journal of Applied Ecology* 50 (2):499-509.
[14]Brasseur, S. M. J. M., van Polanen Petel, T. D., Gerrodette, T., Meesters, E. H.W.G., Reijnders, P. J. H. and Aarts, G. 2015. Rapid recovery of Dutch gray seal colonies fueled by immigration. *Marine Mammal Science*, 31: 405–426. doi:10.1111/mms.12160

**Loch Fleet population. However, studies are underway to obtain similar data from new sites in Orkney and western Scotland.**

***Age and sex structure***

The absence of any extensive historical cull data or a detailed time series of pup production estimates means that there are no reliable data on age structure of the UK harbour seal populations. Although seals found dead during the PDV epidemics in 1988 and 2002 were aged, these were clearly biased samples that cannot be used to generate population age structures.

***Survival and fecundity rates***

Survival estimates among adult UK harbour seals from photo-ID studies carried out in NE Scotland have been published[15,16]. This resulted in estimates of 0.95 (95% CI 0.91-0.97) for females and 0.92 (0.83-0.96) for males.

A population model for the Moray Firth harbour seals has been developed to investigate the sensitivity of the population to changes in various vital rates. The model suggests that even small changes in the survival of adult females could result in a decline in the population. Further details of the model and the potential impact of various covariates were given in SCOS-BP 15/07.

A study investigating survival in first year harbour seal pups using telemetry tags was carried out in Orkney and on Lismore in 2007. Survival was not significantly different between the two regions and expected survival to 200 days was very low at only 0.3[17].

The apparent fecundity of the large harbour seal population in The Wash has shown extremely wide changes since the early 2000s. The rate has been approximately double that of earlier estimates and much higher than in the larger population in the Wadden Sea[6].

***Genetics***

Genetic data from a study directed toward resolving patterns of population structure of harbour seals from around the UK and adjacent European sites[18] has recently been added to (with funding from Scottish Natural Heritage) and combined with the population trend and telemetry data to investigate source-sink dynamics of harbour seal populations. By estimating connectivity between management areas and comparing them with the regional trends in population abundance, the degree of demographic independence and the importance of fecundity, survival or immigration to the persistence of the different harbour seal management areas is being investigated.

[15]Cordes, L.S. & Thompson, P.M. 2014. Mark-recapture modelling accounting for state uncertainty provides concurrent estimates of survival and fecundity in a protected harbor seal population. *Marine Mammal Science* 30(2): 691-705.
[16]Mackey, B.L., Durban, J.W., Middlemas, S.J. & Thompson, P.M. 2008. A Bayesian estimate of harbour seal survival using sparse photo-identification data. *Journal of Zoology*, 274: 18-27
[17]Hanson, N., Thompson, D., Duck, C., Moss, S. & Lonergan, M. 2013. Pup mortality in a rapidly declining harbour seal (*Phoca vitulina*) population. *PLoS One*, 8: e80727.
[18]Olsen, M.T., V. Islas, J.A. Graves, A. Onoufriou, C. Vincent, S. Brasseur, A.K. Frie & A.J. Hall 2017. Genetic population structure of harbour seals in the United Kingdom. *Aquatic Conservation: Marine and Freshwater Ecosystems*, 0: 1-7.

## Harbour Seal Populations

| | |
|---|---|
| **3. Is the existing harbour seal decline recorded in several local areas around Scotland continuing or not and what is the position in other areas?** | MS Q3 |

**Rapid declines are continuing in Orkney and along the East coast of Scotland. Counts in the Moray Firth are variable, but apparently stable. Counts also appear stable in the Western Isles and Shetland. Counts on the West coast of Scotland indicate a large increase over the last decade. The most recent composite count for Scotland for 2011 to 2016 is 25% higher than the equivalent estimate for 2007-2009. Counts for the East coast of England also appear stable. Overall the harbour population in the UK is increasing slowly, but the status of the local sub-populations varies around the UK.**

As reported in SCOS 2008 to 2016, there have been general declines in the counts of harbour seals in several regions around Scotland but the declines are not universal with some populations either stable or increasing. Details of trends are presented in response to Q1 above and in SCOS-BP 17/03.

In Shetland the 2015 count was 12% higher than the previous count in 2009, an average annual increase of 1.7%. The most recent count of 15,184 in the large West Scotland Management Area represents a 43% increase between 2009 and 2015, equivalent to an average annual increase of 5.3%. Counts in the Southwest Scotland Seal Management Area indicate a 23% increase between 2009 and 2015, equivalent to an average annual increase of 3%.

Conversely, there have been continuing declines in the Firth of Tay and Eden Estuary SAC, where the 2016 count of 51 represents a 90% decrease from the mean counts before 2002, and in Orkney where the 2016 count of 1,349 represents a 78% decrease since 1997. In the Moray Firth there is considerable variability in the August total counts for the entire region. The 2014 and 2015 surveys produced the lowest counts in the time series but the 2016 count was 25% higher. Overall there has been no significant trend in the counts of the Moray Firth since 2000.

The composite count for all of Scotland, based on recent (2015-2016) surveys in all areas except the Western Isles (2011), is approximately 25% higher than the previous composite count based on 2007-2009 surveys, representing a 3% p.a. increase over the last seven years (Figure 5; Table 5). The current estimate is about 15% lower than the equivalent for surveys in 1997-1998.

The combined count for the Southeast England management unit in 2016 (5,199) was 10% higher than the 2014 and 2015 counts. The Southeast England population has returned to its pre-2002 epidemic levels (Figure 5). Pup production in the Wash continues to increase at around 7.5% p.a[19].

| | |
|---|---|
| **4. What is the latest understanding of the causes of the recent decline in harbour seals? It would be useful to have a brief (1 page) updated summary of the causal factors so far eliminated as significant, the causal factors that remain contributory and the causal factors considered most likely to be significant and which should be the main focus for investigation.** | MS Q4 |

[19] http://www.smru.st-andrews.ac.uk/files/2017/09/Report-on-the-distribution-and-abundance-of-harbour-seals-during-the-2015-and-2016-breeding-seasons-in-The-Wash_2016.pdf

**A wide range of potential causes of the decline in Scottish harbour seals in some regions has been discussed at previous SCOS meetings (Table 7). The causal mechanisms have not yet been identified, but several factors can now be ruled out as primary causes for the decrease in numbers and research efforts are currently focussed on two of the remaining potential mechanisms: interactions with grey seals and exposure to toxins from harmful algae.**

The Sea Mammal Research Unit has been funded by Scottish Government to investigate the causes of the declines. Details of the project and progress to date is given in SCOS-BP 17/04.

Several putative causes have been investigated and can now be ruled out; e.g. a recent analysis of the *Brucella* serological data has confirmed that this bacteria is not likely to be a factor in the decline[20]. A list of potential causes and the current assessment of their likely importance in the observed declines is given in Table 7. Additional work is required to investigate the remaining potential causal factors.

*Table 7.* A list of potential causes and the current assessment of their likely importance in the observed declines of harbour seals.

| | Factor | Status | Evidence |
|---|---|---|---|
| **1.** | Fisheries bycatch | No | Data from bycatch observer programmes and strandings and the absence of any major gillnet fisheries in the regions of decline suggest that bycatch is unlikely to be a significant factor in the declines. |
| **2.** | Pollution | No | Levels of persistent organic pollutants are very low in the areas of decline and are highest in regions where populations are increasing[21]. |
| **3.** | Loss of habitat | No | Data from aerial surveys and telemetry studies show no evidence that foraging, moulting or breeding sites have been lost. |
| **4.** | Juvenile dispersal | Possible | Data from genetic studies do not indicate large scale dispersal between regions but may have little power to detect recent changes in recruitment patterns. |
| **5.** | Emigration | No | Telemetry data do not indicate large scale, permanent emigration of seals from areas of decline[22], although temporary relocation between regions may be frequent. |
| **6.** | Entanglement in marine debris | No | Data from stranded seals and from faecal samples from haulout sites indicate that entanglement in marine debris or ingestion of plastics are not major issues for UK seals. |
| **7.** | Legal control | No | Introduction of the Marine (Scotland) Act 2010 and the licensing system is ensuring the declining populations are protected. |

[20]Kershaw, J.L., Stubberfield, E.J., Foster, G., Brownlow A., Hall, A.J. and Perrett L.L. In press. Exposure of harbour seals (*Phoca vitulina*) to *Brucella* in declining populations across Scotland. *Diseases of Aquatic Organisms*.

[21]Hall, A.J. & Thomas, G.O. 2007. Polychlorinated biphenyls, DDT, polybrominated diphenyl ethers and organic pesticides in United Kingdom harbor seals - mixed exposures and thyroid homeostasis. *Environmental Toxicology Chemistry*, 26, 851-861.

[22]Sharples, R.J., Moss, S.E., Patterson, T.A. & Hammond, P.S. 2012. Spatial Variation in Foraging Behaviour of a Marine Top Predator (*Phoca vitulina*) Determined by a Large-Scale Satellite Tagging Program. *PLoS ONE*, 7.

| | | | |
|---|---|---|---|
| **8.** | Infectious disease | Unlikely | No evidence of an unusual mortality from strandings or seals taken into rehabilitation. Live capture-release studies show no evidence of disease in areas. No evidence that Brucella infection is responsible[18]. However, other esoteric or secondary disease agents may still be a factor. |
| **9.** | Prey quality and availability | Possible | It is not possible to rule out changes in the prey quantity or quality as factors involved in the decline of harbour seals. |
| **10.** | Competition with other marine predators | Possible | Competition for prey with the increasing grey seal population and/or other marine predators cannot be ruled out. |
| **11.** | Predation | Possible | Predation by grey seals[23] and killer whales is still being reported at several locations. |
| **12.** | Toxins from harmful algae | Possible | Domoic acid and saxitoxin continue to be detected in seals[24] and their prey. |

| | |
|---|---|
| **5. In light of the latest information, should the Scottish Government consider introducing any additional seal conservation areas to protect vulnerable local harbour seal populations or, alternatively, should it consider revoking any existing seal conservation areas? It would be particularly useful to have views on the utility of the current Western Isles Conservation Area.** | MS Q5 |

**Information on the causes of the declines is required for SCOS to give advice on the need for changes to conservation actions. On the basis of continued declines or lack of increases in all affected areas SCOS recommends that the measures to protect vulnerable harbour seal populations should remain in place, but no new conservation measures are proposed. Conservation orders are currently in place for the Western Isles, Northern Isles and down the east coast as far as the border.**

The dramatic decline in the population of harbour seals in the Firth of Tay and Eden Estuary SAC is a clear cause for continued concern. In addition, a further decline was seen in Orkney (see SCOS-BP 17/03 and answer to Q1 and 2 above). The potential biological removal (PBR) is calculated for each region for each year (SCOS-BP 16/08) and the recovery factor is reviewed annually based on the latest survey data.

Conservation areas are currently designated for the Western Isles, Northern Isles and down the east coast as far as the border.

The 2011 survey in the Western Isles indicated that the population had increased since the 2007-09 surveys and was close to the 1996-97 levels. The adjacent and much larger West coast population is at an all-time high since surveys began. In 2016 SCOS advised that reconsideration of conservation measures for the Western Isles population should be deferred until the completion of the next census. The Western Isles are being surveyed in summer 2017 and results should be available for

[23]Brownlow, A., Onoufriou, J., Bishop, A., Davison, N. & Thompson, D. 2016. Corkscrew Seals: Grey Seal (*Halichoerus grypus*) Infanticide and Cannibalism May Indicate the Cause of Spiral Lacerations in Seals. *PLoS ONE*, 11.
[24]Jensen, S.K., Lacaze, J.P., Hermann, G., Kershaw, J., Brownlow, A., Turner, A. *et al.* 2015. Detection and effects of harmful algal toxins in Scottish harbour seals and potential links to population decline. *Toxicon*, 97, 1-14.

SCOS 2018. SCOS would therefore continue to recommend deferring any decision on changes to the Western Isles Conservation Area status until the 2018 meeting.

## Seal Legislation

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|---|---|
| **6. Does the Committee consider that there is a significant scientific requirement or advantage to updating the Conservation of Seals Act 1970, for example, definitions and applications of closed seasons, the netsmen's defence and the potential for the introduction of mandatory recording and/or licencing of shooting?** | **Defra Q9** |

**SCOS recommend that there should be a requirement for mandatory reporting of seals killed. From both scientific and management perspectives the absence of any requirement to record and report on numbers of seals killed in England and Wales is a major omission that prevents any assessment of the effects of seal shooting.**

**For long-lived, annually breeding species such as grey and harbour seals the enforcement of closed seasons associated with the breeding seasons has little effect on the population consequences of removals. From an animal welfare perspective, removal of lactating females will inevitably lead to starvation of their pup and should be avoided.**

## Seal Licensing and PBRs

| | |
|---|---|
| **7. What, if any, changes are suggested in the Permitted/Potential Biological Removals (PBRs) for use in relation to the seal licence system? This seeks an update of the PBR for seal licensing.** | **MS Q6** |

**Provisional regional PBR values for Scottish seals for 2018 are given in SCOS-BP 17/05. The PBR for harbour seals in Orkney has been reduced by approximately 30% due to recent survey results. Regional PBRs for grey seals have increased by 50-67% due to revised population estimates and local population increases.**

PBR values for the grey and harbour seal "populations" that haul out in each of the ten Seal Management Areas in Scotland are presented in SCOS-BP 17/05. Sets of possible values are tabulated for each area with different values of recovery factor. A value is suggested for this parameter in each population, the resulting PBR is highlighted, and a rationale is provided for each suggestion. The PBR values are calculated using the latest confirmed counts in each management area.

The latest survey count for harbour seals in the Orkney and North Coast management region was 30% lower than the previous estimate, resulting in a 30% lower PBR for that management region.

The overall PBR for grey seals in Scotland has increased by 67%. This is in part due to higher counts in Orkney and North coast region but is mainly due to a revised estimate of the ratio between grey seal summer counts and the local population size. The revised estimate is both higher and more precise (SCOS-BP 16/03) and as a consequence the PBR estimate is 50% higher than previously reported.

Recovery factors have been held constant in all management regions.

## Seals and Marine Renewables

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| **8. What is the current state of knowledge of interactions actual or potential between seals and marine renewable devices and possible mitigation measures? What are the questions that remain to be addressed?**<br><br>**What progress is being made in understanding how seals behave around tidal turbine devices, including diving behaviour, and about what might be an appropriate avoidance rate to be applied in collision risk modelling?** | MS Q7;<br>Defra Q7 & 8; |

**Since reporting in 2016 (see SCOS Advice 2016), there have been a number of published updates and preliminary reports of studies on the interactions between seals and marine renewable devices (wind, wave, and tide). Harbour seals showed avoidance of pile driving activity out to ranges of 25km, but did not show avoidance of general construction activity or of operational wind farms. Tests of Acoustic Deterrent Devices (ADDs) as mitigation for pile driving showed that seals exhibited behavioural responses out to 1km range. ADDs may provide improved mitigation at close range compared to current visual observation methods. Telemetry studies at Strangford Lough showed that harbour seals continued to swim past operational tidal turbines. Harbour seals exposed to experimental play back of tidal turbine noise showed significant avoidance within 500m of the source. For tidal turbines, the most effective mitigation for reducing collision risk would be to consider this risk at the turbine design stage and include engineering mitigation measures through early design modifications. Currently proposed mitigation methods are generally based on detection and deterrence.**

**Wind**

Previous results of a behavioural study during the construction of a wind farm using data from GPS/GSM tags on 24 harbour seals in the Wash were reported to SCOS in 2016. In summary, results showed that seals were not excluded from the vicinity of the windfarm during the overall construction phase but that there was clear evidence of avoidance during pile driving, with significantly reduced levels of seal activity at ranges up to 25km from piling sites. Within 2hr of cessation seal distribution returned to pre-piling levels[25]. Analysis of the at sea locations of individual seals during pile driving showed that the closest distance of each seal to pile driving varied from 4.7 to 40.5 km[26]. Based on estimates of sound exposure during piling operations half of the tagged harbour seals were predicted to have been exposed to sound levels that exceeded published auditory damage thresholds for pinnipeds[27]. However, it should be highlighted that these are predictions of auditory damage in marine mammals and there is considerable uncertainty about exposure criteria for impulsive sounds such as pile driving[27].

Recently, further tag deployments on harbour seals which coincide with piling activity at wind farm developments have been carried out in East Anglia and the Moray Firth. A total of 20 seals in the Wash were tagged with GPS/GSM tags in October 2016 and early results suggest that all seals were exposed to pile driving noise during their at-sea trips. Between February and March 2017,

[25]Russell, D.J.F., Hastie, G.D., Thompson, D., Janik, V.M., Hammond, P.S., Scott-Hayward, L.A.S. *et al.* 2016. Avoidance of wind farms by harbour seals is limited to pile driving activities. *Journal of Applied Ecology*, 53, 1642-1652.

[26]Hastie, G.D., Russell, D.J.F., McConnell, B., Moss, S., Thompson, D. & Janik, V.M. 2015. Sound exposure in harbour seals during the installation of an offshore wind farm: predictions of auditory damage. *Journal of Applied Ecology*, 52, 631-640.

27 Southall, B.L., Bowles, A.E., Ellison, W.E., Finneran, J.J., Gentry, R.L., Greene, C.R., Kastak, D., Ketten, D., MIller, J.H., Nachtigal, P.E., Richardson, W.J., Thomas, J.A. & Tyack Peter, L. (2007) Marine mammal noise exposure criteria: Initial scientific recommendations. Aquatic Mammals, 33, 411-521.

immediately prior to the start of pile driving for an offshore wind farm, 31 harbour seals were tagged with GPS/GSM tags in the Moray Firth in a combined Aberdeen University and SMRU project. The majority of these seals were individuals for which historical behavioural and reproductive parameters are known (from long term Photo ID studies); this potentially provides the opportunity to link behavioural responses to pile driving with life history data and measure the effects of pile driving to survival and fecundity.

To date there have been few studies of grey seal movements in relation to wind farm developments. In 2015 the Department for Energy and Climate Change (DECC) funded the deployment of total of 21 GPS tags on grey seals at Donna Nook and Blakeney. There was extensive overlap between grey seal movements and present and planned windfarms; 17 of the 21 individuals entered at least one operational wind farm. There was no indication of overt avoidance or use of windfarms, or other anthropogenic structures. Results of this study are presented in detail in Russell et al.[28].

Grey seals have been tracked in the vicinity of pile driving activity in the Netherlands coastal zone[29]. Changes in dive patterns and possible aversive reactions were observed in approximately a quarter of recorded exposures to piling noise. Seals tracked in the vicinity of operational windfarms in Denmark made frequent transits and did not apparently react to the presence of wind turbines[30].

**Mitigation**

Operational protocols to minimise the likelihood of harm to seals during pile driving operations (published by the Joint Nature Conservation Committee (JNCC) in 2010[31]) and the use of bubble curtains to attenuate the noise from piling were described in SCOS 2015.

The use of acoustic deterrent devices (ADDs) as potential measures to mitigate the effects of pile driving on seals has been tested during a series of controlled exposure experiments with tagged harbour seals and results were reported to SCOS 2015. All seals tested out to a range of 1km showed an identifiable change in behaviour. However, not all responses resulted in straight forward movement away from the sound source and responses varied depending on the particular circumstances of the experiment and probably the motivation and status of the subjects. In contrast, recent results of a series of playbacks of a simulated Lofitech ADD (played through an underwater speaker) to harbour seals suggest a lack of avoidance to the ADD sound signals; the number of seal sightings within 100 m of the playback was significantly higher during ADD playbacks than during the silent controls[32]. However, it should be noted that a difference in the source levels between the two previous studies (193 re 1 µPa root mean squared (RMS) vs 165 re 1 µPa peak-peak) may partly explain the marked differences in the observed seal responses.

**Wave**

Data on the interactions between seals and wave energy devices remains limited. However, SNH-commissioned analyses of land based observer data at the European Marine Energy Centre Billia Croo wave energy test site has recently been published[33]. Observations of marine mammals were

[28]Russell, D.J.F. 2016. Movements of grey seal that haul out on the UK coast of the southern North Sea. Report to DECC, *OESEA-14-47, Feb 2016*, 18pp.

[29]Kirkwood, R., Aarts, G. and Brasseur, S. 2014. Seal monitoring and evaluation for the Luchterduinen offshore wind farm construction 214. Report number C152/14.

[30]McConnell, B., Lonergan, M. and Dietz R. 2012. Interactions between seals and offshore wind farms. The Crown Estate, 41pp. ISBN: 978-1-906410-34-6.

[31]JNCC. 2010. Statutory nature conservation agency protocol for minimising the risk of injury to marine mammals from piling noise. *JNCC, Aberdeen*.

[32]Mikkelsen, L., Hermannsen, L., Beedholm, K., Madsen, P.T. & Tougaard, J. 2017. Simulated seal scarer sounds scare porpoises, but not seals: species-specific responses to 12 kHz deterrence sounds. *Royal Society Open Science*, 4.

[33]Long, C. 2017. Analysis of the possible displacement of bird and marine mammal species related to the installation and operation of marine energy conversion systems. *Scottish Natural Heritage Commissioned Report No. 947*.

made from a cliff top (110m high) overlooking the Billia Croo site between 2009 and 2015. Sightings of seals in the water were recorded using high powered binoculars ('Big Eyes') and horizontal and declination angles from the viewing tripod were recorded to provide locational information; a total of 1,323 seal sightings were made[30]. Spatially-explicit analyses of the distribution of seals in relation to the location of the wave device test berths were carried out. The results suggest that there is no correlation between changes in seal density and the location of wave device test berths, and the authors conclude that changes in seal distribution were not influenced by the installation and operation of devices[33].

**Tidal**

Since reporting in 2016, analysis of the behaviour of harbour seals and an operating tidal turbine (SeaGen in Strangford Narrows, Northern Ireland) has been completed[34]. This analysed data from 32 harbour seals tagged with GPS/GSM tags; results showed that the turbine did not prevent transit of the animals through the channel and therefore did not result in a 'barrier' effect. However, the frequency of transits past the turbine by tagged seals reduced by 20% (95% CI: 10–50%) when the turbine was on, relative to when it was off. This effect was stronger when considering daylight hours only, with a reduction of transit rate of 57% (95% CI: 25–64%). Seals tagged during the operational period transited approximately 250 m either side of the turbine suggesting some degree of local avoidance compared with the pre-installation results.

SNH-commissioned analyses of land based observer data at the European Marine Energy Centre Fall of Warness tidal energy test site has also been published recently[33]. Observations of marine mammals were made from a cliff top (50m high) overlooking the Fall of Warness site between 2005 and 2015. The survey area when viewed from the clifftop, was subdivided into a grid system for recording purposes and the number of seals in each grid cell was recorded during regular scans of the test site; a total of 9,511 sightings of seals (not identified to species level) were made during the observations[33]. Results of spatially explicit analyses suggest that there is no obvious correlation between those grid cells where turbine test berths are located and the estimated change in density of seals between baseline conditions and those expected when devices are installed and operating. Inspection of plots of density change with distance from test berth location suggests that there may be a decrease in density immediately adjacent to the potential impact location (single test berth); however, beyond 1km there is no apparent effect[33]. When harbour seals are considered in isolation, results suggest that grid cells where test berths are located show small but statistically significant reductions in density with the installation of infrastructure. However, these cells variously show increases and decreases in estimated density with progression through the site impact levels (devices onsite but not operational and devices installed and operational), but none of these changes are statistically significant. The plots of density change with distance from test berth indicate very little variation with distance away from the test berth location, suggesting that harbour seal abundance may not be influenced by the location of a test berth[33].

The results of a NERC funded RESPONSE project have now been published[35]; a series of acoustic playbacks of tidal turbine sounds were carried out in a narrow, tidally energetic channel on the west coast of Scotland. A concurrent programme of land based visual observations of harbour seal activity during signal playbacks (simulated turbine signal based on SeaGen) plus equivalent control signals was made. Further, the behaviour of ten harbour seals was measured through swimming tracks of high resolution UHF/GPS telemetry tagged seals collected in conjunction with the playback trials[23]. Results of this study showed that there was no significant difference in the total numbers of seals sighted within the channel between playback and silent control periods. However, there was a

[34]Sparling, C., Lonergan, M. and McConnell, B. Harbour seals (*Phoca vitulina*) around an operational tidal turbine in Strangford Narrows: No barrier effect but small changes in transit behaviour. *Aquatic Conservation: Marine And Freshwater Ecosystems*: Early view.
[35]Hastie, G.D., Russell, D.J.F., Lepper, P., Elliot, J., Wilson, B., Benjamins, S. & Thompson, D. In Press. Harbour seals avoid tidal turbine noise: implications for collision risk. *Journal of Applied Ecology*.

localised impact of the turbine signal; tagged harbour seals exhibited significant spatial avoidance of the sound which resulted in a reduction in the usage by seals of between 11 and 41% at the playback location. The significant decline in usage extended to 500 m from the playback location at which usage decreased by between 1 and 9% during playback[35]. In practice, these empirical changes in usage could be used directly as avoidance rates when using collision risk models to predict the effects of tidal turbines on seals.

Scottish Government funded work is currently being carried out to assess the physical damage inflicted upon a seal when struck by a turbine blade in a series of collision impact tests; this was carried out on seal carcasses using a simulated turbine blade attached to the keel of a jet drive boat, driven over the carcasses at known speeds (adjusted displacement speeds varied from 2.07 to 5.67 $m.s^{-1}$ during initial trials)[36]. Post-trial radiographs of each seal showed no discernible evidence of skeletal damage; cranial, abdominal and pelvic bones remained intact. Carcasses were necropsied and again no indications of damage to visceral organs were apparent. These results suggest that collisions with the tips of tidal turbines at these speeds are unlikely to produce serious or fatal injuries in grey seals. However, more recent trials at a range of higher speeds (between 9.3 $m.s^{-1}$ and 10.3 $m.s^{-1}$) revealed varying degrees of spinal fracture and three out of five seals showed signs of damage to the rib-cage. Massive diaphragmatic rupture was also found in all cases. These results indicate that collisions with the tip of a tidal turbine blade travelling at >10.3 $m.s^{-1}$ would be lethal to a juvenile grey seal. Additional trials to identify damaging impact speed thresholds are ongoing.

**Mitigation**

For tidal turbines, the most effective mitigation for reducing collisions would be to consider this risk during the design stage and include engineering mitigation measures through design modifications.

In terms of operational mitigation, the only method that has been attempted for tidal turbines at this stage is the shutdown protocol at Strangford Lough; this required observers to monitor the outputs of an active sonar system on the turbine and effect an automated shutdown if a target thought to be a marine mammal approaches within a pre-defined mitigation zone. However, this is clearly effort intensive and expensive and therefore not a viable option; automated sonar detection systems have been developed and may prove to be an effective alternative[37]. Alternative operational mitigation measures that have the potential to reduce the risk of collisions include the use of ADDs to deter seals from approaching turbines. However, given that behavioural responses by animals are likely to be highly context specific and will depend on factors such as age class, motivation of the animal to remain in the area, and prior exposure history, it is perhaps not surprising that reports of the effectiveness of ADDs are mixed. The use of ADDs was summarised for SCOS 2013.

A report detailing the current state of knowledge and identifying the priority areas for research was drafted by SMRU for Scottish Government and updated in 2016[38].

[36]Thompson, D. and Onoufriou, J. 2016. Marine Renewable Energy - Individual consequences of tidal turbine impacts. *Report to Scottish* Government MRE2, Sea Mammal Research Unit, University of St Andrews.

[37] Sparling, C.E., Gillespie, D.M., Hastie, G.D., Gordon, J.C.D., MacAulay, J.D. J., Malinka, C.E., Wu, G-M. & McConnell, B.J. (2016) Scottish Government Demonstration Strategy: Trialling methods for tracking the fine scale underwater movements of marine mammals in areas of marine renewable. *Scottish Marine and Freshwater Science* Vol 7 Vol 14. Available at: http://data.marine.gov.scot/dataset/scottish-government-demonstration-strategy-trialling-methods-tracking-fine-scale-underwater

38 http://www.smru.st-andrews.ac.uk/research-policy/reports-to-scottish-government/

## Seals and Fisheries

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| **9. We have seen increasing complaints from the fishing industry in certain areas where reports of depredation of large percentages of catch are reported. There is concern around interactions between fishers and seals and the use of lethal means of control. Can the Committee provide advice on what the extent of the issue is in specific problem areas?** | Defra Q11 |

**SCOS is not aware of any information on the extent of the issue in England and Wales. Some work has been done in Scotland to address the interactions of seals with salmon fisheries. Work with river boards has focused on the use of acoustic deterrent devices to limit access by seals to particular salmon rivers, and identifying individual problematic seals for tagging or removal. Modifications to coastal (stake) salmon nets and the use of acoustic deterrent devices have been shown to be effective in limiting if not eliminating depredation.**

More widely, there are anecdotal accounts that seals cause considerable damage to the catch of many fishermen (Figure 6). Static net fisheries (gillnets, tangle nets etc.) are particularly susceptible, though we are also aware anecdotally of problems with trawl and hook and line fisheries too. The UK Protected Species Bycatch Monitoring Scheme has collected data for 20 years on the bycatch of marine mammals through on board observations, some of which is associated with depredation. It has also collected information on seal-damaged fish recovered from nets. As yet SMRU have not been able to conduct a quantitative assessment of these data, but are actively pursuing funds to do so at present. Qualitatively, it is clear that damaged fish can sometimes account for the majority of the catch brought on deck in some fisheries and areas. This is bound to represent a significant economic loss at times, but may also represent an additional unaccounted for source of mortality in fish stock assessments. The southwest of England (Celtic Sea and Western Channel) contains a high number of static net fishing vessels and a significant number of seals. This is the area where most current SMRU at-sea monitoring is focused and consequently the area from which most complaints about seal damage are heard. This is not to say that seal depredation is not a problem in other areas or fisheries (see Figure 6), but information from elsewhere is more limited or not up to date.

***Figure 6.*** *Much of the catch rendered unmarketable by seal depredation in this net hauled in Yorkshire.*

The SMRU has been working on this issue in Scotland and in relation to salmon fisheries (wild capture fisheries and angling) for several years, funded by Marine Scotland. Documents are available online[39]. Depredation of salmon by seals from coastal static net fisheries represents a significant economic loss to the fisheries concerned and an additional source of mortality for salmonids, a source of mortality that is probably largely dependent upon the presence of the net fishery. We have shown that modifications to coastal (stake) salmon nets and the use of acoustic deterrent devices are effective in limiting if not eliminating such depredation. Work with river boards has focused on the use of acoustic deterrent devices to limit access by seals to particular salmon rivers, and identifying individual problematic seals for tagging or removal.

There is no requirement to record any lethal measures being pursued in English or Welsh waters, but static net fisheries and Salmon River Boards have been issued with licences to shoot problematic seals as a last resort if non-lethal measures fail, under the Marine (Scotland) Act, and returns are published on Marine Scotland's website quarterly.

## Seals and River Fisheries

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| **10. What is the latest understanding of potential non-lethal options for deterring seals from entering and/or transiting up river systems or, if necessary, relocating them from there? Do you have any additional information to further facilitate the development of non-lethal conflict resolution advice? It would be useful to have a short summary of the latest position on the effectiveness of ADDs in this role. It would also be particularly interesting to have the Committee's views on the options of electric barriers and relocation.** | Defra Q3<br>MS Q8 |

**SCOS is not aware of any additional work having been carried out on these issues since the previous SCOS report. ADDs have been successfully trialled to limit the passage of seals up salmon rivers but there are concerns related to how they are deployed and maintained. Electric field barriers have been shown to be effective in some circumstances. A method for trapping seals in rivers has been developed but is untested. For additional information on the use of ADDs around Marine Renewable Energy installations see Q12 below.**

SMRU has been reviewing measures adopted elsewhere in the world to deter seals from entering salmon rivers, but this review is still ongoing. SMRU continues to develop a means of trapping and translocating seals from rivers, though licencing issues have so far prevented the use of a trap. Current efforts are focused on the design and implementation of a net system to trap seals in rivers. No further work has been conducted on the use of ADDs since SCOS 2016, but they proved physically vulnerable in one river system where they were deployed. SCOS is aware that electric systems are being developed commercially for fish farms to keep seals away from pens but no further information is available at this time and no further research has been undertaken since SCOS 2016.

SCOS is not aware of any data on the effectiveness of relocation of grey or harbour seals. There is anecdotal information on a translocation of one harbour seal in the early 1980s from a site 50km up the River Ouse to The Wash. The seal returned to the river site within a week (M. Fedak (SMRU) pers com). Attempts to relocate harbour seals feeding on salmonids at Ballard Locks in Seattle to Hood Canal (>50km) were abandoned because seals returned to the capture site[40] and harbour seals

[39] (http://www.smru.st-andrews.ac.uk/research-policy/)
[40] NOAA-NWFSC Tech Memo-28: Impact of sea lions and seals on Pacific Coast salmonids. http://www.newportbeachca.gov/home/showdocument?id=1590

have been recorded returning to capture sites from release sites between 21 and 421km distant on the west coast of North America [41].

Capture and relocation has also been attempted for California sea lions (*Zalophus californianus*) and both Australian (*Arctocephalus doriferus*) and New Zealand (*A. forsteri*) fur seals. Sea lion relocation attempts were deemed unsuccessful due to animals returning to their capture sites and although California sea lions are still caught in the Columbia River in Oregon and Washington they are no-longer released back into the wild. In 2016 this resulted in the removal and euthanasia of 59 California sea lions[42]. More than 4500 fur seal relocations were undertaken in Tasmania[43]. 56% were recaptured seals with 3% trapped more than 20 times. Recapture intervals were highly variable, ranging from days to years and within the same year, recapture intervals ranged from 4 to 258 days, mean 36 days.

## Seals and Fish Farms

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| **11. What is the latest understanding of interactions between seals and fin fish farms and possible mitigation measures? It would be particularly interesting to have the Committee's views on non-lethal options including improved nets, ADDs, electric barriers, taste aversion and possible relocation.** | MS Q9;<br>Defra Q3 |

**A review of SMRUs activities in this area was presented at SCOS 2016, and a more detailed literature review was commissioned by Marine Scotland in 2014[44].**

A review currently underway for Marine Scotland has highlighted a lack of directed research into novel deterrent options. Research is warranted into several areas including new netting materials, translocation of problem individuals, implementation of electric gradient deterrents and conditioned taste aversion. At present, very limited trials on translocation and of high-density polyethylene (HDPE) netting are being undertaken by commercial operators. Without scientific oversight the results of such trials may remain equivocal and might not enter the public domain. ADDs have been shown to have limited effectiveness, but are thought to be useful in certain circumstances[45] (see also answer to Q12).

A startle response based ADD system was tested at a marine salmon farm over a 19 month period[46]. Predation was monitored at the ADD protected site with and without signal and at two control sites. Results indicate a 91% reduction in lost fish when comparing predation levels with and without the signal at the test site and 97% when comparing the test site against control sites. Harbour porpoise and otter distribution around the farm were not affected by sound exposure.

[41] Oliver, GW; Morris, PA; Thorson, PH; et al. 1998. Homing behavior of juvenile northern elephant seals MARINE MAMMAL SCIENCE 14:245-256

[42]FIELD REPORT:2016 Pinniped Research and Management Activities at Bonneville Dam R. Brown, S. Jeffries, D. Hatch and B. Wright. www.westcoast.fisheries.noaa.gov/publications/protected_species/marine_mammals/pinnipeds/sea_lion_removals/loa_and_bonneville_field_report_2016.pdf

[43] Robinson, S., Terauds, A., Gales, R. and Greenwood, M. (2008), Mitigating fur seal interactions: relocation from Tasmanian aquaculture farms. Aquatic Conserv: Mar. Freshw. Ecosyst., 18: 1180–1188. doi:10.1002/aqc.971

[44]Coram, A.J., Gordon, J.C.D., Thompson, D. & Northridge, S. 2014. Evaluating and Assessing the Relative Effectiveness of Acoustic Deterrent Devices and other Non-Lethal Measures on Marine Mammals. *Report to Scottish Government*, Sea Mammal Research Unit, University of St Andrews, St Andrews. http://www.gov.scot/Resource/0050/00504418.pdf

[45] Gotz, T. & Janik, V. M. 2013 Acoustic deterrent devices to prevent pinniped depredation: efficiency, conservation concerns and possible solutions. Marine Ecology Progress Series. 492, p. 285-302 18 p

[46] Götz, T. & Janik, V. M. 2016 Non-lethal management of carnivore predation: long-term tests with a startle-reflex based deterrence system on a fish farm. Animal Conservation. 19, p. 212-221

A seal module for a generic marine wildlife acoustic deterrence system (FaunaGuard, SEAMARCO, Harderwijk, Netherlands) has been tested on harbour seals in a large pool captive setting[47]. Seals responded by reducing time submerged and/or increased haulout time. An estimated effect threshold suggests that this system would effectively deter harbour seals out to ranges of 200-500m.

Capture and relocation of problem seals is currently under investigation (see answer to Q10 above).

## Use of Acoustic Deterrents

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| **12. Following the 2016 summary of limited evidence available, has there been any further work on understanding of the relative effectiveness of existing models of acoustic deterrents for preventing seal predation at fisheries or fish farms (including locations with or without a high level of cetacean presence)?**<br><br>**What advice can be provided on the use of acoustic deterrent devices (i.e. types, frequencies, trigger mechanisms and usage patterns) that might be most effective in deterring seals without disturbing cetaceans? How might these differ in the scenarios of employment of ADDs at fisheries, fish farms and tidal energy devices respectively?** | MS Q10 & Defra Q4; |

**A comprehensive answer to this question was provided last year (SCOS Advice, 2016, Q 16).**

Two low-frequency 'porpoise friendly' devices are in development by two manufacturers, the 'Genuswave'[48] and the FaunaGuard seal module (*SEAMARCO, Harderwijk, The Netherlands)* (see answer to Q11 above).

Recent research (in Denmark) has also shown that some harbour porpoises avoid the area around a simulated 'Lofitech' ADD, a device which has similar frequency characteristics to the Airmar device widely used at Scottish aquaculture sites[32]. This study, showed that harbour porpoises avoided simulated ADD signals but harbour seals did not and instead appeared to approach the device. This does not prove a lack of effectiveness in mitigating fish farm depredation, but does highlight the lack of scientific evidence supporting their widespread use.

During a series of open water behavioural response trials using the same Lofitech device harbour seals showed avoidance behaviour at ranges of up to 1km from the source[49]. These apparently contradictory results suggest that context is important in determining the reactions of seals to ADD signals.

## Seals and their Non-lethal Management

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| **13. Further to your 2015 advice regarding non-lethal mitigation measures to minimise seal interactions with salmon netting stations, river fisheries, fish** | Defra Q3 |

[47] Ronald A. Kastelein, Manon Horvers, Lean Helder-Hoek, Shirley Van de Voorde, Remment ter Hofstede and Heidi van der Meij 2017. Behavioral Responses of Harbor Seals (Phoca vitulina) to FaunaGuard Seal Module Sounds at Two Background Noise Levels Aquatic Mammals 2017, 43(4), 347-363, DOI 10.1578/AM.43.4.2017.347

[48] Note: The University of St Andrews has a commercial interest in this device.

[49] http://www.smru.st-andrews.ac.uk/files/2015/10/MR8-1_ADD_mitigation_VF2.pdf

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| **farms and marine renewable devises, do you have any additional information to add, which would facilitate the development of non-lethal conflict resolution advice?** | |

**See answers to Questions 10, 11 and 12 above**

## Seal Bycatch

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| **14. What is the latest information on the levels of bycatch in local areas? Are there any areas where it has not been possible to collect seal population/bycatch data and can the Committee provide advice on how to collect additional information?** | Defra Q13 |
| **We noted that the conclusions of SCOS 2015 and 2016 estimated that bycatch of grey seals in particular were high, whilst conversely the UK MSFD indicator for seal abundance and distribution concluded that, throughout their range, grey seals have increased in number. How can we best address these differences in findings and present constant messaging?** | Defra Q12 |

**The most recent estimate of seal bycatch in UK fisheries is 610 animals (95% CI 449-1262)[50]. However, this is based on assumptions about observed bycatch rates from sampling that is predominantly in the Western Channel and Celtic Sea, where most gillnet effort is located. Sampling levels are too low in other areas to provide reliable area-specific estimates.**

**Estimated bycatch levels in the Celtic Sea exceed a PBR for the combined grey seal population of SW England, Wales and Ireland. An additional but un-recorded number of seals are bycaught by Irish and French boats operating in the Celtic Sea. Despite the bycatch, grey seal populations in Wales and Ireland are increasing, suggesting that some of the bycaught seals are immigrants from Scottish populations.**

Table 8 below shows the estimates by ICES Division and general area. Apart from around 80 animals caught annually in the North Sea, most of the rest of the bycatch is thought to occur in the Celtic Sea and Channel. Area specific biases have not been explicitly explored in this analysis. Sampling has been focused in 7e,f & g, and no doubt further sampling in areas that have received less attention to date would provide better estimates for those regions.

Area based estimates currently suggest that bycatch rates are highest in the Western Channel and Celtic Sea (380 seal per year) which is largely due to the overlap of high levels of fishing effort and relatively high seal densities. Bycatch rates in the Eastern Channel are estimated at around 120 seals per year. There is a need for a more focused exploration of the relationship between seal density or distance from breeding colonies, in relation to bycatch rates or bycatch probability. More sampling in areas closer to and much further from such sites might help improve our understanding of seal bycatch probability.

[50] Northridge, S. P., Kingston, A. R. & Thomas, L. J. 2017. Annual report on the implementation of Council Regulation (EC) No 812/2004 during 2016, *Report to Defra*. 36 pp. http://randd.defra.gov.uk/Document.aspx?Document=14086_UK812Reportfor2016.pdf

The majority of seal bycatch is recorded in large mesh tangle nets and trammel nets. Effort in these fisheries is highly focused in area 7d,e & f (61% of UK tangle net effort). Sampling has been focused mainly in 7e,f, & g. Another way to explore which areas may have been under-sampled is by comparing sampling effort with fishing effort by area. Areas that are under-sampled and where there is a large amount of effort, or a high density of seals, could benefit from further observational data. These would include 4a (northern North Sea), 4c (southern North Sea), 7d (eastern Channel) and 7f (North Devon and Cornwall and South Wales).

Although the total bycatch estimate of 610 is not a large number when considering the entire UK grey seal population of over 140,000 animals, the local populations around the Celtic Sea, where most bycatch is known to occur are much lower. Total combined pup production in SW England, Wales and Ireland was approximately 4100 in 2014. With the same assumptions as used to derive a PBR for the Welsh grey seal population ($N_{min}$ = 2.3*pup production; FR = 0.5 (SCOS 2016 answer to Q9)) this pup production produces a PBR of 283 grey seals. Using the less conservative recovery factor (FR = 1.0) applied to Scottish grey seal populations would increase this PBR to 566. The current estimated bycatch for UK registered vessels in ICES areas 7 a,e,f,g & j was 391 (Table 8), approximately 40% greater than the conservative PBR.

The estimate derived for UK bycatch in the Southwest will be augmented by bycatches (of unknown extent) in both Irish and French gillnets working the same areas. It therefore seems probable that the actual bycatch is significantly higher than even the non-conservative PBR for the combined SW England, Wales and Ireland population.

*Table 8.* ***Seal bycatch estimates by ICES Division 2016 (from Northridge et. al 2017 table A2.11[50])***

| Region | ICES Division | Estimated total bycatch | Two-Sided 95% LCL | Two-Sided 95% UCL | One-sided 90% UCL |
|---|---|---|---|---|---|
| **North Sea** | 4a | 24 | 20 | 29 | 28 |
| | 4b | 12 | 9 | 21 | 19 |
| | 4c | 42 | 29 | 125 | 110 |
| **West Scotland offshore** | 6b | 17 | 14 | 21 | 20 |
| **Irish Sea** | 7a | 8 | 6 | 26 | 23 |
| **Eastern Channel** | 7d | 120 | 70 | 391 | 341 |
| **Western Channel and Celtic Sea** | 7e | 181 | 138 | 330 | 304 |
| | 7f | 163 | 130 | 248 | 233 |
| | 7g | 16 | 13 | 32 | 29 |
| | 7h | 11 | 8 | 17 | 16 |
| | 7j | 12 | 9 | 18 | 17 |
| **Biscay** | 8abcd | 4 | 3 | 5 | 5 |

Despite the fact that the recorded bycatch levels are high relative to local population estimates, the populations in the region generally still continue to rise. A large proportion of the bycaught seals were assessed to be first or second year animals[50] and first year mortality is thought to be high in grey seals (SCOS-BP 17/02). If the bycatch mortality pre-dates this enhanced pup mortality it may have a relatively small effect on the dynamics of the populations. Notwithstanding such effects, the bycatch is unlikely to be sustainable by local populations. That they continue to increase suggests that the removals include or are being compensated for by immigrants from more distant breeding colonies in Scotland (see Q15 below).

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| **15. Does immigration potentially override the negative impact of bycatch in the SW or is bycatch a conservation issue that needs to be kept under review?**<br><br>**Are there any local areas that the Committee feel should be prioritised for management and conservation measures related to bycatch in England and Wales?** | Defra Q14<br><br>Defra Q15 |

**The scale of bycatch relative to local population size in the Celtic Sea suggests that significant immigration must be occurring (see Q 14).**

**We do not know the immigration rate of grey seals into the Celtic Sea although ongoing telemetry studies with grey seals at Islay, the Monach Isles and the Welsh Dee Estuary may help explore this. The lack of information on the source of seals caught in the Celtic Sea needs to be investigated but the status of local grey seal populations does not indicate an immediate conservation concern.**

**There is too little bycatch information at present to highlight any particular area for conservation concern, but grey and harbour seal populations in England are either increasing or are large and stable.**

Samples from bycaught animals that are suitable for DNA analysis are routinely collected from bycaught seals and have also been collected from grey seal pups at breeding sites in Wales with the help of NRW. Additional samples are required for breeding sites in Ireland and Western Scotland. This sampling in conjunction with ongoing work elsewhere to describe the grey seal genome in more detail should help us to determine the natal origin of the seals caught in nets. Progress on this issue will require additional funding.

The bycatch rate of seals certainly needs to be kept under review from a conservation perspective. Although there is no clear conservation concern at present, the disparity between bycatch rates and local population dynamics in SW Britain suggests that seals from other areas may be being taken. As argued above, the most likely source would be the west of Scotland. Although this population is large and apparently stable, the management implications of a potentially large take in a distant management unit should be monitored.

At present there are no indications that the declines in harbour seals in some seal management regions in Scotland are related to bycatch, English harbour seal populations are increasing and there do not appear to be conservation concerns associated with the observed bycatch rates of grey seals, as yet. However, given the scale of static net fisheries in the southwest, the amount of depredation that is being recorded during bycatch monitoring and the estimate of total bycatch in the region, the western channel and Celtic Sea would seem to be an appropriate area for additional work.

## Metrics for Monitoring Seals

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| **16. Are the current metrics for monitoring seal populations the most a) cost effective and b) appropriate for meeting obligations under various legislative drivers (i.e. the Conservation of Seals Act, the Marine (Scotland) Act, MSFD and the Habitats Directive)? If the current metrics used are not considered the most applicable what additional/alternative metrics can the Committee suggest?** | Defra Q6 |

**A seal monitoring options paper was drafted by the SMRU and tabled at the Healthy and Biologically Diverse Seas Evidence Group (HBDSEG) in June 2017. The report discusses current monitoring of seals (abundance and distribution, bycatch and seal strandings) and the legislative drivers for this work as well as enhanced monitoring options that could be considered in future.**

**A number of long term research projects are highlighted that could form the basis of future options, particularly to identify population pressures, including: estimating population demography metrics; pathogen, contaminant and toxin analyses; monitoring seal diet and at-sea seal distribution.**

**Considerable further work would be required in order to design and carry out robust and appropriate monitoring programmes.**

The Marine Science Co-ordination Committee (MSCC) is the steering committee set up to identify opportunities for the alignment and development of marine science to forward implementation of the above strategy (https://www.gov.uk/government/groups/marine-science-co-ordination-committee) and the Marine Assessment and Reporting Group (MARG) provides overall direction to the UK monitoring programmes. It defines monitoring programmes required to meet national, European and international obligations and commitments for assessing the state of, and managing, the marine environment. It oversees and coordinates the activities of the four UK Marine Monitoring and Assessment Strategy (UKMMAS) evidence groups, including the Healthy and Biologically Diverse Seas Evidence Group (HBDSEG). This group provides support to deliver the marine biodiversity assessments and both UK seal species are included in this activity as biodiversity indicators.

The UKMMAS data, monitoring and assessment action plan includes developing monitoring and assessment programmes for all its biodiversity indicators. To this end JNCC have drafted monitoring options papers for seabirds, cetaceans and deep seal benthic habitats as part of the UK Marine Biodiversity Monitoring Programme.

However, as seals have specific legislative drivers, a monitoring options paper was drafted by the SMRU and tabled at HBDSEG in June, after review and comments from the Inter-agency Working Group on Marine Mammals and Marine Scotland.

The aspects discussed in the UK Seal Monitoring Options paper include:

(1) current monitoring of seals (abundance and distribution, bycatch (secondary to the primary objective of this scheme to determine cetacean bycatch) and seal strandings (which are included in the scheme in Scotland but not in England and Wales)) and the legislative drivers for this work

and

(2) enhanced monitoring options that could be considered in future.

For the latter, a number of long term research projects are highlighted. These could form the basis of future options, particularly to identify population pressures, including:

- estimating population demography metrics,
- pathogen, contaminant and toxin analyses,
- monitoring seal diet
- monitoring at-sea seal distribution.

Costings for these options were not included. Considerable further work would be required to design and carry-out robust and appropriate monitoring programmes (particularly how and where to monitor, given the wide distribution, different life history and foraging strategies and population variability of UK seals) to estimate appropriate values for these additional parameters.

## Marine Strategy Framework Directive (MSFD)

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| **17. ICES advice to OSPAR in 2014 suggested assessment units for a variety of marine mammals, including harbour and grey seals. However, the 2017 OSPAR M3 interim assessment deviated from the proposed assessment units for grey seal abundance. At the UK scale there are already seal management areas (SMA) in place for Scotland and provisional seal management units for the remainder of the UK that are utilised in the SCOS reporting. It would be helpful to explore and explain the differences between these in order to clearly define a set of assessment and/or management units that can be consistently used for seal management, conservation and reporting in UK waters.** | Defra Q5 |

**The differences between the various management units or areas for UK grey seals have arisen because of differences in the conservation and management objectives of various legislative drivers and therefore the underlying reasons for their specification. The discrepancy is also because grey seals can undertake large scale movements during foraging. In addition, there are differences between the locations of their breeding colonies and non-breeding haulout sites. During the pupping season, thousands of animals may be associated with a particular colony which is rarely used at other times of the year.**

**For UK waters, the 14 areas used to assess pup production trends and to set PBRs using the summer counts of grey seals hauled out are consistent and can be combined if large assessment units or areas are required depending on the context and requirements of the management drivers.**

The areas designated under the Marine (Scotland) Act, 2010 (10 in Scotland) and those used by the Statutory Nature Conservation Bodies (SNCBs) (an additional 4 in England and Wales) are illustrated in Figure 2, SCOS-BP-17/03. The main driver for these management areas was to enable the Scottish Government to use the potential biological removal (PBR) method to estimate permissible anthropogenic takes for each region and use this information to assess licence applications for seal control and other marine activities (see SCOS BP-17/05).

OSPAR covers 5 regions of which two (Region II: Greater North Sea and Region III: Celtic Seas) are relevant to the UK. During the development of the Ecological Quality Objectives for the North Sea it was agreed that for grey seals the population trend objectives should be based on pup production since that metric has been long established as the most robust for determining changes in

population dynamics. Thus the agreed regional subunits were based around the critical breeding areas (Q1, Figure 2 above). These are Orkney; Fast Castle/Isle of May; the Farne Islands; Donna Nook[51]; the French North Sea and Channel coasts; the Netherlands coast; the Schleswig-Holstein Wadden Sea; Heligoland; Kjørholmane (Rogaland).

In 2014 the ICES Working Group on Marine Mammal Ecology[52] were asked by OSPAR to advise on appropriate management units for grey seals in the OSPAR Maritime area, with specific consideration be given to the common indicators (grey seal abundance at breeding and haulout sites). There is a considerable amount of movement of grey seals that occurs (as observed from telemetry data) among the different areas and regional subunits of the North Sea and no evidence to suggest that grey seals on the North Sea coasts of Denmark, Germany, the Netherlands or France are independent from those in the UK. Similarly on the west coast there is considerable movement of animals between France, Ireland western Scotland and Wales. Therefore the Working Group recommended that assessment units at a larger spatial scale would be more appropriate to the MSFD indicator assessments since they are not all based on pup production. Thus a single North Sea unit and a single western Britain, Ireland and western France unit was recommended[38].

For UK waters, the 14 areas used to assess pup production trends and to set PBRs using the summer counts of grey seals hauled out are consistent between areas and can be combined if large assessment units or areas are required depending on the context and requirements of the management drivers. In the 2017 OSPAR Interim assessment it was agreed that comparable abundance metrics, whose trends could be reliably assessed over time, would only be possible for a large assessment unit encompassing the Great North Sea and the UK part of the Celtic Sea. This was again because grey seals forage and move so widely and regularly but also because some populations are assessed from pup production which is converted to total population size (UK and the Netherlands) and others from counts of animals during their spring moult (https://oap.ospar.org/en/ospar-assessments/intermediate-assessment-2017/biodiversity-status/marine-mammals/seal-abundance-and-distribution/). For the pup production metric, 21 assessment units were used. Those in the UK were equivalent to 14 assessment areas described above (https://oap.ospar.org/en/ospar-assessments/intermediate-assessment-2017/biodiversity-status/marine-mammals/grey-seal-pup/).

## OSPAR seals abundance assessment

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| **18. The draft conclusions of the OSPAR seals abundance assessment identified a number of areas where the potential course in the decline in seal population remains unclear including:**<br>• **The historical and present dynamic between grey seals and harbour seals. As grey seal populations recover, harbour seals may face increased competitive pressure from grey seals that could have a detrimental effect on their abundance.**<br>• **The increase of additional human pressures such as pollution and underwater noise could influence future growth by determining the level of carrying capacity.**<br>**Can the Committee provide their view on the conclusion of the assessment and suggest a way to address these uncertainties?** | Defra Q10 |

[51] SCOS note that the recently established but now large colonies at Blakeney and Horsey are not included in this list, but their inclusion would not alter the area designations.
[52] ICES. 2014. Report of the Working Group on Marine Mammal Ecology (WGMME), 10–13 March 2014, Woods Hole, Massachusetts, USA. ICES CM 2014/ACOM:27. 234 pp.

**Grey seals may have a detrimental effect on the abundance of harbour seals through competition and or direct predation. Factors such as pollution and noise could also affect the potential population growth. Determining their relative importance will require dedicated research studies, the results of which would inform predictive population dynamics models.**

The draft conclusions of the OSPAR seal abundance assessment highlighted some potential causes for the decline in harbour seals in some regions of the UK. They included increased competition between grey and harbour seals. Information on diet composition and the spatial and temporal abundance of the various prey items as well as overlap in foraging areas all need to be considered before inter-specific competition can be confirmed or quantified.

Research into the diet of grey and harbour seals (funded by Scottish Government with additional support from Natural England) carried out in 2011 and 2012[53,54] indicated that these species do feed on similar prey, at the same time of year and in the same regions. However, the fish size classes preferred by the different species varied. Investigating these aspects empirically to reduce uncertainty will be challenging, both from a logistical and a scientific viewpoint. An accurate assessment of prey availability is essential for assessing the potential for and impacts of competition. Ideally, coordinated diet sampling and foraging behaviour studies need to be carried out for both species simultaneously. Grey seals forage over wide areas so investigating overlap between the species requires a broad geographical spread to ensure that animals foraging in one region but hauling out in another are included. Data on fish prey abundance at the fine scale required is not currently available and can only be collected by dedicated fish surveys which target the foraging areas.

Establishing the level of predation by grey seals on harbour seals and estimating the associated uncertainty for a given region is also likely to be difficult. Cases of grey seal predation on harbour seals are geographically widespread and can be identified post mortem. However, the proportion of dead seals washing ashore and then being reported to the strandings schemes is low. Under-reporting and logistical problems mean that stranding scheme coverage is sporadic in most areas even in Scotland where the Scottish Marine Animal Stranding Scheme has a remit to carry out post-mortem examinations on seals. Those that are reported are often too decomposed for cause of death to be established.

Studies to investigate the impact of both pollution (including emerging contaminants as well as the legacy pollutants) and underwater noise (see Q8 above) continue to be carried out. For example, recent results on the concentrations of organochlorine pollutants in grey seal pups from the Isle of May (SCOS-BP 17/06) suggest a modest but significant decrease in PCBs has occurred between 2002 and 2015, whereas DDT levels have increased over the same period. In both cases, the concentrations measured are below the limits that cause immediate negative health effects in seals. The consequences of the observed changes are unknown and investigation of the impact of PCBs, PBDEs and DDTs on measures of energy balance are continuing. Findings from these studies can be used in risk assessments to estimate their likely effect on populations.

It is unlikely that noise or pollution effects will operate by directly reducing the carrying capacity of the environment. Establishing carrying capacity for any marine mammal population has proven to be extremely difficult against a background poorly documented and changing prey abundance. It will be more challenging when two species with similar foraging capabilities and diets are potentially competing for the same resources.

[53]Wilson, L.J. and Hammond P.S, 2016. Harbour seal diet composition and diversity. Scottish Marine and Freshwater Science Report, Vol. 7, No. 21, Marine Scotland Science.
[54]Hammond, P.S. and Wilson, L.J. 2016. Grey seal diet composition and prey consumption. Scottish Marine and Freshwater Science Vol. 7, No. 20. Marine Scotland Science.

## Climate change

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| **19. What are considered the most likely potentially significant impacts of climate change on seal populations?** | Defra Q11 |

**Ongoing work suggests that both grey and harbour are at risk of range contraction at the southern end of their range under predicted climate changes in both the lowest and highest warming scenarios presented by the IPCC. However these scenarios do not take account of potential prey re-distributions.**
**Climate change impacts may include:**

- **Water temperature changes leading to:**
  - **changes in habitat availability**
  - **changes in prey distribution**
- **Sea level rise leading to**
  - **reduced haulout and breeding site availability**
  - **Increased exposure to wave action and flooding.**
- **Increased exposure to Harmful Algal Blooms**
- **Exposure to novel diseases/pathogens**
- **Changes in coastal use patterns**
- **Changes in predation risk**

Most of the research focus on the impact of climate change on marine mammals has been on arctic species that are threatened by shrinking suitable habitats. Changes in cold temperate waters may also be profound and will likely impact on continental shelf marine predators such as seals. SCOS-BP 17/07 presents a preliminary exploration of potential habitat shifts of both harbour and grey seals, in two scenarios of climate change, using seal telemetry data and environmental grids. Core habitat determined through telemetry locations was projected on the lowest and highest scenarios of warming as determined for the IPCC's 2014 report (SCOS-BP 17/07).

The low warming scenario predicted an overall compression of core habitat, with slight loss of habitat in the northern and extensive habitat loss in the southern edges of distribution in the North Atlantic. In the high warming scenario, there was a general northward shift in predicted core habitat in the North Atlantic for both species. In geographical terms the northern expansion of habitat exceeds the southern contraction so that both species would be predicted to have larger habitat extents in the future. However specific loss of the habitat on the Scotian shelf means that areas currently holding the majority of the grey seals in the western Atlantic will likely be lost.

The present methodology seems to be a useful tool for initial exploration of a species' potential climate-related changes in habitat. However, explicit consideration of prey species responses to climate change will be needed to improve predictions.

In temperate regions environmental changes will probably manifest themselves as changes in prey distributions, abundance and availability as a consequence of oceanographic changes. Earlier stratification of warmer water and changes in the timing of plankton blooms and secondary production blooms will likely have effects throughout the food chain. Such changes have already been detected in the North Sea at several levels of the food chain. Changes in flow patterns and locations of frontal systems may also impact seal foraging habitat quality.

An additional concern is the spread of infection into regions where organisms may not previously had the capacity to survive, due to unfavorable environmental conditions. Coupled with this is the concern about the spread and persistence of antimicrobial resistance. Marine mammals can act as reservoirs and vectors of antimicrobial resistance genes (AMRG) which may have consequences for public health, the treatment of zoonoses and animal fitness. Studies on the occurrence of AMRG in seals are currently being undertaken. Early results in grey seals (females and pups) from the Isle of May suggest that seal gut bacteria have acquired a range of antimicrobial genes.

Associated with assessing the risk of emerging diseases to seals is the need to understand and characterize their immune system. Studies on the nature of early immune protection in grey seals are currently being carried out (SCOS-BP 17/08). Results indicate that the transition between colostrum and mature milk in this species is more rapid than yet found in any other mammal and that immune factors, particularly immunoglobulin G, were unusually persistent throughout lactation.

Continued sea level rise is an inevitable consequence of the projected climate trends. Although projected rises are modest they will encroach on seal haulout and breeding sites. In areas such as the Wash, with mainly intertidal haulout sites, there may be some loss of habitat but the scale of such losses will depend on the extent of sea defence efforts. Where sea defences are abandoned new habitat will likely replace these losses. On existing breeding sites, seals will be more exposed to wave action particularly during storms and this is likely to increase pre-weaning pup mortality. Storm frequency and intensity are both expected to increase further exacerbating such problems.

Potential increased tourism associated with increased summer temperatures around the UK coasts may increase and extend the geographical scope of disturbance issues particularly for harbour seals.

Range shifts of other species in response to temperature changes may expose seals to novel and or increased predation risks.

## Grey seal predation

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| **20. The predation of harbour seal, harbour porpoise and grey seal pups by grey seal has been documented in several countries within the Northeast Atlantic (UK, Germany, The Netherlands, Belgium and France). On 30 April 2017 an ICES workshop 'Predator-prey Interactions between Grey Seals and other marine mammals (WKPIGS)' was held to further explore this issue and to:**<br><br>**a ) Define and harmonise the pathological indicators of a grey seal predation event in marine mammal carcasses;**<br>**b ) Describe the known prevalence and spatio-temporal trends of grey seal predation on other seals and harbour porpoises across the North Atlantic;**<br>**c ) Identify potential environmental or demographic drivers of the behaviour and trends;**<br>**d ) Discuss potential methods to quantify the impact of grey seal predation on harbour seal and harbour porpoise populations and to quantify the importance of cannibalism in grey seals;**<br>**e ) Identify knowledge gaps and develop a collaborative program of research to address these.**<br>**Can you provide a summary of the findings/conclusions from WGPIGS, particularly in relation to b and c above, and, if possible, the workshop report (due for completion on 1 June 2017) appended as an information paper to the SCOS report? Can the Committee also advise on how to best progress the findings/conclusions of the working group?** | Defra Q16 |

**The I.C.E.S. WKPIGS workshop report was not available for the SCOS meeting. A preliminary draft was discussed. The report was published shortly after the SCOS meeting[55] and the executive summary is presented below for information.**

A one day Workshop on Predator-prey Interactions between Grey Seals and other marine mammals (WKPIGS) focused on predatory behaviour of grey seals (*Halichoerus grypus*) towards other grey seals, harbour seals (*Phoca vitulina*) and harbour porpoises (*Phocoena phocoena*) in European waters was convened in April 2017. It was attended by 30 scientists from organisations in six nations across Europe, and the USA and aimed to define and harmonise the pathological indicators of grey seal predation events across nations and to collate data on the prevalence and distribution of such events. A further objective was to discuss methods to aid in detection of predation events and potential population level consequences of reported incidences. The report summarises the presentations and discussions held in each of four workshop sessions: pathological indicators, distribution and prevalence, population consequences and research priorities.

The challenge of ascribing grey seal predation as the cause of a mortality event from limited pathological evidence was discussed. In cases where the behaviour has been observed in pinnipeds, a straight-edged wound margin which spirals around the carcass is typical; however, most cases are not directly observed. Inferring grey seal predation as a cause of death from stranding reports, photographs and necropsies occurs by ruling out other potential causes of death and by examining the macroscopic and microscopic pathology. Decision-trees have been reported elsewhere and the workshop focused on the challenges of distinguishing grey seal predation from grey seal scavenging and from scavenging by other (terrestrial or avian) predators. New techniques examining the histo-pathology of wound margins and forensic (DNA) evidence can aid in detection of tearing of warm tissue (indicator of active predation) and in ruling out predators other than grey seals.
Reported cases of grey seal predation events in Europe were collated and summarised. The behaviour has been detected throughout much of the grey seal range, although information is lacking from some key areas. Seasonal trends of predation on pinnipeds peaked during their respective pupping/mating seasons while cases of predation on harbour porpoises peaked in spring months. A total of 737 cases were reported, peaking in 2016.

The implications of these findings for populations of grey seals, harbour seals and harbour porpoises were limited by the challenges of detecting the true prevalence of the behaviour in the grey seal population. The incidence of grey seal predation on other marine mammals steadily increased over the last 10 years although it is not known if this represents a true increase in prevalence, reflects the steady increase in European grey seal numbers over the same period or is due to an increase in effort and reporting. It was noted that if previously high rates of harbour seal mortality due to grey seal predation were sustained, they could potentially account for observed declines in some populations. Coupled with the rise in European grey seal numbers, this could become the most important driver of local harbour seal extinctions in populations already beyond natural recovery. Future research priorities include continued standardisation of pathological indicators, development of affordable DNA screening techniques and possible targeted ground surveys of for example, breeding sites where the behaviour has been detected to increase our understanding of prevalence. If possible, telemetry devices could be attached to grey seals exhibiting the behaviour to further study their movements at sea and gain an understanding of the ecological importance of the behaviour from both the individual and population level.

[55] http://www.ices.dk/sites/pub/Publication Reports/Expert Group Report/SSGEPD/2017/01 WKPIGS - Report of the Workshop on Predator-prey Interactions between Grey Seals and other marine mammals.pdf

## Seal Foraging

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| **21. What is SCOS' view on the role of foraging radii of grey seals in defining the spatial scale at which effects on a population, in the context of Habitat Regulations Assessments (HRA) or Environmental Impact Assessments (EIA), should be considered?**<br><br>**In relation to question 2, what is SCOS' view on defining foraging ranges (as above) based on energetics rather than travel distances, especially for weaned pups and adult grey seals outside of the breeding season?** | NRW Q2 & NRW Q3 |

**The various Statutory Nature Conservation Bodies in the UK and N.I. use differing metrics to determine the spatial scale at which anthropogenic activities need to be considered in HRAs and EIAs.**

**Foraging radii and energetics models are used to assess effects of the activities of central place foragers such as colonial breeding seabirds, but are not thought useful for grey seals.**

At present the various SNCBs in the UK apply different criteria for assessing the geographical scale at which anthropogenic activity should be considered with respect to impacts on SAC populations. In practice this means that individual permit/licencing applications are treated on a case by case basis taking into account local conditions and relevant available information. Essentially the information required to make such assessments is an estimate of the probability that an animal impacted by human activity is from or is associated with a particular SAC or other protected population or management unit (This issue has already been discussed in the context of bycatch in the Celtic Sea in answer to Q15 above).

Assessing the spatial scale that needs to be considered in the context of HRA and EIAs requires information on movements between breeding sites and other locations used throughout the year. Russell *et al.*[56] argued that there is little requirement to differentiate at-sea time into 'travelling', 'foraging' and 'resting' and the following discussion does not differentiate between movement types. Also, the discussion below is restricted to movement connectivity and does not cover the likely individual consequence (displacement and/or change in reproductive potential) or population consequence of any anthropogenic disturbance or injury.

Grey seals undertake from one- to 20 or more-day foraging trips to sea. Frequently the departure and return haulout sites are the same, but individuals may also travel hundreds of kilometres to a distant site. This inter-haulout movement means that using 'haulout site specific' foraging trip radii to define MU's as applied to bird movement from breeding colonies[57] is not generally applicable for grey seals.

As capital breeders, grey seals have the ability to store large amounts of energy as blubber. Thus well-provisioned weaned pups and adults have the potential to travel over 1,000 km before starvation. Thus the energetic basis for MU delineation is not appropriate for most animals unless in the special case where they are in poor condition or nutritionally stressed.

[56]Russell, D.J.F., McClintock, B.T., Matthiopoulos, J., Thompson, P.M., Thompson, D., Hammond, P.S. *et al.* (2015). Intrinsic and extrinsic drivers of activity budgets in sympatric grey and harbour seals. Oikos, 124, 1462-1472.
[57]Thaxter, C.B., Lascelles, B., Sugar, K., Cook, A.S.C.P., Roos, S., Bolton, M. *et al.* (2012). Seabird foraging ranges as a preliminary tool for identifying candidate Marine Protected Areas. Biological Conservation, 156, 53-61.

Grey seal movements are extensive and, biologically, their categorisation into management units risks over-simplification. Indeed, recent studies[58] suggest that Evans et al.'s[59] statement that "Telemetry studies suggest that [grey] seals may make foraging trips to highly localised areas, with animals from a particular locality tending to remain in that region." may need to be revisited.

The advantage of MU's is that that they provide a simple and transparent framework. However, they may not capture the variability and extent of grey seal movement. The latter concern can only be addressed by an analysis of available movement data or the use of genetic markers to identify immigration and emigration between populations.

[58]Russell, D.J.F., McConnell, B., Thompson, D., Duck, C., Morris, C., Harwood, J. *et al.* (2013). Uncovering the links between foraging and breeding regions in a highly mobile mammal. *Journal of Applied Ecology*, 50, 499-509.
[59]Evans, P. G. H. 2012. Recommended Management Units for Marine Mammals in Welsh Waters. *CCW Policy Research Report* CCW.

## ANNEX I

**NERC Special Committee on Seals**

Terms of Reference

1. To undertake, on behalf of Council, the provision of scientific advice to the Scottish Government and the Home Office on questions relating to the status of grey and harbour seals in British waters and to their management, as required under the Conservation of Seals Act 1970, Marine Coastal and Access Act 2009 and the Marine (Scotland) Act 2010.

2. To comment on SMRU's core strategic research programme and other commissioned research, and to provide a wider perspective on scientific issues of importance, with respect to the provision of advice under Term of Reference 1.

3. To report to Council through the NERC Chief Executive.

**Current membership**

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| Dr M. Hammill (Chair) | Maurice Lamontage Institute, Canada; |
| Professor A. Hall | Sea Mammal Research Unit, University of St Andrews; |
| Dr F. Daunt | Centre for Ecology and Hydrology, Edinburgh; |
| Dr J. Forcada | British Antarctic Survey, Cambridge; |
| Dr K. Brookes | Marine Scotland, Science, Aberdeen; |
| Dr J. Teilmann | Aarhus University, Denmark; |
| Dr C. Lynam | Centre for Environment Fisheries and Aquaculture Science, Lowestoft; |
| Professor P. Thompson | Institute of Biological and Environmental Sciences, University of Aberdeen; |
| Dr O. Ó Cadhla | National Parks and Wildlife Service, Ireland; |
| Dr D. Mason (Secretary) | Natural Environment Research Council, Swindon Office. |

## ANNEX II

### Questions from Marine Scotland

Dear Mrs Mason

MARINE (SCOTLAND) ACT 2010 (CONSEQUENTIAL PROVISIONS) ORDER 2010: ANNUAL REVIEW OF MANAGEMENT ADVICE

Thank you for your letter of 9 May concerning the next meeting of the Special Committee on Seals on 13 and 14 September 2017 and asking whether the Scottish Government has any specific questions on which it would welcome the Committee's scientific advice.

It would be very helpful if the Committee could provide a general update on seal populations and respond to some more specific questions on particular issues as set out below.

We have, as usual, structured our request for advice from the Committee in two broad categories. The first comprises a shorter than usual list of standard questions seeking a update on some of the key information regularly provided by the Committee in previous years:-

**1. What are the latest estimates of the number of seals in Scottish waters?**

**2. What is the latest information about the population structure, including survival and age structure, of grey and harbour seals in European and Scottish waters? Is there any new evidence of populations or sub-populations specific to local areas?**

Specific questions about improving seal management:-

**Harbour Seal Populations**

3. Is the existing harbour seal decline recorded in several local areas around Scotland continuing or not and what is the position in other areas?

4. What is the latest understanding of the causes of the recent decline in harbour seals? It would be useful to have a brief (1 page) updated summary of the causal factors so far eliminated as significant, the causal factors that remain contributory and the causal factors considered most likely to be significant and which should be the main focus for investigation.

5. In light of the latest information, should the Scottish Government consider introducing any additional seal conservation areas to protect vulnerable local harbour seal populations or, alternatively, should it consider revoking any existing seal conservation areas? It would be particularly useful to have views on the utility of the current Western Isles Conservation Area.

**Seal Licensing and PBRs**

6. What, if any, changes are suggested in the Permitted/Potential Biological Removals (PBRs) for use in relation to the seal licence system? This seeks an update of the PBR for seal licensing.

**Seals and Marine Renewables**

7. What is the latest understanding of interactions actual or potential between seals and marine renewable devices and possible mitigation measures? What are the questions that remain to be addressed?

**Seals and River Fisheries**

8. What is the latest understanding of potential non-lethal options for deterring seals from entering and/or transiting up river systems or, if necessary, relocating them from there? It would be useful to have a short summary of the latest position on the effectiveness of ADDs in this role. It would also be particularly interesting to have the Committee's views on the options of electric barriers and relocation.

**Seals and Fish Farms**

9. What is the latest understanding of interactions between seals and fin fish farms and possible mitigation measures? It would be particularly interesting to have the Committee's views on non-lethal options including improved nets, ADDs, electric barriers, taste aversion and possible relocation.

**Use of Acoustic Deterrents**

10. What advice can be provided on the use of acoustic deterrent devices (i.e. types, frequencies, trigger mechanisms and usage patterns) that might be most effective in deterring seals without disturbing cetaceans? How might these differ in the scenarios of employment of ADDs at fisheries. fish farms and tidal energy devices respectively.

**Climate Change**

11. What are considered the most likely potentially significant impacts of climate change on seal populations?

As in previous years, it is our intention to publish a link to the advice provided by the Committee on the Scottish Government web-site. We will liaise about the timing of that in due course.

I also enclose the information requested on licences issued by the Scottish Government during 2016 under The Marine (Scotland) Act 2010. This information can be found on the Scottish Government web-site through the following link (see Tables 1, 2a and 2b):-
http://www.gov.scot/Topics/marine/Licensing/SealLicensing/2011/2016

I am copying this letter to Defra colleagues for information.

Yours sincerely

IAN WALKER
Marine Conservation

## Questions from Defra

Dear Mrs Mason

# CONSERVATION OF SEALS ACT 1970: ANNUAL REVIEW OF MANAGEMENT ADVICE

Thank you for your email letter of 09 May 2017, asking if Defra has any specific questions on which it wishes to receive scientific advice.
The following are standard questions seeking a general update on information regularly provided by the Committee in previous years but relating to seals in English waters on the understanding that each devolved administration would ask similar questions so that a UK wide picture would be provided in the annual SCOS report.

**Seal populations in English waters**

1. What are the latest estimates of the number of seals in English waters?
2. What is the latest information about the population structure, including survival and age structure, of grey and common/harbour seals in English waters and is there any new evidence of populations or sub-populations specific to local areas?

The following are specific questions on improving seal management:-

**Seals and their non-lethal management**

3. Following your 2016 advice regarding non-lethal mitigation measures to minimise seal interactions with salmon netting stations, river fisheries, fish farms and marine renewable devices, and deterring seals from entering and/or transiting up river systems, do you have any additional information to further facilitate the development of non-lethal conflict resolution advice?
4. Following the 2016 summary of limited evidence available, has there been any further work on understanding of the relative effectiveness of existing models of acoustic deterrents for preventing seal predation at fisheries or fish farms (including locations with or without a high level of cetacean presence)?

**Marine Strategy Framework Directive (MSFD)**

5. ICES advice to OSPAR in 2014 suggested assessment units for a variety of marine mammals, including harbour and grey seals. However, the 2017 OSPAR M3 interim assessment deviated from the proposed assessment units for grey seal abundance. At the UK scale there are already seal management areas (SMA) in place for Scotland and provisional seal management units for the remainder of the UK that are utilised in the SCOS reporting. It would be helpful to explore and explain the differences between these in order to clearly define a set of assessment and/or management units that can be consistently used for seal management, conservation and reporting in UK waters.

**Metrics for Monitoring Seals**

6. Are the current matrices for monitoring seal populations the most a) cost effective and b) appropriate for meeting obligations under various legislative drivers (i.e. the Conservation of Seals Act, the Marine (Scotland) Act, MSFD and the Habitats Directive)? If the current matrices used are not considered the most applicable what additional/alternative matrices can the Committee suggest?

**Seals and Marine Renewables**

7. Following the 2016 advice, is there any further understanding of interactions actual or potential

between seals and marine renewable devices and possible mitigation measures?

8. What progress is being made in understanding how seals behave around tidal turbine devices, including diving behaviour, and about what might be an appropriate avoidance rate to be applied in collision risk modelling?

**Seal legislation**

9. Does the Committee consider that there is a significant scientific requirement or advantage to updating the Conservation of Seals Act 1970, For example, definitions and applications of closed seasons, the netsmen's defence and the potential for the introduction of mandatory recording and/or licencing of shooting?

**OSPAR seals abundance assessment**

10. The draft conclusions of the OSPAR seals abundance assessment identified a number of areas where the potential course in the decline in seal population remains unclear including:
    a. The historical and present dynamic between grey seals and harbour seals. As grey seal populations recover, harbour seals may face increased competitive pressure from grey seals that could have a detrimental effect on their abundance.
    b. The increase of additional human pressures such as pollution and underwater noise could influence future growth by determining the level of carrying capacity.

    Can the Committee provide their view on the conclusion of the assessment and suggest a way to address these uncertainties?

**Interaction between fishers and seals**

11. We have seen increasing complaints from the fishing industry in certain areas where reports of depredation of large percentages of catch are reported. There is concern around interactions between fishers and seals and the use of lethal means of control. Can the Committee provide advice on what the extent of the issue is in specific problem areas?

**Seal Bycatch**

12. We noted that the conclusions of SCOS 2015 and 2016 estimated that bycatch of grey seals in particular were high, whilst conversely; the UK MSFD indicator for seal abundance and distribution concluded that, throughout their range, grey seals have increased in number. How can we best address these differences in findings and present constant messaging?
13. What is the latest information on the levels of bycatch in local areas? Are there any areas where it has not been possible to collect seal population/bycatch data and can the Committee provide advice on how to collect additional information?
14. Does immigration potentially override the negative impact of bycatch in the SW or is bycatch is a conservation issue that needs to be kept under review?
15. Are there any local areas that the Committee feel should be prioritised for management and conservation measures?

**Grey seal predation**

16. The predation of harbour seal, harbour porpoise and grey seal pups by grey seal has been documented in several countries within the Northeast Atlantic (UK, Germany, The Netherlands, Belgium, France). On 30 April 2017 an ICES workshop 'Predator-prey Interactions between Grey Seals and other marine mammals (WKPIGS)' was held to further explore this issue and to:
    a ) Define and harmonise the pathological indicators of a grey seal predation event in marine mammal carcasses;
    b ) Describe the known prevalence and spatio-temporal trends of grey seal predation on other seals and harbour porpoises across the North Atlantic;

c ) Identify potential environmental or demographic drivers of the behaviour and trends;
d ) Discuss potential methods to quantify the impact of grey seal predation on harbour seal and harbour porpoise populations and to quantify the importance of cannibalism in grey seals;
e ) Identify knowledge gaps and develop a collaborative program of research to address these.
Can you provide a summary of the findings/conclusions from WGPIGS, particularly in relation to b and c above, and, if possible, the workshop report (due for completion on 1 June 2017) appended as an information paper to the SCOS report? Can the Committee also advise on how to best progress the findings/conclusions of the working group?

Yours sincerely

Sarah Jones

Marine Species Protection Policy Advisor

## Questions from Natural Resources Wales

Dear Debbie

**CONSERVATION OF SEALS ACT (1970): ANNUAL REVIEW OF MANAGEMENT ADVICE**

Thank you for your email to ask if Natural Resources Wales (NRW) has any specific questions on which it wishes to receive scientific advice.

It would be very helpful if the Committee could provide a view on the following questions:

1. What is the status of grey seal populations in UK?

2. What is SCOS' view on the role of foraging radii of grey seals in defining the spatial scale at which effects on a population, in the context of HRA or EIA, should be considered?

The context for question 2 comes from the suitability or otherwise of using Marine Mammal Management Units (MMMU) or foraging/travel distances as the appropriate spatial scales for screening in Special Areas of Conservation (SACs) and developments in Habitats Regulations Assessments (HRA).

For sea birds, management units (MU) are not used. Instead, distances from a development or its effect footprint are used to decide which sites (Special Protection Areas -SPAs) and developments should be considered (screened in) in an HRA. Thaxter et al (2012) foraging ranges (mean max distances) are commonly used as the evidence for screening out (ie not considering) sites (SPAs) that are beyond the foraging ranges for particular species.

SCOS (2014) (Q7) provided maximum ranges and mean maximum ranges from satellite tracked grey seal pups and adults from around Wales, and Q6 of SCOS (2014) indicated the connectivity of grey seals between/among SACs in the UK (also see Pomeroy et al 2014 for connectivity in Wales from photoID results). For HRAs in Wales, typically we would include all (multiple) SACs/developments in the large South and West England and Wales Management Unit because it provides the currently agreed spatial scale of the population and its management and is underpinned by evidence of connectivity among colonies within the MU (e.g Baines et al 1995; Keily et al 2000; Pomeroy et al 2015; SCOS 2013, 2014; Thompson 2011; Vincent et al 2005). However, the large size of this MU means that the environmental assessments are often not considered proportionate ie sites and developments far away are arguably unnecessarily considered in an assessment, with little material difference to the outcome of the consent decision, whilst placing an additional administrative burden on applicants and regulators. Further, there could be a risk that undertaking an assessment at such a broad spatial scale detracts from a thorough consideration of local effects and impact pathways.

It would be of value to get SCOS' view on the benefits and disadvantages, from a **scientific perspective**, on the use of foraging or travel ranges (radii) at different times of the year (breeding/non-breeding) as opposed to a fixed spatial scale of the management unit in assessing impacts on populations. Moreover, when using either approach (MU or distances), how would SCOS go about determining proportional contribution, ie what proportion of seals from SAC x and SAC y are impacted from a development at location z. The advice will help will inform management decisions.

3. In relation to question 2, what is SCOS' view on defining foraging ranges (as above) based on energetics rather than travel distances, especially for weaned pups and adult grey seals outside of the breeding season?

Baines ME, Earl SJ, Pierpoint CJL, Poole J (1995) The west Wales grey seal census. CCW Contract Science Report No. 131. Countryside Council for Wales, Bangor

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Pomeroy, P, Rosas Da Costa, O & Stringell, TB, (2014). Grey seal movements – photoID. SCOS Briefing Paper. *In* SCOS 2014. Scientific Advice on Matters Related to the Management of Seal Populations: 2014. Special Committee on Seals, SMRU, University of St Andrews

SCOS (2013) Scientific Advice on Matters Related to the Management of Seal Populations: 2013. Special Committee on Seals, SMRU, University of St Andrews

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Thompson D (2011) Grey Seal Telemetry Study. In: Anon (ed) Assessment of Risk to Marine Mammals from Underwater Marine Renewable Devices in Welsh waters Phase 2 - Studies of Marine Mammals in Welsh High Tidal Waters. RPS for Welsh Government

Vincent C, Fedak MA, McConnell BJ, Meynier L, Saint-Jean C, Ridoux V (2005). Status and conservation of the grey seal, *Halichoerus grypus*, in France. Biological Conservation 126:62-73.

## ANNEX III

### Briefing Papers for SCOS

The following briefing papers are included to ensure that the science underpinning the SCOS Advice is available in sufficient detail. Briefing papers provide up-to-date information from the scientists involved in the research and are attributed to those scientists. Briefing papers do not replace fully published papers. Instead they are an opportunity for SCOS to consider both completed work and work in progress. It is also intended that briefing papers should represent a record of work that can be carried forward to future meetings of SCOS.

### List of briefing papers

**17/01** Estimating the size of the grey seal population between 1984 and 2016. Thomas, L.

**17/02** 2017 Annual review of priors for grey seal population model. Russell, D.J.F.

**17/03** The status of UK harbour seal populations in 2016 including summer counts of grey seals. Duck, C., Morris, C.D. and Thompson, D.

**17/04** Harbour seal decline - vital rates and drivers. A progress report on Year 2. Arso Civil, M., Smout, S., Thompson, D., Brownlow, A., Davison, N., ten Doeschate, M., Duck, C.D., Morris, C.D., Cummings, C., McConnell, B. and Hall, A.J.

**17/05** Provisional Regional PBR values for Scottish seals in 2018. Thompson, D., Morris, C.D. and Duck, C.D.

**17/06** Persistent organic pollutant concentrations in grey seal weaned pups from the Isle of May, 2015 compared to 2002. Robinson, K., Bennett, K., Eppe, G., and Hall, A.J.

**17/07** Potential Future Global Distributions of Grey and Harbour Seals under different climate change scenarios. Zicos, M., Thompson, D. and Boehme, L.

**17/08** Protein and metabolite changes in seal milk from birth to desertion. Lowe, A.D., Bawazeer, S., Watson, D.G., Eadie-McGill, S., Burchmore, J.S., Pomeroy, P.P. and Kennedy, M.W.

# Estimating the size of the UK grey seal population between 1984 and 2016.

Len Thomas.

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**Abstract**

We estimated grey seal population size in 2016 by projecting forwards one year from the outputs of the population model derived in last year's briefing paper. That model is a Bayesian state-space model of seal population dynamics, fitted to regional estimates of pup production from 1984-2014 and two independent estimates of total population size in 2008 and 2014. Estimated adult population size in regularly monitored colonies in 2016 is 128,200 (95% CI 106,200-154,400), an increase of approximately 1% on the 2015 estimate.

## Introduction

This paper presents estimates of British grey seal population size, building on the model fitted by Thomas (2016). No new data were available, and no information came to light requiring revision of the model priors; hence, estimates for 2016 were obtained by projecting forwards from the 2015 estimates, using parameter estimates from the fitted model.

## Methods

Full details of the population dynamics model, data and fitting methods are given by Thomas (2015) and references therein. Model fitting in Thomas (2015) used a stochastic simulation-based procedure, which yielded a set of 28,500,000 weighted samples from the joint posterior distribution of model parameters and states, including age-specific population size in each year 1984-2015. To generate population estimates for 2016, we (1) extracted 100,000 samples from this distribution by sampling with replacement and probability proportional to the weights; (2) projected each sample forward stochastically using the population dynamics model, and the demographic parameter values and 2015 population size for that sample. Estimates given here are the posterior predictive mean (i.e., mean of the projected samples), with 95% equal-tailed credible interval ($2.5^{th}$ and $97.5^{th}$ percentile of projected samples).

## Results and Discussion

Estimated pup production was 50,700 (95% CI 44,200-58,700) and adult population size was 128,200 (95% CI 106,200-154,400). These estimates are shown in Figures 1 and 2, together with those for previous years from Thomas (2016). Estimated adult population size in 2015, from Thomas (2016), was 127,100 (95%CI 105,900-151,900), so the estimate for 2016 is approximately 1% higher. Adult population estimates for each year are given in the Appendix, from which it is clear that population growth is not uniform across regions: the populations are estimated to be stable in Inner Hebrides, Outer Hebrides and Orkney, but growing (approx. 3% per year) in North Sea.

## References

Thomas, L. 2016. Estimating the size of the UK grey seal population between 1984 and 2015. SCOS Briefing Paper 16/02

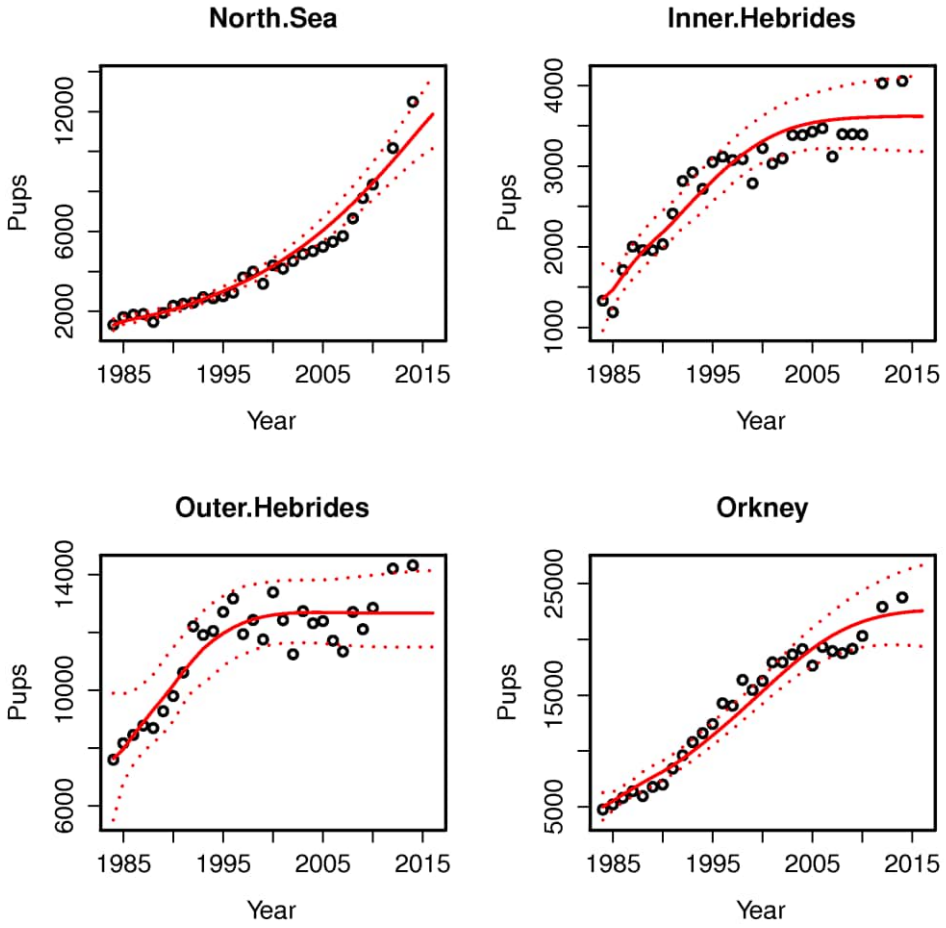


**Figure 1.** Posterior mean estimates of pup production (solid lines) and 95%CI (dashed lines) from the model of grey seal population dynamics, fitted to pup production estimates from 1984-2014 (circles) and the total population estimates from 2008 and 2014. Fit is taken from Thomas (2016), with estimates for 2016 added by simulating forwards from the fitted model.

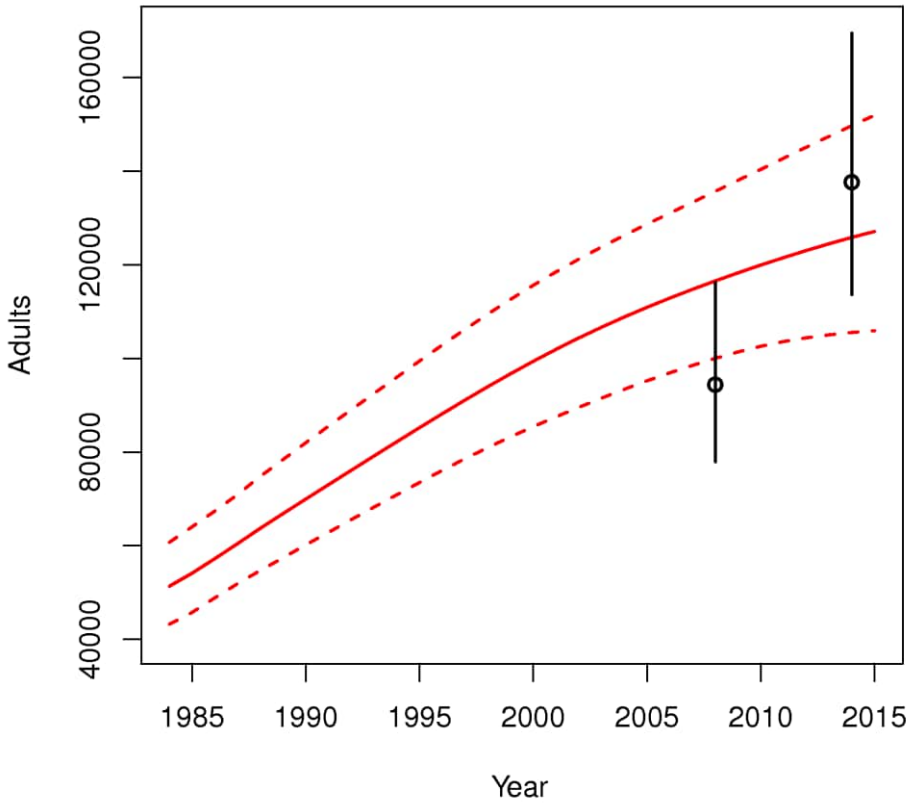


**Figure 2.** Posterior mean estimates (solid lines) and 95%CI (dashed lines) of total population size in 1984-2016 from the model of grey seal population dynamics, fit to pup production estimates from 1984-2014 and total population estimates from 2008 and 2014 (circles, with vertical lines indicating 95% confidence interval on the estimates). Fit is taken from Thomas (2016), with estimates for 2016 added by simulating forwards from the fitted model.

**Appendix**

Estimates of total population size, in thousands, at the beginning of each breeding season from 1984-2015, made using the model of British grey seal population dynamics fit to pup production estimates from 1984-2014 and total population estimates from 2008 and 2014. Numbers are posterior means followed by 95% credible intervals in brackets. Estimates are taken from Thomas (2016), with estimates for 2016 added by simulating forwards from the fitted model.

| Year | North Sea | Inner Hebrides | Outer Hebrides | Orkney | Total |
|---|---|---|---|---|---|
| 1984 | 4.7 (4 5.5) | 5 (4.2 5.9) | 23.3 (19.7 27.6) | 18.4 (15.4 21.7) | 51.4 (43.2 60.7) |
| 1985 | 5 (4.2 5.8) | 5.2 (4.4 6.2) | 24.4 (20.6 29) | 19.5 (16.5 23) | 54.1 (45.8 64) |
| 1986 | 5.4 (4.6 6.3) | 5.5 (4.7 6.5) | 25.5 (21.8 30.3) | 20.8 (17.7 24.3) | 57.2 (48.9 67.4) |
| 1987 | 5.8 (5 6.7) | 5.8 (5 6.9) | 26.5 (22.8 31.4) | 22.3 (19.1 25.9) | 60.4 (51.9 70.9) |
| 1988 | 6.3 (5.4 7.2) | 6.2 (5.3 7.3) | 27.4 (23.5 32.6) | 23.9 (20.5 27.7) | 63.7 (54.7 74.8) |
| 1989 | 6.7 (5.8 7.8) | 6.5 (5.6 7.7) | 28.1 (24.1 33.3) | 25.6 (21.9 29.6) | 66.9 (57.4 78.4) |
| 1990 | 7.2 (6.2 8.3) | 6.8 (5.9 8) | 28.7 (24.6 34) | 27.3 (23.4 31.6) | 70 (60.2 82) |
| 1991 | 7.7 (6.7 8.9) | 7 (6.2 8.3) | 29.2 (25.1 34.5) | 29.1 (25 33.7) | 73 (62.9 85.6) |
| 1992 | 8.3 (7.2 9.6) | 7.3 (6.4 8.6) | 29.6 (25.5 35) | 30.9 (26.6 35.8) | 76.1 (65.6 89.1) |
| 1993 | 8.9 (7.7 10.3) | 7.5 (6.5 8.9) | 29.9 (25.8 35.2) | 32.9 (28.2 38) | 79.2 (68.2 92.5) |
| 1994 | 9.6 (8.3 11.1) | 7.8 (6.7 9.2) | 30.1 (26 35.4) | 34.8 (29.8 40.3) | 82.2 (70.9 96) |
| 1995 | 10.3 (8.9 11.9) | 7.9 (6.8 9.4) | 30.2 (26.2 35.5) | 36.8 (31.5 42.6) | 85.2 (73.5 99.5) |
| 1996 | 11 (9.6 12.8) | 8.1 (7 9.6) | 30.3 (26.4 35.5) | 38.8 (33.1 45) | 88.2 (76.1 102.9) |
| 1997 | 11.8 (10.3 13.7) | 8.2 (7.1 9.7) | 30.4 (26.5 35.5) | 40.7 (34.8 47.2) | 91.1 (78.6 106.2) |
| 1998 | 12.6 (11 14.7) | 8.3 (7.1 9.9) | 30.4 (26.5 35.5) | 42.6 (36.3 49.4) | 94 (81 109.5) |
| 1999 | 13.5 (11.8 15.8) | 8.4 (7.2 9.9) | 30.4 (26.5 35.4) | 44.3 (37.8 51.5) | 96.7 (83.2 112.6) |
| 2000 | 14.5 (12.6 16.9) | 8.5 (7.2 10) | 30.4 (26.5 35.3) | 46 (39.1 53.4) | 99.4 (85.4 115.6) |
| 2001 | 15.5 (13.5 18.2) | 8.5 (7.3 10) | 30.4 (26.5 35.2) | 47.4 (40.3 55.1) | 101.9 (87.5 118.5) |
| 2002 | 16.6 (14.4 19.4) | 8.6 (7.3 10.1) | 30.4 (26.4 35.2) | 48.8 (41.5 56.6) | 104.4 (89.5 121.2) |
| 2003 | 17.8 (15.3 20.8) | 8.6 (7.3 10.1) | 30.4 (26.4 35.1) | 49.9 (42.5 57.9) | 106.7 (91.5 123.8) |
| 2004 | 19 (16.3 22.2) | 8.6 (7.3 10.1) | 30.4 (26.4 35.1) | 50.9 (43.4 59) | 108.8 (93.4 126.3) |
| 2005 | 20.2 (17.4 23.6) | 8.6 (7.3 10.1) | 30.4 (26.4 35) | 51.7 (44.2 59.9) | 110.9 (95.2 128.7) |
| 2006 | 21.5 (18.4 25.2) | 8.6 (7.3 10.1) | 30.3 (26.3 35) | 52.4 (44.8 60.7) | 112.9 (96.9 131) |
| 2007 | 22.9 (19.6 26.8) | 8.6 (7.3 10.2) | 30.3 (26.3 35) | 52.9 (45.3 61.4) | 114.8 (98.5 133.4) |
| 2008 | 24.2 (20.7 28.5) | 8.7 (7.3 10.2) | 30.3 (26.3 35) | 53.3 (45.7 62) | 116.5 (100 135.7) |
| 2009 | 25.6 (21.8 30.2) | 8.7 (7.3 10.2) | 30.3 (26.3 35) | 53.6 (46 62.6) | 118.3 (101.4 138) |
| 2010 | 27.1 (22.8 31.9) | 8.7 (7.3 10.2) | 30.4 (26.3 35.1) | 53.9 (46.2 63.2) | 119.9 (102.6 140.4) |
| 2011 | 28.5 (23.7 33.8) | 8.7 (7.3 10.2) | 30.4 (26.3 35.1) | 54 (46.3 63.7) | 121.5 (103.6 142.7) |
| 2012 | 29.9 (24.5 35.6) | 8.7 (7.3 10.2) | 30.4 (26.3 35.1) | 54.1 (46.3 64.1) | 123 (104.4 145.1) |
| 2013 | 31.2 (25.2 37.5) | 8.7 (7.3 10.3) | 30.4 (26.3 35.1) | 54.2 (46.2 64.5) | 124.5 (105 147.4) |
| 2014 | 32.5 (25.8 39.5) | 8.7 (7.3 10.3) | 30.4 (26.3 35.2) | 54.3 (46.1 64.8) | 125.8 (105.5 149.7) |
| 2015 | 33.7 (26.2 41.4) | 8.7 (7.3 10.3) | 30.4 (26.3 35.2) | 54.3 (46.1 65.1) | 127.1 (105.9 151.9) |
| 2016 | 34.8 (26.6 43.5) | 8.7 (7.3 10.3) | 30.4 (26.3 35.2) | 54.3 (46.0 65.4) | 128.2 (106.2 154.4) |

# 2017 Annual review of priors for grey seal population model

Debbie JF Russell
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**Abstract**

Here we review the current priors for the population model; we highlight the changes in comparison to the previous year and also provide justification for the current prior distributions. Only the adult survival prior was modified in this year's model runs.

The adult survival prior in 2015 produced a posterior mean on adult survival (0.99. SD = 0.01) that was considered too high. Therefore, an upper bound of 0.97 was set in 2016. The revised prior resulted in a more realistic posterior mean of 0.96 (SD = 0.01) for adult survival and a higher mean estimate for first year survival (0.37, SD = 0.06). The posterior mean was similar to an independent estimate from a long term branding study of Canadian grey seals.

A fecundity prior with a mean 0.83 and 95% CIs of 0.65 to 0.98 was selected. This is consistent with recent estimates from North Rona and the Isle of May and results from the long term branding study on Sable Island.

An adult female:male sex ratio prior of 1:0.73 has been used since 2014. The value is remarkably similar to the adult sex ratio based on observed adult survival rates in the Sable Island branding study.

## Introduction

Here we review the current priors for the population model; we highlight the changes in comparison to the previous year and also provide justification for the current prior distributions (Table 1). The pup production model and population estimation model have not been updated since 2016. This document presents the priors as defined in 2016 with additional supporting information from Canadian grey seal studies and revised fecundity and survival estimates from the long term studies at North Rona and the Isle of May. These revised estimates fall within the priors used in 2016 and would not lead in themselves to any change is the fitting process.

## Changes compared to SCOS 2015

*Adult survival*

Only one change was made in the priors used for the main analyses in SCOS 2015 (Thomas 2015); a change in the adult survival prior (annual survival rate from the end of the first year). In the main analysis in 2015, the posterior mean on adult survival was 0.99 (SD = 0.01); this was considered by SCOS to be unrealistically high. In contrast the posterior mean on maximum first year survival, which is negatively correlated with adult survival, was very low (0.27, SD = 0.05). Thus in additional investigations in 2015 (Thomas 2015), a revised prior on adult survival was used which had an upper bound of 0.97, but a similar variance to the previous prior. This revised prior resulted in a more realistic posterior mean of 0.96 (SD = 0.01) for adult survival and a higher mean estimate for first year survival (0.37, SD = 0.06).

**Justification**

The priors on first year survival, adult survival (prior to the change described above), and fecundity are justified in detail in Lonergan (2012). In that briefing paper, the available published and unpublished data were reviewed and in some cases reanalysed.

*Adult survival*

Adult survival refers to the annual female survival rate from the end of the first year. The prior on adult survival (without the upper bound of 0.97) is justified in detail in Lonergan (2012). It is based on multiple data sources (Hewer 1964; Harwood & Prime 1978; Schwarz & Stobo 2000). Aging of teeth collected between 1956 and 1966 by Hewer (1964; 1974, n=239) resulted in an adult survival estimate of 0.93; a reanalysis of which resulted in an adult survival estimate of 0.95 (assuming a population growth rate of 7% per annum; Lonergan 2012). Depending on various assumptions made, the analyses of shot samples from the Farne Islands (544 in 1972 and 482 in 1975), led to adult survival estimates of between 0.86 and 0.95 (Harwood & Prime 1978).

In a preliminary study of re-sightings of seals branded as pups on Sable Island, adult female survival was estimated to be 0.92, 0.91, and 0.88 for pups marked in 1985, 1986 and 1987, respectively (Schwarz & Stobo 2000). Den Heyer and Bowen (2016) used a Cormack-Jolly-Seber model to estimate age- and sex-specific adult survival from a long term brand resighting programme on Sable Island, effectively an expanded and greatly extended version of the data used by Schwarz and Stobo (2000). Average adult survival was high (male=0.943, SE=0.003; female=0.976, SE=0.001), but male grey seals had lower survival at all ages. The survival rate estimate for adult females is above the upper limit of the prior used in the 2016 model runs. In fact, the Sable data suggests that adult female survival between 4-24 years is 0.989 and then decrease to 0.904 for ages 25+. For males the equivalent rates are 0.97 and 0.77.

Lonergan (2012) calculated that the mathematical lower limit of adult female survival was 0.8; the population is currently increasing suggesting that the lower limit is likely to be higher than 0.8. As a result of this review, a prior mean of 0.95 was considered most suitable with limits of 0.8 and 1. As noted above this has now been rescaled from the previous range to 0.80 - 0.97.

Since Lonergan (2012), Hiby et al. (2013) estimated apparent survival at the declining NR colony using a variety of models using photo-id recaptures. Three models produced estimates in the range 0.75-0.89, while a fourth estimated apparent survival at 0.79 (0.66-0.95). Pomeroy *et al.* (2015), based on a capture-mark-recapture study on the Isle of May, estimated apparent adult survival of breeding females to be between 0.92 and 0.94. The current prior incorporates these values.

*Pup survival*

Pup survival refers to survival in a seals' first year of life. There are various published estimates of first-year survival (Harwood & Prime 1978; Hall, McConnell & Barker 2001, 2002; Hall, Thomas & McConnell 2009). Harwood & Prime (1978) estimated a pup survival rate of 0.66, under the assumption of a 7% per annum population growth rate, an adult survival rate of 0.93 and fecundity rate of 0.9 from age 6. A mark-recapture study for which 204 pups were tagged with hat tags in 1997, resulted in a first year survival of females born on the Isle of May of 0.617 (SE = 0.155; Hall, Mcconnell & Barker 2001). Using some of the data (n = 133) from (Hall, McConnell & Barker 2001) and additional data from 158 individuals tagged on the Farne Islands in 1998 (Hall, McConnell & Barker 2002), first year female survival was estimated to be 0.41 and 0.03 for pups born on the Isle of May and Farne Islands, respectively (Lonergan 2012). However, there were some doubts about the reliability of these results as tag loss was not accounted for. In 2002, phone tags were deployed on 27 female pups on the Isle of May (Hall, Thomas & McConnell 2009) and the resulting data suggested first year female survival rate of 0.64. (Hall, Thomas & McConnell 2009) was considered

the most robust study and thus the prior was centred close to a value of 0.64 (Lonergan 2012). The levels of variance which should be included in the prior were unclear, but a study by Pomeroy *et al.* (2010) suggested there can be considerable inter annual variability in pup survival which would increase variance, thus a diffuse prior was used (Figure 4). It should be noted that the data used for pup survival estimates were collected during a time of exponential population growth and thus are appropriate for use in deciding the prior on maximum first year survival (before any density dependent effects come into play).
As in Scotland, the pup production at the large Canadian grey seal colony at Sable Island has shown a reduction in growth rate since the late 1990s, from a previous rate of 13% p.a. to about 4% since 2000. den Heyer *et al*. (2014) reported a reduction in juvenile survival from 0.65-0.8 in the 1980s and early 1990s to 0.27-0.4 in the early 2000s. This decrease is consistent with the pup survival mediated density dependence model used for UK grey seals.

As with the UK based estimates, the value from the 1980s and early 1990s represents a period of rapid exponential growth when the effect of density dependence would be minimal. The range of pup survival estimate during this apparently unconstrained growth period was slightly higher than the equivalent UK estimates. It is worth noting that the North Sea population which is the only segment of the UK population to be increasing exponentially has had a consistent growth rate of XX% throughout the recording period, i.e. over a wide range of population sizes. Even near the start of the time series in the UK the population as a whole has had maximum growth rates around XX%. This lower growth rate may be partially explained by the lower pup survival rates in the UK population compared to the Sable Island population.

*Fecundity*

For the purposes of this population model, fecundity refers to the proportion of females (aged 6 and over) which will give birth to a pup in a year (natality rate). For the most part, studies have measured pregnancy rather than fecundity rates. The resulting estimates will be maxima as abortions will cause pregnancy rates to exceed birth rates. Lonergan (2012) reviewed the following datasets: Hewer 1964; Boyd 1985; Hammill & Gosselin 1995; Bowen *et al.* 2006; Øigård *et al.* 2012; and Smout *et al.* unpublished. Hewer (1964) estimated a pregnancy rate of 0.93 (n=79). Boyd (1985) estimated pregnancy rates of 0.94 (95% CI: 0.89 - 0.97; n=140) and 0.83 (95% CI: 0.74 - 0.89; n=88) from shot samples at the Farne Islands and Hebrides respectively. Hammill & Gosselin (1995) examined 526 dead seals in Canada, and estimated pregnancy rates of between 0.88 and 1 for seals over 5 years of age. In an observational study, Bowen *et al.* (2006) estimated apparent fecundity to be between 0.57 and 0.83 depending on animal age (n=245). Øigård *et al.* (2012) estimated a fecundity rate of adult grey seals in Norway of 0.81, and report slightly higher values from Iceland. Lonergan noted that observational studies may result in lower fecundity estimates due to some females breeding elsewhere in some years, present females not being observed at the colony each year, and/or the mismatch between fecundity and pregnancy rates.

A prior with a mean 0.83 and 95% CIs of 0.65 to 0.98 was selected; this incorporates the estimates from the UK shot samples (Boyd 1985), with a lower extent allowing for the estimates of apparent fecundity resulting from the UK long term studies (Smout *et al.* 2010,2011). Estimates of fecundity rates for populations of marked study animals, adjusted for estimates of unobserved pupping events were 0.79 (95% CI: 0.76 - 0.81) and 0.82 (95% CI: 0.79 - 0.84) for North Rona and the Isle of May, respectively. DenHeyer *et al.* 2016 reported that females on Sable Island that pupped in any year had a probability of 0.85 of pupping the following year. Females that did not pup in a year had a probability of 0.56 of pupping the following year. In combination, this produces an overall fecundity rate of approximately 0.79. This estimate is similar to the NR estimate and although breeding probability varied among years, there was no trend over time suggesting the average natality rate has not changed despite the slowing of the rate of growth in pup production.

The estimates from North Rona and the Isle of May and Sable Island are within the range of the current prior.

*Shape of density dependence*

The first time this parameter is included in the population model is in 2005 (Thomas & Harwood 2005). Upon undertaking sensitivity analyses, they note that the posterior distribution has a reasonably low sensitivity to the prior distribution.

*Carrying Capacities*

It is likely that these priors have a negligible influence on parameter estimates or population size because the posteriors differ considerably from the priors in regions for which carrying capacity is being approached. In the North Sea, in which the population size is still increasing rapidly, it is unlikely that the posterior carrying capacity would influence population size. However, it is worth noting that since the prior on carrying capacity for the North Sea was set, the population has increased considerably. Thus to increase efficiency and to ensure the upper limits of the prior distribution do not constrain the estimate of population size, the North Sea prior should be adjusted next year.

*Observation coefficient of variation (CV)*

The CV on the regional pup production estimates is estimated in a preliminary run of the population model (Thomas 2014). Currently, the pup production model produces CVs on a colony level rather than the regional level required by the population model. The planned revision of the pup production model will involve estimating regional CVs around pup production which can then be included in the population model.

*Sex ratio*

Up until 2009, there was no independent estimate to provide information regarding the sex ratio of non-pups. Thus a fixed multiplier of 1.73 used to scale the female population to the total population up until 2012 (Thomas 2012). This value originated from the shot samples on the Farne Islands in 1972 and 1975 (544 in 1972 and 482 in 1975; Harwood and Prime 1978) for which estimated adult male survival (from age 10) was 0.80. This sex ratio was based on the following assumptions: that the shot males were a representative sample of the population; that female survival was 0.935; and that survival was the same between the sexes up until age 10. More recent evidence (Hall, McConnell & Barker 2001, 2002) suggests that male first-year survival may be lower than female survival which would cause a reduced number of males to females. It should be noted that a similar population model developed for use with the Canadian grey seal population assumes a 1:1 sex ratio.

The inclusion of an independent estimate of total population size provided data to inform the sex ratio, thus a sex ratio prior was defined. Lonergan (2012) suggested a prior on the scalar to raise the female population to the total population that had a mean of 1.2 (SD = 0.63). This was derived by combining pup survival data (Hall, McConnell & Barker 2001) with age and sex data from shot samples (Hewer 1964), making the assumption that these shot sample were representative of the population which Hewer noted was unlikely. Part of the justification for such a sex ratio was that, in comparison to the 1:0.73 sex ratio, it greatly reduced the inconsistency between the population size estimated using the population dynamics model and that estimated by scaling the summer counts. This discrepancy has been reduced as a result of the revised independent estimate for 2008 (Russell *et al.* 2016).

Thomas (2013) implemented both the fixed sex ratio (1:0.73) and the prior suggested by Lonergan (2012; 1:0.2). In 2014, Thomas implemented both the fixed sex ratio (1:0.73) scalar and a prior based on this fixed sex ratio; a highly informative prior with a mean of 1.7 (SD = 0.02); 90% of the prior mass was between 1.68 and 1.73. This revised prior was based on a preliminary re-analyses of hat tag (Hall, McConnell & Barker 2001, 2002) and phone tag data (Hall, Thomas & McConnell 2009), taking into account detection probability inferred by telemetry data. Although there were no significant differences in survival between males and females, the mean male survival was lower than females for both datasets (Table 2). If combined with data from Hewer (1964), the resulting sex ratio would be 0.66-0.68 males per female. Also considered were shot samples from the Baltic (Kauhala, Ahola & Kunnasranta 2012) which indicated that pup survival varied by year, being 0.67 and 0.53 for females in the early and late 2000s, respectively, and 0.33 and 0.50 for males in the early and late 2000s, respectively. This prior has been adopted by SCOS for years following 2014.

Den Heyer and Bowen (2016) estimated survival rates of male and female branded seals at Sable Island. The differential survival of males and females would produce an effective sex ratio of 1:0.7 if maximum age is set to 40, reducing to 1:0.69 if maximum age is set to 45. This estimate is remarkably similar to the prior used in the 2016 model runs.

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Table 1. Prior parameter distributions (The two parameters of the gamma distribution specified here are shape and scale respectively) for both SCOS 2015 and 2016. The distributions in red are those adopted for use in SCOS 2016.

| Parameter | SCOS 2015 | | | | | | SCOS 2016 | |
|---|---|---|---|---|---|---|---|---|
| | Main analysis | | Additional investigation on adult survival | | Additional investigation on sex ratio | | Main analysis | |
| | distribution | mean (SD) | distribution | mean (SD) | distribution | mean (SD) | distribution | mean (SD) |
| adult survival $\phi_a$ | 0.8+0.2*Be(1.6,1.2) | 0.91 (0.05) | 0.8+0.17*Be(1.6,1.2) | 0.90 (0.04) | 0.8+0.17*Be(1.6,1.2) | 0.90 (0.04) | as SCOS 2015 additional analysis on adult survival | |
| pup survival $\phi_j$ | Be(2.87,1.78) | 0.62 (0.20) | as SCOS 2015 main analysis | | as SCOS 2015 main analysis | | as SCOS 2015 main analysis | |
| fecundity $\alpha_{\max}$ | 0.6+0.4*Be(2,1.5) | 0.83 (0.09) | as SCOS 2015 main analysis | | as SCOS 2015 main analysis | | as SCOS 2015 main analysis | |
| dens. dep. $\rho$ | Ga(4,2.5) | 10 (5) | as SCOS 2015 main analysis | | as SCOS 2015 main analysis | | as SCOS 2015 main analysis | |
| NS carrying cap. $\chi_1$ | Ga(4,2500) | 10000 (5000) | as SCOS 2015 main analysis | | as SCOS 2015 main analysis | | as SCOS 2015 main analysis | |
| IH carrying cap. $\chi_2$ | Ga(4,1250) | 5000 (2500) | as SCOS 2015 main analysis | | as SCOS 2015 main analysis | | as SCOS 2015 main analysis | |
| OH carrying cap. $\chi_3$ | Ga(4,3750) | 15000 (7500) | as SCOS 2015 main analysis | | as SCOS 2015 main analysis | | as SCOS 2015 main analysis | |
| Ork carrying cap. $\chi_4$ | Ga(4,10000) | 40000 (20000) | as SCOS 2015 main analysis | | as SCOS 2015 main analysis | | as SCOS 2015 main analysis | |
| observation CV ψ | Fixed | 0.89 (0) | as SCOS 2015 main analysis | | as SCOS 2015 main analysis | | as SCOS 2015 main analysis | |
| sex ratio $\omega$ | 1.6+Ga(28.08, 3.70E-3) | 1.7 (0.02) | as SCOS 2015 main analysis | | 1+Ga(0.1,2) | 1.2 (0.63) | as SCOS 2015 main analysis | |

Table 2. Estimates of sex-specific pup survival based on hat tag data, phone tags and telemetry data

| | Females | | | Males | | |
|---|---|---|---|---|---|---|
| Data type | survival | 95% CI | N | survival | 95% CI | n |
| Hat tags (1 year) | 0.65 | 0.39 - 0.85 | 180 | 0.50 | 0.25 - 0.75 | 182 |
| Phone tags (6 months) | 0.54 | 0.18 - 0.86 | 27 | 0.43 | 0.11 – 0.82 | 28 |

# The status of UK harbour seal populations in 2016 including summer counts of grey seals.

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**Abstract**

In August 2016, during the harbour seal moult, the Sea Mammal Research Unit (SMRU) thermal image surveys in Scotland covered Orkney, the North Coast of Scotland, the Moray Firth and the East Coast of Scotland from Fraserburgh to North Queensferry, including the Firth of Tay and Eden Estuary. The 2016 survey formed the start of a new round-Scotland harbour seal survey.

The SMRU fixed-wing surveys in England covered the coast of Lincolnshire, Norfolk and Suffolk. The Tees Seal Research Programme kindly provided information on seal numbers in the Tees Estuary (Bond, 2016). Data from surveys carried out in the Thames Estuary, by the Zoological Society of London, are included in the total for England. Grey seals are counted during harbour seal surveys although during the summer months, grey seal counts can vary more than harbour seal counts.

From August surveys carried out between 2011 and 2016, the minimum number of harbour seals counted in Scotland was **25,149** and in England & Wales it was **5,185**, making a total count for Great Britain of **30,334** (**Error! Reference source not found.**). Including **948** harbour seals counted in Northern Ireland in 2011, the UK harbour seal total count for this period was **31,282**.

From August surveys carried out between 2011 and 2016, the minimum number of grey seals counted in Scotland was **25,839** and in England & Wales **14,335** making a total count for Great Britain of **40,194** (**Error! Reference source not found.**). Including **468** grey seals counted in Northern Ireland in 2011, the UK grey seal total count for this period was **40,662**.

The 2016 harbour seal count for Orkney was **1,240** (33.5% lower than previous 2013 count of 1,865) and for the North coast, **109** giving a total of **1,349** for this Seal Management Area (SMA). 30.4% decline for the Orkney and North Coast (ONC) SMA alone. In the annually surveyed part of the Moray Firth (Helmsdale to Findhorn), the moult count was **892**, 26% higher than the low counts from the two previous years (2014 and 2015). The severe decline in the Firth of Tay & Eden Estuary harbour seal SAC showed no sign of recovery, with **51** harbour seals counted in 2016. This represents 8% of the mean of counts between 1990 and 2002 (641).

In contrast to harbour seals, the 2016 grey seal count for Orkney was **9,300.** Including an additional **343** grey seals counted on the North Coast, gives a total of **9,643** for the ONC SMA. This is the biggest grey seal count for the ONC SMA to date.

## Introduction

Most population surveys of harbour seals are carried out in August, during their annual moult. At this point in their annual cycle, harbour seals tend to spend longer at haul-out sites and the greatest and most consistent counts of seals are found ashore. During a survey, however, there will be a number of seals at sea which will not be counted. Thus the numbers presented here represent the minimum number of harbour seals in each area and should be considered as an index of population size, not actual population size.

Although harbour seals can occur all around the UK coast, they are not evenly distributed. Their main concentrations are in Shetland, Orkney, the Outer Hebrides, the west coast of Scotland, the

Moray Firth and in east and southeast England, between Lincolnshire and Kent (Figure 1). Only very small, dispersed groups are found on the south and west coasts of England or in Wales.

Since 1988, SMRU's surveys of harbour seals around the Scottish coast have been carried out on an approximately five-yearly cycle, with the exception of the Moray Firth (between Helmsdale and Findhorn) and the Firth of Tay & Eden Estuary SAC which have been surveyed annually since 2002. Surveys carried out in 2006, revealed significant declines in harbour seal numbers in Shetland, Orkney and elsewhere on the UK coast (Lonergan *et al*. 2007). Between 2007 and 2009, SMRU surveyed the entire Scottish coast including a repeat survey of some parts of Strathclyde and Orkney. In 2010, Orkney was surveyed again to determine whether previously observed declines continued. The last round-Scotland survey started in 2011 and was completed in 2015. Data presented here include those from a new survey that started in August 2016.

Approximately 90% of the English harbour seal population is found on the Lincolnshire and Norfolk coast which is usually surveyed twice annually during the August moult. Since 2004, additional breeding season surveys (in early July) of harbour seals around The Wash (which lies within the August survey area) were undertaken for Natural England. The Suffolk, Essex and Kent coasts were last surveyed by SMRU during the breeding season in 2011 and during the moult in August 2016 by the Thames Harbour Seal Conservation Project, run by the Zoological Society of London.

A complete survey of Northern Ireland and the Republic of Ireland was carried out in 2011 and 2012. A new survey of the Republic of Ireland will start in 2017, to be finished in 2018.

**Methods**

Seals hauling out on rocky or seaweed covered shores are well camouflaged and difficult to detect. Surveys of these coastlines in Scotland are carried out by helicopter using a thermal-imaging camera which is able to detect groups of seals at distances of over 3km (depending on weather conditions). This technique enables rapid, thorough and synoptic surveying of seals inhabiting complex coastlines. Previously, since 2007, oblique photographs were obtained using a hand-held camera equipped with an image-stabilised zoom lens. Both harbour and grey seals were digitally photographed and the images used to classify species composition of groups of seals. The grey seal counts from these surveys have been used elsewhere to inform the models used to estimate the total grey seal population size (Lonergan *et al*. 2011, SCOS BP 10/4).

In August 2016, a new custom-built, 3-camera system, based on Trakka System's SWE-400, was used to survey seals for the first time. The system consists of a gyro-stabilised gimbal containing a thermal imaging camera, a high-resolution video camera, a digital still camera equipped with a 300mm telephoto lens and a laser range finder. Video and still images are recorded on laptops which display a moving map, highlighting areas that have been recently surveyed and the distribution of harbour and grey seals from previous surveys.

Surveys of the estuarine haul-out sites on the east coast of Scotland and England were by fixed-wing aircraft using hand-held oblique photography. On sandbanks, where seals are relatively easily located, this survey method is highly cost-effective.

To maximise the counts of seals on shore and to minimise the effects of environmental variables, surveys are restricted to within two hours before and two hours after the time of local low tides (derived from POLTIPS, National Oceanographic Centre, NERC) occurring between approximately 12:00hrs and 18:00hrs. Surveys are not carried out in persistent or moderate to heavy rain because seals will increasingly abandon their haul-out sites and return into the water, and because the thermal imager cannot 'see' through rain.

In southeast England, from Suffolk to Kent, the Thames Harbour Seal Conservation Project coordinated August surveys by air, from boat and from land between 7$^{th}$ and 10$^{th}$ August 2016 (ZSL unpublished data, see Barker & Obregon, 2015 as example).

**Results and Discussion**

***1. Minimum population size estimate for harbour seals in the UK***

The overall distribution of harbour seals around the British Isles from August surveys carried out between 2011 and 2016 is shown in Figure 1. For ease of viewing at this scale, counts have been aggregated by 10km squares.

The most recent minimum harbour seal population estimates (i.e. counts between 2011 and 2016) for UK Seal Management Areas (SMAs) are provided in Table 1 and are compared with two previous periods (2007 to 2009 and 1996 to 1997).

Mean values were used for any areas where repeat counts were available (primarily in eastern England and occasionally the Moray Firth).

The most recent minimum estimate of the number of harbour seals in Scotland, obtained from counts carried out between 2011 and 2016, is **25,149** (Table 1). This is mid-way between the 2007-2009 count (20,430) and the 1996-1997 count (29,514; Table 1). Since 2001, harbour seal counts have declined in Shetland, Orkney and along the north and east coasts of Scotland (Lonergan *et al*., 2007; Duck & Morris, 2014; 2015; 2016; 2017) while counts in the West Scotland SMA appear to have increased.

The most recent minimum estimate for England & Wales, obtained from surveys carried out mainly in 2016, is **5,199** (Table 1). This is 29% higher than the 2007-2009 count (4,032) and 58% higher than the 1995-1997 count (3,289; Table 1).

The 2011 count for Northern Ireland of **948** was 25% lower than the previous complete count from 2002 (1,267).

The sum of all the most recent counts carried out between 2008 and 2016 gives a UK total of **31,420** harbour seals (Table 1).

***1.1 Grey seals in the UK counted during August harbour seal surveys***

Grey seals are counted in all harbour seal surveys but, because grey seal counts are significantly more variable than harbour seal counts in August, they have not previously been fully reported. In conjunction with grey seal telemetry data, the grey seal summer counts from 2007 and 2008 have been used to calculate an independent estimate of the size of the grey seal population (Lonergan *et al*. 2011). August grey seal counts will similarly be used in future.

The overall UK and Ireland distribution of grey seals from August harbour seal surveys carried out between 2007 and 2016 is shown in **Error! Reference source not found.**. For ease of viewing at this scale, counts have been aggregated by 10km squares. The most recent estimate of the number of grey seals in Scotland, obtained from August counts carried out between 2011 and 2016 is **25,839** (Table 2). This is 36% higher than the total Scotland count of 18,979 from August surveys between 2007 and 2009.

There were **13,033** grey seals counted in eastern England between 2008 and 2016 and, combined with an estimate of **1,302** in West England & Wales and the 2011 count of **468** in Northern Ireland (Table 2), the most recent UK total count of grey seals in August is **40,662**.

***2. Harbour and grey seals within Seal Management Areas in Scotland***

The parts of Scotland surveyed in August 2016 were: Orkney and the North Coast of Scotland, most of the Moray Firth (from Helmsdale to Fraserburgh) and part of the East Coast of Scotland (from Fraserburgh to North Queensferry). Details of the survey methodology can be found in the Scottish Natural Heritage (SNH) Commissioned Report No. 929 (Duck & Morris, 2016).

Figure 3 shows the years when different parts of the Scottish coast were last surveyed between 2008 and 2016. Areas surveyed in 2016 are in dark green. A new round-Scotland survey started in August 2016.

The most up-to-date distribution of harbour seals in Scotland, from surveys between 2011 and 2016, is shown in Figure 4. The trends in counts of harbour seals in different Seal Management Areas in

Scotland, from surveys carried out between 1996 and 2016 are shown in Figure 5. Harbour seal counts from the most recent surveys and from two previous survey periods (2007 to 2009 and 1996 to 1997) are in Table 1.

The most up to date distribution of grey seals in Scotland, from surveys between 2011 and 2016, is shown in Figure 6. Grey seal counts from the most recent surveys and from two previous periods (2000 to 2006 and 1996 to 1997) are in Table 2.

### *2.1 Orkney and the North Coast - harbour seals*

The Isles of Orkney and the North Coast of Scotland were surveyed between 1st and 5th August 2016. The harbour seal count for Orkney was **1,240** and the count for the North coast was **109** giving a total count of **1,349** for the Orkney and North Coast Management Area (Table 1). This is the lowest count of harbour seals in Orkney since 1985 and represents just under 15% of the highest count (8,522) from 1997.

### *2.2 Orkney and the North Coast - grey seals*

In Orkney, in August 2016, a total of **9,300** grey seals were counted with **414** on the North Coast giving a total of **9,714** for Orkney and the North Coast SMA.

### *2.3 Moray Firth, part - harbour seals*

Part of the Moray Firth was surveyed on 10th August 2016 (Findhorn to Fraserburgh). The annually surveyed section of coast (Helmsdale to Findhorn) was surveyed on 10th August 2016. The coast between Helmsdale and Duncansby Head was last surveyed in August 2011. Between Helmsdale and Findhorn Bay, **892** harbour seals were counted with **47** on the North Moray coast, between Findhorn and Fraserburgh (Table 3). Combined with counts from previous years, the total harbour seal count for the Moray Firth SMA was **940**. This is the highest count of harbour seals in the Moray Firth since 2012 (Table 3).

### *2.4 Moray Firth - grey seals*

In the annually surveyed part of the Moray Firth (Helmsdale to Findhorn Bay) **1,194** grey seals were counted, with a further **43** counted between Findhorn and Fraserburgh (Table 4). Combined with counts from previous years, a total of **1,252** grey seals were counted in the Moray Firth (Table 4).

### *2.5 East Scotland - harbour seals*

The coast of East Scotland, from Fraserburgh to North Queensferry was surveyed on 9th August 2016 where **287** harbour seals were counted. Including counts from surveys in 2013 and 2015 for the remainder of East Scotland, the total harbour seal count for the East Scotland SMA was **368** (Table 1).

The harbour seal count for the Firth of Tay and Eden Estuary SAC in 2016 was **51**, slightly lower than the 2015 count of 60 (Table 2, Table 5).

### *2.6 East Scotland - grey seals*

A total of **3,738** grey seals were counted in the section of East Scotland surveyed in 2016 (Fraserburgh to North Queensferry). Including counts from surveys in 2013 and 2015, the total grey seal count for East Scotland SMA was **3,812** (Table 2). This was considerably higher than the total count of 1,238 from surveys carried out between 2007 and 2009 (Table 2). The biggest haul-out of grey seals was at the mouth of the River Ythan, with a count of **1,924**.

In the Firth of Tay and Eden Estuary SAC in 2016, **936** grey seals were counted (Table 2, Table 5).

## *3. Harbour seal surveys in England and Wales*

### *3.1 England and Wales – harbour seal moult season counts (August)*

The coast of England and Wales has been divided into three Management Units (Figure 1). The great majority of English harbour seals are found in Southeast England (Figure 1). In 1988, the previously increasing numbers of harbour seals in The Wash declined by approximately 50% as a result of the phocine distemper virus (PDV) epidemic. Following the epidemic, from 1989, the area has been surveyed once or twice annually in the first half of August (Table 7, Figure 14). After recovering to

1988 levels by 2001, the population was hit by another PDV outbreak in 2002. It was reduced by around 20% but recovered to pre-epidemic levels by 2012.

In Northeast England, small numbers of harbour seals are found at Holy Island and in the Tees Estuary. The 2016 count for Northeast England was **86**, a combined count from 2015 (Holy Island) and 2016 (Tees Estuary; Table 7). Harbour seals in the Tees Estuary are monitored by the Industry Nature Conservation Association (INCA). The very slow increase in numbers seems to be continuing, although the August 2016 mean count of 86 was slightly lower than the 2015 mean count (100; Table 7 in Bond & Gibson, 2016).

Two aerial surveys of harbour seals were carried out by SMRU in Lincolnshire and Norfolk during August 2016 (Table 7). The 2016 count for the coast between Donna Nook and Scroby Sands (**4,367**) was slightly higher (by 5%) than the 2015 count (4,289). The Zoological Society of London surveyed the wider Thames Estuary between Hamford Water (in Essex) and Goodwin Sands (off the Kent coast) and counted **694** harbour seals (Zoological Society of London, unpublished data), 45% more than in 2015 (451; Barker & Obregon, 2015).

The combined counts for the Southeast England Management Unit (Flamborough Head to Newhaven) in 2016 (**5,061**) was 7% higher than the 2015 count (4,740; Tables 1 and 7). Although the Southeast England population has returned to its pre-2002 epidemic levels, it is still lagging behind the rapid recovery of the harbour seal population in the Wadden Sea where counts increased from 10,800 in 2003 to 26,788 in 2013 (Reijnders *et al*., 2003; Trilateral Seal Expert Group, 2013), equivalent to an average annual growth rate of 9.5% over the ten years. For the second successive year, there was a second slight decline in the Wadden Sea total harbour seal count in 2015 (26,435 in 2015; Galatius *et al*., 2015). In August 2016, part of the Wadden Sea (Lower Saxony/Hamburg) could not be fully counted in 2016 due to adverse weather conditions. Although the 2016 count was not complete (Galatius *et al*., 2016), preliminary estimates indicate that the population has not increased for the third year in succession.

No dedicated harbour seal surveys are routinely carried out in the West England & Wales Management Unit. Estimates given in Table 1 are derived from compiling information from the various sources listed in the Table.

### *3.2 England and Wales – harbour seal breeding season counts (June & July)*

A series of five aerial surveys of The Wash were carried out over the breeding season in 2016 (19th, 24th June and 2nd, 8th and 16th July 2016). The results together with results from previous breeding season surveys are presented in Thompson *et al*. (2016). The 2015 count was substantially lower (22%) than the 2014 equivalent count, but the 2016 peak count was 17% higher than in 2015. These wide fluctuations are not unusual in the long term time series. Despite the wide inter-annual variation, the pup production has apparently increased at around 7.4% p.a. since surveys began in 2001.

### *3.3 England and Wales – grey seal counts (August)*

A total of **6,085** grey seals were counted on the East coast of England between Donna Nook and Dover in August 2016. This is similar to counts from the previous four years (Table 8).

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**Table 1. The most recent August counts of harbour seals at haul-out sites in Britain and Northern Ireland**, by Seal Management Area, compared with two previous periods: 2000 to 2006 and 1996 to 1997.

| Seal Management Unit / Country | Harbour seal counts | | |
|---|---|---|---|
| | **2008-2016** | **2007-2009** | **1996-1997** |
| 1 Southwest Scotland | 1,200 (2015) | 923 (2007; 2009) | 929 (1996) |
| 2 West Scotland [a] | 15,184 (2013-2015) | 10,626 (2007-2009) | 8,811 (1996-1997) |
| 2a West Scotland - South | 7,645 (2014-2015) | 5,930 (2007; 2009) | 5,651 (1996) |
| 2b West Scotland - Central | 6,424 (2014) | 4,004 (2007; 2008) | 2,700 (1996) |
| 2c West Scotland - North | 1,115 (2013; 2014) | 692 (2008) | 460 (1996-1997) |
| 3 Western Isles | 2,739 (2011; 2014) | 1,804 (2005; 2008) | 2,820 (1996) |
| 4 North Coast & Orkney | 1,349 (2013; 2014) | 2,979 (2008-2009) | 8,787 (1997) |
| 4a North Coast | 109 (2016) | 112 (2008) | 265 (1997) |
| 4b Orkney | 1,240 (2016) | 2,867 (2008-2009) | 8,522 (1997) |
| 5 Shetland | 3,369 (2015) | 3,039 (2009) | 5,994 (1997) |
| 6 Moray Firth | 940 (2008; 2011; 2016) | 776 (2007-2009) | 1,409 (1997) |
| 7 East Scotland | 368 (2013; 2015-2016) | 283 (2007; 2010) | 764 (1997) |
| 7.1 Fraserburgh to Carnoustie | 53 (2016) | 24 (2007) | 15 (1997) |
| 7.2 Tay & Eden SAC | 51 (2016) | 111 (2009) | 633 (1997) |
| 7.3 St Andrews to border | 264 (2013; 2015-2016) | 148 (2007) | 116 (1997) |
| **SCOTLAND TOTAL** | **25,149** (2008; 2011; 2013-2016) | **20,430** (2007-2009) | **29,514** (1996-1997) |
| 8 Northeast England [b] | 86 (2015; 2016) | 58 (2008-2009) | * 54 (1997) |
| 9 Southeast England [c] | 5,061 (2016) | 3,952 (2008-2009) | 3,222 (1995; 1997) |
| 10 South England [d] | 23 (estimate) | 13 (estimate) | 9 (estimate) |
| 11 Southwest England [d] | 0 (estimate) | 0 (estimate) | 0 (estimate) |
| 12 Wales [d] | 5 (estimate) | 4 (estimate) | 2 (estimate) |
| 13 Northwest England [d] | 10 (estimate) | 5 (estimate) | 2 (estimate) |
| **ENGLAND & WALES TOTAL** | **5,185** (2015; 2016) | **4,032** (2008-2009) | **3,289** (1995; 1997) |
| **BRITAIN TOTAL** | **30,334** (2008; 2011; 2013-2016) | **24,462** (2007-2009) | **32,802** (1995-1997) |
| **NORTHERN IRELAND TOTAL** [e] | **948** (2011) | **1,101** (2002; 2008) | |
| **UK TOTAL** | **31,282** (2008; 2011; 2013-2016) | **25,563** (2002; 2007-2009) | |

SOURCES - Most counts were obtained from aerial surveys conducted by SMRU and were funded by Scottish Natural Heritage (SNH) and the Natural Environment Research Council (NERC). Exceptions are:

[a] Parts of the West Scotland survey in 2009 funded by Scottish Power and Marine Scotland.

[b] The Tees data collected and provided by the Industry Nature Conservation Association (Bond & Gibson, 2016). The 2008 survey from Coquet Island to Berwick funded by the Department of Energy and Climate Change (DECC, previously DTI).

[c] Essex & Kent data for 2016 collected and provided by the Zoological Society London (e.g. Barker & Obregon, 2015).

[d] No dedicated harbour seal surveys in this management unit and only sparse info available. Estimates compiled from counts shared by other organisations (Chichester Harbour Conservancy) or found in various reports & on websites (Boyle, 2012; Hilbrebirdobs.blogspot.co.uk, 2012, 2013; Sayer, 2010, 2011; Sayer *et al.,* 2012; Westcott, 2002). Apparent increases may partly be due to increased reporting and improved species identification.

[e] Surveys carried out by SMRU and funded by Northern Ireland Environment Agency (NIEA) in 2002 & 2011 (Duck, 2006; Duck & Morris, 2012) and Marine Current Turbines Ltd in 2006-2008 & 2010 (SMRU Ltd, 2010).

*Northumberland coast south of Farne Islands not surveyed in 2005 & 1997, but no harbour seal sites known here.

**Table 2. The most recent August counts of grey seals at haul-out sites in Britain and Northern Ireland**, by Seal Management Area, compared with two previous periods: 2000 to 2006 and 1996 and 1997. Grey seal summer counts are known to be more variable than harbour seal summer counts. Caution is advised when interpreting these numbers.

| Seal Management Unit / Country | | Grey seal counts | | |
|---|---|---|---|---|
| | | 2008-2016 | 2007-2009 | 1996-1997 |
| 1 Southwest Scotland | | 374 (2015) | 233 (2007; 2009) | 75 (1996) |
| 2 West Scotland | [a] | 5,064 (2013-2015) | 2,526 (2007-2009) | 3,435 (1996-1997) |
| 2a West Scotland - South | | 3,618 (2014-2015) | 1,788 (2007; 2009) | 2,125 (1996) |
| 2b West Scotland - Central | | 1,056 (2014) | 561 (2007; 2008) | 931 (1996) |
| 2c West Scotland - North | | 390 (2013; 2014) | 177 (2008) | 379 (1996-1997) |
| 3 Western Isles | * | 4,065 (2011; 2014) | 3,808 (2005; 2008) | 4,062 (1996) |
| 4 North Coast & Orkney | | 9,714 (2013; 2014) | 8,525 (2008-2009) | 9,427 (1997) |
| 4a North Coast | | 414 (2016) | 504 (2008) | 597 (1997) |
| 4b Orkney | | 9,300 (2016) | 8,021 (2008-2009) | 8,830 (1997) |
| 5 Shetland | | 1,558 (2015) | 1,536 (2009) | 1,724 (1997) |
| 6 Moray Firth | | 1,252 (2008; 2011; 2016) | 1,113 (2007-2009) | 551 (1997) |
| 7 East Scotland | | 3,812 (2013; 2015-2016) | 1,238 (2007; 2010) | 2,328 (1997) |
| 7.1 Fraserburgh to Carnoustie | | 2,265 (2016) | 400 (2007) | 145 (1997) |
| 7.2 Tay & Eden SAC | | 936 (2016) | 450 (2009) | 1,891 (1997) |
| 7.3 St Andrews to border | | 611 (2013; 2015-2016) | 388 (2007) | 292 (1997) |
| **SCOTLAND TOTAL** | | **25,839** (2008; 2011; 2013-2016) | **18,979** (2007-2009) | **21,602** (1996-1997) |
| 8 Northeast England | [b] | 6,948 (2015; 2016) | 2,350 (2008-2009) | |
| 9 Southeast England | [c] | 6,085 (2016) | 1,786 (2008-2009) | |
| 10 South England | [d] | 0 (estimate) | 0 (estimate) | |
| 11 Southwest England | [d] | 480 (estimate) | 425 (estimate) | |
| 12 Wales | [d] | 422 (estimate) | 378 (estimate) | |
| 13 Northwest England | [d] | 400 (estimate) | 350 (estimate) | |
| **ENGLAND & WALES TOTAL** | | **14,335** (2015; 2016) | **5,289** (2008-2009) | |
| **BRITAIN TOTAL** | | **40,194** (2008, 2011,2013-2016) | **24,268** (2007-2009) | |
| **NORTHERN IRELAND TOTAL** | [e] | **468** (2011) | **243** (2002; 2008) | |
| **UK TOTAL** | | **40,662** (2008, 2011,2013-2016) | **24,513** (2002; 2007-2009) | |

SOURCES - Most counts were obtained from aerial surveys conducted by SMRU and were funded by Scottish Natural Heritage (SNH) and the Natural Environment Research Council (NERC). Exceptions are:

[a] Parts of the West Scotland survey in 2009 funded by Scottish Power and Marine Scotland.

[b] The Tees data collected and provided by the Industry Nature Conservation Association (Bond & Gibson, 2016). The 2008 survey from Coquet Island to Berwick funded by the Department of Energy and Climate Change (DECC, previously DTI).

[c] Essex & Kent data for 2016 collected and provided by the Zoological Society London (e.g. Barker & Obregon, 2015).

[d] No SMRU surveys in this management unit but some data available. Estimates compiled from counts shared by other organisations (Natural Resources Wales, RSPB) or found in various reports & on websites (Boyle, 2012; B üche & Stubbings, 2014; Hilbrebirdobs.blogspot.co.uk, 2012, 2013; Leeney *et al* ., 2010; Sayer, 2010, 2011, 2012a, 2012b; Sayer *et al* ., 2012; Westcott, 2002, 2009; Westcott & Stringell, 2004). Apparent increases may partly be due to increased

[e] Surveys carried out by SMRU and funded by Northern Ireland Environment Agency (NIEA) in 2002 & 2011 (Duck, 2006; Duck & Morris, 2012) and Marine Current Turbines Ltd in 2006-2008 & 2010 (SMRU Ltd, 2010).

[f] Surveys carried out by SMRU and funded by the National Parks & Wildlife Service (Cronin et al., 2004; Duck & Morris, 2013a, 2013b).

* During the 2011 survey, warm weather probably kept hundreds of grey seals from hauling out at the Monach Isles. Therefore the 2011 count for the Monach Isles has been replaced with the 2008 count .

**Table 3. August counts of harbour seals in the Moray Firth between 1992 and 2016.** Mean values if more than one count per year; red = lowest count, green = highest count per area. Data are from aerial surveys by the Sea Mammal Research Unit. Since 2006, all counts were from digital images obtained using oblique hand-held photography. See Figure 7 for the 2016 distribution of seals within the Moray Firth and Figure 8 for a histogram of these data.

| | Area | 1992 | 1993 | 1994 | 1997 | 2000 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Survey method | fw | fw | fw | ti | fw | fw &ti | fw | 2fw | 2fw &1ti | fw &ti | fw &ti | fw &ti | fw | fw | ti | fw | fw | fw | fw | ti |
| (MEAN) COUNTS | Duncansby Head to Helmsdale | | 2 | | 1 | | | | | 1 | | | 1 | | | | | | | | |
| | Helmsdale to Brora | | 92 | | 193 | | 188 | | | 113 | 150 | 54 | 73 | 19 | 101 | 87 | 102 | 70 | 1 | 21 | 40 |
| | Loch Fleet | | 16 | | 27 | 33 | 59 | 56 | 64 | 71 | 80 | 83 | 82 | 65 | 114 | 113 | 133 | 135 | 156 | 144 | 145 |
| | Dornoch Firth (SAC) | 662 | | 542 | 593 | 405 | 220 | 290 | 231 | 191 | 257 | 144 | 145 | 166 | 219 | 208 | 157 | 143 | 111 | 120 | 85 |
| | Cromarty Firth | 41 | | 95 | 95 | 38 | 42 | 113 | 88 | 106 | 106 | 102 | 90 | 90 | 140 | 101 | 144 | 63 | 100 | 22 | 72 |
| | Beauly Firth (incl. Milton & Munlo | 220 | | 203 | 219 | 204 | 66 | 151 | 178 | 127 | 176 | 146 | 150 | 85 | 140 | 57 | 60 | 30 | 37 | 34 | 30 |
| | Ardersier (incl. Eathie) | | | 221 | 234 | 191 | 110 | 205 | 202 | 210 | 197 | 154 | 145 | 277 | 368 | 195 | 183 | 199 | 28 | 34 | 36 |
| | Culbin & Findhorn | | | 58 | 46 | 111 | 144 | 167 | 49 | 93 | 58 | 79 | 92 | 73 | 123 | 163 | 254 | 218 | 260 | 330 | 484 |
| | Burghead to Fraserburgh | | | 0 | 1 | | | | | 3 | | 0 | | | | 29 | | 39 | | | 47 |
| TOTALS | Dornoch Firth to Ardersier | | | 1,061 | 1,141 | 838 | 438 | 759 | 699 | 634 | 736 | 546 | 530 | 618 | 867 | 561 | 544 | 435 | 276 | 210 | 223 |
| | Loch Fleet to Ardersier | | | | 1,168 | 871 | 497 | 815 | 763 | 705 | 816 | 629 | 612 | 683 | 981 | 674 | 677 | 570 | 432 | 354 | 368 |
| | Loch Fleet to Findhorn | | | | 1,214 | 982 | 641 | 982 | 812 | 798 | 874 | 708 | 704 | 756 | 1,104 | 837 | 931 | 788 | 692 | 684 | 852 |
| | Helmsdale to Findhorn | | | | 1,407 | | 829 | | | 911 | 1,024 | 762 | 777 | 775 | 1,205 | 924 | 1,033 | 858 | 693 | 705 | 892 |
| | Moray Firth SMA * | | | | 1,409 | | 831 | | | 915 | 1,028 | 763 | 778 | 776 | 1,206 | 954 | 1,063 | 898 | 733 | 745 | 940 |

* For years where only the main area was surveyed (i.e. Helmsdale to Findhorn), the most recent counts for the outlying areas are used to give a total for the Moray Firth Seal Management Area.

fw, fixed-wing survey; ti, thermal imager helicopter survey; SMA, Seal Management Area.

**Table 4. August counts of grey seals in the Moray Firth between 1992 and 2016.** Mean values if more than one count per year; red = lowest count, green = highest count per area. Data are from aerial surveys by the Sea Mammal Research Unit. Since 2006, all counts were from digital images obtained using oblique hand-held photography. See Figure 7 for the 2016 distribution of seals within the SAC and Figure 9 for a histogram of these data.

| | Area | 1992 | 1993 | 1994 | 1997 | 2000 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Survey method | fw | fw | fw | ti | fw | fw &ti | fw | 2fw | 2fw &1ti | fw &ti | fw &ti | fw &ti | fw | fw | ti | fw | fw | fw | fw | ti |
| (MEAN) COUNTS | Duncansby Head to Helmsdale * | | 33 | | 0 | | | | | 59 | | | 9 | | | 15 | | | | | |
| | Helmsdale to Brora | | | | 3 | | 6 | | | 111 | 102 | 52 | 449 | 72 | 635 | 156 | 316 | 81 | 27 | 161 | 28 |
| | Loch Fleet | | 0 | | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 3 | 1 | 0 | 7 | 7 | 20 | 18 | 7 | 10 | 31 |
| | Dornoch Firth (SAC) | 233 | | 903 | 456 | 121 | 321 | 79 | 473 | 431 | 748 | 516 | 523 | 819 | 717 | 679 | 74 | 604 | 127 | 716 | 387 |
| | Cromarty Firth | 9 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 2 | 1 | 3 | 1 | 0 | 1 |
| | Beauly Firth (incl. Milton & Munlo | 8 | | 2 | 3 | 8 | 0 | 0 | 0 | 0 | 3 | 4 | 0 | 0 | 2 | 3 | 1 | 5 | 2 | 0 | 2 |
| | Ardersier (incl. Eathie) | | | 36 | 24 | 85 | 0 | 3 | 44 | 55 | 142 | 74 | 142 | 94 | 331 | 74 | 24 | 109 | 2 | 14 | 28 |
| | Culbin & Findhorn | | | 0 | 0 | 0 | 0 | 10 | 0 | 11 | 11 | 28 | 75 | 58 | 58 | 179 | 121 | 218 | 93 | 743 | 717 |
| | Burghead to Fraserburgh | | | 30 | 65 | | | | | 205 | | 61 | | | | 18 | | 258 | | | 43 |
| TOTALS | Dornoch Firth to Ardersier | | | 941 | 483 | 214 | 321 | 82 | 517 | 486 | 894 | 594 | 665 | 913 | 1,051 | 758 | 100 | 721 | 132 | 730 | 418 |
| | Loch Fleet to Ardersier | | | | 483 | 214 | 321 | 82 | 517 | 486 | 895 | 597 | 666 | 913 | 1,058 | 765 | 120 | 739 | 139 | 740 | 449 |
| | Loch Fleet to Findhorn | | | | 483 | 214 | 321 | 92 | 517 | 497 | 906 | 625 | 741 | 971 | 1,116 | 944 | 241 | 957 | 232 | 1,483 | 1,166 |
| | Helmsdale to Findhorn | | | | 486 | | 327 | | | 608 | 1,008 | 677 | 1,190 | 1,043 | 1,751 | 1,100 | 557 | 1,038 | 259 | 1,644 | 1,194 |
| | Moray Firth SMA † | | | | 551 | | 392 | | | 872 | 1,272 | 797 | 1,260 | 1,113 | 1,821 | 1,133 | 590 | 1,311 | 532 | 1,917 | 1,252 |

* In 2011, Duncansby Head to Wick was not surveyed. Therefore the 15 grey seals given for the northern most area in 2011 include 7 counted in 2008.

† For years where only the main area was surveyed (i.e. Helmsdale to Findhorn), the most recent counts for the outlying areas are used to give a total for the Moray Firth Seal Management Area.

**Table 5. August counts of harbour seals in the Firth of Tay and Eden Estuary SAC, 1990-2016.** Mean values if more than one count per year; red = lowest count, green = highest count per area. Data are from aerial surveys by the Sea Mammal Research Unit. Since 2006, all counts were from digital images obtained using oblique hand-held photography. See Figure 12 for the 2016 distribution of seals within the SAC and Figure 13 for a histogram of these data.

| | Area | 1990 | 1991 | 1992 | 1994 | 1997 | 2000 | 2002 | 2003 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Survey method | 1fw | 1fw | 1fw | 1fw | 1ti | 1fw | 1fw | 1fw | 2fw ,1ti | 1fw | 1fw ,1ti | 2fw | 1fw | 1fw | 1fw | 1fw | 1ti | 1fw | 1fw | 1ti |
| (MEAN) COUNTS | Upper Tay | 27 | 73 | 148 | 89 | 113 | 115 | 51 | 83 | 91 | 91 | 63 | 49 | 45 | 41 | 16 | 40 | 36 | 21 | 51 | 41 |
| | Broughty Ferry | 77 | 83 | 97 | 64 | 35 | 52 | 0 | 90 | 51 | 31 | 27 | 13 | 28 | 15 | 18 | 16 | 3 | 0 | 2 | 4 |
| | Buddon Ness | 13 | 86 | 72 | 53 | 0 | 113 | 109 | 142 | 25 | 96 | 64 | 27 | 8 | 23 | 11 | 8 | 10 | 1 | 3 | 0 |
| | Abertay & Tentsmuir | 319 | 428 | 456 | 289 | 262 | 153 | 167 | 53 | 63 | 34 | 31 | 50 | 8 | 9 | 0 | 5 | 0 | 0 | 0 | 1 |
| | Eden Estuary | 31 | 0 | 0 | 80 | 223 | 267 | 341 | 93 | 105 | 90 | 90 | 83 | 22 | 36 | 32 | 19 | 1 | 7 | 4 | 5 |
| | SAC total | 467 | 670 | 773 | 575 | 633 | 700 | 668 | 461 | 335 | 342 | 275 | 222 | 111 | 124 | 77 | 88 | 50 | 29 | 60 | 51 |

fw, fixed-wing survey; ti, thermal imager helicopter survey; SAC, Special Area of Conservation

**Table 6. August counts of grey seals in the Firth of Tay and Eden Estuary SAC, 1990-2016.** Mean values if more than one count per year; red = lowest count, green = highest count per area. Data are from aerial surveys by the Sea Mammal Research Unit. Since 2006, all counts were from digital images obtained using oblique hand-held photography. See Figure 12 for the 2016 distribution of seals within the SAC and Figure 14 for a histogram of these data.

| | Area | 1990 | 1991 | 1992 | 1994 | 1997 | 2000 | 2002 | 2003 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Survey method | 1fw | 1fw | 1fw | 1fw | 1ti | 1fw | 1fw | 1fw | 2fw ,1ti | 1fw | 1fw ,1ti | 2fw | 1fw | 1fw | 1fw | 1fw | 1ti | 1fw | 1fw | 1ti |
| (MEAN) COUNTS | Upper Tay | 0 | 0 | 18 | 20 | 61 | 64 | 78 | 50 | 42 | 22 | 27 | 26 | 55 | 98 | 16 | 39 | 127 | 62 | 115 | 132 |
| | Broughty Ferry | 0 | 3 | 0 | 9 | 0 | 0 | 0 | 16 | 0 | 8 | 1 | 8 | 0 | 0 | 2 | 3 | 0 | 2 | 0 | 0 |
| | Buddon Ness | 0 | 0 | 1 | 104 | 0 | 101 | 0 | 33 | 11 | 25 | 85 | 7 | 0 | 12 | 22 | 13 | 18 | 0 | 2 | 0 |
| | Abertay & Tentsmuir | 912 | 1,546 | 1,191 | 1,335 | 1,820 | 2,088 | 1,490 | 1,560 | 763 | 1,267 | 1,375 | 483 | 395 | 1,406 | 1,265 | 1,111 | 323 | 531 | 687 | 738 |
| | Eden Estuary | 0 | 0 | 16 | 0 | 10 | 0 | 25 | 4 | 27 | 57 | 31 | 33 | 0 | 39 | 17 | 36 | 14 | 39 | 32 | 66 |
| | SAC total | 912 | 1,549 | 1,226 | 1,468 | 1,891 | 2,253 | 1,593 | 1,663 | 843 | 1,379 | 1,519 | 557 | 450 | 1,555 | 1,322 | 1,202 | 482 | 634 | 836 | 936 |

fw, fixed-wing survey; ti, thermal imager helicopter survey; SAC, Special Area of Conservation

**Table 7. August counts of harbour seals on the English east coast, 1988 to 2016.** In years when more than one survey was undertaken, values are means with the numbers of surveys in parentheses. Blank grey cells means that no survey was carried out.

| | Northeast England | | Southeast England | | | | |
|---|---|---|---|---|---|---|---|
| Year | N'umberland | The Tees | Donna Nook | The Wash | Blakeney Point | Scroby Sands | Essex & Kent |
| 1988 | | | 173 | 3,035 | 701 | | |
| 1989 | | 16 (31) | 126 | 1,556 (2) | 307 | | |
| 1990 | | 23 (31) | 57 | 1,543 | | | |
| 1991 | | 24 (31) | | 1,398 (2) | | | |
| 1992 | | 27 (31) | 32 (2) | 1,671 (2) | 217 | | |
| 1993 | | 30 (31) | 88 | 1,884 | 267 | | |
| 1994 | 13 | 35 | 103 (2) | 2,011 (2) | 196 | 61 | |
| 1995 | | 33 (31) | 115 | 2,084 (2) | 415 (2) | 49 | 130 |
| 1996 | | 42 (31) | 162 | 2,151 | 372 | 51 | |
| 1997 | 12 | 42 (31) | 251 (2) | 2,466 (2) | 311 (2) | 65 (2) | |
| 1998 | | 41 (31) | 248 (2) | 2,374 (2) | 637 (2) | 52 | |
| 1999 | | 36 (31) | 304 (2) | 2,392 (2) | 659 (2) | 72 (2) | |
| 2000 | 10 | 59 (31) | 390 (2) | 2,779 (2) | 895 | 47 (2) | |
| 2001 | | 59 (31) | 233 | 3,194 | 772 | 75 | |
| 2002 | | 52 (31) | 341 | 2,977 (2) | 489 (2) | | |
| 2003 | | 38 (31) | 231 | 2,513 (2) | 399 | 38 | 180 |
| 2004 | | 40 (31) | 294 (2) | 2,147 (2) | 646 (2) | 57 (2) | |
| 2005 | 17 | 50 (31) | 421 (2) | 1,946 (2) | 709 (2) | 56 (2) | 101 |
| 2006 | | 45 (31) | 299 | 1,695 | 719 | 71 | |
| 2007 | 7 | 43 (31) | 214 | 2,162 | 550 | | |
| 2008 | 9 | 41 (31) | 191 (2) | 2,011 (2) | 581 (2) | 81 (2) | 319 |
| 2009 | | 49 (31) | 267 (2) | 2,829 (2) | 372 | 165 (2) | |
| 2010 | | 53 (31) | 176 (2) | 2,586 (2) | 391 | 201 (2) | 379 |
| 2011 | | 57 (31) | 205 | 2,894 | 349 | 119 | |
| 2012 | | 63 (31) | 192 (2) | 3,372 (2) | 409 | 161 | |
| 2013 | | 74 (31) | 396 | 3,174 | 304 | 148 | 482 |
| 2014 | | 81 (31) | 353 | 3,086 | 468 | 285 | 489 |
| 2015 | 0 | 91 (31) | 228 (2) | 3,336 (2) | 455 | 270 (2) | 451 |
| 2016 | | 86 (31) | 369 (2) | 3,377 (2) | 424 (2) | 198 (2) | 694 |

SOURCE - Counts from SMRU aerial surveys using a fixed-wing aircraft funded by NERC except where stated otherwise: **Northumberland** - One complete survey in 2008 (funded by DECC (previously DTI). Helicopter surveys with thermal imager from Farne Islands to Scottish border in 1997, 2005, 2007, 2015. Fixed-wing surveys of Holy Island only in 1994 & 2000. **The Tees** - Ground counts by Industry Nature Conservation Agency (Bond & Gibson, 2016). Single SMRU fixed-wing count **Southeast England** - All SMRU aerial surveys, except for Essex & Kent 2013-2016: data from surveys (aerial/by boat/from carried out by the Zoological Society of London (Barker & Obregon, 2015, and unpublished). The 130 for 1995 are an estimate based on a partial SMRU aerial survey.

**Table 8. August counts of grey seals on the English east coast, 1995 to 2016.** In years when more than one survey was undertaken, values are means with the numbers of surveys in parentheses. Blank grey cells means that no survey was carried out.

| | Northeast England | | Southeast England | | | | |
|---|---|---|---|---|---|---|---|
| Year | N'umberland | The Tees | Donna Nook | The Wash | Blakeney Point | Scroby Sands | Essex & Kent |
| 1988 | | | | 52 | 1 | | |
| 1989 | | 7 | | | | | |
| 1990 | | 9 | 115 | 10 | | | |
| 1991 | | 8 | | 48 (2) | | | |
| 1992 | | 9 | 235 | 35 (2) | 6 | | |
| 1993 | | 9 | 59 | 64 | 7 | | |
| 1994 | 100 | 6 | 100 (2) | 94 (2) | 40 (2) | 43 | |
| 1995 | | 10 | 123 | 66 (2) | 18 (2) | 32 | |
| 1996 | | 11 | 119 | 60 | 11 | 46 | |
| 1997 | 603 | 10 | 289 (2) | 49 (2) | 45 (2) | 34 (2) | |
| 1998 | | 11 | 174 (2) | 53 (2) | 33 (2) | 23 | |
| 1999 | | 12 | 317 (2) | 57 (2) | 14 (2) | 89 (2) | |
| 2000 | 568 | 11 | 390 | 40 (2) | 17 | 40 (2) | |
| 2001 | | 11 | 214 | 111 | 30 | 70 | |
| 2002 | | 12 | 291 | 75 (2) | 11 (2) | | |
| 2003 | | 11 | 232 (2) | 58 (2) | 18 | 36 | 96 |
| 2004 | | 13 | 609 (2) | 30 (2) | 10 (2) | 93 (2) | |
| 2005 | 1,092 | 12 (31) | 927 (2) | 49 (2) | 86 (2) | 106 (2) | |
| 2006 | | 8 (31) | 1,789 | 52 | 142 | 187 | |
| 2007 | 1,907 | 8 (31) | 1,834 | 42 | | | |
| 2008 | 2,338 | 12 (31) | 2,068 (2) | 68 (2) | 375 (2) | 137 (2) | 160 |
| 2009 | | 12 (31) | 1,329 (2) | 118 (2) | 22 | 157 (2) | |
| 2010 | | 14 (31) | 2,188 (2) | 240 (2) | 49 (2) | 292 (2) | 393 |
| 2011 | | 14 (31) | 1,930 | 142 | 300 | 323 | |
| 2012 | | 18 (31) | 4,978 | 258 (2) | 65 | 126 | |
| 2013 | | 16 (31) | 3,474 | 219 | 63 | 219 | 203 |
| 2014 | | 16 (31) | 4,437 | 223 | 445 | 509 | 449 |
| 2015 | 6,767 | 16 (31) | 3,766 (2) | 369 (2) | 528 | 520 (2) | 454 |
| 2016 | | 22 (31) | 3,964 (2) | 431 (2) | 355 (2) | 642 (2) | 481 |

SOURCE - Counts from SMRU aerial surveys using a fixed-wing aircraft funded by NERC except where stated otherwise:
**Northumberland** - One complete survey in 2008 (funded by DECC (previously DTI). Helicopter surveys with thermal imager from Farne Islands to Scottish border in 1997, 2005, 2007, 2015. Fixed-wing surveys of Holy Island only in 1994 & 2000.
**The Tees** - Ground counts by Industry Nature Conservation Agency (Bond & Gibson, 2016). For years prior to 2005, only monthly maximums are available for grey seals. For these years, the given values are estimates calculated using the mean relationship of mean to maximum counts from 2005-2013.
**Southeast England** - All SMRU aerial surveys, except for Essex & Kent 2013-2016: data from surveys (aerial/by boat/from carried out by the Zoological Society of London (Barker & Obregon, 2015, and unpublished).

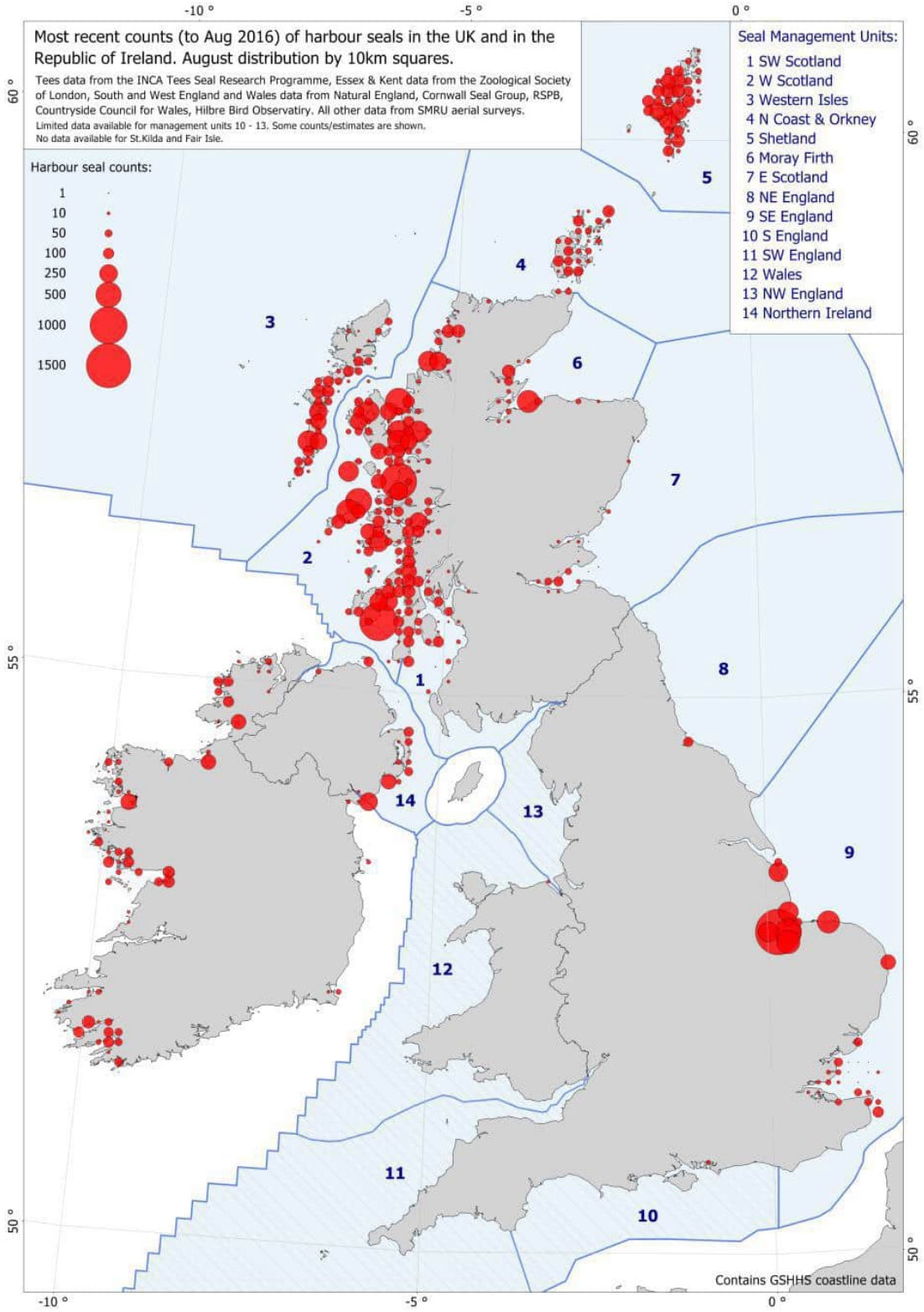



**Figure 1**. August distribution of harbour seals around the British Isles. Very small numbers of harbour seals (<50) are anecdotally but increasingly reported for the Management Units 10-13, but are not included on this map.

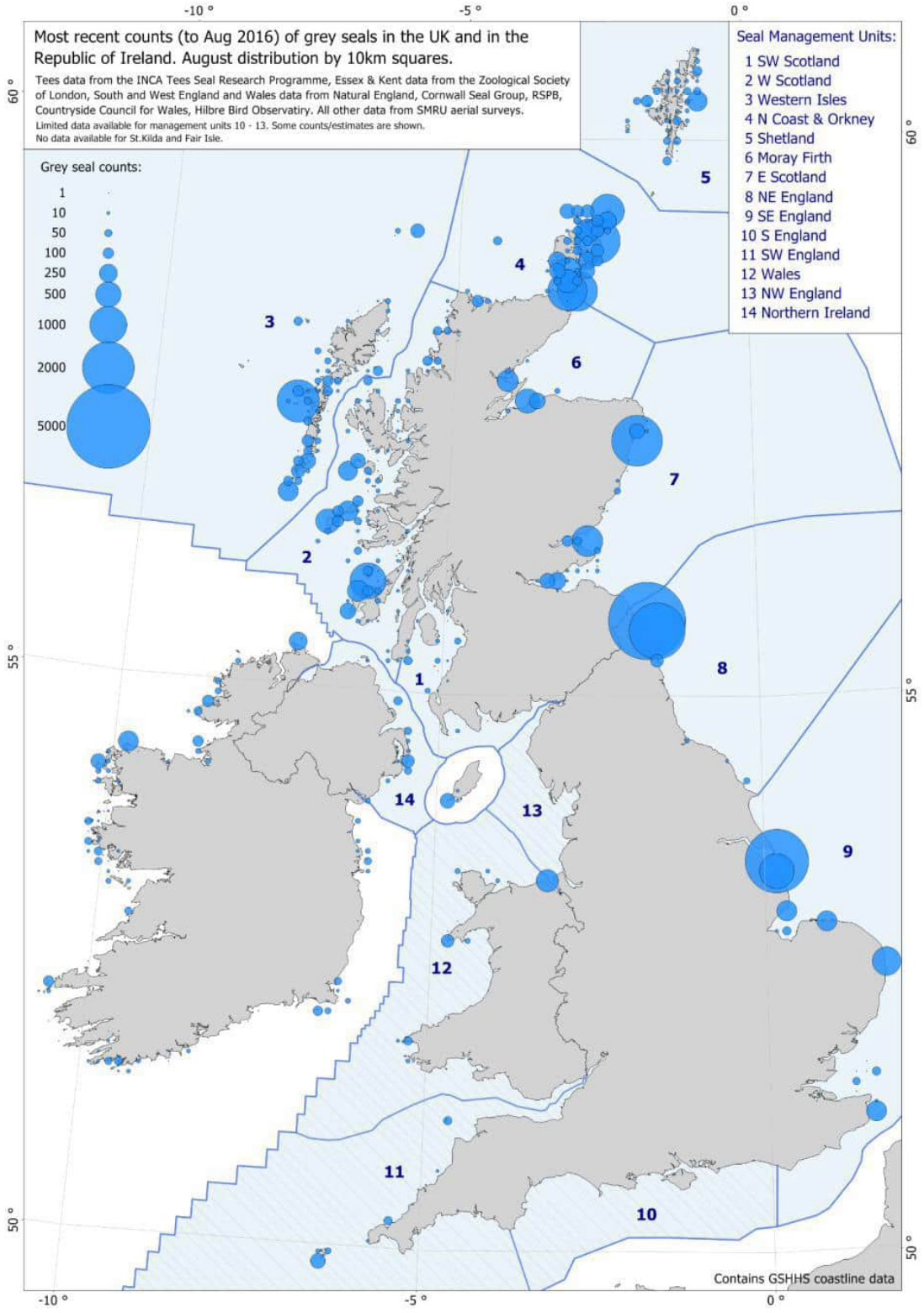



**Figure 2.** August distribution of grey seals around the British Isles. Only a few August counts are available for grey seals in the Management Units 10-13.

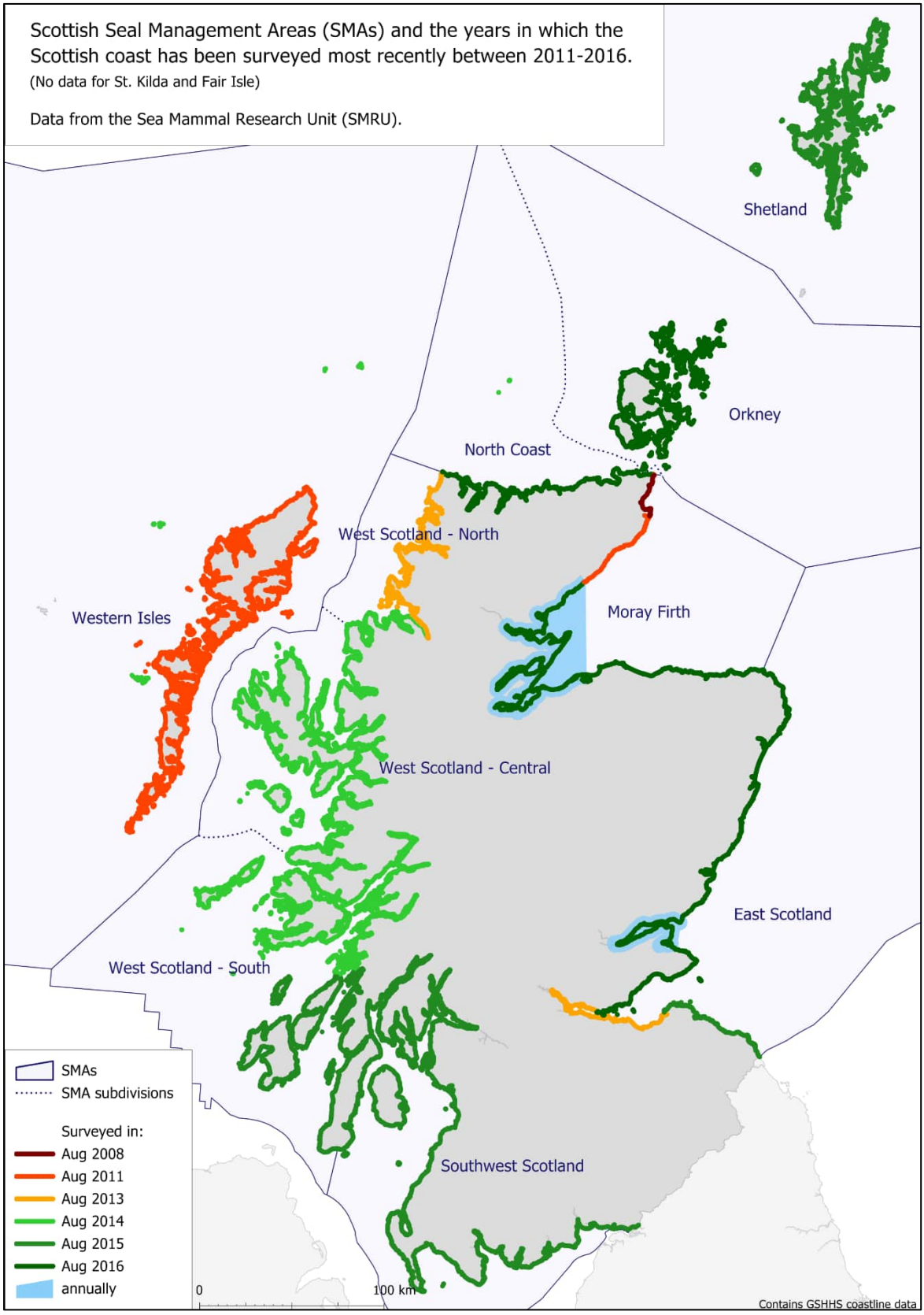



**Figure 3**. Years in which different parts of Scotland were surveyed most recently by helicopter using a thermal imaging camera. Most areas were surveyed between 2011 and 2015. The enclosed areas of the Firth of Tay and the Moray Firth (between Findhorn and Helmsdale) are surveyed every year, usually by fixed-wing aircraft.

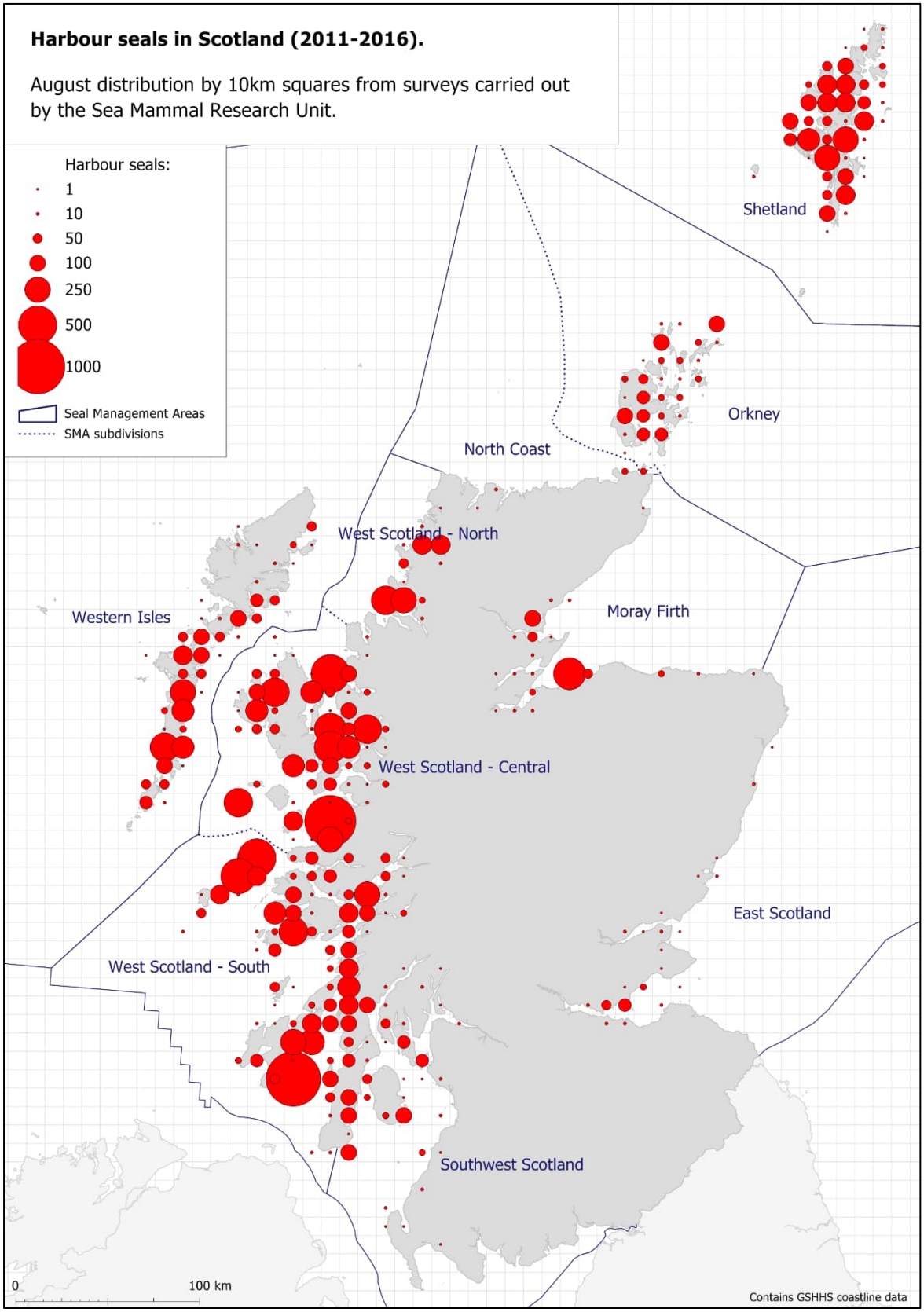



**Figure 4.** August distribution of harbour seals in Scotland. All areas were surveyed by helicopter using a thermal imaging camera, except for the Moray Firth area between Helmsdale and Findhorn, which was surveyed by fixed-wing aircraft without a thermal imager.

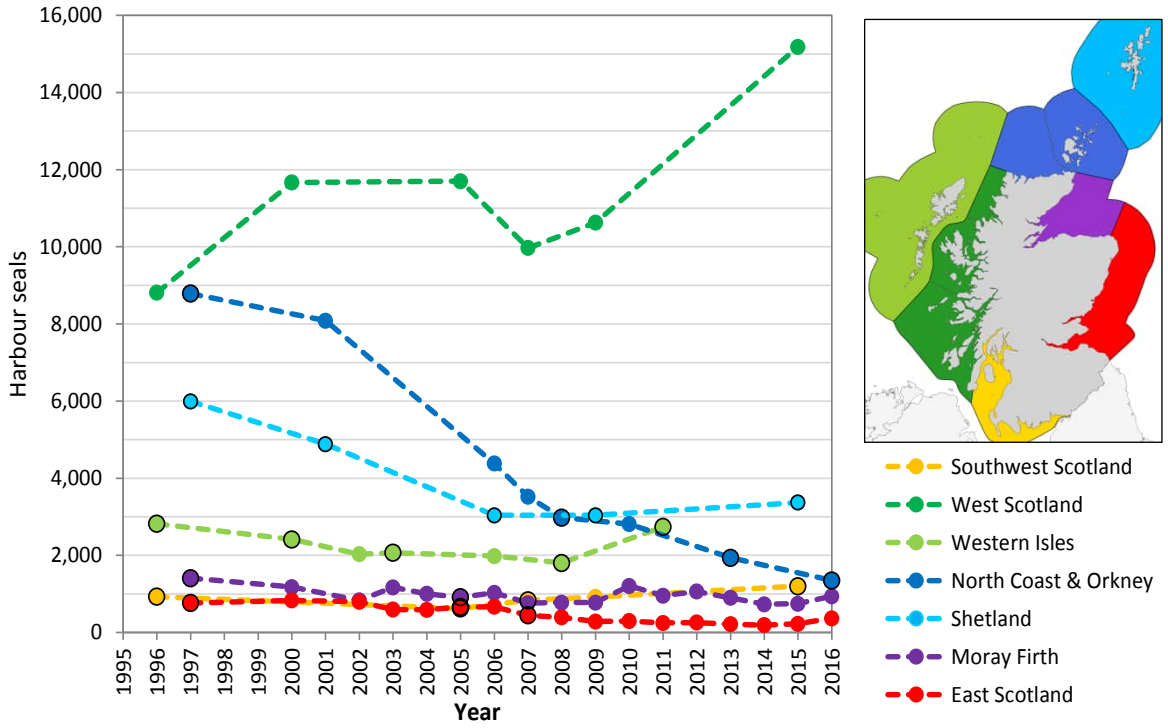



**Figure 5.** August counts of harbour seals in Scottish Seal Management Areas, 1996-2016. Data from the Sea Mammal Research Unit. Note that because these data points represent counts of harbour seals distributed over large areas, individual data points may not be from surveys from only one year. Points are only shown for years in which a significant part of the SMA was surveyed. Points with a black outline are counts obtained in a single year. Trajectories and Seal Management Areas are colour coordinated.

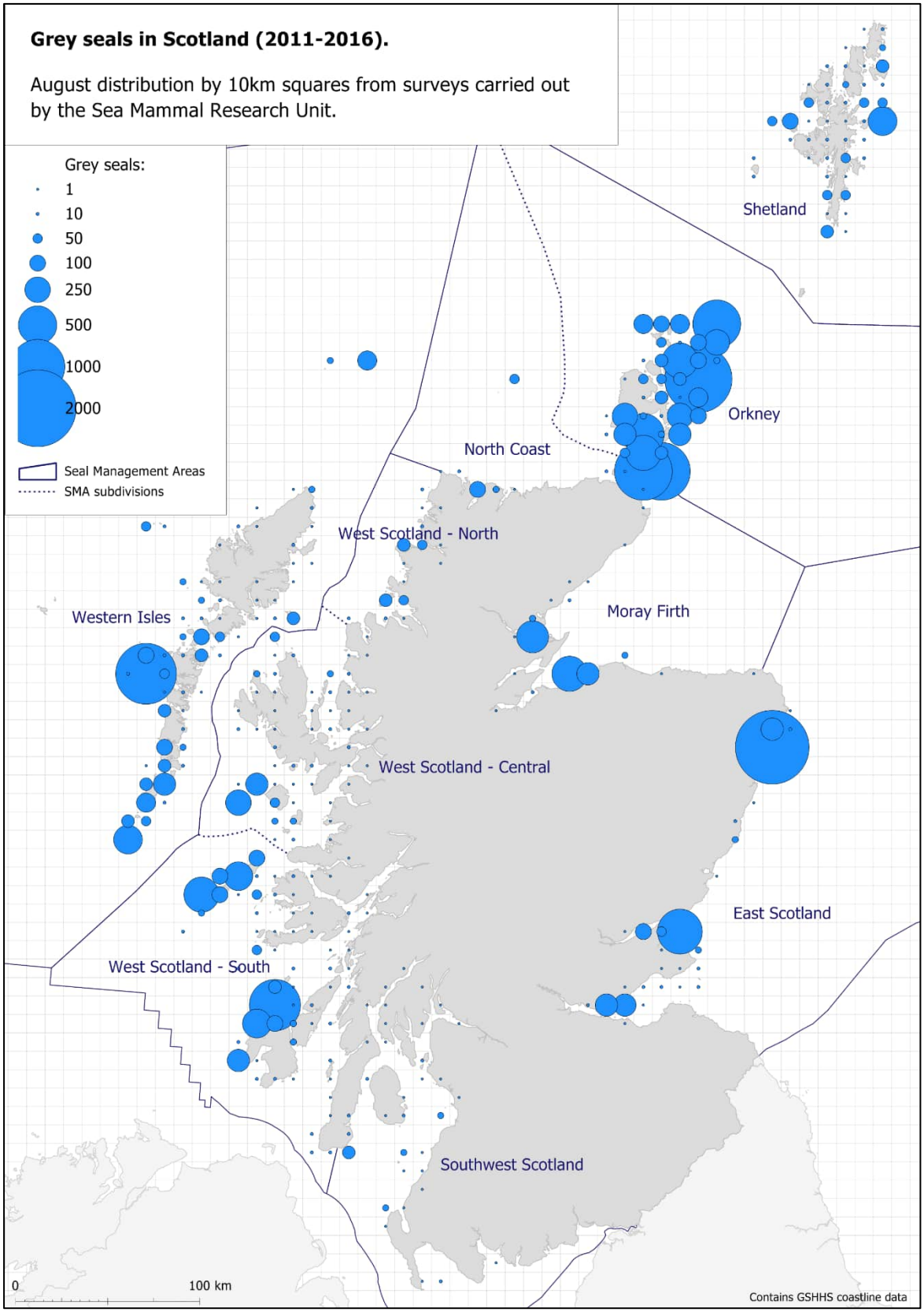



**Figure 6.** August distribution of grey seals in Scotland. All areas were surveyed by helicopter using a thermal imaging camera, except for the Moray Firth area between Helmsdale and Findhorn, which was surveyed by fixed-wing aircraft without a thermal imager.

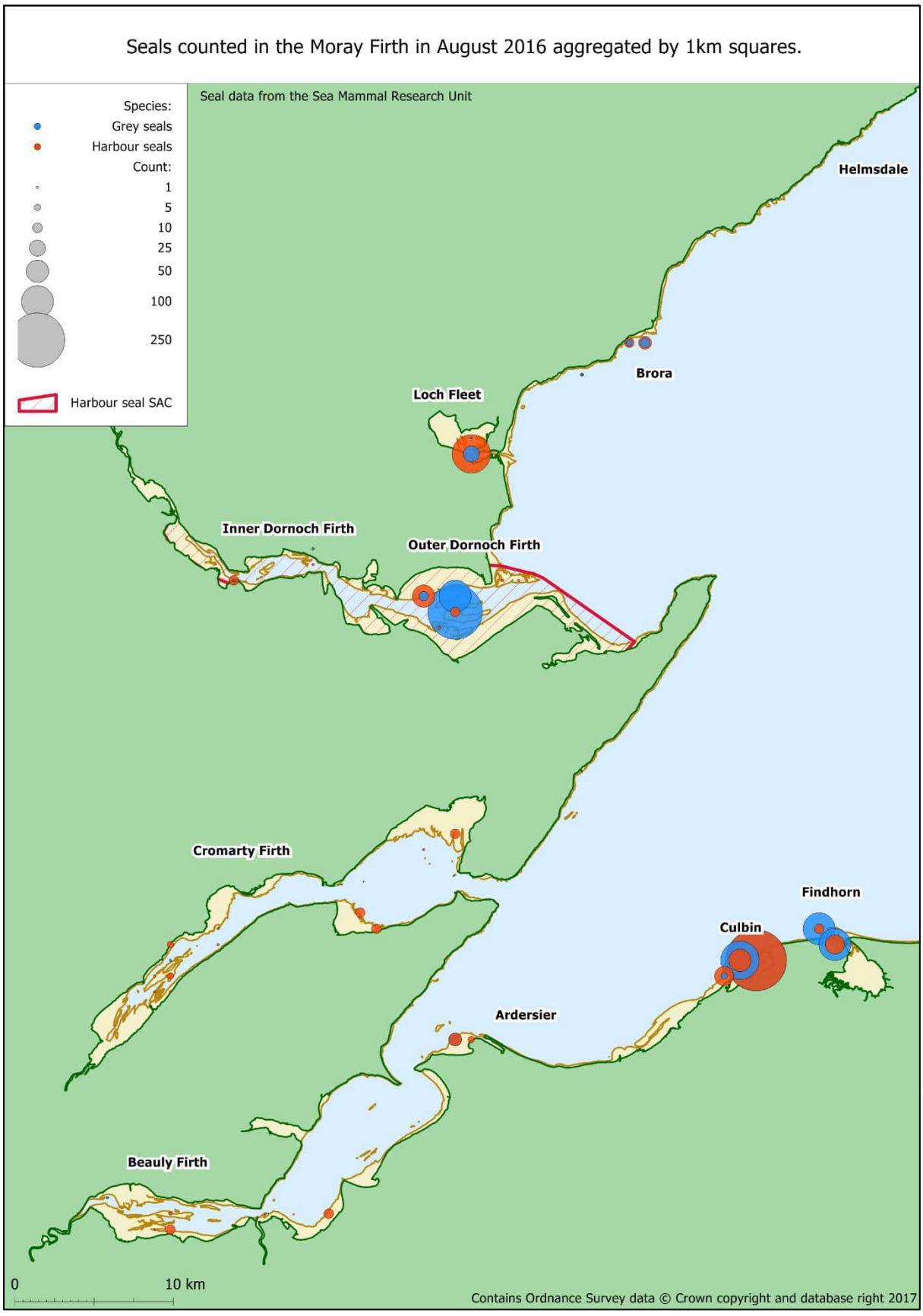



**Figure 7.** Distribution of harbour (red) and grey seals (blue) in the annually surveyed part of the Moray Firth, between Helmsdale and Findhorn, from an aerial survey carried out on 10th August 2016.

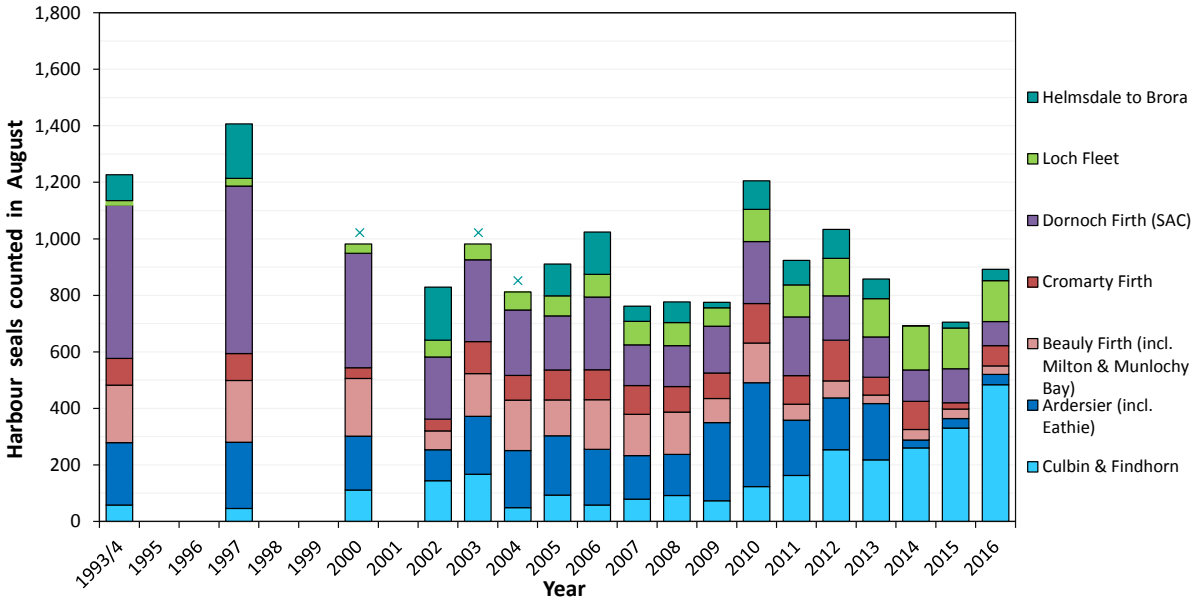



**Figure 8**. August counts of harbour seals in different areas of the Moray Firth, 1994-2016. Data are from the Sea Mammal Research Unit. x: Helmsdale to Brora not surveyed in 2000, 2003 or 2004.

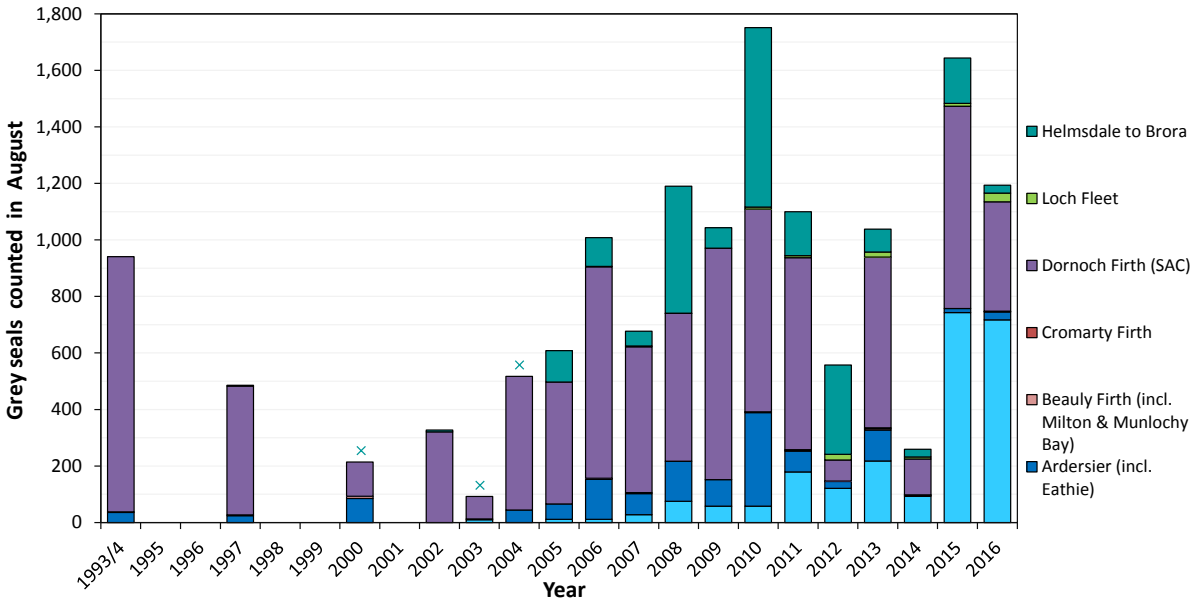



**Figure 9**. August counts of grey seals in different areas of the Moray Firth, 1994-2016. Data are from the Sea Mammal Research Unit. x: Helmsdale to Brora not surveyed in 2000, 2003 or 2004.

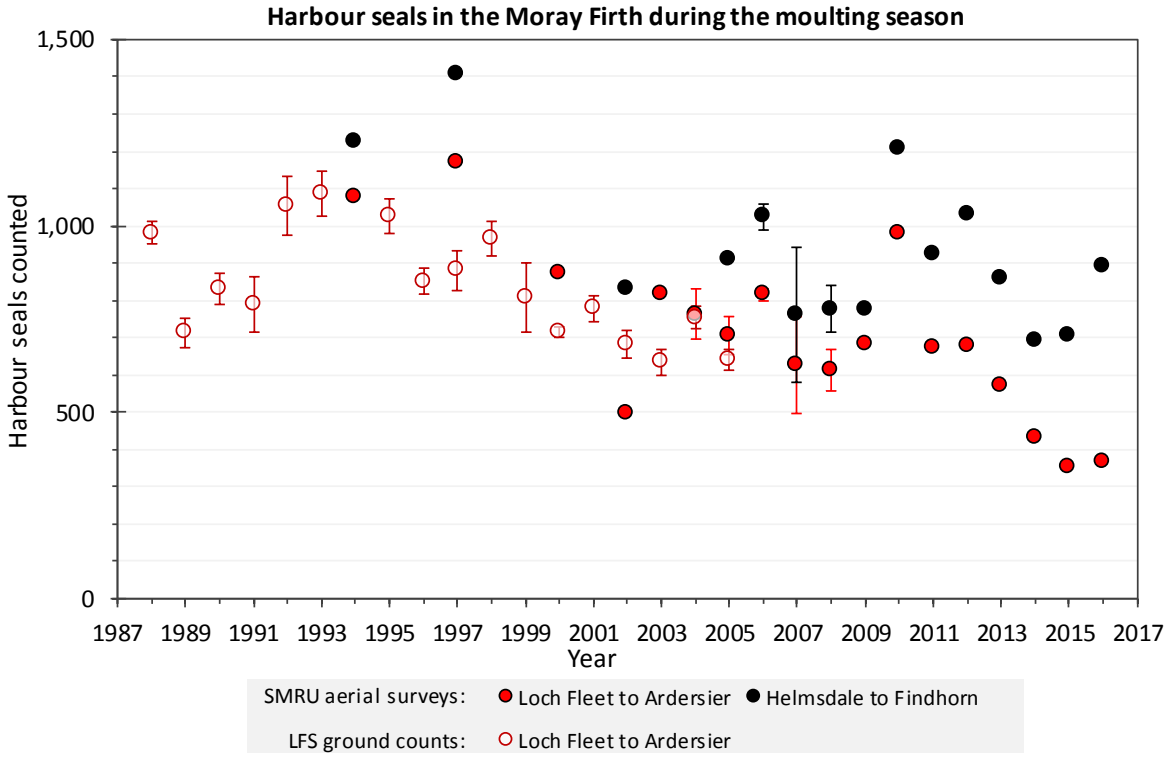



**Figure 10.** Counts of harbour seals in the Moray Firth during the moult season (August), 1988-2016. Plotted values are means ±SE where available. LFS = Lighthouse Field Station (University of Aberdeen).

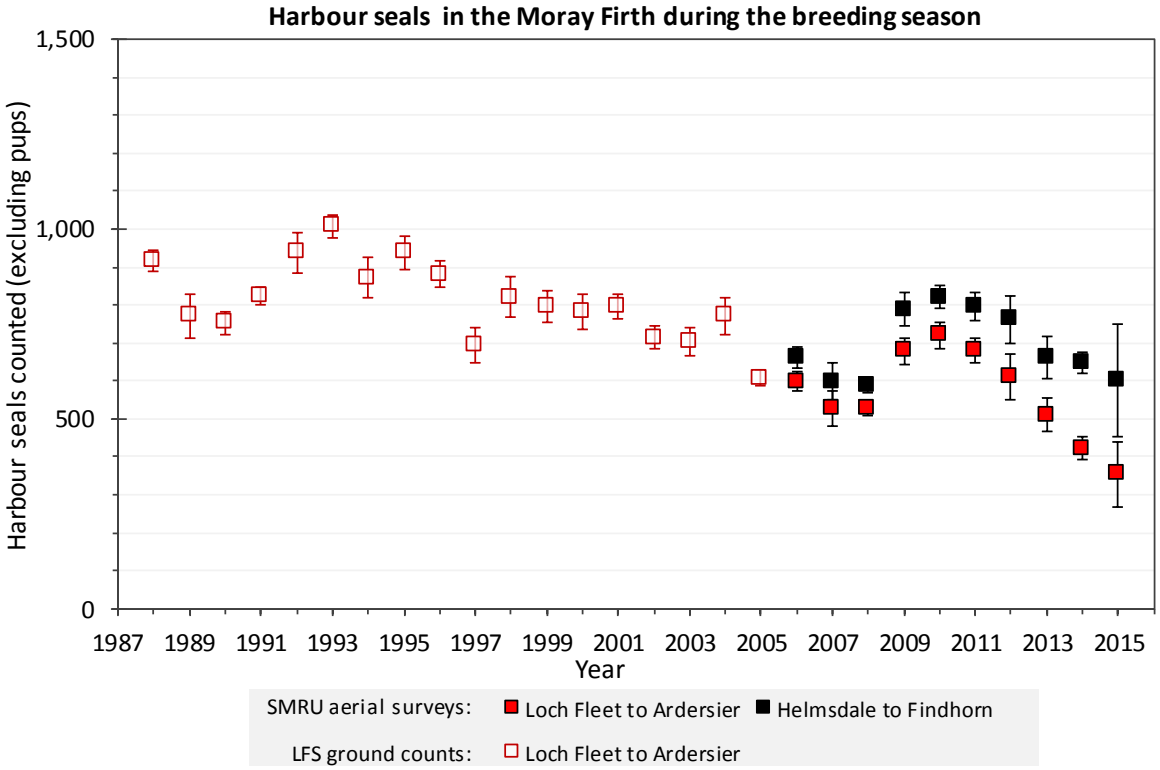



**Figure 11.** Counts of harbour seals in the Moray Firth during the breeding season (June/July), 1988-2016. Plotted values are means ±SE where available. LFS = Lighthouse Field Station (University of Aberdeen).

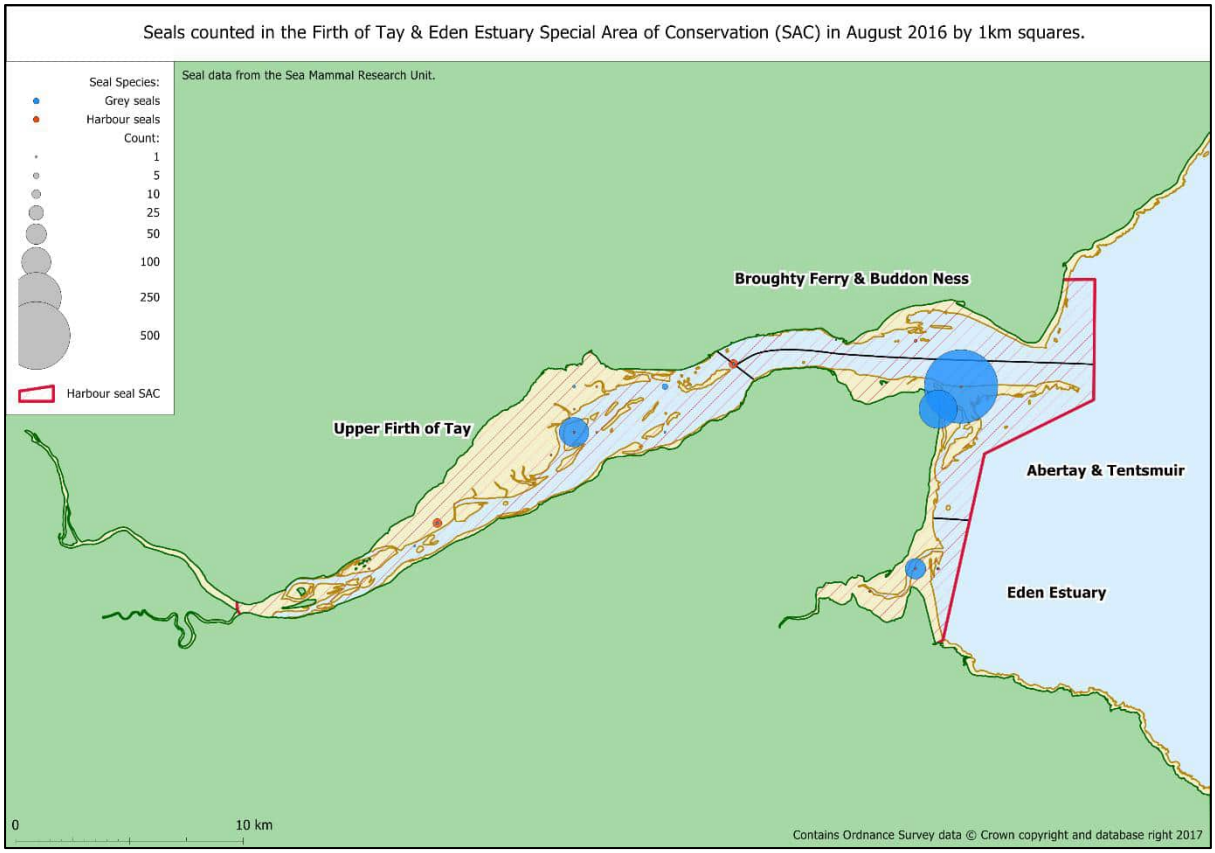



**Figure 12.** The distribution of harbour (red) and grey seals (blue) in the Firth of Tay and Eden Estuary on 9th August 2016.

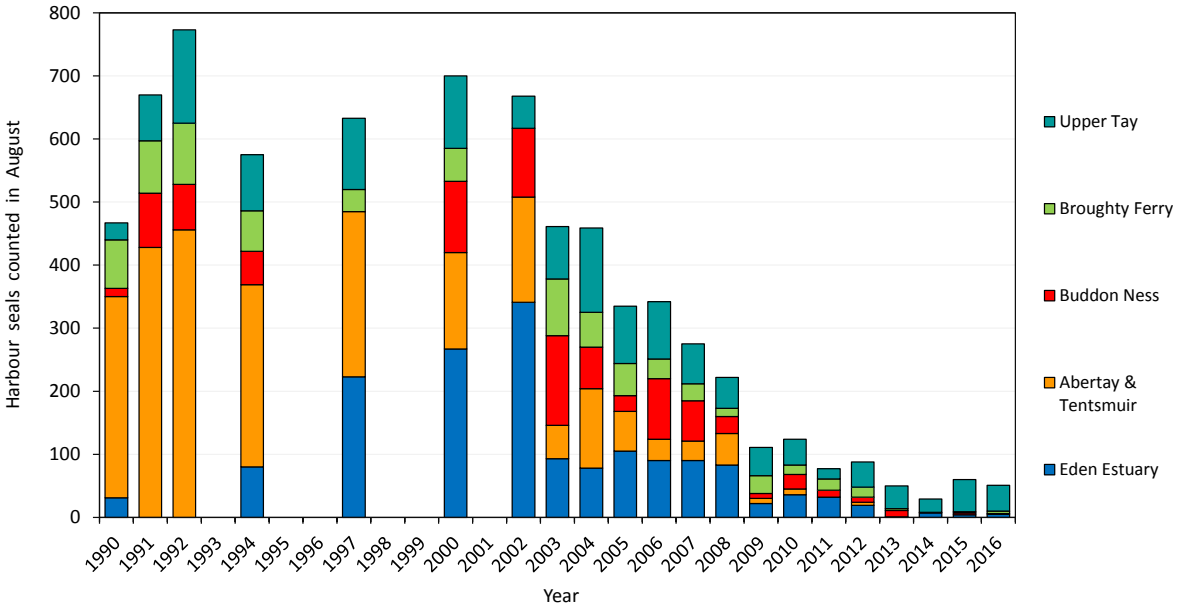



**Figure 13.** August counts of harbour seals in the Firth of Tay and Eden Estuary, 1990 to 2016.

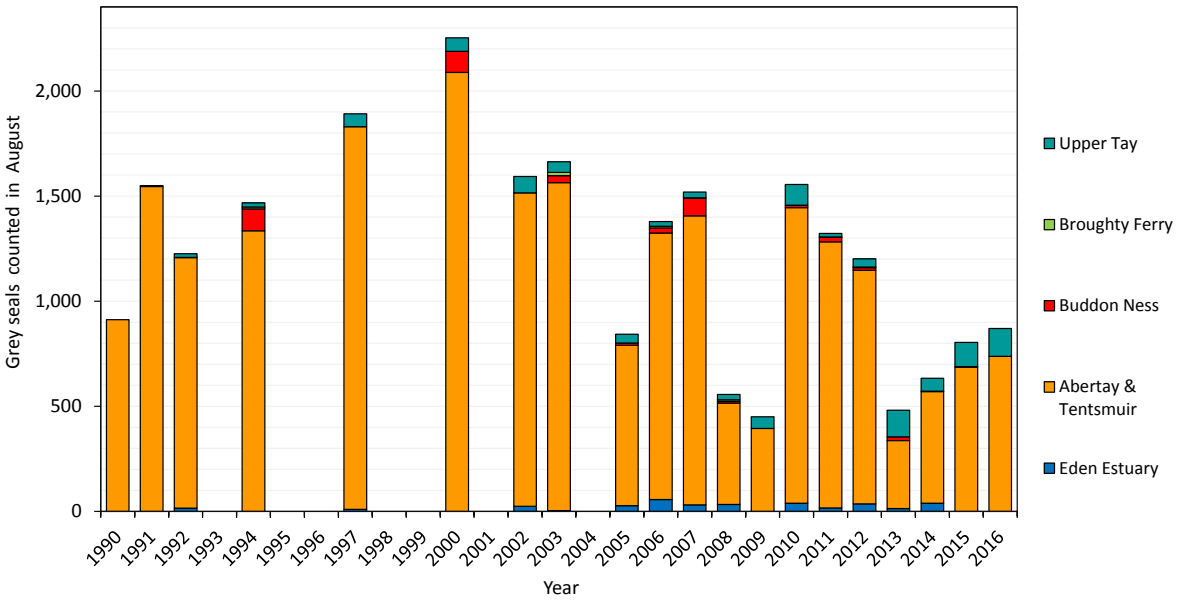
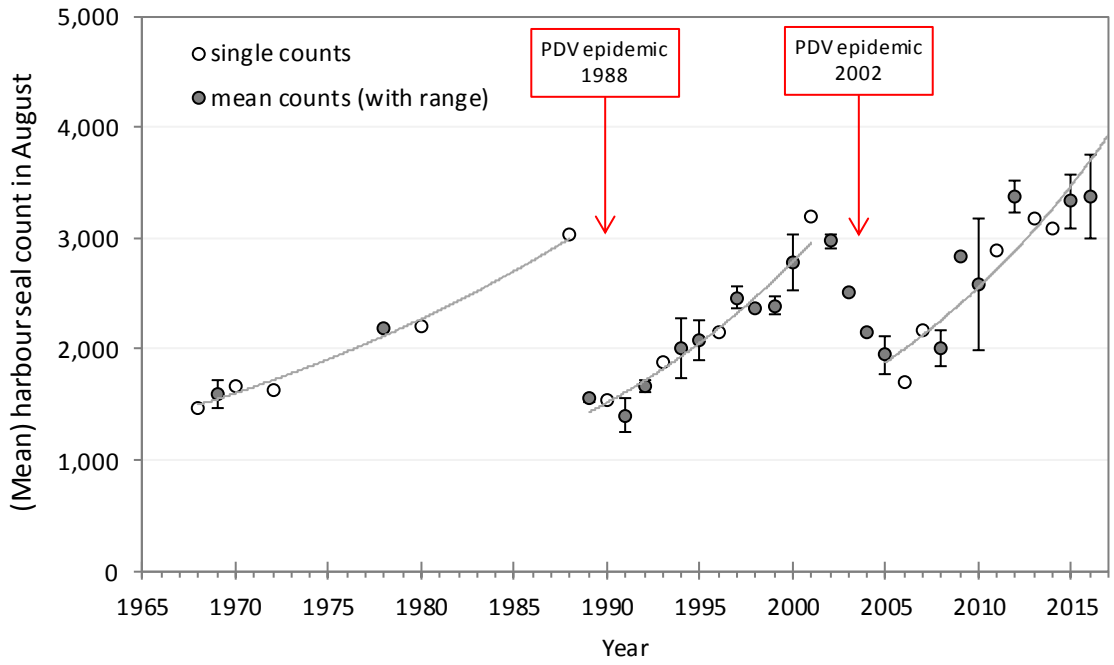



**Figure 14.** August counts of grey seals in the Firth of Tay and Eden Estuary, 1990 to 2016.




NOTE - vertical bars indicate the range of the counts used to calculate the mean.

**Figure 15.** Counts of harbour seals in The Wash between 1967 and 2016 from surveys by the Sea Mammal Research Unit.

# Harbour seal decline - vital rates and drivers

## A progress report on Year 2

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**Abstract**

Numbers of harbour seals (*Phoca vitulina*) have dramatically declined in parts of Scotland over the last 15 years. This report provides a summary of the work conducted under year two of the 'harbour seal decline – vital rates and drivers' task (Marine Mammal Scientific Support Research Programme MMSS/02/15), which aims to identify, understand and assess the relative contribution of various factors in this decline.

A simplified version of the population model previously built for the Moray Firth has been re-coded in JAGS language, and a decision support tool has been developed to include a biologically realistic simulation model and a model-fitting step that attempts to recover the parameters used in the simulation. The fitting software is able to estimate parameters from historical count data containing data gaps and when no pup count data are available.

Live capture-release studies were conducted in Orkney in April and May 2016, to collect individual covariates and deploy telemetry tags to inform the photo-identification effort. Blubber concentrations of progesterone may be a much more reliable indicator of pregnancy than levels in plasma. The proportion of the live-captured adult females (n=13) that were pregnant was 61.5% (95% CI 35% - 88%), which is lower than would have been expected. 88% of the urine and faecal samples collected showed domoic acid above the limit of detection, indicating some low level exposure. Fish viscera (n=85, 4 different species) sampled off the west coast of Orkney mainland were all positive for domoic acid although concentrations in all fish sampled were at low levels.

In addition to the moult aerial surveys conducted in August 2016 in Orkney as part of the SMRU annual survey programme, breeding aerial surveys were conducted in Scapa Flow (Orkney), Kintyre and Isle of Arran, and Loch Dunvegan, using a fix-wing aircraft and digital photography. The difficulty of locating the seals at haulout sites from the aircraft and the impossibility of identifying age classes in the photographs led to the decision of excluding such data from the population model.

A total of 92 seal carcasses (both species) were reported to SMASS between June 2016 and March 2017 in the three study areas. However, no obvious consistent causes of death were identified among the harbour seals that were examined post-mortem.

### Introduction

A decline in Scottish harbour seals (*Phoca vitulina*) was detected in the early 2000s (Lonergan *et al.*, 2007) and has continued in some of the surveyed regions, with the decline in numbers being more apparent for the east and north coasts of Scotland and in the Northern Isles (SCOS, 2015). In order to

determine the management and mitigation options to address this situation, the relative contributions of various factors potentially involved in the declines need to be identified, understood and assessed. Potential drivers include changes in prey quality and/or availability, increasing grey seal population size which may be influencing harbour seal populations through direct predation or competition for resources, and the occurrence and exposure of seals to toxins from harmful algae. Irrespective of the factor or factors driving the decline, changes observed at the population level must result from changes in vital rates (i.e. survival and fecundity rates). Obtaining information on such life history parameters from long-term studies (e.g. Bowen *et al.*, 2003) in regions with contrasting population trajectories (declining compared to stable or increasing populations) will help to identify the causal factors and determine how and where the potentially important natural and/or anthropogenic factors are acting. At present, life history information for harbour seals in Scotland is available only from Loch Fleet and the Moray Firth (Mackey *et al.*, 2008; Cordes and Thompson, 2013), but is completely lacking for other regions in Scotland. In complex ecosystems, populations may experience pressure from multiple causes (e.g. food shortage, predation, toxin exposure and anthropogenic mortality). Causes of mortality or poor condition may impact different parts of the population in different ways (e.g. young or pregnant animals might be especially vulnerable to nutritional stress). Also, for long-lived animals such as harbour seals, considerable time lags may also be seen between cause and consequence in terms of population numbers. Consequently, the outcomes of combined effects at the level of population abundance may be difficult to predict intuitively.

This paper presents a summary of the progress on each of the six approaches included in the task 'habour seal decline – vital rates and drivers' under the Marine Mammal Scientific Support Research Programme MMSS/02/15: (1) integrated population model; (2) harbour seal vital rates using mark-recapture photo-identification data (this approach will not start until the end of photo-ID data collection on Year 5 and is thus not reported here); (3) live capture-release of harbour seals at the photo-ID study sites; (4) aerial survey counts of harbour and grey seals at and adjacent to the study sites; (5) improving the understanding of potential drivers of population change; and (6) seal carcass collection.

**Methods**

1. Integrated population model

The integrated population model is based on original Moray Firth study of local harbour seal population dynamics and subsequent developments of that model (Matthiopoulos *et al*., 2014; Caillat and Smout, 2015). A decision support tool (DST) has been developed to include an age-structured population model coded in R to produce simulated data, and a model-fitting step coded in JAGS package to recover the parameters used in the simulation, using the Bayesian hidden-process modelling approach (Newman *et al*., 2006). The simulation tool provides a framework to test out possible hypothesis about population decline, such as the imposition of 'external' sources of mortality (e.g. shooting, toxic algal blooms, or predation by grey seals). The simulation can show the effects of changes that may affect all the population or only certain age/sex classes.

The simulation approach can also suggest how well model-fitting will inform our understanding of local seal populations, including where data are limited (i.e. sparse data or moult count only data). The DST was first applied to data sets including pup and moult count data and then excluding the pup count data. For the model fitted to moult-only data, a single value representing pup recruitment (i.e. the average number of yearling seals produced in year *t+1* by female pupping in year *t)* was calculated as the product of female fecundity with first year survival. For ease of comparison between models, this is the quantity that has been estimated for all results reported here.

The DST was then used to investigate whether this modelling approach would be suitable for limited data sets, such as those from Scapa Flow (Orkney). The fitted model was modified to include the

change in 'external' mortality as a logistic function of time rather than as a step function, and simplified by excluding the density dependent processes, calculating male survival rate as a simple multiplier (*0.9 X female survival*), and fixing female fecundity at 0.9.

2. Live capture-release at the photo-ID study sites

Two separate trips were conducted in Orkney to carry out live capture-release studies of harbour seals in April and May 2017, focussing on capturing adult females where possible. Seals were captured in South Burray and in Widewall Bay (South Ronaldsay), at haulout sites where photo-ID studies were to be carried during the breeding season. During both trips adult and juvenile harbour seals were captured, individual covariate data were collected from each seal and telemetry tags (GSM/GPS and LO tags) were deployed on adult seals, primarily on females. Pictures of their pelage were taken for photo-identification purposes.

Urine and faecal samples were analysed for domoic acid concentrations using the validated and published ELISA method (Hall and Frame, 2010). The growth layer groups in the collected teeth were counted to determine the age of the individuals (Dietz *et al*., 1991). Blood samples were analysed for progesterone and 17 beta-oestradiol to determine the pregnancy status of the adult females, using commercially available ELISA assays (Gardiner *et al*., 1996). Progesterone was determined in the blubber samples using the same assay following solvent extraction of the steroids (Kellar *et al*., 2006). In addition, all serum and plasma samples collected in 2016 and 2017 will in future be analysed for specific clinical chemistry parameters to determine health condition.

3. Breeding aerial survey counts of harbour seals

The annual moult surveys conducted by SMRU in August covered the Orkney coastline in August 2016. Results of those surveys are reported in SCOS-BP 17/03. Additionally, breeding aerial surveys were conducted in Scapa Flow (Orkney), Kintyre and Isle of Arran, and in Loch Dunvegan (Isle of Skye) using a small fixed-wind aircraft and digital photography. Due to the extent and complexity of the coast line, the west end of Scapa Flow could not be surveyed in a single tide cycle.

4. Improving the understanding of potential drivers of population change

In addition to the excreta samples collected during the live captures, a further six scats were collected at the capture haulout sites in Widewall Bay (n=5 scats) and West Burray (n=2 scats, n=13 in total) during May and June. One scat was also collected at Rubh nan Sgarbh, in Kintyre, west coast of mainland. It was not possible to collect scat at the Isle of Skye study site as it was not possible to land during the photo-ID trips.

Two fishing trips to collect prey samples were undertaken in the waters off Scapa Flow on the west coast of Orkney mainland. A total of 85 fish guts were sampled for domoic acid analysis, using the same method as for the urine and faecal samples. 35 cod, 12 haddock, 36 ling and two torsk were sampled, classified by species and stored in bags containing between 1 and 7 guts, with details on the length of the sampled fish contained in each bag (all fish were measured except for 11).

5. Seal carcass collection

A total of 92 seal carcasses were reported to SMASS between June 2016 and March 2017 in the three study areas (Orkney, Isle of Skye and Kintyre and the Clyde). No carcasses were reported for these areas in April and May 2016.

**Results and Discussion**

1. Integrated population model

Data including both pup and moult count data sub-sampled from a 30 year time interval were fitted in about 15 minutes using 100,000 MCMC iterations on a standard I7 laptop using JAGS. The 'recovered' values of the parameters (marginal posterior distributions estimated by the fitting process, black curves, (Figure 1) were fairly close to the 'known' values (prior distributions, red curves). The fitted model recovers the 'known' population (i.e. known values from the simulated

data set, red curve) trajectory well, and approximates the change point year (Figure 2). The 'known' population trajectory lied within the 95% confidence intervals (dashed curves) of the estimated population trajectory based on the fitted model (black curve).

When only moult count data were made available for model fitting, results showed refined male and female survival rates, compared with the priors, but male survival was not estimated well (Figure 3). This is perhaps not surprising as moult count data do not distinguish adult males from females. Where pup count data are available this may put some constraints on numbers of breeding females and inform estimates of female numbers overall, thus indirectly informing estimates of male numbers and survival rates. It is thus recommended that in all future model-fitting, the approach used in the original Moray Firth model is adopted, and male survival is assumed to be (*0.9 X female survival*). The year in which mortality changes occurred was considerably refined from the broad prior and it was close to the true value, but the estimates' 95% confidence intervals did not include the true value i.e. they were too 'tight', therefore giving artificial confidence in the estimated result (Figure 4). This may be due to poor mixing within the MCMC for this parameter, a technical issue which should be further explored. The estimated population trajectory based on the fitted model compared fairly closely with the 'known' trajectory though there was some deviation associated with imperfect estimation of the change point year (Figure 4).

Fitting a simplified population model to the historical data from Scapa Flow (Orkney) resulted in the MCMC converging and reasonable-seeming parameter values estimated. Total population size model estimates and original data appeared consistent (Figure 5), suggesting that some of the observed patterns in the data could be explained by a change in 'externally forced' mortality starting around 1999. However, resulting estimated pup recruitment (the product of female fecundity with first year survival) was very low compared with results for the previous simulation-based models (Figure 6). This is because the previous models had density-dependence in this quantity so that the reported parameter for those models represents a maximum possible level of pup recruitment, not typically seen except in years of very low population size. For 'typical' years under the density-dependent model, pup recruitment would be reduced well below the level indicated by this parameter, due to intraspecific competition.

2. Live capture-release at the photo-ID study sites

A total of 24 seals were captured (14 females and 10 males) (Table 1). There was no significant difference in the mean age of the males compared to the females (males = 8.6 y, females = 9.3 y, $p>0.05$). Unfortunately, some of the teeth could not be aged because of they were inadvertently stored in ethanol in the field which caused them to split during the sectioning stage of the process (marked with 'x' in Table 1). In addition there was no significant difference in the age of the pregnant compared to the non-pregnant females (not-pregnant = 10.8, pregnant = 8.3, $p>0.05$).

Concentrations of plasma progesterone and 17 beta-oestradiol are shown in Table 1, together with assignment of their pregnancy status based on the progesterone concentrations (n=13, see Table 1) and using the threshold established by Gardiner *et al*. (1996) of 18.9 ng $ml^{-1}$. Concentrations of plasma 17 beta-oestradiol showed considerable overlap between pregnant and non-pregnant animals ($p=0.09$, non-pregnant 117.8 pg $ml^{-1}$, pregnant 297.5 pg $ml^{-1}$). Two females that had been assigned as not pregnant from their blood results were seen with a pup during photo-ID observations (highlighted in green in Table 1). However, when the blubber samples were analysed for progesterone concentration, the degree of agreement with the observations carried out during the photo-ID study were entirely consistent with the assignments from the blubber hormones. Concentrations in blubber samples were significantly different between the two groups ($p=0.0012$, mean concentration in non-pregnant females = 17.16 ng $g^{-1}$, mean concentration in pregnant females = 198.11 ng $g^{-1}$). It appears therefore that the blubber concentrations may be a much more reliable indicator of pregnancy than plasma levels. Using these final assignments, the proportion of the live-captured adult females that were pregnant was 61.5% (95% CI 35% - 88%). This is lower than

would have been expected as other studies in harbour seals (including those carried out in the Moray Firth in the early 1990s) reported between 79% (95% CI 60% - 89%, Gardiner *et al*. (1996)) and 82% (95% CI 67% – 91%, Greig (2002)) of live captured animals as being pregnant (using the above respective concentrations as thresholds). However, the sample size was small, leading to wide confidence intervals compared to the other studies.

Domoic acid concentrations in the urine and faecal samples collected from the live capture-release animals showed that the majority (88%) were above the limit of detection, indicating some low level exposure. Only one pregnant female had a reasonably high level of DA in her urine (>60,000 pg $ml^{-1}$). Unfortunately, it was not possible to collect samples from all individuals. There was no difference in concentrations between pregnant and non-pregnant females (p=0.9) or between males and females (p=0.5). It should be noted that it is not possible to say whether the concentrations measured in the excreta are due to low level, recent exposure or previous higher level exposure. Nevertheless, these animals have been consuming fish contaminated with DA and since the half-life of DA is short, the levels represent a minimum exposure.

Ten adult harbour seals (7 females and 3 males) were equipped with GSM/GPS telemetry tags (GSM) during in the April trip. These tags were funded by Vodafone UK, and their support is gratefully acknowledged. A further five adult females were equipped with low-cost, GPS haulout site location-only (LO) tags, designed at SMRU to provide low-cost tracking of the haulout sites visited . The seals showed a variety of movement patterns as well as individual preferences for certain areas (Figure 7). Some seals showed very restricted movements (e.g. females 263 and 265) while others travelled greater distances (e.g. females 256, 259, 264). The design life for the SMRU LO tags was initially three months, but this was foreshortened due to a programming error that made the tags attempt a GPS location fix once every hour, rather than once every four hours. The durations of the five tags were thus only 6, 13, 18, 21 and 21 days.

3. Aerial survey counts of harbour and grey seals

The search for haulout sites along the coast was guided by previous knowledge from the historical data collected during August moult aerial surveys. Despite this, it was difficult to detect all seals hauled out as they were well camouflaged among the rocky and seaweed-covered shores, meaning some might not have been photographed. During the processing of photographs it also became obvious that it was impossible to distinguish age classes (e.g. harbour seal pup versus yearling or juvenile) from the digital photographs taken, even in the best quality photographs. Given the uncertainty around the resulting pup count data and the ability of the population model to perform without these data, it was decided that harbour seal pup counts would be excluded from the population model.

4. Improving the understanding of potential drivers of population change

Three scat samples from Orkney (two from West Burray and one from Widewall Bay) were positive for domoic acid (12,600 – 23,500 pg $g^{-1}$) but the remainder were either below the limit of detection or the samples were too small for analysis.

All fish gut samples were positive for domoic acid at or above the limit of detection (Figure 8). Interestingly, all the levels in the samples of ling were very low (at the limit of detection). However, in general, concentrations in all fish sampled were at low levels. Samples of fish viscera are also being analysed for the presence of PSP toxins (saxitoxin and its derivatives) at the Marine Scotland Science Laboratory in Aberdeen. Results will be reported as soon as they are available.

5. Seal carcass collection

Most of the reported seal carcasses were found in Orkney (n=72) and on the North Coast (n=1). Of these, 53 were grey seals (6 adults, 7 juveniles, 17 pups, 7 unknown age, and 16 to be determined), 10 were harbour seals (2 adults, 3 juveniles, 3 pups, 2 unknown age) and 9 carcasses could not be identified to the species level. Proximate causes of death for harbour seals in Orkney included

entanglement (n=2), possible grey seal predation (n=2) and starvation/hypothermia (n=2). For the remaining 4 carcasses proximate cause of death could not be determined as there was insufficient data or the carcasses had advanced autolysis preventing any determination.

A total of 7 seal carcasses were reported in Isle of Skye, of which 5 were harbour seals (2 juveniles and 3 pups) and 3 were grey seals. Of these, 6 do not have an associated cause of death as they could not be examined, and one harbour seal pup was frozen for a future post-mortem examination.

In the Kintyre and Clyde area, 12 seal carcasses were reported, of which 5 were harbour seals (1 adult, 3 juveniles and 1 pup), 6 were grey seals (3 juveniles and 3 unknown age) and one carcass could not be identified to the species level. Only two of the carcasses were recovered (2 juvenile harbour seals) and are pending a post-mortem examination.

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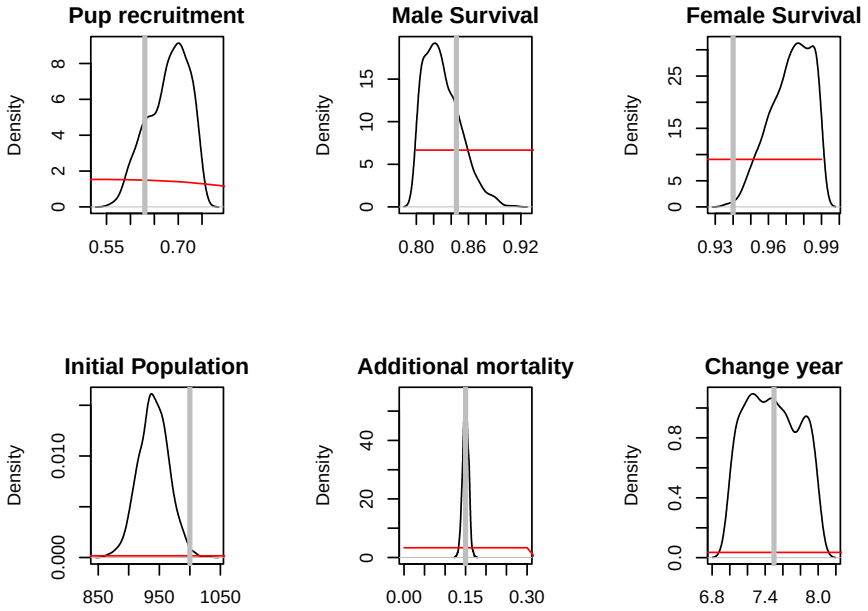


**Figure 1.** Posterior parameter distributions (black curves) compared with prior distributions (red curves) for the DST run with simulated pup and moult count data both included for model fitting. The vertical grey lines represent the 'true' values of the parameters i.e. those that were used in the simulations that produced the simulated data. The most probable estimate of the parameter corresponds to the location (on the x axis) of the peak of the black curve.

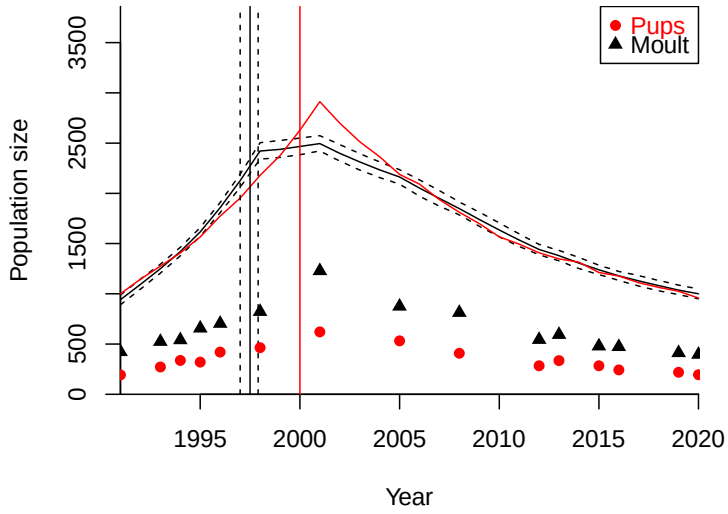


**Figure 2**. Estimated population trajectory (black curve) compared with known population trajectory (red curve) and simulated data for pup counts during breeding (red dots), and seals hauled out during moult (black triangles) (which are mainly adults). The estimated change-point year is shown as a vertical black line and confidence intervals around it are shown with dashed lines. The 'true' value for this change-point is represented by the red vertical line.

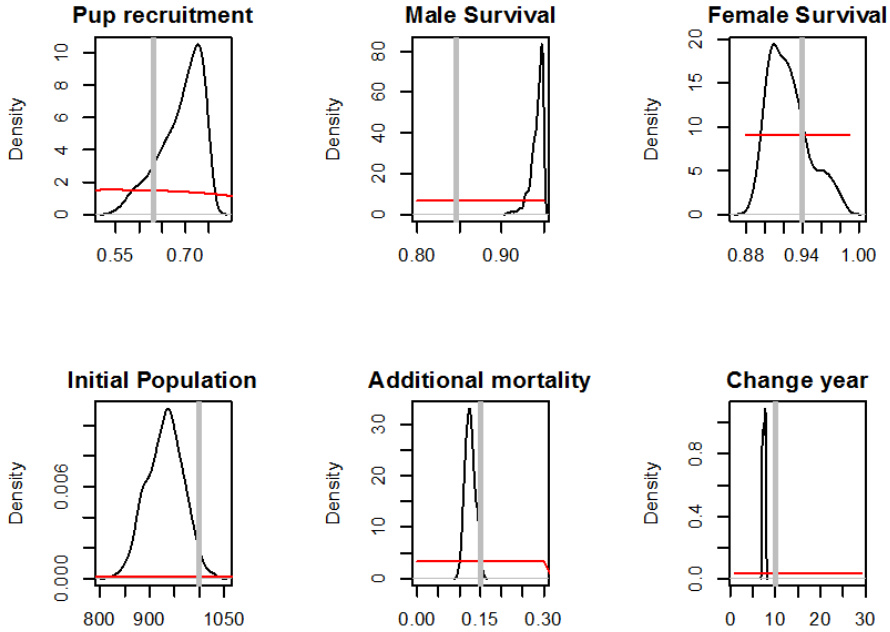


**Figure 3**. Posterior parameter distributions (black curves) compared with prior distributions (red curves) for the DST run with moult count data only included for model fitting. The vertical grey lines represent the 'true' values of the parameters i.e. those that were used in the simulations that produced the simulated data.

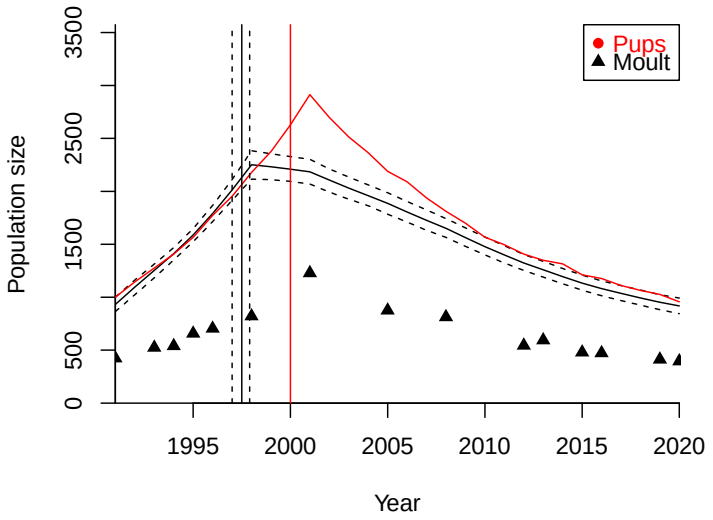


**Figure 4**. Estimated population trajectory (black curve) compared with known population trajectory (red curve) and counts of seals hauled out during moult (which are mainly adults). There are no pup count data. The estimated change-point year is shown as a vertical black line and confidence intervals around it are shown with dashed lines. The 'true' value for this change-point is represented by the dotted vertical line which coincides with the lower confidence limit on the estimate (2000).

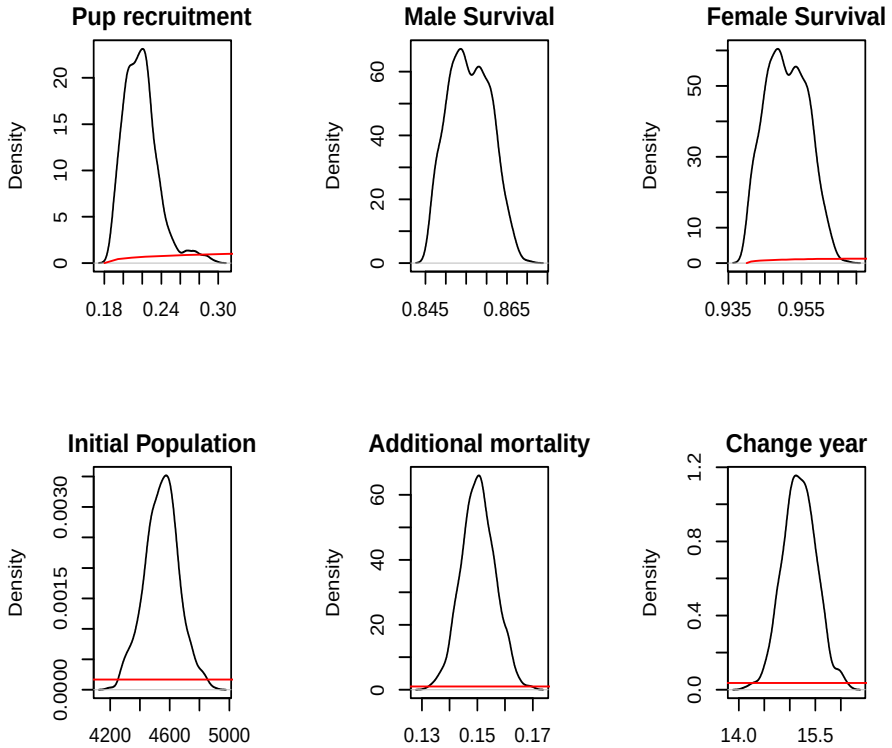


**Figure 6**. Posterior parameter distributions (black curves) compared with prior distributions (red curves) for the historical moult count data at Scapa Flow. No prior is shown for adult male survival, which was modelled using a simple multiplier on female survival (0.9): the posterior distribution is shown here for information only

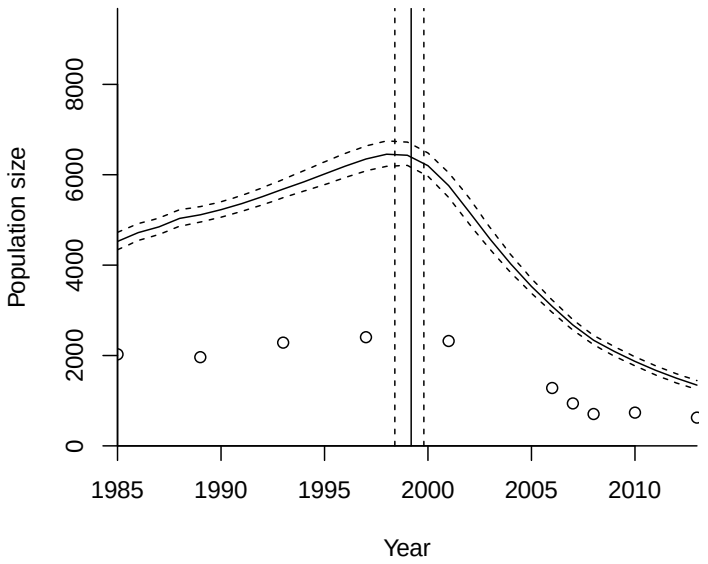


**Figure 5.** Estimated population trajectory (black curve) compared with counts of seals hauled out during moult (which are mainly adults). The estimated change-point year, when mortality increases across the whole population, is shown as a vertical black line, and confidence intervals around it are shown with dashed lines.

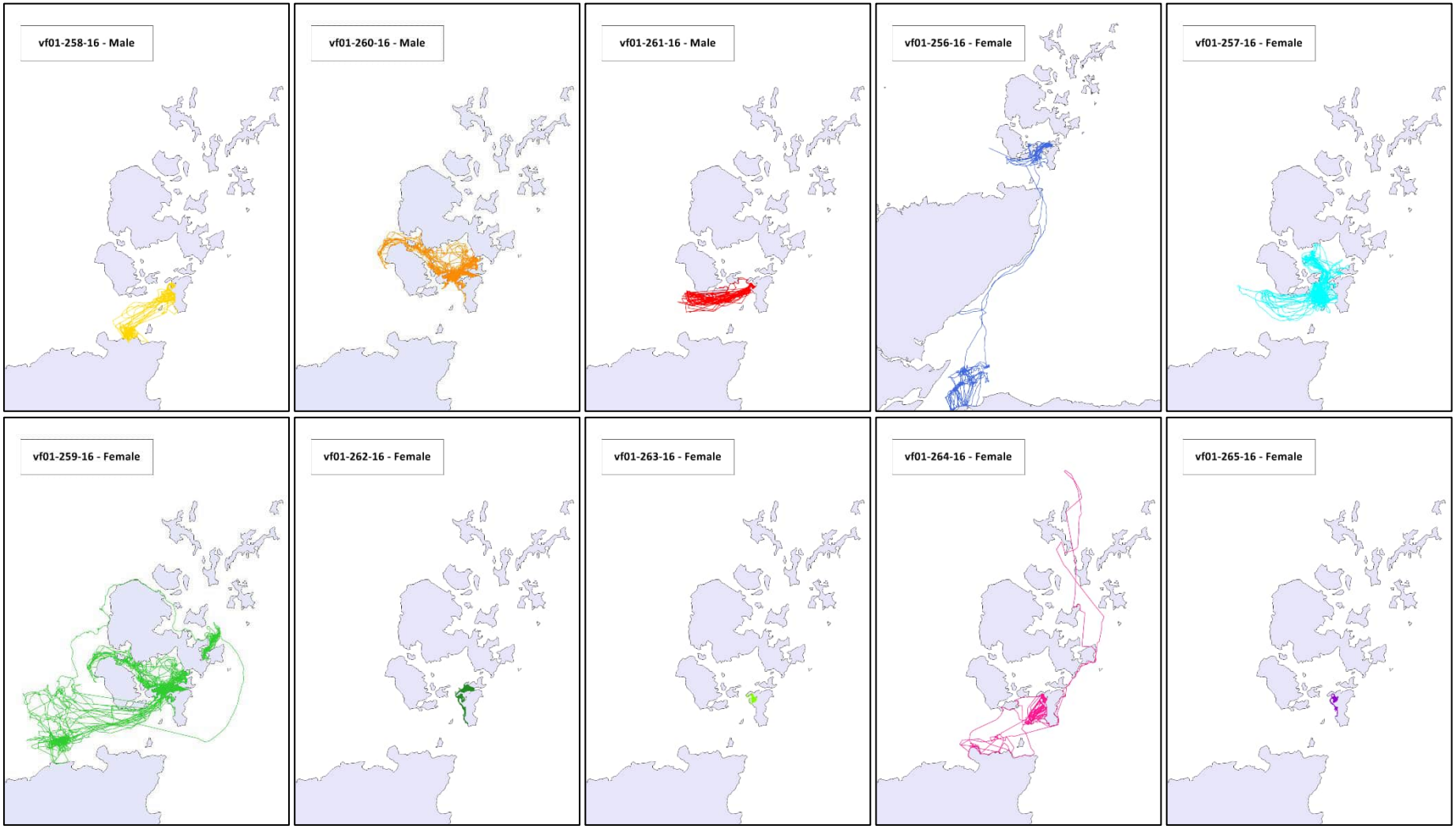


**Figure 7**. Individual tracks from adult harbour seals tagged in Orkney in 2016 with GSM-GPS telemetry devices.

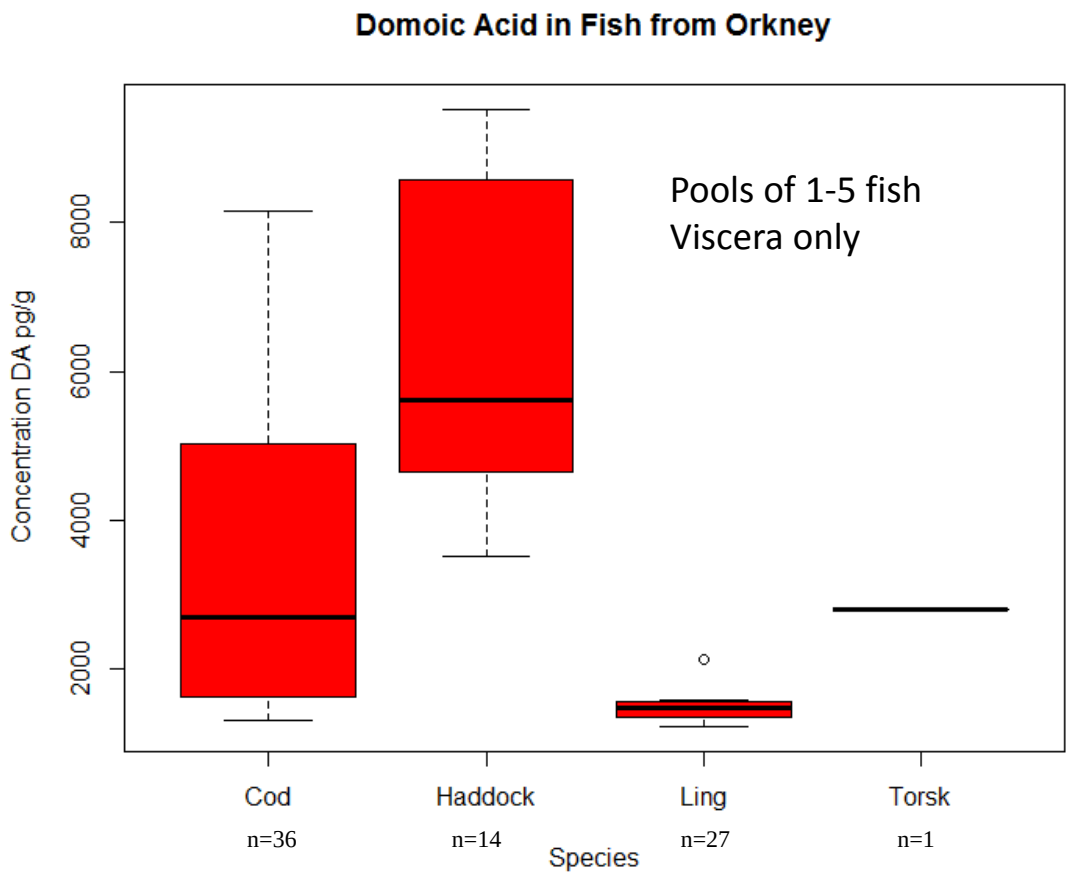


**Figure 8.** Concentration of DA (pg/g) in viscera by species of fish sampled off Scapa Flow in Orkney in 2016. Each data sample contained between 1 and 5 viscera. The black lines show the median, the red boxes the interquartile range and the dashed lines the value range of concentrations of DA.

Table 1. Summary of results from the analysis of samples collected in Orkney in 2016

| Flipper tag | Tag label | Age | Tooth Age (y) | Sex | Progesterone Blood (ng/ml) | 17 beta oestradiol (pg/ml) | Pregnant-Blood | Progesterone Blubber (ng/mg) | Pregnant-Blubber | With Pup | Seen Pregnant | Agreement in pregnancy from blubber progesterone | Urinary Domoic Acid pg/ml | Faecal Domoic Acid pg/g |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 55187 | FA-B-389 | Adult | - | F | 141.70 | 569.40 | Pregnant | 223.02 | Pregnant | yes | | yes | 62937 | |
| 55189 | vf01-264-16 | Adult | 11 | F | 3.94 | 790.70 | Not Pregnant | 61.24 | Pregnant | yes | | yes | 1227 | |
| 00590 | FA-B-666 | Adult | 4 | F | 3.05 | 73.90 | Not Pregnant | 352.78 | Pregnant | yes | | yes | | |
| 55196 | vf01-256-16 | Adult | x | F | 55.57 | 293.90 | Pregnant | 225.46 | Pregnant | yes | | yes | | |
| 00584 | vf01-259-16 | Adult | 5 | F | 85.51 | 225.60 | Pregnant | 113.34 | Pregnant | | yes | yes | | |
| 00600 | FA-B-128 | Adult | 8 | F | 152.25 | 232.50 | Pregnant | 117.01 | Pregnant | | | | 27557 | |
| 55127 | vf01-257-16 | Adult | 12.5 | F | 99.81 | 77.90 | Pregnant | 196.28 | Pregnant | | | | <LOD | |
| 55197 | | Adult | 9.5 | F | 73.47 | 115.80 | Pregnant | 295.74 | Pregnant | yes | | | | 18728 |
| 00591 | FA-B-787 | Adult | 14 | F | 45.52 | 132.10 | Possibly Pregnant | 8.91 | Not Pregnant | | | | 27352 | |
| 00585 | vf01-263-16 | Adult | x | F | 1.40 | 82.50 | Not Pregnant | 15.73 | Not Pregnant | no | | yes | 2803 | |
| 55192 | vf01-262-16 | Adult | 12 | F | 2.39 | 241.90 | Not Pregnant | 23.13 | Not Pregnant | no | no | yes | 2297 | |
| 55186 | FA-B-155 | Adult | 9 | F | 2.00 | 90.70 | Not Pregnant | 23.21 | Not Pregnant | | | | | |
| 55191 | vf01-265-16 | Adult | 8 | F | 1.33 | 41.70 | Not Pregnant | 14.82 | Not Pregnant | | | | | |
| 55188 | | Juvenile | - | F | 2.07 | | | | | | | | | |
| 00583 | | Adult | - | M | 1.21 | | | | | | | | 5184 | |
| 00586 | vf01-261-16 | Adult | x | M | 1.79 | | | | | | | | 1695 | |
| 55126 | vf01-260-16 | Adult | 5.5 | M | 1.08 | | | | | | | | 3453 | |
| 55128 | vf01-258-16 | Adult | 7.5 | M | 1.14 | | | | | | | | <LOD | |
| 55129 | | Adult | 9.5 | M | 1.06 | | | | | | | | 2083 | |
| 55190 | | Juvenile | - | M | 1.17 | | | | | | | | 16596 | |
| 55193 | | Juvenile | x | M | 1.61 | | | | | | | | | 28191 |
| 55198 | | Adult | 4.5 | M | 2.37 | | | | | | | | 6977 | |
| 55199 | | Adult | 5 | M | 1.09 | | | | | | | | 15566 | |
| 73349 | | Adult | 19.5 | M | 1.86 | | | | | | | | 4134 | |

# Provisional Regional PBR values for Scottish seals in 2018

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## Abstract

This document estimates PBR values for the grey and harbour seal "populations" that haul out in each of the ten Seal Management Areas in Scotland. Sets of possible values are tabulated for each area using the equation in Wade (1998) with different values of that equation's recovery factor. A value is suggested for this parameter in each population, the resulting PBR is highlighted, and a rationale is provided for each suggestion. The PBR values are calculated using the latest confirmed counts in each management area.

Changes since last year: The latest survey counts for Orkney and North Coast management region was 30% lower than the previous estimate, resulting in a 30% lower PBR for that management region. A revised estimate of the ratio between grey seal summer counts and the local populations in all areas has increased the PBR by approximately 50% in all regions and together with higher counts in Orkney and North coast region pushed the overall PBR for Scottish grey seals up by 67%.

Recovery factors have been held constant in all management regions.

## Introduction

Potential Biological Removal is a widely used way of calculating whether current levels of anthropogenic mortality are consistent with reaching or exceeding a specific target population, chosen to be the Optimum Sustainable Population. It is explicitly given, in an amendment to the US Marine Mammal Protection Act, as the method to be used for assessing anthropogenic impacts in the waters around that country. The method has been supported by simulations demonstrating its performance under certain assumptions (Wade 1998). The formulation of the equation allows for small anthropogenic takes from any population, however much it is depleted or fast it is declining.

Scottish Government uses PBR to estimate permissible anthropogenic takes for each of the ten seal management regions and uses this information to assess licence applications for seal control and for other licensable marine activities.

## Materials and Methods

### The PBR calculation:

PBR = Nmin.(Rmax/2).FR

where:

PBR is a number of animals considered safely removable from the population.

Nmin is a minimum population estimate (usually the 20th percentile of a distribution)

Rmax is the population growth rate at low densities (by default set 0.12 for pinnipeds), this is halved to give an estimate of the growth rate at higher populations. This estimate should be conservative for most populations at their OSP.

FR is a recovery factor, usually in the range 0.1 to 1. Low recovery factors give some protection from stochastic effects and overestimation of the other parameters. They also increase the expected equilibrium population size under the PBR.

The approach and calculation is discussed in detail in Wade (1998).

Data used in these calculations

Nmin values used in these calculations are from the most recent summer surveys of each area, for both species:

- Harbour seals: The surveys took place during the harbour seal moult, when the majority of this species will be hauled out, so the counts are used directly as values for Nmin. (An alternative approach, closer to that suggested by Wade (1998), would be to rescale these counts into abundance estimates and take the 20th centile of the resulting distributions. Results of a recent telemetry study in Orkney (Lonergan et al., 2012) suggest that would increase the PBRs by between 8%, if the populations are predominantly female, and 37%, if most of the animals are male.)

- Grey seals: Analysis of telemetry data from 107 grey seals tagged by SMRU between 1998 and 2016 shows that around 23.9% (95% CI: 19.2 - 28.6%) were hauled out during the survey windows (Russell et al. 2016 SCOS-BP 16/03). The 20th centile of the distribution of multipliers from counts to abundances implied by that data is 3.86. This represents a 50% increase over previous estimates due to a revised estimate of the proportion of time seals spend hauled out and available to be counted during the aerial survey window that is substantially lower than previous estimates and has narrower confidence intervals.

**Rmax** is set at 0.12, the default value for pinnipeds, since very little information relevant to this parameter is available for Scottish seals. A lower value could be argued for, on the basis that the fastest recorded growth rate for the East Anglian harbour seal population has been below 10% (Lonergan et al. 2007), though that in the Wadden Sea has been consistently growing at slightly over 12% p.a. (Reijnders et al. 2010). Regional pup production estimates for the UK grey seal population have also had maximum growth rates in the range 5-10% p.a. (Lonergan et al. 2011b). However the large grey seal population at Sable Island in Canada has grown at nearly 13% p.a. (Bowen et al. 2003).

**$F_R$** needs to be chosen from the range [0.1, 1]. Estimated PBR values for the entire range of $F_R$ values are presented. A recommended $F_R$ value is indicated for each species in each region, together with a justification for the recommended value.

## Areas used in the calculations

Figure 1 and Table 1 shows the boundaries of the Seal Management Areas.

Particularly for grey seals, there will probably be substantial movement of animals between these areas. The division is a pragmatic compromise that attempts to balance: current biological knowledge; distances between major haul-outs; environmental conditions; the spatial structure of existing data; practical constraints on future data collection; and management requirements

Table 1: Boundaries of the Seal Management Areas in Scotland.

| Seal Management Area | | Area Covered |
|---|---|---|
| 1 | Southwest Scotland | English border to Mull of Kintyre |
| 2 | West Scotland | Mull of Kintyre to Cape Wrath |
| 3 | Western Isles | Western Isles incl. Flannan Isles, North Rona |
| 4 | North Coast & Orkney | North mainland coast & Orkney |
| 5 | Shetland | Shetland incl. Foula & Fair Isle |
| 6 | Moray Firth | Duncansby Head to Fraserburgh |
| 7 | East Scotland | Fraserburgh to English border |

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## Results

PBR values for grey and harbour seals for each Seal Management Area. Recommended $F_R$ values are highlighted in grey cells.

**Table 1.** Potential Biological Removal (PBR) values for harbour seals in Scotland by Seal Management Unit for the year 2018

| | 2008-2016 | | | PBRs based on recovery factors $F_R$ ranging from 0.1 to 1.0 | | | | | | | | | | selected | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Seal Management Area** | **count** | **Survey years** | **$N_{min}$** | **0.1** | **0.2** | **0.3** | **0.4** | **0.5** | **0.6** | **0.7** | **0.8** | **0.9** | **1.0** | **$F_R$** | **PBR** |
| 1 Southwest Scotland | 1,200 | (2015) | 1,200 | 7 | 14 | 21 | 28 | 36 | 43 | 50 | 57 | 64 | 72 | 0.7 | 50 |
| 2 West Scotland | 15,184 | (2013-2015) | 15,184 | 91 | 182 | 273 | 364 | 455 | 546 | 637 | 728 | 819 | 911 | 0.7 | 637 |
| 3 Western Isles | 2,739 | (2011; 2014) | 2,739 | 16 | 32 | 49 | 65 | 82 | 98 | 115 | 131 | 147 | 164 | 0.5 | 82 |
| 4 North Coast & Orkney | 1,349 | (2014; 2016) | 1,349 | 8 | 16 | 24 | 32 | 40 | 48 | 56 | 64 | 72 | 80 | 0.1 | 8 |
| 5 Shetland | 3,369 | (2015) | 3,369 | 20 | 40 | 60 | 80 | 101 | 121 | 141 | 161 | 181 | 202 | 0.1 | 20 |
| 6 Moray Firth | 940 | (2008; 2011; 2016) | 940 | 5 | 11 | 16 | 22 | 28 | 33 | 39 | 45 | 50 | 56 | 0.1 | 5 |
| 7 East Scotland | 368 | (2013; 2015-2016) | 368 | 2 | 4 | 6 | 8 | 11 | 13 | 15 | 17 | 19 | 22 | 0.1 | 2 |
| **SCOTLAND TOTAL** | **25,149** | (2008; 2011; 2013-2016) | **25,149** | **149** | **299** | **449** | **599** | **753** | **902** | **1,053** | **1,203** | **1,352** | **1,507** | | **804** |

$PBR = N_{min} \cdot (R_{max}/2) \cdot F_R$

where: **PBR** is a number of animals considered safely removable from the population.

**$N_{min}$** is a minimum population estimate (counts were used directly as values for $N_{min}$).

**$R_{max}$** is the population growth rate at low densities (by default set 0.12 for pinnipeds), this is halved to give an estimate of the growth rate at higher populations. This estimate should be conservative for most populations at their OSP.

**$F_R$** is a recovery factor, usually in the range 0.1 to 1. Low recovery factors give some protection from stochastic effects and overestimation of the other parameters. They also increase the expected equilibrium population size under the PBR.

**Table 2.** Potential Biological Removal (PBR) values for grey seals in Scotland by Seal Management Unit for the year 2018

| Seal Management Area | 2008-2016 count | Survey years | $N_{min}$ | PBRs based on recovery factors $F_R$ ranging from 0.1 to 1.0 | | | | | | | | | | selected $F_R$ | selected PBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 0.9 | 1.0 | | |
| 1 Southwest Scotland | 374 | (2015) | 1,444 | 8 | 17 | 25 | 34 | 43 | 51 | 60 | 69 | 77 | 86 | 1.0 | 86 |
| 2 West Scotland | 5,064 | (2013-2015) | 19,547 | 117 | 234 | 351 | 469 | 586 | 703 | 820 | 938 | 1,055 | 1,172 | 1.0 | 1,172 |
| 3 Western Isles | 4,065 | (2011; 2014) | 15,691 | 94 | 188 | 282 | 376 | 470 | 564 | 659 | 753 | 847 | 941 | 1.0 | 941 |
| 4 North Coast & Orkney | 9,714 | (2014; 2016) | 37,496 | 224 | 449 | 674 | 899 | 1,124 | 1,349 | 1,574 | 1,799 | 2,024 | 2,249 | 1.0 | 2,249 |
| 5 Shetland | 1,558 | (2015) | 6,014 | 36 | 72 | 108 | 144 | 180 | 216 | 252 | 288 | 324 | 360 | 1.0 | 360 |
| 6 Moray Firth | 1,252 | (2008; 2011; 2016) | 4,833 | 28 | 57 | 86 | 115 | 144 | 173 | 202 | 231 | 260 | 289 | 1.0 | 289 |
| 7 East Scotland | 3,812 | (2013; 2015-2016) | 14,714 | 88 | 176 | 264 | 353 | 441 | 529 | 618 | 706 | 794 | 882 | 1.0 | 882 |
| **SCOTLAND TOTAL** | **25,839** | (2008; 2011; 2013-2016) | **99,739** | **595** | **1,193** | **1,790** | **2,390** | **2,988** | **3,585** | **4,185** | **4,784** | **5,381** | **5,979** | | **5,979** |

$PBR = N_{min} \cdot (R_{max}/2) \cdot F_R$

where: **PBR** is a number of animals considered safely removable from the population.

**$N_{min}$** is a minimum population estimate. Analysis of SMRU tagging data shows that around 23.9% of grey seals were hauled out during the survey windows (Russell et al., 2016). The 20th centile of the distribution of multipliers from counts to abundances implied by that data is 3.86.

**$R_{max}$** is the population growth rate at low densities (by default set 0.12 for pinnipeds), this is halved to give an estimate of the growth rate at higher populations. This estimate should be conservative for most populations at their OSP.

**$F_R$** is a recovery factor, usually in the range 0.1 to 1. Low recovery factors give some protection from stochastic effects and overestimation of the other parameters. They also increase the expected equilibrium population size under the PBR.

## Rationale for the suggested recovery factors

The original PBR methodology leaves the setting of the recovery factor as a subjective choice for managers. Factors such as the amount of information available about the population (and in particular its maximum annual growth rate), recent trends in local abundance, and the connections to neighbouring populations are relevant to setting this. The main factors affecting the value suggested for each species in each area are given below:

## Harbour seals

1) Shetland, Orkney + North Coast and Eastern Scotland ($F_R$= 0.1)

$F_R$ set to minimum because populations are experiencing prolonged declines.

2) Outer Hebrides ($F_R$ = 0.5)

Population was undergoing a protracted but gradual decline but the most recent count was close to the pre-decline numbers. The population is only partly closed being close to the relatively much larger population in the Western Scotland region, and the $R_{max}$ parameter is derived from other seal populations. Suggested recovery factor to be revised when new survey data become available for 2017.

4) Western Scotland ($F_R$ = 0.7)

The population is largely closed, likely to have limited interchange with much smaller adjacent populations. The population is apparently stable and the intrinsic population growth rate is taken from other similar populations.

4) South West Scotland ($F_R$ = 0.7)

The population is apparently stable, is closed to the south and the adjacent population to the north is apparently stable. The intrinsic population growth rate is taken from other similar populations.

5) Moray Firth ($F_R$= 0.1)

Counts for 2016 in the Moray Firth were 26% higher than in 2015 which was one of the lowest counts ever in the Moray Firth. This continues a pattern of large inter annual fluctuations with no overall trend over the past 15 years. The neighbouring Orkney and Tay populations are continuing to undergo unexplained rapid and catastrophic declines in abundance. Data available from electronic telemetry tags suggest there is movement between these three areas. In the absence of a significant increase in the Moray Firth counts it is recommended that the $F_R$ should be left at its previously recommended value of 0.1.

## Grey seals

All regions ($F_R$ = 1.0)

There has been sustained growth in the numbers of pups born in all areas over the last 30 years, with some now appearing to be at or close to their carrying capacities (Lonergan et al. 2011b). Available telemetry data and the differences in the regional patterns of pup production and summer haul-out counts (Lonergan et al. 2011a) also suggest substantial long-distance movements of individuals.

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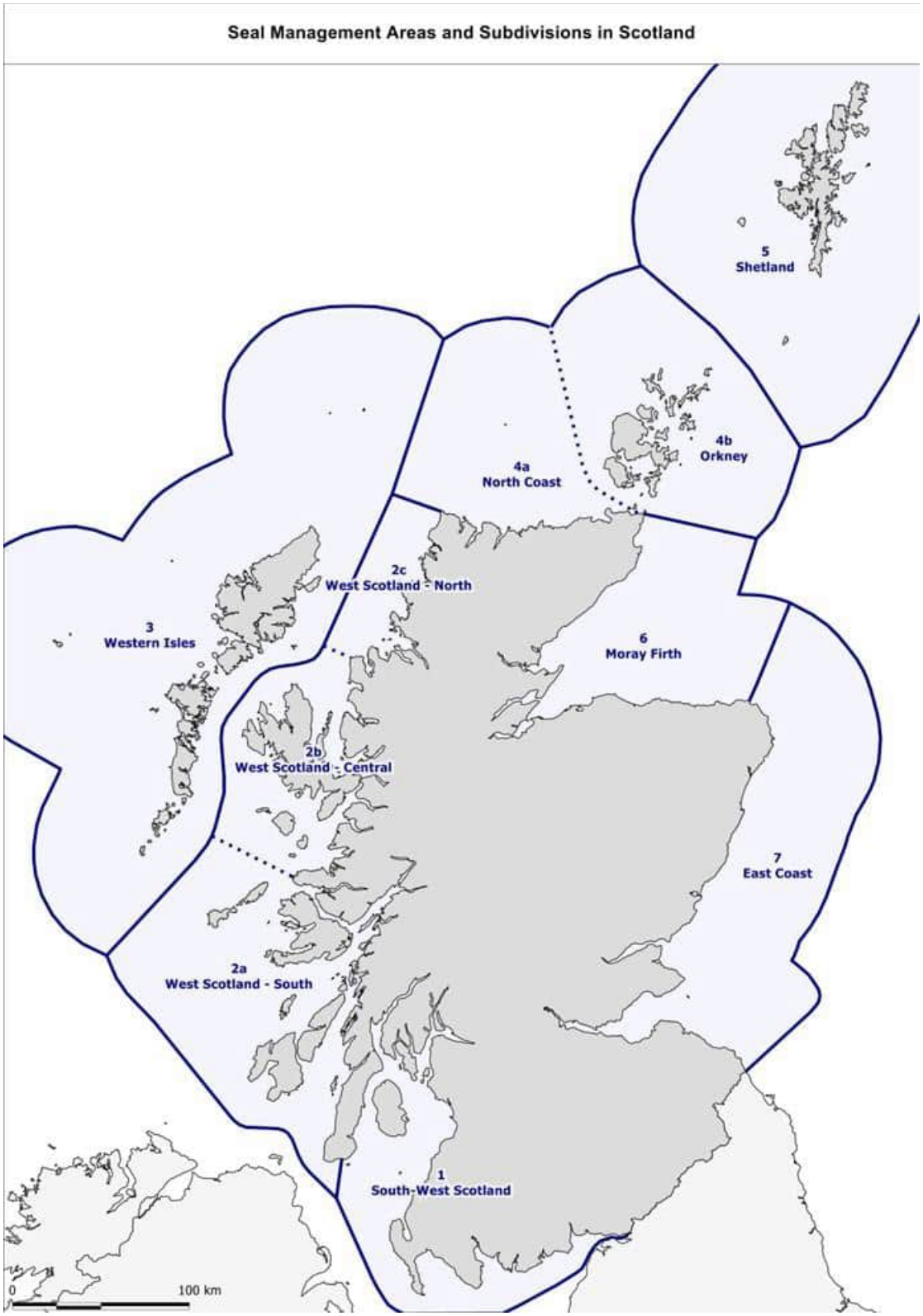


**Figure 1**.Seal management areas in Scotland.

# Persistent organic pollutant concentrations in grey seal weaned pups from the Isle of May, 2015 compared to 2002.

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**Abstract**

Persistent organic pollutants (POPs) remain a major risk to marine mammal health. They accumulate in fat tissue and biomagnify up the food chain, such that seals have high levels in their blubber. Regulation of PCB manufacture and release caused a reduction of these compounds in the marine environment and in marine mammals during the late 1990s, but the reduction seems to have slowed more recently. Here we present a preliminary comparison of PCB and DDT concentrations in blubber tissue of grey seal pups sampled in 2002 and 2015 to investigate whether these compounds have changed in seal tissues since the early 2000s. Our data suggest a modest but significant decrease in PCBs has occurred, whereas DDT levels have increased over the same period. In both cases, the concentrations measured are well below the limits that cause immediate negative health effects in seals. Cross laboratory comparisons will be undertaken to establish whether small methodological differences in the analysis process may be responsible for observed differences in concentrations. Differences in concentration between years were not due to mass or sex differences in the pups sampled, but may reflect parity and/ or age of the pups' mothers. Higher variation in PCB and DDT levels in 2002 could have been caused by a greater range in the time of sampling relative to weaning compared with 2015. The consequences of the observed changes in POP loads are unknown. Investigation of the impact of PCBs, PBDEs and DDTs on measures of energy balance are underway.

## Introduction

The impact of persistent organic pollutants (POPs) on the health and survival of phocid seals continues to be a concern (Hitchcock *et al.* 2017), particularly the risk they pose in combination with other stressors (National Academies of Sciences & Medicine 2017). Of the so-called 'legacy' POPs, polychlorinated biphenyls (PCBs) and dichlorodiphenyltrichloroethanes (DDTs) are of particular interest as they can alter thyroid hormone homeostasis and impact on immunity, energy regulation and reproduction (Weijs & Zaccaroni 2016). Indeed these compounds may also be a factor in determining the probability of first year survival in UK grey seals (Hall *et al.* 2009).

The Sea Mammal Research Unit (SMRU) has been studying the effect of these pollutants on grey seals from the Isle of May, Firth of Forth, since the early 1990s (Pomeroy *et al.* 1996). More recently the University of Abertay, in conjunction with SMRU, have been investigating the link between fat metabolism and POP exposure in grey seal pups during development and fasting. As part of this project, blubber biopsy samples were taken from pups during the post-weaning fast and analysed for the presence of a range of POPs, particularly the PCBs and DDTs that make up the majority of the contaminant burden in this species. These compounds were also measured in Isle of May post-weaned pups in 2002 as part of a survivorship study (Hall et al. 2009), allowing a comparison

between concentrations over the intervening 13 year period to be carried out. Since the ban on the production and use of both PCBs and DDTs in the mid-1980s, concentrations in the environment have declined. However, in many marine mammals although blubber levels declined during the 1990s, since then they have shown no further reduction (Law 2014, Law *et al.* 2012). Concentrations in weaned pups reflect the contaminant concentrations in the adult females as the only source of POPs in animals at this life stage is through gestation and lactational transfer. This briefing paper summarises initial comparisons of PCB and DDT concentrations in the blubber of Isle of May grey seal weaned pups.

**Methods**

Blubber samples were taken from individually identified pups during the post-weaning period using a sterile biopsy punch (Acupunch, Acuderm, Fort Lauderdale, US), following an intravenous 0.01 ml dose of Zoletil$_{100}$ (Virbac, Carros, France) and 2 ml 2% w/v subcutaneous dose lignocaine (Lignol, Dechra, Northwich, UK) in the dorsal midpelvic region.

*Blubber contaminant analysis methods*

Samples collected in 2002 were analysed at the University of Lancaster and details of the method can be found in Hall et al. (2009). In brief, samples were mixed with anhydrous sodium sulfate, extracted with dichloromethane (DCM) using an accelerated solvent extraction system (Soxhlet). An aliquot was taken for gravimetric lipid determination, and the remaining sample was transferred to hexane. All samples were spiked with seven 13C-labeled PCBs and 13C-labeled BDE 209 before extraction. Samples were then cleaned by chromatography using silica gel treated with concentrated sulphuric acid, eluted with hexane. All samples received a secondary cleanup using gel permeation chromatography before being concentrated to a small volume with internal standards added. Samples were analysed for 7 PCB congeners (namely PCB 28, 52, 101, 138, 153, 170 and 180) using a GC-MS system (Finnigan TRACE) in SIM mode using an EIC source. The concentration of organochlorine pesticides was also determined. Four of these (namely, *p*,*p*'-DDD, *p*,*p*'-DDE, *o*,*p*'-DDT and *p*,*p*'-DDT) were also analysed using the Finnigan TRACE GC-MS in EI mode.
A set of seven calibration standards, containing all of the internal standards, recovery standards, and analytes, was run on the instrument before and after a batch of up to 24 samples. Within the batch, after every 6 samples, a specially prepared "QC" standard was run. Samples were quantified using the Thermo "Xcaliber"' instrument software, and calibration and quantification was achieved using an internal standards method. Recoveries averaged 67-81% for each of the 13C labelled standards.

Samples collected in 2015 were analysed at the University of Liege using the same methods as above with the exception that the purified extracts were analysed using a Thermo Quest Trace, 2000 (Thermo Quest, Milan, Italy). Before the extraction, 100 ml of a hexanic solution of PCB congener 112 (Dr. Ehrenstorfer, Augsburg, Germany) was added to the samples as a surrogate internal standard at a concentration of 50 pg/ml. The PCB and the pesticide concentrations in each sample and in the QC were corrected for initial sample weight, and the percentage recovery of the surrogate PCB 112 (Damseaux *et al.* 2017).

Statistical analysis was carried out using the statistical package R (R Core Team, 2016) using linear modelling and analysis of variance to investigate differences between years.

**Results and Discussion**

A summary of the pup mass data for all the study animals sampled by year and sex is shown in Table 1. A total of 90 animals were included in the analysis, 60 sampled in 2002 and 30 in 2015. There was no significant difference in the mean mass of the pups by year or sex ($p > 0.05$).

**Table 1.** Summary of post-weaned pup masses by year and sex.

| Year | n | Sex | Mean mass (kg) | SD |
|---|---|---|---|---|
| 2002 | 31 | F | 39.19 | 5.38 |
| | 29 | M | 42.24 | 6.25 |
| 2015 | 18 | F | 42.40 | 3.79 |
| | 12 | M | 40.92 | 5.42 |

*Polychlorinated biphenyls (PCBs)*

The distribution of the total of the seven PCB congeners (sum PCBs, ng/g lipid weight) analysed in both years is shown in Figure 1. The concentrations were log-normally distributed. Further analysis was performed on the log-transformed data and mean concentrations are reported as geometric means and standard deviations.

The geometric mean concentration of sum PCBs in the blubber samples collected in 2002 = 763.9 ± 1.88 and in 2015 = 558.3 ± 1.63 ng/g lipid wt. The concentrations were significantly lower in 2015 than 2002 ($p = 0.019$, Figure 2). There was no difference between the sexes and no interaction between sex and year.

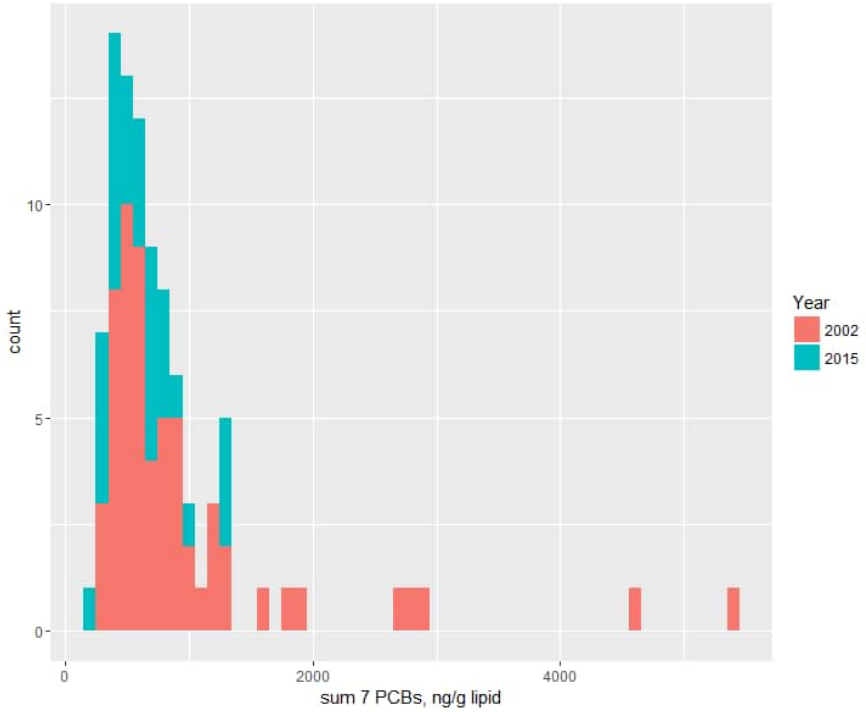


**Figure 1**. Distribution of sum PCBs in post-weaned pups by year

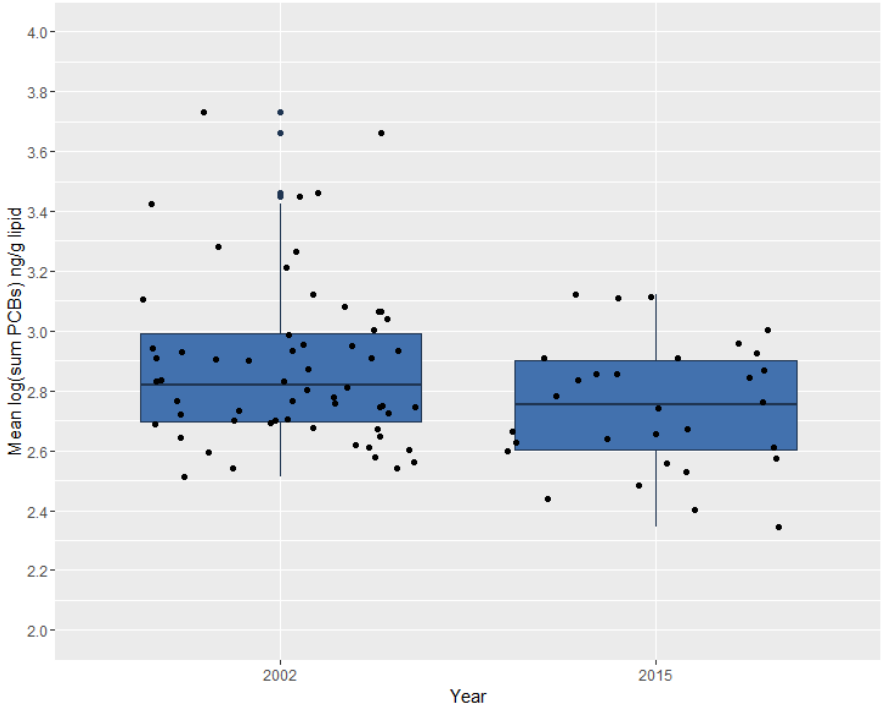


**Figure 2.** Log(sum PCBs) in post-weaned pups by year

*Dichlorodiphenyltrichloroethanes (DDTs)*

Concentrations of DDTs (sum of four DDT congeners) were significantly positively correlated with concentrations of PCBs (Figure 3) in both datasets. The intercept was significantly higher in 2015 than in 2002. Thus, in contrast to the PCBs, the concentrations of DDTs were significantly higher in 2015

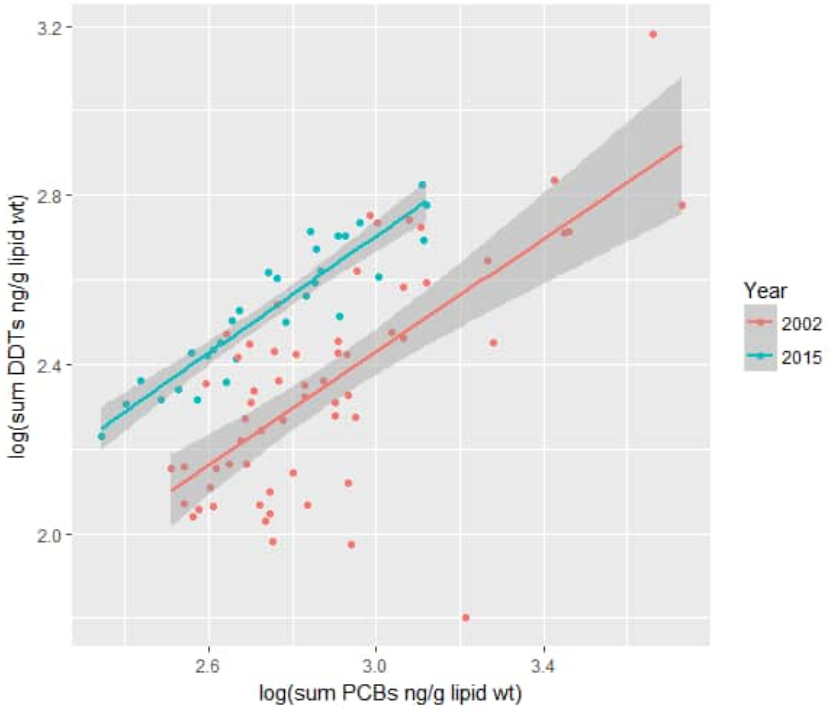


**Figure 3**. Relationship between sum PCBs and sum DDTs in post-weaned pups by year

than in 2002 (geometric mean concentration of sum DDTs in 2002 = 224.9 ± 1.84 and in 2015 = 337.5 ± 1.44 ng/g lipid wt., p=0.001, Figure 4).

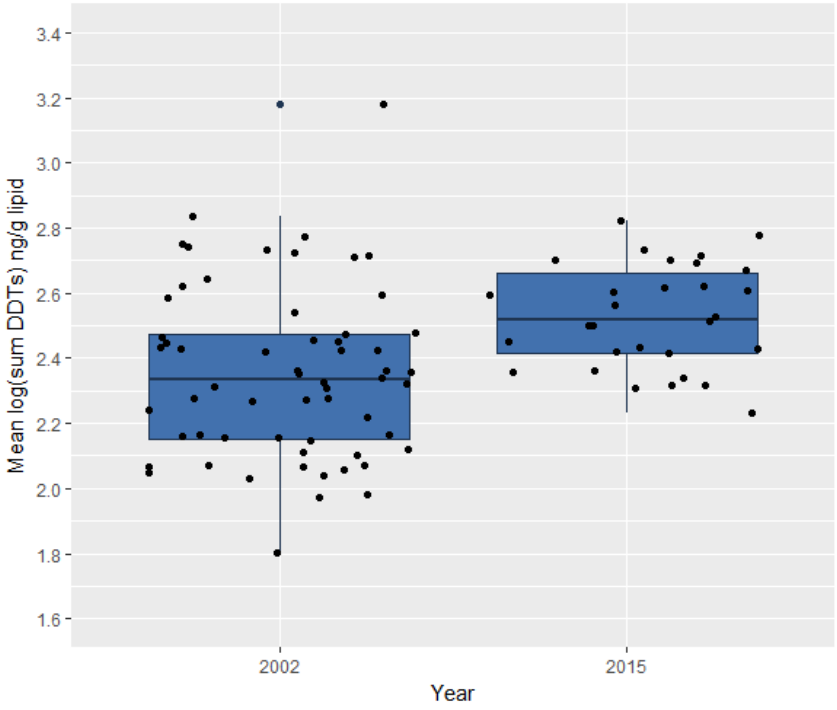


**Figure 4**. Log(sum DDTs) in post-weaned pups by year.

**Discussion**

This initial investigation comparing the concentration of selected PCB and DDT congeners in post-weaned grey seal pups from the Isle of May found that concentrations of PCBs were lower in recently collected samples compared with those collected 13 years earlier. However, DDT concentrations were higher. A number of factors could account for these findings.

1. The analysis has been carried out in two different laboratories using essentially the same methods. Without an inter-laboratory comparison it is not possible to determine whether any differences reported are due to measurement variation. This should be borne in mind when interpreting these findings and further inter-laboratory comparisons will be carried out in future.

2. Samples were collected from fasting post-weaned pups at different stages in their fast. Despite no differences in the mass of the animals, differences in body composition may account for some of the variation reported. As animals lose body fat and increase body protein, contaminants will concentrate in the remaining blubber, resulting in an increase in concentrations (Hall *et al.* 2008, Hall *et al.* 2003). This may account for the higher variability in the 2002 data as the pups sampled included a range of post-weaned stages whereas in 2015 were very closely matched by days post weaning.

3. The concentrations in the pups will reflect the concentrations in the females. If the cohort sampled in either year was biased towards either primiparous females, which will have higher concentrations of POPs in their blubber (Iwata *et al.* 2004), or older females, which may have depurated a large proportion of their burdens depending on reproductive history. The pups sampled

in 2002 were randomly selected from the animals on the colony and data on their mothers' ages and parity is not available.

With these caveats in mind, it is interesting that whilst the concentrations of PCBs have declined, those of DDTs have not, and may even have increased over time. It should be noted that the PCB concentrations measured here are an order of magnitude *below* those considered to pose a health risk. Kannan *et al.* (2000) assessed the blubber threshold level for effects for seals to be ~17,000 ng/g lipid wt. Thus, any changes in concentration between the years seen here are well within the limits of immediate risk. However, studies on factors affecting the survival of pups in 2002 indicated that higher contaminant concentrations, particularly the polybrominated diphenyl ethers in the blubber, together with sex and mass at weaning, were significant predictors of first year survival probability (Hall et al. 2009) and effects on energy balance may occur well below the estimated threshold for effects. It may be that the main risks following uptake of these compounds in grey seal pups from the Isle of May occur in conjunction with other energetic stressors during their early development.

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# Potential Future Global Distributions of Grey and Harbour Seals Under Different Climate Change Scenarios.

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**Abstract**

Most research on the impact of climate change on marine mammals has been focussed on arctic species that are threatened by shrinking suitable habitats. Here we present an exploration of potential habitat shifts of two temperate pinniped species, the harbour and grey seal, in two scenarios of climate change, using seal telemetry data and environmental grids. Core habitat, determined through telemetry locations, was projected on the lowest and highest scenarios of warming as determined for the Intergovernmental Panel on Climate Chante's 2014 report.
The low warming scenario predicted an overall compression of core habitat, with loss of habitat in the northern and southern edges of distribution for both species in the North Atlantic. In the high warming scenario, there was a general northward shift in predicted core habitat in the North Atlantic with substantial loss at low latitudes but substantial increase in available habitat in high Arctic regions.
The present methodology seems to be a useful tool for an initial exploration of a species' potential climate-related changes in habitat. However, explicit consideration of prey species' responses to climate change will be needed to improve predictions. As demonstrated in this study, the methods are easily applicable to other species, and provide the opportunity to use in-situ location data from telemetry studies to explore potential changes in habitat use.

## Introduction

Recent IPCC projections based on a range of greenhouse gas production trajectories all suggest significant increases in global surface temperatures (IPCC, 2014) leading to rising sea levels, changes in water temperatures and reduced seasonal sea-ice cover, all of which could influence marine mammal distributions both locally and globally (Ferguson *et al*., 2005; IPCC, 2014; Learmonth *et al*., 2006). Future changes in environmental conditions could impact populations, so understanding the interactions between species distributions and climatic shifts will be needed to inform both conservation and management strategies (Kaschner *et al*., 2011).

To date, most of the focus on future marine mammal habitat predictions has been on polar species as the ecosystems in the Arctic where the loss of sea ice may lead directly to the loss of a critical habitat for many species in higher trophic levels (Kovacs *et al*. 2011; Laidre *et al*. 2015) but may benefit other species by opening up foraging habitats (Ragen *et al*. 2008).

To date little attention has been paid to temperate marine habitats. Boehme *et al*. (2012) suggested that the population size of grey seals changed dramatically over time due to the lack of available shelf areas during the Last Glacial Maximum about 20,000 years ago. This postglacial population expansion was confirmed by Klimova *et al*. (2014) based on DNA extraction showing how grey seal populations are affected by habitat availability. Such results from temperate ecosystems might appear less spectacular compared to the rapid changes in the Arctic ecosystems, but understanding these drivers will help us to understand the likely pressures on temperate species and ecosystems.

Here we present a preliminary study using the methods of Boehme *et al*. (2012) to make predictions concerning potential habitat shifts for harbour seals (*Phoca vitulina*) and grey seals (*Halichoerus grypus*) over the next century in response to climate change.

## Methods

### 1. Telemetry data

Our data comprise the dive records of 131 harbour seals and 128 grey seals. The harbour seal tags were deployed between 2005 and 2014 and covered most areas of the British Isles, as well as north-east Ireland. The grey seal deployments spanned 2003 to 2007 and covered the east and western sides of the North Atlantic (Table 1). Two types of tags were used in this study: satellite-relay data loggers (SRDL) (Fedak *et al*. 2002) and GPS-GSM tags (Cronin & McConnell 2008), both of which provided detailed depth and temperature profiles as well as location fixes.

### 2. Current habitat definitions

Boehme *et al*. (2012) showed that a combination of a depth range based on locations and dive profiles from tracked seals in combination with a temperature range based on the annual mean SST for areas visited by tracked seals was a reliable indicator of suitable habitat for grey seals.

For the current analysis the frequency distribution of observed maximum dive depths were used to define suitable water depths used by the seals. For each species a cut-off at the 99th percentile of maximum dive depth distribution was used as the boundary of suitable habitat.

As the location data for harbour seals were limited to areas around the British Isles, which represents only a small part of the animals' distribution it was likely that the annual mean SST range would not be representative of the species' range. Consequently, local in-situ mean SSTs across the harbour seal's current range (south-east Greenland, Iceland and west Svalbard in the north down to the North coast of France) were used in conjunction with the actual observed SST records from the tracked seals to define the range of temperatures potentially encountered by harbour seals.

### 3. Environmental data for future habitat estimation

*3.1. Present conditions*

Following Boehme *et al*. (2012) three environmental variables were chosen to describe the present habitat of seals: bathymetry (ETOPO1), annual mean sea surface temperature climatology (WOA13), and climatological summer (September) sea ice concentration (National Ice Center). All data were interpolated onto a common 5 minute grid spanning the northern hemisphere as a compromise between calculation time and a reasonably fine spatial scale. Suitable habitat based on bathymetry and temperature was defined using in-situ tag measurements (see above) for each species. Summer sea ice was chosen as another constraint to limit the use of high-latitude areas. Both species frequent pack ice but do not inhabit fast ice areas. For harbour seals, the maximum "suitable" ice concentration was set at 50% based on telemetry studies in Svalbard (Blanchet *et al*. 2014) but as grey seals breed on sea ice in Canada and the Baltic, the limit of ice concentration for this species was set at 90%.

*3.2. Future conditions*

The environment experienced by seals for the year 2,100 was estimated using gridded field outputs from the series of CMIP5 experiments, commissioned for the IPCC reports on Climate Change (IPCC 2014) using outputs from NOAA's isopycnal Earth System Model (ESM2G) (Delworth *et al*. 2006). Grids of monthly SST and monthly sea level change as well as the September sea ice area fraction were chosen from scenarios of carbon emissions at either end of the spectrum: the highest (RCP 8.5)

and the lowest (RCP 2.6). The monthly values for temperature and sea level were averaged for the year 2,100 to calculate annual mean values. Global annual sea level rise was subtracted from the reference bathymetry for the present, to estimate the water depth in the future. All data were interpolated onto a common 5-minute grid for each carbon emission scenario.

**4. Core habitat calculations**

For each cell of the reference 5-minute grid, suitable habitat status was achieved if depth, temperature and sea ice concentration were within the ranges described earlier. Core habitat extent was the sum of the areas of "suitable" grid cells. Those areas were calculated for current, RCP 2.6 and RCP 8.5 scenarios at the global level, as well as for each coast of the Atlantic and Pacific.

## Results

### Present habitat

*Harbour seals*

A total of 2,170,000 dives by 125 seals were included in the analysis. Maximum dive depths ranged between 1.2 m and 248.6 m, with a 99$^{th}$ percentile of 96.9 m. The interpolated bathymetry under each seal location fix gave similar results, with maximum bottom depth of 224.3 m and 99% of bottom depths of 101.8 m. The dive limit for harbour seals was therefore set at 97 m depth (fig.1).

480,000 temperature profiles were included, with surface temperatures ranging from 0.5° to 31.4°C. Restricting those data to the central 99% generated temperature limits of 2.8° and 13.9°C (fig.1).

Under those limits for habitat, the present core habitat (PCH) covered 1.97x10$^6$ km$^2$ (fig. 2).

*Grey Seals*

A total of 90 tags contributed 800,000 dive profiles to the analysis. Maximum dive depths ranged from 2 to 445 m, with the 99$^{th}$ percentile at 171 m (fig. 1). 87 tags contributed to the surface temperature datasets with almost 30,000 temperature profiles. Consistent with the methodology of Boehme *et al*. (2012) the SST limits were generated using the interpolated average annual SST. There was no need to use in situ recordings as a proxy as the deployments spanned most of the species' distribution. The limits for suitable SST were 1.7° to 12.5°C.

PCH for the Atlantic region was estimated to be 3.21x10$^6$ km², (fig. 3)

- 1.85x10$^6$ km² in the eastern North Atlantic,
- 1.36x10$^6$ km² and western North Atlantic.

### Future habitat – low warming scenario

*Harbour seals*

Under the low emission (RCP2.6) scenario the FCH was estimated to be 1,74 x10$^6$ km², representing an overall loss of habitat for Atlantic harbour seals in the future. The global future core habitat (FCH) covered 88% of PCH. There was a substantial increase in suitable habitat in Hudson Bay more than discounted by a minor loss of habitat at the southern edge of the range on both sides of the Atlantic and the loss of significant amounts of habitat in the White Sea and northern coasts of Hudson Bay (fig. 2).

*Grey seals*

Using the grey seal habitat limits in the low warming scenario RCP 2.6 resulted in an overall decrease of core habitat. FCH extent for the Atlantic in 2100 was 2.61x10$^6$ km², representing 81% of PCH (fig. 3). The southern boundary of suitable habitat was predicted to move north on both sides of the

Atlantic, to a greater extent than for harbour seals. A large area of Hudson's Bay becomes suitable but at present this is an area not frequented by grey seals. More surprisingly, large areas of PCH in the northern part of their current range will be excluded from the FCH mainly due to decreases in SST under the low impact scenario (fig. 3a).

**Future habitat – high warming scenario**

*Harbour seals*
Overall, the FCH for harbour seals under the high emission RCP 8.5 scenario was estimated at $2.38 \times 10^6$ km², representing a 21% increase over the PCH estimate. As expected there was increased area loss in lower latitude areas of the species' distribution on both sides of the Atlantic, leaving no suitable habitat along the USA and French coasts. However, these losses were more than compensated for by a large increase in suitable habitat in the high Arctic in Canada, Svalbard and along the Arctic coast of Russia (fig 2b).

*Grey seals*
In RCP 8.5 scenario, the total area of suitable habitat was $3.68 \times 10^6$ km², 14% larger than the present PCH. The southern boundaries of suitable habitat for grey seals were pushed northwards, resulting in a loss of 10% and 17% of the present suitable habitat in the East and West Atlantic respectively (fig 3b,). Importantly this predicted shift incorporates the Scotian shelf and waters off New England in the west. These areas currently hold the majority of the NW Atlantic grey seal population. However, the habitat loss in the south is more than compensated by a dramatic increase in available habitat in the high Arctic. Although the northern coast of Iceland was lost, large areas of Arctic Canada and Russia as well as Svalbard are identified as part of the FCH.

**Discussion**

This paper presents a preliminary examination of potential range shifts in distribution of grey and harbour seals in the Atlantic as a result of predicted climate change scenarios. It is not meant to provide an accurate description of the fine scale distribution pattern within the available habitat but does provide a methods for defining the limits of suitable range under different predicted conditions. As shown previously by Boehme *et al.* (2012) the use of simple metrics such as depth of dives and in-situ temperature range effectively delimits the current range of the two species allowing examination of future range shifts for any scenario where those simple metrics can be predicted.

Predicted PCH for both species corresponded well with species distribution maps (such as Burns 2009) and incorporated all known breeding areas. For grey seals this included the peripheral breeding sites in France and on the Murman coast of Russia as well as the recently established colonies in Maine and Massachusetts in the US (Wood, Brault and Gilbert 2007).

For both species, the PCH included some areas that are not currently occupied. In most cases these correspond to areas known to have had breeding populations relatively recently (Mikkelsen 2010; Hassani *et al*. 2010; Rosing-Asvid *et al*. 2010 & Haug, Hammill and Olafsdóttir 2007). Exceptions are the absences of grey seals from Hudson Bay, the Grand Banks and Svalbard, all of which were identified as PCH for both species. It is not known whether these absences are due to extinction in prehistory or failure to colonise them at any time since the LGM.

Relative to PCH, FCH in the low warming scenario tended to show contraction of the habitat available to grey and harbour seals in the Atlantic. In the high warming scenario, FCH showed a continued and enhanced loss of southernmost habitat, compensated for by an increase in habitat in arctic latitudes in North-Eastern Canada and the Barents Sea.

It appears that southernmost populations of both species could be at risk of habitat loss in both scenarios. Southern edges of FCH were pushed northwards compared to the present, due to the warming ocean.

Loss of core habitat has implications for the harbour seal colonies on the US east coast and in the southern North Sea. Additional factors such as reduced productivity (Hoegh-guldberg & Bruno 2010) and therefore increased intra and interspecific competition might increase the pressures of a changing environment. These populations thus might warrant additional conservation efforts in the near future.

The range contraction observed in 2100 for the low carbon emission scenario is interesting. Aside from warmer southern waters pushing the boundaries of FCH northward, warming is also at the source of loss of FCH in high latitudes: the influx of cold melted glacial ice from Greenland and other ice sheets caused an influx of cold fresher meltwater into areas such as Hudson Bay and Labrador in Canada, Greenland, Iceland and the Barents Sea area. Additionally, though not illustrated in the FCH because of the use of summer sea ice for the study, this meltwater might result in a higher production of winter sea ice despite the annual warming (Nummelin *et al*. 2016; Bintanja *et al*. 2015). The cooling of high latitude waters would affect a large number of harbour and grey seal populations, though the timing and extent is as yet unclear in this exploratory study.

The high warming scenario produced very different results for high latitude areas, where new habitat was gained by both species. Warming in high latitude waters, and the associated receding summer sea ice extent is thought to result in a northward shift of pagophilic pinnipeds (Kovacs *et al*. 2011). It is possible that such shifts will make some areas available to harbour and grey seals, enabling expansion in northern Canada, and Barents area. However, it is unclear whether arctic species will all shift northwards or if temperate seals will move northward to fill these new habitats.

Current emission levels (404ppm in December 2016) are similar (if not worse) than in the high warming scenario RCP8.5 (404ppm for 2016) (https://www.co2.earth/), making its FCH more likely than that of scenario RCP 2.6. To some extent, the conditions predicted in the low warming scenario will necessarily happen en-route to the high warming scenario.

To estimate FCH we used 3 abiotic variables, but there are more factors determining habitat suitability, such as substrate of haul-outs and foraging areas (Bailey *et al*. 2014) and most importantly the presence and availability of suitable prey. Climate change is predicted to negatively impact primary productivity (Hoegh-guldberg & Bruno 2010) and prey species distributions may not change in favourable ways. This could result in parts of FCH becoming more difficult or even unsuitable and reduce the carrying capacity compared to the present. Additionally, anthropogenic pressures can also impact seals whether directly or indirectly and potentially exacerbate problems.

**Conclusion**

This study investigated the current habitat of harbour seals and grey seals using depth and SST from a large dataset of telemetry. Despite a simple approach to environmental grids, with a need for interpolation and a limited resolution to bathymetry, the use of depth and annual SST limits to delineate core habitat appears to be a useful method to represent possible habitat extent in the present and possibly the future.

Although the methodology would need refining to supply more quantitative results, it provides an easy and fast tool for initial exploration of a species' potential climate-related changes in distribution.

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Table 2 - Deployments used in the study

| Species | Deployment name | Country | Location | Start Date | Tag type | No. seals |
|---|---|---|---|---|---|---|
| Phoca vitulina | pv11 | UK | Dornoch | March 2005 | Argos SRDL | 5 |
| Phoca vitulina | pv15 | UK | Wash | March 2005 | Argos SRDL | 8 |
| Phoca vitulina | pv23 | UK | Eden | May 2008 | GPS/GSM | 7 |
| Phoca vitulina | pv24 | UK | Pentland Firth | September 2010 - March 2011 | GPS/GSM | 14 |
| Phoca vitulina | pv24e | UK | Eden | February 2011 | GPS/GSM | 5 |
| Phoca vitulina | pv33 | UK | Strangford Lough | April 2010 | GPS/GSM | 12 |
| Phoca vitulina | pv40 | UK | Thames | January 2012 | GPS/GSM | 10 |
| Phoca vitulina | pv41 | UK | Islay | September 2012 | GPS/GSM | 17 |
| Phoca vitulina | pv42 | UK | Wash | January 2012 | GPS/GSM | 25 |
| Phoca vitulina | pv44 | UK | Eden | August 2012 | GPS/GSM | 21 |
| Phoca vitulina | pv47 | UK | Orkney | July 2012 | GPS/GSM | 7 |
| Phoca vitulina | pv50 | UK | Kirkaldy/St Andrews | March2013 - May 2013 | GPS/GSM | 21 |
| Phoca vitulina | pv55 | UK | Islay | April 2014 | GPS/GSM | 10 |
| Halichoerus grypus | hg4 | Canada | Sable Island | February 2004 | Argos SRDL | 45 |
| Halichoerus grypus | hg7 | UK | Wales | June 2004 | Argos SRDL | 19 |
| Halichoerus grypus | hg5 | Canada | Gulf of St Lawrence? | June 2004 | Argos SRDL | 20 |
| Halichoerus grypus | hg9 | Canada | Sable Island | January 2007 | Argos SRDL | 6 |
| Halichoerus grypus | hg1 | UK | Oronsay, Colonsay | May 2003 | Argos SRDL | 12 |
| Halichoerus grypus | hg3 | UK | Oronsay | September 2003 | Argos SRDL | 10 |
| Halichoerus grypus | hg6 | UK | Tiree, Coll | April 2004 | Argos SRDL | 12 |
| Halichoerus grypus | hg11 | UK | Donna Nook | July 2005 | Argos SRDL | 10 |

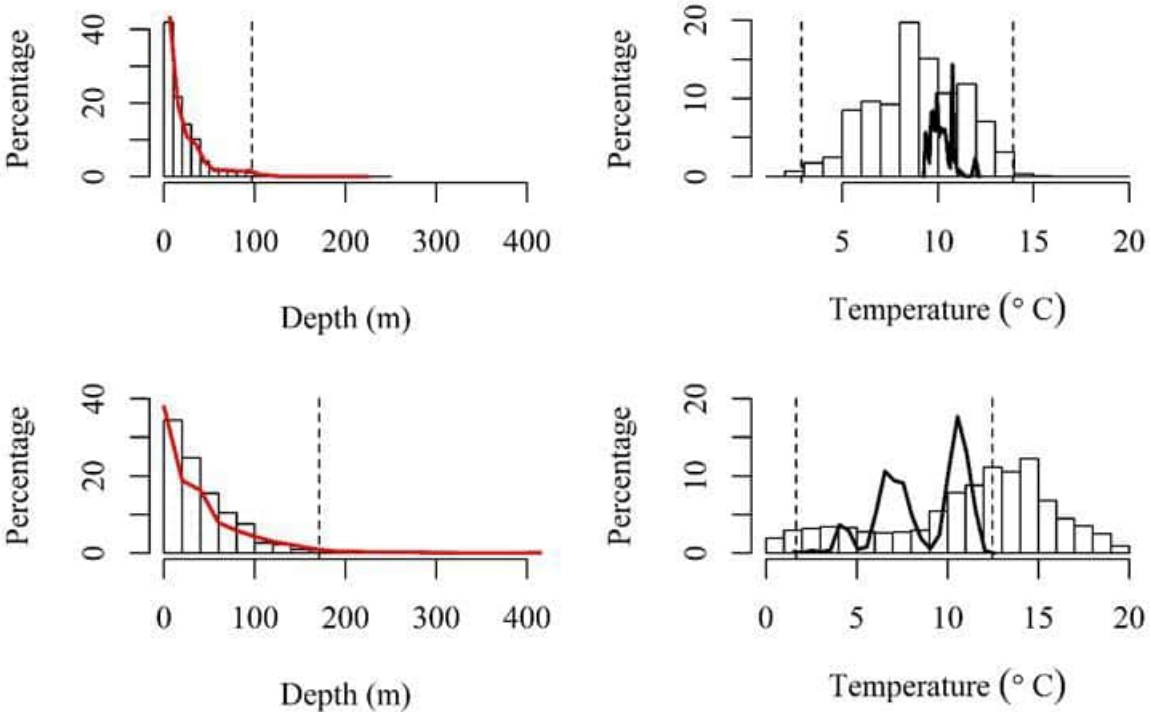


**Figure 1.** Histograms of tag-recorded depths and temperatures for harbour (top) and grey seals (bottom). Interpolated bottom depths (bold red) and annual SST (bold black) are overlaid, and the limits for maximum depth and temperatures are represented as dashed lines.

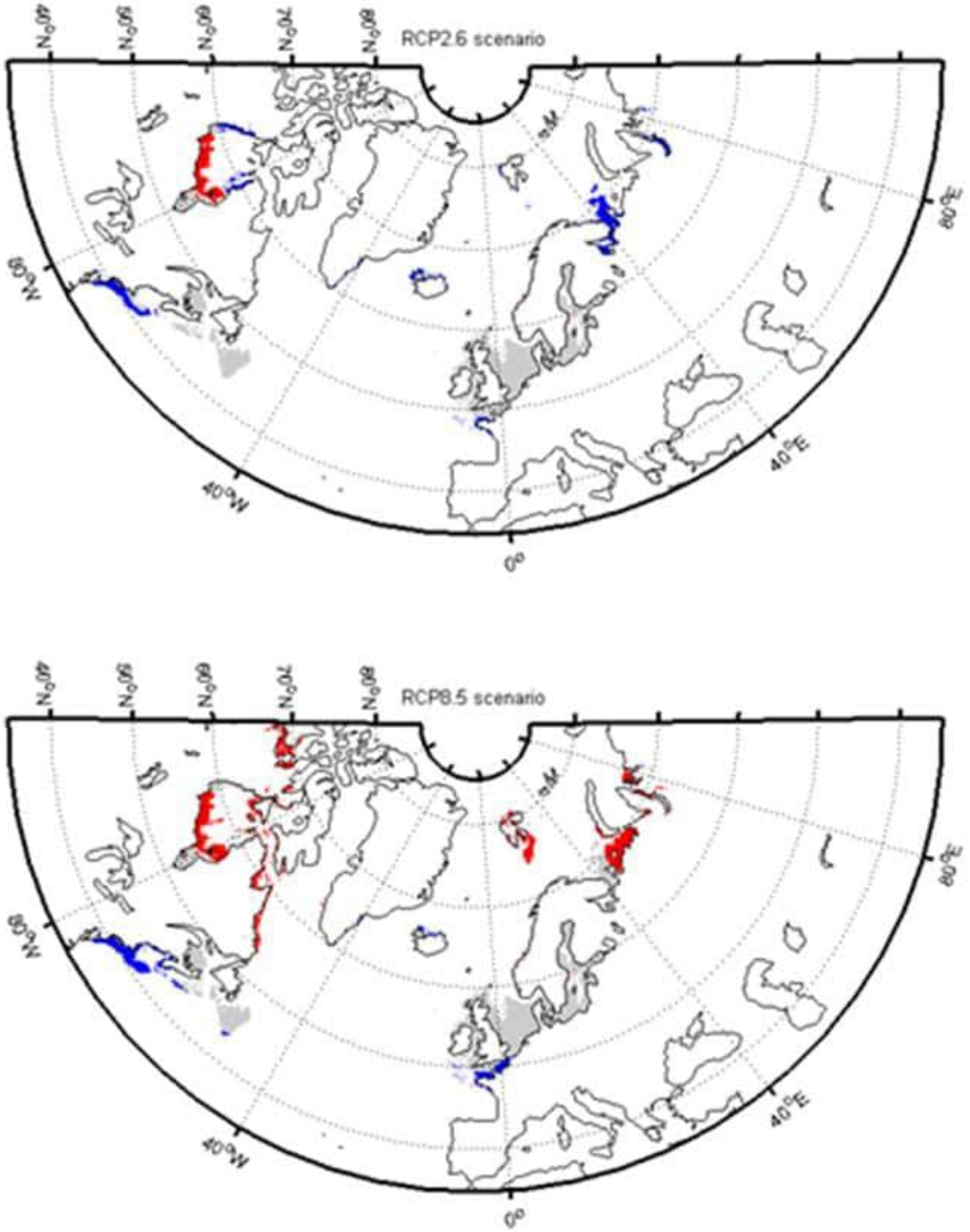


**Figure 2.** Future core habitat (FCH) for harbour seals in the year 2100 under low emission scenario RCP 2.6 (a) and high emission scenario RCP 8.5 (b). Grey represents or areas of habitat common to the present core habitat (PCH) and FCH. Blue and red represent habitat loss and gain (respectively) relative to the PCH. PCH: is the combination of areas common to the present and future scenario (red) and those lost in the FCH (blue).

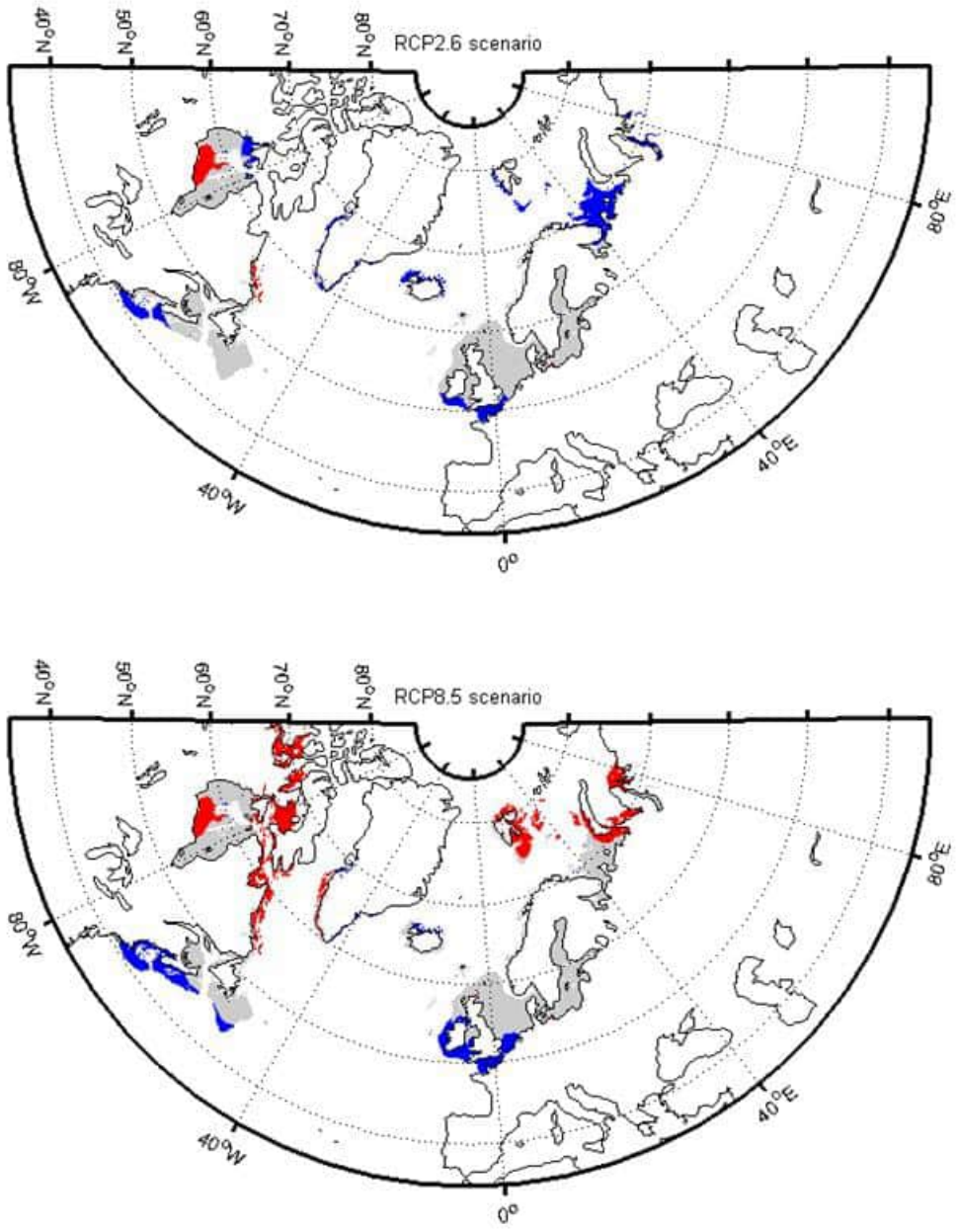


**Figure 3.** Future core habitat (FCH) for grey seals in the year 2100 under low emission scenario RCP 2.6 (a) and high emission scenario RCP 8.5 (b). Only the Atlantic is shown. Grey represents or areas of habitat common to the present core habitat (PCH) and FCH. Blue and red represent habitat loss and gain (respectively) relative to the PCH. PCH: is the combination of areas common to the present and future scenario (red) and those lost in the FCH (blue).

# Protein and metabolite changes in seal milk from birth to desertion.

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**Summary**

True seals, such as the two species that occur around the British Isles, have uniquely short lactation periods, and then desert their pups. We periodically collected milk samples from grey seals throughout lactation and submitted them to proteomic and metabolomic analyses. These seals were found to exhibit a more rapid transition between colostrum and mature milk than yet found in any other mammal. This may be a general character of all true seals. Immune factors such as immunoglobulin G were unusually persistent in milk throughout lactation, whereas anti-microbial oligosaccharides were found only early in the lactation cycle. Taurine levels fell with time, suggesting that taurine-dependency in seals, and depletion of maternal stores during their fast, should be investigated. Indicators of progressive changes in fat metabolism of the mothers were found, indicating that markers of metabolic strain could be used to predict when a mother seal will desert her pup, or is under premature metabolic stress.

## Introduction

True seals have the shortest lactation periods of any species group of mammals. Nursing females may fast while transferring a substantial proportion of their body reserves to their pups, which they then desert, and there is no period of mixed feeding. Post-desertion survival of the pups in breeding colonies, and subsequently at sea, will be heavily influenced by the body condition and physiology of nursing mothers, and what immune factors she can provide. Detrimental changes in food resources and environment of pre-parturtion females may therefore have both short- and long-term effects on their own and their pup's survival, and both their subsequent abilities to reproduce. Long term reproductive potential of seal populations, and hence population recovery from, for instance, disease epidemics will be affected by the starting quality of pups. We have begun an analysis of the proteins, micronutrients and metabolites in grey seal (*Halichoerus grypus*) milk from birth to desertion to address the following questions.

1. Given the unusually abbreviated lactation periods of seals, how rapid is the transition from colostrum (first milk) to main phase milk?

2. What agents of innate and acquired immunity are transferred from mother to young? And how do these change in kind and quantity from birth to desertion?

3. As the mothers fast and their fat reserves deplete to criticality, their fat metabolism is likely to change change. What signals of this can be detected in their milk?

4. Are there signs of encroaching metabolic stress detectable in seal milk as desertion approaches? Can we find a metabolic indicator of when a mother is about to desert?

These questions were aimed at both increasing our understanding of seal reproductive biology, and to provide signs of deterioration in maternal condition that may be caused by changes in food resources, build-up of pollutants, and predicted alterations in climate and sea conditions.

**Methods**

Milk samples were collected from the colony of Atlantic grey seals on the Isle of May, Scotland, during October and November 2013, and stored frozen until processed. A further collection was made in November 2016 to obtain samples as close after birth as possible without risking adverse maternal behaviour or survival of pups. The samples were centrifuged at 4°C, and the water soluble layer below the fat layer collected for analysis. For protein analysis and proteomics, samples were separated on 1- and 2-dimensional protein electrophoresis gels. Gel bands or spots were excised and submitted to proteomics. There is no genome database for grey seals, so the identification of the isolated proteins was obtained by interrogation of the collective databases for the Caniformia subset of the Carnivora, which includes genome data for Weddell seals. Metabolomics was carried out by liquid chromatography-high resolution mass spectrometry analysis and peak extraction and alignment were calculated by integration of the area under the curve, using MZMine 2.14 software.

**Results**

**Proteins.** The visual appearance of milk samples after initial processing by centrifugation in the cold illustrated the degree to which grey seal milk changes with time after birth (Figure 1). When these samples were subjected to protein gel electrophoresis, it was seen that the protein profiles mature extremely rapidly, such that the putative colostrum phase is over within a day (Figure 2). As expected, immunoglobulins (antibodies) were present at higher levels early in lactation (IgG in addition to IgA and IgM in particular). These are likely to be transferred across the neonate's gut to provide systemic immunity, and directly protect against pathogen colonisation of both the neonate's gut and the mother's mammary gland. Unexpectedly, immunoglobulin G (IgG) was found at relatively high levels until soon before desertion.

**Oligosaccharides.** These complex sugars in milk are thought not to be to support a neonates energy metabolism , but instead to be important in preventing the establishment of pathogens in the gut of infant animals. We found two major oligosaccharides, fucosyllactose and sialyllactose in grey seal milk, each of which is thought to have anti-microbial activities. Unexpectedly, however, these putatively protective complex sugars were apparent for only a few days after birth (See Figure 3 for sialyllactose).

**Taurine.** This compound is essential to a range of cellular and developmental processes, including membrane stabilisation, modulation of calcium signalling, and it is essential for cardiovascular function, development and function of skeletal muscle, the retina, and the central nervous system. Taurine is also a component of bile acids that are crucial for the processing of fats in the intestine – which is likely to be of particular importance in seal pups given the extremely high fat content of seal milk. Most mammals can synthesise their own taurine, but some hypercarrnivores (such as cats, and possibly also polar bears) cannot, and are therefore dependent on carnivory to maintain a supply. We found that the level of taurine in grey seal milk was initially at high relative levels, and fell with time after birth (Figure 3).

**Indicators of metabolic activity?** We sought for potential indicators of changes in maternal fat metabolism with time as lactation proceeds, concentrating on nicotinamide and its derivatives. We found substantial changes in these with time, such that nicotinamide itself (Figure 3) increased in

concentration, whereas acetlycarnitine fell. These changes do suggest that there are substantial changes in maternal fat metabolism as lactation proceeds.

A point of note is that while the general trends in the levels of the above metabolites are clear, there is nevertheless considerable variation in the levels between mothers, possibly indicative of diversity in pre-parturition body stores, or individual variation in metabolism and lactation.

**Discussion, conclusions and prospective**

The following points and questions arise.

1. The transition from colostrum to mature phase lactation is faster in seals than has been observed in any other group of mammals.

2. The persistence of IgG may indicate that there is prolonged direct transfer of immunity from mother to the circulation of their pups through delayed closure of the gaps between the enterocytes of the gut, or that there are mechanisms for trans-enterocyte transfer of IgG from milk to blood circulation in seals.

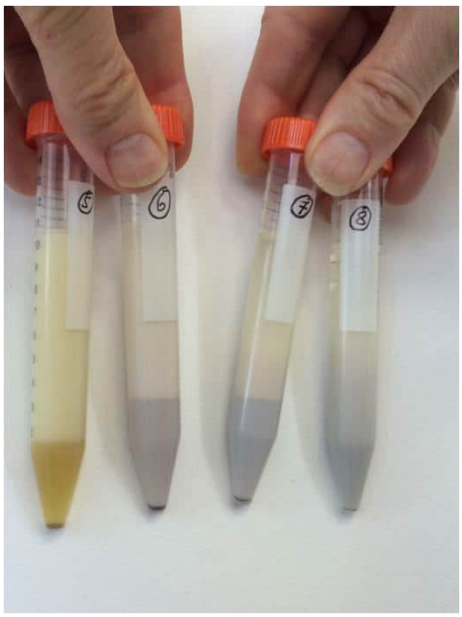
3. Is there trans-placental transfer of immunoglobulins? This could investigated by examination of the blood plasma of pups before first suckle. Collecting such samples is unethical because of the risk to maternal acceptance of a newborn pup, but opportunistic collection could be done on, for example, a pup that dies accidentally soon after birth or is stillborn.

4. The milks of some mammals contain large quantities of oligosaccharides of many different types. This applies to humans, but not to mice or cows, in which other innate protective mechanisms presumably suffice. The abbreviated appearance of oligosaccharides in the first half of lactation in grey seal milk is therefore puzzling? Is it to protect the neonate's gut and the mother's mammary gland from new exposure to a host of microbes, or to assist the establishment of a then persistent microbiota?

5. What is the initial gut microbiome of seal pups and how does it change with time?

6. Are seals taurine-dependent? If so, then pups will be particularly vulnerable to limitations in supply. Is the fall in taurine levels in milk with time due to an increase in milk volume or depletion in maternal reserves? If the latter, and if seals are taurine-dependent, then fasting seal mothers may become dangerously depleted towards the end of lactation, and their milk will be of reduced value to a taurine-dependent offspring. Further metabolomics, or genomics of grey seals or related seals (already available for Weddell seals) could show whether the taurine synthetic pathway is intact.

7. There appear to be indicators of changes in fat metabolism of mother seals as lactation proceeds. Is it therefore possible that seal mothers reach a stage in the depletion of their fat reserves that is not metabolically sustainable for lactation to continue, or for survival upon return to sea through loss of insulation? This raises the possibility that there exist detectable indicators of when females are about to desert in addition to those found here. If so, then they may be more evident in blood samples than in milk.

A 

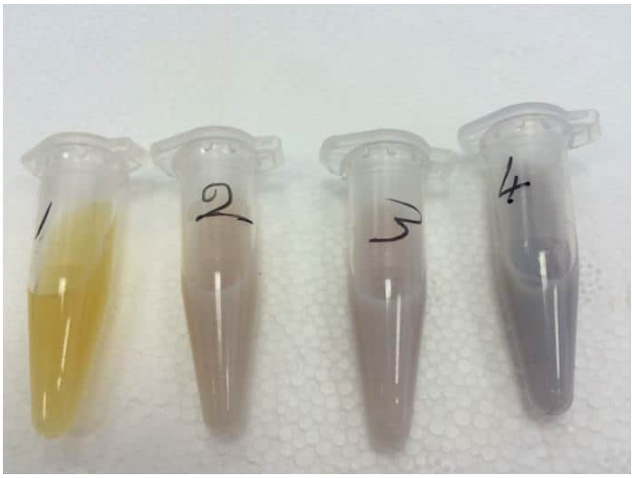

B 


**Figure 1.** Change in appearance of grey seal milks with time after birth. Ten ml of each milk sample were centrifuged at 4°C. Panel A shows the resulting separation between the upper fat layers and the lower water soluble layer below. The latter layer was removed from the tubes in A to provide samples such as in B. The samples in panel A are from days 2, 7, 13, and 18 of an18-day lactation of an individual seal. The samples in panel B are, in numerical order, from days 1, 7, 13, and 18 of a 21-day lactation by another seal.

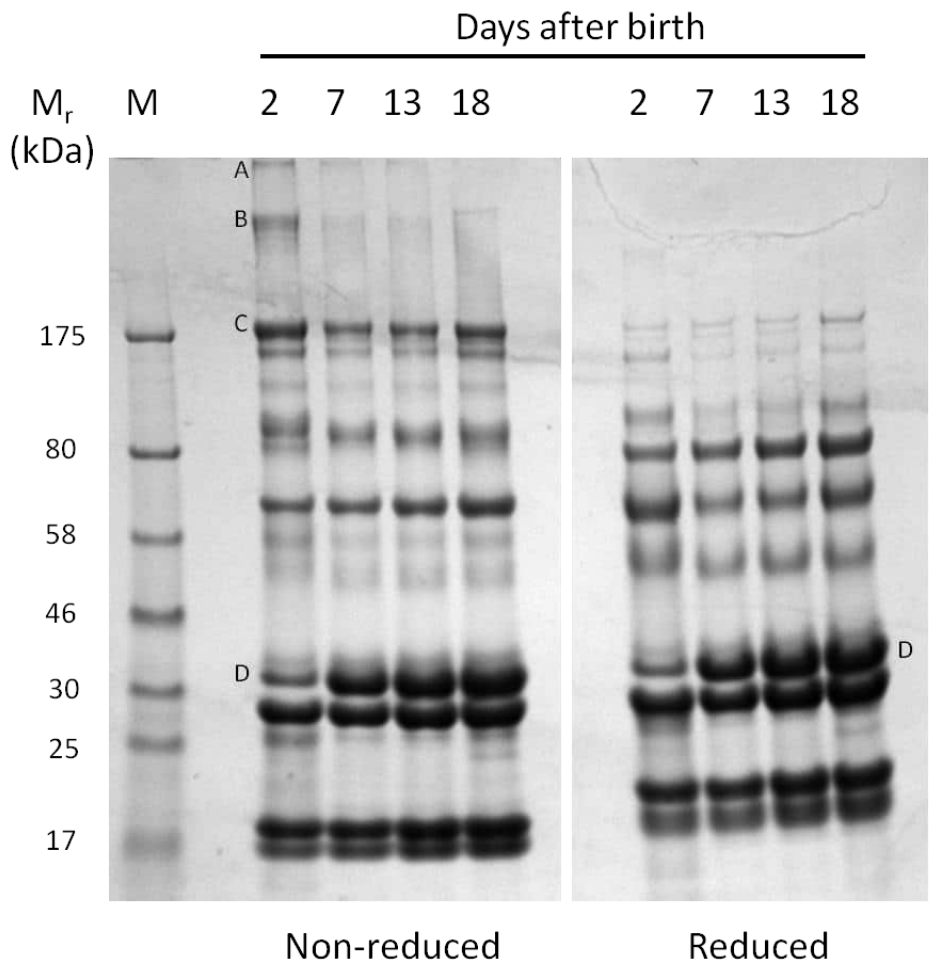



**Figure 2.** Changing protein profiles of grey seal milk with time after birth. Gradient SDS-PAGE of milk samples obtained from a single mother seal on the days indicated. Gels were stained for protein with Coomassie blue. Note the rapid fall in the amounts of immunoglobulins IgM (band A) and IgA (band B), but the persistence of IgG (band C). Also, the low level of one of the milk caseins at an early stage(band D). Samples taken between 10 and 19 hours after birth show the same effects. Most of the other bands were identified by proteomics. Overall, the time taken for the maturation of the protein profile after birth is remarkably short. M – size standard proteins.

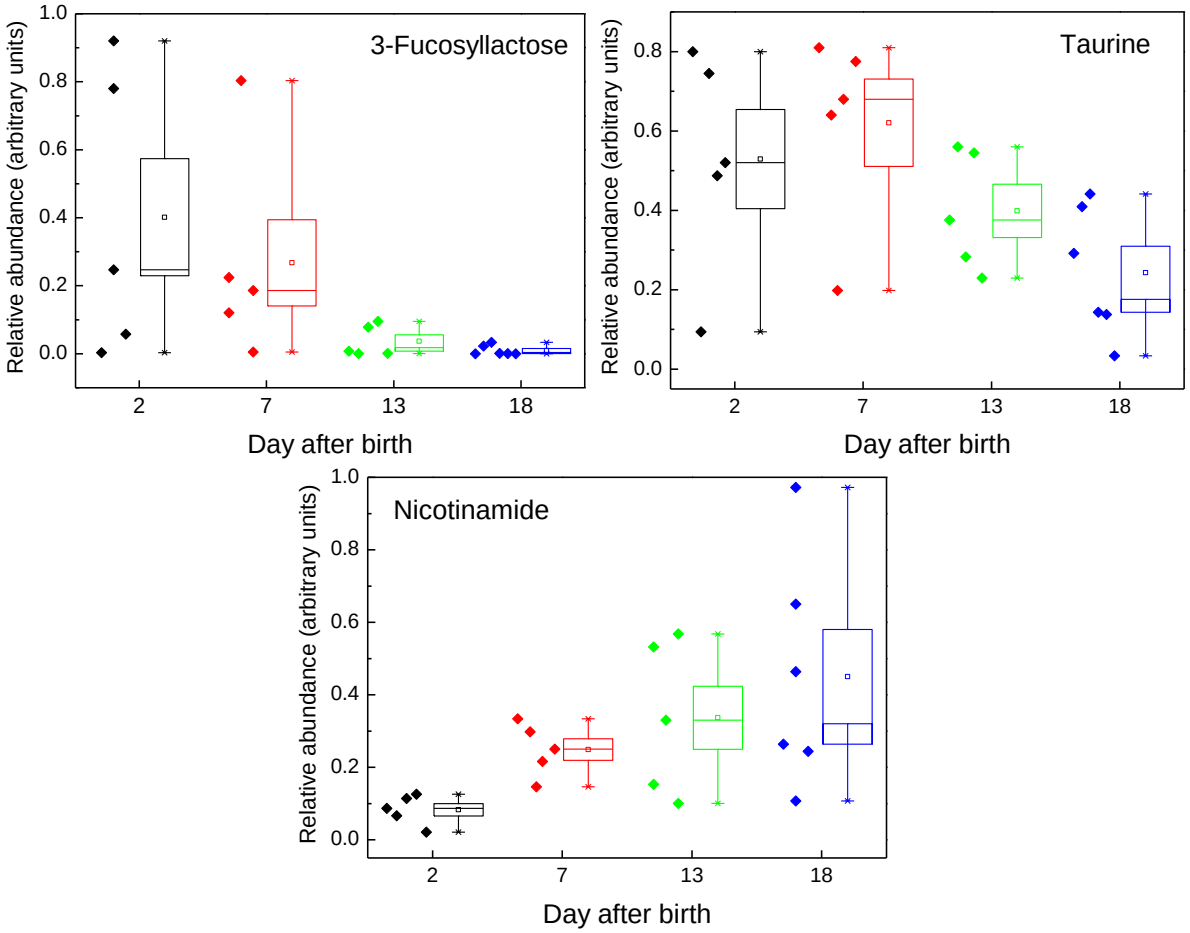



**Figure 3.** Changes in grey seal milk small molecules/metabolites with time after birth. Selection of three compounds illustrating distinctive patterns of change. Fucosyllactose is an oligosaccharide that has known inhibitory effects on microbial colonisation of the gut in some species. Taurine is an essential dietary requirement in some species of hyperpredator (such as cats) – seals are piscovorous hyperpredators. Nicotinamide is associated with fat metabolism, which is likely to be particularly important in seals in terms of mobilisation of maternal body reserve lipids, and lipids required for rapid growth and maintenance of pups that need to accumulate large fat reserves for the forthcoming starvation period and for thermal insulation at sea. The square symbol in a box is the mean; the band in the box is the median; the box extends to the standard error of the mean; the whiskers indicate the range.

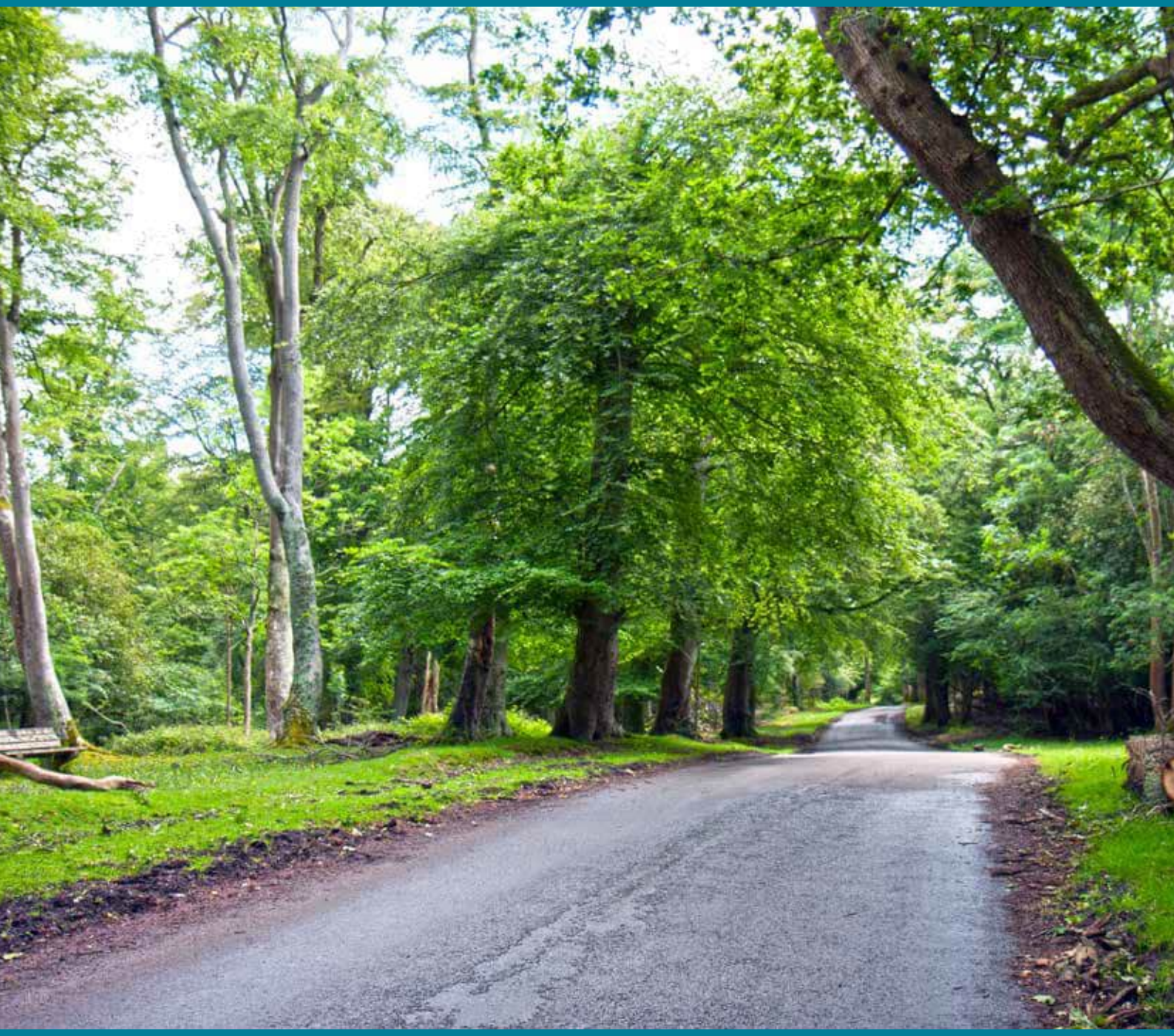
# Appendix 7: Air Quality Impacts

Institute of Air Quality Management

# A guide to the assessment of air quality impacts on designated nature conservation sites

Version 1.0

June 2019



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# Contents

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**Institute of Air Quality Management:** IAQM aims to be the authoritative voice for air quality by maintaining, enhancing and promoting the highest standards of working practices in the field and for the professional development of those who undertake this work. Membership of IAQM is mainly drawn from practising air quality specialists working within the fields of air quality science, air quality assessment and air quality management.

# 1. Introduction

### 1.1 Purpose

1.1.1 This document has been produced by the Institute of Air Quality Management (IAQM) to assist its members in the assessment of the air quality impacts of development on designated nature conservation sites. It may also be useful for ecologists, who use the results of air quality assessments (AQAs) to evaluate the effects of air pollution on habitats and species, by increasing their understanding of the information provided by air quality specialists. This subsequent stage of the overall process, i.e. the assessment of the *effects* that air quality impacts may have on habitats and species, is generally outside the expertise of IAQM members and no specific detail on this stage is provided in this guidance.

1.1.2 This document focuses on air quality assessments in support of Habitats Regulations Assessments (HRA)[1], but it will also be useful when assessing the air quality impact on national or local designated nature conservation sites.

### 1.2 Producing this guidance

1.2.1 The IAQM and the Chartered Institute of Ecology and Environmental Management (CIEEM) intended to produce a joint document on the assessment of the ecological effects of air pollution. The members of both organisations, some regulatory bodies and nature conservation agencies were consulted on a draft document in October 2017. The need to take account of complex new case law relating to European sites, coupled with the voluntary nature of producing this guidance has meant that the final joint document has been unavoidably delayed.

1.2.2 In the meantime, the IAQM made the decision to publish the air quality sections as a standalone document, as feedback from the original consultation indicated that there was an absence of guidance for our members that should be addressed. It is still the intention to produce a joint document as soon as possible.

1.2.3 A second round of consultation of IAQM members was undertaken for the draft of this document in Spring 2019. The comments received from both consultations have been taken into account in the production of the final document.

1.2.4 It is recognised that there may be useful learning points and amendments to be made to this guidance once it has been applied in practice. IAQM, therefore, welcomes comments and

Jonathan Petersson | Pexels

feedback on the guidance and will endeavour to produce, if necessary, a revised version at an appropriate time.

1.2.5 The publication of this document replaces the IAQM Position Statement on 'Use of a Criterion for the Determination of an Insignificant Effect of Air Quality Impacts on Sensitive Habitats' issued in January 2016.

1.2.6 A glossary of terms is provided in **Appendix A**.

### 1.3 Sites covered by this guidance

1.3.1 This IAQM guidance is applicable to the assessment of European, national and local designated sites where such assessments are required by the decision maker. This guidance, therefore, applies to the assessment of Special Areas of Conservation (SACs) and Special Protection Areas (SPAs) (known as European sites) and Ramsar sites[2] which are covered by the Habitats Regulations. It also applies to Sites of Special Scientific Interest (SSSIs), Areas of Special Scientific Interest (ASSIs), National Nature Reserves (NNRs), local nature reserves (LNRs), local wildlife sites (LWSs) and areas of ancient woodland (AW)[3]. All these sites may require assessment depending on the type of project and/or the regulatory system under which the application is made. In this document, these are referred to as 'designated sites'.

1.3.2 The Habitats Regulations[4], which transpose the Habitats Directive[5] into legislation in the UK[6], require that a development proposal, or a project or plan, will not cause a likely significant effect or, where likely significant effects cannot be discounted, no adverse effect on the integrity of European sites[7]. Proving the absence of significant effects is more difficult than proving that a significant effect will occur. The air quality practitioner has an important role to play in ensuring the right information is provided to the ecologist to allow them to make that judgement.

1.3.3 Different requirements apply to national and local designated sites. In England, for example, the National Planning Policy Framework (NPPF)[8] states that planning permission should be refused if significant harm to biodiversity cannot be avoided, mitigated or, as a last resort, compensated[8]. The same basic assessment methodology can be used although the final determination of the significance of effect may be different.

### 1.4 The Habitats Regulations

1.4.1 The European Commission (EC) provides guidance on managing internationally designated nature conservation sites[9]. The flow chart in **Appendix B**, reproduced from this EC guidance, illustrates the stages of the assessment process. It should be noted that the process is iterative, i.e. it is possible to return to earlier stages during the assessment of a project or plan. Air quality assessment may be required at any stage.

1.4.2 The requirement to produce an HRA is driven in England and Wales by the Conservation of Habitats and Species Regulations 2017 (as amended), which states that: 'A competent authority, before deciding to undertake, or give any consent, permission or other authorisation for, a plan or project which

- Is likely to have a significant effect on a European site or a European offshore marine site (either alone or in-combination with other plans or projects); and

- Is not directly connected with or necessary for the management of that site, must make an appropriate assessment of the implications for that site in view of that site's conservation objectives.'

1.4.3 Similar requirements apply in Scotland and Northern Ireland.

1.4.4 The contents of an appropriate assessment are not defined in the legislation, and there is no current Government guidance providing clarification. The competent authority[10] varies depending on the type of the project or plan, but for planning applications is primarily the local planning authority For appeals, for example, in England, the planning inspector or the Secretary of State can also be the competent authority. For environmental permits the UK competent authorities include the Environment Agency in England (EA), Scottish Environmental Protection Agency (SEPA) in Scotland, Industrial Pollution and Radiochemical Inspectorate (IPRI) in Northern Ireland, Natural Resources Wales (NRW) in Wales, and local authorities. It should be noted that the regulators of industrial installations in the devolved authorities generally, but not exclusively, rely on EA advice[11].

1.4.5 Typically, consultants working for the applicant produce an HRA, which is used by the competent authority to inform the 'appropriate assessment'. The role of the air quality specialist is to assess the potential impacts so as to either demonstrate that a project or plan will not have a likely significant effect (alone or in-combination) or, if this is not possible, to provide an ecologist with an estimate of the air quality impacts. If there is a need for an HRA covering the air quality impacts, the ecologist should produce it in liaison with the air quality specialist.

1.4.6 Where the appropriate assessment concludes that the project or plan will not result in an adverse effect on the integrity of the European site(s) being considered, consent may be granted. If adverse effects on the integrity of the European site(s) cannot be ruled out, consent cannot be granted without further work. This may include the identification of further measures to address the predicted adverse effect(s).

1.4.7 Where no further measures are available, and the project or plan is needed for 'imperative reasons of overriding public interest' (IROPI), the competent authority may authorise the project or plan despite the potential for adverse effects provided there are no reasonable alternatives to achieving the objectives of the plan or project which would have less effect on European sites. Under these circumstances, consent can only be granted if suitable compensatory measures are identified.

### 1.5 Scope of this document

1.5.1 This IAQM guidance document is not intended to be a primer on how to model air quality impacts[12] but instead is intended to provide practical guidance for those air quality specialists who undertake air quality impact assessments and are already familiar with modelling techniques. It also aims to encourage greater communication and co-operation between air quality and ecological specialists.

1.5.2 The planning and environmental permitting systems are somewhat different in the various devolved administrations. In addition, these two regulatory systems have different requirements in terms of the types of designated site that require assessment.

1.5.3 The air quality specialists undertaking assessments are required to make professional judgements. This is due to the diverse range of projects and the wide range of factors that influence the approach taken, which means it is not possible to be entirely prescriptive. IAQM advice is that the assessments of impacts should be undertaken by, or under the close supervision of, an experienced air quality practitioner. Where possible the name of the assessors and/or supervisors should be included in the assessment with a brief summary of their relevant qualifications, experience and role in the assessment.

## Box 1.1 Key Issues for the Air Quality Assessment

1. Impacts vs. effects

- The air quality practitioner calculates the air quality impacts
- The ecologist identifies the ecological effects

2. IAQM document scope

- This document is concerned with determining whether there will be a 'likely significant effect' on a habitat, and where this cannot be screened out, providing the ecologist with detailed information on the air quality impacts.
- It is the job of the ecologist to determine whether in reality there will be a 'significant effect', or, for European sites, a 'adverse effect on the integrity of the site'.

3. Consultation

- Always consult the regulator on the:
  - assessment approach
  - pollutants to be included
  - designated sites to be considered
  - the list of projects and plans to be included in the in-combination or cumulative impact assessment.

4. Collaboration

- Work closely with the project ecologist throughout the air quality assessment
- If there is no project ecologist, as is the case for many environmental permit applications, it may be necessary in some circumstances to recommend to the client that one is appointed.

5. Professional judgement

- There are too many different types of plans and projects and regulatory regimes in the UK to be prescriptive on how to undertake air quality assessments
- Professional judgement of an experienced air quality practitioner is essential.
- Demonstration of experience of undertaking similar assessments should be provided in the assessment report or other appropriate document.

6. Proportionate

- The scope and detail of assessment should be proportionate to the risk.

7. Precautionary principle

- The assessment should be precautionary, but not so precautionary as to produce results that are unrealistic.

8. Guidance changes with time

- Always check for the most recent guidance from the relevant regulator.

The key issues to be considered when undertaking an air quality assessment of ecological impacts with reference to this practical guidance are set out in **Box 1.1**.

1.5.4 In this document, current guidance from other bodies is referred to, recognising that it may be revised in the future as the regulatory position and case law evolves. If that happens, this document will be amended accordingly.

1.5.5 Throughout this document the term 'regulator' is used to describe the decision maker in both the planning and environmental permitting regimes; where the assessment includes a European Site, the 'regulator' is also the competent authority.

### 1.6 Other IAQM guidance

1.6.1 Impacts associated with dust soiling, e.g. from construction projects and minerals sites are not within the scope of this guide. Such impacts may be included in a subsequent edition. A methodology for the qualitative risk assessment of construction dust on ecological sites is available from IAQM[13]. IAQM also produces guidance for the assessment of impacts of mineral sites for planning applications[14].

1.6.2 Existing guidance on planning and air quality has been produced by Environmental Protection UK (EPUK) and IAQM[15]. This guidance applies in the context of human receptors only and specifically excludes consideration of ecological sites and so does not conflict in any way with this document. These guidance documents are complementary to this document and it is not anticipated that there will be any substantial overlap of application, as they serve different purposes.

### 1.7 Ecological impact assessment guidance

1.7.1 For many developments that could give rise to air quality impacts on designated sites, there will be a need to incorporate the assessment of these impacts into a wider ecological impact assessment (EcIA). CIEEM defines EcIA as '*...a process of identifying, quantifying and evaluating the potential effects of development-related or other proposed actions on habitats, species and ecosystems.*'[16]

1.7.2 CIEEM has produced guidelines for implementing the EcIA process in the UK. The various stages of the EcIA process as recommended by CIEEM will interact with the various stages of an air quality assessment on designated sites. For detailed information on the EcIA process, the reader is referred to the CIEEM Guidelines. A summary of how the two processes may interact is provided in **Appendix C**.


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[1] Also known as a Habitats Directive Article 6 Assessment.
[2] These sites are designated under The Convention on Wetlands, known as the Ramsar Convention.
[3] Throughout this guidance, areas of ancient woodland are included within the definition of 'designated sites'. Environment Agency guidance states that ancient woodland within 2 km of a new emitting installation should be included in detailed assessments for environmental permit applications. (www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit). 'Ancient woodland' is in many cases included on countrywide Ancient Woodland Inventories; these are coordinated by the relevant country Statutory Nature Conservation Organisation (SNCO) and / or government forestry department. Ancient woodland can also occur in areas not included in the inventory
[4] The Conservation of Habitats and Species Regulations 2010 (as amended); in Scotland, by The Conservation (Natural Habitats, &c.) Regulations 1994 (as amended) and in Northern Ireland, by The Conservation (Natural Habitats, etc.) Regulations (Northern Ireland) 1995.
[5] The Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora.
[6] Readers need to check the status of elements of the Regulations in devolved administrations.
[7] The definition of site integrity covers the distribution, structure, function and abundance; 'typical species'; whether a species is a 'viable component of its natural habitat'; and a sufficiently large habitat to maintain populations on a long-term basis. www.clientearth.org/reports/natura-2000-site-integrity-briefing.pdf.
[8] MHVLG, 2019, National Planning Policy Framework 2019, www.gov.uk/government/publications/national-planning-policy-framework--2.
[9] European Commission, 2018, Commission Notice "Managing Natura 2000 Sites -The provisions of Article 6 of the 'Habitats' Directive 92/43/EEC", Brussels 21.11.18, C(2018) 7621 final. ec.europa.eu/environment/nature/natura2000/management/guidance_en.htm.
[10] '*Competent authorities*' are defined by the Habitats Regulations, and include local planning authorities, government departments and statutory undertakers.
[11] For example NRW had its own guidance on 'Assessing the impact of ammonia and nitrogen on designated sites from new and expanding intensive livestock' (Guidance Note 020) cdn.naturalresources.wales/media/684017/guidance-note-20-assessing-the-impact-of-ammonia-and-nitrogen-on-designated-sites-from-new-and-expanding-intensive-livestock-units.pdf
[12] See for example, Defra, 2016, Local Air Quality Management Technical Guidance TG.16 laqm.defra.gov.uk/technical-guidance/
[13] iaqm.co.uk/text/guidance/construction-dust-2014.pdf.
[14] www.iaqm.co.uk/text/guidance/mineralsguidance_2016.pdf.
[15] www.iaqm.co.uk/text/guidance/air-quality-planning-guidance.pdf.
[16] CIEEM, 2018, *Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal*. Chartered Institute of Ecology and Environmental Management, Winchester.

# 2. Background

2.1 The broad effects of air pollution on habitats are now reasonably well understood, after several decades of research. Although the threat from acid deposition in the UK has diminished considerably in recent years, with the dramatic reduction in emissions of sulphur dioxide ($SO_2$), there is still a legacy effect in some habitats from the accumulated deposition since the Industrial Revolution. The effects of other pollutants are also apparent at many of the designated sites, especially from the deposition of nitrogen (N), and this problem is likely to persist for some time at the national and international level.

2.2 To provide clarity, IAQM uses the term 'impact' where discussing changes in concentration or deposition and the term 'effect' when discussing the ecological changes due to the air pollution impact.

2.3 To quantify and describe the effects on a designated site that might result from introducing a new source of airborne pollution, there needs to be an understanding of the atmospheric processes that define the scale of the impact following the release of a pollutant and the consequences of this impact for the habitat.

2.4 A useful summary of knowledge on this subject is provided by a consortium of environmental and conservation agencies on the Air Pollution and Information System (APIS) website[17], as hosted by the Centre for Ecology and Hydrology. This site provides a key database of information pertaining to air pollution effects at designated sites.

2.5 This IAQM document assumes that many users will be well acquainted with the subject of air pollution. For those who require an introduction to the concepts and terminology, a very brief summary is provided below, supported by further information found in **Appendix D**.

2.6 There are two categories of pollutants that are typically the subject of AQAs for designated sites. These are pollutants that have an effect on vegetation/habitats in a gaseous form and those which have an impact through deposition.

2.7 For some important gaseous pollutants, critical levels below which significant harmful effects are not thought to occur[18] have been adopted by, amongst others, the European Union and the United Nations Economic Commission for Europe (UNECE) and are used as regulatory standards. These are summarised in **Table 2.1.** Their origin and use are explained in further detail within **Appendix D**.

2.8 Some other pollutants, for example, heavy metals and hydrogen chloride, are emitted by industrial processes and these pollutants may also need to be assessed. It is recommended that, prior to the assessment of industrial emissions, the scope of any assessment is discussed with the regulator.

2.9 Another gaseous pollutant that has important effects on vegetation is ozone. This is a secondary pollutant, formed in the atmosphere from emissions of nitrogen oxides ($NO_x$) and volatile/semi-volatile organic compounds. Its production

**Table 2.1 Critical levels**

| Pollutant | Averaging Period | Critical Level |
|---|---|---|
| Oxides of nitrogen ($NO_x$) | 24 hours | 75/200 µg/m³ * |
| | Annual | 30 µg/m³ |
| Sulphur dioxide ($SO_2$) | Annual | 10 µg/m³ (for lichens and bryophytes) |
| | Annual | 20 µg/m³ |
| Ammonia ($NH_3$) | Annual | 1 µg/m³ (for lichens and bryophytes) |
| | Annual | 3 µg/m³ |
| Hydrogen fluoride (HF) | 24 Hours | 5 µg/m³ |
| | Weekly | 0.5 µg/m³ |

* The critical level is generally considered to be 75 µg/m³; but this only applies where there are high concentrations of $SO_2$ and ozone, which is not generally the current situation in the UK. See **paragraph D.4.11** in **Appendix D**.[19]

through photochemical reactions occurs at a considerable distance from the release point and is not amenable to the assessment methods set out in this document. Consequently, no guidance on its assessment is provided.

2.10 For the deposition of air pollutants critical loads, given as a range, for different habitats have been provided by UNECE (see the APIS[20]). APIS provides critical loads for nitrogen deposition (leading to eutrophication) and acid deposition (leading to acidification).

2.11 Critical loads for nitrogen deposition are in units of kilogrammes of nitrogen per hectare per year (kg N/ha/year) and vary with habitat sensitivity.

2.12 Nitrogen and sulphur deposition both contribute to acid deposition, as do some other compounds such as hydrogen chloride. APIS provides a Critical Load Function that defines the contributions from sulphur and nitrogen deposition that will not cause harmful effects. Critical loads for acidification are in units of kilograms of $H^+$ ion equivalents per hectare per year (keq/ha/year).



[17] www.apis.ac.uk
[18] There is some more recent evidence that damage can occur at lower levels.
[19] Values taken from www.apis.ac.uk/critical-loads-and-critical-levels-guide-data-provided-apis#_Toc279788051
[20] Available at www.apis.ac.uk

# 3. Case Law

3.1 Several recent judgements in the European and national courts affect the way assessments of the impacts of developments and local plans on designated sites are undertaken. Four are discussed below. A more comprehensive review of case law is provided by the European Commission.[21]

3.2 Natural England's guidance[22] summarises Habitats Directive case law on the meaning of 'likely significant effect' as follows:

- An effect is likely if it *'cannot be excluded on the basis of objective information'*
- An effect is significant if it *'is likely to undermine the conservation objectives'*
- In undertaking a screening assessment for likely significant effects *'it is not that significant effects are probable, a risk is sufficient'....* but there must be credible evidence that there is *'a real, rather than a hypothetical, risk'.*

3.3 The implication of the Wealden Judgement, summarised in **Box 3.1**, means that it is no longer appropriate to scope out the need for a detailed assessment of an individual project or plan using, for example, the 1000 annual average daily traffic (AADT) increase in the Design Manual For Roads and Bridges (DMRB)[23] or the 1% of the critical level or load used by Defra/Environment Agency[24] without first considering the in-combination impact with other projects and plans. This position has been adopted by Natural England in its internal guidance for competent authorities assessing road traffic emissions under the Habitats Directive[25].

3.4 In 2016, the European Commission challenged a 2008 decision by the Federal Republic of Germany to authorise the construction of a coal-fired power station at Moorburg, near Hamburg.[26] The Court of Justice of the European Union (CJEU) ruled that even though the power station was a considerable distance from the Natural 2000 site, there was still a requirement to assess whether there would be was a likely significant effect on the site. The assessment undertaken showed that the power plant drawing cooling water from the river Elbe would result in a high risk for migratory species of fish. As the Court has previously held, competent authorities may authorise an activity only if they have made certain that it will not adversely affect the integrity of the protected site. There should be no reasonable scientific doubt as to the absence of such adverse effects. In this case, the Court ruled that the impact assessment did not contain sufficient definitive data regarding the effectiveness of the proposed mitigation measure. Although this case was not air quality-related, the ruling suggests there must be definite evidence of the efficacy of any mitigation measures proposed.

3.5 This case also concerned the failure of the impact assessment to take account of the cumulative impacts of a pumped-storage power plant and a potential hydroelectric plant on the fish stocks. When assessing cumulative effects, the Habitats Directive requires the assessment to take into account all other projects and plans which, in-combination with the project or plan for which an authorisation is sought, are likely to have a significant effect on a protected site even where those projects/plans precede the date of transposition of the directive.

3.6 In the 'People Over Wind', the Irish High Court referred the following question to the CJEU for a preliminary ruling: *"Whether, or in what circumstances, mitigation measures can be considered when carrying out screening for appropriate assessment under Article 6(3) of the Habitats Directive?"*[27]

3.7 In reaching its decision, the Court noted the importance of the precautionary principle to the interpretation of Article 6(3) of the Habitats Directive. The Court judgment, made in 2017, was that it is more appropriate to consider mitigation at the assessment stage than the screening stage. What is unclear is where the boundary lies between what is an integral part of a proposed development and what is a mitigation measure.

3.8 The fourth recent case relevant to air quality assessments was on nitrogen emissions from farms in the Netherlands. In 2018 the CJEU ruled[28] that a reduction in emissions can only be taken into account in an appropriate assessment if the expected benefits are certain at the time of the assessment.

3.9 Previous case law on the interpretation of the Habitats Directive has clarified that 'certain' does not mean absolute certainty but *'where no reasonable scientific doubt remains'*[29] (emphasis added). In the Netherlands case, the CJEU recognised that the measures with which they were concerned had *"not yet been taken or have not yielded any results, so that their effects are still uncertain"*. It is in that context that the CJEU stated *"The appropriate assessment of the implications of a plan or project for the sites concerned is not to take into account the future benefits of such 'measures' if those benefits are uncertain, inter alia because the procedures needed to accomplish them have not yet been carried out or because the level of scientific knowledge does not allow them to be identified or quantified with certainty"*.

3.10 A summary of the ruling in the context of air quality assessments is provided in **Box 3.2**.

3.11 Also, of note is that the Court ruled that the grazing of cattle and the application of fertiliser may be classified as a 'project' under the Habitats Directive, and therefore require an appropriate assessment if it is likely to cause a significant effect on the designated site. The grazing of cattle and application of fertiliser is often a long-established activity, predating the Habitats Directive. The judgement suggests that a change in location, the rate of application, or spreading technique may be sufficient to trigger an assessment. This may mean that more assessments will be required for agricultural developments.

## Box 3.1 The Wealden Judgement

**Judgment in Wealden District Council v Secretary of State for Communities and Local Government, Lewes District Council and South Downs National Park Authority) [2017] EWHC 351 (Admin)**

DATE: 21 March 2017

Wealden District Council challenged a part of the Lewes Joint Core Strategy (JCS) prepared jointly by Lewes District Council (LDC) and the South Downs National Park Authority (SDNPA). The case concerned the approach to in-combination assessments pursuant to the Habitats Regulations.

The principal issue was whether LDC and the SDNPA had acted unlawfully in concluding, on advice from Natural England, that the JCS would not be likely to have a significant effect on the Ashdown Forest Special Area of Conservation (SAC), in-combination with the Wealden Core Strategy. An in-combination assessment of the impact of vehicle emissions on nitrogen deposition on the heathland within the SAC had not been undertaken using advice from the then Highways Agency, in the Design Manual for Roads and Bridges (DMRB). This states that where annual average daily traffic movements (AADT) resulting from development did not exceed 1000 on affected roads, environmental effects could be regarded as neutral and "scoped" out of any further assessment.

Wealden District Council argued that, whereas its Core Strategy had been prepared on the basis that it would generate 950 AADT on part of the A26 road next to the SAC, the effect of the JCS would be to increase the AADT beyond the 1000 threshold and, on a proper interpretation of the DMRB guidance, this required an in-combination assessment of the effects of both the Wealden Core Strategy and the JCS which had not been carried out in the Habitats Regulations Assessment (HRA) associated with the preparation of the JCS. LDC and the SDNPA argued that no in-combination assessment was required, because the JCS on its own involved the generation of traffic below the threshold and, in applying the guidance, no further in-combination assessment was required.

The Secretary of State also referred to separate guidance relied upon by Natural England and prepared by the Air Quality Technical Advisory Group (AQTAG), to the effect that the 1000 AADT threshold equated to a 1% change in critical loads/levels which, if not exceeded, allowed the decision-maker to conclude that there was no likely significant effect. The advice also stated that experience of permitting allowed the Group to be *"confident that it was unlikely that a substantial number of plans or projects will occur in the same area at the same time, such that their in-combination impact would give rise to concern at the appropriate assessment stage. If such a situation were to arise then the assessment could be determined on a case-specific basis"*. Wealden District Council argued that this confirmed the unlawfulness of the approach taken in the HRA.

The judge found that, on a proper interpretation of the DMRB, at least in principle, in-combination effects are potentially relevant at the initial "scoping" stage as well as the subsequent stage requiring further assessment. It was also concluded that advice from Natural England to LDC and SDNPA on the approach to be taken to the HRA, which relied on the AQTAG guidance, was *"plainly erroneous"*:

It was therefore held that the HRA was *'contaminated'* by Natural England's advice, because LDC and the SDNPA should have undertaken further inquiry of Natural England in circumstances where no explanation had been given for not aggregating the two amounts; and because Natural England's error directly affected the decision-making process. The judge also directed Natural England to reconsider its advice in the light of this judgment and that the DMRB should be re-examined, and clarified, to reflect the concerns indicated.

3.12 The 2019 Clean Air Strategy includes a commitment that the EU Withdrawal Bill will ensure existing EU environmental law continues to have effect in law after the UK leaves the EU. Therefore, the above rulings of the CJEU are likely to remain relevant for the foreseeable future.

## Box 3.2 The Netherlands Air Quality Judgement

**Judgment of the Court (Second Chamber)**

DATE: 7 November 2018

**Coöperatie Mobilisation for the Environment UA and Vereniging Leefmilieu v College van gedeputeerde staten van Limburg and College van gedeputeerde staten van Gelderland. Requests for a preliminary ruling from the Raad van State Joined Cases C-293/17 and C-294/17**

These two cases challenged the Netherlands approach to the assessment and permitting of ammonia emissions from beef, dairy, pig and poultry farms. The Netherlands Government has adopted a strategic approach to regulating nitrogen deposition, known as the Programma Aanpak Stikstof or PAS. This aims to conserve or where necessary to restore the Natura 2000 sites to favourable conservation status whilst also allowing economic growth. The premise of PAS is that nitrogen deposition will reduce, and that half of that reduction can be offset by the emissions from new economic activity.

The national court referred a number of questions to the CJEU. These include whether an appropriate assessment may take into account the existence of conservation measures, preventative measures, measures specifically adopted for a programme or autonomous measures (i.e. those that are not part of the programme; in this case the PAS).

Of most relevance to the way air quality assessments are undertaken in the UK is the following question *"May the positive effects of the autonomous decrease in the nitrogen deposition … be taken into account in the appropriate assessment…, is it important that the autonomous decrease in the nitrogen deposition be monitored and, if it transpires that the decrease is less favourable than had been assumed in the appropriate assessment, that adjustments, if required, be made?"* The judgement states that according to previous case law *"…it is only when it is sufficiently certain that a measure will make an effective contribution to avoiding harm to the integrity of the site concerned, by guaranteeing beyond all reasonable doubt that the plan or project at issue will not adversely affect the integrity of that site, that such a measure may be taken into consideration in the 'appropriate assessment' within the meaning of Article 6(3) of the Habitats Directive"*.

The court concluded that an appropriate assessment may not take into account the existence of conservation measures, preventive measures, measures specifically adopted for a programme such as that at issue in the main proceedings (the PAS) or autonomous' measures (i.e. measures not part of that programme), if the expected benefits of those measures are not certain at the time of that assessment.

The CJEU also considered whether a threshold can be used to exclude projects from authorisation if the court is satisfied that the appropriate assessment carried out in advance meets the criterion that there is no reasonable scientific doubt as to the lack of adverse effect on the integrity of the sites concerned. The CJEU concludes that, under these circumstances, thresholds can be used. It should be noted that the PAS threshold (1 mol N/ha/yr which is equivalent to 0.014 kg N/ha/yr) is lower than 1% of the critical load (1 mol N/ha/yr is 0.28% where the critical load is 5 kg N/ha/yr). It must be ascertained, however, that, even below the threshold values, there is no risk of significant effects being produced which may adversely affect the integrity of the sites concerned.

An appropriate assessment must contain complete, precise and definitive findings and conclusions capable of removing all reasonable scientific doubt as to the effects of the plans or the projects proposed on the protected site concerned.

[21] European Commission, 2018, Commission Notice, Managing Natura 2000 sites - The provisions of article 6 of the Habitats Directive' 92/43/EEC Brussels 21.11.2018, C(2018) 7621 final.
[22] Natural England, 2018, Natural England's approach to advising competent authorities on the assessment of road traffic emissions under the Habitats Regulations.
[23] Highways Agency, 2007, Design Manual for Roads and Bridges, Volume 11 Environmental Assessment, Section 3 Environmental Assessment Techniques, Part 1 HA207/07 Air Quality.

[24] www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit
[25] Natural England, 2018, Natural England's approach to advising competent authorities on the assessment of road traffic emissions under the Habitats Regulations.
[26] C-142/16 Judgement of the Court 26 April 2017, Action under Article 258 TFEU. For failure to fulfil obligations, brought on 9 March 2016, European Commission v Federal Republic of Germany curia.europa.eu/juris/document/document.jsf?text=&docid=190143&pageIndex=0&doclang=en&mode=lst&dir=&occ=first&part=1&cid=11885397.
[27] C-323/17 Judgement of the Court 12 April 2018, Request for a preliminary ruling under Article 247 TFEU from the High Court (Ireland), made by decision on 10 May 2017, received at the Court on 30 May 2017, in the proceedings of People Over Wind and Peter Sweetman v Coillte Teoranta, curia.europa.eu/juris/document/document.jsf?text=&docid=200970&pageIndex=0&doclang=en&mode=req&dir=&occ=first&part=1&cid=619449.
[28] C-293/17 andC-294/17 Judgment of the Court (Second Chamber) of 7 November 2018 in Coöperatie Mobilisation for the Environment UA and Vereniging Leefmilieu v College van gedeputeerde staten van Limburg and College van gedeputeerde staten van Gelderland. Requests for a preliminary ruling from the Raad van State curia.europa.eu/juris/liste.jsf?language=en&num=C-293/17.
[29] Case C-239/04 Commission v Portugal, 2006, ECR I-10183, para. 24; Holohan *et al* vs. An Bord Pleanála (C-461/17), para. 33

# 4. Assessment outline

### 4.1 Introduction

4.1.1 The principal purpose of this document is to set out a procedure for air quality specialists to follow when evaluating the impacts of airborne pollution at designated sites. Whilst an air quality specialist may be able to conclude that there are no likely significant effects using established thresholds, they will not generally be able to assess the effects of the air pollution on the integrity of the designated site. This is the job of an ecologist. This chapter provides an overview of the complete assessment process and, where applicable, the basis for reaching a conclusion that there is no likely significant effect because the air quality impact is too small.

4.1.2 The procedure assumes that the assessment will be collaborative between air quality and ecology specialists since this represents the ideal combination of expertise. Collaboration between the two can be valuable at various stages of the assessment and it is important that the most appropriate specialist undertakes certain tasks. Collaboration can also help to minimise duplication of effort to ensure assessments are undertaken efficiently. The outline stages of an ideal assessment are set out in **Table 4.1**.

4.1.3 It should be noted, however, that ecologists are not engaged on all projects for which an air quality assessment is undertaken. This is a decision for the promoter of the proposed project or plan.

**Table 4.1 Outline of assessment stages**

| Stage | Who | What | Planning/permitting output (all sites) | HRA output (European sites only) | Guidance in this document/ elsewhere |
|---|---|---|---|---|---|
| Scoping | Air quality specialist & ecologist | Initial evaluation of potential receptors, consultation with competent authority/ stakeholders | Study area, relevant receptors, pollutants, | n/a | Chapter 4 and 5 |
| Quantification & Screening | | | | | |
| Simple assessment | Air quality specialist | Calculate / estimate PC and compare with screening thresholds (1%, 1000 AADT) | Identify if insignificant OR if further assessment required (e.g. detailed modelling) | Screening Identification of likely significant effects (project alone & in-combination) | Chapter 5 |
| | Ecologist | | Assessment of significance of effects (inter & intra project) | | |
| Detailed assessment | Air quality specialist | Calculate PC & PEC and compare against critical levels/loads at relevant receptors | Identification of impacts (project alone & cumulative impacts) | Identification of adverse effects on integrity (project alone & in-combination) | |
| | Ecologist | | Assessment of significance of the project alone and cumulative effect (i.e. inter and intra project effects) | | |
| Mitigation & monitoring | Air quality specialist & ecologist | The application of measures to address air quality impacts and associated ecological effects following a mitigation hierarchy, and the use of monitoring | | Apply mitigation hierarchy. Identify imperative reasons of overriding public interest (IROPE) | IAQM position statement sets out the basic hierarchical principles for identifying mitigation measures[30] |

4.1.4 A more complete description of the air quality assessment procedure follows in **Chapter 5**.

### 4.2 Scoping

4.2.1 Both the ecology and the air quality specialists should consult with each other and the relevant decision-makers and/or stakeholders prior to commencing their assessments. The results of those consultations should be shared between the specialists to allow the scope of the assessment to be defined. It may be appropriate at this stage to scope out the requirement for an air quality assessment of effects on habitats, because of the absence of relevant pollutants, and/or the lack of proximity of sensitive sites or species.

4.2.2 A summary of the key elements to be considered during the project initiation and evaluation (i.e. scoping) is given in **Box 4.1**.

### 4.3 Quantification of air quality impacts

4.3.1 **Box 4.2** sets out the key elements of the air quality assessment.

### 4.4 The ecological assessment

4.4.1 In those cases where effects (alone and in-combination) cannot be definitively described as insignificant on the basis of the air quality assessment alone (see **Section 5**), the ecologist will review the information provided by the air quality specialist and consider the likely significance of the effects.

4.4.2 For European the next formal stage is the completion of an HRA. This is largely undertaken by an ecologist.

4.4.3 It is the ecologist's responsibility (where included in the project team) to report the ecological assessment and the conclusions of the assessment. The air quality specialist would normally separately describe their assessment methodology, assumptions, and the impacts on air quality and deposition.

4.4.4 It is important that the ecologist provides the draft ecological assessment report to the air quality specialist to ensure that there has been no misinterpretation of the information.

4.4.5 If the ecologist identifies a significant effect or, for European Sites, adverse effect on the integrity of the site, mitigation and emission control measures need to be explored. These measures may include the need for changes to the project to avoid or reduce the air quality impact and this should be discussed with the air quality specialist, who may need to liaise with other members of the project team, such as the transport consultant or the process engineer designing the installation.

## Box 4.1 Initial evaluation (Scoping)

**Considerations**

Pollutants: Are there any that may cause adverse effects on vegetation or habitats?

Study area: Has the relevant regulator specified any screening distances from air pollution sources?

Has the ecologist identified any other designated sites that might be affected by the change in emissions?

**Actions**

Identify designated sites.

- Scope out any sites with habitats/species not sensitive to air pollution.
- Provide mapping showing the sites to be assessed.

## Box 4.2 Key elements of the air quality assessment (Quantification and Screening)

**Considerations**

Agreement between the air quality and ecology specialists on appropriate critical loads.

Agreement on the locations where estimates of pollutant concentrations and deposition rates are required.

Agreement with the regulator on the 'in-combination' effects that need to be accounted for.

Are the estimated impacts sufficiently small that their effects could be described as insignificant?

**Outputs**

- A list of sites and/or pollutants that have been screened out and require no further assessment;
- A list of sites and/or pollutants that require further assessment to determine whether, or not, there may be a likely significant effect at the relevant site(s);
- The grid references or areas of the modelled impacts;
- The basis for emissions calculations, and whether it takes into account the operational characteristics e.g. batch processes do not operate continuously;
- A list of the emission sources considered in the in-combination assessment and why they were included or excluded.
- Existing concentrations and deposition rates (except in some cases for permitting);
- The change due to the project, or the 'future baseline with project', and 'future baseline without project' concentrations and deposition rates;
- The change in the case of European sites should be quantified for the project without taking into account mitigation.
- A description of the assumptions used in the assessment e.g. hours of operation, assessment year, location of ecological habitats of concern, and future year conditions. The degree of conservatism and whether there are known uncertainties in the input data. A summary of the habitat categories selected, the critical levels and loads applied and existing concentrations and rates of deposition at each site;
- Tabulated results for the project or plan alone and, in-combination with other projects and plans showing for all pollutants the totals and changes in concentrations and deposition rates at the key locations of interest, and contributions as a percentage of the air quality criteria (critical levels and loads);
- If they are likely to be useful in the interpretation (notably, when assessing impacts of point sources) concentration contours (isopleths) overlaid in a clear manner over an Ordnance Survey (or equivalent) base map.

* Mitigation is generally considered to be any additional measure to reduce or remove emissions, or diminish their impacts, above and beyond those that would be expected to be present as part of a proposal or project design. See also **paragraph 3.7**.

[30] iaqm.co.uk/text/position_statements/mitigation_of_development.pdf.

# 5. The assessment of air quality impacts

## 5.1 Introduction

5.1.1 There is a range of existing statutory and non-statutory guidance and supporting tools provided by *inter alia* the Environment Agency (EA), Natural Resources Wales (NRW), Scottish Environmental Protection Agency (SEPA), Highways England, Defra, Natural England and the Air Pollution Information Service (APIS) on how to estimate the impact of a project or plan on ambient concentrations and pollutant deposition. It is not the intention of this chapter to reproduce this guidance, nor to describe how to model concentrations or deposition of air pollutants. This chapter aims to supplement existing guidance with further explanation of the air quality assessment process.

5.1.2 Most of the existing published guidance predates the Wealden Judgement and CJEU rulings described in **Chapter 3**. The exception is guidance for road traffic produced by Natural England in 2018 to address specifically the issues raised in the Wealden judgement[31].

5.1.3 The approaches to air quality assessment differ according to whether the project or plan comprises transport sources, industrial sources[32] or agricultural sources. A single project may include a mixture of these source types and therefore more than one guidance document may applicable.

5.1.4 There are three stages of the air quality assessment which can be summarised as:

i. Scoping;
ii. Quantification; and
iii. Screening.

5.1.5 This chapter describes the air quality assessment process. Where an assessment concludes that there is a significant effect, or for European sites, a significant effect on the integrity of the site, there may also be an need for air quality mitigation measures to be investigated.

## 5.2 In-combination impacts

5.2.1 The Habitats Regulations place a duty on competent authorities to assess the effect of new projects and plans both alone and in-combination with other projects and plans, i.e. the effects of the plan or project being assessed must also be considered together with the effects of other relevant projects and plans. This is because a series of individually modest impacts may, in-combination, produce a significant effect on a habitat/species.

5.2.2 For development requiring Environmental Impact Assessment (EIA) under the EIA Regulations[33], there is a requirement to consider the cumulative effects of the development with other relevant developments. This is known as the inter cumulative impacts.

5.2.3 In EIA, cumulative effects can also apply to the combined effects of different impacts, e.g. an increase in air pollution and an increase in noise pollution. This is known as the intra cumulative impacts.

5.2.4 There is, therefore, an overlap between the meaning of 'in-combination effects' and 'cumulative effects' but they are not the same in all cases. In this IAQM document, the term 'in-combination' impact is used to refer to the cumulative air quality impacts of the project or plan being authorised with other relevant projects and plans that are in the public domain[34].

5.2.5 It should, however, be noted that where the impacts are due to road traffic emissions, the cumulative impact may not be explicitly identified (see **paragraph 5.4.1.19**).

5.2.6 Relevant projects and plans to be considered include those that may have been approved but are, as yet, incomplete (e.g. a committed development), the subject of an outstanding appeal, or ongoing review. The air quality specialist and ecologist should liaise with each other and the regulator to agree the list of relevant projects and plans. This information may also reside with other specialists in the wider assessment team, such as transport or planning. Ultimately, for European sites, a decision on the inclusion of other projects or plans is the responsibility of the competent authority.

5.2.7 It is important that the assessor considers the potential for in-combination impacts of plans and projects resulting from all relevant sources of emissions where there could be an overlap of air quality impacts.

5.2.8 Road transport emissions near to designated sites are often the result of many projects and plans located some distance from the site. It is normal in an air quality assessment to include traffic growth estimates using the Department of Transport's TEMPRO[35] growth factors or from a strategic transport model that explicitly includes traffic from other projects and/or plans.

5.2.9 It is, however, rare for a proposed new or enlarged industrial installation to be located close to other proposed new or enlarged industrial facilities and the risk of the

plumes overlapping and giving rise to a significant effect on a designated site is generally low. Should these circumstances arise, the dispersion modelling can be extended to account for multiple sources, should the emission data be available. There is a higher likelihood that there will be a cluster of overlapping intensive agricultural emission sources close to designated sites and these need to be considered in assessments[36].

5.2.10 Regarding the permitting of industrial sources, the Air Quality Technical Advice Group (AQTAG) states that *"Experience of permitting allows us to be confident that it is unlikely that a substantial number of plans or projects will occur in the same area at the same time, such that their in-combination impact would give rise to concern at the appropriate assessment stage. If such a situation was to arise then the assessment could be determined on a case-specific basis"*[36].

5.2.11 The impacts from different pollutants also need to be considered, such as the impact on deposition of nitrogen derived from $NO_x$ and $NH_3$. For example, the $NH_3$ contribution from agricultural activities may need to be considered together with $NO_x$ and $NH_3$ emissions from road transport.

5.2.12 Where the impact of an isolated project meets the regulator's screening threshold (see later in this chapter) on its own and there will not be an in-combination effect with other projects or plans, the screening criterion can be used for the project alone. Defining an 'isolated source' precisely is not possible, and it is a matter for an experienced air quality specialist to use their professional judgement in consultation with the regulator. If there is any doubt, it should be assumed that there may be an in-combination effect.

5.2.13 Further advice on in-combination assessments is provided in the European Commission's 2018 guidance[37].

### 5.3 Stage 1. Scoping

5.3.1 The first stage in any assessment is to consult with the relevant regulator and stakeholders to ensure that the scope and approach to the assessment meet their requirements. Depending on the type of project, the stakeholders may include the relevant Statutory Nature Conservation Organisation (SNCO) (e.g. Natural England), environmental agencies and other potentially affected public and private bodies and special interest groups. The objective of this stage is to identify the *scope* of the assessment, in terms of the relevant habitats to be included, and to *screen* out any emission sources on the grounds that they are too small or too far away from a habitat to have a meaningful effect.

5.3.2 The locations and boundaries of international and national designated sites can be found online, e.g. on the MAGIC website or similar online resources from the relevant SNCO. If local sites are to be assessed, details can be obtained by consulting the local biodiversity records office who may charge a nominal fee for this service.

5.3.3 For individual planning applications for conventional residential or mixed-use development where European sites are a consideration, the assessor should first investigate whether the air quality issues have already been fully explored for the Local Plan HRA. If this has been done, then it would be appropriate and in line with government guidance[38] to defer to that over-arching Local Plan assessment. This should be a suitable approach for windfall development[39] as well as actual allocations, as Local Plans all make an allowance for a specified quantum of windfall development in particular locations and this should be included in the strategic Local Plan air quality assessment and HRA.

5.3.4 Similarly, if a given local authority believes that Neighbourhood Plans will be coming forward in their authority boundary, they should consider including any sites allocated in those plans in their air quality modelling. This would also avoid problems for the planning application or Neighbourhood Plan that might otherwise result from the Wealden judgment (see **Box 3.1**). Deferring 'upwards' to the Local Plan also addresses the undesirable situation of having multiple traffic and air quality models for a single local authority area and the potential inconsistencies that can be introduced in such circumstances.

5.3.5 For projects requiring assessment, the air quality specialist, assisted by the ecologist, should identify the designated sites likely to be affected by the source of emissions to air that require assessment, taking into account distance criteria in the relevant guidance documents, where these exist, relevant to the scale and type of development being assessed. These criteria are described below.

5.3.6 The Design Manual for Roads and Bridges (DMRB)[40] describes the approach for the assessment of the impact of emissions from schemes on the strategic road network. A quantitative air quality assessment is required if European Sites are within 200 m of affected roads. Within this context, the distance of the affected road from the designated site is an important consideration. Air pollution levels fall sharply within the first few tens of metres from a road before reducing more slowly with distance. The air quality impact of a given change in traffic on a designated site where the relevant habitat/species is 100 m from a road will be very different to one that abuts the road.

5.3.7 For strategic planning, where substantial changes in traffic volumes are being considered, there is the potential for

wider-scale impacts, which can potentially affect the future background concentrations, as well concentrations within 200m of individual roads within the affected network. In these circumstances, the modelling may need to encompass a large road network.

5.3.8 Natural England[41] advises that the next step is to identify the spatial distribution of qualifying features within a designated site. If there are no qualifying features sensitive to air pollution within 200 m of a road, then no further assessment is required. For example, a chalk river will not typically be sensitive to acid deposition because of its natural buffering capacity. In these circumstances, a screening conclusion of no likely significant effect on the site can be reached with regard to air quality without undertaking any modelling.

5.3.9 In some cases, a road surface and its adjacent verges may be included within its boundary. This does not necessarily mean that they will be of nature conservation interest and form part of a qualifying feature. This inclusion might simply be for convenience, e.g. for defining a boundary. These areas will, therefore, be of no special nature conservation interest. Conversely, at some sites, roadside verges may have been deliberately included within a site boundary and be an integral part of a designated site. It is important that the air quality specialist works with the project ecologist to make these decisions.

5.3.10 If a project/plan has not been screened out using the criteria outlined above, the next step is to consider the risk of the road traffic emissions using either the annual average daily traffic flow (AADT) or the predicted air quality impacts.

5.3.11 The DMRB provides a series of traffic screening criteria. These include the change in AADT flows on a given road of 1000 vehicles or 200 heavy duty vehicles (HDVs). These thresholds have been widely used to screen out the need for quantitative assessment of projects/plans in the absence of any other thresholds recognised as being applicable in this context.

5.3.12 The 2017 Wealden judgment[42] (see **Box 3.1**) has clarified that, if the DMRB screening criteria are used, they should be used to screen in-combination impacts as well as the project/plan alone.

5.3.13 The Defra/Environment Agency's *Air emissions risk assessment for your environmental permit* (which applies to industrial emission sources) currently identifies distances of 2 km for local and nationally important sites and areas of ancient woodland, and 5, 10 or 15 km depending on the emission source for European Sites. Smaller industrial facilities or waste sites may not require such a large study area. Different distances apply for agricultural emissions. The air quality specialist should check first with the relevant regulator/SNCO what distances apply as they can vary. Different regulators throughout the United Kingdom have different criteria in some cases, most notably for livestock and ammonia emissions.

5.3.14 The locations and boundaries of international and national designated sites can be found online, e.g. on the MAGIC website or similar online resources from the relevant SNCO. If local sites are to be assessed, details can be obtained by consulting the Environment Agency or local biodiversity records office who may charge a nominal fee for this service. Sufficient time should be allowed to obtain this data.

5.3.15 It is important that the air quality specialist and the ecologist discuss the types of habitat located within the distance criteria. It may be that a site is screened-in, but the relevant habitat feature/species is not present in the study area (e.g. based on APIS or site survey data) nor needs to be present for the site to achieve its conservation objectives. In this circumstance, a conclusion of no likely significant effect on the site can be reached with regard to air quality without undertaking any modelling.

## 5.4 Stage 2. Quantification

### 5.4.1 Approach and methods

5.4.1.1 Once all the required information on the project/plan and the projects/plans for the in-combination assessment, has been gathered, concentrations and deposition rates will be calculated.

5.4.1.2 The change in pollutant concentrations due to an industrial or agricultural source is often determined simply by modelling the dispersion of the emissions. This is known as the process contribution (PC)[43]. The in-combination[44] impacts would then be assessed by adding the PCs from the other relevant projects and plans.

5.4.1.3 The PCs may be calculated by a variety of methods, depending on the circumstances and scale of the project. For a simple approach, for instance, at a screening stage, a spreadsheet tool such as the Environment Agency's risk assessment tool[45] or the Simple Calculation of Atmospheric Impact Limits (SCAIL)[46] may be used. However, these models have limitations. In reality, detailed dispersion modelling is used in most cases.

5.4.1.4 To determine the concentrations/deposition rates, the PC is added to the baseline concentrations/ deposition rates. These may be taken from measurement data or other appropriate sources such as Defra or APIS background maps. The concentration/deposition rate is known as the predicted environmental concentration (PEC).


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5.4.1.5 Case law (see the Moorburg case in **Chapter 4**) suggests that it may no longer be sufficient to rely solely on the background data provided by Defra and APIS in all assessments, as these provide 'average' data and are typically based on emissions data for a time period which does not encompass newly operating facilities. Some assessments may need to include the impact of existing sources explicitly or those that have recently started operating. For this reason, the term 'baseline' is used instead of 'background' in this document.

5.4.1.6 It may also be worthwhile investigating whether operators of existing facilities or local authorities are required, or intend, to make improvements that will change air emissions and consequently future baseline concentrations.

5.4.1.7 Measurements of pollutant concentrations are made by local authorities and Defra and are available online or on request. The choice of data source will often depend on the location of the study area, i.e. whether urban or rural, which dictates the amount of monitoring data available. Site-specific monitoring (e.g. using diffusion tubes) is sometimes undertaken to determine baseline concentrations, to obtain the most up to date information or where appropriate baseline data are not available.

5.4.1.8 The APIS website holds a database of three-year average pollutant concentrations and deposition rates. These are available for five by five kilometre grid squares covering the whole of the UK. CEH also maintains another database of results from its Concentration Based Estimated (CBED) model[47]. This provides deposition rates for nitrogen and sulphur for three year averages at 5 $km^2$ resolution for two surface types (forest and moorland).

5.4.1.9 As noted earlier, care should be taken to ensure all relevant emission sources are included in the baseline concentration selected for each receptor location. For example, it is important that, where a sensitive receptor is close to a busy road, the contribution from traffic emissions on that road is explicitly included in the estimation of the PEC.

5.4.1.10 For projects/plans that generate road traffic, the dispersion modelling will estimate the PEC "without the project/plan" (i.e. the future baseline) and PEC concentrations "with the project/plan". The PC is derived by subtracting one from the other. This future baseline typically takes account of the traffic from other project/plans. To calculate the in-combination PC another scenario will need to be modelled. This may use the baseline traffic data with future emission factors to provide an alternative future baseline PEC. By subtracting this from with the project/plan PEC describe in the last paragraph will provide the in-combination impact. This approach enables the future decline in road traffic $NO_x$ emissions per vehicle km to be taken into account.

5.4.1.11 The road traffic PC could be calculated using the publicly available version of the 2007 DMRB spreadsheet model; this, however, dates back over a decade and uses out of date emission factors and fleet composition. The IAQM

recommends that the latest version of the Emission Factor Toolkit (EFT) and dispersion modelling is used.

5.4.1.12 When modelling the dispersion of emissions, it is good practice to assess several points within each designated site, both along the site boundary and within the site itself (for point emission sources, this may be a grid of receptors, or for a road, a transect) to identify the maximum impact (i.e. the PC) at the site, as well as the range that may be experienced across the entire area[48].

5.4.1.13 Concentrations should not, however, be predicted too close to the roadway, since such predictions can be unreliable and may not represent areas of relevance to the assessment. It is recommended, for example, that predictions are not made closer than 2 m from the edge of a road.

5.4.1.14 The maximum PC within, or on, the boundary of the designated site should be used to provide a robust assessment (where that coincides with the presence of a habitat or species of concern).

5.4.1.15 Consideration should also be given to the distribution of habitat features of interest within the site. A single receptor point may be adequate if the site area is small and is situated a relatively large distance from the source, as there is less potential for variation in concentrations and deposition rates across the site. The air quality specialist should consult the appropriate guidance for determining the approach to selecting receptor points and grids[49].

5.4.1.16 The surface roughness in the wider area will affect the modelled ground level concentration of pollutant. A suitable value (or values) should be used, in line with model guidance.

5.4.1.17 Multiple years of representative meteorological data (typically three to five consecutive years, depending on the type of assessment) should be used in the dispersion modelling of point sources; for road schemes, one year is normally sufficient (according to LAQM TG16).

5.4.1.18 For road transport sources, individual receptors along a transect, or along a series of transects at suitable intervals, perpendicular to the road up to 200 m are generally used[50]. As $NO_x$ emissions from road traffic and other sources are forecast to decrease in the future, it is appropriate to estimate future air quality (see below). For a project, this usually is the year when it will be first operational. For large projects, several future years may be used, with and without the project, to provide information on the impacts during phases of development. For land use plans, the end year of the plan period is normally used as this is when the development set out in the plan may have been fully built out. This may, however, miss the potential for significant effects as there is a balance between traffic growth and declining emissions per kilometre from vehicles. Modelling one or more intermediate years should be considered.

5.4.1.19 Transport consultants often do not provide separate data to enable the impact of the other projects or plans to be explicitly estimated; however, a decision maker may require this to be assessed so they can review the impact of the project/plan alone and in-combination with other projects/plans. It is therefore important for the air quality specialist to consult with the decision maker and transport consultant at the earliest opportunity. (Also see **paragraph 5.4.1.10**).

5.4.1.20 The changes in deposition rates (i.e. PC) resulting from the project or plan for the pollutants of interest are typically derived from the product of the atmospheric concentration and the deposition velocity[51] (taking into account the units). The best available estimate of the deposition velocity available should be used for this calculation. The deposition velocity depends on the vegetation type (this can be general, for example, forest

**Table 5.1 Deposition velocities (after AQTAG)**

| Pollutant | Habitat | Deposition velocity (m/s) |
|---|---|---|
| $NO_2$ | Grassland | 0.0015 |
| | Forest | 0.003 |
| $SO_2$ | Grassland | 0.012 |
| | Forest | 0.024 |
| $NH_3$ | Grassland | 0.020 |
| | Forest | 0.030 |
| HCl | Grassland | 0.025 |
| | Forest | 0.060 |

or heathland) at the location of interest. This information on vegetation type can be informed by the ecologist.

5.4.1.21 The most commonly used values are shown in **Table 5.1**, taken from AQTAG guidance[52]. It should be noted that the current DMRB guidance only provides a deposition velocity for $NO_2$ only and that it is different from the AQTAG $NO_2$ deposition velocity. IAQM recommends that the AQTAG value is used in preference to the DMRB value. It should also be noted that the deposition velocity for NO is extremely small and assuming that all $NO_x$ is in the form of $NO_2$ is therefore highly conservative. An air quality specialist may choose to derive their own deposition velocities based on a review of published data. The source of the deposition velocity and justification for its use should be provided.

5.4.1.22 The Environment Agency's *"Guidance on modelling the concentration and deposition of ammonia emitted from intensive farming"*, where relevant, should be referred to when calculating deposition of ammonia from intensive farming[53].

### 5.4.2 Future concentrations and deposition rates

5.4.2.1 Natural England guidance[54] signposts the APIS website which provides information on deposition trends drawn from the results of national modelling over a number of years. APIS is updated annually, though background trends are a 3-year average to account for weather variation. The trend data for these 3-year averages are provided for maximum and minimum deposition (nutrient nitrogen and acid).

5.4.2.2 The APIS website also provides background concentrations data, but the higher spatial resolution background data available from Defra for certain pollutants should be used when possible. Note that it may be necessary to forecast future concentrations taking into account sources of emissions not directly relevant to the project/plan under consideration, such as road traffic for industrial projects

5.4.2.3 The air quality specialist may choose to assume no change in future baseline concentrations or deposition rates, where there is no evidence to indicate that they may decrease in value. This may be appropriate if, for example, the project/plan under consideration is likely to be completed within a relatively short period of time (one or two years in the future). If there is a long lead-in period (due to construction and/or commissioning periods), it may be more appropriate to reduce future baseline concentrations/deposition rates to allow for anticipated improvements in national emissions. (There is an IAQM Position Statement on the uncertainties in the estimation of future road traffic emissions).

5.4.2.4 The judgement in the Netherlands cases concludes that 'autonomous measures' (see **Box 3.2**) can only be taken into account if it is sufficiently certain that the measure will deliver as anticipated. There is clear evidence that UK $NO_x$ emissions, including those from road traffic, are declining and will continue to do so in the future. $NO_2$ concentrations are also declining.

5.4.2.5 What is not certain is the exact rate of reduction of $NO_x$ emissions and therefore it is important that a conservative estimate is used for the modelling. There are reasons to believe that Defra's current Emission Factor Toolkit (version 9.0) may overestimate emissions over the longer term. This is because the assumptions in the fleet turnover model that is used in EFT do not reflect recent developments in either national policy nor in purchasing trends relating to diesel and non-conventional cars[55, 56].

5.4.2.6 The Netherlands case also clarifies that a mechanism must be in place to ensure that the expected reductions take place. In the UK, the Government has published a Clean Air Strategy, which sets out the mechanisms by which the target of a 73% reduction in $NO_x$ emissions will take place by 2030 (relative to a 2005 baseline). This will ensure compliance with the National Ceilings Emission Directive. The strategy also includes a target for the reduction of deposition of reactive forms of nitrogen in England's protected priority sensitive habitats.

5.4.2.7 There is more uncertainty regarding ammonia emissions, but the government is legally committed, under the 2016 National Emissions Ceiling Directive to reduce these emissions, along with $SO_2$ and $NO_x$ emissions. The UK has a good track record on meeting its international emission reduction obligations. Any assumption should be clearly explained, with justification given.

5.4.2.8 It should be recognised that there is a non-linear relationship between emissions, concentrations and deposition and these relationships may change in the future because of changes in atmospheric chemistry.

5.4.2.9 The 2007 DMRB guidance for ecological assessment suggests reducing the background deposition rates by 2% each year. This approach is now considered to be inappropriate as it is not supported by monitoring data.

5.4.2.10 Whichever approach is adopted, it is advisable to gain agreement in advance from the competent authority and explain to the ecologist the basis of assessment, so they can use the information in their judgement of significance, particularly where precautionary assumptions have been applied.

## 5.5 Stage 3. Screening

### 5.5.1 Introduction

5.5.1.1 A database of site-specific critical loads for nitrogen and acid deposition rates is available on the APIS website[57].

Unless the lowest value for a high-level screening assessment is adopted, the selection of critical loads requires knowledge of the habitat type, site interest features, and specialist knowledge, such as whether the environment is nitrogen or phosphorous limited, or whether grassland is acidic or calcareous. It also requires knowledge as to the relative reliability of the critical load in question as some are supported by firmer evidence than others. This is identified on the APIS website.

5.5.1.2 In many circumstances, the air quality specialist will suggest the assessment criteria, although this may be modified by an ecologist in the light of knowledge of the habitat in question. It should be noted that ecologists are not appointed for the assessment of all developments and the air quality specialist may need to use professional judgment.

5.5.1.3 APIS does not cover all habitat types. In these cases, for an assessment to be undertaken advice from a suitably qualified ecologist is required.

5.5.1.4 For each site, and for each habitat within each site, the air quality specialist should calculate the PC as a percentage of the relevant critical level/load both alone and in-combination with other plans and projects.

5.5.1.5 The calculated maximum PC as a percentage of the relevant critical load/level is used to determine whether the impacts will have an insignificant effect or, conversely, may be large enough to warrant further evaluation by an ecologist.

5.5.1.6 In the case of Environment Agency permitting, an increment of 1% (or less)[58] of the relevant long term critical level or critical load alone is considered inconsequential. A change of such magnitude, i.e. two orders below the criterion for harm to occur, is challenging to measure (even by the most precise air quality instrument)[59] and difficult to distinguish from natural fluctuations in measured data (due to other variables such as variations in emissions and weather). For this reason, and others, it has been used as a precautionary screening criterion.

5.5.1.7 The 1% threshold has become widely used throughout the air quality assessment profession to define a reasonable quantum of long term pollution which is not likely to be discernible from fluctuations in background/measurements[60]. For example, for many habitats, 1% of the critical load for nitrogen deposition equates to a very small change of less than 0.1 kgN/ha/yr, well within the expected normal variation in deposition. Its use has not been challenged by the courts, but it should be used in the context of an in-combination assessment.

5.5.1.8 Crucially, the 1% screening criterion is not a threshold of harm and exceeding this threshold does not, of itself, imply damage to a habitat.

5.5.1.9 For all types of project/plan, if the air quality specialist identifies that the impact is sufficiently large (alone and/or in-combination) that it cannot be screened out and therefore it could have a potential significant effect, the information should be passed to the ecologist to use their expertise to determine whether or not there is, in fact, a likely significant effect of the project or plan on the habitat, and, if so, whether for European Sites it is possible to ascertain that there will be no adverse effect on the integrity of the site and for other types of designated sites, no likelihood of damage.

5.5.1.10 If the ecologist concludes, however, that an adverse effect on site integrity cannot be ruled out, the air quality specialist may be required to undertake an assessment of the impact of mitigation measures including providing advice on emission control measures that could be employed to prevent avoid, minimise or reduce impacts. The air quality specialist should provide evidence on the efficacy of any recommended mitigation measures.

### 5.5.2 Industrial point sources

5.5.2.1 The Environment Agency's risk assessment guidance[61] includes a series of criteria to define when impacts can, in their view, be screened out for an individual installation for the purposes of permitting. It should be noted these criteria are intended to be applied to simple and cautious calculation methods (e.g. the risk assessment tool). They are, however, commonly applied to all assessments, both those that have used a dispersion model to estimate the PC and point sources not regulated by the Environment Agency or equivalent organisation. For Ramsar, European and national designated sites, the guidance advises that to screen out the need for further assessment, a PC for any substance emitted from an industrial source[62] must meet both of the following criteria:

- the short-term PC is less than 10% of the short-term environmental standard[63]; and
- the long-term PC is less than 1% of the long-term environmental standard.

5.5.2.2 For local wildlife sites and ancient woodlands, the Environment Agency uses less stringent criteria in its permitting decisions. Environment Agency policy for its permitting process is that if either the short-term or long-term PC is less than 100% of the critical level or load, they do not require further assessment to support a permit application.

In ecological impact assessments of projects and plans, it is, however, normal practice to treat such sites in the same manner as SSSIs and European Sites, although the determination of the significance of an effect may be different. It is difficult to understand how the Environment Agency's approach can provide adequate protection.

5.5.2.3 In March 2015, AQTAG clarified to the Planning Inspectorate that *'For installations other than intensive pig and poultry farms, AQTAG is confident that a process contribution (PC, as predicted by H1 or a detailed dispersion model) < 1% of the relevant critical level or load (CL) can be considered inconsequential and does not need to be included in an in-combination assessment'*[64].

5.5.2.4 AQTAG has also drawn a clear distinction between *'projects and plans considered to be inconsequential and never likely to have an in-combination effect (and so not included in any assessment of likely significant effect in-combination with a new plan or project)'* and those concluded to have *'no likely significant effect'* (insignificant alone but which may need to be considered in the assessment of any other new plans or projects)[64].

5.5.2.5 These recommendations made by AQTAG were made prior to the most recent court rulings. This advice may change in the future and alter the circumstances in which the screening criteria can be used with confidence. This is why it is important to consult with the relevant regulator.

5.5.2.6 In the IAQM's opinion, the 1% and 10% screening criteria should not be used rigidly and, not to a numerical precision greater than the expression of the criteria themselves. Whilst it is straightforward to generate model results for the PC to any level of precision required, the accuracy of the result is much less certain and it is unwise to place too much emphasis on whether the PC is 0.9% or 1.1%, for example. In practice, because the magnitude of impacts attributable to new sources is often around 1% of the criterion, a regulator may require the results to be presented at greater resolution, i.e. having one


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(or more) decimal places. The distinction here is between the presentation of the model results and the weight given to fine differences around the criterion itself in making a judgement.

5.5.2.7 It is important to remember that a change of more than 1% does not necessarily indicate that a significant effect (or adverse effect on integrity) will occur; it simply means that the change in concentration or deposition rate cannot in itself be described as numerically inconsequential or imperceptible and therefore requires further consideration.

### 5.5.3 Predicted Environmental Concentration (PEC)

5.5.3.1 The PEC (which applies to both annual mean concentrations and deposition rates) should be calculated with the project or plan alone and in-combination with other projects and plans to identify whether the critical levels or critical loads will be exceeded. This information should be passed on to the ecologist if the PC exceeds 1% of the critical level/load either alone or in-combination.

5.5.3.2 The Environment Agency risk assessment guidance states that if the PEC is less than 70% of the long-term criterion it can be deemed to be insignificant, regardless of the PC. For some pollutants (nitrogen deposition, in particular) background values are high over much of the UK and it is unlikely there will be many occasions where the PEC is less than 70%. Also, this was intended to be a trigger for detailed dispersion modelling. It is not intended to be a damage threshold.

### 5.5.4 Traffic impacts

5.5.4.1 In the DMRB methodology[65] for the air quality assessment of ecological effects for Highways England schemes, concentrations of $NO_x$ are used as the main basis for evaluating the potential for significant effects. Where the assessment indicates that changes in annual mean $NO_x$ concentrations within a designated site cannot be dismissed as imperceptible (i.e. an increase of over 0.4 $\mu g/m^3$) and the $NO_x$ critical level is exceeded, then changes in nutrient nitrogen deposition should be calculated as supporting information to further assist in the evaluation of significance. This is because $NO_x$ is an important source of nitrogen deposition. The interim methodology does not consider the emissions of $NH_3$ from road vehicles.

5.5.4.2 If the only emission of concern is $NO_x$, and the change in concentration is less than 1% of the critical level detailed assessment in terms of nutrient and acid deposition may not be necessary. This is because, for the majority of habitats, the impact in terms of deposition would also be less than 1% of the relevant critical load. Natural England, however, encourages the assessment of nitrogen deposition as well as $NO_x$ because the baseline nitrogen deposition is more likely to exceed the critical load than the baseline $NO_x$ is likely to exceed the critical level.

5.5.4.3 Where internationally important sites are involved this should be discussed with the project ecologist (or the HRA co-ordinator) to ensure that the potential for 'in-combination' effects is treated appropriately.

5.5.4.4 If a formal assessment of 'in-combination' impacts is required, it must take place before applying the 1% criterion. Within this context, it may be possible to screen for effects of nitrogen deposition without specifically calculating the nitrogen deposition rate and identifying relevant critical loads and baseline concentrations at all sensitive sites. This assumes a linear relationship between concentration and deposition of $NO_x$ (through the application of simple conversion factors to calculate deposition from concentration – there may be cases when a more complex relationship is applied) means that where the change in $NO_x$ concentrations is less than 0.4 $\mu g/m^3$, it is unlikely that it would exceed 1% of the most stringent critical loads for nitrogen and acid deposition for a sensitive habitat. This, however, may not be true for all habitats[66], and depends on the deposition velocity used.

[31] Natural England, 2018, Natural England's approach to advising competent authorities on the assessment of road traffic emissions under the Habitats Regulations.
[32] Including residential and commercial large boilers, combined heat and power plant, and data centres which may not be typically be considered to be industrial sources of emissions.
[33] The Town and Country Planning (Environmental Impact Assessment) Regulations 2017.
[34] Sufficient data to quantify the impacts is only likely to be available for projects where planning permission (or other regulatory consent) has been applied for or granted but not yet implemented. For proposed plans data is only likely to be available in the public domain for those that are published for consultation.
[35] Trip End Model Presentation Program (TEMPRO) www.gov.uk/government/publications/tempro-downloads
[36] Air Quality Technical Advisory Group, AQTAG21, 'Likely significant effect' – use of 1% and 4% long-term thresholds and 10% short -term threshold, Updated version approved 2 October 2015.
[37] Natural England, 2018, Natural England's approach to advising competent authorities on the assessment of road traffic emissions under the Habitats Regulations.

[38] July 2012 Defra issued guidance on 'Competent Authority Co-Ordination under the Habitats Regulations', which recommends that '*Competent authorities should adopt the reasoning, conclusion or assessment of another competent authority, if they can*' and goes on to state that where another competent authority is a specialist in the issues under consideration, robustness of the previous HRA *'can be assumed ... if the reasoning, conclusion or assessment was undertaken or made by a competent authority with the necessary technical expertise'*. www.gov.uk/government/publications/guidance-on-competent-authority-coordination-under-the-habitats-regulations
[39] Development that does not have a specific allocation, usually because local authorities do not allocate development sites below a certain size.
[40] Design Manual for Roads and Bridges, Volume 11, Section 3 Part 1 (HA207/07) and subsequent Interim Advice Notes. The DMRB methodology must be used for Highways England road schemes but is often also applied for schemes in Wales, Scotland and Northern Ireland.
[41] Natural England, 2018, Natural England's approach to advising competent authorities on the assessment of road traffic emissions under the Habitats Regulations.
[42] Wealden District Council vs Secretary of State for Communities and Local Government. Lewes District Council and South Downs National Park Authority and Natural England. [2017] EWHC 351 (Admin) (See Box 3.1).
[43] HRA requires the in-combination effects to be assessed; Environmental Impact Assessment requires the cumulative impacts to be assessed. For assessing air quality impacts these terms may be different.
[44] Process contribution (PC) is a term used in the Environment Agency to define the contribution to ambient concentrations and deposition rates due to the emissions from the process being permitted. In this guidance the term is also applied to the contribution from any source such including road traffic, and commercial boilers.
[45] Formerly called the H1 screening tool, available at www.gov.uk/government/collections/risk-assessments-for-specific-activities-environmental-permits#H1-software-tool.
[46] A suite of screening tools for assessing the impact from agricultural and combustion sources on semi-natural areas. Produced by CEH, available at www.scail.ceh.ac.uk.
[47] www.pollutantdeposition.ceh.ac.uk/data.
[48] For some sources, notably tall point sources, it is not always the case that the highest modelled concentrations will occur on the site boundary closest to source.
[49] admlc.files.wordpress.com/2015/08/dispersion-model-guidelines-v1-5.pdf
[50] A distance of 200 metres is generally used as concentrations from the road source decrease rapidly with distance from the source and beyond this distance the road source contribution is not typically discernible from fluctuations in the background concentration. See DMRB Volume 11.3.1, Appendix C, Figure C.1. The receptor locations along the transect should be chosen so as to capture the salient features of the changes in concentration or deposition rate.
[51] This quantity is correctly described as the 'deposition flux', a term used by the Environment Agency, for example. In this document, the term deposition rate is used instead, on the grounds that we are using deposition flux as a proxy for the quantity of pollutant deposited on the habitat over a defined period of time.
[52] Air Quality Advisory Group, 2014, AQTAG06 Technical guidance on detailed modelling approach for an appropriate assessment for emissions to air.
[53] Defra/Environment Agency, 2018, Intensive farming risk assessment for your environmental permit, www.gov.uk/guidance/intensive-farming-risk-assessment-for-your-environmental-permit
[54] Natural England, 2018, Natural England's approach to advising competent authorities on the assessment of road traffic emissions under the Habitats Regulations.
[55] The proportion of new cars that are diesel has fallen from a peak of just over 51% in 2012 to 30% in the third quarter of 2018. Electric and plug in hybrids accounted for 2.5% in the same quarter. EFT v8.021 assumes that there will be zero miles driven on rural roads in 2030 by electric vehicles. www.gov.uk/government/statistical-data-sets/veh02-licensed-cars, Table 253.
[56] Development of the CURED V3A Emissions Model, Air Quality Consultants.
[57] www.apis.ac.uk/indicative-critical-load-values.
[58] For intensive farming the Environment Agency environmental permitting guidance use 4%.
[59] The Ambient Air Quality Directive (2008/50/EC) sets data quality standards for monitoring; e.g. for NOx (including NO2) automatic monitors the uncertainty requirement is 15%; indicative methods (such as diffusion tubes) is 30%. It should be noted that deposition is not routinely monitored, but calculated from ambient concentrations.
[60] Some readers will be aware that the EPUK/IAQM planning guidance defines a method for describing the severity of impacts. Within this framework, an impact that is 0.5% of an assessment level is defined as negligible and can be regarded as not having a significant effect on air quality. There is no contradiction between this part of the impact descriptor framework in the planning guidance and the choice of 1% as a screening criterion for habitats. The two values serve a different purpose and have different origins.
[61] www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit.
[62] There are different screening criteria for agricultural sources.
[63] The short-term thresholds are only applied to the critical level rather than the critical load (since there are no short-term exposure critical loads) and is only relevant to point source emissions rather than vehicle exhaust emissions.
[64] AQTAG position regarding In-combination guidance and assessment. Correspondence between AQTAG and PINS. March 2015.
[65] Highways Agency, 2013, Interim Advice note 174/13, Updated advice for evaluating significant local air quality effects for users of DMRB Volume 11, Section 3, Part 1 'Air Quality (HA207/07). Note that IAQM considers that there is a typo in this note and that $NO_x$ concentrations and critical levels should be used (i.e. not NO2 concentrations and critical levels)

[66] There may be an exception to this for the most sensitive habitats, but in most cases the lowest critical load encountered for a grassland type habitat is 5 kgN/ha/yr and for forests is 10 kgN/ha/yr. An exception may be floating water plantain with a critical load of 3 kgN/ha/yr although this is a water based species and thus other moderating factors will apply.

# 6. Local plans

6.1 It has been increasingly common practice for air quality assessments to be undertaken to support the development of Local Plans for local planning authorities where sensitive internationally important wildlife sites may be affected. This is to enable an HRA to be completed for that Local Plan. Due to the nature of Local Plans, this means that all growth expected across a given district over a long period is assessed collectively.

6.2 The DMRB AADT thresholds were useful to decide whether the air quality assessment for a given Local Plan needed to consider a particular European site. Since the Wealden judgement, the 1000 AADT threshold cannot be applied, at least not rigidly, to growth arising from a single district.

6.3 One of the issues with an assessment of a local plan is how far the air quality assessment needs to 'cast its net'.

6.4 The scale of physical separation between a Local Plan area and European site will clearly be an important factor in making the decision, given that there is a limit to the accuracy of transport modelling at considerable distances (i.e. tens of kilometres) from source, as well as the fact that very small changes in air quality (such as are likely to occur at these distances) are unlikely to be detectable in air quality calculations, or in monitoring data. Distance alone, however, does not automatically mean that the contribution of growth in a given Local Plan area will be imperceptible. This will also be a function of the nature and scale of the development, the presence of strategic routes roads linking the development to the European site and consideration of journey-to-work and trip distribution data.

6.5 It is no longer appropriate for individual local authorities to rely purely on a change in flows of less than 1000 AADT as a reason to dismiss traffic-related air quality impacts in-combination with other local plans, unless there is reason to believe that flows on the road in question would be likely to be dominated by journeys arising from that district (for example, a minor road).

6.6 Since the judge in the Wealden case did not dismiss the use of the 1000 AADT threshold entirely, but only as a threshold to automatically rule out *individual* Local Plans' there will be a greater need for local authorities to consider modelling their Local Plan air quality impacts collectively, as a group of authorities around a particular European site, rather than creating separate individual models. This already happens in some parts of the UK, such as within the Partnership for Urban South Hampshire and among Councils to the north and west of Epping Forest SAC.

6.7 The 'alone' assessment should be a comparison of a scenario which includes the background traffic growth (sometimes referred to as a 'do nothing scenario) but not the Local Plan, with a 'with Plan' scenario which adds on the Local Plan traffic.

6.8 Importantly, the air quality calculations should also make reasonable assumptions about expected changes in the baseline $NO_2$ concentrations over the plan period; given the 15 to 20 year or so timescale of most Local Plans. To assume no improvement over a 15 or 20 year period, would effectively ignore the more stringent legal requirements for vehicle $NO_x$ emission standards to be achieved under real world driving conditions, trends in new vehicle registrations and ongoing government and international initiatives to improve air quality through reductions in emissions. Making a suitable allowance for improvements in baseline air quality (given the long timescale of most Local Plans) will mean that overall air quality at the end of the plan period is very likely to be better than air quality at the start, even allowing for the effects of Local Plan growth on traffic flows. It should be noted that there is no presumption that this improvement can be exploited for allowing unnacceptable air quality impacts, with consequent effects on designated sites.

6.9 For ammonia emissions, it is more difficult to be certain regarding future trends, and it seems reasonable to either assume no change or to assume that emissions will change in line with the requirements of the 2016 National Emissions Ceiling Directive.

6.10 The application of national forecasts to local conditions may need to be justified to ensure the assessment is robust and not subject to challenge.

6.11 Assessing the results of both the 'alone' and 'in-combination' assessments, it is possible to identify the relative contribution of the Local Plan being assessed. This is necessary if the ecologist concludes that there is an adverse effect on the integrity of the designated site to enable the appropriate scale of mitigation measures that may be needed (such as transport management plans, rerouting of heavy duty vehicles,). If, for example, the Local Plan makes little or no difference to the nitrogen deposition when reported to the limits of reliability then little or no action would be specifically required to address the contribution of that Local Plan.

6.12 Additionally, if the ecologist concludes that there is no likely adverse effect on the integrity of the designated site no mitigation would be required. Given the likelihood

that many Local Plan air quality assessments will identify an overall net improvement in air quality over the plan period, the contribution of the individual Local Plan(s) will often be in the form of potential retardation in improvement (i.e. a delay), rather than a deterioration. That is an important distinction in making judgments on adverse effects, although it may still be appropriate (depending on the scale of that delay) to introduce measures to address the plan contribution.

6.13 The preceding discussion is concerned with Local Plans, but the same principle would apply to the traffic impacts of Minerals & Waste Plans where those plans are expected to result in any net increase in vehicle movements within 200 m of sensitive designated sites. Minerals allocations may not result in a net change in vehicle movements due to the nature of minerals sites being worked sequentially (in other words, the 'growth' is in duration of operation rather than scale of activity); similarly, traffic associated with minerals and waste sites may be restricted to certain roads that would not lead them past designated sites. These factors will, therefore, be an important consideration in determining the need for traffic modelling or air quality calculations.

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# 7. General principles

7.1 There are a number of principles that should be applied when undertaking assessments of the air quality impacts on designated sites, which are set out below.

1. Suitably qualified, experienced and competent assessors should be responsible for the assessment.
2. A precautionary approach is required.
3. The assessment should be appropriate to the risk.
4. The assessment should be undertaken with an ecologist.
5. Always consult with the regulator.

### 7.2 Suitably qualified, experienced and competent assessors should be responsible for the assessment

7.2.1 All assessments require the use of professional judgement, as it is not possible to provide detailed guidance that covers the individual circumstances of all projects and plans that require assessment. Therefore, all assessments should be undertaken by suitably qualified and competent assessors or under the close supervision of such a person. It is considered useful for the air quality assessment report to include a short biography of each person involved in its production together with their role in the project.

### 7.3 A precautionary approach is required

7.3.1 Where there is uncertainty in an evaluation of the impact of a project or plan, a precautionary approach is required. This requirement is set out in Article 191 of the Treaty on the Functioning of the European Union. It aims to ensure a higher level of environmental protection than would be the case if this approach was not used. Similar provisions are to be set out in the Environment Bill, and therefore the intention is that the same approach will apply when the UK leaves the EU.

7.3.2 The European Commission guidance[67] on the precautionary principle states its application shall be informed by:

- *"the fullest possible scientific evaluation of the determination, as far as possible, of the degree of scientific uncertainty;*
- *a risk evaluation and an evaluation of the potential consequences of inaction;*
- *the participation of all interested parties in the study of precautionary measures, once the results of the scientific evaluation and/or the risk evaluation are available."*

7.3.3 In addition, the general principles of risk management remain applicable when the precautionary principle is invoked. These are the following five principles:

- *"proportionality between the measures taken and the chosen level of protection;*
- *non-discrimination in the application of the measures;*
- *consistency of the measures with similar measures already taken in similar situations or using similar approaches;*
- *examination of the benefits and costs of action or lack of action;*
- *review of the measures in the light of scientific developments."*

7.3.4 This would suggest that a degree of pragmatism should be used because absolute scientific certainty is rare. That is the nature of scientific endeavour. It often takes decades for scientific doubt to be satisfied. (Climate change is such an example).

### 7.4 The assessment should be appropriate to the risk

7.4.1 The European Commission guidance also suggests that the assessment should be proportional to the risk.

7.4.2 This means that the assessment must provide sufficient detail to enable a robust conclusion to be drawn regarding the air quality impacts. The level of detail required will depend on the specific circumstances of the project.

### 7.5 The assessment should be undertaken with an ecologist

7.5.1 The assessment of the impact of air pollution on designated wildlife sites is best undertaken in collaboration with a suitably qualified and experienced ecologist. An air quality specialist should not be making judgements on whether there is a likely significant effect or an adverse effect on the integrity of a site.

### 7.6 Always consult with the regulator

7.6.1 It is important that the assessment team consults with the regulator to agree the scope of the assessment. This includes agreeing the other projects that need to be considered in the cumulative or in-combination impact assessment. The regulator is the decision maker and failure

to consult can result in an assessment being rejected at a late stage in the process. This consultation should be undertaken early in the project to avoid unnecessary work.

### 7.7 Future Clarity

7.7.1 As alluded to above, there has been much litigation on the interpretation of the Habitats Directive and this is likely to continue. Whether or not the UK will voluntarily be bound by its rulings is a matter of conjecture at the current time. There are also increasing legal challenges on environmental decisions in the UK courts and therefore it is likely that litigation on this issue will continue and further clarity will be produced on the principles of assessment.

PublicDomainPictures | Pixabay

[67] The Precautionary Principle eur-lex.europa.eu/legal-content/EN/TXT/?uri=LEGISSUM%3Al32042

# Appendix A: Glossary & Terminology

| Term | Abbreviation | Description |
|---|---|---|
| Acid deposition | | Atmospheric input to ecosystems of pollutants which may acidify soils and freshwaters. |
| Air Pollution Information System | APIS | An information system that provides a comprehensive source of information on air pollution and the effects on habitats and species (online at www.apis.ac.uk). |
| Air Quality Assessment | AQA | The process of assessing the impact of a project or plan on air quality. |
| Air Quality Modelling and Risk Assessment Team | AQMRAT | A Natural Resources Wales team that specialises in air quality related issues and assessments. |
| Air Quality Modelling and Assessment Unit | AQMAU | An Environment Agency team that specialises in air quality related issues and assessments. |
| Air Quality Standards Regulations 2010 | | UK regulations that transposed Directive 2008/50/EC into UK legislation. It contains mandatory limit values, targets and information levels for ambient air quality for the protection of human health and vegetation. |
| Air Quality Strategy | AQS | The 2007 AQS for England, Scotland, Wales and Northern Ireland provides details of national air quality objectives for air pollutants. |
| Air Quality Technical Advisory Group | AQTAG | AQTAG was established in 2000 by the Environment Agency's Habitats Directive Project to provide technical guidance on the assessment of air emissions from IPC/IPPC processes. Membership has since expanded to include all UK regulators and conservation agencies. |
| Ammonia | $NH_3$ | A gas which may cause acidification of soils and physically damage vegetation. |
| Annual Average Daily Traffic | AADT | The number of vehicles using a road in a 24-hour period averaged over a year. |
| Ancient Woodland | | Typically, a woodland that has existed continuously since 1600 or before (this can include areas where trees have been cut down and or replanted). |
| Annual Mean | | The average of concentrations measured for one year (usually a calendar year). |
| Appropriate Assessment | AA | An assessment required by the Habitats Directive and Habitats Regulations, where a project (or plan) would be likely to have a significant effect on a European site, either alone or in-combination with other plans or projects. Undertaken by the competent authority (i.e. the decision maker). |
| Area of Outstanding Natural Beauty | AONB | A landscape designation protected under the Countryside and Rights of Way Act, 2000. |
| Area of Special Scientific Interest | ASSI | A Northern Ireland designation. |
| Avoidance | | Prevention of adverse impacts occurring through, for example, decisions about project location or design. |
| Background | | When used in the context of concentration or deposition rate this refers to the average over a 1km by 1km or 5km by 5km grid provided by Defra or CEH e.g. the LAQM background maps. |
| Baseline | | The conditions that exist in the absence of the proposed project either at the time an assessment or survey is undertaken or in the future when the project would be constructed, operated or decommissioned. |
| Chartered Institute of Ecology and Environmental Management | CIEEM | Professional body governing ecology/ecologists. |

| Term | Abbreviation | Description |
|---|---|---|
| Centre for Ecology and Hydrology | CEH | Natural Environment Research Council research organisation focusing on land and freshwater ecosystems and their interaction with the atmosphere. |
| Compensation | | Measures taken to make up for the loss of, or permanent damage to, ecological features despite mitigation Under the Habitats Directive and Habitats Regulations. Any replacement area should be similar in terms of biological features and ecological functions that have been lost or damaged, or with appropriate management, have the ability to reproduce the ecological functions and conditions of those biological features. |
| Conservation objective | | The objective for the conservation of biodiversity (e.g. specific objective for a designated site or broad objectives of policy). |
| Conservation status | | The state of a species or habitat including, for example, extent, abundance, distribution and their trends. |
| Critical level | | The concentration of an air pollutant above which adverse effects on ecosystems may occur based to present knowledge. |
| Critical load | | Deposition flux of an air pollutant below which significant harmful effects on sensitive ecosystems do not occur, according to present knowledge. Usually measured in units of kilograms per hectare per year (kg/ha/yr). |
| Cumulative effect | | Changes caused by a proposed project in conjunction with other projects and plans. |
| Department for Environment, Food and Rural Affairs | Defra | The government department responsible for environmental protection, food production and standards, agriculture, fisheries and rural communities. |
| Deposition | | The main pathway for removing pollutants from the atmosphere, by settling on the earth's surface. |
| Deposition flux | | Deposition velocity x concentration. |
| Designated Site | | Land designated for its wildlife interest. These include the following designations (note different names may be given to locally designated sites):<br>• Ramsar site<br>• Special Area of Conservation (SAC)<br>• Special Protection Area (SPA)<br>• Site of Special Scientific Interest (SSSI)<br>• Areas of Special Scientific Interest (ASSI)<br>• Local Wildlife Site (LWS)<br>• Local Nature Conservation Site (LNCS)<br>• Site of Importance for Nature Conservation (SINC)<br>• Area in the Ancient Woodland Inventory (AWI)<br>• National Nature Reserves (NNR)<br>• Local Nature Reserves (LNR)<br>• Ancient Woodland (AW) |
| Ecological feature | | Habitat, species or ecosystem. |
| Ecosystem | | An entire functional ecological system i.e. the plant and animal species that make up the constituent habitat (or habitats) plus the air, water, soil etc. that they require to persist and thrive. |

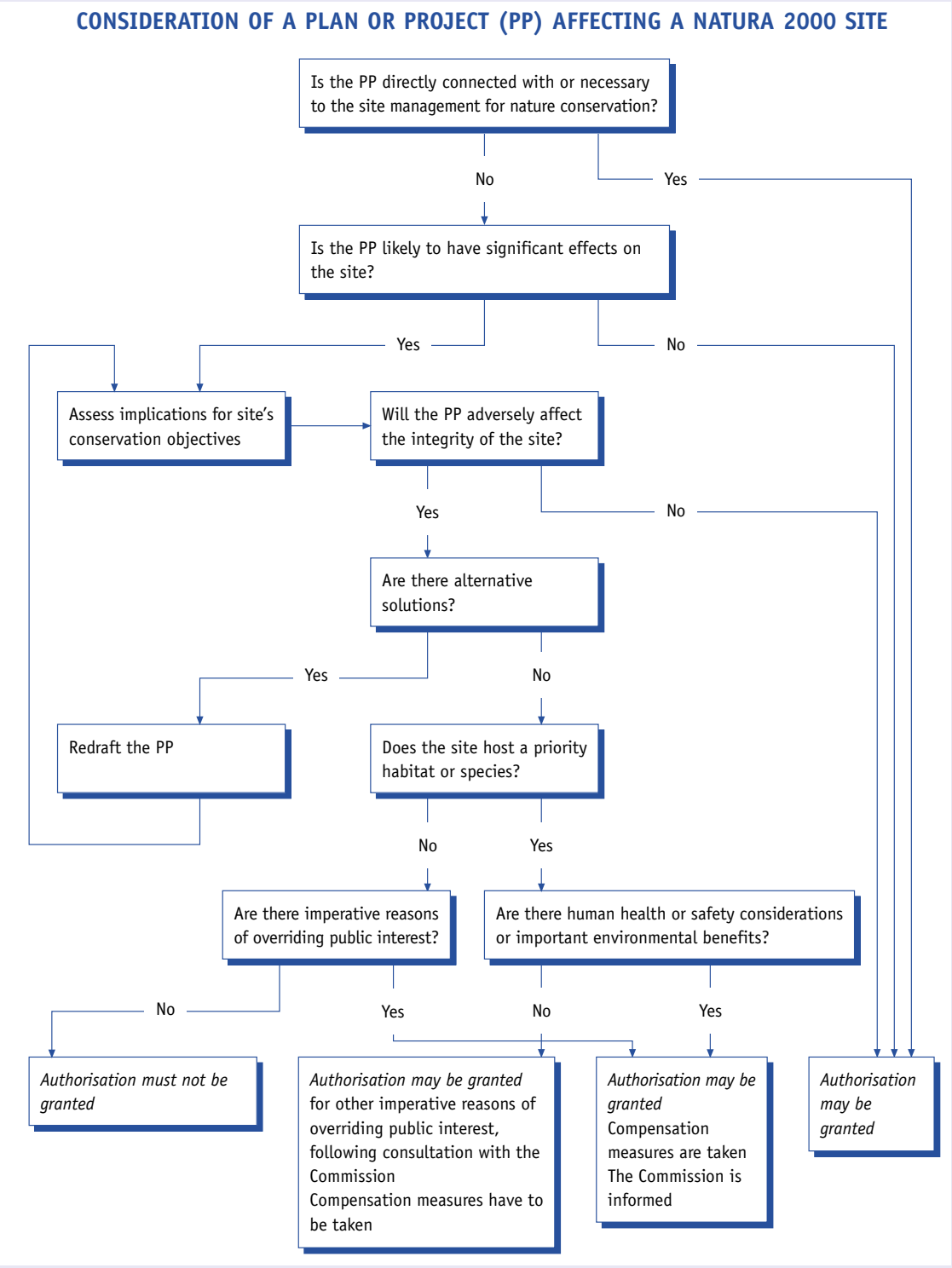
| Term | Abbreviation | Description |
|---|---|---|
| Effect | | The changes that occur to a habitat as a result of changes in concentrations or deposition of air pollution. Also, see 'Impact'. |
| Emission | | The release of a substance into the air. May be discharged from a stack, vent, vehicle exhaust or from diffuse sources. |
| Emission Limit Value | | The legal limit on the emission of a pollutant. |
| Enhancement | | Improved management of ecological features or provision of new ecological features, resulting in a net benefit to biodiversity, which is unrelated to a negative impact or is 'over and above' that required to mitigate/compensate for an impact. |
| Environment Agency | EA | The Environment Agency is responsible for permitting certain industrial process in England. |
| Environmental Impact Assessment | EIA | The process of assessing the likely significant environmental effects of a proposed project as part of gaining consent carried out under the EIA Directive and Regulations. |
| Ecological Impact Assessment | EcIA | A process of identifying, quantifying and evaluating potential effects of development-related or other proposed actions on habitats, species and ecosystems. |
| Environmental Permit | EP | A permit required by industrial operators in accordance with the Environmental Permitting Regulations. |
| Environmental Permitting Regulations | EPR | The various sets of national regulations that regulate pollution through a permitting system. |
| Environmental Protection UK | EPUK | UK environmental Non-Governmental Organisation (NGO) working to improve the quality of the local Environment. |
| Environmental Statement | ES | The document which reports the process, findings and recommendations of an EIA. |
| Environmentally Sensitive Area | ESA | A designation for agricultural areas needing special protection by virtue of their landscape, wildlife or historical value. |
| European sites | | A network of European designated sites including Special Protection Areas (designated under Directive 2009/147/EC) and Special Areas of Conservation as listed in Annex I and II of the EU Directive 92/43/EEC ("Habitats Directive"). Also referred to as Natura 2000 sites. |
| European Union | EU | A political and economic union of 28-member states that are located primarily in Europe. |
| Eutrophication | | The process by which an ecosystem is subject to excessive growth of a few species of competitive plants and/or microorganisms as a result of excessive nutrient supply, thus forcing out less competitive plants and (in aquatic ecosystems) resulting in oxygen depletion and a reduction in animal life. |
| H1 | | The screening tool in the Environment Agency's former Horizonal guidance H1. This has been replaced by the Risk Assessment Tool in 'Air emissions risk assessment for your environmental permit' |
| Habitat | | An assemblage of physical and biological elements which form a recognisable unit. For example, heathland is a different habitat from chalk grassland or wet woodland, most obviously due to differences in specific plant and animal composition and physical structure. |

| Term | Abbreviation | Description |
|---|---|---|
| Habitat Regulations Assessment | HRA | An assessment of a plan or project potentially affecting European (Nature 2000) sites in the UK, required under the Habitats Directive (European Directive 92/43/EEC) and Regulations (Conservation of Habitats and Species Regulations, 2010, as amended). |
| Impact | | The change in concentrations or deposition of an air pollutant. This may or may not rise to an effect on an ecological feature. |
| Isolated project | | A project which, due to its geographical location, is not likely to give rise to in-combination effects on a designated site. This is determined using professional judgement and needs to take account of where there may be an overlap of the air quality impacts of projects and/or plans. |
| Institute of Air Quality Management | IAQM | The professional body representing air quality specialists. |
| Joint Nature Conservation Committee | JNCC | The public body that advises the UK government and devolved administrations on UK-wide and international nature conservation. |
| Kilogram per hectare per year | kg/ha/yr | Unit of measurement used to describe the rate of deposition. |
| Kilogram equivalent per hectare per year | keq/ha/yr | Unit of measurement used to describe the rate of acid deposition, in terms of hydrogen ion ($H^+$) equivalent. |
| Leaching | | Leaching is the process whereby nutrients from agricultural fertilisers are washed out of the soil through the percolation of rainfall. |
| Local Nature Reserve | LNR | Statutory designation for places with wildlife or geological features that are of special interest locally. |
| Local wildlife sites | | 'Non-statutory' sites of nature conservation value that have been identified 'locally' (i.e. excluding SSSIs, SPAs, SACs, and Ramsar sites). LNRs are included as they are a designation made by the Local Authority rather than statutory country conservation agencies. These are often called Local Wildlife Sites, Local Nature Conservation Sites, Sites of Importance for Nature Conservation or other, similar names. |
| Microgram per cubic metre | µg/m$^3$ | Unit of measurement of the concentration of an air pollutant. Often used for ambient concentrations. |
| Milligram per cubic metre | mg/m$^3$ | Unit of measurement of the concentration of an air pollutant. Often used to describe emissions and their limit values for industrial processes. |
| Mitigation | | Measures taken to avoid, reduce, or otherwise address the negative effects of air quality impacts. See also compensation (which is separate from mitigation). |
| Multi-Agency Geographic Information for the Countryside | MAGIC | A web-based mapping browser showing various geographical designations including designated nature conservation site boundaries. |
| National Nature Reserve | NNR | Statutory designations, supporting wildlife or geological features that are significant at a national level. |
| Natural Resources Wales | NRW | Welsh Government Sponsored Body, created in 2013, which took over the work of Countryside Council for Wales, Environment Agency Wales and Forestry Commission Wales. |
| Nitrate Vulnerable Zone | NVZ | A designated area where land drains into and contributes to nitrate found in nitrate-polluted waters. |
| Nitrogen | N | Nitrogen ($N_2$) is a relatively inert gas, but certain molecules containing nitrogen are more reactive with other chemicals. |

| Term | Abbreviation | Description |
|---|---|---|
| Nitric oxide | NO | Produced during combustion processes. |
| Nitrogen dioxide | $NO_2$ | Produced during combustion and formed by the oxidation of NO in the atmosphere. |
| Oxides of nitrogen | $NO_x$ | A term describing a mixture composed of nitrogen oxides (NO and ($NO_2$). |
| Pathway | | The route by which a pollutant moves from a source to a receptor. |
| Predicted Environmental Concentration | PEC | The term used in AQAs of industrial processes to describe the concentration or deposition (i.e. process contribution (PC) plus baseline). |
| Process Contribution | PC | The term used in AQAs of industrial processes s to describe the incremental impact of the proposed development on the concentration or deposition flux). |
| Project (also known as plan or permission) | | The term used for proposals to which this guidance might be applied (e.g. development proposal, road scheme, industrial facility or other land use change). |
| Ramsar | | A wetland site designated of international importance under the international Convention on Wetlands, known as the Ramsar Convention. These sites are considered in the same way as European (Natura 2000) Sites as a matter of government policy. |
| Receptor | | An identified location where an effect may occur. |
| Restoration | | The re-establishment of a damaged or degraded system or habitat to a close approximation of its pre-degraded condition. |
| Scoping | | A process early on in AQA, EIA or EcIA, to determine the matters to be addressed and ensure effective input to the assessment. |
| Screening | | This term can be used either to determine whether or not an EIA or HRA is necessary or in the context of air quality assessment, to "screen out" emissions that are inconsequential using numerical criteria. |
| Scottish Environment Protection Agency | SEPA | Responsible for permitting certain industrial process in Scotland. |
| Significant effect | | An effect that either supports or undermines biodiversity conservation objectives for 'important ecological features. |
| Site of Special Scientific Interest | SSSI | A geological or biological conservation designation denoting a nationally protected area in the UK. |
| Scottish Natural Heritage | SNH | Funded by the Scottish Government with the purpose to promote, care for, and improve natural heritage. |
| Special Area of Conservation | SAC | Area of protected habitats and species as defined in the European Union's Habitat Directive (92/43/EEC). |
| Special Protection Area | SPA | A designated area for birds under the European Union Directive on the Conservation of Wild Birds (2009/147/EC). |
| Statutory Nature Conservation Organisation | SNCO | E.g. Natural England, Natural Resources Wales, Scottish Natural Heritage. |
| Sulphur dioxide | $SO_2$ | Combustion product formed from sulphur contained in fuels. |
| United Nations Economic Commission for Europe | UNECE | Regional commission of the United Nations helping countries to convene and cooperate on standards and conventions in support of the Sustainable Development Goals. |

| Term | Abbreviation | Description |
|---|---|---|
| Windfall development | | Development that does not have a specific allocation in a local plan, often because local authorities do not allocate development sites below a certain size. |
| World Health Organization | WHO | Directs and coordinates international health within the United Nations' organisation. |

# Appendix B: Flowchart reproduced from Annex III of European Commission's guidance on managing Natura 2000 sites



# Appendix C: Typical relationship between Ecological Impact Assessment (EclA) and Air Quality Assessment (AQA)

| EcIA Stage[68] | Interactions with this guidance |
|---|---|
| **Scoping:** Determining the matters to be addressed in the EcIA. Scoping is an ongoing process – the scope of the EcIA may be modified following further ecological survey/ research and during impact assessment. | The initial stages of the air quality assessment process will determine whether air quality impacts on designated sites require consideration. See Chapters 3 and 4 |
| **Establishing the baseline:** Collecting information and describing the ecological conditions in the absence of the proposed project, to inform the assessment of impacts. | The ecologist and air quality specialist will often jointly identify designated sites that are relevant to the plan or project and describe these. See Chapters 3 and 4.<br>It should be noted that ecologists are not instructed on all projects that require an AQA, for example, many applications for environmental permits. |
| **Important ecological features:** Identifying important ecological features that may be affected, with reference to a geographical context in which they are considered important. | |
| **Impact assessment:** An assessment of whether important ecological features will be subject to impacts and characterisation of these impacts and their effects. Assessment of residual ecological impacts of the project remaining after mitigation and the significance of their effects, including cumulative effects. | The assessment of air quality impacts on designated sites is an iterative process, with consideration of potential impacts starting early in the process set out in this guidance. Initial consideration of impacts starts during the air quality scoping (see Chapter 4) with the assessment becoming more detailed in the latter stages (see Chapter 4) |
| **Avoidance, mitigation, compensation and enhancement:** Incorporating measures to avoid, reduce and compensate ecological impacts, and the provision of ecological enhancements. Monitoring impacts of the development and evaluation of the success of proposed mitigation, compensation and enhancement measures. | An IAQM Position Statement[69] sets out the basic hierarchical principles for identifying mitigation measures. |
| **Consequences for decision making:** Consideration of the legal and policy framework throughout the EcIA process and assessment of how the proposed development has responded to this. | This will be assessed iteratively throughout the process of assessing air quality impacts on designated sites. |

[68] Modified from page iv of: CIEEM (2016) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal, 2nd edition. Chartered Institute of Ecology and Environmental Management, Winchester
[69] iaqm.co.uk/text/position_statements/mitigation_of_development.pdf

# Appendix D: Air pollutants and deposition processes

### D.1 Introduction

D.1.1 Maintaining good air quality is important for the protection of ecosystems. Air pollution and its deposition onto vegetation, soil and water can damage vegetation directly or indirectly through the addition of nutrients or changes in acidity levels within a habitat. These can cause a shift in the competitive balance between species, changes in plant species composition or subtle changes in vegetation structure, which can affect the use of a habitat by an animal species.

### D.2 Pollutant emission and deposition processes

D.2.1 The main air pollutants affecting vegetation and ecosystems are nitrogen oxides ($NO_x$), sulphur dioxide ($SO_2$) and ammonia ($NH_3$). Ozone ($O_3$) is also important but this pollutant is not addressed by this guide as it is a regional pollutant not assessed at scheme or project level.

D.2.2 These have both direct effects e.g. through exposure to the gas itself; and indirect effects, e.g. through deposition of the gas to soil and freshwater (dry deposition) or with precipitation (wet deposition).

D.2.3 Figure D1[70] illustrates in simple form the sources, pathways and receptors processes.

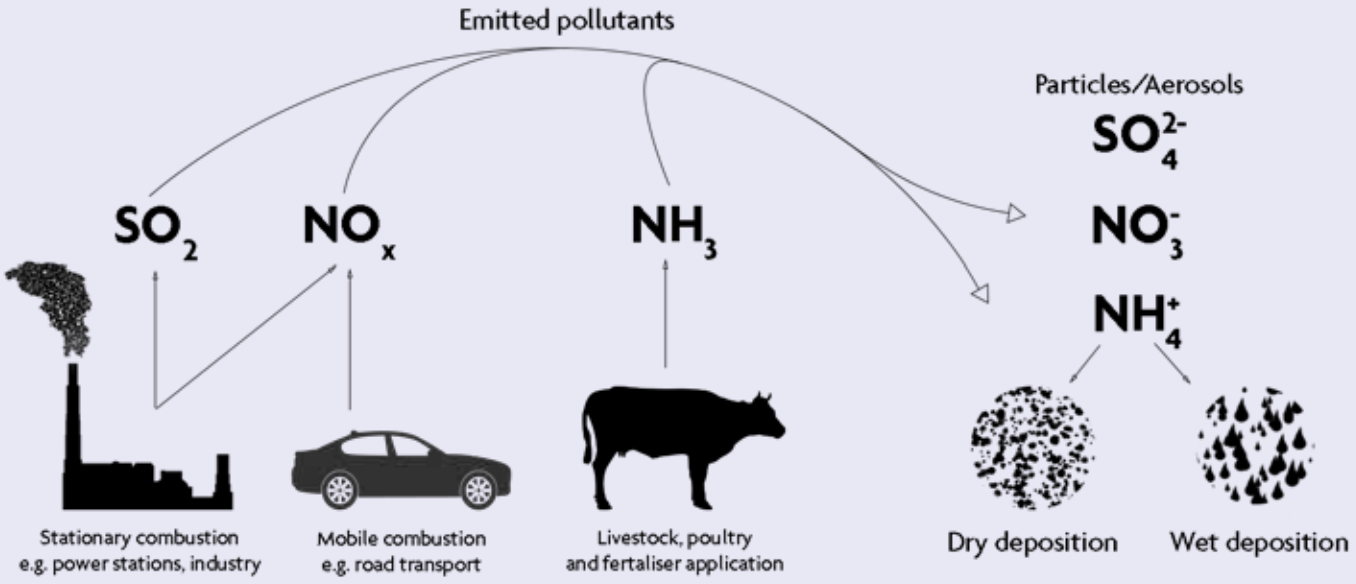
### D.3 Critical levels and loads

D.3.1 The concepts of critical levels and critical loads were introduced by the United Nations Economic Commission for Europe (UN ECE) Convention on Long-range Transboundary Air Pollution (CLRTAP).

D.3.2 **Critical levels** are defined by the UNECE[71] as: *"concentrations of pollutants in the atmosphere above which direct adverse effects on receptors, such as human beings, plants, ecosystems or materials, may occur according to present knowledge"*. In terms of ecosystem effects, they relate to effects on plant physiology, growth and vitality, and are expressed as atmospheric concentrations over a particular averaging time (hours to years). They are thus important as an indicator of direct adverse effects on ecological receptors and are thus useful tools for ecological assessment.

D.3.3 The critical levels for $NO_x$ and $SO_2$ are set in the European Union (EU) Ambient Air Quality Directive[72] and transposed

**Figure D1. Schematic of the sources of air pollution**



into law by the Air Quality Standards Regulations 2010 and similar Regulations in the devolved administrations. The Directive defines a critical level as *"A level fixed on the basis of scientific knowledge, above which direct adverse effects may occur on some receptors, such as trees, other plants or natural ecosystems but not on humans"*. Under the Directive, assessment of compliance with the critical levels is strictly only required at locations more than 20 km from towns with more than 250,000 inhabitants or more than 5 km from other built-up areas, industrial installations or motorways[73]. In practice, however, assessment against critical levels for vegetation is frequently undertaken to inform planning and permitting processes across the country, regardless of this definition.

D.3.4 The Air Quality Strategy for England, Wales, Scotland and Northern Ireland[74] has adopted these critical levels, as national objectives for the maximum ambient air concentrations of $NO_x$ and $SO_2$ (and ozone[75]) to be attained, for the aim of protection against the direct effects of air pollution.

D.3.5 The main critical levels used in air quality assessments of designated sites are set out in Table 2.1.

D.3.6 **Critical loads** relate to the potential effects of pollutant deposition [over periods of decades] and are defined by UNECE as *"a quantitative estimate of exposure to one or more pollutants below which significant harmful effects on specified sensitive elements of the environment do not occur according to present knowledge"*.

D.3.7 There are critical loads for nitrogen deposition (leading to eutrophication) and acid deposition (leading to acidification). Critical loads for nitrogen deposition are given as a range and quoted in units of kilograms of nitrogen per hectare per year (kg N/ha/year). A critical load for acidification is described in units of kilograms of $H^+$ ion equivalents per hectare per year (keq/ha/year). Most assessments consider nitrogen and sulphur deposition, but for some industrial processes, including energy from waste, other chemical species need to be considered, such as hydrogen fluoride (HF).

D.3.8 Critical loads are habitat dependent, further detail and supporting information is provided by the online resource, the Air Pollution Information Service (APIS)[76].

### D.4 Oxides of nitrogen ($NO_x$)

D.4.1 Oxides of nitrogen ($NO_x$; also referred to as nitrogen oxides), are produced mainly as a result of combustion processes[77]. Almost half of the $NO_x$ emissions in the UK are from road vehicles, mostly diesel engines; approximately one quarter is from power generation and the remainder from other industrial and domestic combustion processes. Emissions of $NO_x$ are also produced naturally by lightning, forest fires and, to a small extent, microbial processes in soils. $NO_x$ is a mixture of nitrogen oxides, conventionally considered to be a mixture of nitrogen dioxide ($NO_2$)[78] and nitric oxide (NO)[79]. The general long term UK trend in $NO_x$ has been one of improvement (particularly since 1990) despite an increase in vehicles on the roads[80].

D.4.2 $NO_x$ can affect plants directly or indirectly. It may directly enter a plant via the stomata (as NO or $NO_2$), where it has phytotoxic effects. Lower plants such as lichens and bryophytes (including mosses, landworts and hornworts) are particularly vulnerable to direct exposure to the gases in this way[81]. $NO_x$ can also deposit onto soil and, following transformation to nitrate, enrich the soil, leading to eutrophication, as discussed later.

D.4.3 There is no published evidence for any direct toxic effect of $NO_x$ on animals and therefore effects on animals are not directly included in ecological impact assessments, which focus on the effects on vegetation. The effects on animals are sometimes indirectly included in an assessment where species are dependent on particular habitats for their survival and an assessment will focus on this supporting habitat.

D.4.4 The effects of elevated $NO_x$ concentrations on vegetation can be broadly categorised as[82]:

- growth effects: particularly increased biomass, changes in root to shoot ratio and growth of more competitive species, but also including growth suppression of some species;
- physiological effects: e.g. $CO_2$ assimilation and stomatal conductivity; and
- (bio)chemical effects: e.g. changes in enzyme activity and chlorophyll content (probably through the effects of increased nitrogen, as demonstrated in lichens[83], but also documented in higher plants).

D.4.5 The long term (annual average) critical level for $NO_x$ is 30 µg/m$^3$. At concentrations above this critical level, both beneficial and adverse responses have been recorded, and there is evidence suggesting an adverse synergistic effect when plants are exposed to both $NO_x$ and $SO_2$[84].

D.4.6 The long term critical level for $NO_x$ was set on the basis that growth effects are likely to affect vegetation diversity and survival and occur at lower annual average concentrations than other effects.

D.4.7 Data presented by the World Health Organization (WHO) 2000[82] indicates that, other than growth effects, biochemical or

physiological effects have been demonstrated in vascular plants from exposure to annual average concentrations of more than 100 µg/m$^3$. With regard to lower plants, Das *et al* (2011)[85] recorded evidence of chlorophyll changes in lichens, also correlated with $NO_x$ at higher concentrations (over 260 µg/m$^3$). These studies have also attributed the effects to the increase in available nitrogen, but at such high concentrations NO and $NO_2$ can also increase cellular acidity and inhibit lipid biosynthesis (Wellburn, 1990)[86].

D.4.8 The critical level does not differentiate between the role of nitrogen deposition and $NO_x$ in the air. It is a precautionary general threshold, not specific to a particular habitat, plant species or impact pathway, below which there is currently a high degree of confidence that no adverse effects on vegetation will arise. Long term $NO_x$ concentrations below the critical level are therefore desirable. Some species or habitats may not show adverse effects until higher concentrations are present.

D.4.9 The long term (annual mean) concentration of $NO_x$ is most relevant for its impacts on vegetation, as the effects, particularly through the nitrogen deposition pathway, are additive over months and years. This is reflected in the adoption of the long term guideline in the EU Air Quality Directive as a limit value for vegetation. However, atmospheric exposure to very high concentrations of $NO_x$ for short periods (hours/days) may also have an adverse effect under certain conditions even if the long term concentrations are below the limit value. The WHO guidelines[87] include a short term (24-hour average) $NO_x$ critical level of 75 µg/m$^3$. Originally set at 200 µg/m$^3$ as a four-hour mean, the more detailed CD-ROM version of the 2000 WHO guidelines[88] comments: "*Experimental evidence exists that the CLE decreases from around 200 µg/m$^3$ to 75 µg/m$^3$ when in-combination with $O_3$ or $SO_2$ at or above their critical levels. In the knowledge that short-term episodes of elevated $NO_x$ concentrations are generally combined with elevated concentrations of $O_3$ or $SO_2$, 75 µg/m$^3$ is proposed for the 24 h mean.*" Ozone and $SO_2$ concentrations are typically low in the UK compared to many other countries. If a regulator does require the use of the short term $NO_x$ critical level, given the low UK $SO_2$ concentrations IAQM consider it is most appropriate to use 200 µg/m$^3$ as the short term critical load.

D.4.10 The relative importance of the long term mean compared to the short term mean is reflected in several studies which state that the *'UNECE Working Group on Effects strongly recommended the use of the annual mean value, as the long term effects of $NO_x$ are thought to be more significant than the short term effects'*[89, 90]. This IAQM guidance, therefore, recommends that only the annual mean $NO_x$ concentration is used in assessments unless specifically required by a regulator; for instance, as part of an industrial permit application where high, short term peaks in emissions, and consequent ambient concentrations, may occur.

### D.5 Sulphur dioxide ($SO_2$)

D.5.1 The main anthropogenic source of sulphur dioxide ($SO_2$) is the combustion of sulphur containing fuel in electricity generation, other industry and domestic heating. Since the 1970s, UK emissions have fallen by 95% with the largest reductions occurring between 1990 and 2000, when emissions reduced by 70%[91].

D.5.2 $SO_2$ is directly toxic to both higher and lower plants. Lower, non-vascular, plants such as lichens and bryophytes are particularly vulnerable. In the UK, however, many lichen species have increased in abundance after the return to low ambient concentrations (<10 µg/m$^3$).

D.5.3 The critical level for protection of all vegetation types from the effects of $SO_2$ is 20 µg/m$^3$, as an annual mean, except for lichens and bryophytes (including mosses, landworts and hornwarts) for which the criterion is 10 µg/m$^3$, reflecting their greater sensitivity.

D.5.4 Another key effect of $SO_2$ is through the indirect effects arising from the acidification of soils. This is discussed in more detail below.

### D.6 Ammonia ($NH_3$)

D.6.1 Agriculture is the main source of anthropogenic ammonia ($NH_3$) in the UK (82% in 2016[92]). A small amount of ammonia is emitted from petrol vehicles with early three way catalysts, although this source is declining as these older vehicles are retired from the fleet. Vehicles that use Adblue to control $NO_x$ emissions from diesel engines potentially emit ammonia, but vehicles using this technology should have an effective system to remove ammonia from the exhaust gases. Anaerobic digesters used in the waste industry are also an important source of ammonia.

D.6.2 The direct uptake of $NH_3$ through the stomata increases the amount of nitrogen within the plant. In addition, its alkalinity adversely affects plant biochemistry; lichens and bryophytes are particularly sensitive to this effect[93]. Ammonia also reacts in the atmosphere to produce ammonium ions ($NH_4^+$) which contribute to nutrient nitrogen and acid deposition. Higher plants are considered to be less sensitive and, for this reason, the annual critical level for higher plants is 3 µg/m$^3$ but is reduced to 1 µg/m$^3$ where lower plants (lichens and bryophytes, including mosses, landworts and hornwarts) are a particular interest feature of a habitat. It is the ecologist's role identify the presence of these lower plants.

### D.7 Hydrogen fluoride (HF)

D.7.1 Hydrogen fluoride (HF) is an acidic gas released from industrial processes (such as coal fired power stations, waste incinerators

and aluminium production). In elevated concentrations, HF can have an adverse impact on the chlorophyll content of plants. The WHO recognises that HF concentrations in ambient air should be less than 1 μg/m$^3$, to prevent effects on livestock and plants; this guideline applies to long term (annual) exposure. The Environment Agency online risk assessment guidance[94] for permitting contains weekly and daily average standards for HF for the protection of vegetation.

### D.8 Other pollutants

D.8.1 Other pollutants, for example, heavy metals and hydrogen chloride, are emitted by industrial processes and these pollutants may need to be assessed. It is recommended that prior to the assessment of industrial emissions that would be regulated by the Environment Agency or equivalent country regulator, the scope of any assessment is discussed with the regulator.

### D.9 Pollutant deposition

D.9.1 There are two processes for atmospheric deposition of pollutants:

- Dry deposition is the deposition of gases and aerosols directly to the Earth's surface.

- Wet deposition is the process whereby pollutants are removed from the atmosphere by precipitation (e.g. rain, snow, fog) and then deposited to ground or vegetation.

D.9.2 Wet deposition is the dominant component of the background deposition rate[95] and often determines whether the critical load is exceeded. Wet deposition primarily depends on the rate of precipitation, and therefore generally follows rainfall patterns.

D.9.3 Wet deposition is not normally assessed by air quality practitioners because the impacts of a project or local development plan typically occur over short distances and over timescales that are too short for wet deposition to be significant. One exception to this is hydrogen chloride (HCl), which is readily 'washed out' of plumes at short range and can, therefore, be required for some industrial permit applications[96].

D.9.4 Deposition rates are dependent on the habitat as well as atmospheric pollutant concentrations. For example, the typical leaf area and height of a species will affect the available surface area for deposition. The deposition velocities used in assessments should reflect the type of vegetation cover.

### D.10 Nitrogen deposition

D.10.1 Dry deposition of nitrogen is high within large conurbations and close to major roads, due to the higher $NO_x$ concentrations in the atmosphere. High rates are also found close to agricultural activities such as intensive livestock farming, due to 'reduced nitrogen', which is derived from emissions of ammonia.

D.10.2 Although nitrogen is an essential growth nutrient, not all plants require the same relative quantities. Plants which are of higher conservation value tend to be those which have lower nitrogen requirements and are associated with lower nutrient status habitats.

D.10.3 The growth stimulation effects of nitrogen deposition are generally subtler than the effects of the application of agricultural fertiliser since the quantities of nitrogen deposited over a given period of time are much smaller. Negative effects have been demonstrated in epiphytic lichens. This is caused by a combination of growth inhibition[97] of more sensitive species and growth stimulation of nutrient tolerant species. This has been demonstrated in several studies in London[98].

D.10.4 The role of nitrogen deposition in growth stimulation depends on the availability of the three macronutrients (nitrogen, phosphorus and potassium). In most terrestrial systems nitrogen and phosphorus are naturally relatively scarce and this ordinarily restricts growth and keeps more competitive species in check. If nitrogen is available in sufficient quantities it ceases to be limiting.

D.10.5 Freshwater habitats are typically phosphorus limited[99]. Therefore, nitrogen deposition is usually less important than in terrestrial systems and control of eutrophication in freshwater environments is often directed towards controlling phosphorus inputs. Be aware some rivers and lakes may have nitrogen limits where nutrient nitrogen deposition is more ecologically important to assess.

D.10.6 Coastal systems are generally nitrogen limited. Therefore, nitrogen inputs are typically more important in coastal environments than in freshwater environments. The situation is more complex for terrestrial habitats because those that have a strong freshwater influence may be phosphate limited, others may be nitrogen limited.

D.10.7 Understanding how nutrients affect particular habitats is essential to understanding the role of nitrogen deposition and avoiding unnecessary time and effort being expended controlling non limiting nutrients.

D.10.8 'Site relevant critical loads' (relating to internationally and nationally important wildlife sites) and habitat, or ecosystem specific, critical loads are available through APIS[100]. The APIS website provides advice on the selection of an appropriate value within the critical load range that should

be applied in assessments, based on the interest features of the site. It is at this point that the advice of an ecologist can be particularly important. This is discussed in **Chapter 3**.

### D.11 Acid deposition

D.11.1 A range of air pollutants can cause the acidification of soil and freshwater. Salt water systems naturally buffer (acid neutralizing) any acid deposition in almost all cases. The key pollutants are sulphur, in the form of sulphate ions ($SO_4^{2-}$), and nitrogen, as nitrate ($NO_3^-$), nitric acid ($HNO_3$) and ammonium ($NH_4^+$) (from ammonia). As these pollutants are removed from the atmosphere the $H^+$ ion concentrations in the precipitation increases, making it more acidic.

D.11.2 Acid deposition is most likely to affect vegetation indirectly through changes to soil properties. Evidence from national monitoring programmes[101] shows that this occurs through increasing the soil acidity, which tends to increase the mobility of certain toxic metals (e.g. aluminium and manganese) and reduce the buffering capacity of the soil. Acid deposition can also cause nutrient deficiencies, by reducing base cation availability (e.g. phosphorus). In forests, leaching of base cations from the soil has been linked to leaf chlorosis (yellowing) (Huettl *et al*, 1990)[102]. Acid deposition can also lead to leaching of calcium from conifer needles, which subsequently may be less able to withstand winter freezing/desiccation damage (Borer *et al* 2005)[103]. There may also be changes in microbial transformations. Root damage may result, especially from aluminium toxicity. Nutrient imbalance can lead to stunted growth. These effects can lead to changes in species composition.

D.11.3 Some ecological sites are more at risk from acid deposition than others, depending on the soil type, bedrock geology, weathering rate and buffering capacity. In general, habitats dependent on slightly acidic substrate (i.e. heathland or acid grassland) and bog habitats are at greater risk of being adversely affected by increased rates of acid deposition than those associated with more calcareous habitats (e.g. chalk grassland). However, it should be noted that calcareous substrates are not immune to acidification as the buffering ability of the soil can become exhausted over time.

D.11.4 Emissions of all acidifying pollutants, typically nitrogen and sulphur but also any other relevant compounds e.g. HCl, should be taken into account when assessing potential acidification of soils and impacts on vegetation. Nitrogen and sulphur containing compounds can be assessed using the APIS Critical Load Function tool[104].

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[70] www.apis.ac.uk/starters guide air pollution and pollution sources
[71] www.unece.org/env/lrtap/WorkingGroups/wge/definitions.htm
[72] The EU Ambient Air Quality Directive refers to the Critical Levels as limit values for the protection of vegetation.
[73] The Directive notes that the risk posed by air pollution to vegetation and natural ecosystems is most important in places away from urban areas and that compliance with critical levels for the protection of vegetation should focus on places away from built up areas.
[74] Defra and the devolved adminstrations, 2007, The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, Volume 1
https://www.gov.uk/government/publications/the-air-quality-strategy-for-england-scotland-wales-and-northern-ireland-volume-1
[75] There are limit values and target values for ozone set out in the EU Ambient Air Quality Directive.
[76] Available at www.apis.ac.uk
[77] National Atmospheric Emissions Inventory naei.defra.gov.uk
[78] $NO_2$ is the component of $NO_x$ that cause human health effects.
[79] Another oxide of nitrogen, $N_2O$ (nitrous oxide) is not generally considered part of $NO_x$ in terms of ambient air quality but it is an important greenhouse gas.
[80] Emissions of nitrogen oxides fell by 72% between 1970 and 2017. Source: www.gov.uk/government/uploads/system/uploads/attachment_data/file/579200/Emissions_airpollutants_statisticalrelease_2016_final.pdf [accessed 14/06/2019]
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[90] June 2011. Manual on Methodologies and Criteria for Modelling and Mapping Critical Loads & Levels and Air Pollution Effects, Risks and Trends. Chapter 3: Mapping Critical Levels for Vegetation
[91] naei.defra.gov.uk/overview/pollutants?pollutant_id=8
[92] naei.defra.gov.uk/overview/pollutants?pollutant_id=21 [accessed 06/03/2019]
[93] www.apis.ac.uk
[94] www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit
[95] In this guidance, the term deposition rate is used to describe the amount of pollutant deposited over an area over a period of time, i.e. kg/ha/yr. This is also called the deposition flux.
[96] Where hydrogen chloride (HCl) or nitrate (HNO3) are emitted from industrial activities, advice should be sought from the regulator
[97] Munzi S, Pisani T, Loppi S. 2009. The integrity of lichen cell membrane as a suitable parameter for monitoring biological effects of acute nitrogen pollution. Ecotoxicology and Environmental Safety 72 2009 2012
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[99] However, some riverine designated sites, e.g. the River Clun SAC in Shropshire/Herefordshire, do have targets for nitrogen levels set in their conservation objectives.
[100] APIS recommends values within nutrient nitrogen critical load ranges for use in air pollution impact assessments. www.apis.ac.uk/sites/default/files/downloads/APIS%20critical_load_range_document_0.pdf
[101] National Soil inventory (NSI), Countryside Survey, Environmental Change Network of sites (ECN), Inter National Co operative Programme (ICP)) and long term experiments.
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[103] Borer, C.H., Schaberg, P.G., DeHayes, D.H., 2005, Acidic mist reduces foliar membrane associated calcium and impairs stomatal responsiveness in red spruce, Tree Physiology 25, 673 680
[104] APIS focuses on the effects of nitrogen and sulphur compounds. These have been incorporated into the Critical Load Function tool, www.apis.ac.uk/critical load function tool

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# Appendix 8: Common Standards Monitoring Guidance

# Common Standards Monitoring Guidance

for

## Saltmarsh Habitats

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# Common Standards Monitoring guidance for saltmarsh habitat

## Contents

# 1 Introduction

Saltmarshes are found in sheltered embayments and estuaries and in the lee of barrier islands and spits, as mud can accumulate only in relatively low energy environments where wave action is limited. Saltmarsh is restricted to the area between mid neap tide level and high water spring tide level. It lies inland of littoral inshore sediment and/or rock. Landward, there may a transition to other habitats such as cliff, dune, shingle, machair, reedbed, fen, carr or saline wet grassland (grazing marsh) containing brackish ditches.

## 1.1 Dynamics of saltmarsh

The location, character, and dynamic behaviour of saltmarshes is governed by four physical factors: sediment supply, tidal regime, wind-wave climate and the movement of relative sea level. There are four elements necessary for the development and growth of a salt marsh:

- a relatively stable area of sediment that is covered by the tide for a shorter period than the time it is exposed
- a supply of suitable sediment available within the period of tidal cover
- water velocities that are sufficiently low for some of the sediment to settle out
- a supply of seeds or other propagules for the establishment of vegetation cover.

Saltmarshes are dynamic systems. They have been subject to historical land claim. Many estuaries are still adjusting to the reduction of tidal prism caused by large-scale agricultural reclamation. Estuaries can show at least two different responses, depending on the amount of offshore sediment available. On the west coast, the Ribble and Dee Estuaries have been enhanced by intertidal accretion resulting in channel cross sections that have been progressively reduced through sedimentation. In Essex, on the other hand, where little offshore sediment is available, velocity of the flood tidal wave has increased and erosion has speeded up.

In addition, there may be anthropogenic fixtures both within or outwith the coastal cell (a natural division of the coastline – ideally each cell is self-contained in sediment transport terms) which limit the volume of sediment entering the system. Anthropogenic factors include the interruption of natural cliff erosion through hard coastal defences or the interception of mobile sediment through groynes.

In many cases both accretion and erosion will occur within one cell e.g. Morecambe Bay, where over the last 25 years there has been erosion on one side of the bay, at Silverdale marsh, while on the other side, the saltmarsh on the Cartmel Peninsula is actively accreting. There is net accretion within the Bay system as a whole.

Many areas show cycles of erosion and accretion within a given period that may span decades or hundreds of years, as for example in the Severn Estuary, where episodes of erosion and accretion, governed by changes in wind-wave climate, are reflected by marsh terraces. Saltmarsh may be part of a successional sequence, and later develop to a different feature. For example, at Berrow Marsh in Somerset, the saltmarsh that formed after 1910 in the lee of a sand dune has subsequently become reed swamp, as a result of dune formation blocking tidal inundation and thereby reducing salinity. Topography and vegetation may alter quickly.

# 2 Definitions

There have been several different classifications of salt marsh biotopes in Britain. We have used a classification proposed by the Council of Europe (Dijkema (ed.), 1984).

## 2.1 Biotope classification on sedimentary shores

*1. Open-coast back-barrier salt marshes*

These marshes develop in the lee of spits or barrier islands, where the angle of slope of the inter-tidal and immediate sub-tidal area is shallow on the exposed side. This type of salt marsh is found in north Norfolk. The salt marsh develops adjacent to sand dune or shingle and these transition zones can be rich in plant species.

*2. Foreland salt marsh*

This type of salt marsh develops in front of sheltered alluvial coastal plains (e.g. areas protected by a bay or offshore banks). There tend to be deeper sediment deposits in this type of marsh. Typical examples of this marsh are found around the Wash or Dengie in Essex, Morecambe Bay, Kentra Bay (Ardnamurchan Peninsula), the North Lincolnshire Coast.

*3. Estuarine salt marsh*

Estuarine marshes are found where rivers gradually merge into the open sea. There is usually, at least in the upper part of the system, an appreciable influence of fresh water which often leads to interesting transitions to fresh-water such as brackish reed beds or fen communities. However, estuarine marshes have often been 'reclaimed' and converted to agricultural land.

Estuarine salt marsh is associated with the larger rivers of the east coast of Britain e.g. the Severn, Dee, or Thames and the river valleys and rias of the upland coasts of the western seaboard. Most of the estuaries where saltmarshes are extensive are in areas where there is a significant soft-sediment supply - i.e. the north west and eastern England (although sediment is mainly marine and not fluvial in England). In areas of low sediment supply, such as the south west rias, we would not expect large areas of saltmarsh.

*4. Lagoonal*

Lagoonal salt marshes occur where a narrow spit of land encloses a tidal water body with a narrow opening to the sea. Poole Harbour and Montrose basin are examples.

## *2.2* Biotope classification on rocky shores

*1 Loch or fjord-head salt marshes*

These are typically small and are characteristic of north-western Scotland and parts of Northern Ireland. Sediment supply is limited. Natural transitions to terrestrial habitats such as reedbeds or alder-sallow carr occur. Examples include Lochan Havurn at the head of Loch Eriboll on the north coast and Kinlochhourn on the west coast of Scotland.

*2 Beach head salt marsh*

These develop locally on rocky steeply-shelving shorelines where there is little sediment. The best examples are on the east coast of Scotland. They are usually species rich and show a natural foreshortened succession to brackish and freshwater fen.

*3 Ria-bay salt marsh*

Rias are drowned river valleys and appear as shallow tidal bays on rocky coasts. They are characterised by a thin clay layer over a rocky subsoil. The Fal-Ruan estuaries in Cornwall are a good example in Britain.

## 2.3 Descriptions of United Kingdom salt marshes

England has the largest area of salt marsh of the four countries that make up the UK, with an estimated total area of 32,500 hectares and 59 sites over 100ha. This compares to 6748 ha in Scotland (14 sites over 100 ha) 6089 ha in Wales and 239 ha in N. Ireland.

United Kingdom saltmarshes include the following NVC communities (Rodwell, 2000). Saltmarsh zonation follows SSSI/ASSI selection guidelines (NCC, 1989).
E = England, S = Scotland, NI = Northern Island and W = Wales.

**Pioneer saltmarsh**

| NVC community | Community name | Distribution |
|---|---|---|
| SM4 | *Spartina maritima* | E only |
| SM5 | *S. alterniflora* | E only |
| SM6 | *Spartina anglica* salt-marsh | S, E, NI, W |
| SM7 | *Sarcocornia perennis* | E only |
| SM8 | Annual *Salicornia* salt-marsh | S, E, NI, W |
| SM9 | *Suaeda maritima* salt-marsh | S, E, NI, W |
| SM11 | *Aster tripolium* var. *discoides* saltmarsh | E, |
| SM12 | Rayed *Aster tripolium* on saltmarsh | S, E, W |

**Low-mid marsh communities**

| NVC community | Community name | Distribution |
|---|---|---|
| SM10 | Transitional low marsh vegetation with *Puccinellia maritima*, annual *Salicornia* species and *Suaeda maritima*. | S, E, NI, W |
| SM13a | *Puccinellia maritima* saltmarsh, *Puccinellia maritima* dominant sub-community | S, E, NI, W |
| SM14 | *Atriplex portulacoides* saltmarsh | E, NI, W |

**Mid-upper marsh communities**

| NVC community | Community name | Distribution |
|---|---|---|
| SM13b | *Puccinellia maritima* saltmarsh, *Glaux maritima* sub-community | S, E, NI, W |
| SM13c | *Puccinellia maritima* saltmarsh, *Limonium vulgare-Armeria maritima* sub-community | S, E, NI, W |
| SM13d | *Puccinellia maritima* saltmarsh, *Plantago maritima-Armeria maritima* sub-community | S, E, NI, W |
| SM13e | *Puccinellia maritima* saltmarsh, turf fucoid sub-community | S only |
| SM13f | *Puccinellia maritima – Spartina maritima* sub-community | E only |
| SM15 | *Juncus maritimus – Triglochin maritima* saltmarsh | S, E, W |
| SM16a | *Festuca rubra* saltmarsh *Puccinellia maritima* sub-community | S, E, W |
| SM16b | *Festuca rubra* saltmarsh *Juncus gerardii* sub-comunity | S, E, NI, W |
| SM16c | *Festuca rubra* saltmarsh *Festuca rubra-Glaux maritima* sub-community | S, E, NI, W |
| SM16d | *Festuca rubra* saltmarsh tall *Festuca rubra* sub-community | S, E, NI, W |
| SM16e | *Festuca rubra* saltmarsh *Leontodon autumnalis* sub-community | S, E, NI, W |
| SM16f | *Festuca rubra* saltmarsh *Carex flacca* sub-community | S, E, W |
| SM17 | *Artemisia maritima* saltmarsh | S, E, W |

| | | |
|---|---|---|
| SM18 | *Juncus maritimus* saltmarsh | S, E, NI, W |
| SM19 | *Blysmus rufus* saltmarsh | S, E, NI, W |
| SM20 | *Eleocharis uniglumis* saltmarsh | S, E, NI, W |
| SM21 | *Suaeda vera - Limonium binervosum* saltmarsh | E only |
| SM22 | *Atriplex portulacoides - Frankenia laevis* saltmarsh | E only |
| SM23 | *Spergularia marina – Puccinellia distans* saltmarsh | S, E |
| SM26 | *Inula crithmoides* stands | E only |
| SM27 | Ephemeral saltmarsh vegetation with *Sagina maritima* | S, E, W |

**Drift-line**

| NVC community | Community name | Distribution |
|---|---|---|
| SM24 | *Elytrigia atherica* saltmarsh | E, W, |
| SM25 | *Suaeda vera* drift-line | E only |
| SM28 | *Elytrigia repens* saltmarsh | S, E, NI, W |

The salt marshes of Britain were described by Burd (1989). Burd saltmarsh categories are related to NVC categories in the report Appendix. In addition, there have been more recent surveys of some areas, including Morecambe Bay (Hawker, 1998), the Severn Estuary (Dargie, 1998) and the Wash and North Norfolk (Posford Haskoning, 2003).

In general, communities common to the four countries of the UK are annual *Salicornia* and *Suaeda maritima* salt marsh, transitional low marsh vegetation with *Puccinellia maritima*, typical *Puccinellia maritima* saltmarsh and the *Festuca rubra* community. There is, however, considerable variation in salt marsh communities in the four countries, which partly reflects the climatic requirements of one or more of the key species concerned.

### *2.3.1 Saltmarsh in England*

In England the pattern of salt marshes is one of large marshes in the south and east. In the north-west saltmarsh is associated with the major estuaries. In contrast, in the south-west and the north-east there are many smaller scattered marshes.
*Sarcocornia perennis* and the community it characterises (SM7) is restricted to south-east England. *Spartina maritima* (and SM4) is restricted to south-east England and *S. alterniflora* (SM5) to Hampshire and Dorset. Two Mediterranean species reach their northern limit in East Anglia or Lincolnshire - *Suaeda vera* (and SM21) - restricted to Norfolk - and *Frankenia laevis* (SM22) restricted to the south-east. Both these species are associated with the transition zone at the upper edge of the marsh. *Suaeda maritima* (and SM9) is found in East Anglia and *Aster tripolium discoides* (SM11) to the south or south east of England.

Other species reach their northern limit in Britain at the Solway (e.g. *Elytrigia atherica* and *Atriplex portulacoides*). *Inula crithmoides* is restricted to southern England and Wales. There is also a western element where a wetter climate favours species such as *Juncus maritimus, J. gerardii* and *Eleocharis uniglumis*. SM28, with *Elytrigia repens* as the north-western equivalent of the SM24 *Elytrigia atherica*.

### *2.3.2 Saltmarsh in Scotland*

Saltmarshes are often associated with estuaries or Firths, and the largest saltmarsh area in Scotland is on the Solway. The other Firths also have significant representation, but the smaller saltings of the islands and west coast loch-heads are varied and add to the overall coastal biodiversity, even where the area of an individual marsh is small. The

number of salt marsh communities is fewer than those found in England or in the much smaller area of Wales.

Scottish saltmarshes are under-represented by the NVC, which tends to concentrate on English types. Scottish saltmarshes tend to have little 'pioneer' vegetation in comparison with those of England and to be dominated by communities of higher tidal levels than those of England and Wales. An important feature of Scottish saltmarshes is the frequent occurrence of natural transitions to terrestrial habitats, which remain intact in many areas.

Many of the common plants of English systems are absent from Scotland (e.g. perennial glasswort *Sarcocornia perennis*, shrubby sea-blite *Suaeda vera*) or are very much restricted to the south-west (e.g. sea-purslane *Atriplex portulacoides*, rock sea-lavender *Limonium binervosum* and sea couch *Elytrigia atherica*) (e.g. Angus, 2001). The marshes of the south facing coasts of Dumfries and Galloway leading in to the Solway estuary appear to represent a natural geographical boundary which has been referred to by a number of authors as the 'Solway line' (Adam, 1990). *Limonium vulgare*, *L. humile, Seriphidium maritimum* (SM17) *Parapholis strigosa*, *Elytrigia atherica* and *Atriplex portulacoides* (SM14) are typical of the salt marsh species which reach their northern limit along the north coast of the Solway, while saltmarsh flat-sedge *Blysmus rufus* and slender spike-rush *Eleocharis uniglumis* are northern elements which become more frequent in Scotland. The rare *Eleocharis parvula* has recently been discovered in the Cromarty Firth. A short, closely grazed turf containing the turf fucoid *Fucus cottonii* is characteristic of saltmarshes in NW Scotland. As with England, there is also a western element with species such as *Juncus maritimus* (SM18) and *Blysmus rufus* (SM18).

### *2.3.3 Saltmarsh in Wales*

There are an estimated 6,000 hectares of salt marsh in Wales and of this nearly half (2,876 ha) is found in Llanelli and West Glamorgan. Salt marshes are, however, found in all the major estuaries and inlets around the Welsh coast and in other sheltered locations such as in the lee of spits as at Abermenai Point, Anglesey, or in the shelter of islands such as Holy Island. There is a detailed survey of the Welsh salt marsh currently being conducted by the Countryside Council for Wales (pers. comm.).

*Juncus maritimus* (SM18) and *Juncus gerardii* (SM16) are found around the coast, while *Blysmus rufus* (SM19) and *Eleocharis uniglumis* (SM20) communities are restricted to the north west of the principality and *Seriphidium maritimum* (SM17) is limited to the south west.

### *2.3.4 Saltmarsh in Northern Ireland*

Ireland as a whole contains some extensive saltmarshes, but the larger systems occur in the Republic. Saltmarshes are frequent around the coast of Northern Ireland, but they tend to be small in extent, and only account for around 250 ha. Estuarine marsh is the main type of saltmarsh, but there are many smaller bay head or loch head marshes similar to those found in the west of Scotland. One of the major floristic differences in the salt marshes of Ireland is the replacement of *Limonium vulgare*, the species common in most English, Scottish and Welsh marshes, with *L. humile*, continuing the trend set in the west of the Solway and in west Pembrokeshire (Boorman, 1966). *Atriplex portulacoides* is also significant phytogeographically as it reaches its northern limit at Ballymacormick Point in north Down. A number of other species are either absent or uncommon towards the north, showing a clear correlation with the "Solway Line" in Britain. As a result, some of the saltmarsh plant communities on the north coast tend to be rather impoverished.

In Northern Ireland, salt marshes are found all around the coast, mostly in units of 1 hectare or less, but they are more extensively developed at Strangford Lough, Mill Bay in Carlingford Lough, the Roe Estuary, Larne Lough and the Bann Estuary. These five sites account for 90% of the salt marsh area of Northern Ireland. The NVC classification did not include Northern Ireland. However, it is possible to compare many of the plant communities in Northern Ireland with equivalent communities in Great Britain. Many of the coastal plant communities in Northern Ireland have been described to NVC standard by the Northern Ireland Coastal Vegetation Survey (Cooper, *et al*. 1992). Eleven of the 25 NVC salt marsh categories have been found in Northern Ireland, including the rare SM19 (*Blysmus rufus* - community) and SM20 (*Eleocharis uniglumis* - community). Strangford Lough is the most diverse salt marsh site with 14 of the 17 NVC salt marsh communities and sub-communities found in Northern Ireland. In addition, there is an unassigned community found across Northern Ireland with extensive secondary colonisation of SM 16 by *Spergularia media* and, near the Giant's Causway in Antrim, a variant of SM16 (the sub-community dominated by *Juncus gerardii*) with *Schoenus nigricans*.

## 3 Attributes and targets

A series of broad habitat attributes have been defined that should normally be part of the conservation objectives or the management plan for all sites where saltmarsh is an interest feature.

There should normally be at least one target specified for each of the attributes. The targets set out here are for guidance only. They should be interpreted in terms of local knowledge of the site, its history and its surroundings. When a target is not applicable to a particular site it should be excluded, but a record of why the decision was taken should be made.

For saltmarsh the mandatory(*) attributes are

- Habitat extent
- Physical structure: creeks and pans
- Vegetation structure: zonation; sward structure
- Vegetation composition: characteristic species; indicator of negative trend (*Spartina anglica*)
- Other negative indicators

The presence of notable species (vascular plants) or other important features e.g. transitions to other habitats, is considered to be a discretionary attribute (indicators of local distinctiveness). It will not be appropriate to use these ‘quality indicators’ on every saltmarsh site, but where they are part of the reason for notification of the feature they should form an integral part (mandatory) of the condition assessment.

Guidance is given in the following sections as to what needs to be considered for the above attributes and, where appropriate, some examples are provided of the sorts of targets that should be set.

## 4 Habitat Extent

Extent of the saltmarsh is a fundamental attribute to be assessed in determining condition of the saltmarsh feature. The target is no decrease in extent from the established baseline with the caveat 'subject to natural change'. There is a need to focus on the long term geomorphological future of the feature. Coastal features are dynamic and will attempt to adjust and reach

equilibrium in response to climatic changes or local changes in wind and wave energy. The amount of offshore sediment available will also determine response of the system to such changes. Offshore sediment may be affected by anthropogenic activities or structures both within or outwith the coastal cell that limit the volume of sediment entering the system. Effects include the interruption of natural cliff erosion through hard coastal defences or the interception of mobile sediment through groynes. There are other activities which may affect sediment supply, such as dredging. Both accretion and erosion may occur within one coastal cell, estuary or throughout one designated site. There may also be cycles of erosion and accretion within a period which may span decades or hundreds of years. See Appendix I for examples of case studies.

Where there is erosion in one part of a site and, following the key for extent (see section 13**),** that component would be assessed as unfavourable, the overall feature could be judged favourable for extent **provided** we can be certain that there is at least equal accretion in other components of the feature on the same site, i.e. within the saltmarsh system as a whole.

### 4.1 The effects of sea level rise

Sea level rise may contribute to saltmarsh erosion. There may be various reasons for this. In south-east England, increase in tidal range and in particular increase in storminess (wind and wave energy) have caused much of the accelerated erosion of saltmarsh in the past 30 years.

Marshes may continue to accrete both vertically and laterally despite sea level rise if sufficient sediment is available. Their position in the tidal frame will determine lateral growth; if sea level rise occurs the estuary needs to be wider in order to maintain equilibrium. This is called landward transgression or migration of the saltmarsh. Where the system is constrained by hard sea defences, the migration of saltmarsh habitats is prevented. In addition, energy levels within the estuary will be high if a wide expanse of shallows is not available to dissipate energy within the system. These trends result in a reversal of vegetation succession where high and mid marsh communities revert to low marsh communities with the eventual drowning of the vegetation and the reversion of saltmarsh to mudflat or pools of standing water ('coastal squeeze').

Vertical accretion may keep pace with the loss of saltmarsh horizontal extent (e.g. on Furzey Island on Poole Harbour, where erosion is greater in the lower marsh and pioneer zones but where there is increased accretion at the higher elevations on the same marsh). However, this is not always the case, and on the Dengie Peninsula, although there is vertical accretion of up to 7.5mm/year, lateral retreat reaches 22m/year in places. Similarly, at Gravesend, Thames Estuary a 2m high marsh-edge cliff has accreted but continues to retreat at an average rate of 1-2m/year.

Where landward transgression of the saltmarsh is constrained by anthropogenic constructions such as fixed sea defences, natural habitat migration which would otherwise occur is prevented (coastal squeeze). The condition of the feature would be **unfavourable**, since it is prevented from reaching a natural geomorphological equilibrium. However, if the feature is prevented from migrating by a natural topographic feature, such as a cliff, we would consider this to be in **favourable** condition as regards extent (although it may not be favourable for other attributes such as zonation), as the feature is free to reach a natural dynamic equilibrium.

### 4.2 Patterns of saltmarsh erosion

Short to medium term trends of marsh edge progradation (shoreline accretion) can often be found by examination of the marsh-edge morphology. Accreting and stable seaward marsh

edges have an accretional ramp upon which pioneer and low-marsh vegetation can become established (see Sherwood *et.al*.2000, p365). Erosional margins are characterised either by the presence of mud-mound topography or by marsh-edge cliffs fronted by:

- toppled cliff blocks with live or dying vegetation
- rotational slide
- overhanging (cantilever) blocks.

Terraced marsh margins indicate episodic erosion and accretion on timescales over decades to centuries (see Sherwood *et.al*.2000, p365)

The main modes of saltmarsh erosion are

- lateral retreat of the seaward edge
- erosional lowering of parts of the marsh surface usually involving partial or complete destruction of the vegetation (e.g. in the Orwell Estuary)
- internal dissection and enlargement of the drainage network, ultimately leading to the creation of mud basins (e.g. in the Orwell Estuary)

A marsh cliff edge may be eroded by storm events, followed by a period of re-advancement. (Pethick, chapter 3 *in Saltmarsh geomorphology*, 1992). Many open coast marshes are characterised by a highly dissected edge on which vegetation growth is absent, or ephemeral 'mud-mounds'. Vegetation is eroded from the mounds during storm events (pushing back the marsh edge) but will later re-advance over the upper surface of the mud-mounds.

### 4.3 Managed realignment

Managed realignment or managed retreat involves relocating sea embankments further inland and recreating inter-tidal habitat in front of them. Alternatively, intertidal habitat can be recreated back to a natural, high ground contour. There have been several sites where sea wall have been breached and saltmarsh is re-establishing (for example Orplands and Abbotts Hall in Essex) although restoring a fully functioning saltmarsh ecosystem will be a lengthy process (see for example Boorman, 2002; DEFRA/Environment Agency, 2002; Hazelden and Boorman, 2001).

## 5 Physical structure: creeks and pans

Creeks and pans of varying size and density typical of the site are frequent features of the saltmarsh. Creeks absorb tidal energy and assist with the delivery of sediment into saltmarshes. The efficiency of this process depends on creek pattern. Creek density is influenced by vegetation cover, suspended sediment load and tidal influence. Creeks allow pioneer vegetation to be established along their banks higher into the saltmarsh system. Natural salt pans can occur at any level in a saltmarsh. Major erosion of saltmarsh is indicated by internal dissection and enlargement of the drainage network, ultimately leading to the creation of mud basins. The target is no further anthropogenic alteration of creek patterns or loss of pans compared to an established baseline. This is assessed by examination of aerial photographs or other output from remote sensing.

## 6 Vegetation structure

### 6.1 Zonation

When considering the range and distribution of zones, care should be taken to allow for variation in saltmarsh composition. The pattern of saltmarsh zonation will vary regionally

and also from site to site. Saltmarshes have been subject to large-scale historical claim for agriculture, which in many cases has limited or destroyed natural transitions to terrestrial communities. In other cases the pioneer zone may naturally be reduced or even missing, for example in Scotland or on many higher estuarine saltmarshes in south-west England. We are interested in monitoring a habitat to detect **change**, with consideration for natural processes. Pioneer saltmarsh may move around in an estuary, especially if river channels are shifting. At Berrow in North Somerset a succession was seen through pioneer to mixed saltmarsh and subsequently to reedbed, where development of a dune system blocked tidal inundation and reduced salinity.

Where coastal squeeze is occurring (e.g. in Essex) reversed vegetation succession may occur when pioneer saltmarsh (particularly *Salicornia* spp.) recolonises higher marsh as this is eroded.

#### *6.1.1 Characteristics of saltmarsh zones*

In most cases there should be several distinct saltmarsh zones, typically pioneer (low, patchy cover of *Salicornia* spp., *Suaeda maritima*, *Aster tripolium* with bare mud and sand surface), low-mid marsh (continuous cover with *Puccinellia maritima* or *Atriplex portulacoides* often dominant), mid-upper marsh (with *Festuca rubra*, *Limonium vulgare*, *Armeria maritima*, *Plantago maritima* often dominant) and transitions to terrestrial habitats (see 6.1.2) (see Appendix II for list of common names).

Pioneer vegetation may present some problems in deciding the boundary of pioneer saltmarsh and mudflat. We recommend taking the edge of the pioneer zone where the first *Salicornia* or *Suaeda* annuals appear.

#### *6.1.2 Transitions to terrestrial habitats*

A variety of communities may occur at the transition zone at the upper edge of the salt marsh, where these are still present. These include mesotrophic grassland communities (e.g. MG11 - MG13) tall fen community (with *Filipendula ulmaria, Althaea officinalis* and *Iris pseudacorus*) brackish swamp communities (with *Phragmites australis*, *Bolboschoenus maritimus*, *Scirpus tabernaemontani*) or sand dune. Natural transitions to terrestrial habitats are a particularly important feature of Scottish saltmarshes, where many persist. An endemic Red Data Book eyebright *Euphrasia heslop-harrisonii* is found in upper and transition zones in some Scottish saltmarshes, and the nationally rare *Euphrasia foulaensis* occurs in saltmarshes in northern Scotland.

Site-specific targets should be set according to conservation objectives or the management plan (see also 7.1Characteristic species).

### 6.2 Sward structure

Sward structure is closely related to community type and grazing. In many areas grazing continues to be a major determinant of the nature conservation importance of the saltmarsh habitat, particularly where there is ornithological interest. As a general principle, maintenance of the status quo should be a first option until investigations reveal any opportunities for improving existing management or the nature of any adverse changes. If there has been no history of grazing management this should not be considered. The target is to maintain site-specific structural variation. A varied vegetation structure is important for maintaining invertebrate diversity. Stocking levels will need to be appropriate to the interest of the site. Over-grazing can lead to loss of rare plant species and affect bird breeding and feeding habitats and under-grazing can lead to a loss of plant diversity by competitive exclusion.

Levels of grazing are defined by the standing crop (Dijkema and Wolff, 1983):

- light grazing - most of the standing crop is not removed
- moderate grazing - standing crop almost completely removed
- heavy grazing - height < 10 cm, all standing crop removed
- abandoned grazing - matted vegetation, no standing crop removed

Lightly grazed or ungrazed marshes may still retain good structural diversity, a complete sequence of vegetation from pioneer to transitions to terrestrial habitats and plants sensitive to grazing such as *Atriplex portulacoides*, *Limonium vulgare* and *Seriphidium maritimum*. Where grazing has traditionally been heavy (e.g. in northwest England and north-west Scotland, marshes tend to be heavily grazed. stocking densities up to 6.5 sheep (year round) or 2 cows (summer) per hectare occur (Gray, 1972)) grazing-sensitive species may be eliminated and tillering grasses favoured. However, there will usually be specific bird species associated with these close-cropped swards, such as breeding oystercatcher, or winter-grazing ducks and geese and management must consider all interest features of the saltmarsh site.

Where there is a trend towards a cessation of grazing, such as in eastern Scotland, this may lead to a reduction in species diversity and may also lead to increased sedimentation (as taller plants trap more sediment) and a fall in numbers of feeding and roosting birds.

# 7 Vegetation composition

## 7.1 Characteristic species

Communities may be dynamic in their distribution and are linked to the physical processes operating at the site, including topography, creek patterns etc. The species composition and type of saltmarsh will vary regionally and also from site to site (see also text on zonation, Section 6.1). The target is to maintain the frequency of characteristic species of saltmarsh zones (see Box 1, Section 14) as follows:

Pioneer zone: At least one listed species frequent and another occasional

Low-mid marsh: At least one of *Puccinellia maritima, Atriplex portulacoides* or *Salicornia* spp. dominant., and two other listed species at least frequent

Mid-upper marsh: At least one listed species abundant and three frequent.

Transitions to terrestrial habitats are often a very important feature of saltmarshes, and appropriate targets should also be set for these where present (see 6.1.2). Advice on target setting in the relevant guidance sections (e.g. lowland grassland, lowland wetland) should be referred to and adapted to take account of the maritime situation. Examples of targets might be:

- at least one of the following locally abundant: *Filipendula ulmaria*, *Phalaris arundinacea*, *Bolboschoenus maritimus*, *Phragmites australis*, *Iris pseudacorus*

## *7.2* Negative indicator species: *Spartina anglica*

Cord grass *Spartina anglica* is considered to be an invasive species and may impact on intertidal mud flats, pioneer and low-mid marsh communities. However, stands of *Spartina anglica* may play a role in sediment trapping, although under certain tidal conditions erosion around *Spartina* stands may be greater (e.g. on the Humber Estuary). At a number of sites in north west England, former *Spartina*-dominated areas are currently reverting

rapidly to more diverse mixed saltmarsh in which *Spartina* is no more than a component. Scottish saltmarshes have not been affected so much by the introduction of *Spartina anglica* (SM6) as those of England. *Spartina* is a problem only at Auchencairn Bay and the Water of Fleet (both in the Solway) and in the Eden estuary in Fife (Angus, pers.comm).

Natural die-back of *Spartina* has occurred on some saltmarsh along the east and south coasts of England, for example Chichester Harbour or the Solent. It is not yet clear whether this will happen in other areas. Conflict may occur where there is rapid expansion of *Spartina* which impacts negatively on pioneer saltmarsh or mudflat Annex I features. An indicative target has therefore been set of less than 10 % expansion to pioneer saltmarsh in the last 10 years, but this figure may have to be revised following consultation. A monitoring programme would be triggered and management decisions would need to take account of the other designated features of the site. Control of the species would be confined to the pioneer zone. In general, there is no point controlling *Spartina* to protect other types of saltmarsh vegetation. In England, some sites were notified with high *Spartina anglica* cover, so a pragmatic approach is needed. See Appendix I for an example of a case study.

## 8 Other negative indicators

In addition to recording *Spartina anglica*, observations should be made during the field visit for other negative indicators such as:

- signs of disturbance such as new artificial drains (creek realignment is covered in 5)
- obvious visual pollution
- turf cutting
- vehicle damage or trampling at vulnerable locations (tracks, access points).

Targets can be found in the generic table.

## 9 Indicators of local distinctiveness

Indicators of local distinctiveness are features of a saltmarsh that make it 'special' (forming part of the reason for notification) but which are not covered by the attributes already described or by separate guidance e.g. for notified species features. They should be apparent from the SSSI citations or past surveys. This is a discretionary attribute in that it may not be applicable to every site; but where local distinctiveness has contributed to the selection of a site for saltmarsh it should be mandatory. Targets are set to maintain the distinctive elements at current extent/levels and/or in current locations (e.g. to maintain existing populations of notable species or transitions between habitats). The target(s) should be tailored to each site. Such 'quality indicators' may include the following:

- notable plant or animal species that are not notified features in their own right
- associations between saltmarsh and other habitats, e.g. mosaics of vegetation types, transitions to brackish or freshwater swamp.

## 10 Recommended visiting period and frequency of visits

The characteristic plant species of saltmarshes are mostly perennial, which allows them to be assessed over a period of several months. The suggested visiting period is May to October. However, in areas of coastal squeeze, where low-marsh communities dominate, annuals are relatively more abundant and the assessment will need to take this into account ( April to August is suggested). In addition to the basic six yearly monitoring cycle, we recommend the site be checked more frequently if possible.

# 11 Skills required

The person carrying out the assessment should be capable of identifying species most likely to be encountered on saltmarshes. He/she should also have some understanding of the management practices and other factors likely to affect saltmarshes. Knowledge of the site would also be helpful.
Equipment required includes: baseline maps, aerial photographs, hand lens, field forms, SSSI citations and the Conservation Objectives table, management plan or any type of document where the conservation aims for the site are stated. A **hand-held GPS** is extremely desirable for accurate location of sample points.

# 12 Methods of assessment

## 12.1 Data collation

The assessment should be applied to the reporting unit, which may be an SSSI site unit or SAC.

Prior to going out in the field, existing information on the site should be collated. Aerial photographs are particularly useful. Some NVC information should be available for most sites. Each local team should have a copy of the county report of the 1989 Saltmarsh Survey of Great Britain (Burd, 1989), which has original maps for all sites surveyed. In many cases, more recent survey information should be available.

The guidance should be read prior to the field visit and the assessment forms need to be tailored to suit the particular site. If contractors are used, consultation with local conservation agency staff is essential for selecting routes and stopping places.

## 12.2 Assessing habitat extent

Habitat extent should be assessed using any previous information available, preferably aerial photographs. If none is available this first reporting round must form the baseline. The source of the baseline must be clearly identified - aerial photography should include source, date (at least month and year) and scale. Field trials have shown that failure to provide some of this information may mean change will not be able to be assessed. A further problem that may need to be considered is the possible disparity between the extent of saltmarsh habitat notified for saltmarsh interest and that for overwintering birds, as this may not be clear for a site. Local knowledge may be important in this respect. We have a provided a key to help assess condition on saltmarsh if there is loss of habitat extent (see the **key for extent in section 13**)
.
Where there is erosion in one area and (following the **key for extent in section 13**) it was assessed as unfavourable, it could be judged favourable **provided** we can be certain that there is at least equal accretion in other areas on the same site, i.e. within the saltmarsh system as a whole.

## 12.3 Field survey

### *12.3.1 Structured walk*

It is recommended that vegetation structure, vegetation composition and negative indicators for each saltmarsh zone should be assessed using a **structured walk** (e.g. a W shaped walk) with at least 10 stops within each assessment unit (block, management

unit etc.) to avoid excessively variable results. The number of stops should be enough to allow the assessor to have an overview of the site and to judge the condition of the feature. To avoid subjectivity in selecting stops and to ensure that as wide an area as possible is covered, general routes with stops should be pre-selected, based on a map or aerial photograph before the field visit. This also allows the number of stops per unit area to be determined more consistently. The **exact** stopping locations will be recorded in the field using GPS if possible. If contractors are using the guidance, consultation with local staff on route selection and stopping points is **mandatory**.

At each stop, the appropriate attributes (e.g. percentage cover and/or presence of relevant species) should be assessed within approximate 4 $m^2$ sampling units. There is no need to measure cover values precisely – simple visual estimates will suffice. It should not take very long (no more than 5 minutes) to record all the relevant attributes at each 'stop'.

The recommended methods of selecting the number and location of the stops are not intended to have statistical value, and the final condition of the interest feature is not simply the average of the condition of each stop. On the contrary, each stop should contribute to improve the assessor's overview of the state of the site. The following is a quantitative definition of frequency, intended to assist with the assessment of several of the saltmarsh attributes. This is a version of the well-known DAFOR scale which has been adapted to the particular characteristics of saltmarsh:

- **Dominant:** the species appears at most (>60%) stops and it covers more than 50% of each sampling unit.
- **Abundant:** species occurs regularly throughout a stand, at most (>60%) stops and its cover is less than 50% of each sampling unit.
- **Frequent:** species recorded from 41-60% of stops.
- **Occasional:** species recorded from 21-40% of stops.
- **Rare:** species recorded from up to 1-20% of stops.

Sward structure can be assessed by taking the average sward height recorded from the structured walk stops.

### *12.3.2 Transects*

This technique can be used for assessing saltmarsh zonation. It is an assessment of where one zone ends and another begins; the aim of the assessment is to detect long-term negative trends that may be occurring. Transects will allow the width of the saltmarsh zones to be estimated at a minimum of five locations. Transects should ideally be pre-selected, based on a map or aerial photograph before the field visit and locations fixed by GPS. Transects will extend from strandline to lowest continuous marsh and the position should be recorded ideally with GPS to allow easy relocation for future assessments. Transect locations can be recorded using a recording form and ideally drawn over aerial photographs using a GIS system. the width of the zones to be estimated. Where possible the estimated width of zones at the five chosen locations should be compared to previous surveys, to assess any changes.

It is recommended that the transects to assess width of saltmarsh zones are done after the assessment for the vegetation composition.

### *12.3.3 Other aspects of recording*

The routes followed for the structured walk and the start and finish points of the transects should be marked on a map for future comparative use. Ideally these should be traced over aerial photos of the site using GIS, to enable comparisons on future visits.

**Photographs are essential to the condition assessment and should be taken as an accompanying record wherever possible. These should be archived with the assessment file. In some countries photography is a mandatory part of the condition assessment.**

There are several new technologies being trialled to aid the condition assessment process, such as CASI (Compact Airborne Spectrographic Imager) and LIDAR (Light Detection and Ranging) which may provide a very useful tool for assessing zonation as well as extent.

## 12.4 Health and safety

Health and safety is particularly important on saltmarshes and will be another aspect to be considered when planning the route. Saltmarsh creeks can make some areas almost inaccessible and survey may be impossible. In some systems, such as the Solway, the tide may come in with great speed. In other areas you may need to be accompanied, which has significant workload implications.

# 13 Field recording forms

The agencies will supply separate field recording forms that fit within the objectives detailed in this guidance.

It is advisable to record as much information as resources and time allow in a consistent manner during different visits and to keep all the records in a file. This will provide a track of the history of the condition of the site in relation to management. Mark the route of your 'W' walk and transects on a map and take photographs, especially of the more dynamic parts of the habitat. Transects to assess zonation should also be marked on a map.

The tables provided in the field recording forms supplied by each agency are for guidance only. Lists of species should be produced on a site-specific basis, and the assessment should be carried out based on the particular conservation objectives tables or management plans.

**An example of a recording form for zonation:**

*Target: Maintain the range of variation of zonations typical of the site*

Zonation should ideally be assessed **after** sward composition, as you will then be more familiar with the vegetation composition at your site.

As a crude baseline, estimate the width of saltmarsh zones for one or more transects. The transect should extend from strand to lowest continuous marsh. Use the table below to record the GPS start and finish points for each zone. The GPS transect locations should be marked on a map.

| Saltmarsh zones (if present) | Transect | | | | |
|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 |
| GPS coordinates | | | | | |
| Brackish swamp or sand dune transition | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| Other habitats above upper marsh | | | | | |
| Saltmarsh strand | | | | | |
| mid-upper saltmarsh | | | | | |
| low-mid saltmarsh | | | | | |
| pioneer saltmarsh | | | | | |

**Draft key for assessing zonation:**

Where there is horizontal loss of extent and evidence of erosion at the marsh edge, the following key should help decide condition for saltmarsh zonation:

*If there is..*

- reversed vegetation succession where high and mid marsh communities revert to low marsh or pioneer communities with eventual drowning of the vegetation and reversion to mudflat or pools of standing water ***or*** vertical accretion of the saltmarsh accompanying horizontal loss of area

*is the*

-zonation altered with one or more saltmarsh zones (e.g. midmarsh) reduced
*Favourable condition*

-zonation altered with one or more saltmarsh zones (e.g. low-mid marsh or mid-upper saltmarsh) disappeared
*Unfavourable condition*

**Draft key for assessing the extent attribute**

1. extent of the feature based on the most recent aerial photography

- appears to be increasing *or*
- no apparent change *go to 2*

- increase in some places, decrease in others *or*
- appears to be net decrease over the entire area *go to 3*

2. evidence of accretion at the marsh edge (accretional ramp with pioneer species)
*favourable condition for extent*

3. - evidence of erosion in some areas (mud mounds, cliff edge toppling) but accretion in other areas (accretional ramp with pioneer species); indicating a net balance or gain within the system
*favourable condition for extent*

- evidence of erosion over most of the marsh edge surface areas (mud mounds, cliff edge toppling etc. ) combined with loss of horizontal extent of the saltmarsh area
*go to 4*

4. – We need to consider the long-term future of the saltmarsh feature.

- is the saltmarsh constrained by natural topographical features (e.g. high ground, cliff)?
*favourable condition for extent*
**continue with condition assessment**

- do anthropogenic constraints prevent the feature from reaching morphological equilibrium?

*unfavourable condition for extent*

## 14 Generic guidance table

### Table 1. UK GUIDANCE ON CONSERVATION OBJECTIVES FOR MONITORING DESIGNATED SITES

### Interest feature: Saltmarsh

Includes the following:

**Pioneer saltmarsh**: Equivalent NVC communities: SM4, SM5, SM6, SM7, SM8, SM9, SM11, SM12.
Annex I types: *Salicornia* and other annuals colonising mud and sand (1310), *Spartina* swards (1320)
**Low-mid marsh communities:** Equivalent NVC communities: SM10, SM13a, SM14.
Annex I types: Atlantic saltmeadows (1330) *pp*.
**Mid-upper marsh communities:** Equivalent NVC communities: SM13b,c,d, SM15, SM16, SM17, SM18, SM19, SM20, SM21, SM22, SM23, SM26, SM27
Annex I types: Atlantic saltmeadows (1330) *pp*, Mediterranean and thermo-Atlantic halophilous scrubs (1420).
**Driftline:** Equivalent NVC communities: SM24 and SM25, SM28
Annex I types: Atlantic saltmeadows (1330) *pp*
**Transitions**: including mesotrophic grassland communities (e.g. MG 11, MG12, MG13) brackish mire (M28) and swamp communities (e.g. S4, S5, S18, S19, S20, S21, S26)

Phase I category: H2 Saltmarsh

**Reporting category: Littoral sediment**

NB All attributes listed are mandatory, unless indicated as discretionary. A single failure to achieve a target among the mandatory attributes leads to unfavourable condition for the whole monitoring unit

| Attribute | Targets | Method of assessment | Comments |
|---|---|---|---|
| **Extent of habitat** | No decrease in extent from the established baseline, subject to natural change. | A baseline map should be prepared to show the distribution of saltmarsh vegetation, using aerial photography or existing NVC survey data.<br>**See extent key in 5** | See guidance on habitat extent, patterns of saltmarsh erosion, effects of sea level rise (Section 4).<br>Extent may be subject to periodic and seasonal variation, particularly pioneer saltmarsh. Extent should be measured at low tide. |
| **Physical structure: creeks and pans** | No further anthropogenic alteration of creek patterns or loss of pans compared to an established baseline.<br>Realignment of creeks absent or rare. | Aerial photographs can be used, combined with information gathered from the site visit. | Creeks and pans vary in size and density. Creeks absorb tidal energy and assist with the delivery of sediment into saltmarshes. Major erosion of saltmarsh is indicated by internal dissection and enlargement of the drainage network, ultimately leading to the creation of mud basins. |

| Attribute | Targets | Method of assessment | Comments |
|---|---|---|---|
| **Vegetation structure: zonation of vegetation** | Maintain the range of variation of zonations typical of the site. See lists of indicators (Box 1) and notes on transitional vegetation below. | The width of zones can be estimated using one or more transects extending from strand to lowest continuous marsh. The GPS information can be collected and marked on a map. | The pattern of saltmarsh zonation will vary regionally and also from site to site (see Section 6.1). Saltmarsh has up to five main zones: pioneer, low-mid marsh, mid-upper marsh, saltmarsh strand plus transitions (see transitions below) |
| **Vegetation structure: sward height** | Maintain site-specific structural variation in the sward. (see section 6.2)<br><br>Example: Strangford Lough:<br>Maintain short sward (4 – 12 cm) in areas of species-rich vegetation | This can be assessed by taking average sward height from the quadrats forming part of the structured walk | Stocking levels need to be appropriate to the interest of the site (see Section 6.2). Over-grazing can lead to loss of rare plant species and affect bird breeding and feeding habitats and under-grazing can lead to a loss of plant diversity by competitive exclusion. A varied vegetation structure is important for maintaining invertebrate diversity. |
| **Vegetation composition: characteristic species** | Maintain frequency of characteristic species of saltmarsh zones (see Box 1 below) as follows:<br><br>Pioneer zone: At least one listed species frequent and another occasional<br><br>Low-mid marsh: At least one of *Puccinellia maritima, Atriplex portulacoides* or *Salicornia* spp. dominant., and two other listed species at least frequent<br><br>Mid-upper marsh: At least one listed species abundant and three frequent<br><br>Terrestrial transition: where present appropriate targets should be set, with reference to relevant guidance section e.g. Lowland grassland, lowland wetland (see 7.1) | Visual assessment of cover, using structured walk | Communities may be dynamic in their distribution and are linked to the physical processes operating at the site, including topography, creek patterns etc. The species composition and type of saltmarsh will vary regionally and also from site to site (see also text on zonation).<br><br>A variety of communities may occur at the transition zone at the top of the salt marsh. These include mesotrophic grassland communities (e.g. MG11 - MG13) together with swamp communities (e.g. S4, S12, S20, S21 & S28). In addition stands of tall fen community with *Filipendula ulmaria* and *Iris pseudacorus* (M28) can locally be prominent. |
| **Vegetation composition: negative indicator species** *Spartina anglica* | No recent evidence of expansion into pioneer saltmarsh (indicative target of less than 10 % expansion in last 10 years) | Aerial photographs, together with visual assessment of cover, using structured walk | *Spartina anglica* is a species that is considered undesirable in intertidal habitats where it is expanding at the expense of mudflats (seeSection 7.2). However it can be a precursor to the development of saltmarsh where sediments are accreting. Natural die-back has occurred in some areas. |

| Attribute | Targets | Method of assessment | Comments |
|---|---|---|---|
| **Other negative indicators** | Artificial drainage channels adversely affecting hydrology are absent or rare<br><br>No obvious signs of pollution.<br><br>Turf cutting absent or rare<br><br>No increase in bare substrate as a result of anthropogenic activities such as vehicle use or trampling at vulnerable locations (tracks, access points)<br><br>Poaching damage from stock or horses rare, with bare mud extent <25% | Visual assessment during site visit | |
| **Indicators of local distinctiveness***<br><br>*If part of the reason for the notification of the site, this is a mandatory attribute | Maintain distinctive elements at current extent/levels and/or in current locations (e.g. maintain existing populations of notable species, important structural attributes or notable transitions between habitats). | Presence confirmed during visit at appropriate season (list species, add DAFOR score, mark locations on map(s) in file).<br><br>List to be tailored to each site | This attribute is intended to cover any site-specific aspects of this habitat feature (forming part of the reason for notification) which are not adequately covered by the previous attributes , or by separate guidance e.g. for notified species features. |

## Box 1. Typical species for saltmarsh zones

| pioneer zone | low-mid marsh | mid-upper marsh | |
|---|---|---|---|
| *Salicornia* spp.<br>*Suaeda maritima*<br>*Puccinellia maritima*<br>*Aster tripolium* | *Puccinellia maritima*<br>*Triglochin maritima*<br>*Plantago maritima*<br>*Atriplex portulacoides*<br>*Aster tripolium*<br>*Spergularia maritima*<br>*Suaeda maritima*<br>*Salicornia* spp.<br>turf fucoids | *Festuca rubra*<br>*Juncus gerardii*<br>*Armeria maritima*<br>*Agrostis stolonifera*<br>*Limonium vulgare*<br>*Glaux maritima*<br>*Seriphidium maritimum*<br>*Plantago maritima*<br>*Aster tripolium*<br>*Juncus maritimus*<br>*Triglochin maritima*<br>*Blysmus rufus*<br>*Eleocharis uniglumis* | *Artemisia maritima*<br>*Leontodon autumnalis*<br>*Carex flacca*<br>*Carex extensa*<br>turf fucoids |

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# APPENDIX I CASE STUDIES

## 1. Extent

**Essex Estuaries**
Abbotts Hall on the Blackwater Estuary is backed by a seawall. There is a high level of erosion with mud mounds, algae and *Salicornia* spp. recolonising on the lower marsh as this is eroded. The low-mid marsh (with dominant Atriplex portulacoides) is degrading, indicated by increasing abundance of pioneer species (*Salicornia* spp, *Suaeda maritima*). Maritime grasses, e.g. *Puccinellia maritima* are now confined to the seaward face of the seawall and mid-upper species are now absent (Carole Reid *pers.comm*.).
The marsh is recorded as in unfavourable condition (for extent and zonation).

**Norfolk**
The North Norfolk Coast SSSI contains areas where continuous accretion is occurring (at Blakeney Point, western end of Scolt Head, Holkham and Thronham harbour) and others where there is some erosion (at Brancaster Staithe, Blakeney Ridge and Gore Point). Overall a balance is ocurring and the site can be considered to be in favourable condition for extent.

**Morecambe Bay**
Similarly, at Morecambe Bay SSSI there has been erosion over the last 25 years on one side of the bay, at Silverdale marsh, while on the other, at the Cartmel Peninsula, the saltmarsh is actively accreting. There is net accretion within the Bay system as a whole (Adam, P. *in* Sherwood *et al.* 2000, *British Saltmarshes*). Overall a balance is occurring and the site can be considered to be in favourable condition for extent.

## 2. Negative indicators: *Spartina anglica*

**Exe Estuary**
Cockwood corner is part of the Exe Estuary SSSI and is backed by sea defences. This corner of estuarine saltmarsh consists largely of SM6 *Spartina anglica* with some SM14 *Atriplex portulacoides* and some SM24 *Elymus pycnanthus* saltmarsh (from Hughes, M. 1992) but there has been very little change since 1992. The assessment for the area would be favourable condition. (Chris Davies *pers.comm*.).

APPENDIX II Common names and synonyms for saltmarsh plant species

| **Scientific name** | **English/common name** |
|---|---|
| *Agrostis stolonifera* | Creeping bent |
| *Armeria maritima* | Thrift |
| *Seriphidium maritimum* (*Artemisia maritima*) | Sea wormwood |
| *Aster tripolium* | Sea aster |
| *Atriplex* (*Halimione*) *portulacoides* | Sea-purslane |
| *Blysmus rufus* | Saltmarsh flat-sedge |
| *Carex extensa* | Long-bracted sedge |
| *Carex flacca* | Glaucous sedge |
| *Eleocharis uniglumis* | Common spike-rush |
| *Eleocharis parvula* | Dwarf spike-rush |
| *Elytrigia atherica* | Sea Couch |
| *Elytrigia* (*Elymus*) *repens* | Couch |
| *Elytrigia juncea* (*Elytrigia pungens, Elymus farctus*) | Sand Couch |
| *Festuca rubra* | Red fescue |
| *Filipendula ulmaria* | Meadowsweet |
| *Fucus cottonii* | a turf fucoid |
| *Frankenia laevis* | Sea-heath |
| *Glaux maritima* | Sea-milkwort |
| *Inula crithmoides* | Golden Samphire |
| *Iris pseudacorus* | Yellow Iris |
| *Juncus gerardii* (*gerardi*) | Saltmarsh rush |
| *Juncus maritimus* | Sea rush |
| *Limonium vulgare* | Common sea lavender |
| *Limonium humile* | Lax-flowered sea lavender |
| *Parapholis strigosa* | Sea hard-grass |
| *Plantago maritima* | Sea plantain |
| *Puccinellia distans* | Northern saltmarsh-grass |
| *Puccinellia maritima* | Common saltmarsh-grass |
| *Salicornia spp.* | Glasswort, Samphire |
| *Sarcocornia perennis* (*Arthrocnemum perenne)* | Perennial glasswort |
| *Spartina anglica* | Common cord-grass |
| *Spartina maritima* | Cord-grass |
| *Spartina alterniflora* | Smooth cord-grass |
| *Spergularia marina* | Lesser sea-spurrey |
| *Suaeda maritima* | Annual sea-blite |
| *Suaeda vera* | Shrubby sea-blite |
| *Triglochin maritima* | Sea arrowgrass |

# Appendix 9: Policy Map Plan Area WEB

Local Plan
North East Lincolnshire

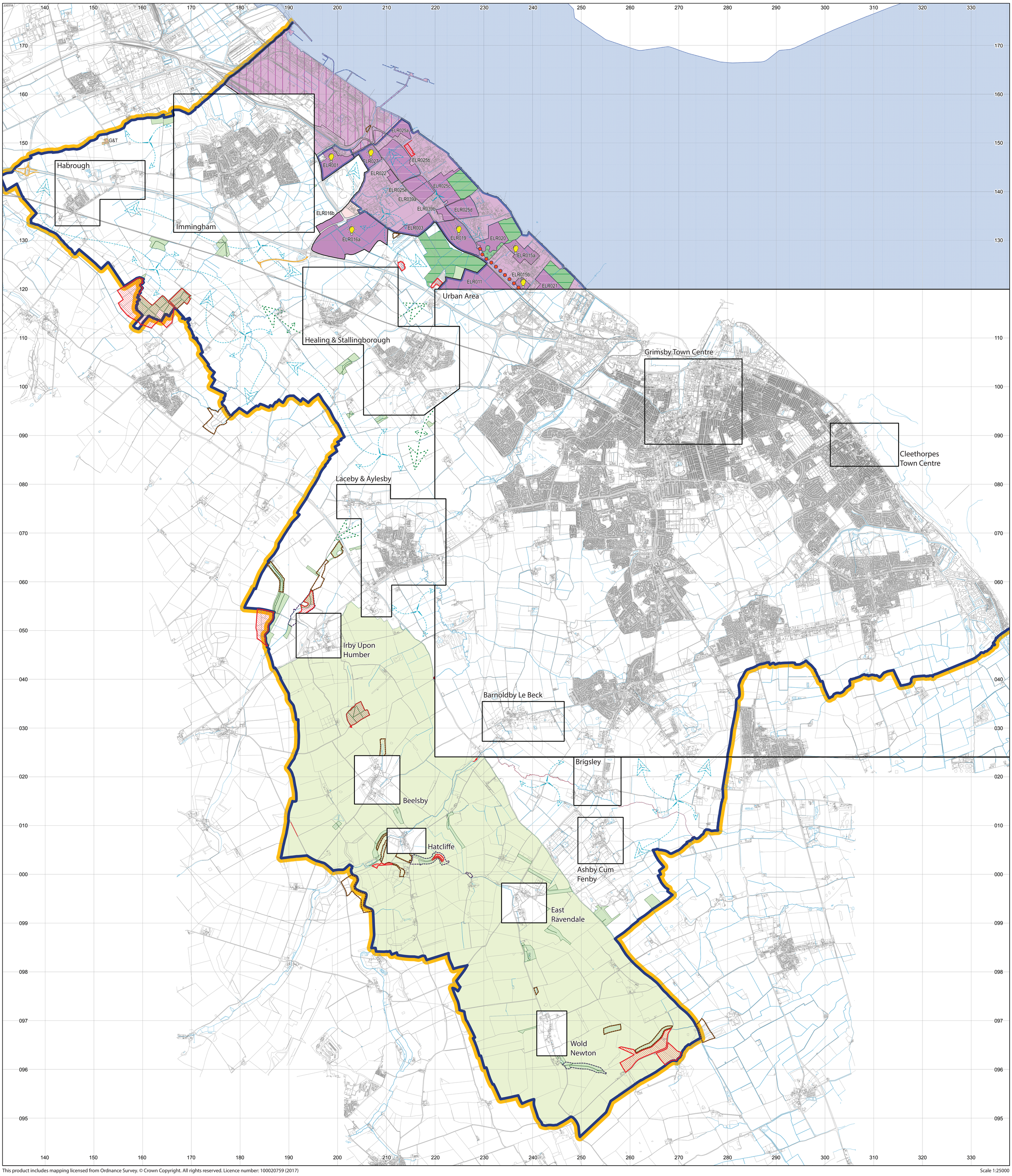
# Local Plan
## 2013 to 2032

(Adopted 2018)

## Plan Area

**KEY**

- SHB Habitat Mitigation Zone
- Habitat Mitigation - Proposed Managed
- Habitat Mitigation - Complimentary Grassland
- AONB
- Openspace & Woodland
- ELR011 Employment - Proposed Allocation
- ELR021 Employment - Retained For Long Term Business Use
- Employment - Existing Employment Area
- Employment - Operational Port
- G&T Gypsy & Traveller - Proposed Provision
- Education Area
- LWS
- cLWS
- LGS
- SNCI
- SSSI
- Ramsar / SPA / SAC
- Local Plan Boundary
- Development Area Boundary
- Road - Proposed New
- Road - Under Construction
- Enterprise Zone
- Strategic Green Infrastructure Corridors (Non specific Width)
- General area most suitable for Wind Energy (Non specific boundary)



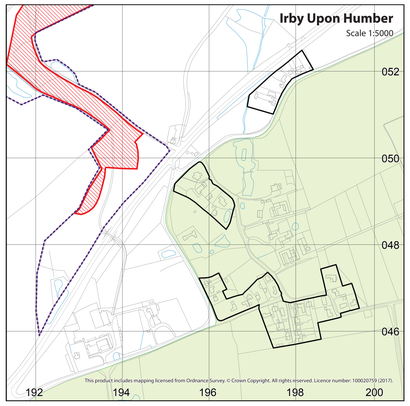


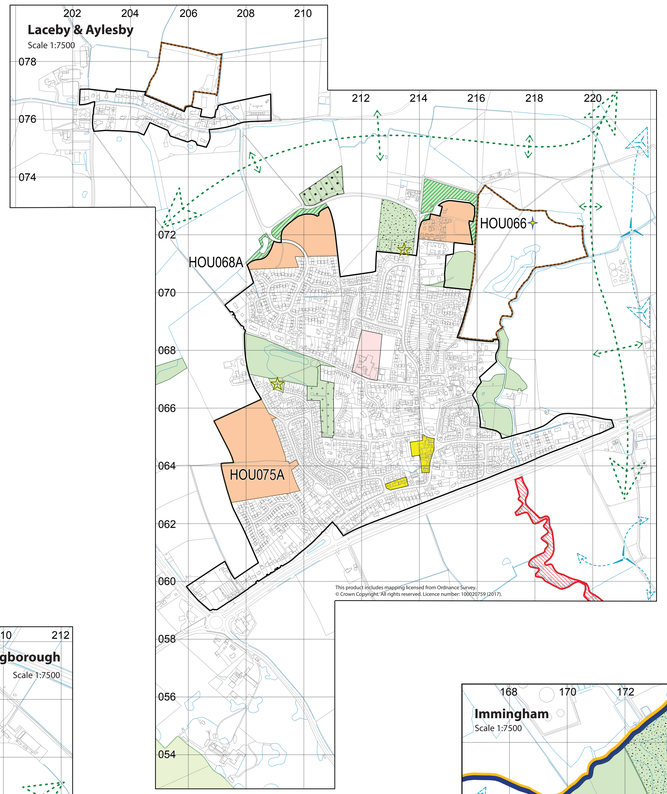

Scale 1:25000

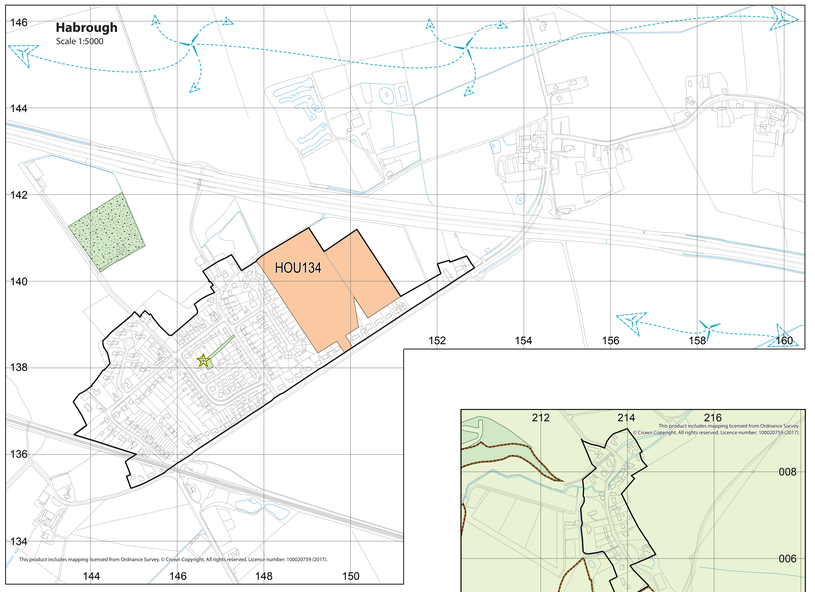
# Appendix 10: Policy Map Inset Maps WEB-1

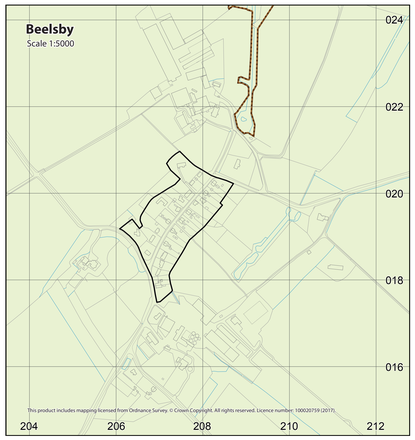
## KEY

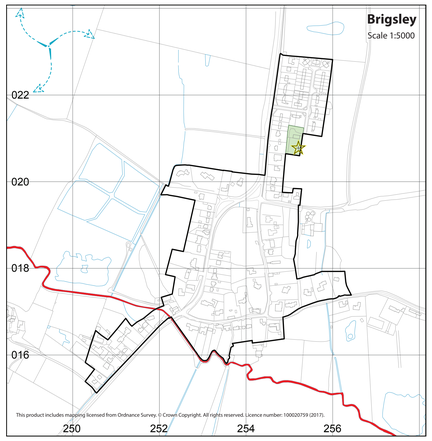
- ELR011 — Employment - Proposed Allocation
- Employment - Existing Employment Area
- Employment - Operational Port
- HOU111 — Housing - Proposed Allocation (Denotes Under Construction)
- Education Area
- Town Centre
- Primary Shopping Frontage
- Local Centre
- LWS
- cLWS
- LGS
- SNCI
- Openspace & Woodland
- Proposed Openspace & Woodland
- Sport & Recreation
- Proposed Sport & Recreation
- Allotment
- Cemetery
- AONB
- Development Area Boundary
- Local Plan Boundary
- Equipped Childrens Play Area
- Strategic Green Infrastructure Corridor (Non specific width)
- General area most suitable for Wind Energy (Non specific boundary)

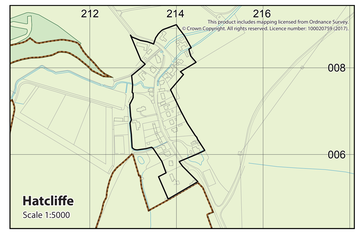


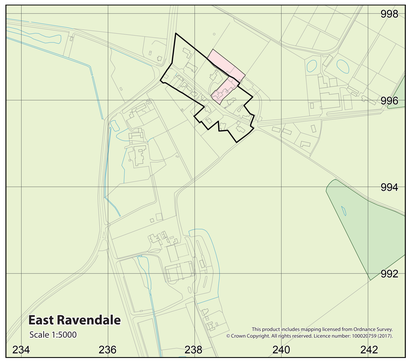



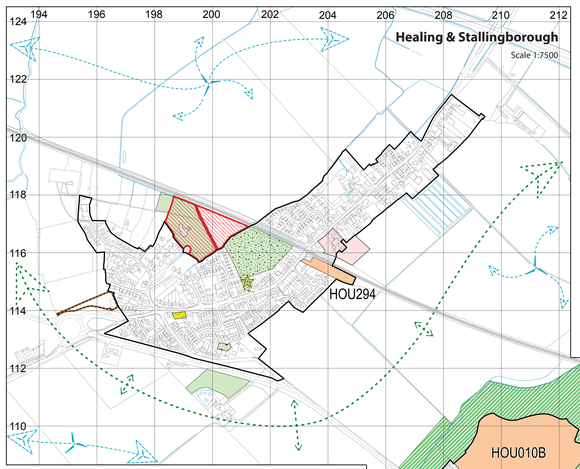



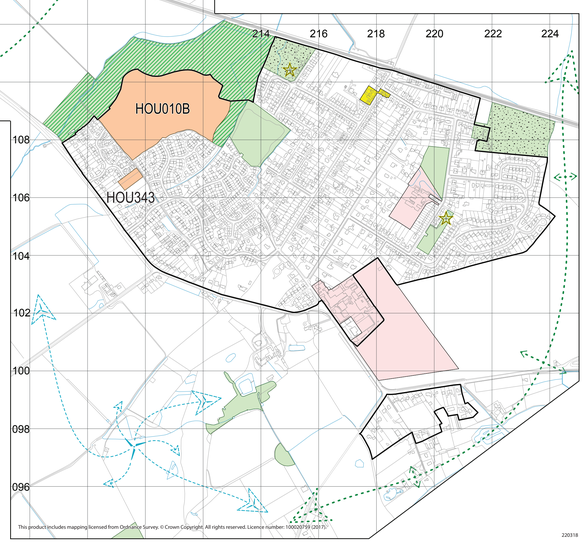



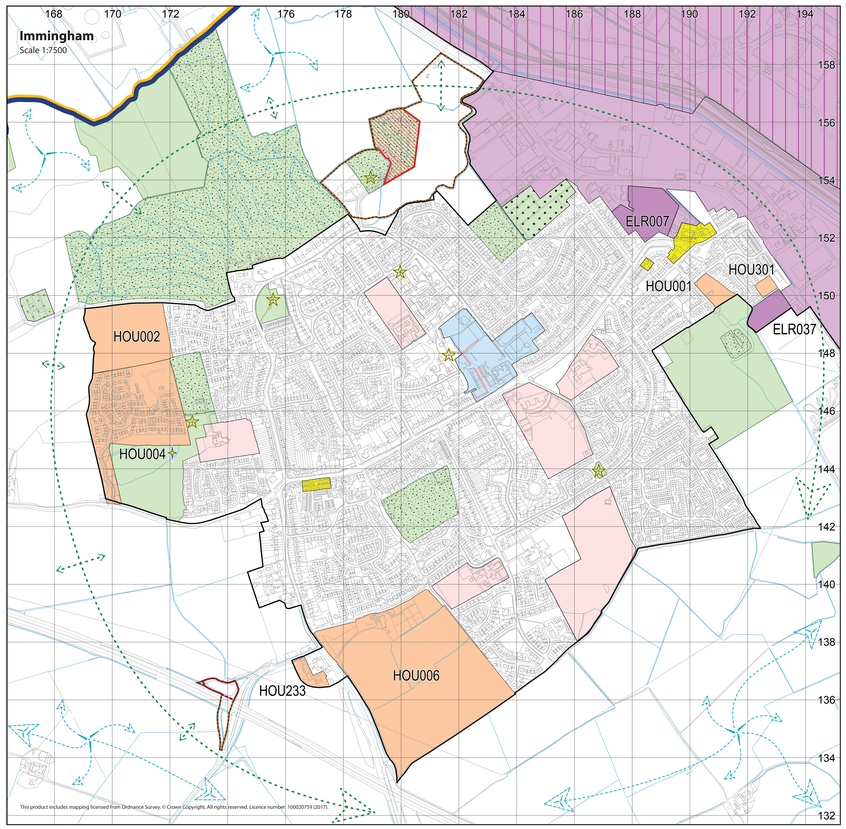



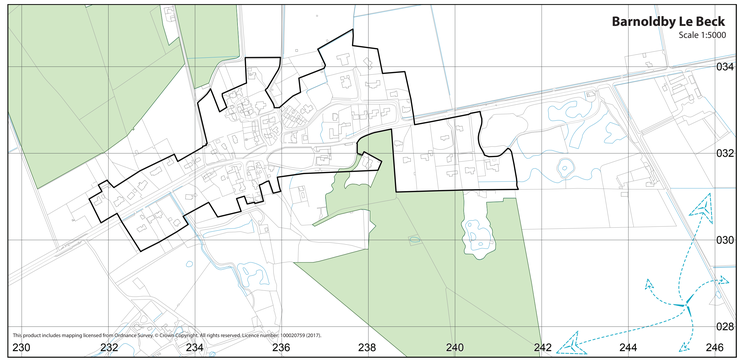



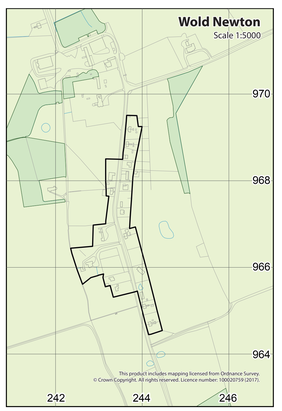



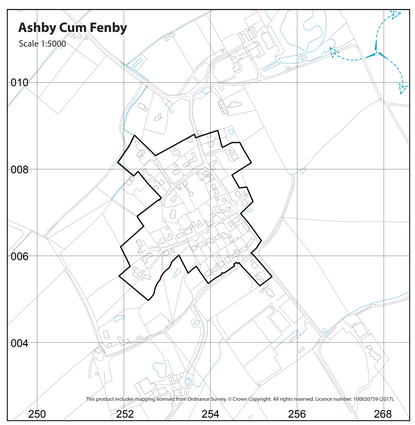




Local Plan
North East Lincolnshire

# Local Plan
## 2013 to 2032

(Adopted 2018)

## Inset Maps

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