MAYOR OF LONDON

Transport for London

# Inner Thames Estuary Feasibility Study

*Response to Airports Commission Call for Evidence*

# The Mayor of London's Submission:
## Supporting technical documents

**23 May 2014**

Title: **Inner Thames Estuary Airport Option: Waders and Waterfowl**

Author: **ABP Marine Environmental Research Ltd**

Purpose of paper:

**To provide a baseline description and high level impact review for waders and waterfowl present within the airport footprint and wider Thames Estuary study area.**

### Key messages:

- **Low tide distribution maps indicate that intertidal areas within the location of the proposed airport are of considerable importance to a number of wader and waterfowl species. Landside areas are also important for roosting birds.**
- **A high-level impact appraisal identified that waders and waterfowl within the study area would potentially be affected by the construction and operation of the Inner Thames Estuary Airport Option through change in habitat extent and suitability; noise, vibration and visual disturbance; fragmentation of habitat; collision risk and bird strike; and accidental discharges and spillages.**
- **More detailed information on bird distributions and the functional use of the area is required before a thorough impact assessment can be undertaken**

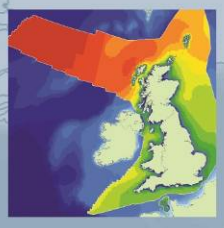
Transport for London

# Inner Thames Estuary Airport Option: Waders and Waterfowl

Report R.2253

May 2014

Creating sustainable solutions for the marine environment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# Inner Thames Estuary Airport Option: Waders and Waterfowl

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# Summary

The Airports Commission (the Commission) was set up in 2012 to take an independent look at the UK's future airport capacity needs. As part of this process it has sought to identify a list of the most credible options for new runway capacity in the UK. In December 2013 the Commission identified two potential sites that were selected for further analysis, namely at Heathrow and Gatwick (Airport Commission, 2013). The Commission also announced that it intended to carry out additional research in respect of the Inner Thames Estuary Option in the first half of 2014.

The Mayor of London Aviation Work Programme is currently co-ordinating a work stream to provide additional information to the Airports Commission with respect to the Inner Thames Estuary Option. ABP Marine Environmental Research Ltd (ABPmer) has been contracted to undertake the following tasks as part of this programme of works:

- A baseline description and high level impact review for waders and waterfowl;
- High level impact assessment; and
- Compensation review.

A baseline description and high level impact review of the waders and waterfowl present within the airport footprint and wider Thames Estuary study area is presented. A number of species are present within the study area in numbers of national and international importance. The key wader and waterfowl species identified in this review include Avocet, Dunlin, Knot, Black-tailed Godwit, Dark-bellied Brent Goose, Lapwing, Wigeon, Gadwall, Teal, Redshank, Grey Plover, Shelduck, Shoveler, Oystercatcher and Ringed Plover. A number of other species of wader and waterfowl also occur within the Thames and surrounding estuaries in significant numbers.

Low tide distribution maps indicate that intertidal areas within the location of the proposed airport are of considerable importance to a number of wader and waterfowl species.

A high-level impact appraisal identified the following pathways by which the waders and waterfowl within the study area may be affected by the construction and operation of the Thames Estuary Inner Airport Option:

- Change in habitat extent;
- Change in habitat suitability;
- Release of contaminants associated with the dispersion of suspended sediments;
- Noise/vibration disturbance;
- Visual disturbance;
- Barrier to movement;
- Collision risk (during construction);
- Bird strike (during operation); and
- Discharge and accidental spillages.

A detailed impact assessment cannot be carried out until more detailed data is obtained and information regarding the scheme design and construction methodologies is provided.

# Acknowledgements

We would like to thank the British Trust for Ornithology for their advice and their valuable online resources that helped inform this study.

# Abbreviations

| | |
|---|---|
| ABPmer | ABP Marine Environmental Research Ltd |
| BAC | Brisbane Airport Corporation |
| BERR | Department for Business Enterprise and Regulatory Reform, formerly |
| BTO | British Trust for Ornithology |
| CAA | Civil Aviation Authority |
| cMCZ | Candidate Tranche 2 Marine Conservation Zone |
| DECC | Department of Energy and Climate Change |
| EGAST | European General Aviation Safety Team |
| EIA | Environmental Impact Assessment |
| EMS | European Marine Site |
| ES | Environmental Statement |
| EU | European Union |
| GGOWF | Galloper Offshore Wind Farm |
| GGOWL | Greater Gabbard Offshore Winds Limited |
| IECS | Institute of Estuarine and Coastal Studies |
| JNCC | Joint nature Conservation Committee |
| MCZ | Marine Conservation Zone |
| PLA | Port of London Authority |
| Ramsar Sites | Wetlands of International Importance |
| rMCZ | Recommended Marine Conservation Zone |
| RSPB | Royal Society for the Protection of Birds |
| SAC | Special Area of Conservation |
| SPA | Special Protection Areas |
| SSSI | Sites of Special Scientific Interest |
| TfL | Transport for London |
| UK | United Kingdom |
| US | United States |
| US FAA | United States Federal Aviation Administration |
| WeBS | Wetland Bird Survey |

Cardinal points/directions are used unless otherwise stated.

SI units are used unless otherwise stated.

# Inner Thames Estuary Airport Option: Waders and Waterfowl

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# 1. Introduction

The Airports Commission (the Commission) was set up in 2012 to take an independent look at the UK's future airport capacity needs. As part of this process it has sought to identify a list of the most credible options for new runway capacity in the UK. During 2013 the Commission received 52 proposals for addressing the UK's airport capacity shortfall, over 40 of which suggested building additional runway infrastructure. These proposals were based on very different visions for the future of the aviation sector. In December 2013 the Commission identified two potential sites that were selected for further analysis, namely at Heathrow and Gatwick (Airport Commission, 2013). The Commission also announced that it intended to carry out additional research in respect of the Inner Thames Estuary Option in the first half of 2014. On this basis, it will reach a view before the end of the 2014 as to whether such an option would offer a credible proposal for consideration alongside the short-listed options. If so, it will be subject to a similar appraisal and consultation process as for those options, although not necessarily to the same timetable.

The Mayor of London Aviation Work Programme is currently co-ordinating a work stream to provide additional information to the Airports Commission with respect to the Inner Thames Estuary Option. The overall scope of works is based on the Inner Thames Estuary feasibility studies terms of reference as issued by the Commission (Airport Commission, 2014). An initial high-level impact appraisal of the Thames Estuary airport scheme reviewed impacts to seabirds (ABPmer, 2013b), and this baseline review now focuses on waders and waterfowl within the estuary. ABP Marine Environmental Research Ltd (ABPmer) has been contracted to undertake the following tasks as part of this programme of works:

- A baseline description and high level impact review for waders and waterfowl;
- High level impact assessment; and
- Compensation review.

This report contains the outputs of the review including:

1) A baseline description of waders and waterfowl usage of the Thames Estuary; and

2) The identification of potential impacts that could arise for waders and waterfowl through the construction and operation of an airport in the Inner Thames Estuary.

The baseline description covers the Thames Estuary and other relevant areas within the region (e.g. Medway, Swale and Crouch and Roach Estuaries as well as sections of open coastline), with the airport footprint located on the north east coast of the Hoo Peninsula (Figure 1). The baseline review and impact assessment has primarily focused on the most abundant and frequently-occurring species, although other species have been included where appropriate.

It should be noted that only the footprint of the possible airport has been considered which does not include the potential impacts that could arise from any associated infrastructure (e.g. construction landing facilities, causeways, cables and tunnels). With regards to decommissioning it has been assumed that the infrastructure installed as part of an airport development of this type would remain permanently *in situ* with at most a change of use employed at the end of the lifespan of the project. No attempt has therefore been made to identify potential impact pathways associated with the decommissioning phase of the Inner Thames Estuary airport proposal. It should be noted that cumulative and in-combination impacts have not been considered within this report.

# 2. Data Sources

A number of information sources have been reviewed to inform the baseline description of waders and waterfowl within the Thames Estuary. These include a number of studies and reports to provide background information on wader and waterfowl distribution and ecology within the Thames Estuary region including:

- Desk study review of data from internationally designated sites; and
- Wetland Bird Survey (WeBS) data collected by the British Trust for Ornithology (BTO) including:
- Inshore Core Counts and Low Tide Counts of waders and waterfowl for the study area described in the most recent WeBS report[1] (Austin *et al*., 2014); and
- WeBS Alerts: a series of reports that analyse bird trends and identify significant declines in species; presented in the latest online report[2] (Cook *et al*., 2013).

Of particular relevance are a number of reviews and monitoring projects which have been undertaken specifically for the Thames Estuary area. These data sources include the following:

- Previous Environmental Statements including Londay Array, Kentish Flats, Galloper Wind Farm Project and London Gateway;
- Aerial surveys of the Thames Strategic Windfarm Areas; and
- BTO through-the-tidal-cycle and night-time surveys of waterbirds to support the London Gateway Assessment.

Information from other surveys and scientific studies on the distribution and ecology of waders and waterfowl in the Thames Estuary and in relation to environmental impacts has also been included where appropriate.

1 The annual WeBS report presents the results of WeBS and includes data from other national and local waterbird monitoring schemes. It provides a single, comprehensive source of information on the current status and distribution of waterbirds in the UK.

2 http://blx1.bto.org/webs-reporting/?tab=alerts

# 3. Overview of the Study Area

## 3.1 Waders and Waterfowl

Waders and waterfowl (collectively referred to as 'waterbirds' in this report) are defined in this study as coastal-living species that feed wholly or mainly within the intertidal environment, rather than birds that spend the majority of their life-history at sea. Waders include several families within the order Charadriiformes, with the exception of the more marine skuas (*Stercorariidae*), gulls (*Laridae*), terns (*Sternidae*) and auks (*Alcidae*). Waterfowl include birds of the order Anseriformes, including ducks, geese and swans. The marine and coastal habitats within the study area support a number of overwintering, passage and resident waders and waterfowl, providing important feeding, roosting and breeding grounds.

Waders are one of the world's furthest migrating groups of birds, with many species migrating annually from Arctic breeding grounds to wintering areas as far away as South America, Africa and Australia[3]. During migration these birds depend heavily on stopover sites where they feed and moult. Both stopover and wintering sites are often coastal areas and estuaries (Adamìk and Pietruszková, 2008). Waterfowl also rely on coastal estuarine habitats at various stages in their life history, particularly as important feeding and wintering areas (McKinney *et al*., 2006). Estuaries therefore often support substantial numbers of both waders and waterfowl, particularly during the winter and passage periods. Many migratory species pass through Britain during spring and autumn on their way to/from breeding grounds. For some species a proportion of the population will overwinter in Britain while others migrate further south.

The intertidal areas of the Thames Estuary support relatively high numbers of both waders and waterfowl, many of which comprise numbers of national or international importance as reflected in the respective environmental designations (see Section 3.2). All bird species are protected under the Wildlife and Countryside Act 1981 (and amendments), under which it is an offence to take, injure or kill these species. This protects all birds, their nests and eggs (a wild bird is defined as any bird of a species that is resident in or is a visitor to the European Territory of any member state in a wild state). All species of naturally occurring birds in the wild state in Europe (applies to birds, their eggs, nests and habitats) are also protected under the Birds Directive.

## 3.2 Nature Conservation Designations

The nature conservation interests of the Thames Estuary and surrounding areas are recognised through a number of international and national designations (Figures 2 and 3). These designations include:

- Special Protection Areas (SPAs);
- Ramsar sites;
- Special Areas of Conservation (SACs);

[3] http://www.rspb.org.uk/wildlife/birdguide/families/sandpipers.aspx

- European Marine Sites (EMS);
- Marine Conservation Zones (MCZs);
- Candidate Tranche 2 Marine Conservation Zones (cMCZs); and
- Sites of Special Scientific Interest (SSSIs).

Of most relevance to this review are the SPA and Ramsar designations within the study area that are specifically classified to protect bird species and their supporting habitats. This section provides an overview of the designated features of these sites within the study area.

### 3.2.1 Thames Estuary and Marshes SPA

The footprint of the Inner Thames Estuary Option overlaps the Thames Estuary and Marshes SPA, which is a designated EMS. EMS are defined in the Conservation (Natural Habitats) Regulations 1994 (since amended to the Conservation of Habitats and Species Regulations 2010) as any part of a European site continuously or intermittently covered by tidal waters or any part of the sea, in or adjacent to Great Britain up to the seaward limit of territorial waters. European sites include SACs and SPAs, designated under the European Habitats Directive (92/43/EEC) and Birds Directive (2009/147/EC) respectively.

The Thames Estuary and Marshes SPA is designated under the Birds Directive due to it supporting a number of qualifying overwintering and passage bird features. The designated features of the Thames Estuary and Marshes SPA at the time of designation are outlined in Table 1 (JNCC, 2006a).

Table 1. Qualifying features of the Thames Estuary and Marshes SPA citation

| Nationally Important Populations of Regularly Occurring Annex 1 Species | |
|---|---|
| Wintering Population (5-year peak mean 1993/94 to 1997/98) | |
| Avocet *Recurvirostra avosetta* | 28.3% of the GB population |
| Hen Harrier *Circus cyaneus* | 1% of the GB population |
| Internationally Important Populations of Regularly Occurring Migratory Species | |
| Wintering Population (5-year peak mean 1993/94 to 1997/98) | |
| Dunlin *Calidris alpina* | 2.1% of the population |
| Knot *Calidris canutus* | 1.4% of the population |
| Black-tailed Godwit *Limosa limosa* | 2.4% of the population |
| Grey Plover *Pluvialis squatarola* | 1.7% of the population |
| Redshank *Tringa totanus* | 2.2% of the population |
| Passage Population (5-year peak mean 1993/94 to 1997/98) | |
| Ringed Plover *Charadrius hiaticula* | 2.6% of the population |
| Internationally Important Assemblage of Birds | |
| Wintering Population (5-year peak mean 1993/94 to 1997/98) | |
| Wintering Assemblage | 75,109 individual birds. Including Avocet *Recurvirostra avosetta*, Golden Plover *Pluvialis squatarola*, Knot *Calidris canutus*, Dunlin *Calidris canutus*, Black-tailed Godwit *Limosa limosa*, Redshank *Tringa totanus*. |

The Natural England advice for the Thames Estuary EMS (English Nature, 2001a) provides conservation objectives for the Thames Estuary and Marshes SPA site. The conservation objectives state: "subject to natural change, maintain in favourable condition the habitats" for all qualifying bird features, including intertidal mudflats, saltmarsh and shingle. The Thames Estuary and Marshes is also listed as a Ramsar site under the Ramsar Convention on Wetlands 1971. As a matter of UK Government policy Ramsar sites are granted the same consideration as SPA sites.

A number of other designated sites are present within the wider study area, namely within the Medway, Swale and Crouch and Roach Estuaries. The designated features of these sites are presented below.

### 3.2.2 Medway Estuary and Marshes SPA

The Medway Estuary is situated to the south of the Thames Estuary on the southern side of the Hoo Peninsula (Figure 2). The habitats present in the Medway Estuary are similar to those in the Thames and support similar waterbird assemblages. The designated features of the Medway Estuary and Marshes SPA at the time of designation are presented in Table 2 (JNCC, 2006b).

Table 2. Qualifying features of the Medway Estuary and Marshes SPA citation

| Nationally Important Populations of Regularly Occurring Annex 1 Species | |
|---|---|
| Breeding Population | |
| Avocet *Recurvirostra avosetta* | 6.2% of the GB breeding population (5-yr peak mean 1998/1992) |
| Common Tern *Sterna hirundo* | 0.6% of the GB breeding population (1994 count) |
| Little Tern *Sterna albifrons* | 1.2% of the GB breeding population (5-yr peak mean 1991-95) |
| Wintering Populations (5-yr peak mean 1991/92-1995/96) | |
| Bewick's Swan *Cygnus columbianus bewickii* | 0.2% of the GB population |
| Avocet *Recurvirostra avosetta* | 24.7% of the GB population |
| **Internationally Important Populations of Regularly Occurring Migratory Species** | |
| Wintering Population (5-year peak mean 1991/92 to 1995/96) | |
| Pintail *Anas acuta* | 1.2% of the population |
| Shoveler *Anas clypeata* | 0.8% of the GB population |
| Teal *Anas crecca* | 1.3% of the GB population |
| Wigeon *Anas penelope* | 1.6% of the GB population |
| Turnstone *Arenaria interpres* | 0.9% of the GB population |
| Dark-bellied Brent Goose *Branta bernicla brenicla* | 1.1% of the population |
| Dunlin *Calidris alpina* | 1.9% of the population |
| Knot *Calidris canutus* | 0.2% of the population |
| Ringed Plover *Charadrius hiaticula* | 1.6% of the population |
| Oystercatcher *Haematopus ostralegus* | 1% of the GB population |
| Black-tailed Godwit *Limosa limosa* | 12.9% of the GB population |
| Curlew *Numenius arquata* | 1.7% of the GB population |
| Grey Plover *Pluvialis squatarola* | 2% of the population |
| Shelduck *Tadorna tadorna* | 1.5% of the population |
| Greenshank *Tringa nebularia* | 2.6% of the GB population |
| Redshank *Tringa totanus* | 2.1% of the population |

| Internationally Important Assemblage of Birds | |
|---|---|
| Breeding Population | |
| Breeding Assemblage | Kingfisher *Alcedo atthis,* Mallard *Anas platyrhynchos,* Short-eared Owl *Asio flammeus,* Pochard *Aythya ferina,* Hen Harrier *Circus cyaneus,* Merlin *Falco columbarius,* Red Throated Diver *Gavia stellata,* Cormorant *Phalacrocorax carbo,* Lapwing *Vanellus vanellus* |
| Wintering Population (5-year peak mean 1998) | |
| Wintering Assemblage | 65,496 individual birds. Including Red Throated Diver *Gavia stellata,* Great Crested Grebe *Podiceps cristatus,* Cormorant *Phalacrocorax carbo,* Bewick's Swan *Cygnus columbianus bewickii,* Dark-bellied Brent Goose *Branta bernicla bernicla,* Shelduck *Tadorna tadorna,* Wigeon *Anas penelope,* Teal *Anas crecca,* Mallard *Anas platyrhynchos,* Pintail *Anas acuta,* Shoveler *Anas clypeata,* Pochard *Aythya ferina,* Oystercatcher *Haematopus ostralegus,* Avocet *Recurvirostra avosetta,* Ringed Plover *Charadrius hiaticula,* Golden Plover *Pluvialis squatarola,* Lapwing *Vanellus vanellus,* Knot *Calidris canutus,* Dunlin *Calidris alpina alpina,* Black-tailed Godwit *Limosa limosa islandica,* Curlew *Numenius arquata,* Redshank *Tringa totanus* , Greenshank *Tringa nebularia,* Turnstone *Arenaria interpres* |

### 3.2.3 The Swale SPA

The Swale Estuary is located to the south of the Isle of Sheppey and links to the Medway Estuary to the west. The Swale supports similar habitats and waterbird assemblages to other estuaries in the study area. The designated features of The Swale SPA at the time of designation are presented in Table 3 (JNCC, 2006c).

The Swale supports similar numbers of wintering waterbirds to The Medway Estuary, and together the two sites comprise the Swale and Medway EMS. Similar to the Thames Estuary EMS, the conservation objectives for the Swale and Medway EMS state: "subject to natural change, maintain in favourable condition the habitats" for all qualifying bird features, including intertidal mudflats, saltmarsh and shingle (English Nature, 2001b).

Table 3. Qualifying features of The Swale SPA citation

| Internationally Important Populations of Regularly Occurring Migratory Species | |
|---|---|
| Wintering Population (5-year peak mean 1991/92 to 1995/96) | |
| Dark-bellied Brent Goose *Branta bernicla bernicla* | 0.7% of the population |
| Dunlin *Calidris alpina* | 2.3% of the population |
| Redshank *Tringa totanus* | 0.9% of the population |
| **Internationally Important Assemblage of Birds** | |
| Breeding Population | |
| Breeding Assemblage | Eurasian Reed Warbler *Acrocephalus scirpaceus,* Teal *Anas crecca,* Mallard *Anas platyrhynchos,* Gadwall *Anas strepera,* Ringed Plover *Charadrius hiaticula,* Common Reed Bunting *Emberiza schoeniclus,* Coot *Fulica atra,* Moorehan *Gallinula chloropus,* Oystercatcher *Haematopus ostralegus,* Curlew *Numenius arquata,* Grey Plover *Pluvialis squatarola,* Shelduck *Tadorna tadorna,* Redshank *Tringa totanus,* Lapwing *Vanellus vanellus* . |

| Wintering Population (5-year peak mean 01/04/1998) | |
|---|---|
| Wintering Assemblage | 65,588 individual birds. Dark-bellied Brent Goose *Branta bernicla bernicla,* Gadwall *Anas strepera,* Teal *Anas crecca,* Oystercatcher *Haematopus ostralegus,* Ringed Plover *Charadrius hiaticula,* Grey Plover *Pluvialis squatarola,* Dunlin *Calidris alpina alpina,* Curlew *Numenius arquata,* Redshank *Tringa totanus* . |

### 3.2.4 Foulness SPA

Foulness is located to the north of the mouth of the Thames Estuary on the mid-Essex coast. The site is an integral component of the phased Mid-Essex Coast SPA (Phase 5) and comprises one of the largest continuous sand-silt flats in the UK. The designated features of the Foulness SPA site at the time of designation are presented in Table 4 (JNCC, 2006d).
Foulness comprises part of the Essex Estuaries EMS. Conservation objectives for Foulness SPA within the advice for the Essex Estuaries EMS (English Nature, 2000) state: "subject to natural change, maintain in favourable condition the habitats" for all qualifying bird features, including shell, sand and gravel shores, intertidal mudflats and sandflats, saltmarsh, shallow coastal waters and boulder and cobble shores.

Table 4. Qualifying features of Foulness SPA citation

| Nationally Important Populations of Regularly Occurring Annex 1 Species | |
|---|---|
| Breeding Population | |
| Avocet *Recurvirostra avosetta* | 5.8% of the GB breeding population (5-yr peak mean 1987-91) |
| Common Tern *Sterna hirundo* | 1.8% of the GB breeding population (1996 count) |
| Little Tern *Sterna albifrons* | 1% of the GB breeding population (5-yr peak mean 1992-96) |
| Sandwich Tern *Sterna sandvicensis* | 2.3% of the GB breeding population (5-yr peak mean 1992-96) |
| Wintering Populations | |
| Hen Harrier *Circus cyaneus* | 2.5% of the GB population (5-yr peak mean 1987/88-1991/92) |
| Bar-tailed Godwit *Limosa lapponica* | 14.6% of the GB population (5-yr peak mean 1991/92-1995/96) |
| Avocet *Recurvirostra avosetta* | 7.9% of the GB population (5-yr peak mean 1991/92-1995/96) |
| Internationally Important Populations of Regularly Occurring Migratory Species | |
| Breeding Population (5-year peak mean 1987/88 to 1991/92) | |
| Ringed Plover *Charadrius hiaticula* | 1.6% of the GB population |
| Wintering Population (5-year peak mean 1991/92 to 1995/96) | |
| Dark-bellied Brent Goose *Branta bernicla brenicla* | 4.4% of the population |
| Redshank *Tringa totanus* | 0.8% of the population |
| Knot *Calidris canutus* | 11.7% of the population |
| Grey Plover *Pluvialis squatorala* | 2.5% of the population |
| Oystercatcher *Haematopus ostralegus* | 1.3% of the GB population |
| Internationally Important Assemblage of Birds | |
| Wintering Population (5-year peak mean 1998) | |
| Wintering Assemblage | 107,999 individual birds. Including Dark-bellied Brent Goose *Branta bernicla bernicla,* Oystercatcher *Haematopus ostralegus,* Avocet *Recurvirostra avosetta,* Golden Plover *Pluvialis squatarola,* Knot *Calidris canutus,* Bar-tailed Godwit *Limosa lapponica,* Redshank *Tringa totanus* |

### 3.2.5 Crouch and Roach Estuaries SPA

The Crouch and Roach Estuaries also form part of the phased Mid-Essex Coast SPA (Phase 3). The two estuaries converge on the coast of south Essex (Figure 2). The intertidal zone is 'squeezed' between the sea walls within the two estuaries, although despite this coastal squeeze the site is still of importance for many wintering waterbirds, notably Dark-bellied Brent Geese. The designated features of the Crouch and Roach Estuaries SPA at the time of designation are presented in Table 5 (JNCC, 2006e).

The Crouch and Roach Estuaries comprise part of the Essex Estuaries EMS. Conservation objectives for the Crouch and Roach Estuaries SPA within the advice for the Essex Estuaries EMS (English Nature, 2000) state: "subject to natural change, maintain in favourable condition the habitats" for all qualifying bird features, including intertidal mudflats and sandflats, saltmarsh and boulder and cobble shores.

Table 5. Qualifying features of the Crouch and Roach SPA citation

| Nationally Important Populations of Regularly Occurring Annex 1 Species | |
|---|---|
| Wintering Populations | |
| Hen Harrier *Circus cyaneus* | 2.5% of the GB population (5-yr peak mean 1987/88-1991/92) |
| **Internationally Important Populations of Regularly Occurring Migratory Species** | |
| Wintering Population (5-year peak mean 1991/92 to 1995/96) | |
| Dark-bellied Brent Goose *Branta bernicla brenicla* | 1% of the population |
| **Internationally Important Assemblage of Birds** | |
| Wintering Population (5-year peak mean 1999) | |
| Wintering Assemblage | 18,607 individual birds. Dark-bellied Brent Goose *Branta bernicla bernicla* |

# 4. Wader and Waterfowl Baseline

This section provides an overview of the wader and waterfowl assemblage present in the Inner Thames Estuary and the Medway Estuary, giving an indication of species trends and any significant declines in numbers, as these areas are closest to the airport footprint. Wader and waterfowl numbers and distribution across the wider study area, including the Swale Estuary, Foulness and the Crouch and Roach Estuaries are also reviewed and further presented in Appendices C, D and E.

The data collated to inform this baseline review includes WeBS high water 'Core Counts', Low Tide Counts and 'Alerts', a system of indicating significant declines in bird numbers. It should be noted that the available data does not include information on waterbird breeding sites/colonies in the study area or detailed flight patterns, which are therefore not included in this baseline review.

## 4.1 Thames Estuary Overview

The latest online WeBS report for 2011/12, published by the BTO (Austin *et al*., 2014), presents the most up to date numbers and trends available for wetland birds at locations around the UK. This report lists the Thames Estuary as the fifth most important key site in terms of overwintering bird numbers in the UK (behind The Wash, Ribble Estuary, Morecambe Bay and North Norfolk Coast). In 2011/12 the Thames Estuary supported 153,801 birds, with a 5-year peak mean of 159,528[4]. This figure is notably higher than the quoted assemblage in the original SPA citation of a 5-year peak mean of 75,109 waterbirds between 1993/94 and 1997/98. The latest 5-year peak means (2007/08 to 2011/12) for waterbirds in the Thames Estuary taken from Austin *et al*. (2014) indicate that there were internationally important numbers of Avocet, Dunlin, Knot, Black-tailed Godwit, Grey Plover, Ringed Plover and Redshank.

The SPA citation for the Thames Estuary and Marshes site and the latest WeBS data indicate that the key waterbird species present in the Thames Estuary include Avocet, Black-tailed Godwit, Dark-bellied Brent Goose, Dunlin, White-fronted Goose, Gadwall, Grey Plover, Knot, Lapwing, Little Grebe, Oystercatcher, Pintail, Redshank, Ringed Plover and Shoveler.

### 4.1.1 High Water Distribution Within the Thames Estuary

WeBS high water Core Counts are co-ordinated monthly counts of waders and waterfowl on inland and coastal wetland areas, generally undertaken during high-tide throughout each winter, between September and March. Core Counts of the Thames Estuary therefore generally describe roosting numbers of birds within the estuary at high water.

[4] The 5-year peak mean statistic is the average of the winter peak count of each species over the last 5 winters.

An overview of trends of each of the most significant species present in the Thames Estuary (both SPA qualifying species and non-designated species) at high water from the latest WeBS Core Counts data is presented in Table 6 below. Also included are the 1% national and international importance thresholds for reference and the month in which species numbers peak.

Wader and waterfowl numbers within the Thames Estuary at high water are dominated by Knot, Dunlin, Oystercatcher, Dark-Bellied Brent Goose and Lapwing. Peak monthly counts often exceed 10,000 individuals within a year for these species. Waterbird numbers within the estuary have shown high variability throughout the last five years. Although the causes of such variability are not well understood they are likely to be linked to changes in weather conditions (such as the very cold winter conditions experienced in 2009/10 and 2010/11) which in particular can alter the distribution of wintering flocks as birds respond by finding more favourable conditions. In addition to the weather, there will be multiple other factors that will be influential in the observed abundance patterns such as breeding success, timing of migrations, national population trends and inter-annual or inter-generational changes in roosting/feeding site selection.

In addition to qualifying SPA species, species that are not specifically listed in the original SPA and Ramsar citations have been present in the Thames Estuary in numbers that exceed the international and national importance thresholds throughout the most recent 5-year period for which Core Count data is available. Over the last five years, these species that have been present in internationally important numbers include Oystercatcher, Bar-tailed Godwit, Gadwall and Dark-bellied Brent Goose. Nationally important numbers of Lapwing, Turnstone, Green Sandpiper, White-fronted Goose, Wigeon, Curlew, Teal, Pochard, Little Grebe, Little Egret, Shelduck, Shoveler and Sanderling have also been present which are also not featured in the SPA citation.

More detailed data and maps of the high tide distribution of waterbirds within individual count sectors within the Thames Estuary have not been included in this review, although they are available from the BTO at a cost.

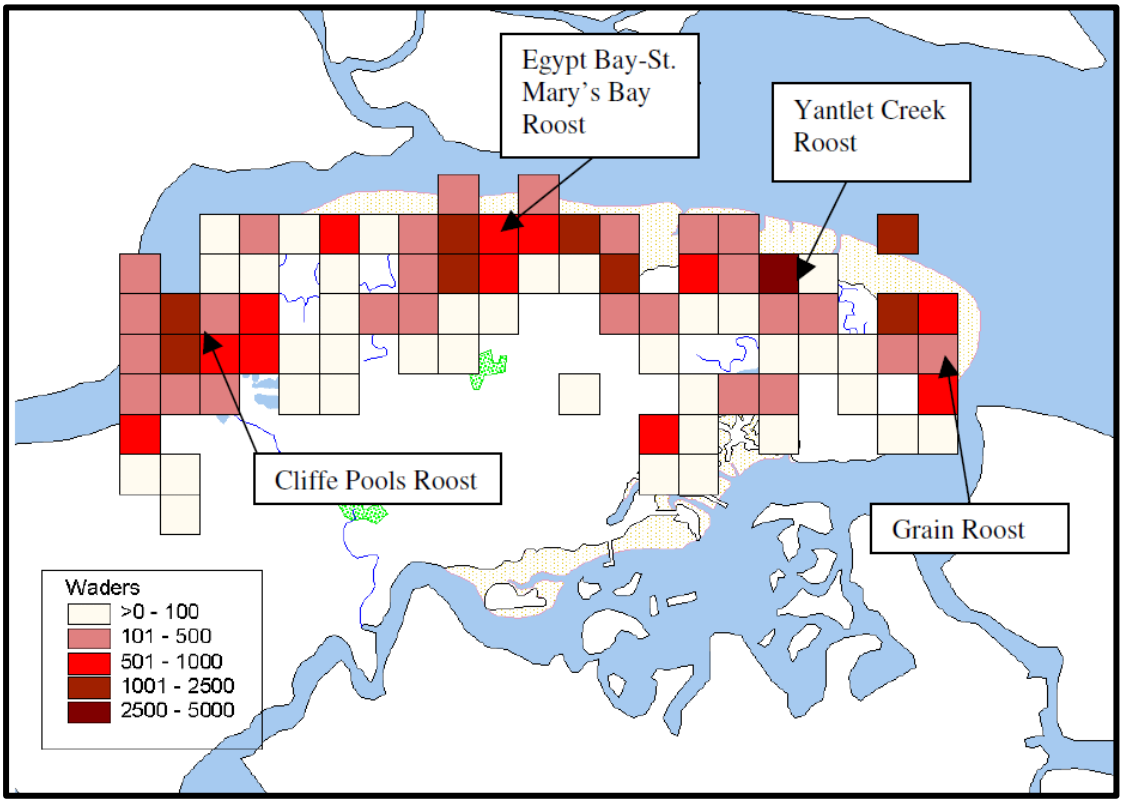
Table 6. WeBS Core Counts of the main wader and waterfowl species present in the Thames Estuary from 2007/08 to 2011/12

| Species | International Importance Threshold | National Importance Threshold | 2007/08 | 2008/09 | 2009/10 | 2010/11 | 2011/12 | 5-year Peak Mean | Month |
|---|---|---|---|---|---|---|---|---|---|
| Avocet* | 730 | 75 | 1,633 | 1,689 | 1,702 | 1,728 | 1,353 | 1,621 | Mar |
| Dunlin** | 13,300 | 3,500 | 34,941 | 32,123 | 23,217 | 16,950 | 25,396 | 30,820 | Nov |
| Knot** | 4,500 | 3,200 | 45,162 | 28,203 | 17,861 | 30,725 | 34,466 | 31,283 | Jan |
| Black-tailed Godwit** | 610 | 430 | 8,081 | 4,709 | 5,783 | 2,021 | 3,288 | 4,776 | Sep |
| Grey Plover** | 430 | 65 | 2,970 | 2,801 | 4,734 | 4,288 | 3,709 | 3,700 | Mar |
| Redshank** | 2,400 | 1,200 | 3,512 | 4,243 | 3,701 | 3,436 | 2,950 | 3,568 | Mar |
| Ringed Plover** | 730 | 340 | 748 | 830 | 733 | 739 | 883 | 787 | Nov |
| Little Grebe | 3,900 | 160 | 315 | 474 | 369 | 403 | 389 | 390 | Jan |
| Little Egret | 1,300 | 45 | 277 | 421 | 383 | 331 | 235 | 471 | Sep |
| Greenshank | 2,300 | 6 | 132 | 130 | 129 | 69 | 103 | 113 | Aug |
| Shelduck | 3,000 | 610 | 2,498 | 1,941 | 1,362 | 1,904 | 1,241 | 1,789 | Jan |
| Gadwall | 600 | 250 | 431 | 687 | 909 | 734 | 328 | 743 | Oct |
| Shoveler | 400 | 180 | 227 | 486 | 355 | 537 | 266 | 374 | Mar |
| Lapwing | 20,000 | 6,200 | 8,728 | 8,101 | 9,246 | 12,397 | 9,682 | 9,631 | Jan |
| Oystercatcher | 8,200 | 3,200 | 26,905 | 33,659 | 24,278 | 20,494 | 16,528 | 24,373 | Oct |
| Bar-tailed Godwit | 1,200 | 380 | 3,711 | 3,804 | 7,903 | 8,784 | 7,804 | 6,401 | Feb |
| Curlew | 8,400 | 1,400 | 3,722 | 4,130 | 4,603 | 3,620 | 2,771 | 3,769 | Sep |
| Turnstone | 1,400 | 480 | 1,090 | 1,060 | 382 | 703 | 428 | 733 | Jan |
| Dark-bellied Brent Goose | 2,400 | 910 | 22,047 | 11,684 | 12,541 | 23,057 | 16,759 | 17,218 | Oct |
| Wigeon | 15,000 | 4,400 | 9,293 | 4,428 | 6,641 | 6,932 | 7,626 | 6,984 | Feb |
| Teal | 5,000 | 2,100 | 3,373 | 4,393 | 5,917 | 4,176 | 3,115 | 4,195 | Dec |
| Pochard | 3,000 | 380 | 854 | 588 | 714 | 929 | 983 | 814 | Feb |
| White-fronted Goose | 12,000 | 24 | 24 | 17 | 28 | 96 | 22 | 41 | Nov |
| Green Sandpiper | 15,500 | 9 | 26 | 21 | 22 | 17 | 9 | 19 | Sep |
| Sanderling | 1,200 | 160 | 689 | 951 | 587 | 897 | 1,080 | 841 | Sep |

Key: Thames Estuary and Marshes SPA designated due to supporting:
* Populations of National Importance;
** Populations of International Importance

#### 4.1.1.1 High Water Roosts on the Hoo Peninsula

Bell *et al*. (2003) carried out a review of the main roost sites for waders and waterfowl around the Hoo Peninsula. This review identified four main roost sites used by wader species at high tide, which in most cases were situated closest to the respective feeding areas used by birds. The wader species included in this review were Oystercatcher, Ringed Plover, Golden Plover, Grey Plover, Lapwing, Knot, Dunlin, Black-tailed Godwit, Bar-tailed Godwit, Curlew and Redshank[5]. The four major roost sites used by these species on the Peninsula are indicated in Image 1 and described below.




(Bell *et al*., 2003)

Image 1, Distribution of waders across the Hoo Peninsula indicating the four main roost sites

The Cliffe Pools complex is spread over a large area between Higham Marshes and Redsham Mead. The extent of its use depends on the height of the tide as many birds remain on the foreshore of Higham Creek unless forced off by a spring tide, when they move onto Cliffe Pools and Higham Marshes. Birds using the Cliffe Pools complex to roost generally feed in the intertidal area of the Thames closest to the airport footprint.

[5] It should be noted that other species may potentially be of importance across the Hoo Peninsula that were not covered by Bell *et al*. (2003).

Egypt Bay and St. Mary's Bay are not inundated with water on every high tide and many birds also congregate here to roost. When the bays are covered at very high tides, birds fly southwards to roost on the pasture land over the sea wall or on the Medway, or east towards St. Mary's Creek or Yantlet Creek.

The foreshore of the mouth of Yantlet Creek remains uncovered even at very high tides and attracts large numbers of birds. However, a combination of disturbance from the nearby Ministry of Defence range, high water levels and the presence of raptors has been observed to cause birds to disperse to other roost sites.

Grain Point does not comprise a particularly large roost although it may be used by large numbers of Dunlin and other small waders. This area also appears to provide an intermediate roost between the Thames and Medway Estuaries (Bell *et al*., 2003).

The data presented in Bell *et al*. (2003) indicates that the sites used by waterfowl at high tide across the Hoo Peninsula are comparable to the roost sites identified for wader species. Highest numbers of species were recorded within the freshwater areas of Allhallows, Cliffe Pools and Marshes, Grain, Egypt and St. Mary's Bay and Yantlet Creek. These areas therefore seem the most important sites for the majority of coastal bird species at high water in the vicinity of the development footprint.

### 4.1.2 Low Water Distribution Within the Thames Estuary

WeBS Low Tide counts collect information regarding the relative importance of intertidal feeding areas of UK estuaries for wintering waterbirds. Low water counts monitor the winter abundance and distribution of birds within a number of estuaries around Great Britain from November to February each year, including the Thames Estuary.

WeBS Low Tide counts are available for 2002/03 and 2008/09 for the Thames Estuary, along with density maps that indicate the density and approximate distribution of birds across Low Tide Count Sectors. Across the Thames Estuary a total of 31 wader and waterfowl species were recorded during the WeBS Low Tide Counts in 2008/09. Table 7 summarises the abundance of the main wader and waterfowl species observed within the Thames Estuary at low tide in 2002/03 and 2008/09. These numbers represent the peak count in any month between November and February. Dunlin was present in the largest numbers in 2008/09, followed by Knot and Oystercatcher (Table 7). A breakdown of waterbird numbers by count sector along the northern shore of the Hoo Peninsula is presented in Section 4.3.1.

Density distribution maps for each species are presented in Appendix A to indicate the most important feeding areas at low water for each species within the study area during 2008/09 where available. These maps have been taken from the latest online WeBS report (Austin *et al*., 2014). Areas shaded grey were not included in the Low Tide Counts for 2008/09 and therefore no data is available. An example density distribution map for Dark-bellied Brent Goose in the Thames Estuary is shown in Image 2. It should be noted, however, that coverage of WeBS Count Sectors throughout Low Water Counts may be patchy and a number of areas may not be counted in a particular winter. Coverage of the Thames Estuary has been notably patchy in recent years, although the BTO has stated that coverage will improve in future

winters (Neil Calbrade, pers. comm., April 2014). Count Sectors that are not covered in the WeBS Low Tide Counts appear grey in the BTO's density maps.

Table 7. Peak counts at low water of waders and waterfowl in the Thames Estuary during the winters of 2002/03 and 2008/09

| Species | WeBS Low Tide Peak Count | |
|---|---|---|
| | 2002/03 | 2008/09 |
| Avocet* | 6 | 11 |
| Dunlin** | 28,880 | 32,123 |
| Knot** | 11,103 | 17,941 |
| Black-tailed Godwit** | 953 | 531 |
| Grey Plover** | 1,222 | 1,181 |
| Redshank** | 554 | 699 |
| Ringed Plover** | 50 | 107 |
| Little Egret | 9 | 14 |
| Shelduck | 603 | 285 |
| Gadwall | 80 | 4 |
| Shoveler | 3 | 8 |
| Lapwing | 1,473 | 1,623 |
| Oystercatcher | 901 | 3,208 |
| Bar-tailed Godwit | 161 | 3 |
| Curlew | 785 | 768 |
| Turnstone | 23 | 152 |
| Dark-bellied Brent Goose | 48 | 704 |
| Wigeon | 7,029 | 1,883 |
| Teal | 565 | 76 |
| Sanderling | 0 | 90 |

Key: Thames Estuary and Marshes SPA designated due to supporting:
* Populations of National Importance;
** Populations of International Importance

It should be noted that the WeBS Low Tide Counts for some species are not consistent with the high water Core Count data. For example for, the peak high water count in 2008/09 indicates 1,689 Avocet in the Thames, while the peak low tide count was only 11 birds. Large discrepancies between high water and low water counts also exist for Black-tailed Godwit, Redshank, Shelduck, Gadwall, Shoveler, Oystercatcher, Bar-tailed Godwit, Dark-bellied Brent Goose and Teal (see Tables 6 and 7).

This discrepancy between the number of birds present at high tide and low tide may be due to the limited coverage of the estuary in low water counts outlined above, with the main feeding grounds at low water for certain species not covered by the WeBS Low Tide Counts. Habitat use by Dark-bellied Brent Geese, for example, is known to be sequential, as they deplete intertidal food resources before switching to foraging inland by midwinter (Ward, 2004), where they will not be covered by Low Tide Counts. Low tide Avocet distribution has previously been shown to be concentrated around the foreshore of East Tilbury (Musgrove *et al*., 2003), which is indicated on the low tide density maps as not being covered by the latest Low Tide Counts. Detailed information regarding bird movements throughout the estuary between roosting sites and feeding areas will be necessary to fill this data gap and understand functional usage of different areas of the estuary.

The BTO's low tide density maps indicate that from the species for which maps are available, those occurring in highest densities within the footprint of the Inner Thames Estuary Option include Shelduck, Oystercatcher, Knot, Dunlin, Redshank and Curlew. To a lesser extent, Dark-Bellied Brent Goose, Grey Plover, Golden Plover and Turnstone are also present in relatively high densities within the airport footprint.

Low water data is also available for individual WeBS Count Sectors along the northern shore of the Hoo Peninsula. A review of this data is presented in the following section.

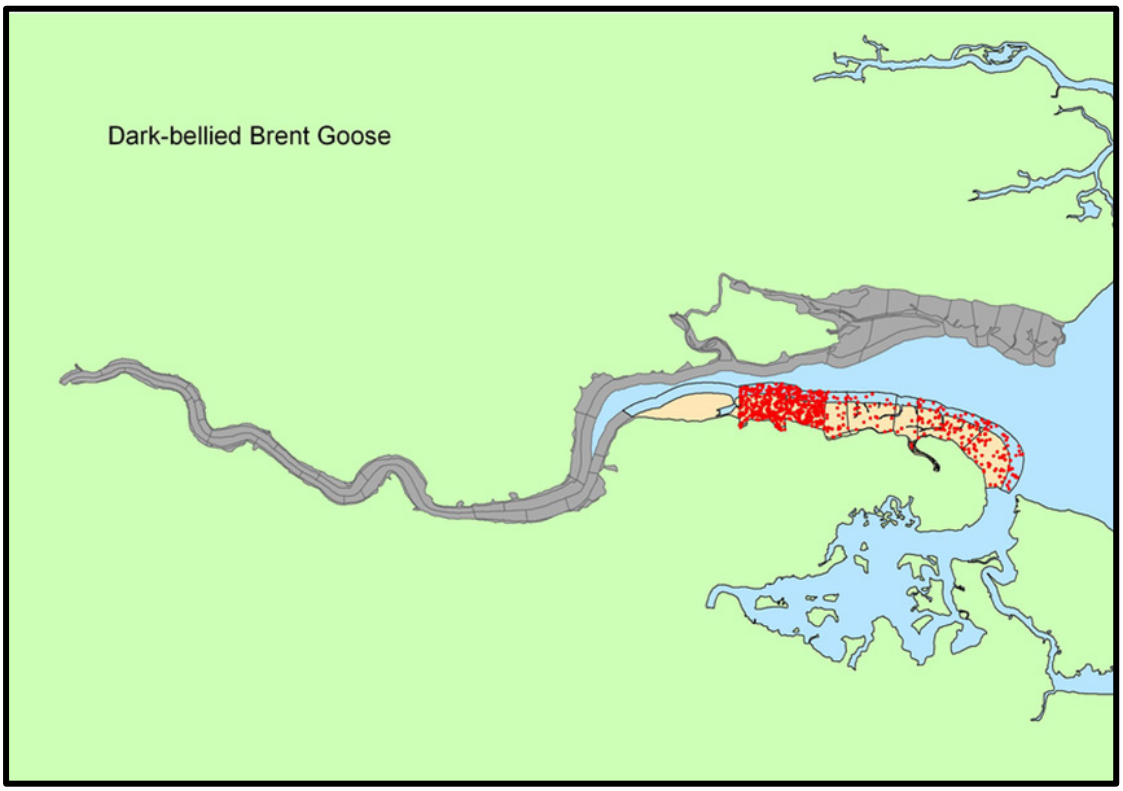


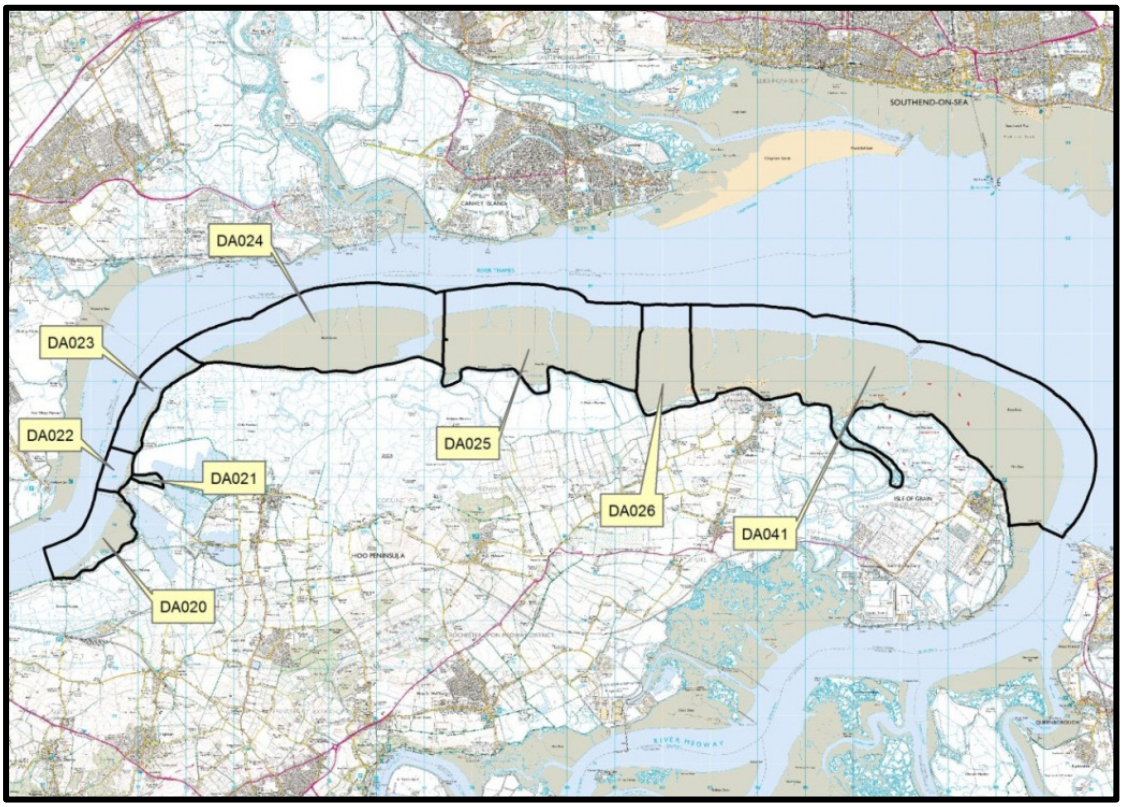

Image 2. Example density distribution map of Dark-bellied Brent Goose within the Thames Estuary 2008/09

#### 4.1.2.1 Low Water Distribution Along the Northern Hoo Peninsula Shore

The low tide data for specific WeBS Low Tide Count Sectors along the Thames' southern shore between Shorne and Grain throughout the 2002/03 winter has been accessed via the Port of London Authority's website[6]. This data coincides with much of the development footprint on the northern shore of the Hoo Peninsula and the Isle of Grain (Image 3), providing further information on the feeding distribution of waders and waterfowl at low water within this area.

6 https://www.pla.co.uk/Environment/Main-Biodiversity-Resources-in-the-Tidal-Thames-Species

Table 8 presents mean and peak monthly counts and densities of each wader and waterfowl species observed at low water in the count sectors shown in Image 3, throughout the winter of 2002/03. Details of each species' preferred habitat and the area of this habitat in each count sector are also presented.




(Neil Calbrade, pers. comm.)

Image 3. Location of WeBS Low Tide Count Sectors for which data is presented in Table 8

Table 8 indicates that Count Sectors DA024, DA025, DA026 and DA041 supported more species and higher numbers of birds than other sectors along the northern shore of the Hoo Peninsula. These sectors comprise larger areas of intertidal habitat that provide important food resources for wintering birds and this is reflected in the high numbers of birds present in these areas. Bird assemblages in these areas were dominated by high numbers of highly gregarious Knot (peak of 5,375 birds in DA041) and Dunlin (peak of 14,650 birds in DA025), as well as Wigeon (peak of 6,300 birds in DA024) Large numbers of Lapwing (peak of 755 birds in DA024) and Grey Plover (peak of 750 birds in DA025) were also present.

Table 8. WeBS Low Tide Count Data for the winter 2002/03 for count sectors along the southern Thames Estuary shoreline.

| Count Sector | Species | Preferred Habitat | Area (ha) | Peak Count | Peak Density (Birds/ha) | Mean Count | Mean Density (Birds/ha) |
|---|---|---|---|---|---|---|---|
| DA020 | Shelduck | All habitats | 187 | 6 | 0.03 | 2 | 0.01 |
| | Wigeon | All habitats | 187 | 204 | 1.09 | 91 | 0.49 |
| | Gadwall | All habitats | 187 | 42 | 0.22 | 15 | 0.08 |
| | Teal | All habitats | 187 | 148 | 0.79 | 62 | 0.33 |
| | Mallard | All habitats | 187 | 37 | 0.20 | 14 | 0.07 |
| | Oystercatcher | Intertidal | 70 | 3 | 0.04 | 1 | 0.01 |
| | Avocet | Intertidal | 70 | 6 | 0.09 | 2 | 0.02 |
| | Ringed Plover | Intertidal | 70 | 14 | 0.20 | 4 | 0.05 |
| | Golden Plover | Intertidal & non-tidal | 84 | 184 | 2.19 | 64 | 0.76 |
| | Grey Plover | Intertidal | 70 | 123 | 1.76 | 72 | 1.03 |
| | Lapwing | Intertidal & non-tidal | 84 | 92 | 1.10 | 58 | 0.69 |
| | Dunlin | Intertidal | 70 | 2,600 | 37.14 | 1,511 | 21.59 |
| | Bar-tailed Godwit | Intertidal | 70 | 7 | 0.10 | 2 | 0.03 |
| | Curlew | Intertidal & non-tidal | 84 | 47 | 0.56 | 22 | 0.26 |
| | Redshank | Intertidal & non-tidal | 84 | 128 | 1.52 | 71 | 0.84 |
| | Turnstone | Intertidal | 70 | 1 | 0.01 | 0 | 0.00 |
| DA021 | Little Egret | Intertidal & non-tidal | 12 | 6 | 0.50 | 3 | 0.23 |
| | Oystercatcher | Intertidal | 12 | 1 | 0.08 | 0 | 0.02 |
| | Curlew | Intertidal & non-tidal | 12 | 2 | 0.17 | 1 | 0.04 |
| | Redshank | Intertidal & non-tidal | 12 | 55 | 4.58 | 18 | 1.48 |
| DA022 | Little Egret | Intertidal & non-tidal | 6 | 1 | 0.17 | 0 | 0.04 |
| | Shelduck | All Habitats | 51 | 10 | 0.20 | 3 | 0.06 |
| | Wigeon | All Habitats | 51 | 4 | 0.08 | 1 | 0.02 |
| | Gadwall | All Habitats | 51 | 8 | 0.16 | 2 | 0.04 |
| | Lapwing | Intertidal & non-tidal | 6 | 115 | 19.17 | 29 | 4.79 |
| | Dunlin | Intertidal | 6 | 20 | 3.33 | 5 | 0.83 |
| | Curlew | Intertidal & non-tidal | 6 | 1 | 0.17 | 1 | 0.08 |
| | Redshank | Intertidal & non-tidal | 6 | 119 | 19.83 | 30 | 5.00 |
| DA023 | Little Egret | Intertidal & non-tidal | 21 | 1 | 0.05 | 0 | 0.01 |
| | Shelduck | All Habitats | 146 | 1 | 0.01 | 0 | 0.00 |
| | Wigeon | All Habitats | 146 | 13 | 0.09 | 4 | 0.03 |
| | Gadwall | All Habitats | 146 | 54 | 0.37 | 16 | 0.11 |
| | Teal | All Habitats | 146 | 42 | 0.29 | 13 | 0.09 |
| | Mallard | All Habitats | 146 | 4 | 0.03 | 2 | 0.01 |
| | Shoveler | All Habitats | 146 | 3 | 0.02 | 1 | 0.01 |
| | Ringed Plover | Intertidal | 21 | 12 | 0.57 | 3 | 0.14 |
| | Grey Plover | Intertidal | 21 | 1 | 0.05 | 1 | 0.02 |
| | Lapwing | Intertidal & non-tidal | 21 | 37 | 1.76 | 9 | 0.44 |
| | Dunlin | Intertidal | 21 | 5 | 0.24 | 3 | 0.12 |
| | Curlew | Intertidal & non-tidal | 21 | 8 | 0.38 | 4 | 0.17 |
| | Redshank | Intertidal & non-tidal | 21 | 3 | 0.14 | 2 | 0.07 |
| DA024 | Great Crested Grebe | Sub-tidal | 316 | 1 | 0.00 | 0 | 0.00 |
| | Grey Heron | Intertidal & non-tidal | 430 | 1 | 0.00 | 1 | 0.00 |
| | Shelduck | All Habitats | 746 | 411 | 0.55 | 164 | 0.22 |
| | Wigeon | All Habitats | 746 | 6,300 | 8.45 | 1,822 | 2.44 |
| | Gadwall | All Habitats | 746 | 3 | 0.00 | 1 | 0.00 |
| | Teal | All Habitats | 746 | 375 | 0.50 | 100 | 0.13 |
| | Mallard | All Habitats | 746 | 42 | 0.06 | 14 | 0.02 |
| | Pintail | All Habitats | 746 | 253 | 0.34 | 72 | 0.10 |

| Count Sector | Species | Preferred Habitat | Area (ha) | Peak Count | Peak Density (Birds/ha) | Mean Count | Mean Density (Birds/ha) |
|---|---|---|---|---|---|---|---|
| | Shoveler | All Habitats | 746 | 2 | 0.00 | 1 | 0.00 |
| | Avocet | Intertidal | 430 | 3 | 0.01 | 1 | 0.00 |
| | Ringed Plover | Intertidal | 430 | 47 | 0.11 | 13 | 0.03 |
| | Golden Plover | Intertidal & non-tidal | 430 | 4 | 0.01 | 1 | 0.00 |
| | Grey Plover | Intertidal | 430 | 80 | 0.19 | 39 | 0.09 |
| | Lapwing | Intertidal & non-tidal | 430 | 755 | 1.76 | 358 | 0.83 |
| | Knot | Intertidal | 430 | 3 | 0.01 | 1 | 0.00 |
| | Dunlin | Intertidal | 430 | 5,885 | 13.69 | 3,164 | 7.36 |
| | Black-tailed Godwit | Intertidal & non-tidal | 430 | 131 | 0.30 | 44 | 0.10 |
| | Bar-tailed Godwit | Intertidal | 430 | 1 | 0.00 | 0 | 0.00 |
| | Curlew | Intertidal & non-tidal | 430 | 108 | 0.25 | 51 | 0.12 |
| | Spotted Redshank | Intertidal & non-tidal | 430 | 1 | 0.00 | 0 | 0.00 |
| | Redshank | Intertidal & non-tidal | 430 | 11 | 0.03 | 5 | 0.01 |
| | Turnstone | Intertidal | 430 | 1 | 0.00 | 0 | 0.00 |
| | Greylag Goose | All Habitats | 746 | 28 | 0.04 | 7 | 0.01 |
| DA025 | Grey Heron | Intertidal & non-tidal | 526 | 2 | 0.00 | 1 | 0.00 |
| | Bewick's Swan | All Habitats | 747 | 5 | 0.01 | 1 | 0.00 |
| | Dark-bellied Brent Goose | All Habitats | 747 | 8 | 0.01 | 4 | 0.01 |
| | Shelduck | All Habitats | 747 | 109 | 0.15 | 34 | 0.04 |
| | Wigeon | All Habitats | 747 | 600 | 0.80 | 286 | 0.38 |
| | Gadwall | All Habitats | 747 | 2 | 0.00 | 1 | 0.00 |
| | Mallard | All Habitats | 747 | 65 | 0.09 | 30 | 0.04 |
| | Pintail | All Habitats | 747 | 55 | 0.07 | 15 | 0.02 |
| | Shoveler | All Habitats | 747 | 1 | 0.00 | 0 | 0.00 |
| | Oystercatcher | Intertidal | 516 | 26 | 0.05 | 9 | 0.02 |
| | Ringed Plover | Intertidal | 516 | 16 | 0.03 | 4 | 0.01 |
| | Golden Plover | Intertidal & non-tidal | 526 | 30 | 0.06 | 14 | 0.03 |
| | Grey Plover | Intertidal | 516 | 750 | 1.45 | 502 | 0.97 |
| | Lapwing | Intertidal & non-tidal | 526 | 645 | 1.23 | 253 | 0.48 |
| | Knot | Intertidal | 516 | 725 | 1.41 | 360 | 0.70 |
| | Dunlin | Intertidal | 516 | 14,650 | 28.39 | 10,438 | 20.23 |
| | Black-tailed Godwit | Intertidal & non-tidal | 526 | 783 | 1.49 | 359 | 0.68 |
| | Bar-tailed Godwit | Intertidal | 516 | 10 | 0.02 | 3 | 0.00 |
| | Curlew | Intertidal & non-tidal | 526 | 311 | 0.59 | 269 | 0.51 |
| | Redshank | Intertidal & non-tidal | 526 | 97 | 0.18 | 55 | 0.10 |
| | Greylag Goose | All Habitats | 747 | 35 | 0.05 | 9 | 0.01 |
| DA026 | Little Egret | Intertidal & non-tidal | 195 | 2 | 0.01 | 1 | 0.00 |
| | Dark-bellied Brent Goose | All Habitats | 245 | 20 | 0.08 | 5 | 0.02 |
| | Shelduck | All Habitats | 245 | 10 | 0.04 | 3 | 0.01 |
| | Mallard | All Habitats | 245 | 3 | 0.01 | 1 | 0.00 |
| | Pintail | All Habitats | 245 | 280 | 1.14 | 70 | 0.29 |
| | Oystercatcher | Intertidal | 180 | 50 | 0.28 | 17 | 0.09 |
| | Grey Plover | Intertidal | 180 | 50 | 0.28 | 20 | 0.11 |
| | Knot | Intertidal | 180 | 5,000 | 27.78 | 1,495 | 8.31 |
| | Dunlin | Intertidal | 180 | 4,750 | 26.39 | 1,735 | 9.64 |
| | Curlew | Intertidal & non-tidal | 195 | 100 | 0.51 | 55 | 0.28 |
| | Redshank | Intertidal & non-tidal | 195 | 120 | 0.62 | 46 | 0.23 |
| DA041 | Little Egret | Intertidal & non-tidal | 1,207 | 1 | 0.00 | 1 | 0.00 |
| | Grey Heron | Intertidal & non-tidal | 1,207 | 4 | 0.00 | 1 | 0.00 |
| | Mute Swan | Sub-tidal | 582 | 4 | 0.01 | 1 | 0.00 |
| | Dark-bellied Brent Goose | All Habitats | 1,789 | 40 | 0.02 | 21 | 0.01 |
| | Shelduck | All Habitats | 1,789 | 217 | 0.12 | 109 | 0.06 |
| | Wigeon | All Habitats | 1,789 | 35 | 0.02 | 15 | 0.01 |

| Count Sector | Species | Preferred Habitat | Area (ha) | Peak Count | Peak Density (Birds/ha) | Mean Count | Mean Density (Birds/ha) |
|---|---|---|---|---|---|---|---|
| | Gadwall | All Habitats | 1,789 | 8 | 0.00 | 2 | 0.00 |
| | Mallard | All Habitats | 1,789 | 10 | 0.01 | 6 | 0.00 |
| | Pintail | All Habitats | 1,789 | 10 | 0.01 | 3 | 0.00 |
| | Oystercatcher | Intertidal | 1,172 | 890 | 0.76 | 563 | 0.48 |
| | Ringed Plover | Intertidal | 1,172 | 37 | 0.03 | 19 | 0.02 |
| | Golden Plover | Intertidal & non-tidal | 1,207 | 47 | 0.04 | 12 | 0.01 |
| | Grey Plover | Intertidal | 1,172 | 355 | 0.30 | 298 | 0.25 |
| | Lapwing | Intertidal & non-tidal | 1,207 | 232 | 0.19 | 60 | 0.05 |
| | Knot | Intertidal | 1,172 | 5,375 | 4.59 | 3,640 | 3.11 |
| | Dunlin | Intertidal | 1,172 | 6,717 | 5.73 | 3,224 | 2.75 |
| | Black-tailed Godwit | Intertidal & non-tidal | 1,207 | 260 | 0.22 | 70 | 0.06 |
| | Bar-tailed Godwit | Intertidal | 1,172 | 154 | 0.13 | 47 | 0.04 |
| | Curlew | Intertidal & non-tidal | 1,207 | 394 | 0.33 | 278 | 0.23 |
| | Redshank | Intertidal & non-tidal | 1,207 | 330 | 0.27 | 228 | 0.19 |
| | Turnstone | Intertidal | 1,172 | 22 | 0.02 | 16 | 0.01 |
| | Greylag Goose | All Habitats | 1,789 | 59 | 0.03 | 15 | 0.01 |

### 4.1.3 WeBS Alerts

WeBS Alerts are a series of reports that provide a review of the status of bird species at sites in the UK which are designated due to their conservation value. Species that have undergone declines in numbers are flagged according to the degree of change by the issuing of an Alert. The WeBS Alerts process identifies changes in numbers of non-breeding wintering waterbirds in the UK and issues 'alerts' where significant declines have occurred over four different timescales; short-term (5-years), medium-term (10 years), long-term (25 years) and since SPA classification.

Medium Alerts are triggered if bird numbers have dropped by between 25 and 50%; and high Alerts are triggered if declines exceed 50%. The latest WeBS Alerts report incorporates data up to the winter of 2010/11 (Cook *et al.*, 2013). While short- and medium-term trends are of use to indicate more recent changes, the importance of long-term trends is acknowledged in showing the overall pattern in a species' numbers.

According to the site account in the online WeBS Alerts report (Cook *et al.*, 2013), seven species within the Thames Estuary and Marshes SPA are declining in numbers sufficiently to have been issued Alerts. These species include:

- White-fronted Goose (High and Medium Alerts);
- Shoveler (Medium Alert):
- Ringed Plover (Medium Alert);
- Grey Plover (High Alert);
- Lapwing (Medium Alert);
- Knot (High Alerts); and
- Dunlin (Medium Alerts).

The magnitude of these alerts and the timescales at which they have been issued is presented in Table 9.

Table 9. WeBS Alerts issued for species within the Thames Estuary and Marshes SPA site over all timescales

| Species | Short-term (%) | Medium-term (%) | Long-term (%) | Since Designation (2000) (%) |
|---|---|---|---|---|
| White-fronted Goose | -26 | -63 | -98 | -63 |
| Shoveler | -5 | -33 | -23 | -33 |
| Ringed Plover | -37 | -24 | 41 | -24 |
| Grey Plover | -17 | -50 | 40 | -50 |
| Lapwing | -17 | -35 | 32 | -35 |
| Knot | -51 | -85 | -50 | -85 |
| Dunlin | -28 | -3 | 138 | -3 |
| Red | High alert (> 50% decline); | | | |
| Amber | Medium alert (25 – 50% decline). | | | |

Of the species presented in Table 9, comparison of site trends with broadscale regional and national trends suggests that declines in White-fronted Geese, Grey Plover and Knot may be due to site-specific pressures within the Thames Estuary and Marshes SPA site.

While the Alerts report notes any issues present at each site, it is important to note that this does not in any way imply causality between these issues and any declines observed at the site. Further work would be necessary to investigate any contributing factors and identify specific reasons for any such decline in species numbers at a site.

### 4.1.4 Additional Data from the Wider Thames Estuary

Additional surveys and reviews of the ornithology of the outer and inner areas of the Thames Estuary have been carried out in recent years in support of specific development projects within the estuary. Data from these surveys and reviews provides further information on the usage of different areas of the Thames Estuary by waders and waterfowl. The relevant sources of such information that have been reviewed to inform the wader and waterfowl baseline include:

- The Gunfleet Sands Offshore Wind Farm Environmental Statement (DONG Energy, 2007);
- Kentish Flats Offshore Wind Farm Extension Environmental Statement (Vattenfall, 2011);
- Aerial Surveys of Waterbirds in Strategic Windfarm Areas: 2007 Final Report (BERR, 2008);
- Aerial Surveys of Waterbirds in the UK: 2007/08 Final Report (DECC, 2009);
- Greater Gabbard Offshore Wind Farm Environmental Statement (PMSS, 2005);
- Galloper Wind Farm Project Environmental Statement - Chapter 11: Offshore Ornithology (Royal Haskoning, 2011); and
- Through-the-tidal-cycle and Night-time Waterbird counts undertaken by the BTO as part of the London Gateway Assessment (Armitage *et al.*, 2002).

The majority of these reports present and review the results of specific aerial and boat-based bird surveys carried out in the outer regions (i.e. beyond the estuary mouth) of the Thames Estuary and in offshore areas. These surveys have been undertaken to fill data gaps on waterbird distribution and abundance in the Thames and surrounding areas in order to inform EIAs for various wind farm developments.

Project-specific surveys such as those undertaken in support of the Gunfleets Sands, Kentish Flats, Greater Gabbard and Galloper Wind Farms have generally focused on the area of the proposed wind farm. A series of aerial surveys have also been carried out in the outer Thames region in recent years that focused on specific survey grids, in order to inform future wind farm developments in the area, and the Environmental Statements of these wind farm development also refer to data from these surveys. Figure 4 indicates the sites of the aforementioned wind farm developments and the aerial survey grids to provide an indication of the outer regions of the Thames Estuary for which waterbird data is also available.

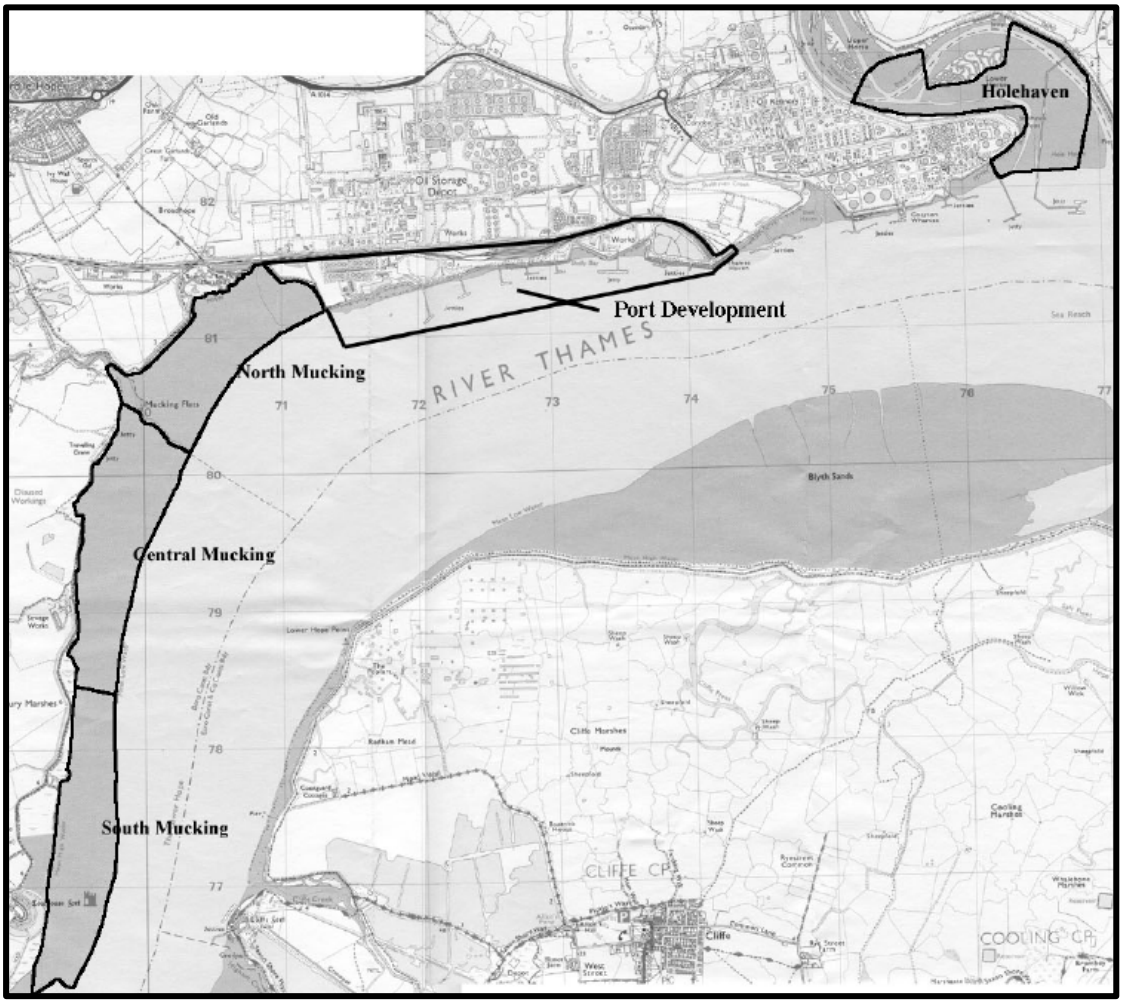
Results from these surveys indicate low numbers of waders and waterfowl in the outer areas of the estuary. The vast majority of bird species observed in the areas indicated in Figure 4 during these surveys comprised seabirds and seaducks such as Gulls, Auks, Divers and Terns. Most wader and waterfowl species were observed during aerial surveys and the majority of numbers were present on shallow intertidal sand banks towards the mouth of the estuary in survey grid TH1. The most abundant species of waders and waterfowl observed in the Outer Thames Estuary were comparable to those in the Inner Estuary; including Geese, Ducks and Wader species[7].

In addition to these surveys in the outer estuary, BTO carried out through-the-tidal-cycle and night-time counts of waterbirds in the middle estuary area as part of the London Gateway Assessment (Armitage *et al*., 2002). These surveys covered areas of the northern bank of the estuary opposite the Hoo Peninsula, in the vicinity of the London Gateway Port development (Image 4). Results were comparable to those from counts taken on the south bank of the estuary, with numbers dominated by Dunlin (peak of 11,625 birds) and relatively high numbers of Redshank (peak 1,337), Grey Plover (peak 508), Avocet (951), Black-tailed Godwit (peak 620) and Shelduck (peak 582) also present.

These BTO surveys were carried out to provide additional information on bird distribution and abundance throughout the tide, in support of previous surveys of the London Gateway area to support the EIA of the development (Posford Haskoning, 2002). Results from these surveys provided further details of waterbird distribution between individual count sectors and showed a comparable waterbird assemblage in the region between 1999 and 2002.

The low occurrence of waders and waterfowl in offshore areas and in the outer estuary demonstrates their high fidelity to the important feeding and overwintering grounds present in the Inner Thames Estuary that they rely on as wintering grounds or stopover sites during migratory movements.

7 Birds were not always identified to species level during aerial and boat-based surveys.




(Armitage *et al*., 2002)

Image 4. Areas surveyed by BTO as part of the London Gateway Assessment

## 4.2 Medway Estuary Overview

The Medway Estuary is located to the south of the Thames Estuary and is of significant importance to wader and waterfowl species. The estuary is listed as the 38th most important site in terms of overwintering bird numbers in the 2011/12 WeBS report (Austin *et al*., 2014). In 2011/12 the Medway Estuary supported 30,285 birds with a 5-year peak mean of 32,740, lower numbers than the wintering bird assemblage in the original SPA citation of 65,496 birds. The latest 5-year peak means from the WeBS Core Counts report shows internationally important numbers of Avocet and Black-Tailed Godwit and nationally important numbers of Dark-bellied Brent Goose, Shelduck, Pintail, Shoveler, Grey Plover, Dunlin and Green Sandpiper.

The SPA citation for the Medway Estuary and Marshes SPA also notes an internationally important breeding bird assemblage that includes wader and waterfowl species that breed within the estuary including Mallard, Pochard and Avocet.

### 4.2.1 High Water Distribution Within the Medway Estuary

Core Counts of the Medway Estuary have been obtained from the latest WeBS report with data up to 2011/12. The data describe roosting numbers of birds within the estuary at high water. An overview of species trends within the Medway Estuary (both SPA qualifying species and non-designated species) at high water from the latest WeBS Core Counts data is presented in Table 10.

The overwintering bird assemblage of the Medway Estuary is dominated by high numbers of Dunlin, Knot, Lapwing, Oystercatcher, Wigeon and Shelduck. Numbers of these species regularly exceed 1,000 individuals in winter annual counts, although variability in the number of wintering birds exists between years.

Table 10. Importance thresholds and latest WeBS Core Counts of the main wader and waterfowl species present in the Medway Estuary from 2007/08 to 2011/12

| Species | International Importance Threshold | National Importance Threshold | 2007/08 | 2008/09 | 2009/10 | 2010/11 | 2011/12 | 5-year Peak Mean | Month |
|---|---|---|---|---|---|---|---|---|---|
| Avocet* | 730 | 75 | 453 | 791 | 604 | 1,048 | 1,575 | 1,005 | Oct |
| Dunlin** | 13,300 | 3,500 | 9,132 | 10,633 | 3,795 | 7,340 | 5,619 | 7,304 | Oct |
| Knot** | 4,500 | 3,200 | 2,940 | 4,304 | 400 | 4,485 | 440 | 2,514 | Jan |
| Black-Tailed Godwit* | 610 | 430 | 490 | 603 | 384 | 968 | 1,451 | 852 | Oct |
| Grey Plover** | 430 | 65 | 1,586 | 1,331 | 349 | 767 | 506 | 1,048 | Oct |
| Redshank** | 2,400 | 1,200 | 668 | 874 | 497 | 1,073 | 1,269 | 928 | Oct |
| Ringed Plover** | 730 | 340 | 181 | 109 | 119 | 154 | 110 | 141 | Sep |
| Bewick's Swan* | 220 | 70 | 9 | 0 | 0 | 0 | 0 | 5 | - |
| Greenshank* | 2,300 | 6 | 9 | 4 | 50 | 9 | 33 | 42 | Oct |
| Shelduck** | 3,000 | 610 | 1,631 | 1,604 | 1,673 | 1,884 | 2,292 | 1,817 | Jan |
| Pintail** | 600 | 290 | 663 | 351 | 353 | 314 | 759 | 579 | Feb |
| Shoveler* | 400 | 180 | 156 | 298 | 51 | 105 | 148 | 201 | Feb |
| Oystercatcher* | 8,200 | 3,200 | 2,535 | 4,160 | 991 | 2,285 | 1,565 | 2,313 | Oct |
| Mallard | 20,000 | 6,800 | 284 | 288 | 220 | 356 | 409 | 351 | Feb |
| Pochard | 3,000 | 380 | 131 | 109 | 170 | 170 | 93 | 135 | Jan |
| Lapwing | 20,000 | 6,200 | 6,805 | 5,325 | 1,011 | 5,110 | 3,449 | 4,563 | Jan |
| Curlew* | 8,400 | 1,400 | 671 | 579 | 635 | 873 | 745 | 731 | Oct |
| Turnstone* | 1,400 | 480 | 350 | 288 | 103 | 232 | 348 | 264 | Oct |
| Teal* | 5,000 | 2,100 | 942 | 1,455 | 1,433 | 1,976 | 1,924 | 1,546 | Oct |
| Dark-bellied Brent Goose** | 2,400 | 910 | 1,367 | 959 | 1,509 | 1,684 | 2,016 | 1,507 | Feb |
| Wigeon* | 15,000 | 4,400 | 2,393 | 2,154 | 1,665 | 2,828 | 2,478 | 2,341 | Oct |

Key: Medway Estuary and Marshes SPA designated due to supporting:
* Populations of National Importance;
** Populations of International Importance

### 4.2.2 Low Water Distribution Within the Medway Estuary

The most recent available WeBS Low Tide Counts for the Medway Estuary are for the 2005/06 winter. A total of 30 wader and waterfowl species were counted during this winter. Table 11 summarises the abundance of the main wader and waterfowl species observed feeding at low water within the Medway Estuary in 2004/05 and 2005/06. Dunlin was the most abundant species during these counts, followed by Wigeon and Curlew. In the winter of 2005/06, high numbers of Knot, Redshank, Shelduck, Teal and Lapwing were also present in the Medway Estuary, although numbers dropped in the winter of 2005/06.

Table 11. Summary of the low water abundance of waders and waterfowl in the Medway Estuary during the winters of 2004/05 and 2005/06

| Species | WeBS Low Tide Peak Count | |
|---|---|---|
| | 2004/05 | 2005/06 |
| Avocet* | 309 | 91 |
| Dunlin** | 9,373 | 4,936 |
| Knot** | 3,024 | 50 |
| Black-Tailed Godwit* | 277 | 65 |
| Grey Plover** | 453 | 269 |
| Redshank** | 1,068 | 494 |
| Ringed Plover** | 332 | 30 |
| Bewick's Swan* | - | - |
| Greenshank* | - | - |
| Shelduck** | 2,360 | 791 |
| Pintail** | 812 | 135 |
| Shoveler* | 19 | 10 |
| Oystercatcher* | 854 | 515 |
| Mallard | 152 | 61 |
| Pochard | - | - |
| Lapwing | 3,442 | 834 |
| Curlew* | 408 | 1,367 |
| Turnstone* | 73 | 145 |
| Teal* | 1,146 | 667 |
| Dark-bellied Brent Goose** | 1,834 | 215 |
| Wigeon* | 2,250 | 1,966 |
| Greylag Goose | 589 | 520 |
| Canada Goose | 365 | 935 |

Key: Medway Estuary and Marshes SPA designated due to supporting:
* Populations of National Importance;
** Populations of International Importance

Density maps indicate that low tide data is only available for the southern shores of the Medway Estuary. The maps show that the highest densities of these species occur in the areas of the estuary between Queenborough and Upchurch (Appendix B). The area of the Medway Estuary in closest vicinity to the proposed airport development was not, however, covered in the most recent Low Tide survey.

### 4.2.3 WeBS Alerts

According to the site account for the Medway Estuary and Marshes SPA on the online WeBS Alerts report[8], declines have been sufficient for alerts to have been triggered for 12 of the 17 species assessed for the site. These species include:

- Dark-bellied Brent Goose (High and Medium Alerts);
- Shelduck (High and Medium Alerts);
- Wigeon (Medium Alert);
- Pintail (Medium Alerts);
- Great Crested Grebe (High and Medium Alerts);
- Cormorant (High and Medium Alerts);
- Oystercatcher (Medium Alerts);
- Ringed Plover (High and Medium Alerts);
- Grey Plover (Medium Alert);
- Dunlin (High Alerts);
- Curlew (High and Medium Alerts); and
- Redshank (High Alerts).

The magnitude of these alerts and the timescales at which they have been issued is presented in Table 12.

Table 12. WeBS Alerts issued for species within the Medway Estuary and Marshes SPA site over all timescales

| Species | Short-term (%) | Medium-term (%) | Long-term (%) | Since Designation (1993) (%) |
|---|---|---|---|---|
| Dark-bellied Brent Goose | 2 | -39 | -36 | -60 |
| Shelduck | -11 | -28 | -30 | -64 |
| Wigeon | 29 | -10 | 31 | -33 |
| Pintail | -34 | -48 | -15 | -30 |
| Great Crested Grebe | 13 | -8 | -69 | -25 |
| Oystercatcher | 39 | -32 | 194 | -16 |
| Ringed Plover | -25 | -70 | -86 | -83 |
| Grey Plover | -20 | -64 | -24 | -71 |
| Dunlin | 42 | 3 | -53 | -68 |
| Curlew | -29 | -61 | -24 | -65 |
| Redshank | -13 | -52 | -68 | -74 |
| Red | High alert (> 50% decline); | | | |
| Amber | Medium alert (25 – 50% decline). | | | |

8 http://blx1.bto.org/webs-reporting/?tab=alerts

In all cases, comparison of the site trend with broad-scale regional and national trends suggests that the decline in numbers of all these species within the Medway Estuary and Marshes SPA site may be due to site-specific pressures. The online Alerts report notes any site issues present, although it should be noted that the identification of these issues in the WeBS Alerts report does not imply causality, and further work would be necessary in order to identify specific contributing factors to any declines.

## 4.3 The Swale Estuary Overview

The Swale Estuary is located to the south east of the Medway Estuary and to the south of the Isle of Sheppey. The Swale is also of significant importance to wader and waterfowl species. The estuary is listed as the 12th most important site in terms of overwintering bird numbers in the 2011/12 WeBS report (Austin *et al*., 2014). In 2011/12 the Medway Estuary supported 51,837 birds with a 5-year peak mean of 75,275, higher numbers on average than the wintering bird assemblage in the original SPA citation of 65,588 birds. The latest 5-year peak means from the WeBS Core Counts report shows internationally important numbers of Black-Tailed Godwit and Teal and nationally important numbers of White-fronted Goose, Dark-bellied Brent Goose, Shelduck, Wigeon, Pintail, Shoveler, Little Egret, Oystercatcher, Avocet, Ringed Plover, Golden Plover, Grey Plover, Lapwing, Knot, Dunlin, Ruff, Bar-tailed Godwit, Curlew, Green Sandpiper, Greenshank and Redshank.

The SPA citation for The Swale SPA also notes an internationally important breeding bird assemblage that includes wader and waterfowl species that breed within the estuary including Teal, Mallard, Gadwall, Ringed Plover, Coot, Moorhen, Oystercatcher, Curlew, Grey Plover, Shelduck, Redshank and Lapwing.

### 4.3.1 High Water Distribution Within the Swale Estuary

Core Counts of the Swale Estuary have been obtained from the latest WeBS report with data up to 2011/12. The data describe roosting numbers of birds within the estuary at high water. An overview of species trends within the Swale Estuary (both SPA qualifying species and non-designated species) at high water from the latest WeBS Core Counts data is presented in Appendix C1.

The overwintering bird assemblage of the Swale Estuary is dominated by high numbers of Wigeon and Lapwing, for which the latest 5-year peak means exceed 10,000 birds. A number of other species regularly exceed 5,000 individuals in winter annual counts that are indicated in Appendix C1.

### 4.3.2 Low Water Distribution Within the Swale Estuary

The most recent available WeBS Low Tide Counts for the Swale Estuary are for the 2011/12 winter. A total of 42 wader and waterfowl species were counted during this winter. The abundance of the main wader and waterfowl species observed feeding at low water within the Swale Estuary in 1992/93, 2001/02 and 2011/12 are presented in Appendix C2. Dunlin was the most abundant species during 2011/12, followed by Wigeon and Oystercatcher. Dunlin has

consistently been the most abundant species in the Swale Estuary during low tide counts, with Oystercatcher and Shelduck also present in high numbers. Wigeon numbers in 2011/12 were the highest recorded, while Shelduck numbers were lower compared to previous years.

Density maps presented in Appendix C3 indicate the distribution of species within the Swale Estuary at low tide during the winter of 2011/12. The maps show that the highest densities of these species occur in the middle and outer areas of the estuary between Queenborough and Upchurch. The area of the Swale Estuary in closest vicinity to the proposed airport development has not been covered in the most recent Low Tide Counts however and density maps for this area are therefore not available.

### 4.3.3 WeBS Alerts

According to the site account for The Swale SPA on the online WeBS Alerts report[9], declines have been sufficient for alerts to have been triggered for nine of the 21 species assessed for the site. Of these species, eight are wader and waterfowl species and include:

- White-fronted Goose (High Alerts);
- Shelduck (Medium Alert);
- Shoveler (Medium Alert);
- Pintail (Medium Alerts);
- Little Grebe (High and Medium Alerts);
- Grey Plover (Medium Alert);
- Lapwing (Medium Alert);
- Dunlin (Medium Alert); and
- Redshank (Medium Alerts).

The magnitude of these alerts and the timescales at which they have been issued is presented in Appendix C4.

For two species; White-fronted Goose and Little Grebe, comparison of the site trend with broadscale regional and national trends suggests that the decline in numbers may be due to site-specific pressures. A list of site issues is included in the WeBS Alerts report, although this does not imply causality, and further work would be necessary in order to identify specific contributing factors to any declines.

## 4.4 Foulness Overview

Foulness is located to the north east of the Thames Estuary on the mid-Essex coast. There is currently no coverage of Foulness within the WeBS Core Counts or Low Tide Counts, and as such no high and low tide counts of waders and waterfowl are available. Foulness SPA comprises part of the phased Mid-Essex SPA, however, and WeBS Alerts are available.

9 http://blx1.bto.org/webs-reporting/?tab=alerts

### 4.4.1 WeBS Alerts

According to the site account for Foulness SPA on the online WeBS Alerts report[10], declines have been sufficient for alerts to have been triggered for nine of the 15 species assessed for the site. These species include:

- Shelduck (Medium Alerts);
- Little Grebe (Medium Alert);
- Golden Plover (High Alerts);
- Grey Plover (High Alerts);
- Lapwing (Medium and High Alerts);
- Knot (Medium and High Alerts);
- Dunlin (Medium Alerts);
- Bar-tailed Godwit (Medium Alerts); and
- Redshank (Medium Alerts).

The magnitude of these alerts and the timescales at which they have been issued is presented in Appendix D.

For four species; Golden Plover, Grey Plover, Knot and Bar-tailed Godwit, comparison of the site trend with broadscale regional and national trends suggests that the decline in numbers may be due to site-specific pressures. The online Alerts report lists site issues that currently exist. Identification of these issues does not imply causality, however, and further work would be necessary in order to identify specific contributing factors to any declines.

## 4.5 Crouch and Roach Estuaries Overview

The Crouch and Roach Estuaries are located to the north of the Thames Estuary and are of significant importance to wader and waterfowl species. The estuary is listed as the 31st most important site in terms of overwintering bird numbers in the 2011/12 WeBS report (Austin *et al*., 2014). In 2011/12 the Crouch and Roach Estuaries supported 33,611 birds with a 5-year peak mean of 35,560. The latest 5-year peak means from the WeBS Core Counts report shows internationally important numbers of Dark-bellied Brent Goose and Black-tailed Godwit and nationally important numbers of Wigeon, Lapwing, Dunlin, Golden Plover, Oystercatcher, Knot, Teal, Shelduck, Curlew, Grey Plover, Redshank, Bar-tailed Godwit, Avocet, Ringed Plover, Pintail, White-fronted Goose, Shoveler, Little Egret, Ruff, Greenshank and Green Sandpiper.

### 4.5.1 High Water Distribution Within the Crouch and Roach Estuaries

Core Counts of the Crouch and Roach Estuaries have been obtained from the latest WeBS report with data up to 2011/12. The data describe roosting numbers of birds within the estuaries at high water. An overview of species trends within the two estuaries (both SPA

10 http://blx1.bto.org/webs-reporting/?tab=alerts

qualifying species and non-designated species) at high water from the latest WeBS Core Counts data is presented in Appendix E1.

The overwintering bird assemblage of the Crouch and Roach is dominated by high numbers of Lapwing, Dark-bellied Brent Goose, Golden Plover, Dunlin, Wigeon and Teal for which the latest 5-year peak means exceed 2,000 birds.

### 4.5.2 Low Water Distribution Within the Crouch and Roach Estuaries

The most recent available WeBS Low Tide Counts for the Crouch and Roach are for the 2010/11 winter. A total of 35 wader and waterfowl species were counted during this winter. The abundance of the main wader and waterfowl species observed feeding at low water within the two estuaries in 1995/96, 2004/05 and 2010/11 are presented in Appendix E2. Dark-bellied Brent Goose was the most abundant species during 2010/11, followed by Lapwing, Golden Plover and Wigeon. Lapwing numbers were highest in 2004/05, however, with more than 10,000 individuals present. Dunlin and Redshank are also consistently present in relatively large (>1,000) numbers.

Density maps presented in Appendix E3 indicate the distribution of species within the Crouch and Roach at low tide during the winter of 2010/11. The maps show that the highest densities of these species occur in the middle and outer areas of the estuary and that the highest densities of most species share the same areas at low tide, indicating the high ecological value of these areas (Appendix E3).

### 4.5.3 WeBS Alerts

The Crouch and Roach Estuaries SPA is not currently covered within the WeBS Alerts online report (Cook *et al*., 2013). Data may be available which has not yet been assigned to the relevant SPA site.

# 5. Impact Appraisal

The following section identifies the generic impact pathways that could impact upon waders and waterfowl through the construction and operation of the Inner Thames Estuary Option. The assessment will focus on the protected waders and waterfowl that occur in the highest numbers as identified in Section 5.

## 5.1 Construction Phase

The construction phase of the airport and the associated infrastructure has the potential to affect seabirds through the following pathways:

- Changes in habitat extent;
- Changes in habitat suitability;
- Release of contaminants associated with the dispersion of suspended sediments;
- Noise/vibration disturbance;
- Visual disturbance;
- Barrier to movement;
- Collision risk; and
- Discharges and accidental spillages.

### 5.1.1 Change in Habitat Extent

As a result of the construction of the airport, areas of habitat used by birds within the Thames Estuary will be directly or indirectly lost. Intertidal habitat is important for foraging birds and provides important prey resources, as well as roosting areas. Habitat loss may affect local populations through impacts on individual fitness (survival, body condition, fecundity). The direct loss of intertidal habitat due to construction of the airport could displace birds and cause them to redistribute either locally or to neighbouring sites. Furthermore, indirect impacts to the extent of intertidal habitats may arise due to local hydrodynamic changes as a result of airport construction.

Bird displacement to other sites may in turn affect the birds at those sites through competition and density-dependent mortality. Redshank displaced following the construction of an amenity barrage at Cardiff Bay (South Wales), for example, had a lower survival rate after they moved (Burton *et al*. 2006). Lambeck (1991) found that oystercatchers displaced following large-scale habitat loss in the Delta region of The Netherlands experienced significantly higher mortality than those originally ringed elsewhere in the Delta, presumably as a result of the increased densities in recipient areas.

Effects on areas further afield also should be considered. Research on the movements of Dark-bellied Brent Geese following the loss of saltmarsh at Rodenäs Vorland on the German Wadden Sea found that long-distance movements were more frequent among displaced birds than control birds and that many displaced birds moved to traditionally less preferred sites (Ganter *et al*. 1997).

The baseline review therefore indicates that species are present within the area that past research has shown to be impacted by changes in habitat extent and habitat loss. Furthermore, many other species not referenced in the scientific literature are present in the area with similar ecology and life-history traits which may therefore be similarly vulnerable to this impact pathway. Based on the airport footprint and the review of the available data, the species considered most at risk to direct or indirect loss of habitat associated with the construction of an Inner Thames Estuary airport are presented in Table 13.

Table 13. Species considered most at risk to changes to habitat extent based on the airport footprint and low and high water abundance and distribution

| Species | Rationale |
|---|---|
| Dark-bellied Brent Goose | Low tide counts |
| Shelduck | Low tide densities and counts. |
| Oystercatcher | Low tide densities and counts; high water roosts |
| Lapwing | Low tide densities; high water roosts |
| Golden Plover | Low tide densities. |
| Grey Plover | Low tide densities and counts; high water roosts |
| Knot | Low tide densities and counts; high water roosts |
| Dunlin | Low tide densities and counts; high water roosts. |
| Redshank | Low tide densities and counts; high water roosts. |
| Curlew | Low tide densities and counts; high water roosts |
| Black-tailed Godwit | Low tide counts; high water roosts. |
| Bar-tailed Godwit | High water roosts. |
| Ringed Plover | High water roosts. |
| Wigeon | Low tide counts. |

### 5.1.2 Change in Habitat Suitability

Indirect impacts to waders and waterfowl could arise from a change in the availability of prey resources as a result of airport construction. For example, hydrodynamic changes as a result of airport presence may alter rates of sediment deposition and erosion in the intertidal zone. Such changes may affect the community composition of the invertebrate assemblage within the intertidal that provides important prey resources to coastal bird communities.

Changes in the rates of sedimentation on the intertidal mudflats and saltmarsh habitats may also change their suitability for roosting. A loss of these habitats as a result of increased erosion may displace birds and cause them to roost in other local or neighbouring sites. Increased competition and density-dependent processes may affect birds at these sites. A loss of suitable roosting habitat may also result in birds attempting to roost within the airport site itself, potentially leading to an increased risk of collision events.

Habitat suitability may also be reduced by construction of the airport through habitat fragmentation, resulting in the spatial separation of areas of habitat that were previously continuous. Fragmentation reduces the area of habitat, decreasing its suitability for area-dependent species that rely on large habitat areas or particular areas of food resource (Robbins *et al*., 1989). Bird movements may also be affected by fragmentation, forcing birds to fly longer distances between feeding areas and roost sites, with increased energetic costs. Fragmentation also increases the proportion of edge habitat, potentially increasing negative

interactions with adjacent habitats (Temple and Cary, 1988). In order to assess the impacts of habitat fragmentation a detailed understanding of habitat usage is required.

### 5.1.3 Release of Contaminants Associated with the Dispersion of Suspended Sediments

Disturbance to contaminated sediments during airport construction could increase concentrations of contaminants in benthic biota which form the main prey species of coastal waders and waterfowl. Contaminants may bioaccumulate and persist in the body tissue and eggs of bird species. The precise risk would depend on the levels of any sediment contamination and its disturbance, as well as the use of the area by foraging waders and waterfowl.

### 5.1.4 Noise/Vibration Disturbance

The subject of noise disturbance to birds during construction has been the focus of much recent monitoring work and research. Disturbance events from construction activities on the shoreline or on or near to the coast can cause an interruption to the feeding, roosting or breeding behaviour of birds. Disturbance can result in birds flying away or ceasing to feed which may cause an increase in their energy requirements or result in them relocating to alternative, less suitable feeding or roosting sites. This may result in possible long-term effects where there is a repetition of such activities and can lead to consequences such as: prolonged displacement from a habitat, effects on energy budgets and food intake, loss of weight, condition and a reduction in reproductive success and potentially survival (Kaiser, 2002; Stillman *et al*. 2012).

Research indicates that bird species will often habituate to repeated disturbance events, with irregular or unknown visual and noise stimuli often causing the greatest behavioural responses. With respect to piling specifically, it has been concluded that although piling has the potential to create most noise during construction; it often consists of rhythmic “bangs”, which birds are likely to become accustomed to after a short period (ABP Research, 2001).

Other research has also indicated that in general, birds appear to habituate to continual noises as long as there is no large amplitude ‘startling’ component (Hockin *et al*., 1992). For example, as part of the construction work for ABB Power Generation Ltd (Pyewipe), winter bird monitoring showed that there was no large-scale disturbance due to construction work on the site. Although some localised disturbance was recorded in response to two sudden events, this was not considered to have a major effect on surrounding bird populations and was found to be no greater than the effect arising from third party disturbance, including walkers and stopped cyclists, which were unrelated to the work carried out by ABB. Observations suggested that it was the initial sudden bang during piling activities, which caused the disturbance, and that subsequent bangs typically resulted in reduced disturbance, demonstrating habituation (ERM, 1996).

For this reason noise from construction and regular vehicle or vessel movements are often tolerated more by birds than sporadic visits to a feeding or roosting area. Overall, responses to construction noise appear to initiate similar or less disturbance than that of recreational activities (IECS, 2009).

### 5.1.5 Visual Disturbance

Visual disturbance can also interrupt feeding, roosting and breeding behaviour of coastal birds, with similar effects to those caused by noise disturbance. Repeated disturbance can cause habitat displacement, effects on energy budgets and food intake resulting in loss of weight, condition and reduction in reproductive success and potentially survival. Birds will typically disperse when disturbed, with prolonged and repeated disturbance potentially causing displacement. The magnitude of the effects of such disturbance is linked to the number of occurrences and the status of the conditions that are prevalent (Liley & Fearnley, 2011; Coleman *et al*., 2003; Ruddock & Whitefield, 2007). Human activities on the shoreline can have the greatest effects in terms of causing a disturbance event. However the character of these activities is also relevant. Smit and Visser (1993) have indicated that regular and defined movements are less disturbing than erratic and random movements of people.

Visual disturbance during construction is generally temporary and only short term. The level of impact will however be dependent on the distance of visual disturbance sources from key foraging, roosting and breeding areas for birds. Anecdotal observations as part of ongoing ornithological surveys at the Port of Mostyn, North Wales, have found that boats and machinery tend to create lesser disturbance than people (ABPmer, in prep.). The greatest visual disturbance during construction is therefore likely to be caused by human presence and work on the foreshore. It typically appears that birds will often habituate to regular and repeated activities, with irregular or unknown visual stimuli causing the greatest behavioural responses (ABPmer, 2013a; IECS, 2009). For instance in a study of the Forth Estuary, Dwyer (2010) found that Redshank, Curlew, Oystercatcher and Shelduck in areas subject to higher levels of disturbance allowed a closer approach by humans than individuals of the same species in less disturbed areas, before becoming alert and moving away.

There has been limited research concerning the impacts of overnight lighting on coastal birds. Work investigating night-time feeding of Lapwing and Dunlin during moonlit nights suggests that these birds take advantage of higher ambient light levels to feed visually during those times (Milson *et al*., 1990; Mouritsen, 1994). Herons have also been observed to feed preferentially at night at fish farms under artificial lights (Draulans and van Vessem, 1985). However, research into the effects of artificial lighting on the biorhythm of birds, in general, suggests that it can lead to disruptive effects, including songbirds singing at night, potential early migration of Bewick's Swans and early moult (de Molenaar *et al*., 2006; Rees, 1982).

### 5.1.6 Barrier to Movement

The construction of an airport in the inner Thames Estuary would create a potential physical barrier to movement by waders and waterfowl. In this respect birds in flight would likely need to alter their flight route in order to avoid the airport and associated structures, although it is recognised that little information on bird flight paths within the Thames Estuary is available. Dedicated site-specific surveys would be required to fill this data gap.

Little is known about the sensitivity of coastal bird species to barrier effects and their ability to alter flight paths/heights. Avoidance behaviour and the deviation of flight routes may however

result in increased energy expenditure if birds fly higher or further in order to avoid construction structures and machinery. Increased energetic costs have been observed in seabirds, for example, as a result of avoiding marine wind farms. Migrating birds generally avoid offshore wind farms by flying further or higher, with avoidance distances increasing at night (Desholm & Kahlert, 2005; Drewitt & Langston, 2006; Griffin *et al*., 2010; Masden *et al,* 2010). Linkages between important feeding, roosting and breeding areas may be disrupted as a result.

### 5.1.7 Collision Risk

Coastal waders and waterfowl may potentially collide with vessels or other construction machinery during the construction phase of a development. Collision risk and mortality depends on a range of factors relating to individual bird species, abundance, movements between foraging and roosting areas, timings of such movements, topography, weather conditions, the value of a particular area as a feeding ground, the consistency with which it is used for foraging and the nature of the structures or construction machinery, including artificial lighting used for construction components.

Collision risk during construction would be expected to be low given the highly mobile nature of birds. It is also likely that visual or noise disturbance associated with construction activities would result in avoidance and therefore limit the potential for collision incidents.

### 5.1.8 Discharges and Accidental Spillages

There is a risk of accidental spillages of oil, fuel or other construction materials (e.g. cement and grout) during the construction programme. Dewatering discharges may also introduce contaminants into the marine environment.

Coastal birds may be particularly sensitive to contamination by oil and research has shown oil to cause significant damage to waterproofing and flight in seabirds (Wernham *et al*., 1997; Votier *et al*., 2008). Ingestion of oil can also cause considerable physiological damage. Coastal birds are considered to be highly sensitive to oil spillages but it is dependent on a species' typical behaviour or distribution and the location of any spillages. Coastal waders and waterfowl will be most vulnerable to any spillages or discharges occurring along the foreshore and less vulnerable to effects of 'at sea' spillages.

## 5.2 Operational Phase

The operational phase of an airport in the inner Thames Estuary has the potential to affect coastal waders and waterfowl through the following pathways:

- Change in habitat extent;
- Change in habitat suitability;
- Noise/vibration disturbance;
- Visual disturbance;
- Barrier to movement;
- Bird strike; and
- Discharges and Accidental Spillages.

### 5.2.1 Change in Habitat Extent

The possible impacts associated with a direct and indirect loss of habitat for coastal waders and waterfowl have been considered in Section 5.1.1. In summary, exclusion from important foraging habitats prevents access to prey resources which can lead to changes in the way that individual birds forage. Habitat loss may affect local populations through impacts on individual fitness (survival, body condition, fecundity). This may lead to increased stress levels and alterations to energy budgets and food intake, as well as increased competition and increased effects of density-dependent processes.

If birds are displaced, alternative foraging areas may be of lower quality and of further distance from roosting areas. Species-specific feeding and roosting habits may determine the level of such impacts, such as some species being more reliant on a particular prey source within a location and having less potential to adapt and switch foraging areas or habits.

### 5.2.2 Change in Habitat Suitability

The distribution and availability of important roosting and foraging habitats within the study area will likely change as a result of the placement and operation of an airport in the inner Thames Estuary. This is discussed in Section 5.1.2 in the context of changes to prey availability and the availability of suitable roosting habitat as a result of hydrodynamic changes altering rates of sediment erosion or accretion in the intertidal environment. Habitat fragmentation is also considered. The areas of habitat occupied by waders and waterfowl may also become more vulnerable to disturbance from airport operations (see Sections 5.2.3 and 5.2.4).

### 5.2.3 Noise/Vibration Disturbance

Noise associated with general airport operations and aircraft movements has the potential to disturb birds and to interrupt key behaviours, leading to health impacts, impacts on breeding behaviour, survival of individual birds and of populations. Repeated major disturbance can cause prolonged displacement from a habitat, effects on energy budgets and food intake, loss of weight, condition and a reduction in reproductive success and survival (Kaiser, 2002; Stillman *et al*. 2012).

Komenda-Zehnder *et al*. (2003) performed experimental overflights on waterbirds in Swiss lowlands and found the disturbance effect of helicopters to be greater than that of aeroplanes. Birds disturbed by aircraft returned to a relaxed behaviour within five minutes of the overflight, however, and the minimum flight level that did not disturb birds was 450m for helicopters and 300m for aeroplanes. Smit and Visser (1993) reviewed existing data and showed comparable reactions in birds in the Dutch Wadden Sea and Delta Area. Oystercatcher generally were most tolerant to aircraft noise and Curlew least tolerant. One study showed a negative impact on foraging behaviour in Knot, with large numbers of birds absent on days in which aircraft activity was high. Reactions to aircraft noise were more severe when visibility was reduced. Light aircraft cause strong disturbance in Knot, even when flying above 100m (Koolhaas *et al*., 1993). A review of WeBS survey data in relation to disturbance showed that aircraft noise, particularly from low flying military aircraft, was one of the most common causes of disturbance

to coastal birds, although it is recognised that general airport movements will be more regular with increased chances of habituation occurring (Robinson and Pollitt, 2002).

Komenda-Zehnder *et al*. (2003) found no evidence of habituation of waterbird during 326 experimental flights, although other studies have shown that habituation to regular noise disturbance can occur (see Section 5.1.4). In particular, flocks of waterfowl on the Humber Estuary appear to habituate to regular approaches of planes towards Humberside Airport, although the same birds appeared to be disturbed by the 'shadow' of an approaching plane in some instances (IECS, 2009). Furthermore, a report by Brisbane Airport Corporation states that surveys in 2005/06 found no visible reaction from roosting or feeding shorebirds to overhead air traffic (BAC, 2007).

### 5.2.4 Visual Disturbance

Generic airport operations and the presence of aircraft could generate visual disturbance to coastal waders and waterfowl. The potential impacts of visual disturbance are discussed in Section 5.1.5. Birds typically show a dispersive reaction to disturbance with prolonged disturbance causing displacement. Visual disturbance can interrupt feeding, roosting and breeding in birds with possible negative long-term effects including displacement, effects on energy budgets and food intake resulting in loss of weight, condition and reduction in reproductive success and potentially survival. There is, however, evidence of some habituation to regular visual disturbance in coastal birds.

### 5.2.5 Barrier to Movement

The presence of an airport in the inner Thames Estuary would create a physical barrier to movement in waders and waterfowl and birds in flight would likely need to change flight routes in order to avoid the airport and associated structures. Little is known about the sensitivity of coastal bird species to barrier effects and their ability to alter flight heights, although estuaries comprise important stopover and wintering sites for migratory birds, with many thousands of birds arriving and leaving the region each winter. Impacts due to a barrier effect of the new airport within the inner Thames Estuary are discussed in Section 5.1.6.

### 5.2.6 Bird Strike

Bird strike is a significant risk to aircraft, particularly near airports and at lower altitudes, where most collisions between aircraft and birds occur. The risk of bird strikes occurring is highest where there are major aggregations of birds. Studies have shown that the majority of strikes occur during take-off and approach, with more than 75% of bird strikes occurring below 1000 feet and 92% occurring below 3,500 feet (Transport Canada, 2004; Maragakis, 2009; Atkins, 2013; US FAA, 2013). The UK has a 13km radius safeguard circle that is based on a statistic that 99% of bird strikes occur below a height of 2,000ft and that an aircraft on a normal approach would descend into this circle at approximately this distance from a runway (CAA, 2008). Much of the literature available on the subject is in the context of aviation safety, as strikes can cause a loss of human life and significant economic damage. Airports often provide ideal habitats for a range of bird species, with open grassy areas ideal for roosting and feeding, and standing water often present that can attract flocks of waterfowl to airport land.

A review of bird strike rates published by aviation authorities gives an indication of the numbers of birds involved in aircraft collisions each year. The number of bird strikes is markedly higher during bird migration periods when large numbers of birds migrate between wintering and breeding grounds across Europe (EGAST, 2012). The US Federal Aviation Administration published a review of wildlife strikes to civil aircraft in the United States between 1990 and 2012 (US FAA, 2013). This report shows a total of 4,137 reported strikes involving waterfowl and 4,985 involving 'shorebirds' or waders, throughout the 23-year period from 1990 to 2012.

The UK Civil Aviation Authority also regularly reports quarterly strike numbers over a three-year period. Latest figures from 2011 to 2013 show a total of 1,529 confirmed bird strikes in 2011, 1,404 in 2012 and 1,535 in 2013. A peak of 721 confirmed bird strikes in 2013 occurred between July and September. In reality however the numbers may be higher as these represent confirmed statistics only. The CAA also provides a summary of the top ten species involved in bird strikes each year, from 2008 to 2013. A review of this data indicates that the species most commonly involved in collisions with aircraft are Gulls, Pigeons, Kestrels and other small passerine species. However, a large proportion of bird strikes are listed as 'unknown bird'[11] (CAA website).

Data from both the US and the UK therefore suggest that bird strikes with aircraft do not affect significant numbers of wader or waterfowl species. US statistics throughout the 23-year period represent averages of 217 waders and 180 waterfowl involved in aircraft collisions each year. UK statistics for waders and waterfowl specifically are unavailable at present, although from the available data it can be assumed that in terms of species populations occurring within the UK, the numbers of these species affected by aircraft collisions are negligible.

Other international reports support this assumption. A report discussing the implications of a new runway at Brisbane Airport situated on the coast of Queensland, Australia, notes that the airport has a low bird strike rate with wader species, despite its close proximity to tidal mudflat habitat used by flocks of foraging coastal waders. Furthermore, a Danish thesis reviewed bird strike statistics in the country between 1992 and 2005 and reported only 56 strikes with 12 species of wader and 4 strikes with 2 duck species. The paper concluded that the majority of strikes affected passerine species and Gulls, comparable with the CAA statistics for the UK (Christensen, PhD Thesis, unpublished).

In the context of impacts to the bird populations within the study area, it is recognised that it is difficult to assess the collision risk of birds as species may make random migration or foraging trips or may repeatedly fly over the same routes. Identifying the main flyway routes is complex due to the nature and limitations of the available information on the subject. Such movements are likely to occur across broad fronts rather than along clear, definable routes. Variation in the flight heights of different bird species must also be considered.

11 https://www.caa.co.uk/default.aspx?catid=2008

Bell *et al*. (2003) carried out an assessment of the bird populations, movements, and behaviour on and around the Thames and Medway Estuaries in order to assess the risks of bird movements to aircraft using a proposed new international airport at Cliffe, North Kent. The study identified the area as having a potentially significant bird strike problem in terms of aviation safety due to the large populations of birds present in the two estuaries. This assessment did not however consider impacts to the bird populations themselves.

While large-scale bird movements are difficult to predict, the report by Bell *et al*. (2003) describes local bird movements around the Hoo Peninsula. The majority of movements are between the roost sites indicated in Image 1, while many birds move along the northern bank of the Hoo Peninsula within the intertidal zone, often within the airport footprint. Bell *et al*. produced a table that ranked the bird species present in the area by the probability of bird strikes occurring, which showed that those waterbirds at most risk of strikes with aircraft were Dunlin, Lapwing, Oystercatcher and Curlew; those present in the area in high numbers. This information with regards to the waders and waterfowl in the area is reproduced in Table 14 below.

Table 14. Assessment of strike probability for wader and waterfowl species on and around the Hoo Peninsula

| Probability of Strikes | | | | |
|---|---|---|---|---|
| Very Low | Low | Moderate | High | Very High |
| ▪ Gadwall<br>▪ Pintail<br>▪ Coot<br>▪ Grey Heron<br>▪ Bewick's Swan<br>▪ White-fronted Goose<br>▪ Canada Goose | ▪ Ringed Plover<br>▪ Golden Plover<br>▪ Bar-tailed Godwit<br>▪ Mallard<br>▪ Brent Goose<br>▪ Mute Swan<br>▪ Greylag Goose<br>▪ Redshank | ▪ Teal<br>▪ Grey Plover<br>▪ Knot<br>▪ Black-tailed Godwit<br>▪ Shelduck<br>▪ Wigeon | ▪ Dunlin<br>▪ Lapwing<br>▪ Oystercatcher<br>▪ Curlew | N/A |

(Source: Bell *et al*., 2013_

While the evidence presented suggests that the incidence of bird strikes involving waders and waterfowl may not significantly affect the wintering populations within the study area, a precautionary approach must be taken when assessing the impacts of a proposed airport. Detailed information on species movements between roosting and foraging grounds will need to be obtained, as well as information regarding species flight heights, migratory pathways and responses to increased noise and visual disturbance related to aircraft movements. Information on effective mitigation such as airport bird deterrents should also be sought to scope the potential for minimising the risk of collisions between aircraft and birds.

### 5.2.7 Discharges and Accidental Spillages

There is a risk of accidental spillages of fuel, oil and other contaminants during the operational phase of the airport. Impacts of such incidents are discussed in more detail in Section 5.1.8.

# 6. Conclusions and Additional Data Requirements

This baseline review of the wader and waterfowl populations within the inner Thames Estuary and the potential generic impact pathways associated with the construction and operation of such an airport identified the following generic impact pathways that may affect coastal marine bird species during the construction and operation of an Inner Thames Estuary Airport:

- Change in habitat extent;
- Change in habitat suitability;
- Release of contaminants associated with the dispersion of suspended sediments;
- Noise/vibration disturbance;
- Visual disturbance;
- Barrier to movement;
- Collision risk (during construction);
- Bird strike (during operation); and
- Discharge and accidental spillages.

The main species considered most at risk to impacts associated with the Inner Thames Estuary airport option, based on this limited initial review have been identified as:

- Dark-bellied Brent Goose;
- Shelduck;
- Oystercatcher;
- Lapwing;
- Golden Plover;
- Grey Plover;
- Knot;
- Dunlin;
- Redshank;
- Curlew;
- Black-tailed Godwit;
- Bar-tailed Godwit;
- Ringed Plover; and
- Wigeon.

It should be noted that this list has been based on the airport footprint only, and it is recognised that many other potentially significant factors associated with the construction and operation of an Inner Thames Estuary Airport could impact upon the bird populations within the area through the pathways outlined above. It is clear that changes in habitat extent will be unavoidable, although indirect impacts and other influences are not currently well understood. At this stage there is insufficient detail regarding the scheme design (including any associated infrastructure) and construction methodologies for a meaningful assessment to be made.

Should the inner Thames option be pursued further, detailed assessments would be required to determine a final list of potential impact pathways and their associated significance and to fill existing data gaps. Full consideration must also be given to any cumulative and in-combination impacts. In order for such detailed assessments to be made, an extensive programme of field survey would be required.

This field work could potentially include a 5-year pre-construction monitoring programme across the whole of the Thames Estuary with a focus on the Hoo Peninsula. In particular, information such as high and low water counts and densities in individual count sectors, overnight counts, major flight paths and the location of significant roost sites should be obtained in order to develop a better understanding of the functional use and importance of the areas likely to be affected by airport development and operation. The assessment of impacts would also be likely to benefit from the application of bird energetics models which would also have their own specific data collection requirements, for example, information on the density and biomass of prey items within the Thames Estuary.

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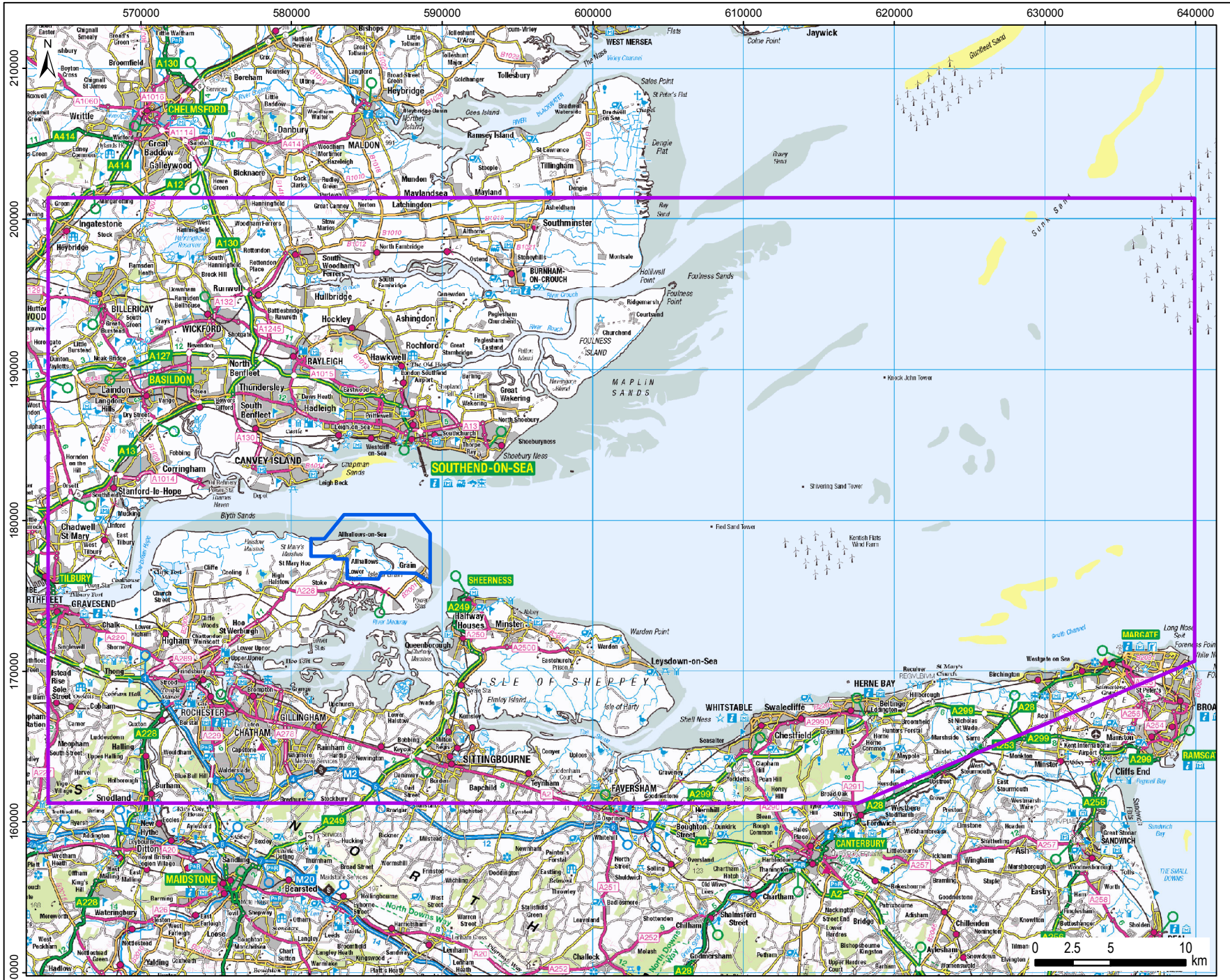
# Figures




Study Area

Inner Thames Estuary Option

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| Projection | | Transverse Mercator | |
| Scale | | 1:350,000 | |
| QA | | DLW | |
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| Produced by ABPmer | | | |



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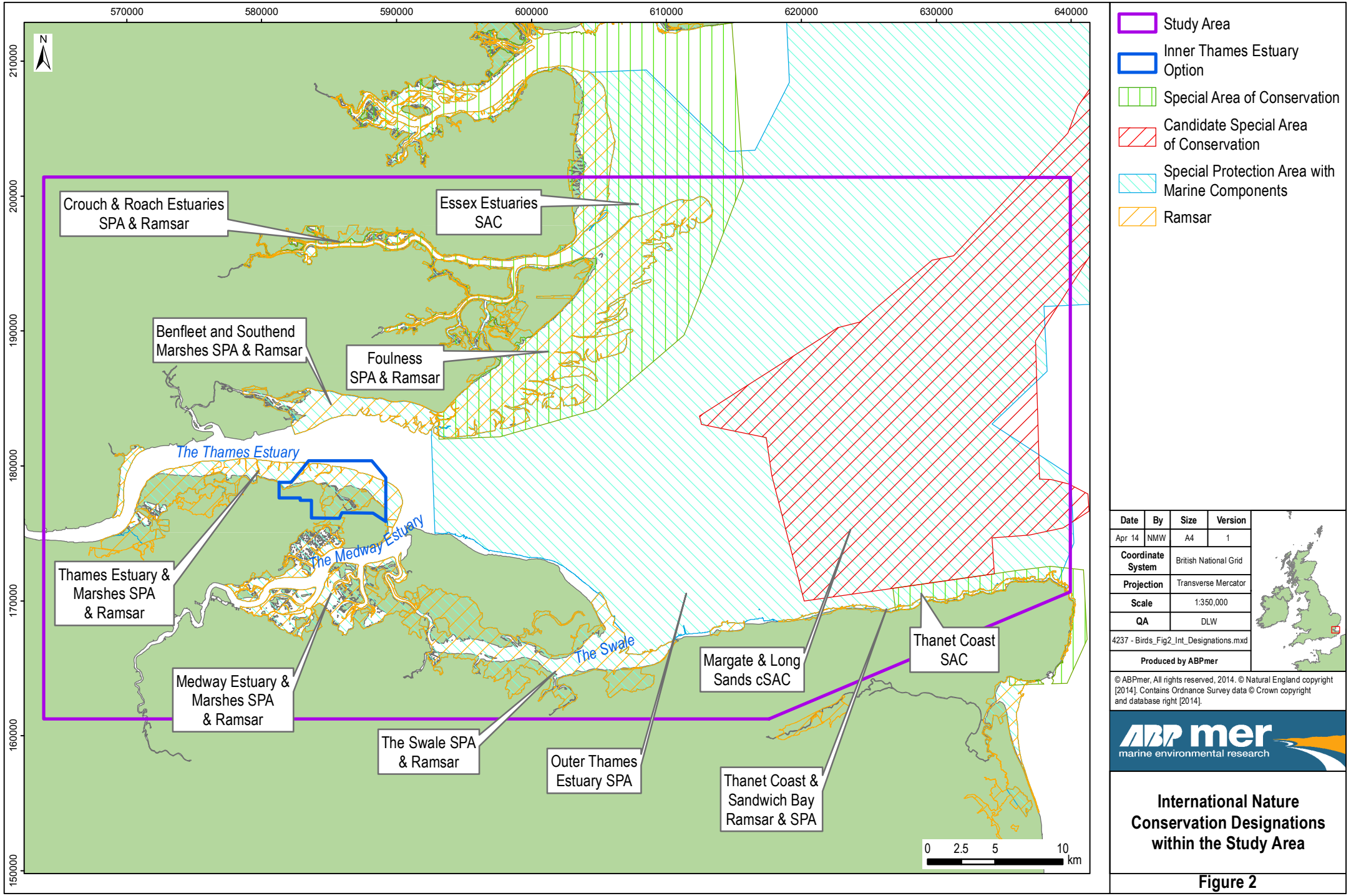
# Study Area and Location of Inner Thames Estuary Option

Figure 1



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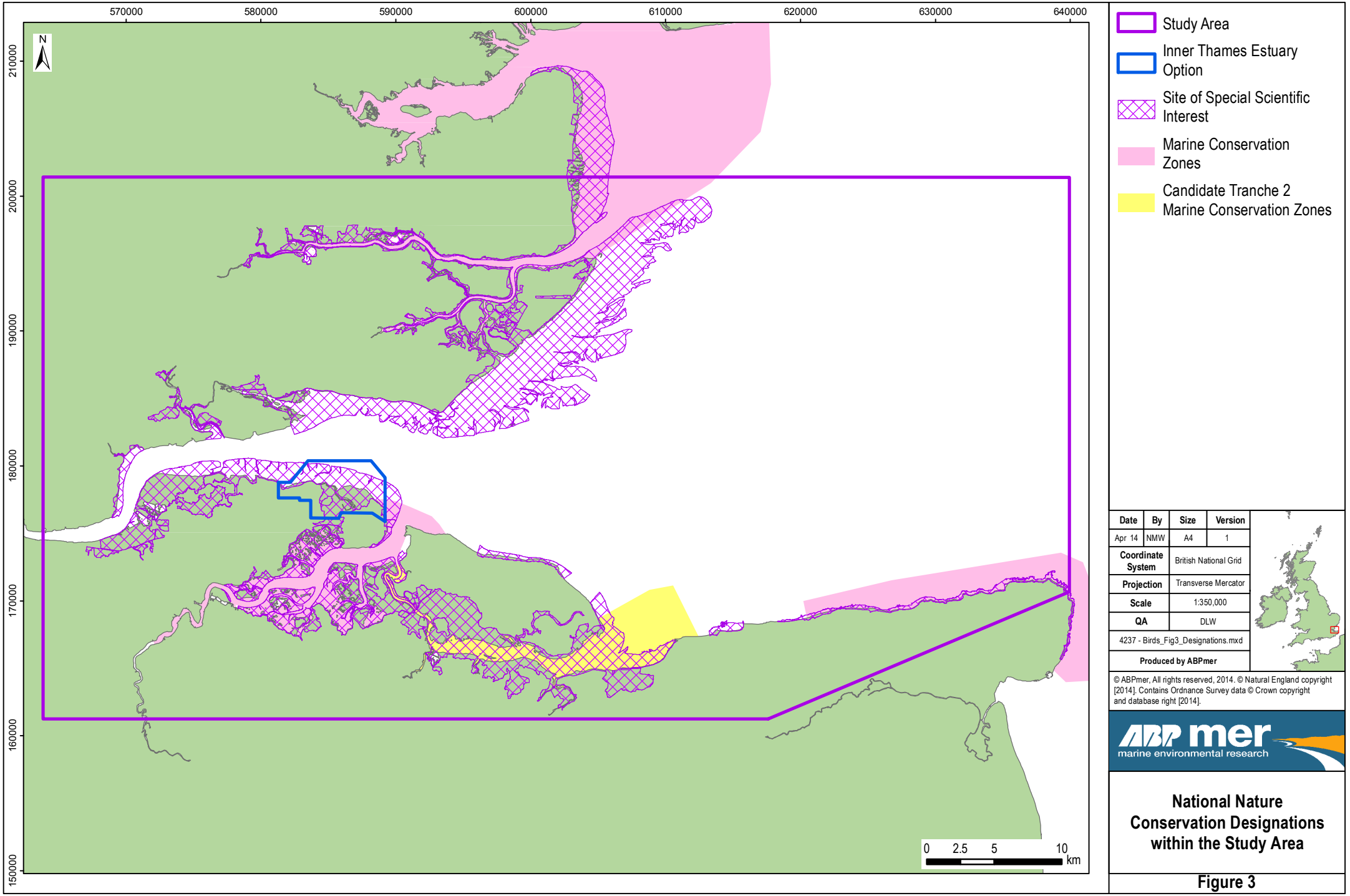
**International Nature Conservation Designations within the Study Area**

**Figure 2**



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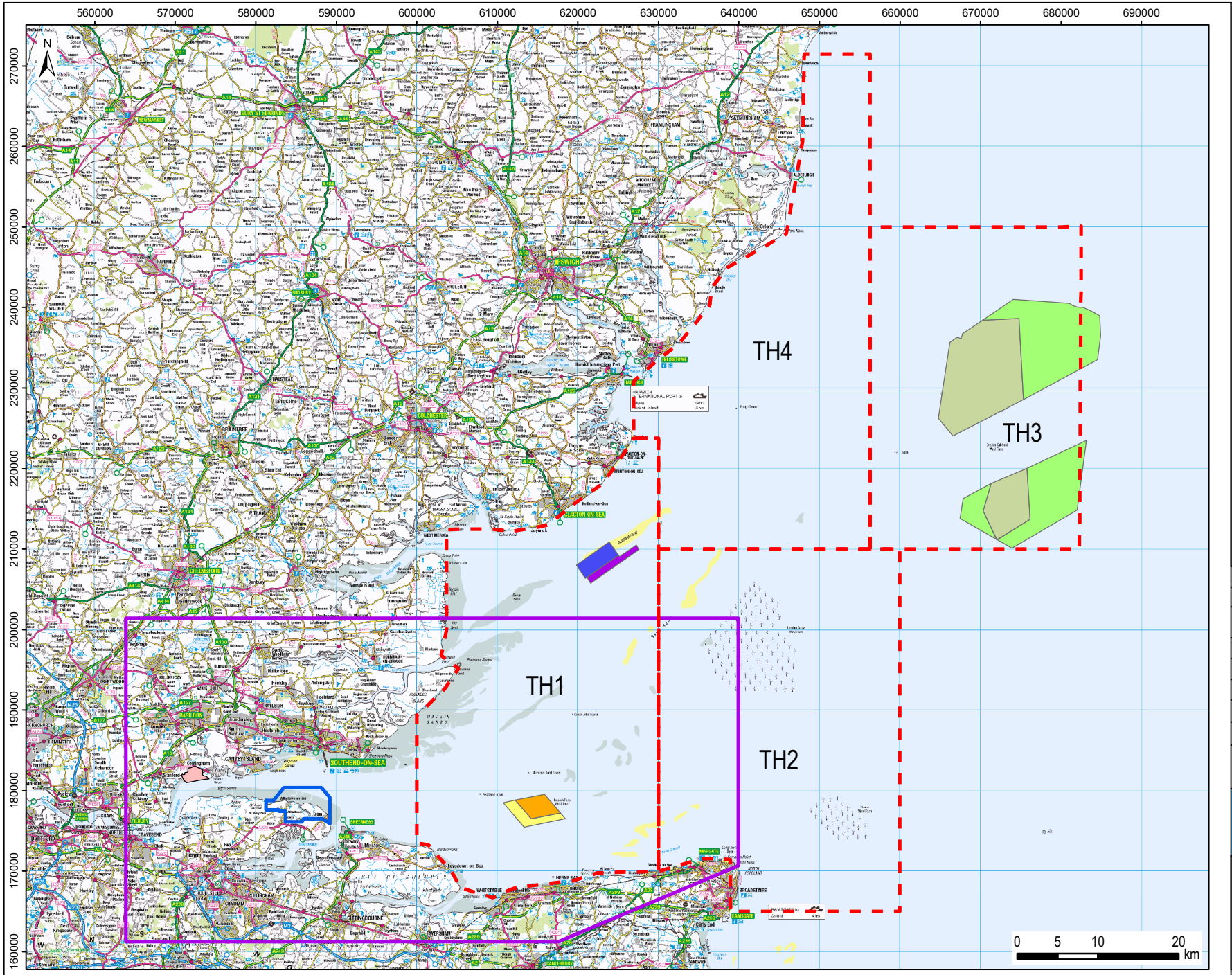
**National Nature Conservation Designations within the Study Area**

**Figure 3**




Aerial Bird Survey Areas

Study Area

Inner Thames Estuary Option

**Previous Count Areas**

- Greater Gabbard
- Galloper Extension
- Gunfleet Sands I
- Gunfleet Sands II
- Kentish Flats
- Kentish Flats Extension
- London Gateway

| Date | By | Size | Version |
|---|---|---|---|
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| 4237 - Birds_Fig4_Prev_Surveys.mxd | | | |
| Produced by ABPmer | | | |



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**Areas of Previous Surveys Reviewed for the Wider Thames Estuary**

**Figure 4**

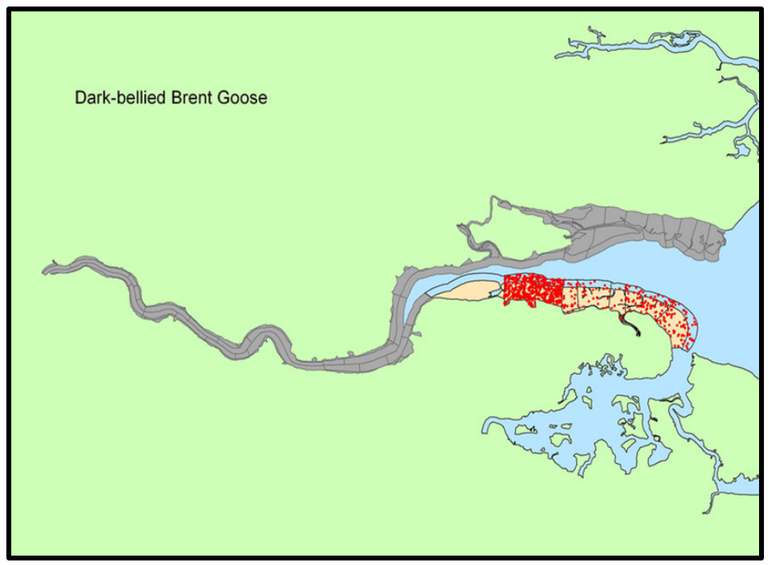
# Appendices

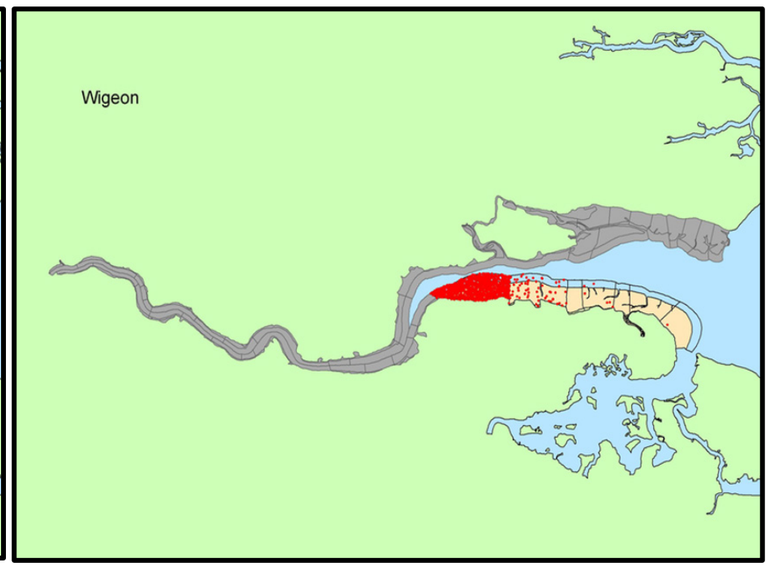
# Appendix A

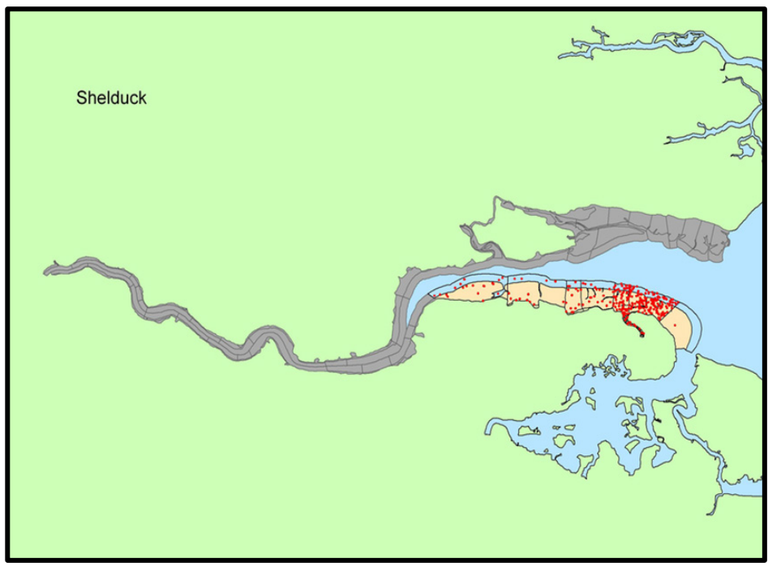
## WeBS Low Tide Distribution Maps of Waders and Waterfowl Within the Thames Estuary

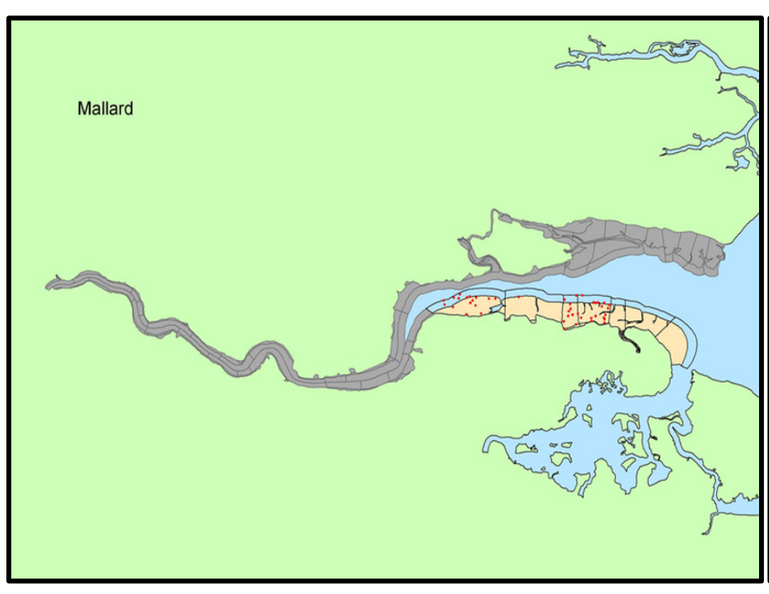
# A. WeBS Low Tide Distribution Maps of Waders and Waterfowl Within the Thames Estuary

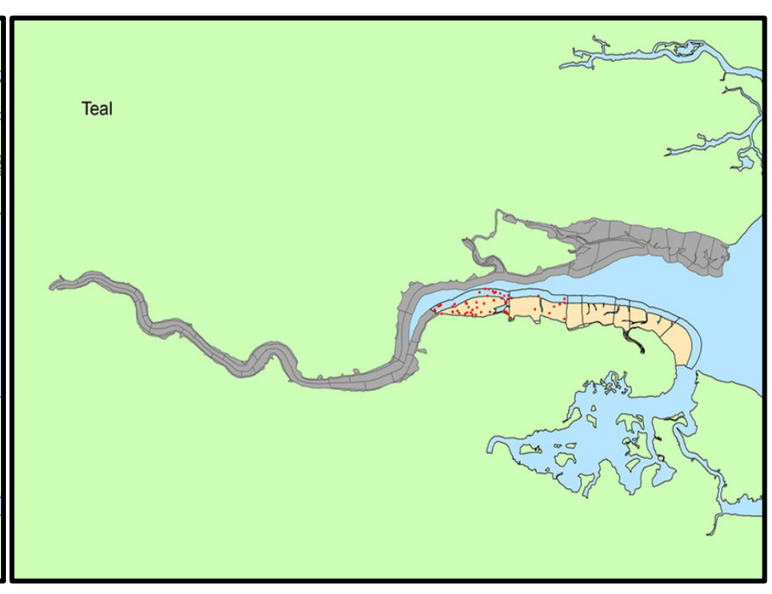
## A.1 WeBS Low Tide Distribution Maps of Waders and Waterfowl Within the Thames Estuary in Winter 2008/09[12]

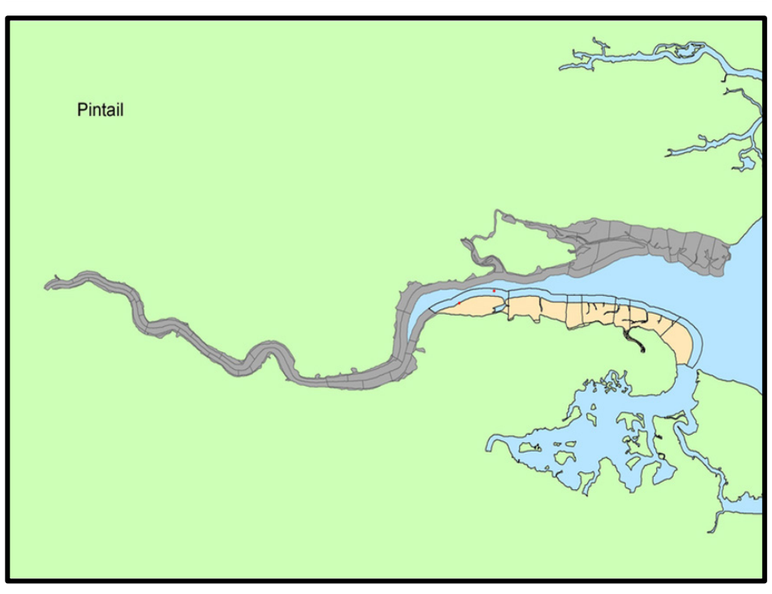


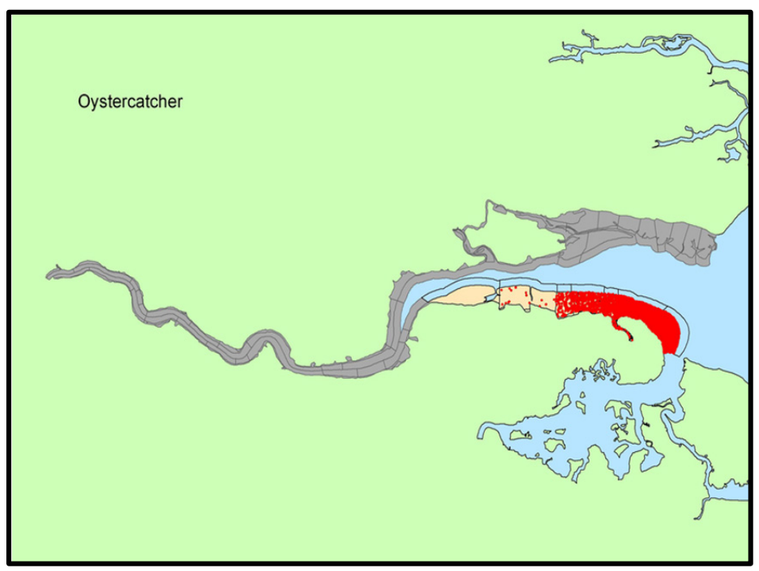



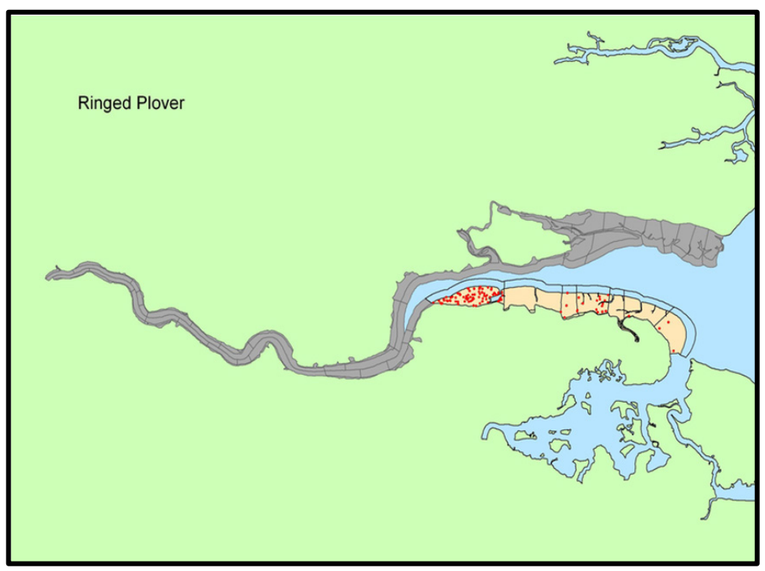



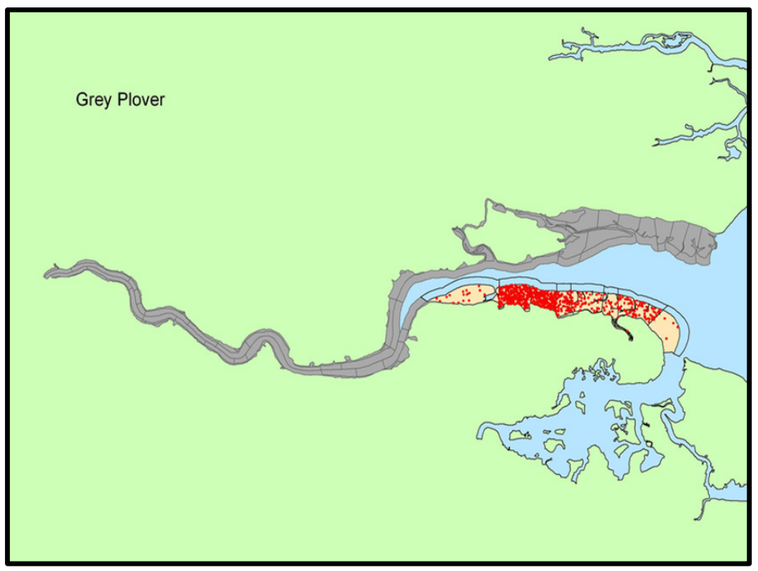



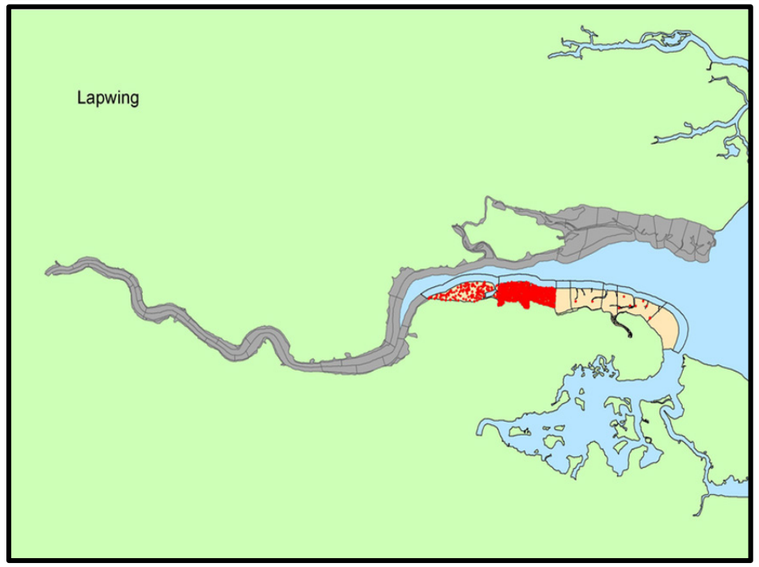




12 N.B. Count areas shaded grey indicate areas where no counts were carried out for the relevant winter.


Oystercatcher


Ringed Plover


Grey Plover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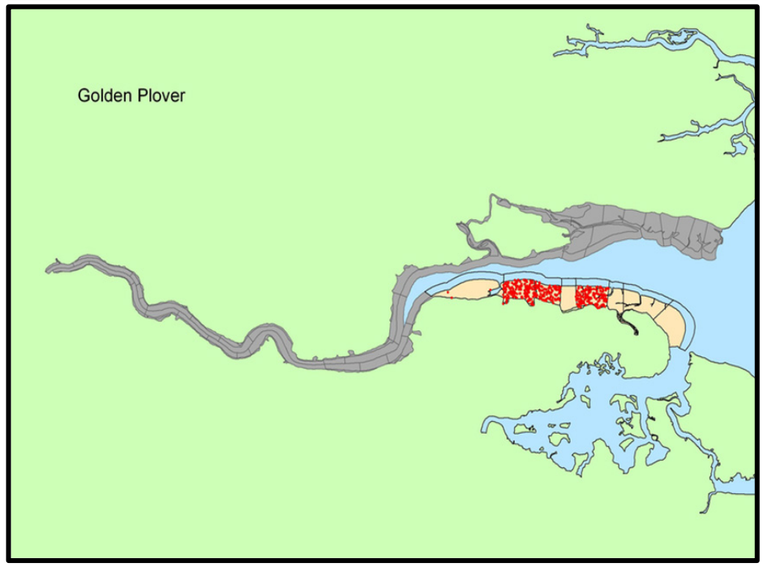
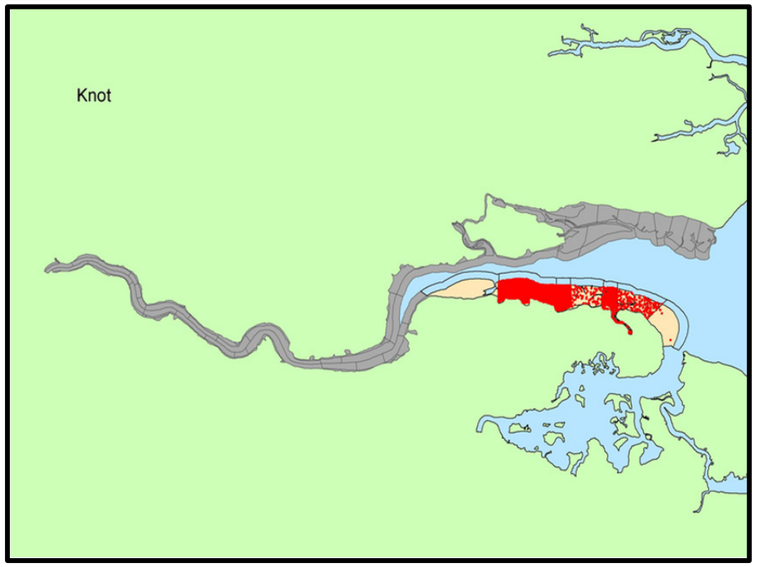

Golden Plover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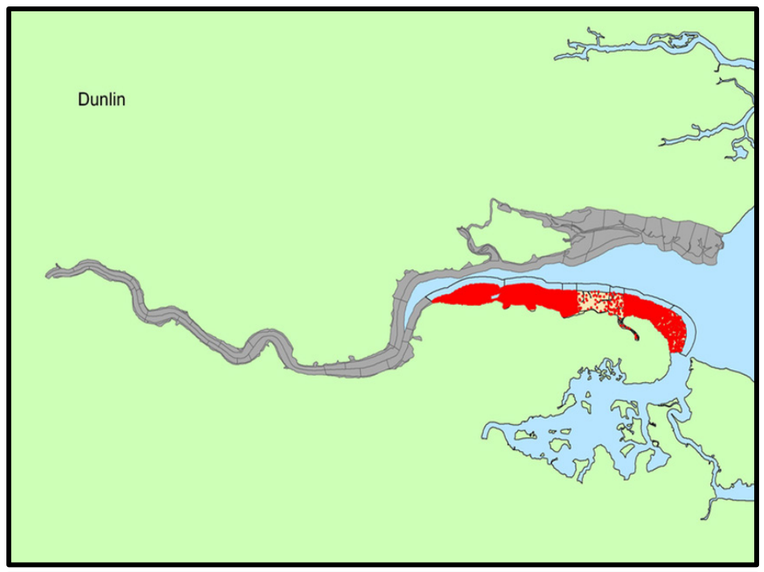
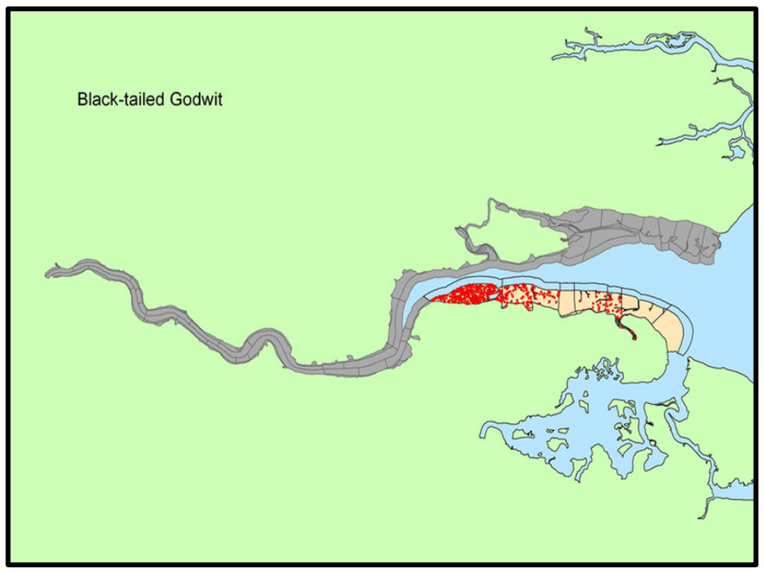
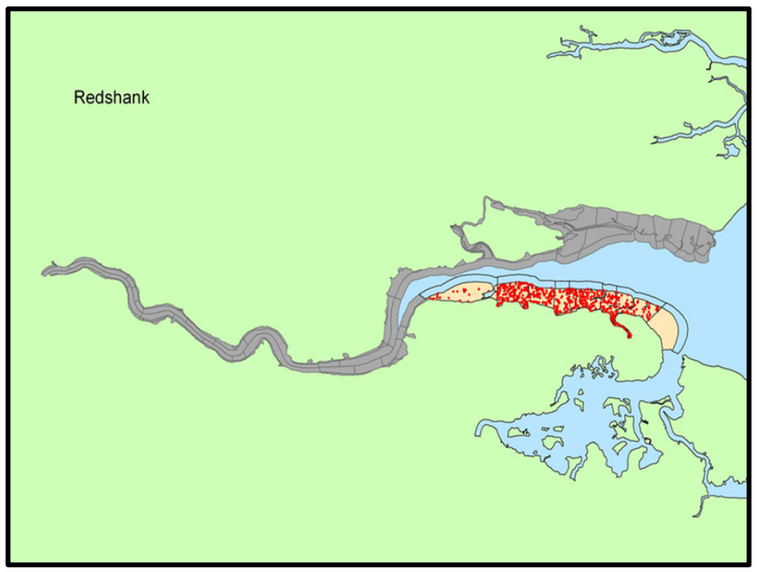

Dunlin


Black-tailed Godwit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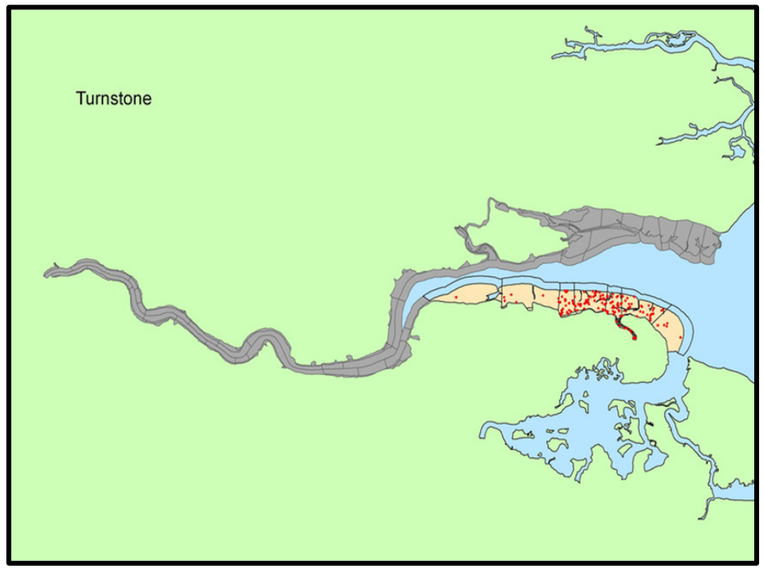
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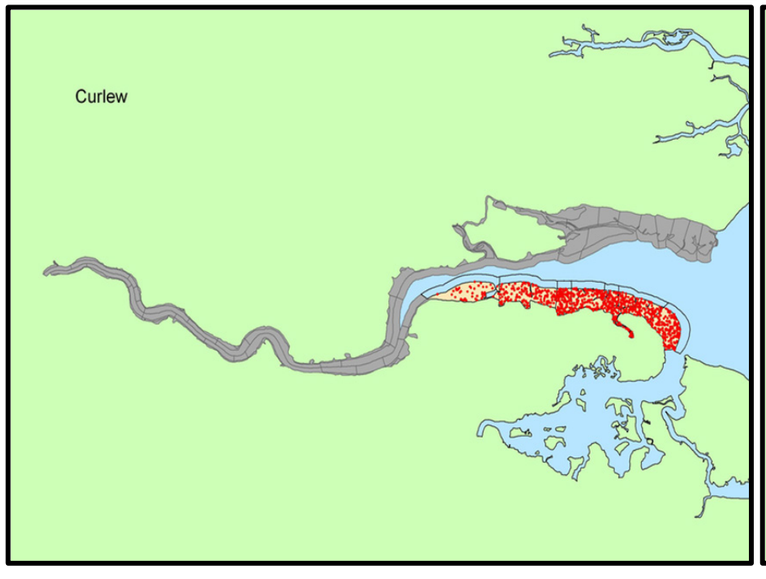
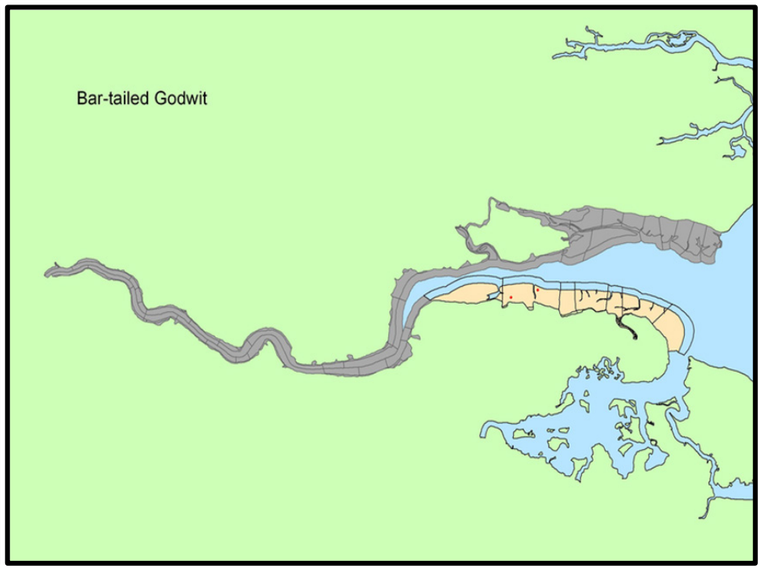

Curlew

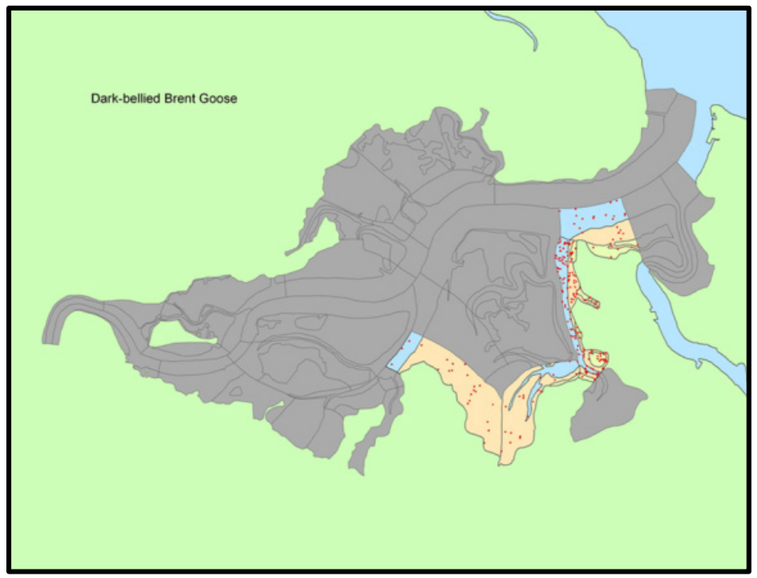

Bar-tailed Godwit

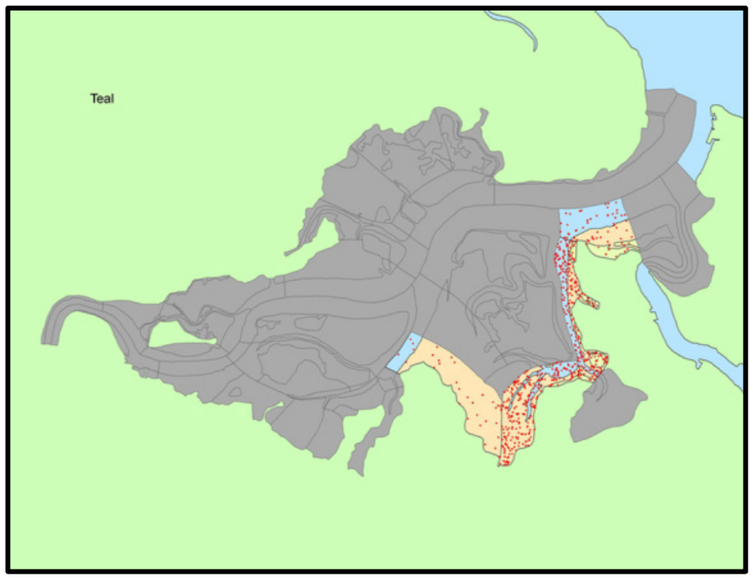
# Appendix B

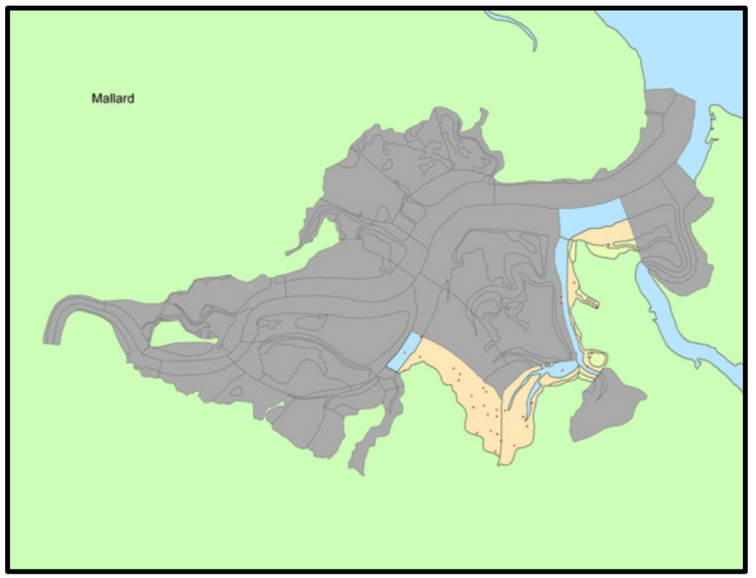
## WeBS Low Tide Distribution Maps of Waders and Waterfowl Within the Medway Estuary

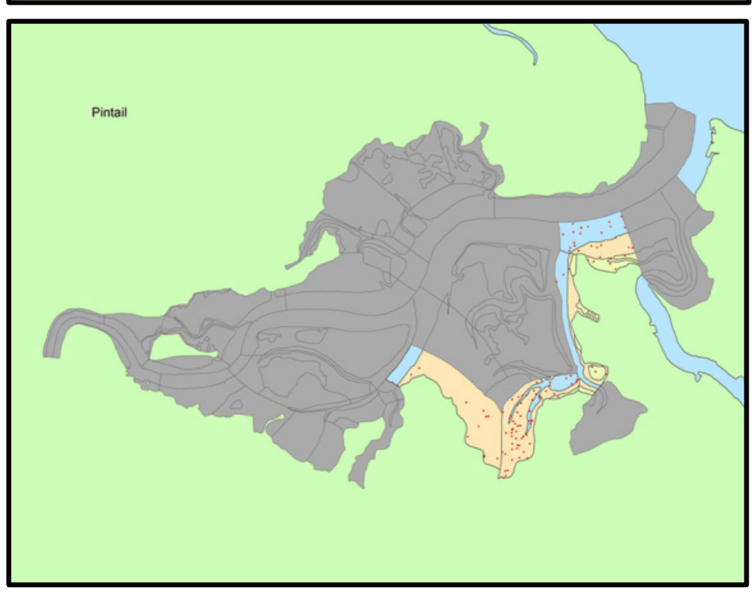
# B. WeBS Low Tide Distribution Maps of Waders and Waterfowl Within the Medway Estuary

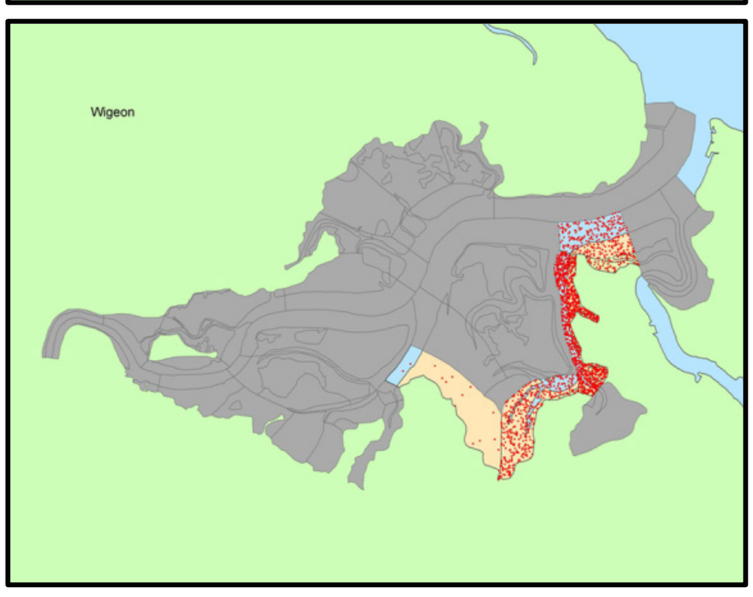
## B.1 WeBS Low Tide Distribution Maps of Waders and Waterfowl Within the Medway Estuary in Winter 2005/06[13]

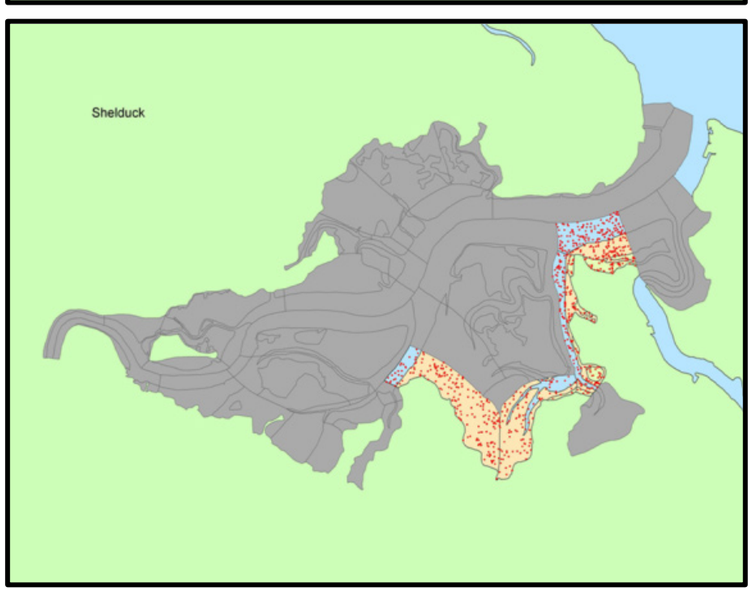


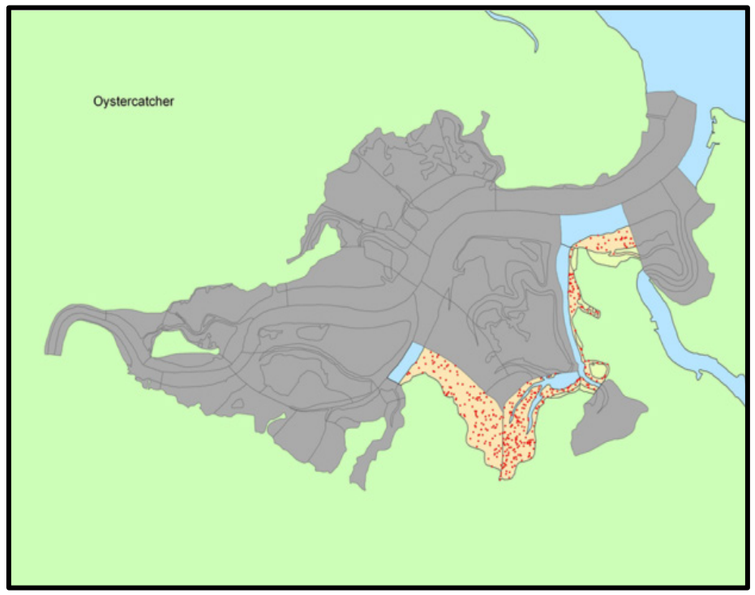



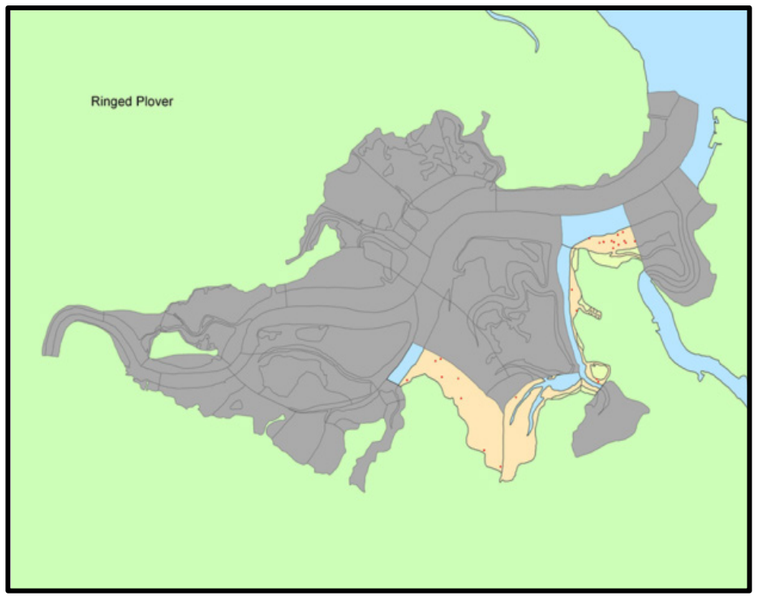



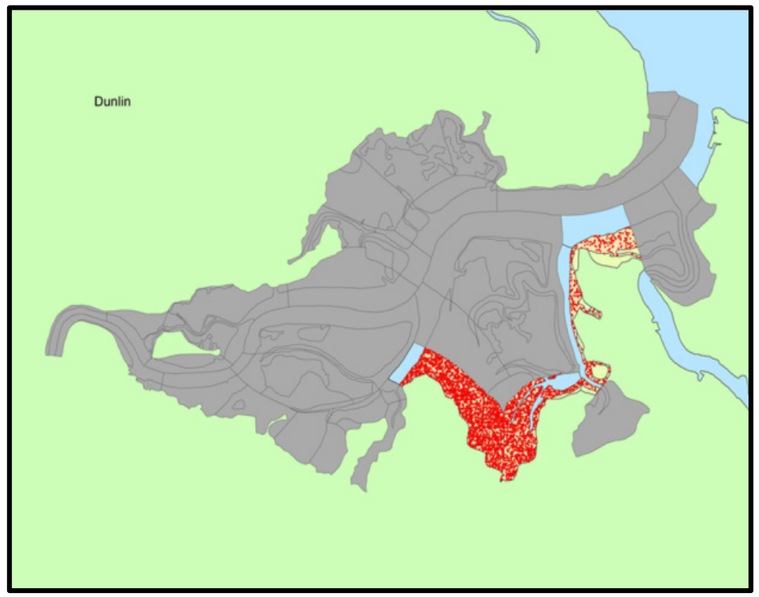



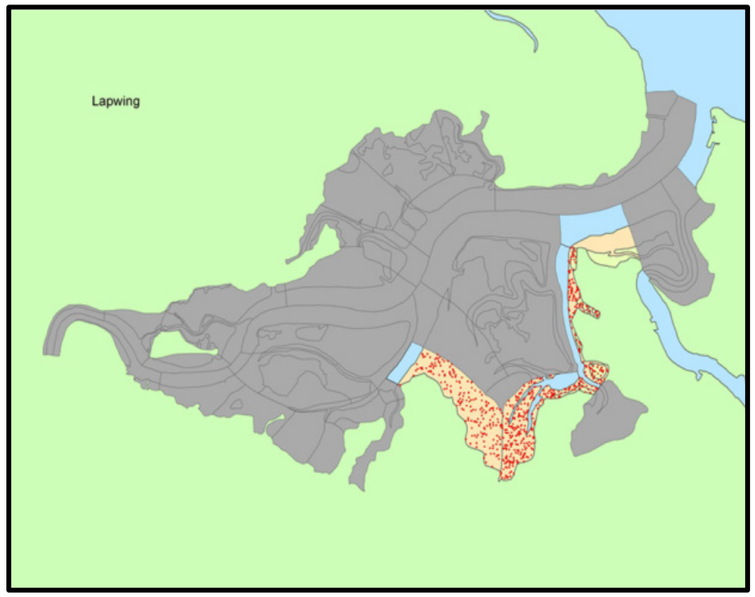



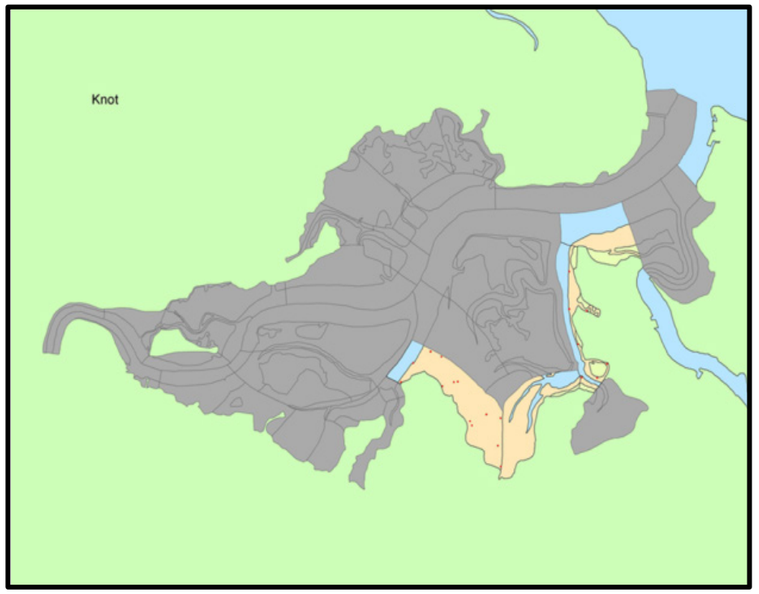

13 N.B. Count areas shaded grey indicate areas where no counts were carried out for the relevant winter.

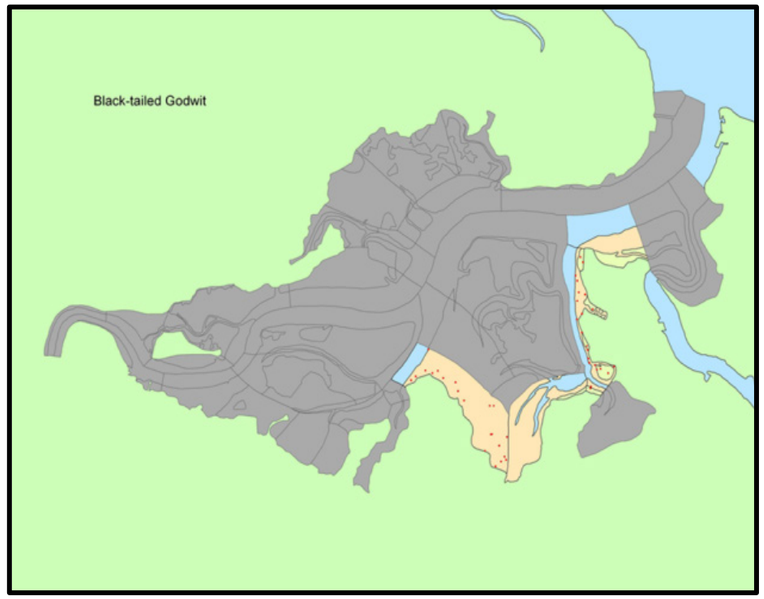

Oystercatcher

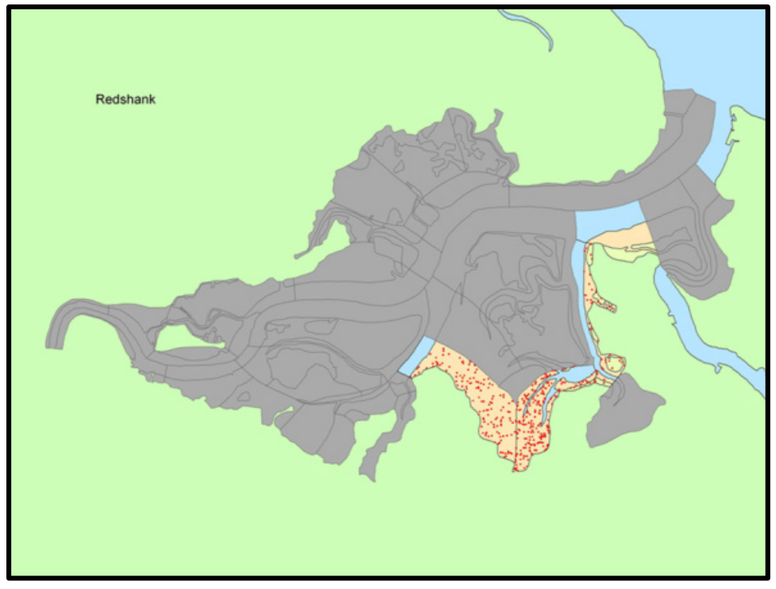

Ringed Plover

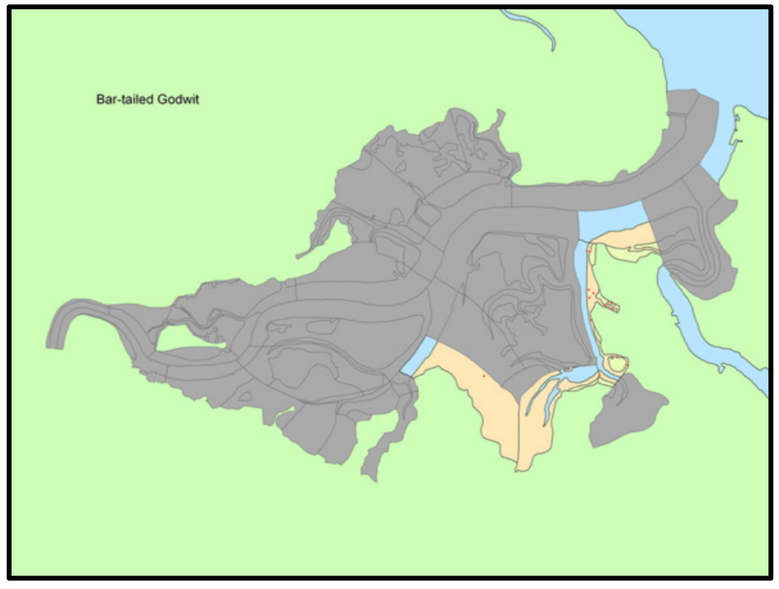

Dunlin

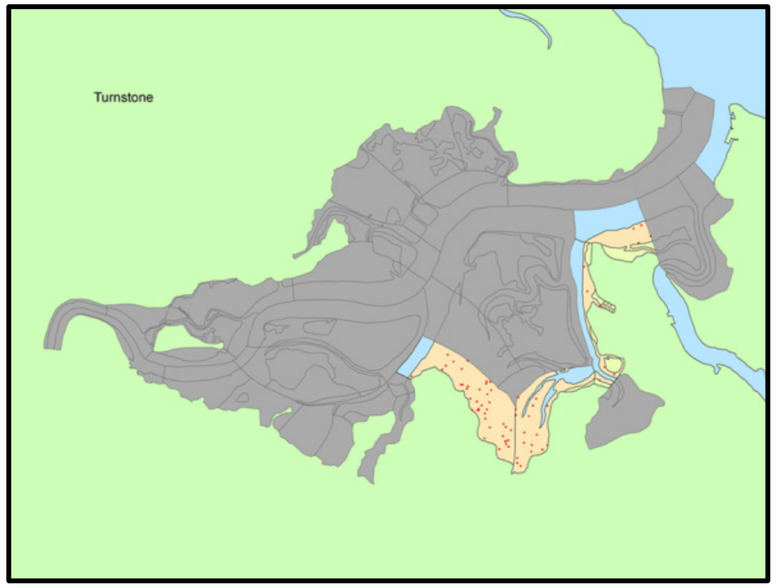

Lapwing

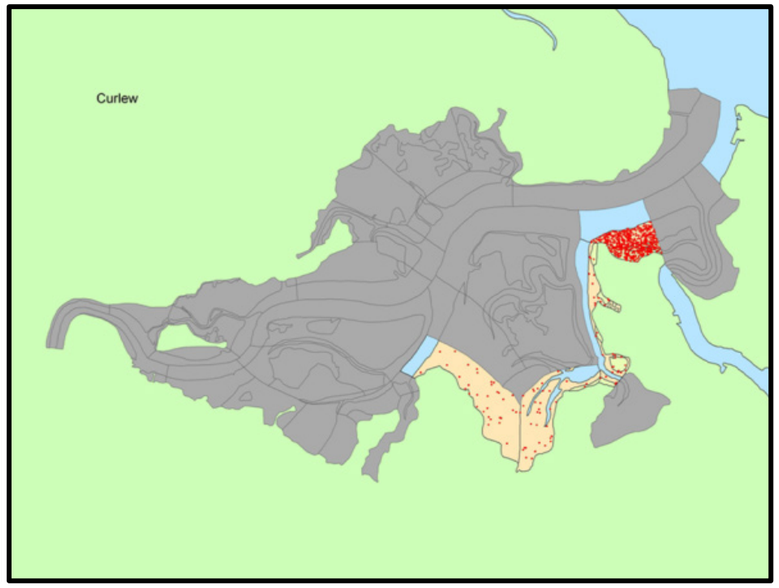

Knot


Black-tailed Godwit


Redshank


Bar-tailed Godwit


Turnstone


Curlew

# Appendix C

## Wader and Waterfowl Abundance and Distribution Within the Swale Estuary

# C. Wader and Waterfowl Abundance and Distribution Within the Swale Estuary

## C.1 High Water Distribution within the Swale Estuary

Table C1. Importance thresholds and latest WeBS Core Counts of the main wader and waterfowl species present in The Swale from 2007/08 to 2011/12

| Species | International Importance Threshold | National Importance Threshold | 2007/08 | 2008/09 | 2009/10 | 2010/11 | 2011/12 | 5-year Peak Mean | Month |
|---|---|---|---|---|---|---|---|---|---|
| Dark-bellied Brent Goose** | 2,400 | 910 | 1,857 | 2,115 | 1,782 | 1,448 | 4,126 | 2,387 | Oct |
| Dunlin** | 13,300 | 3,500 | 7,692 | 6,419 | 13,073 | 9,046 | 8,073 | 8,861 | Jan |
| Redshank** | 2,400 | 1,200 | 1,384 | 1,049 | 910 | 1,375 | 1,361 | 1,258 | Nov |
| Gadwall | 600 | 250 | 65 | 198 | 183 | 69 | 23 | 150 | Nov |
| Teal | 5,000 | 2,100 | 4,470 | 5,485 | 7,030 | 5,831 | 2,409 | 5,045 | Nov |
| Oystercatcher | 8,200 | 3,200 | 4,106 | 3,293 | 5,425 | 6,819 | 5,513 | 5,031 | Aug |
| Ringed Plover | 730 | 340 | 294 | 605 | 830 | 421 | 653 | 561 | Aug |
| Grey Plover | 2,500 | 430 | 1,631 | 1,322 | 2,003 | 1,207 | 1,305 | 1,537 | Jan |
| Curlew | 8,400 | 1,400 | 1,357 | 1,433 | 1,808 | 2,097 | 1,215 | 1,619 | Oct |
| White-fronted Goose | 12,000 | 24 | 315 | 160 | 523 | 758 | 230 | 397 | Jan |
| Shelduck | 3,000 | 610 | 2,003 | 1,926 | 1,636 | 1,667 | 1,392 | 1,725 | Jan |
| Wigeon | 15,000 | 4,400 | 11,560 | 12,134 | 25,848 | 14,800 | 6,246 | 14,118 | Feb |
| Pintail | 600 | 290 | 597 | 630 | 381 | 521 | 220 | 470 | Nov |
| Mallard | 20,000 | 6,800 | 2,972 | 1,981 | 1,432 | 1,427 | 1,474 | 1,857 | Jan |
| Shoveler | 400 | 180 | 331 | 216 | 459 | 291 | 124 | 375 | Jan |
| Lapwing | 20,000 | 6,200 | 23,479 | 9,996 | 8,744 | 9,009 | 5,220 | 11,290 | Jan |
| Knot | 4,500 | 3,200 | 5,002 | 3,528 | 1,650 | 5,151 | 2,010 | 3,468 | Jan |
| Avocet | 730 | 75 | 447 | 586 | 654 | 602 | 549 | 568 | Nov |
| Golden Plover | 9,300 | 4,000 | 17,327 | 7,407 | 6,112 | 8,305 | 1,904 | 8,412 | Nov |
| Ruff | 12,200 | 8 | 40 | 14 | 44 | 32 | 19 | 33 | Feb |
| Black-tailed Godwit | 610 | 430 | 1,186 | 1,545 | 1,825 | 1,760 | 1,182 | 1,589 | Oct |
| Bar-tailed Godwit | 1,200 | 380 | 750 | 842 | 1,806 | 1,752 | 738 | 1,178 | Feb |
| Green Sandpiper | 15,500 | 9 | 9 | 4 | 13 | 22 | 17 | 15 | Aug |
| Greenshank | 2,300 | 6 | 7 | 9 | 12 | 24 | 32 | 19 | Oct |

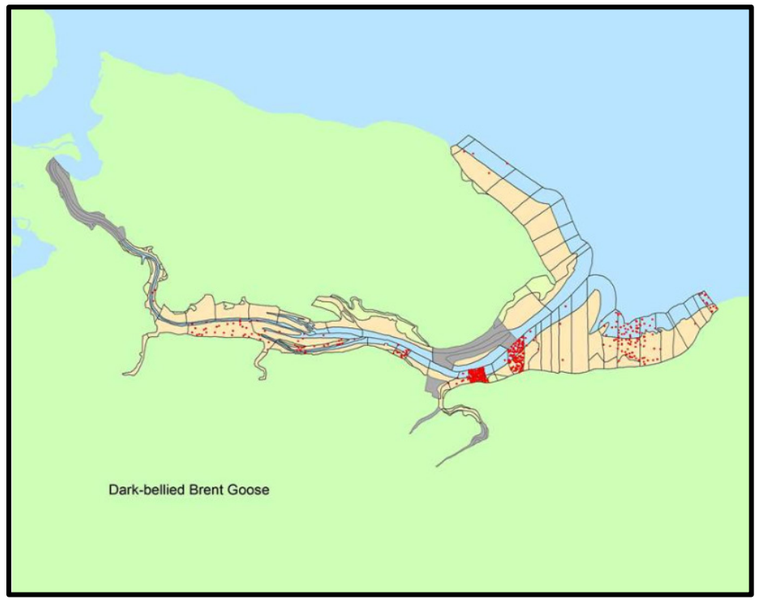
Key: The Swale SPA designated due to supporting:
* Populations of National Importance;
** Populations of International Importance

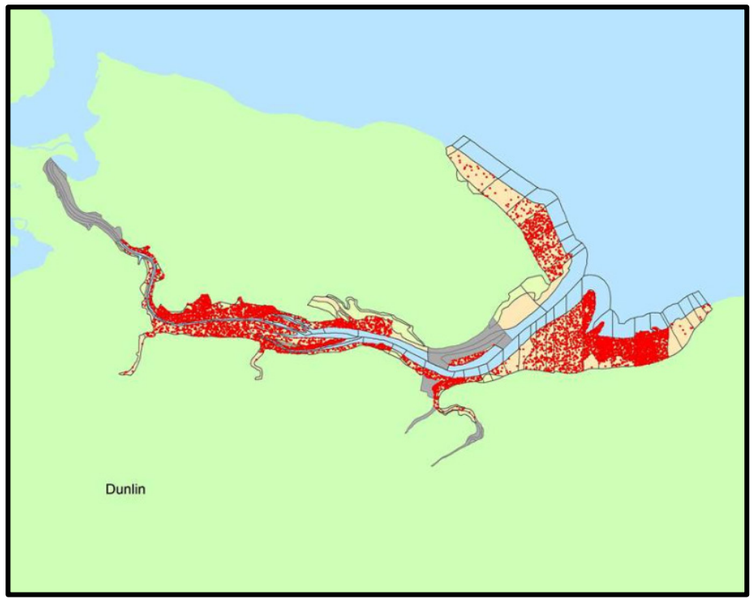
## C.2 Low Water Distribution Within the Swale Estuary

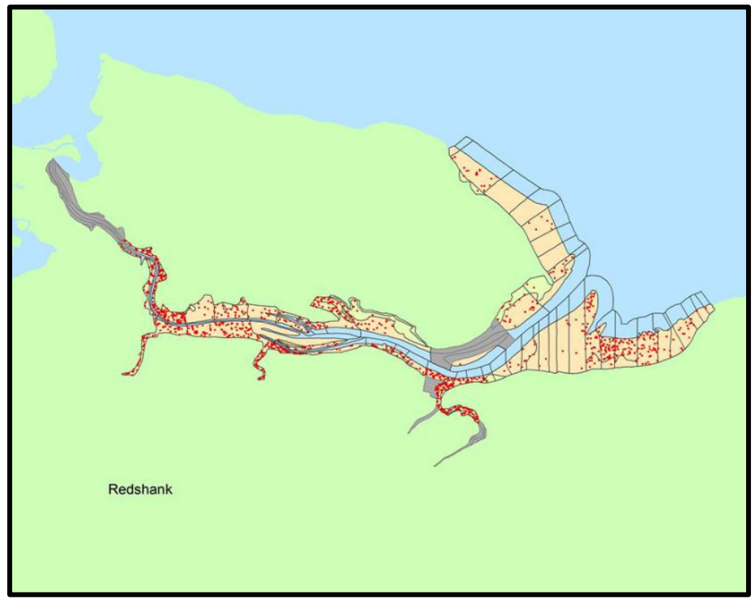
Table C2. Summary of the low water abundance of waders and waterfowl in The Swale during the winters of 2001/02 and 2011/12

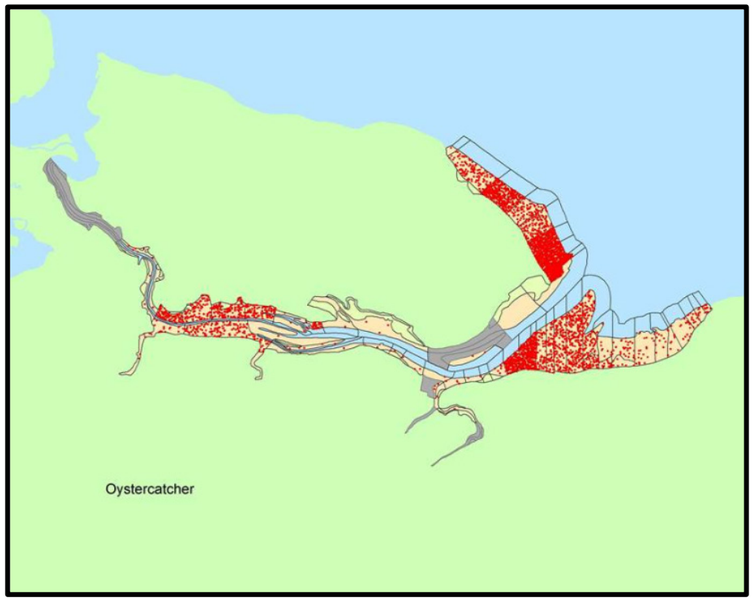
| Species | WeBS Low Tide Peak Count | |
|---|---|---|
| | 2001/02 | 2011/12 |
| Dark-bellied Brent Goose** | 1,690 | 1,446 |
| Dunlin** | 9,189 | 9,621 |
| Redshank** | 1,777 | 1,078 |
| Gadwall | 6 | 16 |
| Teal | 692 | 1,701 |
| Oystercatcher | 6,085 | 4,014 |
| Ringed Plover | 206 | 172 |
| Grey Plover | 1,567 | 770 |
| Curlew | 1,174 | 1,079 |
| Shelduck | 2,039 | 1,546 |
| Wigeon | 1,187 | 6,036 |
| Pintail | 503 | 219 |
| Mallard | 264 | 613 |
| Shoveler | 166 | 2 |
| Lapwing | 1,941 | 3,159 |
| Knot | 1,110 | 2,370 |
| Avocet | 118 | 310 |
| Golden Plover | 2,335 | 2,145 |
| Ruff | - | 9 |
| Black-tailed Godwit | 1,580 | 1,329 |
| Bar-tailed Godwit | 383 | 1,159 |
| Green Sandpiper | - | 1 |
| Greenshank | - | 4 |
| Turnstone | 389 | 182 |
| Key: The Swale SPA designated due to supporting: *Populations of National Importance; **Populations of International Importance | | |

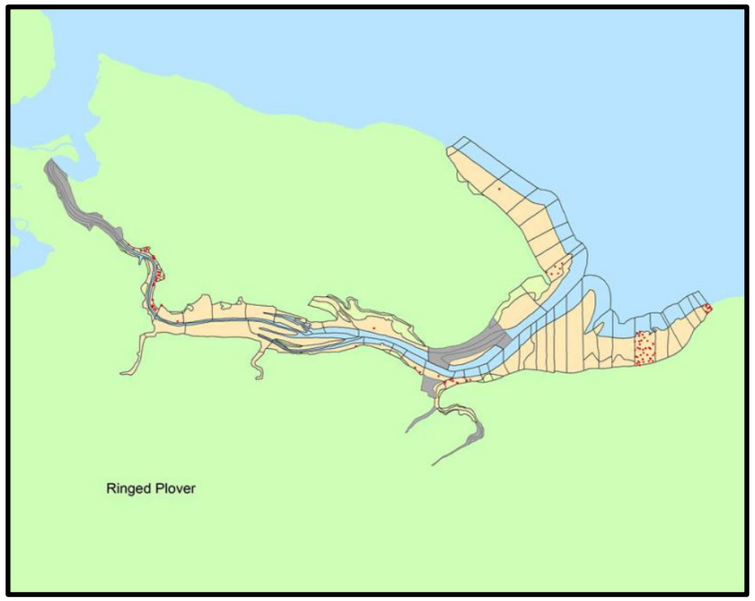
## C.3 WeBS Low Tide Distribution Maps of Waders and Waterfowl Within the Swale Estuary in winter 2011/12[14]

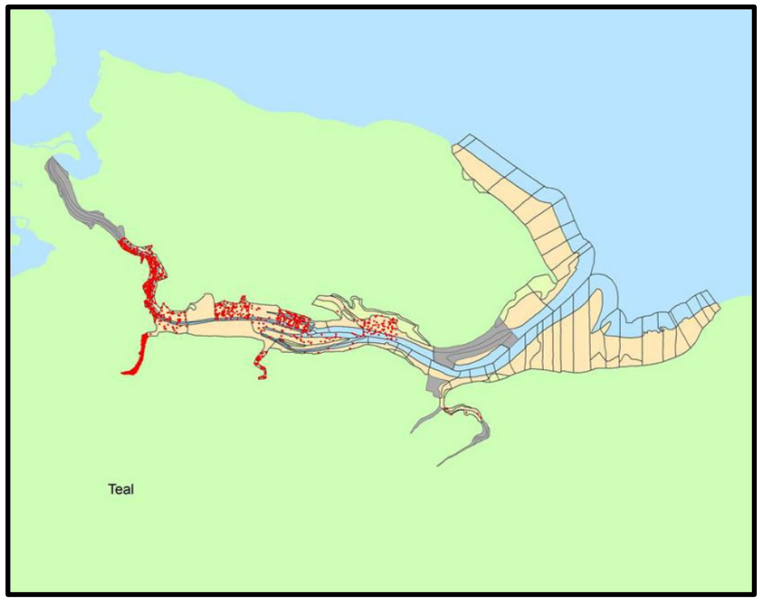


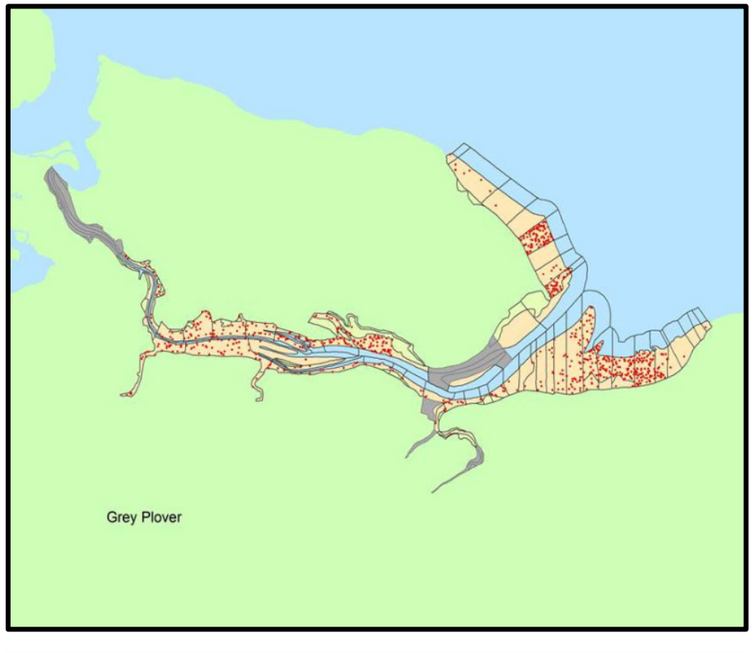



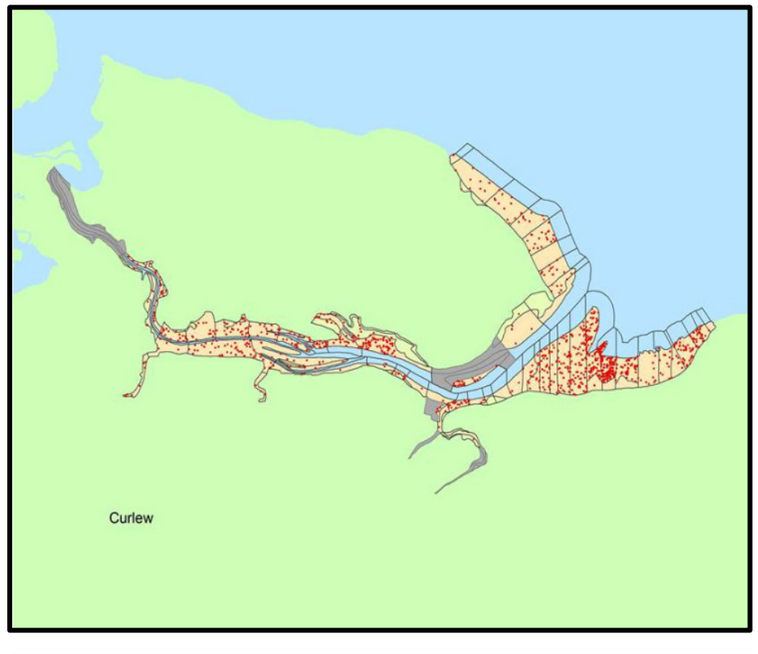



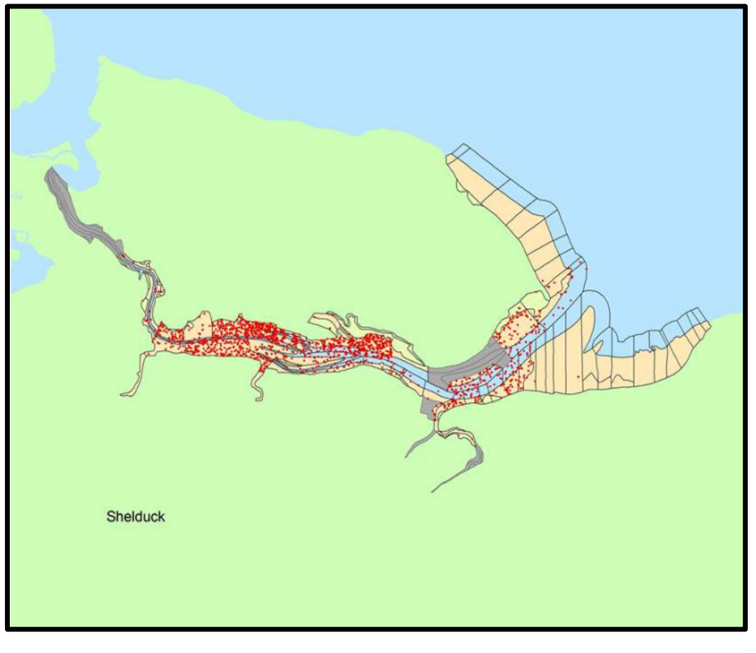



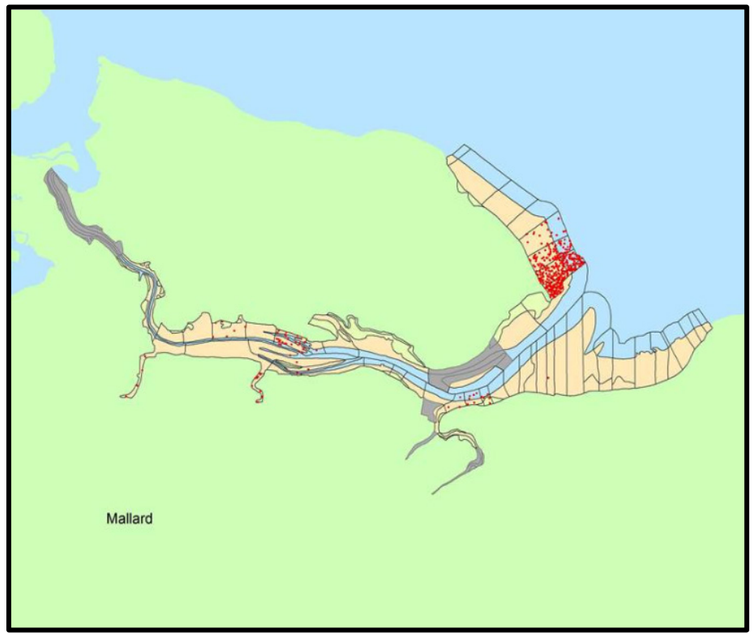



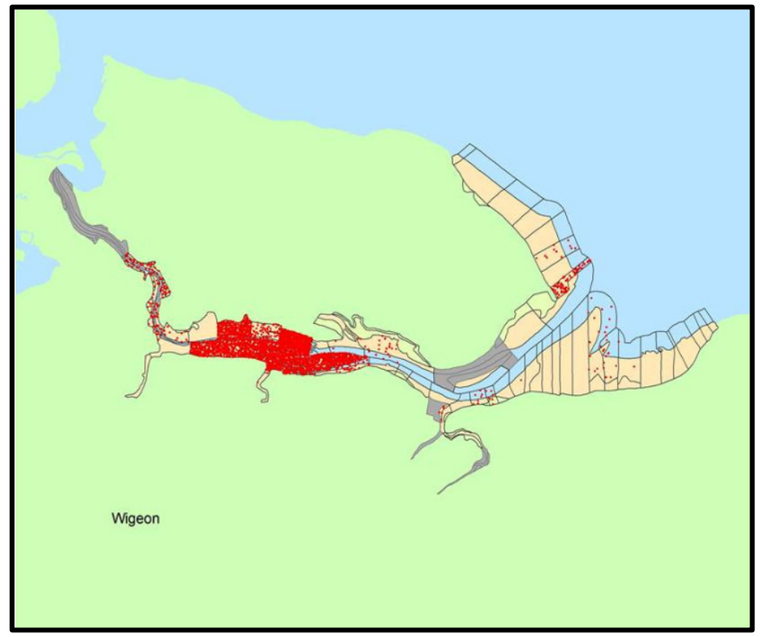

14 N.B. Count areas shaded grey indicate areas where no counts were carried out for the relevant winter.

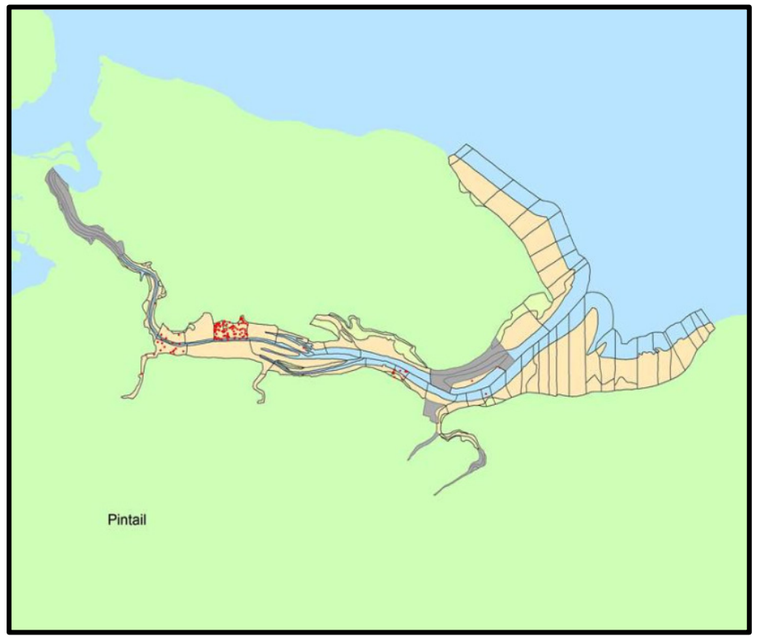

Grey Plover

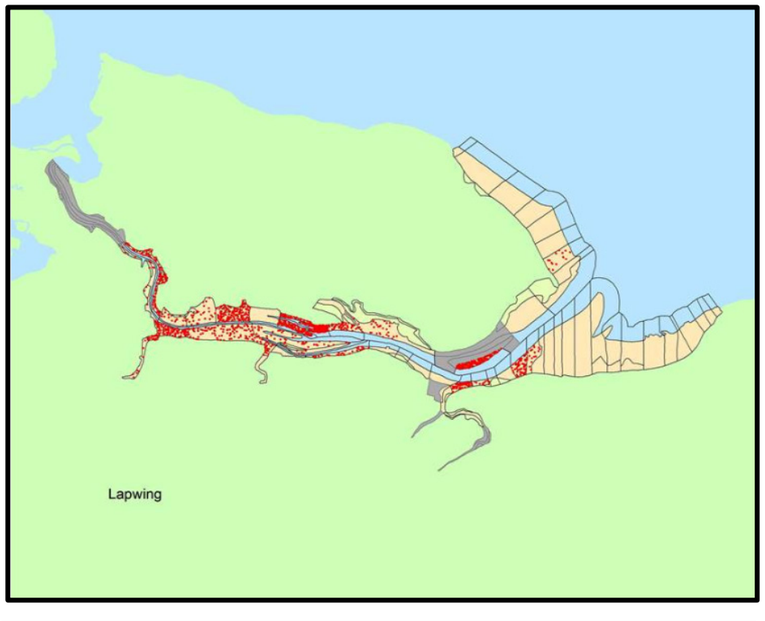

Curlew

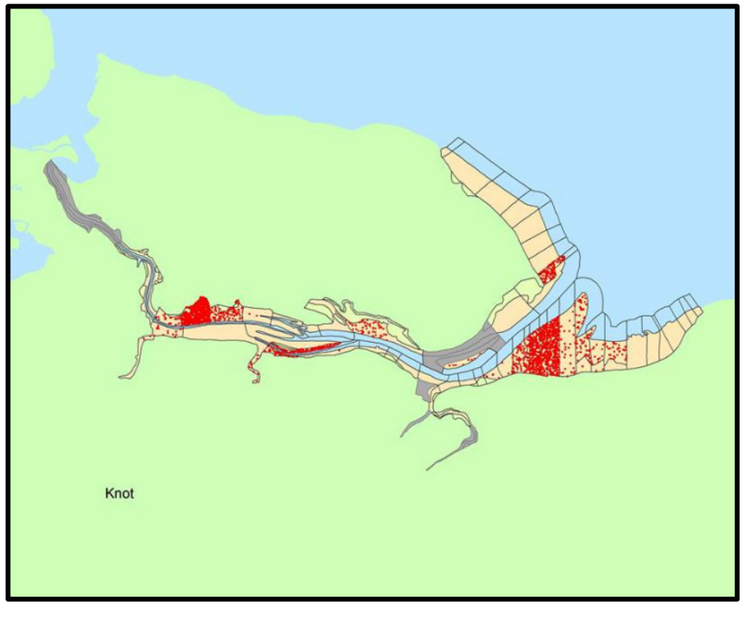

Shelduck

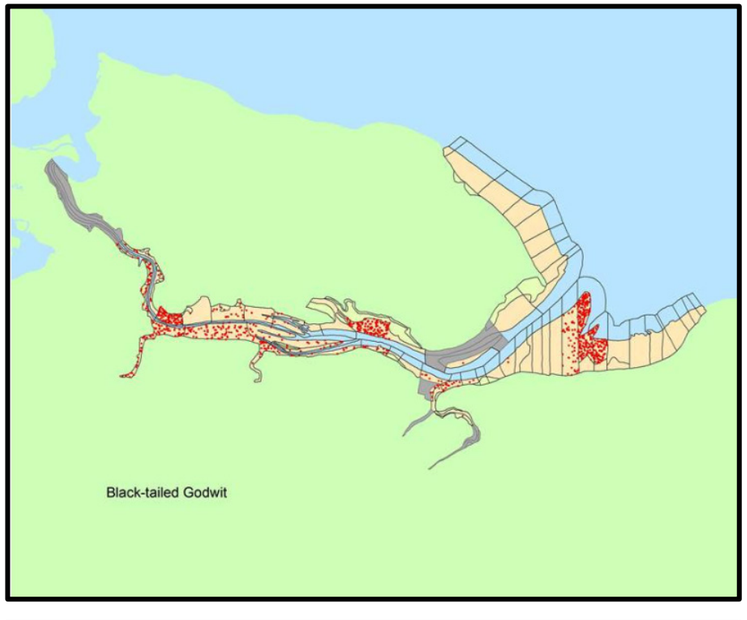

Mallard

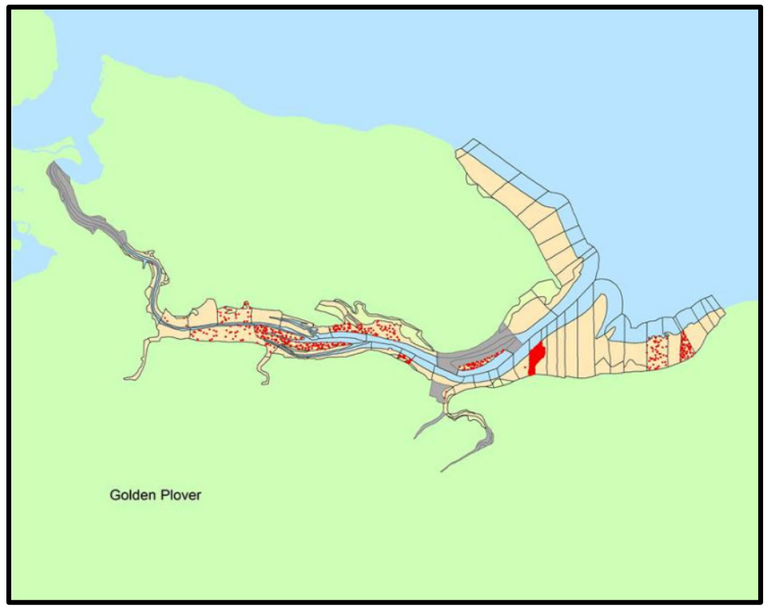

Wigeon

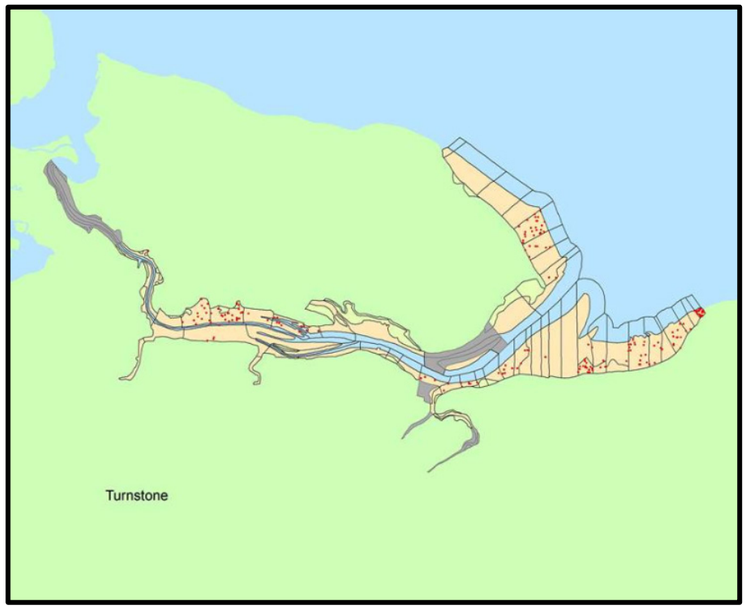

Pintail

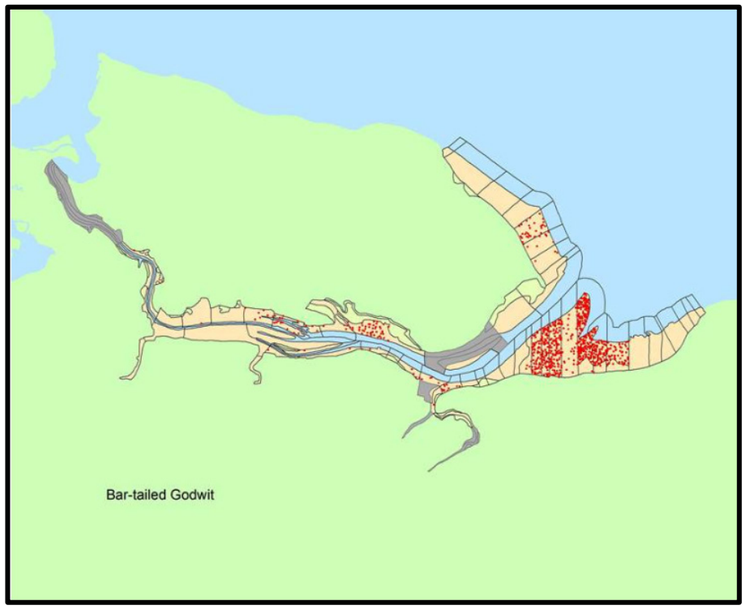

Lapwing


Knot


Black-tailed Godwit


Golden Plover


Turnstone


Bar-tailed Godwit

# C.4 WeBS Low Tide Distribution Maps of Waders and Waterfowl Within the Swale Estuary in winter 2011/12

Table C3. WeBS Alerts issued for species within The Swale SPA site over all timescales

| Species | Short-term (%) | Medium-term (%) | Long-term (%) | Since Designation (1982) (%) |
|---|---|---|---|---|
| White-fronted Goose | 10 | -23 | -75 | -75 |
| Shelduck | -15 | -26 | 22 | 40 |
| Shoveler | 5 | -25 | 8 | 8 |
| Little Grebe | -31 | -74 | -48 | - |
| Grey Plover | -2 | -44 | -14 | 1 |
| Lapwing | -17 | -42 | 52 | -3 |
| Dunlin | 14 | -5 | -30 | -16 |
| Redshank | -4 | -36 | -43 | -20 |
| Red | High alert (> 50% decline); | | | |
| Amber | Medium alert (25 – 50% decline). | | | |

# Appendix D

## WeBS Alerts Issued for Wader and Waterfowl Species within Foulness SPA

# D. WeBS Alerts Issued for Wader and Waterfowl Species Within Foulness SPA

Table D1. WeBS Alerts issued for species within Foulness SPA site over all timescales

| Species | Short-term (%) | Medium-term (%) | Long-term (%) | Since Designation (1996) (%) |
|---|---|---|---|---|
| Shelduck | -25 | -44 | -29 | -48 |
| Little Grebe | -35 | 27 | 548 | 94 |
| Golden Plover | -60 | -62 | 147 | -58 |
| Grey Plover | -60 | -62 | -5 | -66 |
| Lapwing | -30 | -42 | 128 | -56 |
| Knot | -62 | -26 | 18 | -56 |
| Dunlin | -31 | -33 | -32 | -36 |
| Bar-tailed Godwit | -28 | 34 | -16 | -48 |
| Redshank | -3 | -21 | -11 | -28 |
| Red | High alert (> 50% decline); | | | |
| Amber | Medium alert (25 – 50% decline). | | | |

# Appendix E

## Wader and Waterfowl Abundance and Distribution Within the Crouch and Roach Estuaries

# E. Wader and Waterfowl Abundance and Distribution Within the Crouch and Roach Estuaries

## E.1 High Water Distribution Within the Crouch and Roach Estuaries

Table E1. Importance thresholds and latest WeBS Core Counts of the main wader and waterfowl species present in the Crouch and Roach Estuaries from 2007/08 to 2011/12

| Species | International Importance Threshold | National Importance Threshold | 2007/08 | 2008/09 | 2009/10 | 2010/11 | 2011/12 | 5-year Peak Mean | Month |
|---|---|---|---|---|---|---|---|---|---|
| Dark-bellied Brent Goose** | 2,400 | 910 | 4,534 | 4,242 | 3,149 | 3,110 | 5,743 | 4,156 | Jan |
| Shelduck | 3,000 | 610 | 823 | 1,029 | 935 | 1,738 | 736 | 1,052 | Feb |
| Teal | 5,000 | 2,100 | 1,900 | 1,754 | 3,010 | 2,074 | 1,843 | 2,170 | Nov |
| Shoveler | 400 | 180 | 259 | 330 | 227 | 200 | 279 | 259 | Dec |
| Avocet | 730 | 75 | 131 | 213 | 139 | 343 | 155 | 196 | Feb |
| Ringed Plover | 730 | 340 | 594 | 349 | 419 | 316 | 471 | 430 | Nov |
| Golden Plover | 9,300 | 4,000 | 6,696 | 3,298 | 4,342 | 3,411 | 3,729 | 4,295 | Nov |
| Grey Plover | 2,500 | 430 | 292 | 526 | 474 | 482 | 521 | 459 | Nov |
| Lapwing | 20,000 | 6,200 | 9,255 | 8,002 | 7,101 | 5,704 | 6,732 | 7,359 | Nov |
| Dunlin | 13,300 | 3,500 | 4,403 | 2,930 | 5,209 | 4,242 | 4,546 | 4,266 | Feb |
| Black-tailed Godwit | 610 | 430 | 754 | 627 | 764 | 508 | 1,096 | 750 | Dec |
| Green Sandpiper | 15,500 | 9 | 4 | 8 | 24 | 6 | 6 | 10 | Sep |
| Greenshank | 2,300 | 6 | 32 | 9 | 20 | 21 | 18 | 20 | Aug |
| Redshank | 2,400 | 1,200 | 1,361 | 2,403 | 1,791 | 2,601 | 1,250 | 1,881 | Jan |
| Wigeon | 15,000 | 4,400 | 2,311 | 2,592 | 2,392 | 3,888 | 3,134 | 2,863 | Dec |
| Mallard | 20,000 | 6,800 | 547 | 487 | 706 | 482 | 440 | 532 | Jan |

Key: Crouch and Roach Estuaries SPA designated due to supporting:
* Populations of National Importance;
** Populations of International Importance

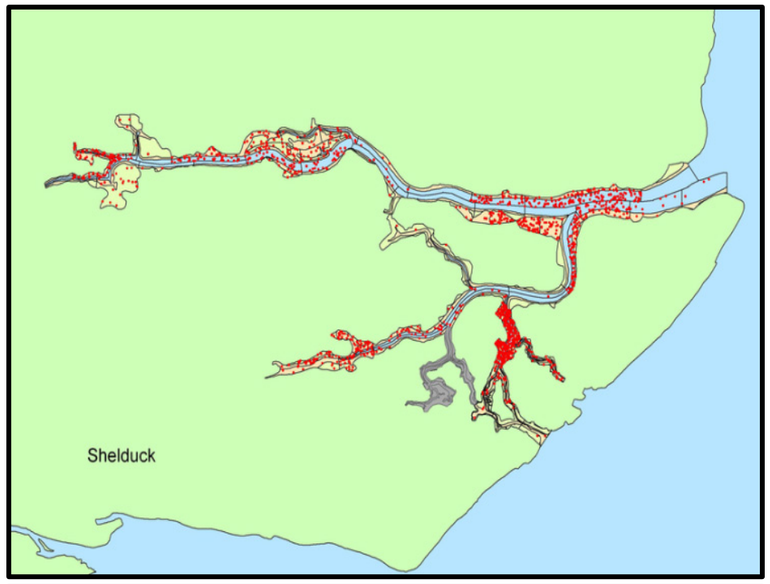
# E.2 Low Water Distribution Within the Crouch and Roach Estuaries

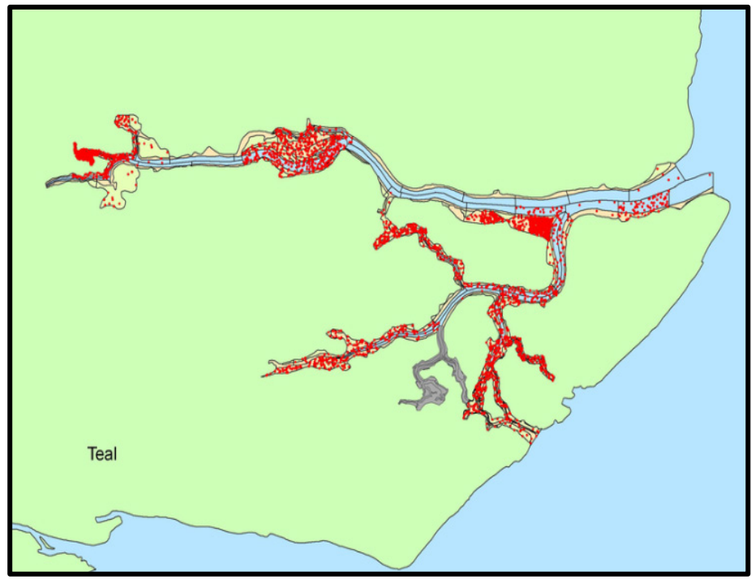
Table E2 Summary of the low water abundance of waders and waterfowl in the Crouch and Roach Estuaries during the winters of 2004/05 and 2010/11

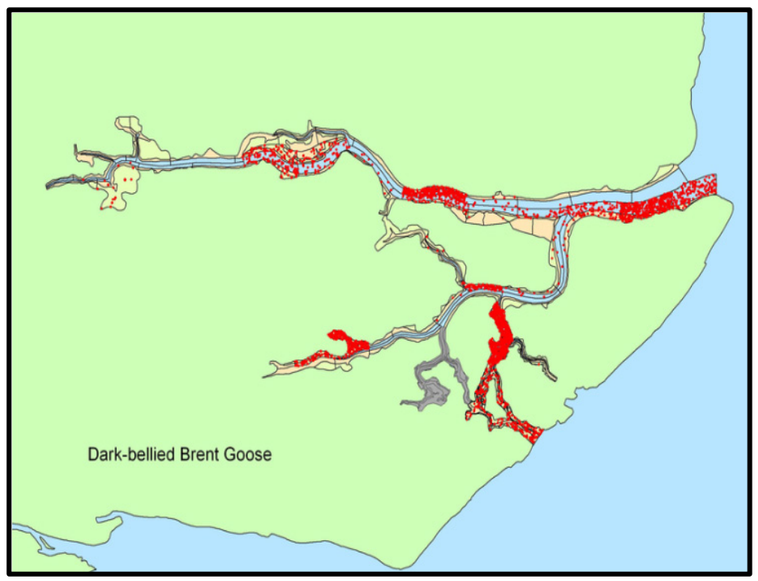
| Species | WeBS Low Tide Peak Count | |
|---|---|---|
| | 2004/05 | 2010/11 |
| Dark-bellied Brent Goose** | 4,635 | 4,075 |
| Shelduck | 1,629 | 745 |
| Teal | 2,981 | 988 |
| Shoveler | 5 | 26 |
| Avocet | 288 | 290 |
| Ringed Plover | 193 | 46 |
| Golden Plover | 4,771 | 2,057 |
| Grey Plover | 306 | 41 |
| Lapwing | 11,288 | 2,748 |
| Dunlin | 3,364 | 403 |
| Black-tailed Godwit | 729 | 175 |
| Green Sandpiper | 2 | 1 |
| Redshank | 3,299 | 1,046 |
| Wigeon | 2,715 | 1,550 |
| Mallard | 181 | 93 |
| Curlew | 498 | 213 |

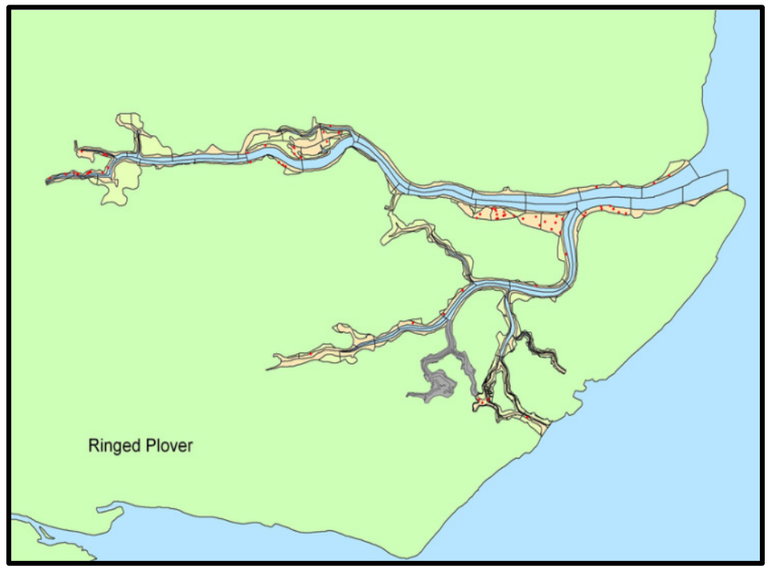
Key: Crouch and Roach Estuaries SPA designated due to supporting:
* Populations of National Importance;
** Populations of International Importance

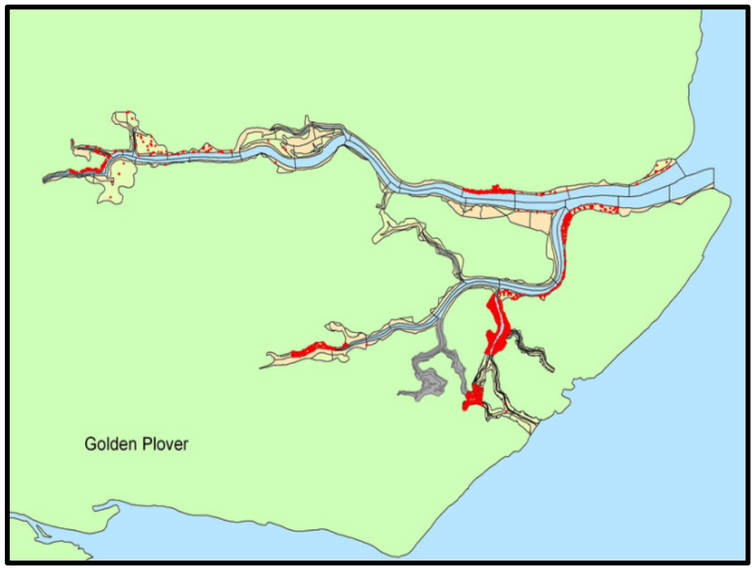
## E.3 WeBS Low Tide Distribution Maps of Waders and Waterfowl Within the Crouch and Roach Estuaries in Winter 2010/11[15]

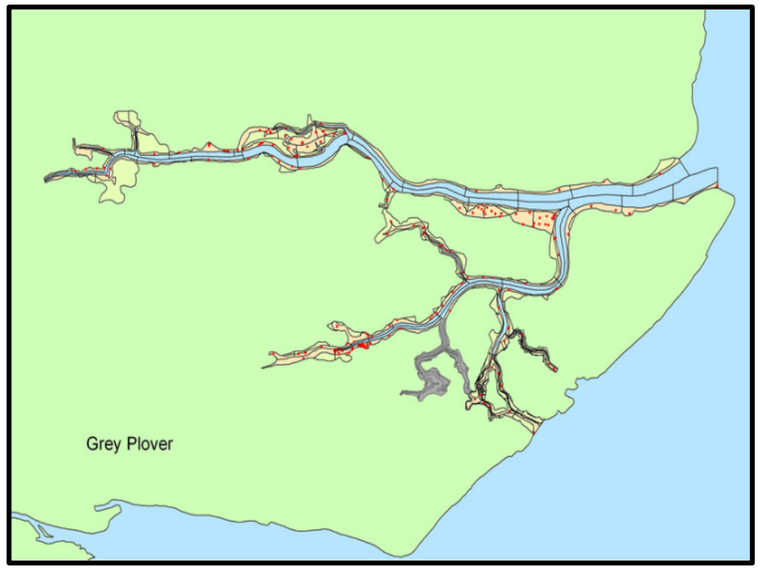


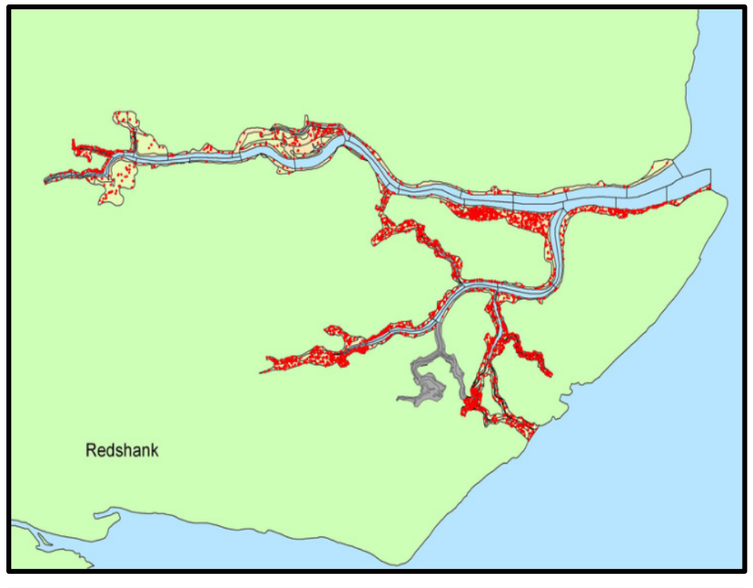



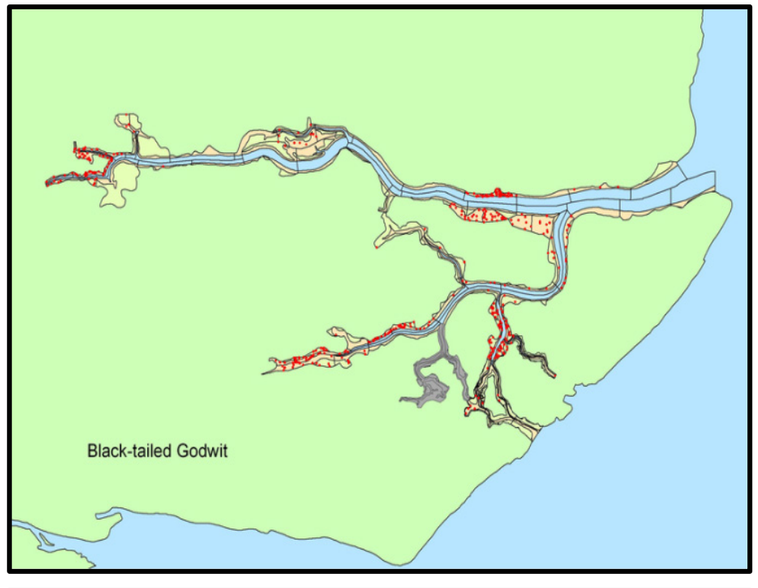



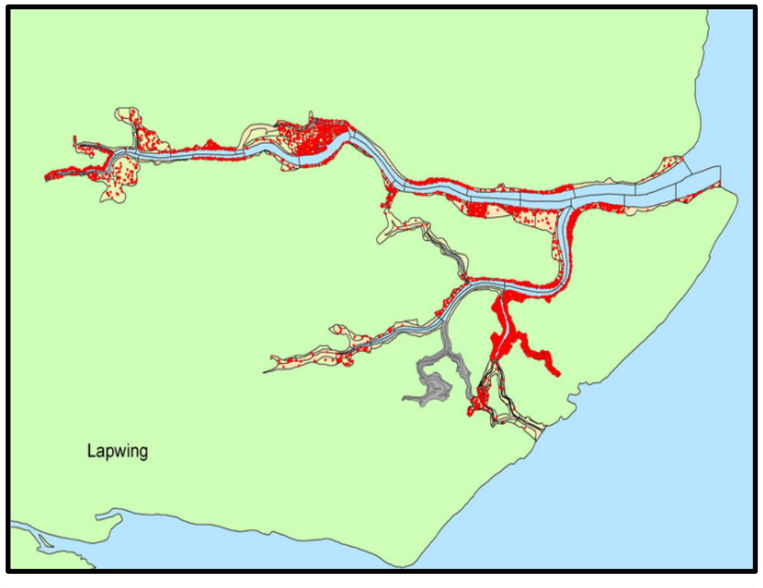



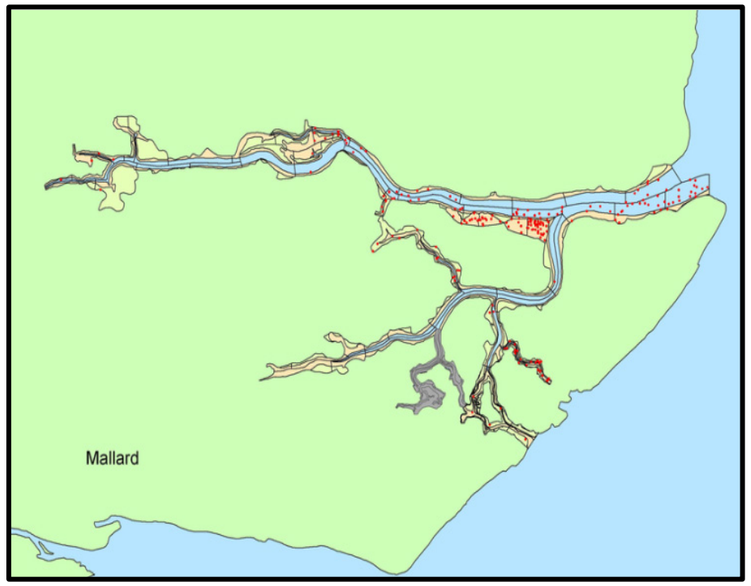



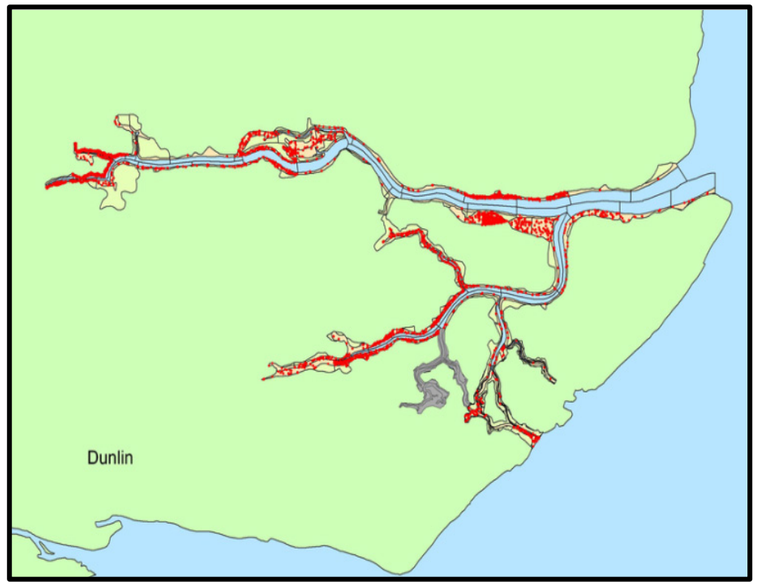

15 N.B. Count areas shaded grey indicate areas where no counts were carried out for the relevant winter.

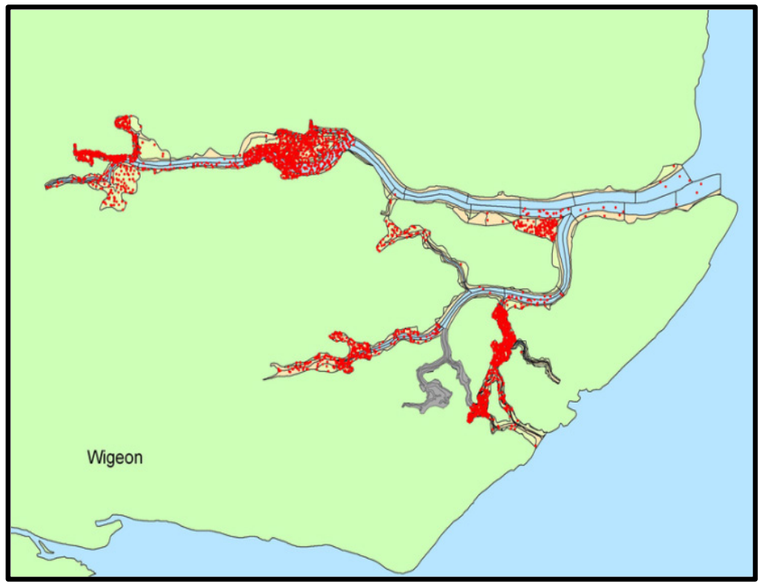

Redshank

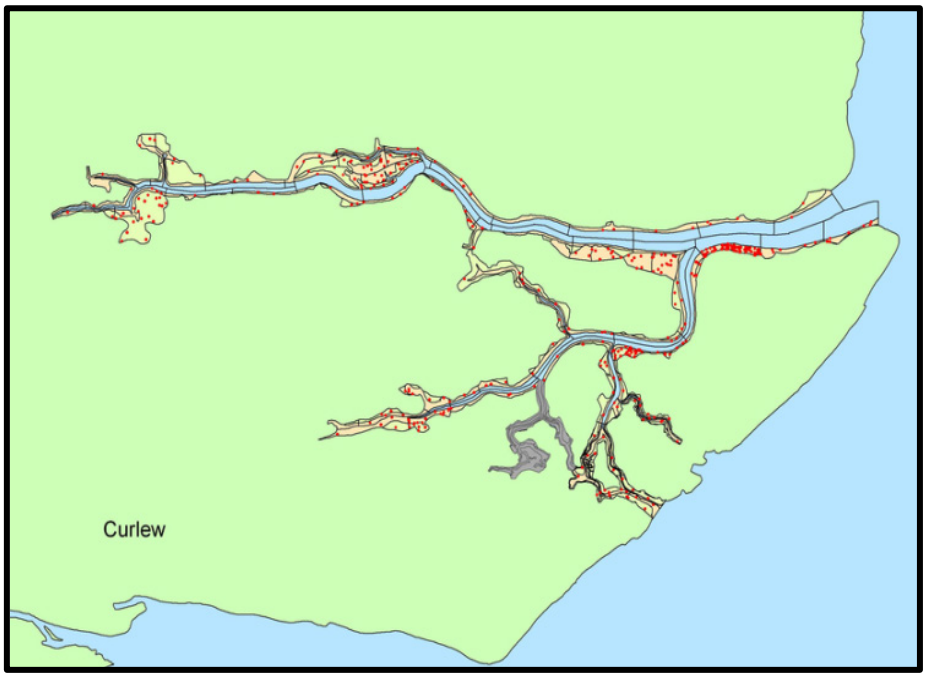

Black-tailed Godwit


Lapwing


Mallard


Dunlin


Wigeon


Curlew

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