Departmental brief:

Proposed extensions to the Hamford Water Special Protection Area (SPA)

Natural England

November 2015

Contents

Summary

Hamford Water SPA citation was written in July 1992 and the site was classified as an SPA in 1993. It supports numbers of European importance of two species listed in Annex I to the EU Birds Directive (breeding little tern *Sternula albifrons* and wintering avocet *Recurvirostra avosetta*) and seven regularly occurring migratory species of waterbirds. Table 1 (below) lists the species for which Hamford Water is classified as an SPA under articles 4.1 and 4.2 of the EU Bird Directive, as set out in the existing citation. It is now proposed that the SPA be extended to include important marine foraging areas used by the little terns from the breeding colonies within the existing SPA. This Departmental Brief makes use of the most recent available estimates of the population sizes of little tern. However, in respect of all other existing features, this Departmental Brief does not make any proposal to amend baseline population figures, nor does it make any proposal to add or remove qualifying features for the site.

Table 1 Summary of qualifying ornithological interest in Hamford Water SPA.

Species	Count (period)	% of subspecies or population	Interest type
Qualifying features with revised counts			
Little tern *Sternula albifrons*	39 pairs[1] – breeding (78 breeding adults) 2010 – 2014	2.1% of GB population[2]	Annex 1
Qualifying features with counts remaining as at 1993 classification			
Avocet *Recurvirostra avosetta*	99 individuals[3] – wintering 1986/87 – 1990/91	7% of GB population[3]	Annex 1
Dark bellied brent goose *Branta bernicla bernicla*	5,650 individuals[3] – wintering 1986/87 – 1990/91	2% of biogeographic population[3]	Migratory
Shelduck *Tadorna tadorna*	840 individuals[3] – wintering 1986/87 – 1990/91	1% of GB population[3]	Migratory
Teal *Anas crecca*	3,630 individuals[3] – wintering 1986/87 – 1990/91	2% of GB population[3]	Migratory
Ringed plover *Charadrius hiaticula*	620 individuals[3] – wintering 1986/87 – 1990/91	1% of biogeographic population[3]	Migratory
Grey plover *Pluvialis squatarola*	1,080 individuals[3] – wintering 1986/87 – 1990/91	2% of GB population[3]	Migratory
Black-tailed godwit *Limosa limosa*	1,580 individuals[3] – wintering 1986/87 – 1990/91	2% of biogeographic population[3]	Migratory
Redshank *Tringa totanus*	1,240 individuals[3] – wintering 1986/87 – 1990/91	1% of biogeographic population[3]	Migratory

[1] Data from: Seabird Monitoring Programme (SMP) augmented with data from a consultant surveyor for 2014 (Gibson 2014)
[2] GB breeding population derived from Musgrove *et al.* (2013)
[3] Data from: Hamford Water SPA citation. In those cases in which % values are expressed in terms of %GB for non-Annex 1 species, no figure, expressed in terms of % of biogeographical population, was given in the original citation.

1. Rationale and data underpinning site classification

In 1979, the European Community adopted Council Directive 79/409/EC on the conservation of wild birds (EEC, 1979) known as the 'Birds Directive'. This has been amended subsequently as **Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds.** This provides for protection, management and control of naturally occurring wild birds within the European Union through a range of mechanisms. One of the key provisions is the establishment of an ecologically coherent network of protected areas. Member States are required to identify and classify in particular the most suitable territories in size and number for rare or vulnerable species listed in Annex I (Article 4.1) and for 'regularly occurring migratory species' under Article 4.2 of the Directive. These sites are known as Special Protection Areas (SPAs) in the UK. Guidelines for selecting SPAs in the UK were derived from knowledge of common international practice and based on scientific criteria (JNCC 1999).

As no changes to the qualifying features are proposed as part of this marine extension this document does not seek to repeat the justification for these features against the JNCC selection guidelines for Special Protection Areas as this was the basis of the 1993 classification.

According to Stroud *et al.* (2001), the task of identifying a coherent network of terrestrial sites in the UK is largely complete, comprising 243 sites of which some include areas used by inshore non-breeding waterbirds, for example in estuaries. However, the JNCC's SPA Selection Guidelines do not review requirements of birds using the wholly marine environment. Johnston *et al.* (2002) describe a process by which SPAs might be identified for marine birds under the Birds Directive consisting of three strands:

Strand 1: seaward extensions of existing seabird breeding colony SPAs beyond the low water mark;
Strand 2: inshore feeding areas used by concentrations of birds (e.g. seaduck, grebes and divers) in the non-breeding season; and
Strand 3: offshore areas used by marine birds, probably for feeding but also for other purposes.

Since then, a fourth strand was added to the work conducted by the Joint Nature Conservation Committee (JNCC) to address the need for:

Strand 4: other types of SPA http://jncc.defra.gov.uk/page-4184 that would identify some important areas for marine birds that may not be included within the above three categories and will be considered individually

To implement conservation measures under Strand 1, the JNCC produced generic guidance (McSorley *et al.* 2003, 2005, 2006; Reid & Webb 2005) to extend the seaward extent of SPA boundaries from seabird colonies. The seaward extensions of existing boundaries in these cases include waters vital for the essential ecological requirements of the breeding seabird populations (e.g. preening, bathing, displaying and potentially local foraging). The distance of the extension is dependent upon the qualifying species breeding within the SPA. However, these generic boundary extensions are not influenced by or meant to encompass the principal foraging areas used by the species for which they are identified or any other species at the colonies concerned.

All five species of tern that regularly breed in the UK (Arctic tern *Sterna paradisaea*, common tern *S. hirundo,* Sandwich tern *S. sandvicensis,* roseate tern *S. dougallii* and little tern *Sternula albifrons*) are listed on Annex I of the EU Birds Directive and thus are subject to special conservation measures including the classification of Special Protection Areas (SPAs). Within the UK there are currently 57 breeding colony SPAs for which at least one species of tern is protected. However, additional important areas for terns foraging at sea have yet to be classified as marine SPAs to complement the existing terrestrial suite. To implement conservation measures under Strand 4, the JNCC has worked since 2007 with the four Statutory Nature Conservation Bodies (SNCBs) towards the identification of such areas as, given the likely extent of these areas, these cannot be addressed by application of the generic "maintenance" extensions approach and are not covered by the work on identifying inshore non-breeding aggregations or important offshore areas.

This Departmental Brief sets out information supporting a proposed extension to the Hamford Water SPA on the basis of the areas of sea identified as being most important to the little tern populations that comprise a qualifying feature of this SPA.

1.1. Data collection

Little tern is a qualifying feature of the existing Hamford Water SPA and the citation states an average of 35 pairs (1986-1990). For this Departmental Brief, the count data for little terns have been taken to be the most recently available which is 39 pairs (2010-2013) derived from the JNCC Seabird Monitoring Programme (SMP) and presented in JNCC report 548 (Parsons *et al*. 2015), augmented by data collected in 2014 by a consultant surveyor (Gibson 2014). Use of these recent count data for this species ensures that the size of the population of the interest feature, the ecological needs of which are the basis of the proposed marine extension, is contemporary with the period of years over which the data used to define that marine extension were gathered. This is in line with Defra advice to always use contemporary bird data for features which are the basis for boundary extensions/amendments as little tern are the basis for the current extension at Hamford Water.

1.2. Defining the boundary of Hamford Water pSPA

The proposed extension to the Hamford Water SPA has been drawn to encompass the sea areas identified under the fourth strand of JNCCs work programme as being most important to support the little terns when foraging. The little terns are already a qualifying feature of the existing SPA. The work done to identify the areas important to little terns is described in the following sub-section.

1.2.1. Identification of important marine areas for little tern

Of the five species of tern which regularly breed in Great Britain, little tern is the smallest and has the most limited foraging range: mean range of 2.1 km, mean of recorded maxima of 6.3 km and maximum ever recorded in the literature being 11 km (Thaxter *et al.* 2012). In the light of this evidence, JNCC, in agreement with all of the Statutory Nature Conservation Bodies (SNCBs), decided that the most effective method to determine the extent of the areas most heavily used for foraging by breeding little terns would be to undertake a programme of shore based observations and of boat-based transects of seaward areas around colonies and to use the resultant distribution data directly in setting the alongshore and seaward boundaries respectively.

Accordingly, between 2009 and 2013 JNCC coordinated a programme of survey work to identify important foraging areas for little terns at a number of UK little tern colonies. These surveys were conducted during the chick rearing period in each year and comprised repeated shore-based counts of little terns seen at a series of observation stations at increasing distances from the colony locations, and repeated boat-based surveys along transects across the waters seawards from the colonies. These surveys sought to establish the distances both alongshore and seawards that little terns were travelling to feed.

In total, 70 shore-based surveys were undertaken at 14 little tern colonies around the UK with a total of 7,006 registrations of little terns at various points along the shore. Twenty three boat-based transect surveys were undertaken across waters near eight colonies around the UK with a total of 781 registrations of little terns at various distances offshore.

The following sub-section summarises survey work and boundaries identified at the Hamford Water SPA little tern colony. Further general information on the little tern survey programme is presented in Annex 4.

1.2.2. Hamford Water SPA

The foraging areas of little tern in the Hamford Water area were assessed in 2012 and 2013 via shore-based 'alongshore' and boat-based 'seaward' extent surveys (Parsons *et al.* 2015). Three shore-based surveys were undertaken in 2013 and recorded a total of 123 tern passes. No shore-based surveys were undertaken in 2012. Five boat-based surveys were completed in 2012 (3 surveys) and 2013 (2 surveys) and recorded in total 51 tern sightings, all of which were made during the 2013 surveys. The fact that no little terns were recorded from the boat surveys in 2012 could have been due to the suboptimal timing of the surveys, as suggested by Lawson & Parsons (2013). The site-specific extents are therefore based on just one year of data, as no little terns were recorded from the boat surveys in 2012 and alongshore counts were undertaken in 2013 only.

According to Parsons *et al*. (2015) the field data is considered sufficient to justify a site-specific seaward extent and the field data for the alongshore extent is considered to be of intermediate sufficiency. Therefore either a generic or site-specific approach to setting the boundary of the proposed marine extension could be taken.

The shallower waters around Pennyhole Bay, which are outside of the current Hamford Water SPA boundary, have been observed locally to be important for foraging little terns. This area has large sand banks and as the tides rise and fall foraging little terns tend to concentrate their efforts in the shallow water close to the sand banks (Leon Woodrow – Nature Conservation Officer at Tendring District Council, *pers comm*). This area corresponds with the cluster of observations from the boat-based surveys in the area around the mouth of Hamford Water. It also corresponds with the area where the highest number of little terns were recorded from alongshore counts. Therefore, based on local knowledge, the alongshore and

seaward site-specific boundary extensions encompass the most important foraging areas for little terns from the Hamford Water colony.

Based on the above, Natural England considered that a site-specific marine boundary extension supported by data collected from site-based surveys was the preferred option. At the N2K Project Board on 18 November 2014 (paper reference 2.14) it was agreed that a site-specific approach would be taken at Hamford Water.

The little tern sightings derived from both the shore-based and boat-based surveys are shown in Figure 1, along with potential alongshore and seaward boundary options: site-specific (using data collected from surveys at Hamford Water alone) or generic (using averages based on data from all colonies where recording was undertaken).

The site-specific survey data collected indicates that the maximum alongshore extent of little tern observations from the SPA colony was 4,000 m north and 3,000 m south. However, the southern extent was exceeded by an observation at 3.5 km that was made from a boat survey (Figure 1), which has been taken as the southern extent. The mean maximum seaward extent was 1,776 m.

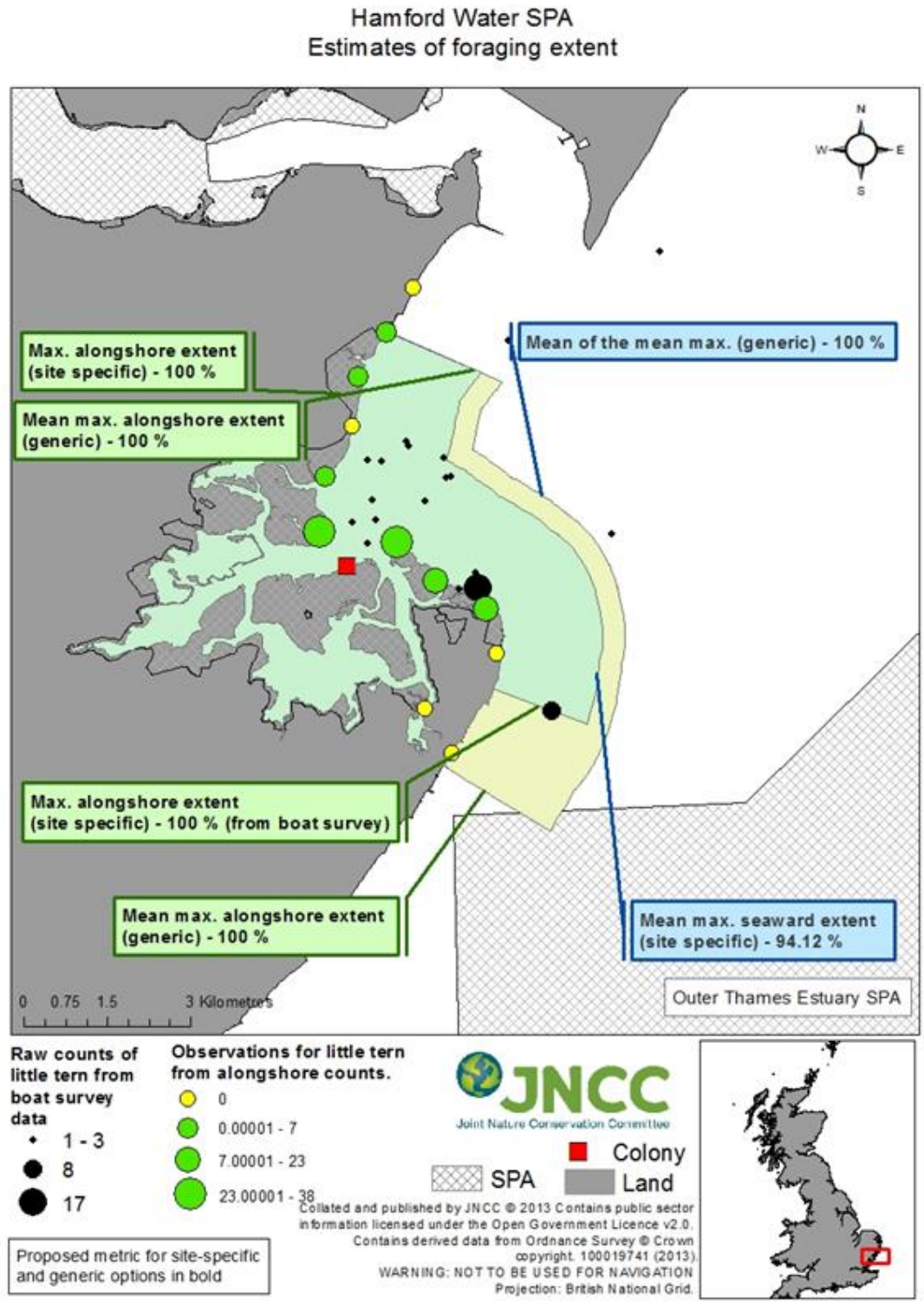

Figure 1. The boundary options considered for the marine extension of Hamford Water SPA for foraging little terns and results from the alongshore and boat based surveys. The site specific option is shown in green and the generic option in yellow. The percentage values given in the labels indicate the site-specific or generic percentage of little tern observations within the shore-based (alongshore) dataset and boat-based (seaward) dataset captured within the proposed alongshore and seaward boundaries. (Reproduced from Parsons *et al.* 2015).

There were no observations of little terns at the shore-based observation stations to either the north or south of the site-specific boundary extents, even though these stations extended to 5 km to the north and 6km to the south of the colony. Three observations of 1-3 terns were made from the boat-based surveys at locations that fall outside of the site-specific alongshore boundary extents, but the vast majority of observations (over 94%) were within the proposed site-specific boundary. However, the boat-based observation of eight little terns that falls on the southern alongshore site-specific boundary was included in the calculations for southerly alongshore extent.

To confirm the extent of the alongshore site specific boundary, further surveys of foraging little terns in the coastal waters adjacent to Hamford Water SPA were conducted in June/July 2015 (Perrow & Harwood 2015). The surveys aimed to measure the utilisation of the coastal strip by little terns either side of their breeding colony at 1 km intervals, as a repeat of the alongshore surveys conducted in 2013. This second year of alongshore data strengthens the proposal to adopt a site-specific approach for the alongshore extent boundary. Little tern observations were most abundant within 1- 2 km of the breeding colony, but on one of the three survey dates little terns were observed foraging at observation point 5, approximately 5 km from the colony (Figure 2). This corresponds to the general area where a small number of foraging little terns were recorded in the boat-based survey of 2013 (Figure 1), although the observations were slightly further south. Following the results from these additional surveys the alongshore extent of the proposed boundary extension was increased by approximately 400 m to the south to be in line with the site-specific approach used by JNCC (Parsons *et al.* 2015) in cases with a good body of empirical data – i.e. to use the maximum alongshore recorded sighting at the site in question to define the boundary (see map at **Annex 1**).

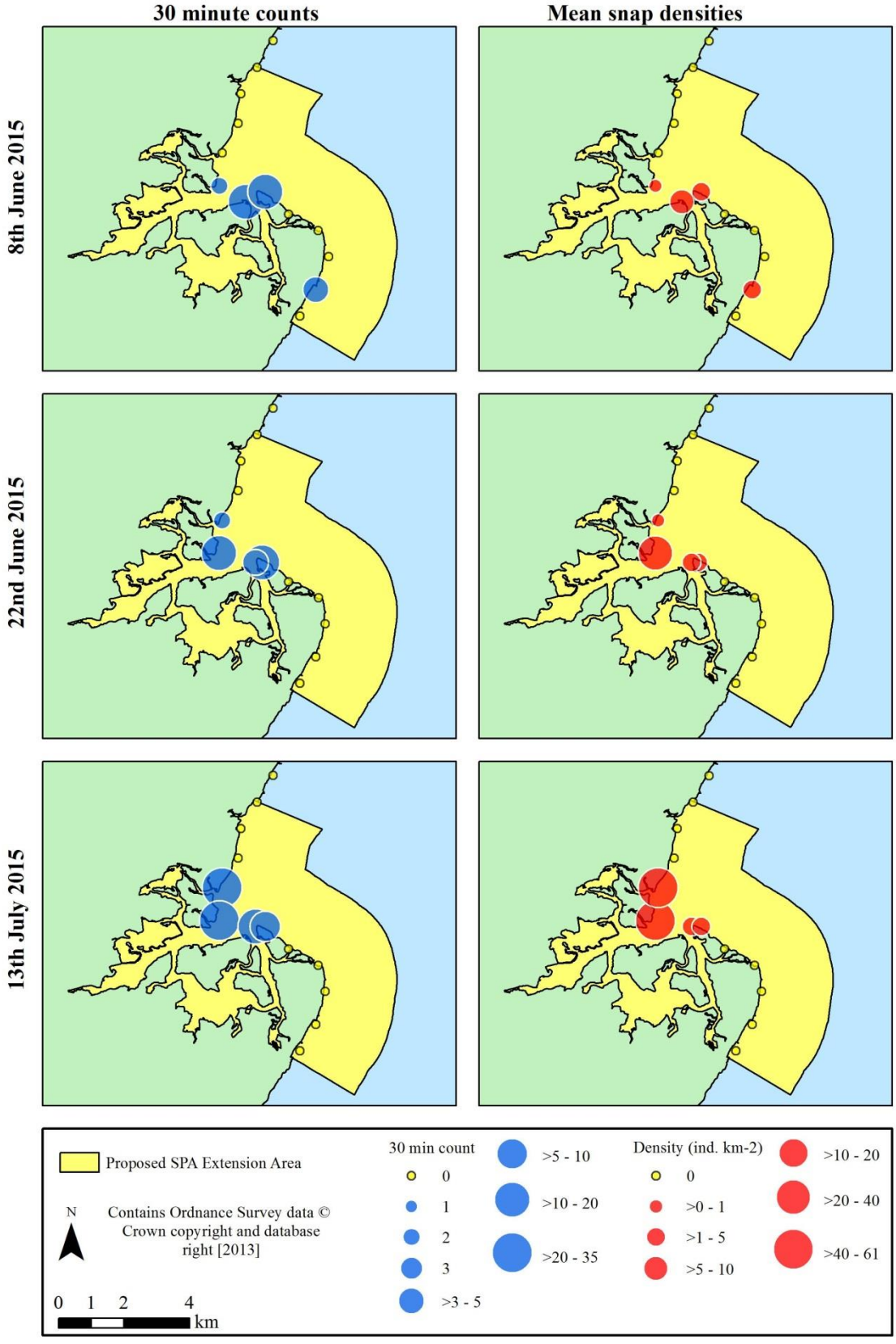

Figure 2. Abundance and distribution of little terns at Hamford Water as shown by timed counts and density (ind. km^{-2}) derived from snapshots within the timed count at the different survey locations in each of the sampling occasions in 2015 (reproduced from Perrow & Harwood 2015 – note that on these maps the proposed SPA extension area is based on generic figures for little terns (yellow shading in Figure 1) and not the area based on the site-specific data available up to 2013).

2. Site status and boundary

(see Annex 1 for the associated map)

The Hamford Water SPA was classified on 8 June 1993. The Natura 2000 Standard Data Form submitted to the European Commission (JNCC 2006) defines an area of 2,187.21 hectares. The entirety of the existing SPA is within the Hamford Water SSSI.

The current boundary of the SPA encompasses areas of sand and shingle used by breeding little tern, as well as a substantial area of sub-tidal habitat (225.07 ha) and intertidal mud, sand and saltmarsh. The sub-tidal area within the current SPA boundary provides an important foraging resource for little terns. However, marine habitat adjacent to the site that is regularly utilised by foraging little terns is not protected within the current site boundary. Thus, a potential extension to the SPA is proposed to include the principal sea areas of importance to support the foraging of the breeding population of little terns at the site. The work done to identify the proposed extension is described in preceding sections while the geography of the extension is described in the following sections and illustrated in detail in the map at **Annex 1**.

The area already classified within Hamford Water SPA is 2,187.21 ha and the proposed SPA marine extension area is 1,344.02 ha. Therefore, the total area of the SPA with the proposed marine extension is 3,532.56 ha[1].

As this is an extension to Hamford Water SPA, the proposed marine extension area would form part of that site and no name change is considered necessary.

2.1. Seaward boundary

The current seaward boundary of the SPA is the Mean Low Water (MLW) line along the shore and the Essex county boundary line for the sub-tidal area at the mouth of Hamford Water. The proposed new seaward boundary is based on a site-specific approach and will be 1,776 m out to sea from the seaward boundary of the existing Hamford Water SPA MLW line to the south of the existing SPA at The Naze beach. The area of the proposed marine extension includes all sub-tidal habitats out to 1,776m, as well as areas of inter-tidal sandbank (Pye Sands) in the Pennyhole Bay area and an area of intertidal beach below the cliffs at The Naze. The line of the proposed seaward boundary (see map at **Annex 1**) follows the line of the coast and indents slightly landward at the mouth of Hamford Water to reflect the current SPA boundary line.

2.2. Alongshore extent boundary

Little terns are known to forage in the shallow waters of the intertidal zone (Parsons *et al*. 2015) and therefore where the intertidal zone is not already included within the current SPA boundary, the proposed marine extension is taken from the Mean High Water (MHW) mark.

Survey work conducted in 2012 and 2013 (Parsons *et al.* 2015) to determine the foraging areas of little terns found that at Hamford Water the birds were using areas to the south of the boundary of the existing SPA. Therefore to ensure all the foraging area is included within the marine extension, the proposed alongshore extent boundary extends along the MHW mark to the south of the current SPA along the coastline as illustrated in the map at **Annex 1**. The southerly most point of the marine extension is just to the north of the town of Walton-on-the-Naze, approximately 800 m to the south of the cliffs at The Naze Tower. The alongshore extent boundary extends northwards along the MHW mark at the bottom of the Naze cliffs, through The Naze SSSI (notified for its geological interest), and then along the MLW line when it meets the seaward boundary of the existing Hamford Water SPA. For the rest of the proposed extension the alongshore extent boundary will abut the seaward boundary of the existing SPA, along the MLW line at the shore-line and the county boundary line for the sub-tidal area at the mouth of Hamford Water. The northerly-most point of the proposed alongshore extent boundary is just past the northern most point of the existing SPA boundary, near the sewage works to the south of Dovercourt.

[1] Note- changes in area relate to Positional Accuracy Improvements which can include movement in the position of MHW meaning the mapped existing extent of Hamford Water SPA currently measures 2188.53 ha as opposed to the cited area of 2187.21 ha.

3. Location and habitats

Hamford Water SPA is located on the north Essex coast, between the towns of Walton-on-the-Naze and Dovercourt. The site is a large shallow estuarine basin comprising tidal creeks, intertidal mud, sand flats and saltmarshes, as well as areas of scrub and unimproved grassland to the landward side of the sea walls.

Several islands are located within the basin, including Horsey Island, Skipper's Island, Hedge-End Island and Garnham's Island. All of these islands have substantial areas of saltmarsh on their margins and within their seawalls, where the seawall has breached, providing important feeding and roosting areas for many of the site's qualifying waterbirds.

Little terns nest on sand and shingle to the north eastern corner of Horsey Island. The grass fields within the sea wall at Horsey Island are utilised by both wintering and breeding waders and wildfowl. Whilst the rough grassland habitat at Skipper's Island supports the largest UK population of the rare Fisher's Estuarine Moth (*Gortyna borelii lunata*) and large stands of its larval food plant, Hog's Fennel (*Peucedanum officinale*). This moth is also found in localised areas along the sea wall on the mainland and on several other islands, including Horsey and Hedge-End.

Extensive intertidal mudflats provide an abundant food resource for wintering waterbirds and areas of seagrass are exploited by large flocks of brent geese on their autumn arrival. Ducks, grebes and cormorants feed within the sub-tidal waters and little terns are frequently recorded foraging in the shallower water, along the edges and mouths of creeks and channels (Leon Woodrow – Nature Conservation Officer at Tendring District Council, *pers comm*). There are shingle spits along the coastline between Pewit Island and Dovercourt and between Walton-on-the-Naze and Stone Point. Ringed Plover use these areas for nesting. The shingle habitat is topped in places by low, retreating sand dunes and supports several uncommon plants including Sea-holly (*Eryngium maritimum*), Sea-kale (*Crambe maritima*) and Sea Sandwort (*Honkenya peploides*).

The entire area of the SPA is also designated at a national level as a Site of Special Scientific Interest (SSSI). As well as aggregations of overwintering wildfowl and waders and breeding little tern and ringed plover, the SSSI is notified for its important coastal habitats and assemblage of rare vascular plants. Areas of the site where Hog's Fennel grows are protected as a Special Area of Conservation for Fisher's Estuarine Moth. Hamford Water is also a Ramsar site and areas to the seaward side of the sea wall are a National Nature Reserve.

4. Assessment of ornithological interest

4.1. Survey information and summary

The site was classified in 1993 for avocet and seven migratory species: dark-bellied brent goose, shelduck, teal, ringed plover, grey plover, black-tailed godwit (Icelandic race), and redshank, for which no amendment is proposed in this Departmental Brief. Little tern was also classified as a feature in 1993 and this Departmental Brief proposes extending the site into the marine environment in recognition of the importance of those areas for foraging to the little tern feature of the existing SPA. The contemporary basis for the site to be considered as a 'most suitable territory' for breeding little terns is set out below.

4.2. Little tern *Sternula albifrons*

The breeding population of little terns in Great Britain is estimated to be 1,900 pairs (Musgrove *et al*. 2013), representing about 10.3% of the Eastern Atlantic breeding population (18,500 pairs derived by division by 3 of the upper estimate of 55,500 individuals: AEWA 2012). Breeding occurs in scattered colonies along much of the east and west coasts of Britain, from the north of Scotland to (and including) the south coast of England (Mitchell *et al.* 2004). The greater part of the population occurs in south and east England from Dorset to Norfolk (Mitchell *et al.* 2004). All British little terns nest on the coast, utilising sand and shingle beaches and spits, as well as tiny islets of sand or rock close inshore (Mitchell *et al.* 2004).

The existing SPA citation states 35 pairs, at that time representing 1% of the GB breeding population (5-year peak mean, 1986-1990) (citation available from: http://publications.naturalengland.org.uk/publication/6658670226046976).

The annual maximum number[2] of pairs of little terns at Hamford Water during a recent 5-year period (2010-2014) are - **45** (2010), **45** (2011), **40** (2012), **30** (2013), **37** (2014). This provides a recent 5-year mean (2010-14) of **39** pairs. This represents 2.1% of the GB breeding population.

Up to 2004, little terns have been recorded nesting at three areas of Hamford Water: Horsey Island, Stone Point and Pewit Island. Since then, nesting little terns have been recorded at the Horsey Island colony only. Some pairs have been recorded at Stone Point in recent years, but they are not thought to have nested (Gibson 2014). The feeding grounds of the little terns that nest at Horsey Island lie predominantly in marine areas in the shallower water along the edges and mouths of creeks and channels and the shallower waters around Pennyhole Bay and along the coastline.

5. Conclusion

Hamford Water SPA continues to be one of the most suitable sites for breeding little tern in the UK, with the most recent 5 year mean of 39 pairs (2010-2014) representing 2.1% of the GB breeding population. A comparison of the most recent 5 year mean at Hamford Water SPA with historical populations at the other UK SPAs where the species is a qualifying feature given in Stroud *et al*. (2001) results in Hamford Water being ranked the 13th most important site for the species in the UK.

In addition to the nesting sites within the current SPA, important marine feeding areas for little terns have been identified that also constitute part of the most suitable territory for little terns. Accordingly, an extension into the marine environment is proposed to the existing SPA to include the whole of the area identified as a most suitable territory for breeding little terns.

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[2] The highest figure is used, sourced from either SMP or the site manager

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Annex 1 Boundary Map

The map has been removed to reduce the size of document. Please see separate web link to view.

Annex 2 Special Protection Area (SPA) Citation

Directive 2009/147/EC on the Conservation of Wild Birds Special Protection Area (SPA)

Name: Hamford Water

Counties/Unitary Authorities: Essex County Council

Boundary of the SPA:

The current seaward boundary of the SPA is the mean low water line along the shore and the Essex county boundary line for the sub-tidal area at the mouth of Hamford Water. The proposed marine extension will extend the SPA out to sea to protect important foraging areas for little terns. The new seaward boundary of the site after the proposed marine extension will be 1,776 m out to sea from the seaward boundary of the existing Hamford Water SPA or from the mean high water line to the south of the SPA at The Naze beach. The alongshore boundary of the proposed marine extension extends to the south and slightly to the north of the current SPA. The southerly most point of the marine extension is just to the north of the town of Walton-on-the-Naze, approximately 800 m to the south of the cliffs at the Naze Tower. The boundary extends northwards along the mean high tide line at the bottom of the Naze cliffs, through The Naze SSSI (notified for its geological interest), and then along the mean low water line when it meets the seaward boundary of the existing Hamford Water SPA. The landward boundary of the proposed SPA extension follows the county boundary line across the sub-tidal area at the mouth of Hamford Water and then the mean low water line to the north of this, along the seaward boundary of the existing SPA. The northerly-most point is just to the north of the existing SPA boundary, near the sewage works to the south of Dovercourt.

Size of SPA: The area already classified within Hamford Water SPA is 2,187.21 ha and the proposed SPA marine extension area is 1,344.02 ha. Therefore, the total area of the SPA with the proposed marine extension is 3,532.56 ha[3].

Site description: Hamford Water SPA is located on the north Essex coast, between the towns of Walton-on-the-Naze and Dovercourt. The site is a large shallow estuarine basin comprising tidal creeks, intertidal mud, sand flats and saltmarshes, as well as areas of scrub and unimproved grassland to the landward side of the sea walls.

Several islands are located within the basin, including Horsey Island, Skipper's Island, Hedge-End Island and Garnham's Island. All of these islands have substantial areas of saltmarsh on their margins and within their seawalls, where the seawall has breached, providing important feeding and roosting areas for many of the site's qualifying waterbirds.

Little terns nest on sand and shingle to the north eastern corner of Horsey Island. The grass fields within the sea wall at Horsey Island are utilised by both wintering and breeding waders and wildfowl. The rough grassland habitat at Skipper's Island supports the largest UK population of the rare Fisher's Estuarine Moth (*Gortyna borelii lunata*) and large stands of its larval food plant, Hog's Fennel (*Peucedanum officinale*). This moth is also found in localised areas along the sea wall on the mainland and on several other islands, including Horsey and Hedge-End.

Extensive intertidal mudflats provide an abundant food resource for wintering waterbirds and areas of seagrass are exploited by large flocks of brent geese on their autumn arrival. Ducks, grebes and

[3] Note- changes in area relate to Positional Accuracy Improvements which can include movement in the position of MHW meaning the mapped existing extent of Hamford Water SPA currently measures 2188.53 ha as opposed to the cited area of 2187.21 ha.

cormorants feed within the sub-tidal waters and little terns are frequently recorded foraging in the shallower water, along the edges and mouths of creeks and channels. There are shingle spits along the coastline between Pewit Island and Dovercourt and between Walton-on-the-Naze and Stone Point. Ringed plover use these areas for nesting. The shingle habitat is topped in places by low, retreating sand dunes and supports several uncommon plants including Sea-holly (*Eryngium maritimum*), Sea-kale (*Crambe maritima*) and Sea Sandwort (*Honkenya peploides*).

The entire area within the current SPA boundary is also protected at a national level as a Site of Special Scientific Interest (SSSI). As well as aggregations of overwintering wildfowl and waders and breeding little tern and ringed plover, the SSSI is notified for its important coastal habitats and assemblage of rare vascular plants. Areas of the site where Hog's Fennel grows are protected as a Special Area of Conservation for Fisher's Estuarine Moth. Hamford Water is also a Ramsar site and areas to the seaward side of the sea wall are a National Nature Reserve.

The area of the proposed marine extension will include all sub-tidal habitats out to 1,776 m, as well as areas of inter-tidal sandbank (Pye Sands) in the Pennyhole Bay area and an area of intertidal beach below the cliffs at The Naze.

Qualifying species:

The site qualifies under **Article 4.1** and **4.2** of the Birds Directive (2009/147/EC) for the following reasons:

Species	**Count (period)**	**% of subspecies or population**	**Interest type**
Qualifying features with revised counts			
Little tern *Sternula albifrons*	39 pairs – breeding (78 breeding adults) 2010 – 2014	2.1% of GB population	Annex 1
Qualifying features with counts remaining as at 1993 classification			
Avocet *Recurvirostra avosetta*	99 individuals – wintering 1986/87 – 1990/91	7% of GB population	Annex 1
Dark bellied brent goose *Branta bernicla bernicla*	5,650 individuals – wintering 1986/87 – 1990/91	2% of biogeographic population	Migratory
Shelduck *Tadorna tadorna*	840 individuals – wintering 1986/87 – 1990/91	1% of GB population[1]	Migratory
Teal *Anas crecca*	3,630 individuals – wintering 1986/87 – 1990/91	2% of GB population[1]	Migratory
Ringed plover *Charadrius hiaticula*	620 individuals – wintering 1986/87 – 1990/91	1% of biogeographic population	Migratory
Grey plover *Pluvialis squatarola*	1,080 individuals – wintering 1986/87 – 1990/91	2% of GB population[1]	Migratory
Black-tailed godwit *Limosa limosa*	1,580 individuals – wintering 1986/87 – 1990/91	2% of biogeographic population	Migratory
Redshank *Tringa totanus*	1,240 individuals – wintering 1986/87 – 1990/91	1% of biogeographic population	Migratory

[1] Data from: Hamford Water SPA citation. In those cases in which % values are expressed in terms of %GB for non-Annex 1 species, no figure, expressed in terms of % of biogeographical population, was given in the original citation.

Principal bird data sources:

Breeding bird features:

- 2010-2013 data: Hamford Water little tern colony counts from JNCC Seabird Monitoring Programme contributed by colony managers.
- 2014 data: consultant surveyor, results of which are presented in Gibson, M. (2014):

Breeding little tern and ringed plover – Hamford Water SSSI 2014. Unpublished report produced for Natural England: September 2014.

Non-breeding bird features:

- Original Hamford Water SPA citation for historical figures i.e. WeBS data 1986/87 – 1990/91. Available from: http://publications.naturalengland.org.uk/publication/6658670226046976

GB population estimates:

- From: Musgrove, M., Aebischer, N., Eaton, M., Hearn, R., Newson, S., Noble, D., Parsons M., Risely K., & Stroud, D. 2013 Population estimates of birds in Great Britain and the United Kingdom. British Birds 106: 64–100

Annex 3 Sources of bird data

Source of Data	Data provider	Subject	Date produced	Method of data collection	Verification
JNCC little tern survey report	JNCC	Empirical survey data on the sightings of little terns along the shore and at sea at several UK colonies and definition of alongshore and seaward limits to important foraging areas around colonies	2009-2013	Shore-based counts from fixed vantage points and boat-based transects at sea.	Verification by JNCC and external peer review of final report
Consultant surveyor	Gibson (2014)	Hamford Water SPA	2014	Standard methodology	
Seabird Monitoring Programme	Site wardens and JNCC	Annual counts of tern colonies at SPAs around GB	To present	Standard methodology	Verified by JNCC
Hamford Water SPA citation	Available from: http://publications.naturalengland.org.uk/publication/6658670226046976	Population counts for notified features of non-breeding waterbirds at the Hamford Water SPA	1986/87-1990/91	Standard methodology	

Annex 4 Detailed information on the definition of little tern foraging areas and seaward boundary definition.

1. Background and overview

All five species of tern that breed in the UK (Arctic *Sterna paradisaea*, common *S. hirundo,* Sandwich *S. sandvicensis,* roseate *S. dougallii* and little tern *Sternula albifrons*) are listed as rare and vulnerable on Annex I of the EU Birds Directive and thus are subject to special conservation measures including the classification of Special Protection Areas (SPAs). Little terns nest on sand or shingle beaches, islets and spits, often very close to the high water mark and are among the rarest seabird species breeding in the UK. There are currently 28 breeding colony SPAs designated within which little terns are protected. The marine areas they use while foraging to provide their young have not yet been identified and classified as SPAs to complement the existing terrestrial suite. Since 2009, the JNCC has been working with the four Statutory Nature Conservation Bodies (SNCBs) towards the identification of such areas.

This annex gives an overview of the survey and analytical work carried out by and on behalf of JNCC between 2009 and 2013 for the little tern. This work focussed on those colony SPAs which have been regularly occupied[1] by significant numbers of little tern pairs over the last 5-10 years (13 colony SPAs). Shore based and boat based survey work was undertaken which allowed characterisation of the distances that little terns fly from their colony in order to forage. Boundaries of important foraging areas were drawn based on the distances which little terns fly along the coast, and distances which they fly out to sea. A full and detailed description of the analysis can be found in the JNCC report on this work (http://jncc.defra.gov.uk/pdf/Report_548_web.pdf). A different approach was deemed appropriate for large terns as they search for food over a much wider area and further from the coast and breeding colony than little terns. A full and detailed description of that analysis can be found in the JNCC report on that work which is available at (http://jncc.defra.gov.uk/page-6644).

2. Data collection

The study aimed to provide three years of colony specific data for all regularly occupied[4] breeding SPAs of little terns. However logistics, colony failure, and other factors meant the data coverage for each colony varied. Surveys were timed to coincide as far as possible with chick rearing, which is the period of greatest energetic demand to the species during the breeding season and therefore critical to the maintenance of the population.

Two types of survey (boat- and shore-based observations) were applied in order to estimate both seaward as well as alongshore (coastal) extent of little tern foraging areas. Shore-based surveys were conducted at all of the study colonies and boat-based surveys were conducted at 8 sites.

2.1. Seaward extent of little tern distribution (boat-based survey)

Boat-based surveys were carried out to assess how far out at sea foraging little terns would range (*i.e*. to confirm their maximum seaward foraging extent). Surveys involved the boats travelling along a series of parallel lines through a survey area around each colony. These surveys extended to 6km from the coast to approximate the mean maximum foraging range as revealed from the literature (e.g. Thaxter *et al.* 2012) and preliminary JNCC observations. Two methods of recording little terns along a transect line were employed: (i) Instantaneous counts undertaken systematically at pre-determined points (between 300m and 1800m apart). The instantaneous count area was an 180^{o} arc either ahead of, or off one side of, the boat depending on viewing conditions. All birds seen within this arc (out to a maximum estimated distance of 300m) were recorded, along with the distance and bearing of the sighting and information on behaviour; (ii) Continuous counts of any little terns observed between the instantaneous points were also recorded to provide an index of relative abundance. Although observers recorded behaviour (foraging/flying), restricting the analysis to just foraging observations would have limited the sample size. Therefore, all records (foraging and not foraging) were included in the analyses.

[4] 'Regularly occupied' was defined where the mean peak breeding numbers of the most recent five years at the time of assessment equalled or exceeded the 1% of the national population. Colony counts were provided by the Seabird Monitoring Programme (www.jncc.defra. gov.uk/page-1550) and direct from site managers.

2.2. Alongshore extent of little tern distribution (shore-based surveys)

Shore-based observations aimed to assess to what extent little terns forage away from their colony along the coastal strip. Observation points were chosen at 1km intervals to either side of the colony, up to a distance of 6km along the coast, according to the mean maximum foraging range indicated by the literature. If preliminary observations found birds going further than 6km, more observation points were added at successive 1km intervals. Birds were counted within a distance of 300m to either side of the observation point (resulting in a 180° arc). The shore based counts recorded passage rate and foraging use and if possible snapshot counts at one minute or two minute intervals were also recorded. The aim of the snapshot counts was to provide information on the intensity of foraging at each observation point. Ideally, counts at different observation points were done concurrently, lasting at least 30 minutes at each observation point. This time is based on the mean foraging trip duration for little terns lasting 16–29 minutes according to Perrow *et al.* (2006). However, in some cases this was not possible due to time constraints and/or logistical difficulties. In order to account for this difference in effort between observation points the shore-based count data were standardised to the number of birds observed per minute at each observation point. Care was taken to cover a range of tidal states, as variations in water levels between the times of high and low water are likely to play a significant role in determining the foraging locations of terns.

To ensure that the data were comparable between sites the samples were analysed as a proportion of the total birds counted (per minute) at the first count point (usually 1km) in either direction alongshore from the colony. Each side of the colony was analysed as a separate sample. This approach assumes that 100% of birds leaving the colony in a particular direction reach the first count point, and that all birds reaching subsequent count points have passed through (and had been counted at) point one on their way.

3. Data analysis

The density of little terns within each survey area was relatively small, leading to small numbers of observations within boat transects and shore based count points. This was particularly evident at the colonies with fewer breeding pairs. Given this, techniques successfully used for defining boundaries to areas of importance for other seabird and waterfowl species i.e. interpolation based on analyses of transect data to yield density maps (e.g. O'Brien *et al.* 2012) could not be used in this case. Furthermore, the small foraging range of the little terns precluded application of the habitat association modelling approach used in the case of the work on larger terns (Annex 5). Accordingly, JNCC developed a method for boundary delineation which would work with this type of data.

The approach developed to boundary setting was based on use of simple metrics that could be derived from the boat-based and shore-based survey data collected at each site. At colonies where sufficient data were available, site-specific survey data were used to determine the values of these metrics. Analysis found that colony size and density had only a weak effect on the extent of little tern foraging ranges, so in the case of colonies where there were insufficient or no data, averages of all the colony specific values were used to define seaward and alongshore boundaries. These options are set out in more detail below.

3.1. Site-specific options

For colonies with sufficient data to describe either or both seaward and alongshore extents, the following site-specific metrics were used to define boundaries:

A) <u>Seaward extent</u>

The **site-specific seaward** extent of foraging areas was determined by the **mean of the maximum extents** of little tern observations from repeated surveys at that site.

Using the mean of the maximum seaward observations across repeated surveys aims to represent the maximum foraging distance used by an average little tern on an average day. Within a given survey day maximum extent is used because there were relatively few survey data available and additional sampling effort would likely extend the observed maximum range. The mean of these maximum extents was used in order to express the variability of extents between samples. This approach avoids the risk of outliers dictating the extent, as would be the case if the 'maximum extent' ever observed at a site was used.

B) Alongshore extent

The **site-specific alongshore** extent of foraging areas was determined by the **maximum extent** of alongshore distribution at that site.

Using the maximum alongshore observation was considered appropriate to avoid a potential bias towards underestimation of the distances travelled alongshore that would have arisen from use of any other metric because there were: i) relatively few survey data available at each site, ii) a tendency for count points furthest away from the colony to receive slightly less counting effort, and iii) instances in which little terns were observed at the furthermost observation point alongshore. Furthermore, there appeared to be very few outliers in these datasets such that there was a lower risk of the alongshore extent being unduly influenced by outliers than in the case of the defining the seaward extent.

3.2. Generic options

For colonies with insufficient or missing data, generic options were applied to define either or both seaward and alongshore extents, based on the averages of the relevant values derived at each of the colonies for which sufficient data were available to determine site-specific values.

A) Seaward extent

The **generic seaward** extent of foraging areas was determined by the **mean** of the **mean maximum extent** obtained from site-specific data.

B) Alongshore extent

The **generic alongshore** extent of foraging areas was determined by the **mean** of the **maximum alongshore extent** obtained from site-specific data.

The validity of using these averages across sites to define the generic values for both seaward and alongshore extent at colonies with insufficient or missing data was explored by examination of the relationships between the cumulative numbers of little tern observations with increasing distance out to sea and alongshore, pooled across all sites (see next section).

3.3. Derivation of site-specific and generic seaward and alongshore extents

A summary of the seaward extents as estimated from boat-based transect surveys at each colony, together with the generic seaward foraging extent derived from these values is set out in Table 1.

Table 1. Values of the maximum seaward observation of little terns on each survey at each SPA surveyed. The number of values in the 2nd column indicates the number of boat-based surveys yielding independent estimates of maximum seaward extent of occurrence at each colony. The values in the 3rd column are the site specific average of the values in the 2nd column. The value in the final row is the average of the site specific mean values.

SPA colony	Maximum seaward observation per survey (m)	Mean of maximum seaward observations (m)
Teesmouth and Cleveland Coast	1564,5661,4504,1357,4153	3448
Solent & Southampton water	492, 1620	1056
North Norfolk Coast	2077, 2129, 1946	2051
Hamford Water	2487, 1065	1776
Great Yarmouth and North Denes	800[1], 3120[1], 3770[1], 1390[2], 1730[2], 3780[2]	2430
Northumbria Coast	2185, 3011	2598
Dee estuary	1674, 2070	1872
Generic (mean value) applied to all other sites	-	2176

1. Derived from birds breeding at the North Denes colony; 85% kernel contours.
2. Derived from bird breeding (radio-tracking; 85% kernel contours) or assumed to be breeding (boat transects) at Winterton colony.

A summary of the alongshore extents as estimated from shore-based surveys at each colony, together with the generic alongshore foraging extent derived from these values is set out in Table 2.

Table 2. Values of the distance of the observation point furthest alongshore (in each direction) from each colony at which little terns were observed on any survey at that colony in any year. The value in the final row is the average of the site specific values.

SPA colony	Maximum alongshore extent from the colony in each direction (km)
Ythan Estuary, Sands of Forvie and Meikle Loch	2, 5.35
Dee Estuary	3, 3
Northumbria Coast	5, 6
Humber Estuary	6, 6
North Norfolk Coast	7, 7
Teesmouth & Cleveland Coast	5, 5
Gibraltar Point	2, N/A
Great Yarmouth North Denes	5, 4
Hamford Water	4, 3
Solent & Southampton water	1, N/A
Morecambe Bay	7, 2
Lindisfarne	3, 4
Chesil Beach and The Fleet	1, 0.5, 1
Generic (mean value) applied to all other sites	3.9

The relationships between the cumulative numbers of little tern observations with increasing distance out to sea and alongshore, pooled across all sites are presented in Figures 1 and 2.

These have been used to assess the appropriateness and degree of precaution associated with the use of the generic values of 2.2km offshore and 3.9km alongshore to define the boundaries in the case of colonies with insufficient or missing data.

These figures demonstrate the nature of the relationship of decreasing cumulative usage with increasing distance from colony. For alongshore (Figure 1) approximately 0.86 of all recorded usage occurred within 3.9km from the colony, this being the mean of maximum extents at other sites and used as the generic value to define alongshore boundaries at colonies with insufficient or missing data. In comparison, at 7km from the colony (i.e. the maximum distance of any observation station from any colony) all recorded usage was encompassed. For offshore extent (Figure 2), approximately 0.97 of all recorded usage occurred within 2.18km of the coast, this being the "mean of the site specific mean maximum extents" at other sites and used as the generic value to define seaward boundaries at colonies with insufficient or missing data. In comparison, at 3.4km which is the greatest of the site specific mean maximum seaward extents, 0.99 of all recorded usage at all sites was encompassed.

From these analyses it can be seen that in order to capture all recorded usage in an alongshore direction (1.0 at 7km) and almost all recorded usage in a seaward direction (0.99 at 3.4km) there would need to be a considerable increase in the distances being considered for defining the generic boundaries over those proposed (i.e. a further 3.1km alongshore in each direction and a further 1.2km offshore). On the simplifying assumption that alongshore and seaward limits define a rectangle lying parallel to the coast and with the landward edge centred on the colony, the sea area encompassed by these greater limits would be approximately 2.8 times that encompassed by the narrower limits proposed. The analyses suggest, however, that the gain in terms of the inclusion of additional areas of significant little tern activity would be relatively modest as the proportion of bird observations included within the narrower generic boundaries proposed already capture 0.86 and 0.97 of recorded usage alongshore and offshore respectively. It would seem to be overly precautionary for an estimate of foraging extent to encompass all or nearly all observations, given that at any one site this would probably result in significant areas of very low tern usage being included in the estimate. Therefore, the average of the site specific maximum alongshore extents

(3.9km) and the average of the site specific mean maximum seaward extents (2.2km) have been adopted for a generic estimation of foraging extent at colonies with insufficient or missing data. Use of these values is, on the basis of the analyses, likely to encompass areas of high to moderate use while excluding areas which are likely to have very low usage.

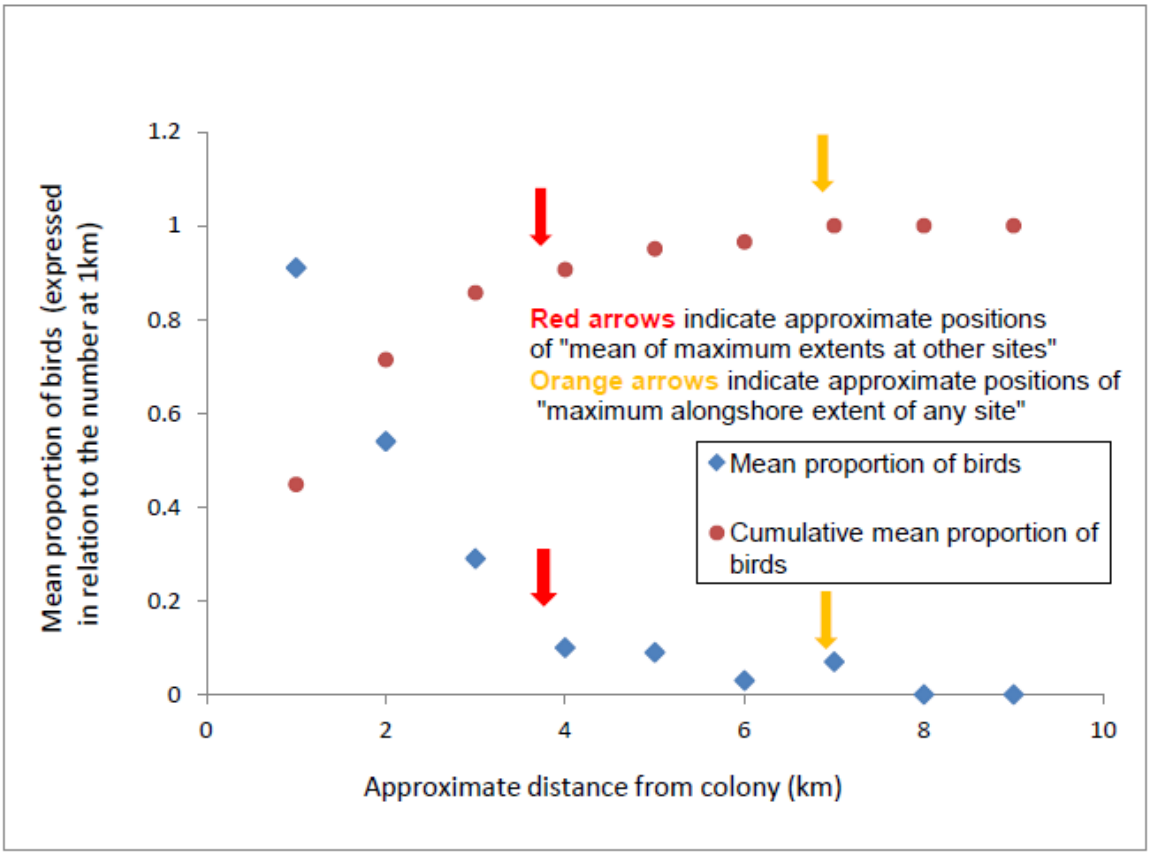

Figure 1: Mean proportion (blue dots) and cumulative mean proportion (red dots) of little terns at increasing distances alongshore from the colony. Each blue point represents the mean proportional usage at each distance band from the colony averaged across colonies. The proportion at each distance (blue dots) is expressed relative to the number at the 1km mark. The mean proportion of birds at 1 km is less than 1.0 because, in a few cases, no birds were observed at 1 km. The red arrows indicate the values at the generic mean of the maximum site-specific alongshore extent (3.9km) whereas the yellow arrows indicate the values at the greatest site-specific maximum alongshore extent recorded (7km at North Norfolk Coast and Morecambe Bay). Source: Parsons *et al.* (2015).

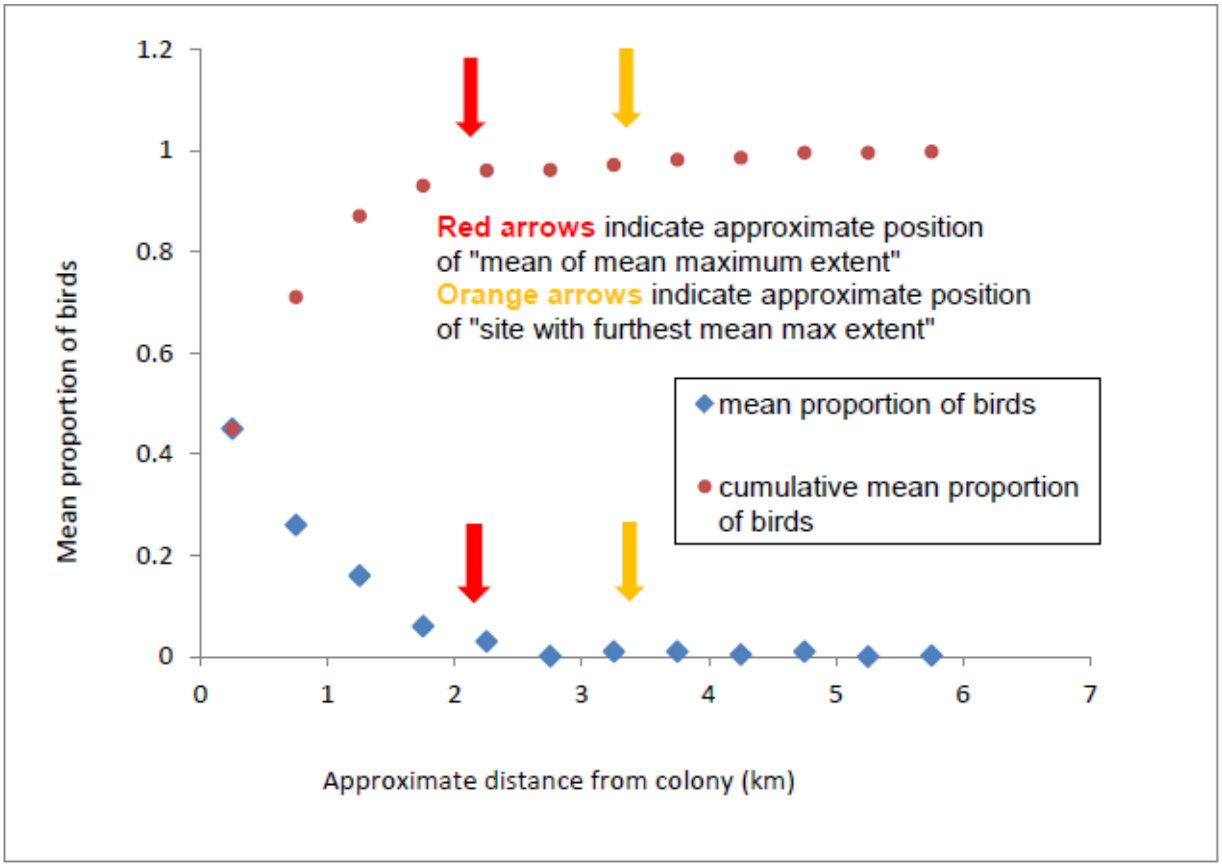

Figure 2: Mean proportion (blue dots) and cumulative mean proportion (red dots) of little terns at increasing seaward distances from mean high water mark. Each blue point represents the mean proportional usage at each distance band from mean high water mark averaged across colonies. The red arrows indicate the values at the generic mean of the mean maximum site-specific seaward extent (2.2km) whereas the yellow arrows indicate the values at the greatest of the site specific mean maximum seaward extents (3.4km at Teesmouth and Cleveland Coast). Source: Parsons *et al.* (2015).

4. Boundary delineation

At each colony SPA, an assessment was made on the quality and quantity of data available for defining seaward extent and alongshore extent. If the quality or quantity was felt to be insufficient (eg no data or low numbers of birds observed, or few surveys, or data from only one year), then the generic option was applied at that colony. Judgement was applied rather than strict adherence to numerical thresholds for quantity of data. If the data at a site was felt to be sufficient, then the site-specific options, as described above, were applied at that colony.

Alongshore boundaries for little tern foraging areas were simply drawn as straight lines perpendicular to the coast at the distances of the site specific or generic alongshore extent on each side of the colony. Site specific alongshore boundaries were allowed to differ between the shores on either side of a colony if the data indicated this to be appropriate, whereas generic alongshore boundaries were drawn equidistant on both sides of a colony. These lines were then joined up using a line parallel to the coast and drawn at a distance defined either by the site specific or generic seaward extent. Observations indicated that little terns forage both in the intertidal zone and subtidal zone, so the landward limit of foraging extents has been taken to Mean High Water.

An example of a potential boundary around little tern foraging areas based on the approach described above is shown in Figure 3.

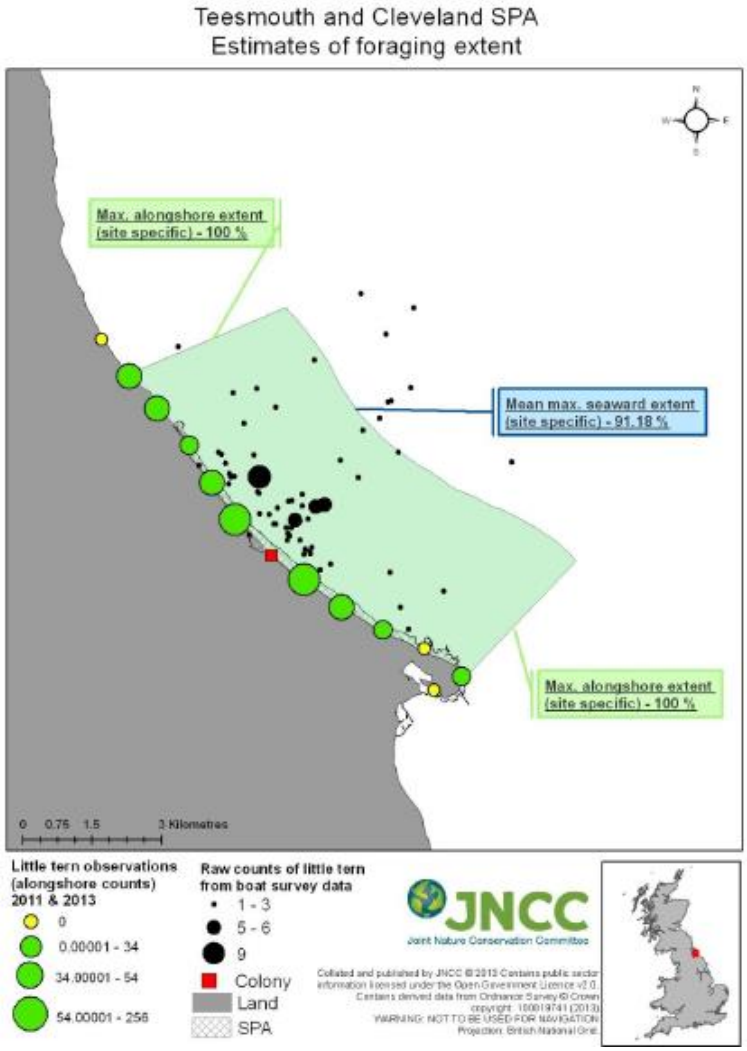

Figure 3. An example of the application of site specific alongshore and site specific seaward extents to define the boundaries to little tern foraging areas at the Teesmouth and Cleveland SPA. The % values given in the labels indicate the site specific % of little tern observations within the shore-based (alongshore) dataset and boat-based (seaward) dataset captured within the alongshore and seaward boundaries. Note that the 91.18% of sightings recorded within the seaward boundary in this instance is not the measure used to define where that boundary should be, but is simply a consequence of setting the boundary at the mean of the survey specific maxima and thereby excluding sightings of a few individuals seen furthest offshore – most likely on the survey day that yielded the furthest ever seaward sightings.

5. Conclusion

The aim of this work was to quantify usage of the marine environment by little terns around their breeding colony SPAs in the UK. The foraging extents identified by this study derive from information gathered over multiple years using site-specific information where possible. Most information derives from data collected between 2009 and 2013, a combination of shore-based observation (to determine the alongshore extent of use) and boat-based transect surveys (to establish the seaward extent). At one SPA - Great Yarmouth North Denes – these data were supplemented by information from radio tracking, collected in 2003-6 (Perrow & Skeate 2010).

Collection of site-specific data was attempted at most currently occupied SPAs, though in many cases data on seaward or alongshore extent could not be collected, and at others, no or few usable data were collected, either due to colony failure (caused by tidal inundation, predation or disturbance) or simply too few breeding pairs for sufficient observations to be detected by surveys.

Therefore, methods were required which aim to quantify foraging extent under a range of cases of data availability: i) where there are good data for both parameters; ii) where there are no site-specific survey data; iii) where data on seaward and/or alongshore extent are deficient.

For colonies with sufficient data on seaward extent, the mean of the maximum seaward extent of little tern observations from repeat surveys at that site has been used. Using the mean of repeat surveys aims to represent average usage and is therefore moderately conservative, and avoids the risk of outliers having a large influence on extent, as would be the case if the alternative – maximum distance offshore at which a single little tern was ever observed at a site – were used. For colonies with sufficient data on alongshore extent, the maximum distance alongshore at which terns were observed has been used, on the basis that because there are relatively few survey data at each site, and the tendency for furthest count points to have received slightly less effort on average, further survey would probably have extended the estimates of range. Because of this, it was judged that choosing the maximum extent at a site would not be excessively precautionary nor would the influence of outliers pose significant risk of over-estimation of extent.

For colonies with no or insufficient data, a method to derive generic extents was developed, based on data collected at other colonies. This aimed to weigh the risks of being overly precautionary (over-estimate foraging extent) or overly conservative (under-estimate foraging extent). Analyses indicated that use of the average across sites of the site specific means of the maximum recorded seaward extents captured 0.97 of all recorded tern observations, while use of the average across sites of the site specific maximum recorded alongshore extent captured 0.86 of all recorded tern observations. This suggested that use of these values at colonies with insufficient data to derive site-specific boundaries to little tern foraging areas would be likely to encompass areas of high to moderate use while excluding areas which are likely to have very low usage.

The colony SPAs selected for study were those assessed to be currently occupied. This, however leaves a number of SPAs where little tern is a feature, where it was judged that little terns are no longer regularly breeding in significant numbers (as well as those currently occupied SPAs where no or few data could be collected). The assessment of occupation of such sites may change with time. This study has provided generic extents that could be applied following changed assessments.

The methods to estimate foraging extents are derived from field surveys and analyses of a nature appropriate to the data and the ecology of the little tern. Habitat modelling, such as that undertaken for the larger tern species (Annex 5) is not appropriate for the little tern, due to the combined effects of their more restricted inherent foraging range and the limited availability of habitat data at a suitable resolution for inshore locations.

The foraging extents of little tern estimated in this study fall within the range identified for little tern in a recent review of foraging ranges (Thaxter *et al.* 2012). That study identified the mean extent of the three studies included in the review as 2.1km, with the mean of maxima across studies as 6.3km. The work by JNCC, on a larger number of colonies, gave a mean maximum extent of 2.2km, with a range of 1.1-3.4km (for seaward extent) and a mean maximum of 3.9km, with a range of 0.5-7km (for alongshore extent). Eglington (2013), in a literature review of foraging ecology of terns, concluded that most studies, including those citing anecdotal information, reported a foraging radius less than 4km from the colony, which accords with the results of JNCC's work.

6. References

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Annex 5 Implementation of Evidence Standard within Boundary Making decision process

Decision-making processes within Natural England are evidence driven and the Natural England strategic evidence standard, and supporting guidance were followed. In particular, the four principles for the analysis of evidence set out in the Natural England Standard *Analysis of Evidence* have been adhered to. These two standards documents can be downloaded from the following web-links:

Strategic Evidence Standard:
http://publications.naturalengland.org.uk/publication/7699291?category=3769710

Analysis of Evidence Standard:
http://publications.naturalengland.org.uk/publication/7850003?category=3769710

An explanation follows as to how the principles within the *Analysis of Evidence* standard have been applied in defining the set of qualifying features and proposed extended boundary of the Hamford Water SPA.

1.) The evidence used is of a quality and relevance appropriate to the research question or issue requiring advice or decision

Quantification of Hamford Water SPA interest feature population sizes.

This is a proposed extension of the existing Hamford Water SPA, and with only one exception, which is set out in the Departmental Brief (and covered in the following section), no changes are being proposed to the suite of qualifying features or the notified populations sizes of those features. Accordingly, the evidence on which those original features were identified and populations quantified is not re-considered in this Annex. Rather, this Annex focuses on the only species for which this Departmental Brief describes a new notified population size i.e. breeding little tern.

The evidence base underpinning the identification of the current population of breeding little tern within the SPA is provided by bird count data from two main sources. These data sources are as follows (see also **Annex 3):**

1. Data from JNCC's Seabird Monitoring Programme (SMP) (http://jncc.defra.gov.uk/smp/) for the Hamford Water little tern colonies between 2010 and 2013.

2. Data from the Hamford Water site warden supplemented the SMP data where this was not available. A consultant surveyor conducted a survey for Natural England in 2014 and this involved recording the number of apparently occupied little tern nests (Gibson 2014).

The count data taken from the SMP database is the best available information. The count data which were obtained directly from the colony managers is source information that will in due course become part of the SMP database. As such, it too is the best available information.

Establishment of extent of marine pSPAs using little tern observation data

Webb & Reid (2004) provide a series of guidelines for the selection of marine SPAs for aggregations of inshore non-breeding waterbirds. This guidance does not directly consider the evidence requirements for the selection of marine SPAs focussed on the principal foraging areas used by breeding seabirds. However, a number of the issues and principles covered in Webb & Reid (2004) nonetheless have some relevance in this context. Accordingly, the following section describes in broad terms a comparison of the quality and relevance of the tern evidence base with the guidelines produced by Webb & Reid (2004).

Webb & Reid (2004) note that the guidelines for selecting SPAs in the United Kingdom are described in Stroud *et al*. (2001), and are adequate and competent for application to site selection in the inshore environment for inshore non-breeding waterbird aggregations. However, given that the type and quality of data which underpins the proposed marine extension for foraging little terns at Hamford Water differs from those used in identifying sites for terrestrial birds and aggregations of non-breeding waterbirds, it is

necessary to consider their adequacy and relevance.

Webb & Reid (2004) set out seven criteria to assess the adequacy of count data. Although not all of direct relevance in the current case these criteria are set out in Table 1 with accompanying comments regarding the little tern surveys.

Table 1 Criteria for inshore SPA data adequacy.

Criterion	**Adequacy of JNCC led little tern surveys**
Experience of observers	All observations of terns were undertaken either by JNCC staff or experienced contractors commissioned by JNCC or volunteer counters who received training in the shore-based observation techniques.
Systematic surveys	Boat-based survey work followed systematic transect survey designs that were appropriate to each colony and were followed on repeated surveys. Shore based survey work used a systematic series of observation stations and a standard recording protocol which was used repeatedly at each colony.
Completeness	Boat-based transects extended up to 6km offshore and alongshore survey stations were positioned at 1km intervals up to at least 6km in either direction from the colony (and where necessary, further). With the mean maximum foraging range reported to be 6.3km, the survey areas gave virtual complete coverage of the likely areas of greatest importance.
Counting method	At sea observations included instantaneous counts at predetermined distances along transects at which all terns in flight within 300m in an 180^{o} arc of the boat were recorded. Between these points, continuous records of all little terns seen were also made to provide an index of relative abundance. During shore-based observations, terns recorded within 300m of the observation point were recorded during timed observation periods. Counts at each station were standardised to birds/minute and expressed as proportions of the value recorded at the 1km observation station to standardise across sites.
Quality of sampling	This was affected by the low numbers of birds at many colonies and the frequent breeding failures. At colonies with 5 or more shore-based surveys yielding records of 200 or more terns, this was deemed sufficient to derive site-specific along shore boundaries. At colonies with at least 2 boat-based surveys yielding at least 20 tern sightings this was deemed sufficient to derive site-specific seaward boundaries. At colonies where these criteria were not met, a generic approach was used by pooling sample data across sites to yield better-evidence based estimates of limits.
Robustness of population estimate	Not applicable as the tern observation work was not used to generate a population estimate
External factors affecting the survey	Although the aim was to collect data from most currently occupied SPAs, in many cases data on seaward or alongshore extent could not be collected due to colony failure (caused by tidal inundation, predation or disturbance) or simply too few breeding pairs for sufficient observations to be detected by surveys. Accessibility to count points in all parts of the possible extent of a foraging area limited the ability to provide site-specific alongshore extents in some cases.

Webb & Reid (2004) also discuss the issue of establishing sufficient evidence in the case of marine SPAs to establish regularity of use, which is a key element of the SPA selection guidelines. The little tern survey programme coordinated by JNCC was never intended to establish regularity of use of certain sea areas by a given number of little terns around particular colonies. The aim of that work was simply to capture sufficient representative information on little tern foraging distribution to allow derivation of reliable colony specific (or if necessary generic averages across sites) estimates of the distances alongshore and offshore

within which the bulk of little tern foraging activity occurs. No formal tests of the regularity of use of the sea areas within the proposed marine boundary extension have been made. Regularity of use of the pSPA, and in particular of the sea areas included within it, has been reasonably inferred from the continued existence of the site's named feature in qualifying numbers at the source colony within the existing SPA.

Webb & Reid (2004) discuss the issue of boundary placement. They note that the principles for defining boundaries for terrestrial SPAs in the UK are described in Stroud *et al.* (2001) thus (emphasis added):

""The first stage of boundary determination involves ***defining the extent of area required by the qualifying species concerned****. These scientific judgements are made in the light of the ecological requirements of the relevant species that may be delivered by that particular site, and the extent to which the site can fulfil these requirements. This follows a* ***rigorous assessment of the best-available local information regarding distribution, abundance and movements of the qualifying species****. It may also involve the* ***commissioning of special surveys*** *where the information base is weak. Following this stage, every attempt is made to define a boundary that is identifiable on the ground and can be recognised by those responsible for the management of the site. This* ***boundary will include the most suitable areas for the qualifying species*** *identified in the first stage……"*

The little tern observations were conducted to define the extent of the area required by this species on the basis of specially commissioned surveys that generated the best available local information regarding distribution, abundance and movements of this qualifying species.

Webb & Reid (2004) discuss the principles of setting both landward and seaward boundaries of marine SPAs.

In regard of setting landward boundaries they note that "*Where the distribution of birds at a site is likely to meet land, a boundary should usually be set at the mean high water mark (MHW)……. unless there is evidence that the qualifying species make no use of the intertidal region at high water*."

The landward boundary of the existing Hamford Water SPA runs along the landward bank of the borrowdyke to the landward side of the seawall for the most part and further inland in certain locations to include important areas of coastal grazing marsh, grassland and scrub. The SPA therefore covers the entire Hamford Water estuarine basin, which includes several islands that lie above the high tide line. Thus, all intertidal, sub-tidal and important terrestrial areas within the estuarine basin are already included within the existing site boundary. However, the survey work to determine the foraging areas of little terns found that at Hamford Water the birds were using areas out to sea past the seaward boundary of the existing SPA and further south of the southernmost extent of the existing boundary on the open coast. Accordingly, the landward boundary of the proposed extension will extend southwards beyond that of the existing Hamford Water SPA along the mean high water mark to a point just north of the town of Walton-on-the-Naze, approximately 800 m to the south of the cliffs at The Naze Tower. Along this stretch of coast the proposed landward boundary will lie within the Naze SSSI (notified for its geological interest) and run along the mean high water mark at the bottom of the Naze Cliffs. For the rest of the proposed extension the landward boundary will abut the seaward boundary of the existing SPA, along the mean low water line at the shore-line and the county boundary line for the sub-tidal area at the mouth of Hamford Water. There will be a very short extension of approximately 70 m past the northern most point of the SPA boundary, near the sewage works to the south of Dovercourt (see map at **Annex 1**).

Webb & Reid (2004) set out a recommended method for defining the seaward boundary of SPAs for inshore non-breeding waterbirds on the basis of analysing bird data from aerial or boat-based sample surveys using spatial interpolation combined with spatial analysis. They note exceptions to this method which include the case in which "*habitat data are also used in combination with bird distribution data to determine boundaries*". This is the approach which was used in the work on the larger tern species (Wilson *et al.* 2014; Win *et al.* 2013). However, due to the very limited foraging range of little terns and the lack of suitable habitat data so close to the coast at the fine spatial resolution needed for such modelling over such relatively small areas, this approach was not used in the case of the work on little terns. In the case of Hamford Water the seaward boundary is being proposed purely on the basis of the observations of little terns at this site. The proposed seaward boundary will extend beyond the current seaward boundary of the SPA at mean low water, out to sea to a distance of 1,776 m from the mean high water mark. This is based on the best available evidence regarding the distribution, abundance and movements of little terns at this

site.

Thus, in summary, although Webb & Reid (2004) does not directly address the issue of data requirements in regard of establishing marine SPAs for breeding seabirds, many aspects of the collection and analysis of the little tern survey work which has been used to define the location and extent of the proposed extended Hamford Water SPA can be seen to be in accord with the guidelines set out in that document.

2.) The Analysis carried out is appropriate to the evidence available and the question or issue under consideration

The major analysis which underpins the proposed extension into the marine environment of the Hamford Water SPA is of the boat-based and shore-based observations of little terns at the site.

The very restricted foraging range of little terns precluded the use of the predictive habitat association modelling approach that was used for the larger terns. Accordingly, it was appropriate to gather empirical evidence on little tern distributions from which to determine directly the boundaries to the areas of greatest usage by foraging birds at each colony. At colonies where evidence was lacking or insufficient it was considered appropriate to make use of data gathered at other colonies to determine "generic" boundaries which, comparison with all available data indicated, would capture a very significant proportion of total usage (see **Annex 4**).

Following completion of the work on little terns, JNCC commissioned external peer review of the work. The peer review did not highlight any significant issues with the appropriateness of the analyses which were not resolved by subsequent discussion between the reviewers and JNCC. Further details of the external peer review are provided in section 5 of this Annex.

3.) ***Conclusions are drawn which clearly relate to the evidence and analysis***

The conclusions regarding the drawing of the proposed landward boundary along the open coast extending to the south of the existing Hamford Water SPA are based upon the evidence provided by the 2012 and 2013 survey work on little terns at Hamford Water.

The use of intertidal areas between MLW and MHW by foraging little terns is recorded in Parsons *et al.* (2015). Furthermore, a review of tern foraging ecology (Eglington 2013) notes that all five species of tern occurring in the UK, including little tern, routinely forage in areas of shallow water. There is no reason, on the basis of these pieces of evidence to consider it likely that little terns at Hamford Water will not forage over intertidal areas. Accordingly, the conclusions regarding the drawing of the proposed landward boundary at MHW along the new stretch of coast relate to the best available evidence.

The conclusions regarding the drawing of the proposed seaward boundary are based upon the evidence provided by the 2012 and 2013 survey work on little terns at Hamford Water. Thus, the conclusions in this respect clearly relate to the best available analysis of the best available evidence.

Uncertainty arising due to the nature of the evidence and analysis is clearly identified, explained and recorded.

Count data

The UK SMP is an internationally recognised monitoring scheme coordinated by JNCC in partnership with others (e.g. statutory nature conservation bodies, the RSPB and other colony managers as data providers, etc.). It collects data according to standardised field methods (Walsh *et al.* 1995). SMP data are verified by the JNCC seabird team. Therefore, there is high confidence in SMP data. The majority of the data which has been used in determining the size of the little tern breeding population at the Hamford Water SPA (i.e. between 2010 and 2013) is based on counts which are on the SMP database and so justify high confidence. However, some of the more recent count data (2014) have not yet been verified by JNCC and indeed some have not yet been submitted to the SMP database. Those data were collected by a consultant surveyor (Gibson 2014) as part of a project funded by Natural England and will be submitted to the SMP database.

Accordingly, even the most recent count data referred to in this Departmental Brief can be considered to justify high confidence.

This Departmental Brief proposes no changes to the suite of qualifying features of the Hamford Water SPA or (with the exception of little tern) to the sizes of their populations. The population figures for all other features of the SPA are taken directly from the original SPA citation, available from: http://publications.naturalengland.org.uk/publication/6658670226046976.

Site boundaries

The position of the proposed seaward boundary and the proposed extension of the SPA boundary to the south along the coast beyond that of the existing SPA are the principal sources of uncertainty in the identification and characterisation of the site. The position of the proposed extended boundary of the SPA has been determined on the basis of a comprehensive site-specific set of observations of the distribution, abundance and movements of little terns over a number of years. In the light of uncertainty in the sufficiency of the evidence base gathered in 2012 and 2013, and reported in Parsons *et al.* (2015), additional surveys were commissioned by Natural England in 2015 to gather additional site-specific information. As a result of that work, an additional 196 sightings of little terns were made (Perrow & Harwood 2015) and the boundary amended accordingly (see map at **Annex 1**). It is considered that the addition of these records has reduced any uncertainty regarding the extension of the SPA boundary.

4.) Independent expert review and internal quality assurance processes

Independent expert review

Natural England's standard in quality assurance of use of evidence, including peer review, (http://www.naturalengland.org.uk/images/operationalstandardsforevidence_tcm6-28588.pdf) has been followed in determining the level of independent expert review and internal quality assurance required in relation to Natural England's analysis of the evidence for this site and the way that the boundary has been drawn up. Independent expert review is to be adopted where there is a high novelty or technical difficulty to the analysis.

The derivation of the alongshore extent and seaward boundary to the proposed marine extension at Hamford Water SPA is based on entirely new survey data on little tern distribution, abundance and movements. Neither the field survey methods nor the analyses of the resultant data were as novel or technically difficult as those employed in the case of larger tern work which has defined the boundaries at other pSPAs which are currently being proposed. Nonetheless, JNCC commissioned independent expert review of the little tern programme of work. A representative of Natural England, along with those of all other country statutory nature conservation bodies, was involved by JNCC in setting the terms of reference for the review work, in nominating potential reviewers for JNCC to consider approaching, and in the selection of those who carried out the reviews.

The reports on the little tern field work methodology and results and subsequent boundary setting work were put out to independent peer review by JNCC. One main point made by the peer reviewer(s) was that the boat and shore-based observations should have been corroborated more extensively with data from radio tracking or even habitat modelling. JNCC did in fact use radio tracking, at one site, where it confirmed the results of their techniques. JNCC did not consider it to be necessary or even practicable to apply this approach more widely. JNCC considered that habitat modelling was not possible, given the small range of the species and the limited availability of environmental data over that range. JNCC noted that it would have been prohibitively expensive to collect their own environmental data, even at a few sites, and with unknown chance of "success". The other main point made by the peer reviewers (in accord with the same suggestion made by the peer reviewers of the larger tern work) was for data to have also been collected during the incubation period. However, it was decided at the outset of the work that the priority should be on the chick-rearing period, because it is probably at this time when little terns face the greatest energetic demands. The focus was on chick-rearing for biological reasons but also logistical ones; JNCC noted that there would have been a risk of obtaining too few data during both incubation and chick-rearing if both periods were studied. One reviewer asked for greater reference to the findings of other studies but JNCC considered this aspect to be sufficient. A number of improvements were made to text, tables and figures by JNCC, on the recommendation of the reviewer, and some additional text was included in the Discussion to

serve as a Conclusion to the final report which is now available at http://jncc.defra.gov.uk/pdf/Report_548_web.pdf.

In the light of Natural England's involvement with the review process conducted by JNCC and in the light of its outcomes, Natural England did not consider it necessary to initiate its own independent expert review of the reports prepared by JNCC.

Internal peer review and quality assurance

A representative of Natural England has been involved in the entire history of the little tern monitoring work programme since its inception. Since late 2009, this role was fulfilled by Dr Richard Caldow (Senior Environmental Specialist: Marine Ornithology). Accordingly, Natural England has, in conjunction with Scottish Natural Heritage (SNH), Natural Resources Wales (NRW) and Department of the Environment Northern Ireland (DoENI), been in a position to review and provide quality assurance of the programme of JNCCs work and its findings from start to finish, as detailed below.

JNCC evidence reports relating to marine SPA identification go through an extensive internal and external QA process. This has applied to all of the main strands of analysis (ESAS analyses to identify offshore hotspots of usage, inshore wintering waterbird work, larger tern work, and little tern work).

The general approach and survey methods are subject to internal and external discussion, often in workshop format. External discussion can involve organisations such as SNCBs who will use the outputs, academics and other researchers in the field. Once an approach and survey method has been agreed and data collection has started, interim reports are prepared which are subject to internal and SNCB review. Analysis of data is subject to discussions (and workshops if appropriate) internally and with academics and statistical contractors if appropriate. For particularly challenging analyses (such as larger tern modelling work) statistical contractors may undertake significant portions of exploration and development work, and/or of final analysis. Finally, once all the data has been collected and analysed, JNCC prepare an extensive report which has contributions from several JNCC staff, undergoes several rounds of JNCC and SNCB comment, and is finally signed off at JNCC Grade 7 level. At this stage it goes to SNCBs for use in their own work in parallel with going to external peer review, where a minimum of 2 reviewers are sought. Reviewers are usually sought with knowledge of the species ecologies and/or statistical and technical understanding, with reviewers sought to complement each other (for example with differing expertise, from differing types of organisation). JNCC then respond to peer reviews, making changes to 'final' reports if appropriate. Only if peer review comments are significant and fundamental is further grade 7 sign off sought before publishing as part of the JNCC report series.

Departmental Briefs are drafted by an ornithologist with support from the site lead who provides the local site specific detail (in this case Helen Rowell with support from Zoe Ringwood). The document is then quality assured by the marine N2K National Project Management team as well as selected members of the Project Board. The brief is circulated for external comments from Defra Marine Policy Officer, JNCC Senior Seabird Ecologists, Marine Protected Area Technical Group and UK Marine Biodiversity Policy Steering Group. The briefs are also sent to Natural England Board members for early sight of SPA proposals. The amended briefs are then reviewed and approved by the Marine N2K Project Board, Marine Director and relevant Area Managers and subsequently by the Natural England Chief Scientist. The brief is then signed off as required by our Non-Financial Scheme of Delegation and in accordance with our Quality Management Standard by a representative of the Senior Leadership Team with delegated authority before being submitted to Defra.

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