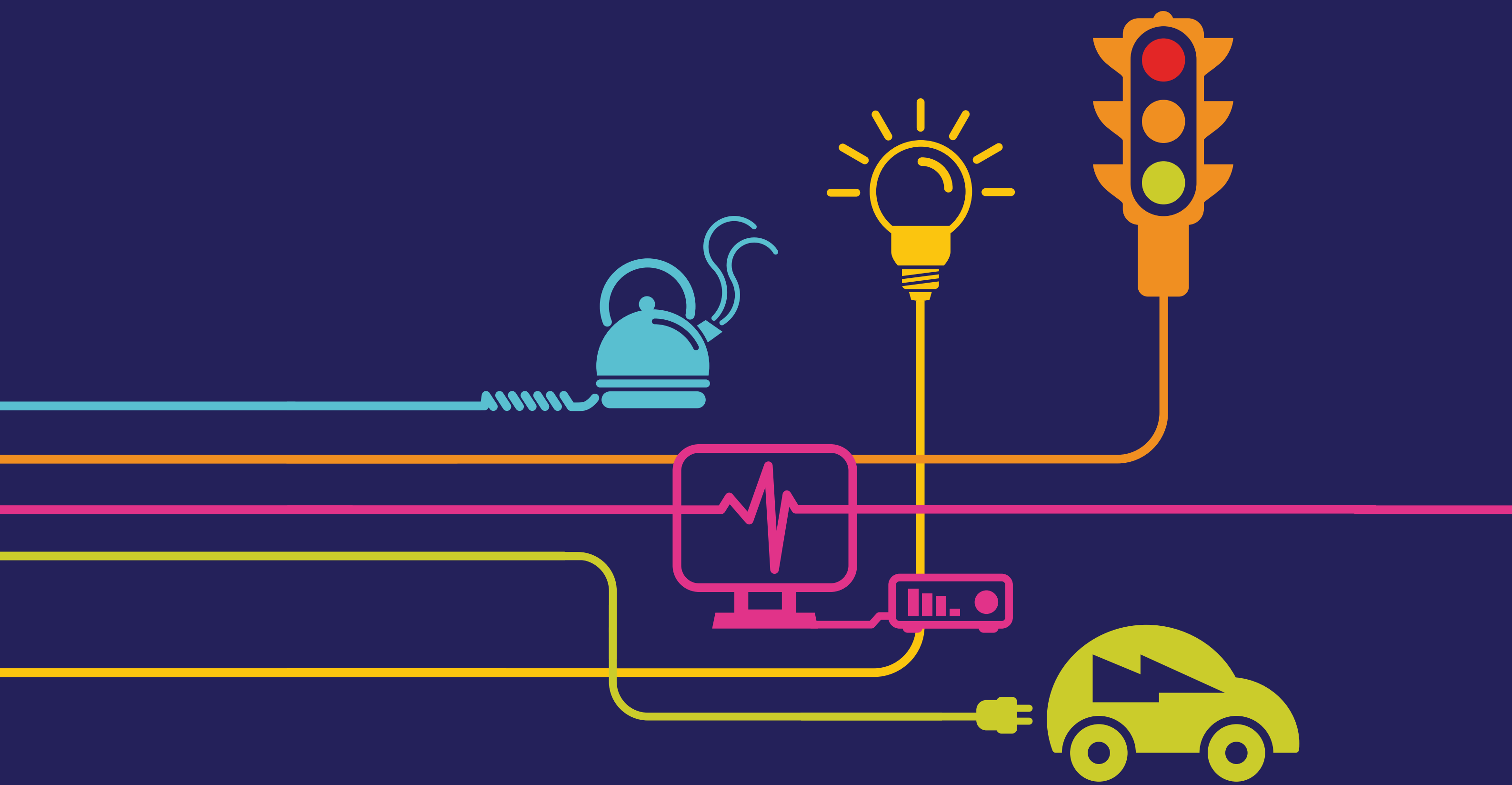
Document 5.8.2.4

nationalgrid

Environmental Statement Biodiversity and Nature Conservation Appendices 8F to 8I

Hinkley Point C Connection Project

Regulation 5(2)(a) of the Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009



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May 2014

Environmental Statement

Hinkley Point C Connection Project

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Appendix 8F – Bird Surveys

PLANNING DESIGN ENVIRONMENT

Hinkley Point C Connection Project
Environmental Statement Volume 5.8.2
Ecology Appendix 8F
Bird Surveys

March 2014

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Version C

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Hinkley Point C Connection Project
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APPENDICES

BIRD SURVEYS

1.0 Introduction

1.1 Project Overview

1.1.1 National Grid Electricity Transmission plc (National Grid) is preparing an application to develop a new 400,000 volt (400kV) connection between Bridgwater, Somerset and Seabank Substation, north of Avonmouth. The Proposed Development is located within the local authority areas of Somerset, West Somerset, Sedgemoor, North Somerset, City of Bristol and South Gloucestershire in the southwest of England.

1.1.2 The Proposed Development is classified as a Nationally Significant Infrastructure Project (NSIP) under Part 3 of the Planning Act 2008. The consenting process requires an application to be submitted for a Development Consent Order (DCO) under Section 37 of the Planning Act 2008; the application will also be in accordance with the Infrastructure Planning (Environmental Impact Assessment) Regulations 2009 (SI 2009/2263) (the 2009 Regulations) and The Infrastructure Planning (Applications: Prescribed Forms and Procedures) Regulations 2009.

1.1.3 The proposed Hinkley Point C Connection project includes the following principal elements:

- Construction of a 400kV transmission connection between Bridgwater and Seabank comprising:
  - Installation of a 400kV overhead line; and
  - Installation of 400kV underground cables.
- Modifications to existing overhead lines at Hinkley Point;
- Construction of three 400kV cable sealing end (CSE) compounds;
- Construction of a 400/132kV substation at Sandford;
- Extension of the existing 400kV substation at Seabank;
- The removal of existing 132kV overhead lines;
- Construction of 132kV overhead lines;
- Construction of 132kV underground cables;
- Extensions/Modifications to existing 132kV substations at Churchill, Portishead, Avonmouth and Seabank;
- Associated works, for example, temporary access roads, highway works, temporary construction compounds, work sites and ancillary works.

1.1.4 These proposals are referred to collectively throughout this report as ‘the Proposed Development’.

1.1.5 The proposed 400kV connection will be between the existing Hinkley Point to Bridgwater overhead line (VQ Route) in Sedgemoor District Council, Somerset (OS Grid Reference 331940, 139657) and the existing 400kV Seabank Substation in the City of Bristol (OS Grid Reference 353640, 182233). The proposed 400kV connection will be approximately 53.5km long (Option A) or 55km long (Option B) and will comprise a 400kV overhead line and 400kV underground cables. The overhead line will comprise three parts; an overhead line between the existing 275kV, VQ Hinkley point to Bridgwater line at Horsey Level and the existing 400kV ZG Hinkley point - Melksham line north of Woolavington; an overhead line between the existing 400kV ZG Hinkley point - Melksham line near to Huntspill and a 400kV CSE compound south of the Mendip Hills; an overhead line between the new substation at Sandford and existing

400kV Seabank substation in Avonmouth. Three CSE compounds are required at the points where the overhead lines and underground cables connect to each other.

1.1.6 As part of the Proposed Development, an existing 132kV overhead line owned and operated by Western Power Distribution (WPD), will be removed. This work consists of the removal of 47.8km of the F Route, between Bridgwater 132kV Substation and Portishead 132kV Substation and 5.4km of the G Route between Portishead and Avonmouth 132kV Substation.

1.1.7 The new 400/132kV Sandford Substation is required to maintain electricity supplies at 132kV to the remaining part of the 132kV network following removal of the F and G overhead lines. A 132kV overhead line supported by steel lattice pylons and underground cable connection is required between the proposed substation and the existing 132kV AT Route overhead line. Part of the existing AT Route will be removed for a distance of approximately 1.1km. A short length of 132kV wooden pole overhead line (approximately 250m) is required between the proposed substation and the existing 132kV N Route overhead line. Part of the existing N Route will be removed for a distance of approximately 400m.

1.1.8 132kV connections are also required between the existing W and Y Route overhead lines and the existing 132/33kV Churchill Substation where minor modifications are required. These connections will consist of a span of overhead line from the W Route and a single circuit 132kV underground cable connected from the Y Route to the substation, by a new CSEPP.

1.1.9 National Grid will construct a new 400kV substation (Shurton Substation) to connect the proposed Hinkley Point C Power Station to the high voltage transmission network. This substation is part of the proposals for which EDF Energy obtained an Order granting Development Consent on 19th March 2013. To connect the proposed Shurton Substation to the transmission network, the existing 400kV overhead lines in the vicinity of the power station complex need to be diverted into the new substation and a new overhead line constructed between the proposed Shurton Substation and the existing Hinkley 400kV Substation (at Hinkley Point B Power Station).

1.1.10 To connect the 400kV circuits into Seabank Substation, National Grid is proposing to extend the existing substation compound and substation building to accommodate additional electrical plant and equipment.

1.1.11 To facilitate construction of the 400kV overhead line across Tickenham Ridge (Section E) a 132kV overhead line owned and operated by WPD (the ‘W Route’) will be removed for approximately 8.7km from south west of Nailsea to Portishead 132kV Substation. This overhead line forms an essential part of the WPD distribution network in North Somerset and will be replaced by approximately 10km of 132kV underground cables. The transition between the existing overhead line and underground cable will be made using a cable sealing end platform pylon (CSEPP) (see Figure 3.1).

1.1.12 Additional removal of 132kV overhead lines and their replacement by underground cables is proposed where the 132kV overhead lines are to be crossed by the proposed 400kV overhead line. This includes a short length of 132kV overhead line known as the ‘BW Route’ at either Portishead in Section F or close to the River Avon (depending upon the 400kV route option taken forward) in Section G; approximately 1.7km of a 132kV overhead line (known as the ‘G Route’) between Avonmouth 132kV Substation and 132kV pylon G31 will be removed and replaced by approximately 2km of undergrounding; and approximately 200m of each of the three 132kV overhead lines (known as the 'G, BW and DA Routes') where they connect on the approach to Seabank Substation. The transition between the existing 132kV overhead lines and underground cables will be made using a CSEPP. Minor modifications are also required at WPD's existing Portishead, Avonmouth and Seabank Substations to accommodate these 132kV connection works.

1.2 Ecological Impact Assessment (EcIA)

1.2.1 The potential effects of the construction, operation and decommissioning of the proposed Hinkley Point C connection on ecological receptors are set out in Chapter 8 of the EcIA.

1.2.2 Ecological receptors are described, including designated wildlife sites, habitats and species. Potential effects of the Proposed Development on these receptors are set out for the construction, operational and decommissioning phases. In line with EU guidance consideration is also given in this chapter to the effects of climate change on biodiversity and accordingly, the ability of each receptor to cope with such effects with the scheme in place. Mitigation measures to prevent, reduce or off-set potential adverse effects are set out, referencing key deliverable documents where appropriate. Ultimately, residual effects are concluded. Chapter 17 considers the potential for cumulative effects arising from other projects.

1.3 Habitats Regulations Assessment (HRA)

1.3.1 Under Article 6(3) of the Habitats Directive, an appropriate assessment is required for a project not directly connected with, nor necessary for the management of European Protected Sites, and which is likely to have a significant effect upon a European site, either alone or in combination with other projects.

1.3.2 Special Protection Areas (SPAs) and Special Areas of Conservation (SAC) are both European Protected Sites receiving protection under the Habitats Directive, which is transposed into UK legislation by the Conservation of Species and Habitats Regulations (2010) (as amended) (commonly referred to as the Habitats Regulations). Ramsar sites are not European Sites as a matter of law, however the UK Government applies the same procedure to Ramsar sites as a matter of policy.

2.0 Approach and Method

2.1 Introduction to Approach and Method

2.1.1 This chapter presents the approach and method followed for this Assessment. This chapter identifies sources of data used including field studies and existing bird records.

2.1.2 The Assessment includes the following components:

- Identifying statutory designated sites present within the wider survey area and the conservation objectives of these sites;
- Preparing a literature review into the environmental effects of overhead lines on birds;
- Reviewing existing sources of historical information concerning the ornithological interest of the study area and the wider locality;
- Undertaking a winter bird survey across the study area to identify field utilisation by birds over four winter seasons (2009 – 2014);
- Undertaking a breeding bird survey across the entire preferred corridor to identify birds breeding during 2012;
- Undertaking additional breeding bird surveys at selected locations associated with substation and Hinkley connection works during 2013;
- Undertaking detailed vantage point surveys within the study area for the period October 2009 to April 2010 to identify bird flight lines;
- Undertaking detailed vantage point surveys within the study area to identify any movement between the Somerset Levels and Moors SPA and the Bridgwater Bay (part of Severn Estuary SPA) (October 2010 to April 2011);
- Undertaking vantage point surveys between Portbury Wharf and Gordano Valley SSSI (November 2013 to March 2014); and
- Analysing bird flight line data for a collision impact assessment.

2.1.3 A number of different terms are used throughout this chapter to describe the areas surveyed and assessed. These terms include:

- Preferred corridor – area of land within which works associated with the Hinkley C Connection project may take place;
- Corridor 2 – one of the proposed corridors used prior to the corridor selection. This corridor has been discontinued.
- Proposed route –proposed 400kV overhead line location.
- Study Area – all land included within bird surveys.

2.1.4 Where any surveyed or assessed areas fall outside of the preferred corridor, these are referred to individually (e.g. Hinkley Point).

2.1.5 These terms are used in the assessment due to the continuous process of corridor selection and subsequent proposed route selection carried out throughout the survey and assessment process. This also reflects the broadness of assessment that is required within the HRA process.

2.2 Statutory Designated Sites

2.2.1 The Special Protection Areas (SPAs) within 10km of the Proposed Development are shown at Figure 8.25. These include the Somerset Levels and Moors SPA and the Severn Estuary SPA. These sites are designated as SPAs under European legislation protecting sites of international ornithological importance. They are also internationally protected under the Ramsar treaty.

2.2.2 SSSIs are notified because of specific biological or geological features. Conservation objectives define the desired state for each site in terms of the features for which they have been designated. When these features are being managed in a way which maintains their nature conservation value, they are said to be in ‘favourable condition’.

2.2.3 The interest features and sub-features for the Somerset Levels and Moors SPA and the Severn Estuary SPA are listed alongside the conservation objectives (see section 3.0).

2.2.4 A Habitat Regulation Assessment must be carried out in light of the conservation objectives. The European Courts have determined that in this context a "significant effect" means an effect likely to undermine a site's conservation objectives. There are no other European sites designated for their bird interest that may be affected by the Hinkley Connection C project.

2.2.5 The potential impacts of the Proposed Development on all protected sites designated for their bird interest are assessed within the EcIA.

2.3 Statutory Bird Protection and Bird Species of Conservation Concern

2.3.1 In the UK, legislation provides general protection under the *Wildlife and Countryside Act 1981* for all wild birds, and prohibits the killing, injuring, taking, or selling, of any wild bird or their nests or eggs.

2.3.2 The *Wildlife and Countryside Act 1981* also lays down special penalties in respect of any of the species of bird listed in Schedule 1 of the act. Under the act, in respect of the Schedule 1 species it is also an offence to:

- Disturb any wild bird listed on Schedule 1 while it is nest building, or near a nest containing eggs or young;
- Disturb the young of such a bird.

2.3.3 In addition to statutory protection, some species have been classified according to their conservation status, including those species listed on Section 41 of the *Natural Environment and Rural Communities Act*, and the red and amber lists of Birds of Conservation Concern (BoCC) in the UK (Gregory *et. al.* 2003). These are defined in greater detail below.

Section 41 Species

2.3.4 The Natural Environment and Rural Communities (NERC) Act came into force on 1st Oct 2006. Under Section 41 (S41) of the Act a list of species which are of principal importance for the conservation of biodiversity in England have been published by the Secretary of State (in consultation with Natural England).

2.3.5 This list of species is used to guide local and regional authorities and other decision-makers in implementing their duty under section 40 of the *Natural Environment and Rural Communities Act 2006* (to have regard to the conservation of biodiversity in England, when carrying out their normal functions).

2.3.6 There are a total of 49 bird species listed under Section 41. These are the species found in England previously identified as requiring action under the UKBAP and which continue to be regarded as conservation priorities under the UK Post-2010 Biodiversity Framework.

UK Birds of Conservation Concern

2.3.7 Red and Amber lists of Birds of Conservation Concern (BoCC) in the UK are set out in Gibbons et al (2002). These lists are compiled by the Royal Society for the Protection of Birds on the basis of the following criteria. The abbreviations are those given in Gibbons et al (2002).

UK red list BoCC

IUCN	Globally Threatened (BirdLife International 2000)
HD	Historical population decline in the UK between 1800 and 1995
BDp	Rapidly declining species: >50% decline in population in UK over the last 25 years
BDr	Rapidly contracting species: >50% decline in range in UK over the last 25 years

UK amber list BoCC

HDrec	Historical population declineduring 1800-1995 but recovering; population size has more than doubled over last 25 years
BDMp	Moderately declining species: declined by 25 – 49% in the UK in numbers in the last 25 years
BDMr	Moderately contracting species: declined by 25 – 49% in the UK in range in the last 25 years
WDMp	Moderately (25 – 49%) decline in the UK non-breeding population in the last 25 years
SPEC 2or3	Species of unfavourable conservation status in Europe
BR	Rare breeder: five-year mean of 1 - 300 breeding pairs in the UK
BL	Localised breeders (>50% of the UK breeding population found in ten or fewer sites), but not BR
WL	Localised non-breeders (>50% of the UK non-breeding population can be found in ten or fewer sites)
BI	Internationally important breeding species: >20% of European breeding population in the UK
WI	Internationally important non-breeding species: >20% of northwest European (wildfowl), East Atlantic Flyway (waders) or European (others) non-breeding populations in the UK

2.3.8 The SPEC categories (Species of European Conservation Concern, as defined by Tucker and Heath (1994) were used as one criterion for the revised red and amber listings. All European bird species have been allocated to one of five categories of conservation concern, although only SPEC 2 or 3 currently appear on UK red and amber lists.

2.3.9 Remaining bird species are placed on the green list of low conservation concern.

2.4 Literature Review of Environmental Effects of Overhead Lines on Birds

2.4.1 The literature review is presented at Appendix A. It has been tailored to concentrate on selected SPA bird species associated with the Somerset Levels and Moors SPA and the Severn Estuary SPA. The literature review addresses the following matters:

- The vulnerability of different bird species to collision with overhead lines;
- Determining avoidance rates for selected bird species of overhead lines;
- Identifying the flight heights for selected bird species during daily foraging flights and migration;
- Assessing to what extent collision impact with overhead lines and other aerial structures can influence individual bird populations;
- Displacement impacts on birds caused by overhead lines and other aerial structures; and
- Impact reduction in relation to overhead lines, including detailed consideration of the benefit of installing flight diverters.

2.4.2 The literature review notes that there is a greater body of evidence on ornithological effects associated with wind farms as compared to effects from overhead lines. Although both types of development involve tall vertical structures, there are differences between wind farms and overhead lines.

2.5 Desktop Study

2.5.1 A detailed desktop study has been undertaken to identify and collate existing historical information concerning the ornithological interest of the study area and the wider locality.

2.5.2 The desktop survey search area was then extended to include all land up to 10km beyond the boundary of the study area. This area is referred to as the ***wider desktop survey area.***

2.5.3 Historical information for the ornithological interest of the Somerset Levels and Moors and the Severn Estuary has also been considered in depth. The desktop survey commenced in September 2009 and consultation with various interest groups has been on-going since then.

2.5.4 Organisations consulted during the desktop survey include:

- Natural England;
- Royal Society for the Protection of Birds (RSPB) – Exeter office;
- Wildfowl and Wetland Trust (WWT)
- Bristol Regional Environmental Records Centre (BRERC);
- Somerset Environmental Records Centre (SERC);
- The British Trust for Ornithology (BTO) – Regional Representative;
- County bird recorders (Somerset);
- Somerset Ornithological Society (www.somersetbirds.net); and
- local birdwatchers with knowledge of the Study Area

2.6 Winter Bird Survey 2009 - 2010

2.6.1 The purpose of this survey was to identify locations in the study area which attract large flocks of waders and/or wildfowl and also to record flight movements of flocks of waders and wildfowl.

2.6.2 The winter bird survey entailed undertaking three survey visits approximately one month apart during the period November 2009 to February 2010. Winter bird surveys were undertaken on 30th November to 1st December 2009; 25th to 26th January 2010; and 22nd to 23rd February 2010.

2.6.3 The winter bird survey focussed on Tealham & Tadham Moors SSSI, Catcott, Edington & Chilton Moors SSSI, Kenn Church, Kenn Pier & Yew Tree Farm SSSI, Biddle Street Yatton SSSI and Puxton Moor SSSI.

2.6.4 The survey used a combination of point counts and walked transect routes during the survey. The survey route made use of many of the roads and adjacent footpaths across these SSSIs to allow the surveyor to view most of the fields within the SSSIs with the exception of some small enclosed fields (<2 hectares). Wader, wildfowl and raptor counts were undertaken from suitable viewpoints. Other bird species such as farmland birds were recorded on an *ad hoc* basis.

2.7 Detailed Vantage Point Surveys 2009 – 2010

2.7.1 The purpose of the vantage point surveys was to identify flight patterns of various species of waders, wildfowl, herons and raptors within the study area for the period 26th October 2009 to 20th April 2010. These species are known from consultation and literature review to be vulnerable to collision with aerial obstructions. This information has been used to determine the collision risk associated with the proposed overhead line. The methodology was agreed with Natural England (Bob Corns, Pers Comm).

Survey Area

2.7.2 The vantage points at which surveyors were positioned during the field survey were determined during an initial walkover visit of the study area on 25th October 2009.

2.7.3 It is known that local and migratory movements of many bird species are influenced by topographic features (e.g. Welty, 1962, In: Faanes, 1987). Prominent topographic features such as rivers and other large watercourses, as well as ridges, may be used as flight corridors – areas that birds tend to move along during local and migratory movements (Thompson, 1978, Faanes, 1987, Bevanger, 1994, APLIC, 2012). Many studies have also highlighted that collision risk with overhead lines is greatly increased where the overhead line is located close to areas used by high concentrations of waterbirds such as roosting or feeding sites (e.g. Faanes, 1987; (Quinn *et al.* 2011).

2.7.4 Vantage point survey locations were therefore strategically positioned to cover sections of corridor crossing major rivers or located between important wildlife sites for birds. The seven vantage point survey locations (Vantage Points - VP1 to VP7) are illustrated at Figure 8.11.

2.7.5 VP3 was originally selected to record birds both within corridor 2 (discontinued) and the preferred corridor. Although VP3 was located outside of the preferred corridor, it was still possible to view bird flight lines within the preferred corridor from this location. Data recorded from VP3 also provides a useful insight into the difference in bird usage between land in the preferred corridor compared with land closer to the Somerset Levels SPA.

Target Species

2.7.6 The target species to be included within this assessment were determined using the October 2009 vantage point surveys, the preliminary findings of the desk survey, consultations with Natural England and the RSPB and the findings of the literature review. Selected wader and wildfowl species of nature conservation importance associated with either the Severn Estuary SPA or Somerset Levels and Moors SPA were identified as being of particular interest.

The Timing of Survey Visits

2.7.7 An average of 47.56 hours of survey were undertaken from each vantage point location between October 2009 and April 2010. The minimum number of hours undertaken from any vantage point was 45 hours for VP 5, whereas the maximum was 48.5 hours from VP 3.

2.7.8 The timing of vantage point visits was stratified to ensure that all parts of the day were covered, with emphasis on the early morning and late evening when birds were most likely to be moving across the study area. Observation periods varied in duration from 2 to 3 hours.

2.7.9 A number of 3-hour nocturnal vantage point surveys were also undertaken at each vantage point location at night time (after dusk but before dawn) with a full moon during the following periods (2 x 3 hours completed at each vantage point location):

- 25th to 26th January 2010
- 22nd to 23rd February 2010
- 23rd to 24th March 2010
- 29th to 31st March 2010

2.7.10 Information recorded by each surveyor included the following:

- Weather during the survey period (recorded at least every hour);
- The time of each observation;
- The bird species and numbers (static birds counted separately);
- The direction of flight and location of the birds relative to the study area;
- The height of the bird/flock recorded in bands, i.e. 0-25m, 25-50m, 50-75m, 75-100m and higher than 100m; and
- The duration in seconds that a bird/flock was recorded flying within each flight band when in the study area.

2.7.11 Attempts were made to undertake survey visits during varying weather conditions and at different states of tide to account for any variation in bird flight activity patterns caused by weather and the state of tide.

Surveyors

2.7.12 The vantage point survey was co-ordinated by TEP's Ornithology Manager Tim Ross, CEnv MCIEEM. Since 2000, Tim has undertaken numerous large-scale collision impact studies for various overhead line and wind farm projects across the UK. All surveyors involved in the vantage point survey were experienced ornithologists with several years' experience in undertaking ornithological surveys.

2.8 Detailed Nocturnal Vantage Point Surveys 2010 – 2011 (Nocturnal)

2.8.1 The aim of the 2010-2011 VP survey was to observe any nocturnal flight activity of wader and wildfowl species associated with the Somerset Levels and Moors SPA and the Severn Estuary SPA within parts of the study area[1] between the Somerset Levels and Bridgwater Bay.

Survey Area

2.8.2 Intensive nocturnal vantage point surveys were undertaken during the full winter period of 2010-2011 focussing on parts of the study area located between the Somerset Levels and the Bridgwater Bay, on the Severn Estuary. These surveys were designed to investigate the possibility that there was a nocturnal movement of waders and/or wildfowl between the Somerset Levels and Moors SPA and the Severn Estuary SPA.

2.8.3 The vantage point survey locations included the following locations:

- VP1 Bawdrip (adjacent to the King's Sedgemoor Drain);
- VP2 Huntspill (adjacent to the Huntspill River).

2.8.4 It was also proposed that two separate vantage point survey locations were undertaken directly west of the Tealham and Tadham Moors and Catcott, Edington and Chilton Moors (parts of the Somerset Levels and Moors SPA). These included the following locations:

- VP3a Chilton Moor (2km to the southwest of VP3);
- VP3b Old Yeo (800m northeast of VP3).

2.8.5 These locations were selected to provide increased coverage of bird flight activity associated with the River Brue and the river known as the Mark Yeo. The locations of vantage points, 3, 3a, 3b, 3c and 3d are illustrated in Figures 8.11 and 8.23.

2.8.6 In December 2010, after the completion of the first two survey visits, it was decided that VP3a Chilton Moor would be discontinued for reasons of Health and Safety brought about due to the isolated nature of the site. In January 2011 two possible replacement vantage point survey locations were trialled including VP3c River Brue (1.3km south west of VP3) and VP3d Crippe River (2.3km south west of VP3). Six hours of vantage point survey were completed at VP3c and VP3d in January 2011. It was decided to continue with VP3d Crippe River due to the greater number of observations of target species recorded at this location.

Survey Timing

2.8.7 The nocturnal survey commenced on 27th October 2010 and continued until 15th April 2011. Single survey visits were undertaken once a month. Vantage point surveys either commenced one hour before dusk or five hours before dawn, each survey visit being six hours in duration. Each survey was partly undertaken by a roving surveyor to ensure that each surveyor took a 30 minute break every three hours.

[1] The study area was defined as the two potential route corridors identified containing broad widths of land within which an overhead line could be routed.

2.8.8 Surveyors used both night vision technology (ATN Nightspirit Gen 2+) and sound recorders to enhance their ability to record nocturnal bird flight activity. Each survey visit included at least two vantage point surveys being undertaken from two different locations at the same time to maximise the chances of recording directions of any long range movements. Radios were used to communicate between surveyors throughout.

2.8.9 Each survey visit was undertaken within four days of a full moon as this helped to ensure that surveyors were able to detect flying birds at distances of between 500m and 1km at night time. Certain wader species are also known to show greater levels of night time activity during a full moon (Gillings & Fuller 1999).

2.8.10 During January and April 2011 surveys were undertaken in two three-hour blocks starting 1.5 hours before dusk and 1.5 hours before dawn. Survey findings throughout the study indicated that the majority of bird movements were occurring at dawn or dusk rather than at night time.

2.8.11 The dates of the surveys undertaken at each location are shown in Table 2.1.

Survey Effort

2.8.12 A minimum of 39 hours of survey observation was undertaken at each vantage point with the exception of VP3d Crippe River, where 30 hours of observation were completed, as this replaced VP3a Chilton Moor in January 2011. Less survey effort was made at the discontinued vantage point locations VP3a (12 hours) and VP3c (6 hours).

Flight Height Bands

2.8.13 During the 2010 – 2011 vantage point survey, the height at which birds flew through the corridor were recorded within a number of height bands. The height bands used were 0-10m, 10-50m, 50-100m, 100-150m and >150m. The height at which bird collision could occur (height from lowest conductor to earth wire) was judged to be 10-50m. This band was therefore called the collision risk zone. At the time of survey the exact specifications of pylons to be used was not yet known, and so it was not possible to differentiate the risk height zone further.

Table 2.1: Dates and locations of vantage point surveys undertaken during 2010-2011.

Total time spent within 1 hour of dusk and dawn is rounded to nearest 15 minutes throughout (0.25 of 1 hour). Tide is classed as “low” where the survey was undertaken within the dusk or dawn period and was within 2 hours of the low tide. Tide is classed as “high” where the survey was undertaken within the dusk or dawn period and was within 2 hours of the high tide.

Vantage Point	Date	Period	Hours Survey	Hours within 1hr of Dawn/Dusk	Dawn/Dusk	Tide	Time of Day
1 -Kings Sedgemoor Drain	27/10/2010	17:40 - 23:40	6	0.25	06:55/ 16:53	Low	Dusk/Night
	22/11/2010	03:00 - 09:00	6	2	07:40/ 16:12	High	Night/Dawn
	06/01/2011	06:25 - 09:25	3	2	08:14/ 16:18	High	Night/Dawn
	06/01/2011	15:35 - 18:35	3	1.75	08:14/ 16:18	Low	Dusk/Night
	21/01/2011	03:15 - 09:15	6	2	08:03/ 16:31	High	Night/Dawn
	16/02/2011	16:30 - 22:30	6	2	07:22/ 17:28	High	Dusk/Night
	16/03/2011	02:00 - 08:00	6	2	06:22/ 18:17	High	Night/Dawn
	13/04/2011	18:45 - 21:45	3	2	06:19/ 20:04	Low	Dusk/Night
	15/04/2011	05:40 - 08:40	3	1.75	06:14/ 20:07	Ebb	Dawn
2 -River Huntspill	27/10/2010	17:45 - 23:45	6	0.25	06:55/ 16:53	Low	Dusk/Night
	22/11/2010	02:50 - 08:50	6	2	07:40/ 16:12	High	Night/Dawn
	06/01/2011	06:35 - 09:35	3	2	08:14/ 16:18	High	Night/Dawn
	06/01/2011	15:35 - 18:35	3	1.75	08:14/ 16:18	Low	Dusk/Night
	21/01/2011	03:15 - 09:15	6	2	08:03/ 16:31	High	Night/Dawn
	16/02/2011	04:45 - 10:45	6	2	07:22/ 17:28	Ebb	Night/Dawn
	16/03/2011	02:00 - 08:00	6	2	06:22/ 18:17	High	Night/Dawn
	13/04/2011	18:50 - 21:50	3	2	06:19/ 20:04	Low	Dusk/Night
	15/04/2011	05:25 - 08:25	3	1.75	06:14/ 20:07	Ebb	Dawn
3a	29/10/2010	01:50 - 07:50	6	1.75	07:08/18:52	Low	Night/Dawn
	22/11/2010	16:05 - 22:05	6	1	07:40/16:12	High	Dusk/Night
3b	29/10/2010	01:50 - 04:50	3	0	07:08/18:52	Low	Night
	29/10/2010	04:50 - 07:50	3	1.75	07:08/18:52	Low	Night/Dawn
	22/11/2010	15:50 - 21:50	6	1.5	07:40/16:12	High	Dusk/Night

Vantage Point	Date	Period	Hours Survey	Hours within 1hr of Dawn/Dusk	Dawn/Dusk	Tide	Time of Day
	05/01/2011	15:30 - 18:30	3	2	08:15/ 16:17	Low	Dusk/Night
	06/01/2011	06:30 - 09:30	3	2	08:14/ 16:18	High	Night/Dawn
	19/01/2011	15:15 - 21:15	6	2	08:05/ 16:37	Flow	Dusk/Night
	18/02/2011	02:30 - 08:30	6	2	07:18/ 17:32	Flow	Night/Dawn
	14/03/2011	17:15 - 23:15	6	2	06:28/ 18:13	Low	Dusk/Night
	14/04/2011	05:30 - 08:30	3	1.75	06:17/ 20:05	Low	Dawn/Day
	14/04/2011	18:45 - 21:45	3	2	06:17/ 20:05	Ebb	Dusk/Night
3c	05/01/2011	15:49 - 18:49	3	1.5	08:15/ 16:17	Low	Dusk/Night
	07/01/2011	06:30 - 09:30	3	2	08:14/ 16:19	High	Night/Dawn
3d	05/01/2011	15:40 - 18:40	3	1.5	08:15/ 16:17	Low	Dusk/Night
	07/01/2011	06:30 - 09:30	3	2	08:14/ 16:19	High	Night/Dawn
	19/01/2011	15:15 - 21:15	6	2	08:05/ 16:37	Flow	Dusk/Night
	18/02/2011	02:20 - 08:20	6	2	07:18/ 17:32	Flow	Night/Dawn
	14/03/2011	17:05 - 23:05	6	2	06:28/ 18:13	Low	Dusk/Night
	14/04/2011	05:30 - 08:30	3	1.75	06:17/ 20:05	Low	Dawn/Day
	14/04/2011	18:30 - 21:30	3	2	06:17/ 20:05	Ebb	Dusk/Night

2.9 Winter Bird Survey 2012

2.9.1 The purpose of this survey was to assess the potential of the land within the corridors to support wintering birds, and to survey birds within areas judged to have high potential to support waders/wildfowl and raptors (species considered most at risk from collision or displacement effects).

2.9.2 These winter bird surveys were carried out at six areas identified as not having previously been subject to wintering bird survey. The assessment areas are shown at Figure 8.11. The six areas are described below:

- Area 1. This area contained land between East Huntspill and Mark, as well as an area of land to the north of Mark, east of Northwick. Included within this area was Huntspill Moor and the River Brue.
- Area 2. This area consisted of land to the east of Rooksbridge and to the west of Biddisham.
- Area 3. This area contained a section of land north of Barton and south of Yarberry. This area included a section of the Lox Yeo river.
- Area 4. This area contained land to the east of Kingston Seymour and west of North End and Yatton. The M5 motorway passes through the western end of this area.
- Area 5. This area includes the north end of the corridor, north of Avonmouth. Area 5 contained mostly farmland, but also contained some industrial land adjacent to the Avonmouth Sewage Treatment Works.
- Area 6. This area contained the Portbury Wharf Local Nature Reserve as well as land to the south adjacent to the M5 motorway and The Portbury Hundred A-road.

2.9.3 The winter bird survey entailed undertaking three survey visits during the period January to March 2012. Winter bird surveys were undertaken on 30th to the 31st January 2012, 27th to the 28th February, 1st March 2012 and the 13th March 2012.

2.9.4 During each winter bird survey visit, a combination of transect routes and point counts were undertaken within each of the six survey areas. Each survey visit was undertaken by two surveyors. Transect routes were then walked along public rights of way and all waders, wildfowl, raptors and groups of other birds of conservation concern were mapped. Point counts were also undertaken from numerous locations throughout the survey area to record any target species.

2.9.5 An additional survey was carried out of 8 field clusters not within Areas 1 to 6, but identified within the Winter Habitat Assessment (see below) as possibly holding moderate to high potential to support waders and wildfowl. This survey visit was carried out by Dr Mike Walker MIEEM on the 1st and 2nd March 2012. The area surveyed is shown on Figure 8.11.

2.9.6 During the course of the winter bird survey nocturnal bird survey visits were undertaken at seven selected locations within Areas 1 to 6 (illustrated on Figure 8.11). These fields had been identified from preliminary findings of the Bird Habitat Assessment as holding potential to support mobile wader species such as lapwing that could move inland to feed at night. Surveyors used both night vision technology (ATN Nightspirit Gen 2+) and sound recorders during a combination of transect route and point count surveys in these locations. All waders, wildfowl and owls were recorded during the survey.

2.9.7 Nocturnal Surveys were undertaken by Tim Ross, Richard Castell and Dr Mike Walker MCIEEM on 27th February and 22nd March 2012.

Winter Habitat Assessment for Birds

2.9.8 During the 2011/2012 survey the habitat within the preferred corridor was assessed for its value for wintering waders and wildfowl. This assessment was based on a combination of analysis of Phase 1 habitat surveys, aerial photography and ground-based assessment in the field.

2.9.9 A range of field characteristics were considered during the assessment including field land use, field size, field openness, field wetness (such as a predominance of rushes or evidence of flooded scrapes) and the presence of permanent water bodies.

2.9.10 The assessment classified each field into one of the following categories for waders/wildfowl:

- **Low potential**: The field/field cluster is largely unsuitable for waders/wildfowl although it may have some limited potential to support small groups of waders/wildfowl (5 individuals or less) on an irregular basis;
- **Moderate potential**: The field/field cluster has features which indicate that it has potential to support moderate numbers of waders/wildfowl (up to 100 waders/wildfowl) on an irregular basis or small numbers of waders/wildfowl on a regular basis; and
- **High potential**: The field/field cluster has features which indicate that it has potential to support moderate or high numbers of wader/wildfowl on a regular basis.

2.10 Breeding Bird Surveys

Breeding Bird Survey 2012

2.10.1 The aim of the 2012 breeding bird survey was to help assess the usage of the preferred corridor by all breeding bird species, focussing on Birds of Conservation Concern (BoCC). The aim of this assessment was to consider the impact of the proposed connection on these bird species, including any displacement effects that may occur.

2.10.2 The survey also included those bird species identified by literature review as being sensitive to collision with overhead lines. These included waders, wildfowl and raptors.

2.10.3 Two breeding bird survey visits were undertaken. The first was undertaken between April and May 2012, and the second between May and the end of June 2012. A team of surveyors were used during each survey visit to maximise survey coverage over a short time period.

2.10.4 The method used was a modified form of both the British Trust for Ornithology's Common Birds Census (CBC) and Breeding Bird Survey (BBS) methods. During each survey visit a transect route was walked throughout the preferred corridor, aiming to pass within 100m of all land within the preferred corridor. The route was walked at a steady pace with stops at regular intervals. All bird activity encountered, including songs, calls, flight lines, feeding, nesting and territorial behaviour was recorded and mapped using standard BTO codes.

2.10.5 Surveys were carried out between half an hour after dawn and mid-day to coincide with peak bird activity. The time of survey and the weather conditions at the time of survey were also recorded during each visit.

2.10.6 The survey was carried out by experienced ornithologists: Dr Mike Walker MCIEEM, Lee Greenhough, Richard Castell MCIEEM, Rebecca Nason and Martin Sutherland.

Breeding Bird Survey 2013

2.10.7 The aim of the 2013 breeding bird survey was to help assess the usage of additional areas not covered by the 2012 breeding bird survey by all breeding bird species, focussing on Birds of Conservation Concern (BoCC). The aim of this assessment was to consider the impact of the proposed connection on these bird species, including any displacement effects that may occur.

2.10.8 The survey also included those bird species identified by literature review as being sensitive to collision with overhead lines. These included waders, wildfowl and raptors.

2.10.9 Two breeding bird survey visits were undertaken. The first was undertaken between April and May 2012, and the second between May and the end of June 2012.

2.10.10 The same methodology as the 2012 breeding bird survey was used. During each survey visit a transect route was walked throughout the preferred corridor, aiming to pass within 100m of all land within the preferred corridor. The route was walked at a steady pace with stops at regular intervals. All bird activity encountered, including songs, calls, flight lines, feeding, nesting, territorial behaviour, was recorded and mapped. Surveys were carried out between half an hour after dawn and mid-day to coincide with peak bird activity.

2.10.11 The survey was carried out by experienced ornithologists: Dr Mike Walker MCIEEM, Lee Greenhough and Chris Swindells.

2.11 Winter Bird Survey 2012 - 2013

2.11.1 The purpose of this survey was to determine usage of the proposed route study area by waders, wildfowl and raptors. Any species listed under Schedule 1 of the *Wildlife and Countryside Act, 1981* were also recorded as well as flocks of any Birds of Conservation Concern species. The route study area included all land within 250m of the proposed route, however any flocks of waders or wildfowl observed outside of this area during the survey were also recorded.

2.11.2 The winter bird survey entailed undertaking seven survey visits approximately one month apart during the period October 2012 to March 2013. Each of these 6 visits was undertaken within 3 hours of high tide to maximise the chances of recording waders and wildfowl within the study area. An additional visit was undertaken at low tide during November 2012 to determine whether any significant variation in site usage by birds was occurring due to tidal influences.

2.11.3 Three winter bird survey visits were also undertaken along the proposed route where it follows the M49 at Avonmouth following an adjustment to the alignment in January 2013.

2.11.4 A combination of point counts and transect routes were used during each survey visit. Each surveyor followed a pre-determined transect route throughout the study area, using a combination of carrying out short watches at key viewpoints throughout the survey area of approximately 10 minutes in duration, and walking public rights-of-way recording all waders, wildfowl and raptors encountered.

2.11.5 Surveys were undertaken by experienced ornithologists: Dr Mike Walker, Tim Ross, Lee Greenhough, Chris Swindells, Rebecca Nason and Colin Davies.

2.12 Winter Bird Survey 2013 - 2014

2.12.1 The purpose of this survey was to determine usage by waders, wildfowl and raptors of an additional section of the proposed route study area at Mark. The location of this section of the proposed route was altered after the 2012-2013 winter bird survey and so had not previously been subjected to a winter bird survey.

2.12.2 The winter bird survey is currently on-going with four survey visits so far completed between the beginning of November 2013 and February 2014. Survey visits were spaced approximately one month apart. Dates of the survey visits so far undertaken include; 13th November 2013, 20th December 2013, 21st January 2014 and the 21st February 2014.

2.12.3 A transect technique was used to walk throughout the land on a pre-determined route, aiming to obtain clear unobstructed views of all land within the survey area (land within 250m of the proposed route). All waders, wildfowl and raptors encountered were recorded as well as any other Bird of Conservation Concern species if in flocks of more than 20 birds, or if considered to be of significant interest.

2.12.4 Surveys were undertaken by experienced ornithologist Chris Swindells.

2.13 Vantage Point Survey 2013 - 2014

2.13.1 The purpose of this survey was to record any flight activity of any target bird species within the Portbury Wharf area within the vicinity of the proposed overhead line. This included whether any movements were recorded over the alternative route where it crosses the Gordano Valley, as well as whether any birds flew inland from the pools at Portbury Wharf potentially crossing either the proposed route or the alternative route.

2.13.2 The vantage point survey is currently on-going, with a total of 24 hours of vantage point survey so far completed during the winter period (November to February). Vantage point surveys were undertaken at various states of tide, with a focus towards recording periods near to high tide as it was considered that this would be the period when movements between the estuary and inland areas were most likely to occur. Vantage point surveys either started half an hour before sunrise or finished half an hour after sunset to cover the time periods when bird movements were most likely to occur.

2.13.3 Flight height bands used during this survey were 0-10m, 10-35m, 35-50m, 50-100m and 100+m. Detailed weather conditions were recorded during each survey visit. These more exact flight height bands were used during these surveys as the likely pylon specifications were known by this stage.

2.13.4 Surveys were undertaken by experienced ornithologist Chris Swindells.

2.14 Additional Bird Surveys at Hinkley Point

2.14.1 Bird surveys have been carried out by Entec to support the planning application for the EDF Hinkley Point C power station since 2006. These surveys also covered the area of proposed works associated with the proposed modifications to the overhead lines at Hinkley Point.

2.14.2 Four breeding bird survey visits were undertaken between April and July 2007 following CBC methodology. These surveys covered all land within at least 500m of the proposed Hinkley Point C Connection works at Hinkley Point.

2.14.3 To determine the usage of coastal fields by birds (particularly bird species listed as part of the qualifying interest of the Severn Estuary SPA/Ramsar) within the vicinity of the proposed Hinkley Point C power station, walkover surveys were undertaken during daylight hours covering all land within at least 500m of the proposed Hinkley Point C Connection works at Hinkley Point. Details of the species seen, their numbers and activity (e.g. foraging, loafing, roosting, etc) was recorded during each visit.The habitat and crop types in each of the fields in which birds were seen were also recorded on each visit in order to identify bird / habitat associations. Field surveys commenced in September 2007, and from October 2007 onwards four visits per month were carried out until March 2009.

2.14.4 To establish whether there was any nocturnal use of coastal fields during the winter period (December to February), particularly in the Wick Moor area (part of Severn Estuary SPA/Ramsar) a nocturnal winter bird survey was undertaken. The nocturnal visits were generally carried out within a week of full moon, using a combination of transect and point count techniques. Surveys were conducted on a twice-monthly basis between December 2007 and May 2008 and between August 2008 and March 2009 inclusive.

2.15 Radar Studies

2.15.1 Additional information on bird movements in the study area is available from three radar studies undertaken for Natural England and for two proposed windfarm sites.

Natural England Radar Survey – 2009

2.15.2 A pilot radar survey was commissioned by Natural England in 2009, in order to study the movements of birds within and between the Somerset Levels and Moors and the Severn Estuary. A Bird Detection Radar was deployed at three locations (Shapwick Heath Reserve, King Sedgemoor and Steart) for a period of seven days during February 2009. The surveys were undertaken during a period of very cold winter weather and therefore the results may not be reflective of typical movements of birds between sites.

Black Ditch and Withy End Wind Farm Radar Surveys

2.15.3 Two radar studies have been undertaken since 2010 to assess potential impacts of two proposed wind farm sites (Black Ditch Wind Farm and Withy End Wind Farm) between the Somerset Levels and Moors SPA/Ramsar and the Severn Estuary SPA/Ramsar.

2.15.4 The Black Ditch radar study was undertaken during January 2011. The bird detection radar system was operated continuously near the proposed Black Ditch Wind Farm site for 108 hours from 20:00 on Monday 24 January to 11:59 on Saturday 29th January. The radar system was located near to the River Huntspill at ST 342 436 and collected bird movement data over a range of four nautical miles. Parts of the Somerset Levels and Moors SPA and the Severn Estuary SPA were covered by the horizontal beam, as well as the proposed wind farm site.

2.15.5 The radar was supported by two field observers who investigated bird activity detected by the radar. They recorded species observed, as well as date, time and flight direction. The field observers made observations from both the radar location itself as well as from various other sites. It is not known for what proportion of the radar operational time field observers were present.

2.15.6 The Withy End radar study was undertaken by the same company (FERA) as the Black Ditch wind farm radar study, and used the same methods and radar location.

2.15.7 The Withy End radar study was undertaken between the 29 January and 2 February 2011, following the Black Ditch Wind Farm study. During the radar study temperatures dropped leading to the freezing of water bodies within the Somerset Levels and Moors SPA. Towards the end of this radar study the conditions warmed up and the water bodies thawed. This radar study commenced 8 days after the nearest January vantage point survey visit undertaken for the Hinkley Point C Connection Project.

2.15.8 A radar study was also undertaken for Natural England during 2010, however this study was carried out during a period of wintery conditions including snow fall, and accurate analysis could not be carried out due to ‘clutter’.

Additional Radar Analysis 2013

2.15.9 Analysis of flight speed data was undertaken by the authors of the radar study during December 2013 for a 48 hour period of all of the data to try and determine what species were involved in the flights associated with the radar tracks recorded.

2.15.10 Parameters such as the size and shape of the target, the strength of the radar echo and the speed of movement superficially suggest that it might be possible to use statistical processes to determine species with a specified level of accuracy, but in reality this is far from simple. For example, the cross-sectional area of a goose flying towards the radar might be very similar to that of a mallard flying perpendicular to the radar beam and both could return a similar signal strength as a result. The apparent shape of a target varies in the same way and is further complicated by the position of the wing in flight. The speed of flight of a bird is measured as speed over the ground by the radar, but this takes no account of the true air speed which will be influenced by wind speed aloft (e.g. a bird flying at 20m/s into a 10m/s headwind will have a measured speed of 10m/s and could thus be miss-classified if the wind speed is not known).

2.16 Assessment of In-Combination Effects

2.16.1 An ‘in-combination’ assessment is required as part of the HRA process where a project may have an effect on a European site.

2.16.2 Plans that were considered included:

- Projects started but not yet completed;
- Projects with consent but not yet started;
- Projects subject to ongoing review;
- Applications lodged but not yet determined;
- Refusals subject to appeal;

- Known projects that do not need consent;
- Proposals in adopted plans;
- Proposals in draft plans formerly published for consultation;
- Allocations or other forms of proposals in adopted development plans; and
- Allocations or other forms of proposals in draft development plans which have been published for consultation purposes.

2.16.3 The HRA will assess whether a likely significant effect and an adverse effect on the integrity of a designated site/interest feature could arise if the effects of the Proposed Development are considered in combination with the effects determined for other plans or projects.

2.16.4 It is not necessary to consider plans/projects where it has either been concluded that they will not have any effect on the site, or if necessary mitigation measures have been put in place to completely remove the likelihood of any effects.

2.16.5 The in-combination assessment included any other plans or projects where the following applied:

- *"It has been concluded that the other plan or project may affect the site, but the effects are not significant on their own;" and*
- *"It has been concluded that the other plan or project may have a significant effect alone and where measures have consequently been included to reduce the effect to a level where it is no longer considered to be significant where the plan or project is considered alone, but where the measure applied will not remove the effect completely".*

2.16.6 The geographical search area for other plans or projects to be included within the assessment of in-combination effects was selected based on the following criteria:

- All land within 5km of the preferred corridor including Hinkley Point overhead line entries and ;
- All land within 10km of the Somerset Levels and Moors SPA/Ramsar, Severn Estuary SPA/Ramsar/SAC; and
- All land between the Somerset Levels and Moors SPA/Ramsar and the Severn Estuary SPA/Ramsar/SAC.

2.16.7 Certain areas of land were excluded from the search area. These excluded town and cities. However, any land within these urban areas found to hold potential for wintering waders/wildfowl based on desk based information (WeBS count areas/wildlife sites etc.) was included plus a 500m buffer.

2.17 Assessment of Cumulative Effects

2.17.1 Full details of the method for assessing cumulative effects is detailed in Chapter 17 of the Environmental Statement.

2.17.2 The method for the assessment of potential cumulative effects took into account the following:

- Scoping Opinion representations;
- Infrastructure Planning (Environmental Impact Assessment) Regulations 2009 (as amended);

- Guidelines for Environmental Impact Assessment (2004);
- Guidelines for the Assessment of Indirect and Cumulative Impacts as well as Impact Interactions' (1999); and
- Planning Inspectorate: Advice Note 9 – Rochdale Envelope (PINS Advice Note 9)

2.17.3 As identified in PINS Advice Note 9, other major development was identified as follows:

- in the relevant Development Plan (and emerging Development Plans - with appropriate weight being given as they move closer to adoption) recognising that much information on any relevant proposals will be limited; and
- in other plans and programmes (as appropriate) which set the framework for future development consents/approvals, where such development is reasonably likely to come forward.

2.17.4 The method considered proposals within development plans and other plans and programmes which are considered likely to proceed to construction and completion. The method therefore considers the following:

- relevant proposals for which a planning application has been made and is still valid (pending decision);
- relevant proposals for which there is an extant planning permission;
- relevant proposals which have been refused planning permission and are currently subject to appeal; and
- relevant proposals for which there is a valid EIA screening or scoping opinion.

2.17.5 Proposals within development plans and other plans and programmes outside of the categories detailed in the paragraph above were not considered, as there is no guarantee that they will come forward in the projected time period, particularly in light of the current economic climate. In addition if no planning application has come forward in respect of a specific proposal, it is very difficult to obtain information on the following:

- timing of the proposed development for both the construction and operation phases;
- detailed design of the development; and
- likely environmental effects that would occur as a result of the proposed development.

2.17.6 To inform the assessment of potential cumulative effects, the geographical extent (using the S42/47 Order Limits) of the Proposed Development has been mapped using Geographical Information Systems (GIS). From this, the maximum geographical extent outside of the Proposed Development Order Limits has been identified for each EIA topic area where it is considered there is the potential for receptors within that geographical extent to experience inter-project cumulative effects. These geographical extents are known as the Zones of Interaction (ZoI).

2.17.7 The general ZoI around the Proposed Development has been identified as 10km (taken from the outer edge of the Proposed Development) for ornithological interactions.

3.0 Designated Sites

3.1 Identifying Qualifying Species for the European Sites

3.1.1 In order to identify all of the qualifying species associated with each European site it is necessary to refer to the following documents:

- The original notifications prepared in 1992;
- The Natura 2000 Standard Data Form;
- The 2001 SPA review; and
- The current conservation objectives.

3.1.2 The original notifications for the Somerset Levels and Moors SPA and Severn Estuary SPA were published in 1992.

3.1.3 Further information for each SPA site was submitted to the European Commission by JNCC using Natura 2000 Data Forms.

3.1.4 Following this, in 2001, a complete review of all SPAs was undertaken by JNCC, Natural England and the other statutory consultees for nature conservation. The 2001 SPA review took account of more recent bird monitoring data for each SPA. SPA descriptions were prepared for each individual SPA which identify a number of additional species not included on the original notification or the Natura 2000 Data Forms. These amendments published in the SPA review have not yet been issued to the EU.

3.1.5 Although Ramsar sites are not technically European sites, in order to ensure compliance with the Ramsar Convention, the government expects all competent authorities to treat these sites as though they are designated European sites. The following RAMSAR sites will therefore also be considered within the HRA:

- Somerset Levels and Moors Ramsar; and
- Severn Estuary Ramsar.

3.2 The Somerset Levels and Moors SPA

3.2.1 The Somerset Levels and Moors are one of the largest areas of traditionally managed wet grassland and fen habitats in lowland UK. The SPA covers 35,000 ha in the floodplains of the Rivers Axe, Brue, Parrett, Tone and their tributaries. The whole site is just above sea level and drains via an array of ditches, drains and rivers. Flooding can occasionally affect large areas during the winter depending on rainfall and tidal conditions. The site attracts important numbers of waterbirds (swans, ducks and waders) in winter.

3.2.2 SPAs are selected and legally classified for all species listed in Annex I of the Birds Directive (Article 4.1), as well as for regular migratory species (Article 4.2). Details of all of the qualifying species for the Somerset Levels and Moors SPA are presented in Table 3.1.

Table 3.1 Qualifying Species for the Somerset Levels and Moors SPA

Qualifying Species	% of GB/International Population*	WeBS 5-Year Peak Mean (07/08-11/12)**	International / GB Population Thresholds***
Article 4.1 Qualification - Overwinter			
Bewick's swan	191 indiv. = 2.7% GB population, 1991/92-1995/96	-	International Threshold is 220.
Golden plover	3,029 indiv. = 1.2% GB population, 1991/92-1995/96	11,856	International Threshold is 9,300.
Article 4.2 Qualification - Wintering			
Teal	13,307 indiv. = 3.3% GB population, 1991/92-1995/96	22,210	International Threshold is 5,000.
Lapwing	36,316 indiv. =0.5% of the population, 1991/92-1995/96	39,766	International Threshold is 20,000.
Additional Qualifying Features Identified by the 2001 UK SPA Review			
Shoveler	501 indiv. = 1.3% GB population, 1991/92-1995/96	907	International Threshold is 400.
Wigeon	13,661 indiv. = 1.1% GB population, 1991/92-1995/96	28,513	International Threshold is 15,000.

Source: Natura 2000 Standard Data Form & 2001 SPA review (www.jncc.gov.uk), **Source: (Holt *et al.,* 2012) WeBS = The Wetland Bird Survey, ***Thresholds represent 1% of the International/GB population. Source: (Austin *et al.*, 2014). - : information not available.

Explanatory Note: Column 2 of Table 3.1 confirms the five-year peak mean population size for qualifying features for Somerset Levels and Moors SPA. In most cases the qualifying feature qualified on account of this five-year peak mean which is also given as a % of the total GB population. Column 3 provides the most up-to-date five-year peak mean for each qualifying feature providing an indication of whether the population has increased or decreased. Column 4 indicates the current International/GB threshold for each qualifying feature. The GB threshold is equivalent to 1% of the total GB population.

3.2.3 Under Article 4.2 Qualification, the Somerset Levels and Moors SPA regularly supports an overwintering population of 72,874 waterfowl (5-year peak mean 1991/2-1995/6). Contributing bird species include Bewick's swan, wigeon, gadwall, teal, pintail, shoveler, snipe, lapwing, golden plover and whimbrel.

3.3 Conservation Objectives for Somerset Levels and Moors SPA

3.3.1 With regard to the individual species and/or assemblage of species for which the site has been classified (listed above);

- Avoid the deterioration of the habitats of the qualifying features, and the significant disturbance of the qualifying features, ensuring the integrity of the site is maintained and the site makes a full contribution to achieving the aims of the Birds Directive.

3.3.2 Subject to natural change, to maintain or restore:

- The extent and distribution of the habitats of the qualifying features;
- The structure and function of the habitats of the qualifying features;
- The supporting processes on which the habitats of the qualifying features rely;
- The populations of the qualifying features; and
- The distribution of the qualifying species within the site.

3.3.3 The Somerset Levels SPA is made up of a number of SSSIs. The closest of these individual components of the SPA to the proposed route are the Catcott, Edington and Chilton Moors SSSI, Tealham and Tadham Moors SSSI, Shapwick Heath SSSI, Moorlinch SSSI and King's Sedgemoor SSSI. Details regarding the individual component SSSI's is provided below to give increased detail on the make up of the overall Somerset Levels SPA bird assemblage.

Catcott, Edington and Chilton Moors SSSI

3.3.4 The Catcott, Edington and Chilton Moors SSSI is 6km southeast of Highbridge and just over 6km northeast of Bridgwater. The closest part of this SSSI lies 2km east of the preferred corridor (see Figure 8.25).

3.3.5 The Catcott, Edington and Chilton Moors form part of the extensive grazing marsh and ditch systems which make up the Somerset Levels and Moors SPA. The land lies in the basin of the River Brue. The Huntspill River also flows from this area out via the Huntspill NNR to the Bridgwater Bay.

3.3.6 The diverse habitats provide suitable feeding and nesting grounds for a wide range of birds. According to its citation sheet the Catcott, Edington and Chilton Moors SSSI supports the following bird species:

- In winter waterfowl feed on the grasslands: golden plover, lapwing, snipe and dunlin;
- Whilst under flood conditions waterfowl move onto the moors: teal, wigeon and mallard;
- The pastures remain moist in the spring and early summer when they support breeding snipe, lapwing, curlew and a few pairs of redshank, yellow wagtail and whinchat; and
- In the spring this area provides an important feeding ground for whimbrel.

Tealham and Tadham Moors SSSI

3.3.7 The Tealham and Tadham Moors SSSI is 7km east of Highbridge. The closest part of this SSSI lies 3km east of the preferred corridor (see Figure 8.25).

3.3.8 The Tealham and Tadham Moors form part of the extensive grazing marsh and ditch systems which make up the Somerset Levels and Moors SPA. The land lies in the basin of the River Brue.

3.3.9 According to its citation sheet the Tealham and Tadham Moors SSSI supports the following bird species:

- Large numbers of waterfowl feed on the wet grasslands: golden plover, lapwing, snipe and dunlin;
- Under flood conditions waterfowl move onto the moor: Bewick's swan, wigeon and teal;
- The pastures remain moist in the spring and early summer supporting breeding waders: snipe, lapwing, curlew and redshank;
- Good numbers of yellow wagtail and whinchat breed on the fringes of the moor; and
- In the spring this area provides an important feeding ground for whimbrel.

3.3.10 Specific bird species or assemblages for which the Tealham and Tadham Moors SSSI are designated include the overall breeding assemblage and wintering teal, golden plover, lapwing, snipe, Bewick's swan, gadwall, wigeon and shoveler.

Shapwick Heath SSSI

3.3.11 The Shapwick Heath SSSI is 8km northeast of Bridgwater. The closest part of this SSSI lies just less than 6km east of the preferred corridor (see Figure 8.25).

3.3.12 Shapwick Heath SSSI forms part of the Somerset Levels and Moors SPA. The land lies in the basin of the River Brue and includes the last remnant of active raised bog on the Somerset Levels and Moors.

3.3.13 According to its citation sheet the Shapwick Heath SSSI supports the following bird species:

- At least 64 breeding bird species including lapwing, snipe, in the wet fields and grasshopper warbler and nightingale in scrubby areas, and water rail and reed warblers in flooded old peat cuttings; and
- The site also supports a large starling roost during the winter and is an important feeding site for hobby during the spring (not in SSSI citation).

3.3.14 Specific bird species or assemblages for which the Shapwick Heath SSSI are designated include the overall breeding assemblage and wintering teal, golden plover, lapwing, snipe, Bewick's swan, gadwall, wigeon and shoveler. Additional species for which the SSSI is designated include marsh harrier, hen harrier, bittern, merlin, peregrine and short-eared owl.

Moorlinch SSSI

3.3.15 The Moorlinch SSSI is 6km east of Bridgwater. Parts of the SSSI lie at least 6km to the east of the preferred corridor (see Figure 8.25).

3.3.16 Moorlinch SSSI forms part of the Somerset levels and Moors SPA. The land lies in the basin of the River Parrett and includes the last remnant of active raised bog on the Somerset Levels and Moors.

3.3.17 The high water table on Moorlinch makes the area attractive to wintering wading birds and waterfowl.

3.3.18 According to its citation sheet, the Moorlinch SSSI supports the following bird species:

- Large flocks of waders feeding on wet grasslands: lapwing, snipe and golden plover; and
- Waterfowl using flooded areas throughout the winter: Bewick's swans, mute swan, mallard and teal; and
- Specific bird species or assemblages for which the Moorlinch SSSI are designated include the overall breeding assemblage and wintering teal, golden plover, lapwing, snipe, whimbrel, Bewick's swan, gadwall, wigeon and shoveler.

King's Sedgemoor SSSI

3.3.19 The King's Sedgemoor SSSI is approximately 6km east of Bridgwater immediately south of Moorlinch SSSI. Parts of the SSSI lie at least 6km southeast of the preferred corridor (see Figure 8.25).

3.3.20 King's Sedgemoor SSSI forms part of the Somerset Levels and Moors SPA.

3.3.21 According to its citation sheet the King's Sedgemoor SSSI supports the following bird species:

- Large flocks of waders feeding on wet grasslands: lapwing, golden plover and dunlin;
- Smaller numbers of snipe, redshank, green sandpiper and jack snipe;
- Large flocks of wildfowl in the late winter: teal and mallard;
- Herds of mute swan and smaller numbers of Bewick's swan; and
- In the spring this area provides the most important feeding ground for whimbrel in the Levels.

3.3.22 Specific bird species or assemblages for which the King's Sedgemoor SSSI are designated include the overall breeding assemblage and wintering teal, golden plover, lapwing, snipe, jack snipe, green sandpiper, Bewick's swan, dunlin, gadwall, mallard, wigeon and shoveler.

North Moor SSSI

3.3.23 The North Moor SSSI is approximately 10km south east of the proposed overhead line proposed route at its closest point. This SSSI is located approximately 7km south east of Bridgwater. (see Figure 8.25).

3.3.24 North Moor SSSI forms part of the Somerset Levels and Moors SPA.

3.3.25 According to its citation sheet the North Moor SSSI supports the following bird species:

- Breeding lapwing, whinchat, snipe, curlew, redshank and yellow wagtail;
- The site harbours large flocks of lapwing, snipe, dunlin and golden plover during the winter. The site also supports smaller numbers of teal and mallard; and
- Flocks of fieldfare and redwing also visit the area.

Westhay Heath SSSI

3.3.26 The Westhay Heath SSSI is approximately 6.5km east of the proposed overhead line proposed route at its closest point. This SSSI is located approximately 1.5km north east of Edington (see Figure 8.25).

3.3.27 Westhay Heath SSSI forms part of the Somerset Levels and Moors SPA.

3.3.28 According to its citation sheet the Westhay Heath SSSI supports the following bird species:

3.3.29 The fen habitat supports breeding populations of at least 16 species, including little grebe, Cetti's warbler, whinchat, water rail, mute swan, reed warbler, sedge warbler and teal.

- It is the only breeding site for marsh harrier in Somerset;
- Barn owl, kingfisher, buzzard and grey heron regularly frequent the area;
- Bittern, bearded tit and Cetti's warbler regularly overwinter within the SSSI; and
- Hobby is a frequent summer visitor to this site.

Westhay Moor SSSI

3.3.30 The Westhay Moor SSSI is located approximately 9km east of the proposed overhead line proposed route at its closest point. This SSSI is located approximately 1.5km north of Meare (see Figure 8.25).

3.3.31 Westhay Moor SSSI forms part of the Somerset Levels and Moors SPA.

3.3.32 According to its citation sheet the Westhay Moor SSSI supports the following bird species:

- At least 39 breeding bird species, including lapwing, snipe, redshank, yellow wagtail, nightingale and little owl; and
- Flooded peat workings attract breeding and wintering wildfowl including little grebe and water rail.

The Somerset Levels and Moors Ramsar

3.3.33 The Somerset Levels and Moors Ramsar site covers the same geographical area as the SPA, however the Ramsar is also designated for a range of features other than birds including invertebrates. Details of all of the qualifying species for the Somerset Levels and Moors Ramsar are presented in Table 3.2.

Table 3.2 Qualifying Species for the Somerset Levels and Moors Ramsar

Qualifying Species	**% of GB/International Population***	**WeBS 5-Year Peak Mean (07/08-11/12)****	**International / GB Population Thresholds*****
RAMSAR Criterion 2 – Supports 17 Species of British Red Data Book Invertebrates			
RAMSAR Criterion 5 – Assemblages of International Importance –Species with Peak Counts in Winter			
Waterfowl	97155 -1998/99-2002/03		
RAMSAR Criterion 6 – Species/Populations Occurring at Levels of International Importance – Species with Peak Counts in Winter			
Bewick's swan (*Cygnus columbianus*)	112 indiv. = 1.3% GB population, 1998/99-2002/03	-	International threshold is 220.
Teal (*Anas crecca*)	21,231 indiv. = 5.3% GB population, 1998/99-2002/03	22,210	International threshold is 5,000.
Lapwing (*Vanellus vanellus*)	36,580 indiv. =1% of the population, 1998/99-2002/03	39,766	International threshold is 20,000.
Species/Populations Identified Subsequent to Designation for Possible Future Consideration under Criterion 6 – Species with Peak Counts in Winter			
Shoveler *(Anas clypeata)*	1094 indiv. = 2.7% GB population, 1998/99-2002/03	907	International threshold is 400.
Wigeon (*Anas Penelope*)	25759 indiv. = 1.7% GB population, 1998/99-2002/03	28,513	International threshold is 15,000.
Pintail *(Anas acuta)*	927 individuals = 1.5% GB population, 1998/99 – 2002/03	530	International threshold is 600
Mute swan *(Cygnus olor)*	842 individuals = 2.2% GB population 1998/99 – 2002/03	1,110	320

*Source: Natura 2000 Summary review sheets (www.jncc.gov.uk), **Source: (Austin *et al.,* 2014), ***Thresholds represent 1% of the International / GB population. Source: (Austin *et al.,* 2014). - = information not available from WeBS.

3.3.34 A number of wintering bird species are also classed as 'noteworthy' within this Ramsar including gadwall, water rail, golden plover, ruff and snipe. These species currently occur at levels of national importance within the Ramsar.

The Severn Estuary SPA

3.3.35 The Severn Estuary is a large estuary comprising extensive mud-flats and sand-flats, rocky areas and islands. Saltmarsh fringes the coast backed by grazing marsh with freshwater ditches and some brackish ditches. The Severn Estuary's unique funnel shape gives it the second highest tidal range in the world. The invertebrate community includes high densities of ragworms, lugworms and other invertebrates, providing an important food source for passage and wintering waders.

3.3.36 The Severn Estuary SPA is of importance during the spring and autumn migration periods for waders moving along the west coast of Britain, as well as in winter for large numbers of waterbirds including swans, ducks and waders.

3.3.37 Details of bird species which are Qualifying Features for the Severn Estuary SPA are listed in Table 3.3.

Table 3.3 Qualifying Species for the Severn Estuary SPA

Qualifying Species	**% of GB/International Population***	**WeBS 5-Year Peak Mean (07/08-11/12)****	**International / GB Population Thresholds*****
Article 4.1 Qualification – Overwinter			
Bewick's swan	280 indiv. = 4.0% GB population, 1991/92-1995/96	245	International threshold is 220.
Article 4.2 Qualification – Overwinter			
Dunlin (*Calidris alpina alpina*)	44,624 indiv. = 3.3% population, 1991/92-1995/96	27,515	International threshold is 13,300.
Shelduck (*Tadorna tadorna*)	3,330 indiv. = 1.1% population, 1991/92-1995/96	4,285	International threshold is 3,000.
Redshank	2,330 indiv. = 1.6% population, 1991/92-1995/96	2,816	GB threshold is 1,200. International threshold is 2,400.
European white-fronted goose (*Anser albifrons albifrons*)	2,664 indiv. = 0.4% population, 1991/92-1995/96	528	International threshold is 12,000.

Qualifying Species	**% of GB/International Population***	**WeBS 5-Year Peak Mean (07/08-11/12)****	**International / GB Population Thresholds*****
Gadwall (*Anas strepera*)	0.9% population, 1991/92-1995/96	<250	National threshold is 250. International threshold is 600.
Additional Qualifying Features Identified by the 2001 UK SPA Review			
Ringed plover	655 indiv. = 1.3% GB population, 1991/92-1995/96	812	International threshold is 730.
Pintail	599 indiv. = 1.0% population, 1991/92-1995/96	589	International threshold is 600.
Shoveler	Number of indiv. not given - 0.9% population, 1991/92-1995/96	548	International threshold is 400.

*Source: Natura 2000 Standard Data Form (www.jncc.gov.uk), **Source: (Austin *et al.,* 2014), ***Thresholds represent 1% of the International / GB population. Source: (Austin *et al.,* 2014). - = information not available from WeBS.

3.3.38 The Severn Estuary SPA is also designated for regularly supporting an overwintering population of 84,317 waterfowl (5-year peak mean 01/04/1998). Contributing bird species include Bewick's swan, European white-fronted goose, shelduck, wigeon, gadwall, pintail, teal, mallard, shoveler, pochard, tufted duck, grey plover, dunlin, lapwing, curlew, redshank and whimbrel.

3.3.39 The Severn Estuary SPA is also designated as a Ramsar site because of its Internationally important bird populations.

The Severn Estuary SPA Regulation 33 Package

3.3.40 All marine Natura 2000 sites, including the Severn Estuary SPA, have an associated Regulation 33 Package which lays out conservation objections for the SPA site which are summarised using Favourable Condition Tables.

3.3.41 There is a broad range of conservation objectives associated with the Severn Estuary SPA. Many relate to specific Habitat Features which support large numbers of waders and wildfowl. Other conservation objectives are for particular bird species identified as Species Features (Table 3.4).

Table 3.4. Relevant Conservation Objectives for the Severn Estuary SPA (as set out in Favourable Condition Table)

Species Features	Site Specific Target Range and Measures	Notes
SPA Interest Feature 1: **Internationally Important Annex 1 Species: Bewick's swan**	No less than 289 individuals (i.e. the 5 year peak mean between 1988/9 – 1992/3). 1 % of NW European population. No decrease in use of the number of sectors and their distribution established as baseline.[1] No significant reduction in numbers or displacement of wintering birds attributable to disturbance from an established baseline.[1]	Mainly found in the Upper Severn Estuary at Slimbridge. WeBS counts provide this information. WeBS low tide counts display distribution information by sector (not annual counts) Birds use certain sectors to a greater or lesser degree from year to year. Significant disturbance attributable to human activities can result in reduced food intake and/or increased energy expenditure. Five year peak mean information on populations will be used as the basis for assessing whether disturbance is damaging.
Internationally Important Populations of Regularly Occurring Migratory Species	No less than 68,026 individuals in the assemblage (i.e. the 5 year peak mean between 1988/9 - 1992/3) For individual species - no less than the 5 year peak mean between 1988/9 - 1992/3 detailed below:	Figures derived from WeBS counts. The 5 year peak means for this period for each of the internationally important populations and species with nationally important populations which make up the internationally important assemblage are provided in the Regulation 33 Package.

Species Features	Site Specific Target Range and Measures	Notes
SPA Interest Features 2 – 6:		
European white-fronted goose	3,002 individuals	
Dunlin	41,683 individuals	
Redshank	2,013 individuals	
Shelduck	2,892 individuals	
Gadwall	330 individuals	

[1]The baseline is not currently established within the Regulation 33 Package.

The Severn Estuary Ramsar

3.3.42 The Severn Estuary Ramsar site covers the same area as the SPA, however the Ramsar is also designated for a range of features other than birds including plants, migratory fish and invertebrates.

3.3.43 The site is designated under RAMSAR criteria 1,3,4,5,6 and 8. These are discussed in more detail below:

- Ramsar criterion 1 –Relates to the immense tidal range, this affects both the physical environment and biological communities;
- Ramsar criterion 3 – Due to unusual estuarine communities, reduced diversity and high productivity;
- Ramsar criterion 4 – This site is important for the run of migratory fish between sea and river via estuary. Species include salmon, sea trout, sea lamprey, river lamprey, allis shad, twaite shad and eel. It is also of particular importance for migratory birds during spring and autumn;
- Ramsar criterion 5 – Assemblages of International Importance. The Severn Estuary supports 70,919 waterfowl (5 year peak mean 1998/99 – 2002/03; and
- Ramsar criterion 6 – Species/populations occurring at levels of International importance. These are detailed in Table 3.5 below.

3.3.44 Ramsar criterion 8 – The fish of the whole estuarine system is one of the most diverse in Britain, with over 110 species recorded. Salmon, sea trout, sea lamprey, river lamprey, allis shad, twaite shad and eel use the Severn Estuary as a key migration route to their spawning grounds in the many tributaries that flow into the estuary. This estuary is also important as a feeding and nursery ground for many fish species, particularly allis shad and twaite shad.

Table 3.5 Qualifying Species for the Severn Estuary Ramsar

Qualifying Species	% of GB/International Population*	WeBS 5-Year Peak Mean (07/08-11/12)**	International / GB Population Thresholds***
Ramsar Criterion 6 – Species/Populations at Levels of International Importance –			

Qualifying Species	% of GB/International Population*	WeBS 5-Year Peak Mean (07/08-11/12)**	International / GB Population Thresholds***
Species with Peak Counts in Winter			
Bewick's swan (*Cygnus columbianus*)	229 indiv. = 2.8% GB population, 1998/99-2002/03	245	International threshold is 220.
European white-fronted goose (*Anser albifrons albifrons*)	2,076 individuals = 35.8% GB population, 1998/99-2002/03	528	International threshold is 12,000.
Shelduck (*Tadorna tadorna*)	3,223 individuals = 1% GB population, 1998/99-2002/03	4,285	International threshold is 3,000.
Gadwall (*Anas strepera strepera*)	241 individuals =1.4% GB population, 1998/99-2002/03		National threshold is 250. International threshold is 600.
Dunlin (*Calidris alpina alpina*)	25,082 individuals = 1.8% GB population, 1998/99-2002/03	27,515	International threshold is 13,300.
Redshank (*Tringa totanus*)	2,616 individuals = 1% GB population, 1998/99-2002/03		National threshold is 1,200. International threshold is 2,400.
Species/Populations Identified Subsequent to Designation for Possible Future Consideration under Criterion 6 – Species with Peak Counts in Winter			
Species Regularly Supported during the Breeding Season			
Lesser black-backed gull (*Larus fuscus graellsii*)	4,167 occupied nests = 2.8% GB population, (Seabird 2000 census)	-	
Species with Peak Counts in Spring/Autumn			
Ringed plover (*Chardrius hiaticula*)	740 indiv. = 1% GB population, 1998/99-2002/03	812	International threshold is 730.
Species with Peak Counts in Winter			
Teal	4,456 individuals =	4,893	International threshold is

Qualifying Species	% of GB/International Population*	WeBS 5-Year Peak Mean (07/08-11/12)**	International / GB Population Thresholds***
(*Anas crecca*)	1.1% GB population 1998/99 – 2002/03		5,000.
Pintail (*Anas acuta*)	756 individuals = 1.2% GB population 1998/99 – 2002/03	589	National threshold is 290. International threshold is 600.

*Source: Natura 2000 Summary review sheets (www.jncc.gov.uk), **Source: (Austin *et al.,* 2014), ***Thresholds represent 1% of the International / GB population. Source: (Austin *et al.,* 2014). - = information not available from WeBS.

3.3.45 Herring gull is classed as 'noteworthy' within this Ramsar for nationally important numbers during the breeding season. The site was found to support 1,540 occupied nests, representing an average of 1.1% of the GB population (Seabird 2000 Census).

3.3.46 A number of migratory species are also classed as 'noteworthy' within this Ramsar during the spring/autumn period. These species include little egret, ruff, whimbrel, curlew and greenshank.

3.3.47 A number of migratory species are also classed as 'noteworthy' within this Ramsar during the winter period. These species include wigeon, shoveler, pochard, water rail and spotted redshank.

Local Sites

3.3.48 Table 3.6 below lists all local wildlife sites within 1km of the Proposed Development which are at least partly designated for their bird interest. The table also summarises the bird interest of each site.

Table 3.6 Local wildlife sites within 1km of the Proposed Development

Locally Designated Sites for Birds	Details	Proximity to Corridor
Borrow Pit, Puriton LWS	Lake with extensive reed beds (with two or more notable plant species) used as breeding site for notable bird species in Somerset which are declining in population size.	Area A lies within LWS.
Cheddar Valley Railway Walk LNR	Network of rhynes and ditches, dense scrub and rough ground. Good habitats for many birds. Part of this site coincides with Dismantled railway and adjacent fields, Winscombe SNCI and is overlapped in a small part by Biddle Street, Yatton SSSI.	Approx. 150m east of Area D.

Locally Designated Sites for Birds	Details	Proximity to Corridor
Tickenham Hill – Cadbury Camp-Chummock Wood Complex SNCI	Ancient semi-natural and semi-natural broad-leaved woodland, unimproved and semi-improved calcareous grassland with semi-improved neutral grassland, dense scrub. Diverse flora and rich in birds and butterflies.	Area E overlaps with SNCI
Field between railway line and A369, Portbury SNCI	Marshy grassland and reedbeds with diverse flora. Supports breeding sedge warbler. Part of this site comprises Priory Farm AWT Reserve.	Over 1km east of Area F
Fields on Caswell Moor SNCI	Diverse marshy grassland and reedbed. Good for breeding warblers/ buntings.	Less than 100m east of Area F
Portbury Dock Wood SNCI	Semi-natural broad-leaved woodland with diverse ground flora. Important site for birds.	Approx 50m north of Area G
Portbury Wharf Nature Reserve SNCI and Portbury Wharf Nature Reserve AWT Reserve	Marshy grassland, open water and associated habitats. Supports overwintering and migrating water fowl. This site has the same boundary as the Portbury Wharf Nature Reserve AWT Reserve.	Option B crosses SNCI and AWT reserve.
Land adjacent to Severn Estuary SSSI (Portbury) SNCI	Marshy grassland This site is also part of the Severn Estuary SSSI, SAC, SPA and Ramsar site.	Section G lies adjacent to SNCI
Severn Estuary SNCI	Forms the western edge of the Bristol area. Important habitat for waterfowl (curlew, redshank, ringed plover, grey plover).	Area G overlaps SNCI
Avonmouth Sewage Works and Hoar Gout SNCI	The sewage works comprise lagoons, rhynes and old meadows and three contiguous ditches. Hoar Gout comprises a series of 3 disused industrial reservoirs showing succession from open water to willow scrub.	Within 1km north west of Section G

Locally Designated Sites for Birds	Details	Proximity to Corridor
	Supports waders and wildfowl. Includes Avonmouth Pools AWT Reserve.	
Fields Between Railway Line and A369, Portbury SNCI	Contains marshy grassland and reedbed habitat and supports passerines.	Area F lies within SNCI
Lamplighter's Marsh SNCI	Part of the site comprises demolished pre-fabricated housing and a sports ground. Remainder comprises areas of saltmarsh influenced grassland as well as ruderal communities, grassland, scrub and secondary woodland. Interesting breeding birds.	Approx 500m south-east of Area G.
Gloucester Road (Railway Sidings) SNCI	Areas of dense scrub and open grassland with interesting flora which supports birds.	Area G crosses part of site
Long Cross Tip SNCI	Supports breeding birds including linnet and bullfinch.	Over 1km east of Area G.
Lawrence Weston Moor SNCI	Network of unimproved neutral to acid grasslands, reedbeds and rhynes. Supports interesting birds. Also part of Lawrence Weston Moor LNR and AWT Reserve.	Over 400m south east of Area G.
Hallen Marsh Junction SNCI	Grassland, scrub, limestone ballast, pools and areas of reed. Supports interesting bird assemblage.	Area G overlaps with SNCI
Severn Estuary SSSI (part of) – New passage to Chittening Warth SNCI	Estuary with saltmarsh, mudflats and cliffs with large bird list.	Area G lies adjacent to SNCI

4.0 Survey Results and Assessment

4.1 Introduction to Results

4.1.1 This chapter summarises the findings of all desktop and field surveys done to date for the Hinkley C Connection Project between 2009 and 2013.

4.1.2 The results focus on all bird species of relevance to this project due to either their conservation interest, occurrence within the surrounding area or at potential risk from any impact as a result of this project. This includes all SPA and Ramsar qualifying species, Schedule 1 species and Birds of Conservation Concern known to occur in the wider area and any species known to be vulnerable to collision risk or disturbance/displacement from overhead lines.

4.1.3 An initial assessment of the potential effects of the proposed connection on each species is provided. This assessment refers to potential effects identified from both literature review and from consultation. These potential effects include collision risk (during migration and local foraging flights), displacement effects and habitat loss.

4.1.4 To help understand the assessment of the potential effects of the proposed overhead line on birds, a brief overview of collision risk, displacement and habitat loss to birds as a result of overhead line installation is provided below, focussing on the key species involved in the assessments. A more in depth analysis of this subject is provided within the literature review (Appendix A). Also provided below is the method through which predicted collision mortality for key species of birds was calculated in this assessment.

4.2 Collision Risk to Birds from Overhead Lines

4.2.1 An initial assessment of the potential effects of the proposed connection on each species is provided. This assessment refers to potential effects identified from both literature review and from consultation. These potential effects include collision risk (during migration and local foraging flights) and also displacement effects.

4.2.2 To help understand the assessment of the potential effects of the proposed overhead line on birds, a brief overview of collision risk to birds is provided below, focussing on the key species involved in the assessment. A more in depth analysis of this subject is provided within the literature review (Appendix A)

4.2.3 In a review of the influence of biological, topographical and meteorological aspects on risk of overhead line collisions, another study demonstrated the vulnerability of “poor” flyers, some raptors and other “fast strong” flyers (Bevanger, 1995; in Scottish Natural Heritage, 1996). Birds which fly regularly between roosting sites and roosting sites, undertake regular local migratory movements, fly in flocks, or fly during low light conditions are also vulnerable.

4.2.4 Birds of large body mass in relation to wing surface area (those with ‘high wing loading’, including ducks, geese, swans and grouse) are generally ‘poor flyers’ and relatively incapable of manoeuvring in the air. This has been confirmed by “hit wire” indices developed from recoveries of ringed birds in the UK (Rose & Baillie, 1989).

4.2.5 A study in Italy reviewed data from 11 mortality censuses and compiled a list of species found among overhead line victims, based on over 1,300 reported casualties. 95 species in all were affected with some groups such as raptors, herons and other large birds being highly affected and passerines and other allies being the least affected (Rubolini et al., 2005).

4.2.6 An investigation of 128 swan mortalities at the Ouse Washes (Owen & Cadbury, 1975; in Scottish Natural Heritage, 1996) found that 38% were due to collision with overhead lines. Another study attributed 11% of 119 raptor deaths recorded in sample sites at Altamont (USA) to collisions with wires including overhead lines (Orloff & Flannery, 1992; in Scottish Natural Heritage, 1996).

4.2.7 According to Bevanger (1998; in Avian Powerline Interaction Committee, 2006) gull electrocutions are uncommon but have been documented. This suggests that actual collisions involving gulls are also fairly uncommon. In southwest France, 3% of avian electrocutions (n=100) were gulls and terns (Bayle, 1999; in Avian Powerline Interaction Committee, 2006). In addition, of both electrocutions and collisions in the same region, 16% were gulls and terns).

4.2.8 Waders, and to a lesser extent ducks and gulls, were found by Winkelman (1992; in Scottish Natural Heritage, 1996) to be the species groups apart from passerines, most represented in the mortalities at Oosterbierum windfarm.

4.2.9 The habit of some species of flying in line formation may make these groups more susceptible to collision as the leading bird negotiates through a group of turbines but followers, particularly rear birds, are more vulnerable. There is some evidence from observations of eiders at Blyth wind farm that rear birds flew critically closer to the sweep of the turbine rotors than leading birds (Still et al, 1995; in Scottish Natural Heritage, 1996).

4.2.10 A number of research studies have considered the possible relationship between collision risk, habituation and learning capacity (Orloff and Flannery, 1992; in Scottish Natural Heritage, 1996). Habituation, particularly of resident gulls was described by Winkelman (1992; in Scottish Natural Heritage, 1996).

4.2.11 Other factors which can influence collision frequency include the age of the bird, weather factors such as strong winds or decreased visibility due to low cloud or fog, terrain characteristics and overhead line routeing (lines that cross the flight paths of birds), overhead line specification (larger structures are more hazardous) and human activity.

4.2.12 The typical flight height of birds on migration and local feeding flights differ between species. During a study of the duck species wigeon flight patterns around Walney Island it was found that 66.3% of birds flew up to 10 metres and 327 birds (82.4%) flew at a height no greater than 15 metres (Cramp *et al*., 1977; in Walney Bird Observatory, 2006). A study of pink-footed geese flights between roost and feeding sites revealed that the geese were equally likely to fly at 0 to 25 metres, 25 to 50 metres and 50 to 75 metres. The geese were less likely to fly at 75 to 100 metres and rarely flew at heights of greater than 100 metres during daytime (TEP Report 1338.008, unpublished).

Collision Impact Reduction

4.2.13 There is evidence to suggest that the higher collision rates recorded for the thinner earth wires may be attributable to the greater visibility of the thicker conductive wires (Alonso *et al*, 1994 in Scottish Natural Heritage, 1996).

4.2.14 There is a suggestion in this literature that orientating overhead lines parallel to flight lines may reduce collision and electrocution risk (Scott, Roberts & Cadbury, 1972; in Scottish Natural Heritage, 1996).

4.2.15 To reduce the overall risk of bird collisions with overhead lines, the earth wire is therefore usually targeted by measures to increase its visibility to birds in flight. In a review of published studies to date, Jenkins (2010) found that the overall findings were that any form of marker that thickens the appearance of the line by at least 20 cm, over a length of at least 10–20 cm, placed with sufficient regularity (at least every 5–10 m) on either the earth wires (preferably) or the conductors, is likely to lower general collision rates by 50–80%.

4.2.16 A large number of studies also state that potential ‘fly-ways’ (areas where bird movements may be concentrated) should be identified to target any measures such as installing bird diverters to reduce collision risk (Faanes, 1987; APLIC, 2012, Barrientos et al., 2012).

4.2.17 From the findings of the largest wire marking study undertaken to date, Barrientos *et al.* (2012) found that wire marking using spiral diverters effectively reduced avian collision risk. It was also recommended in this study that mortality hot-spots should be identified, as taking into account the economic cost of marking, it is likely more useful to attach flight diverters to these hot-spots rather than to do it to whole sections of power line.

<u>Calculation of predicted annual collision mortality</u>

4.2.18 Although collision risk models have been developed to calculate predicted collision mortality associated with wind-farms (e.g. SNH, 2000), there is currently no standard method of calculating numbers of bird collisions associated with proposed overhead lines. A method to calculate the predicted bird mortality associated with the proposed Hinkley Point C Connection Project has been developed by TEP and is presented below.

Stage 1: Determining the number of flight lines recorded

4.2.19 Flight line data collected during the VP survey was analysed to determine how many flight lines were recorded within 250m of the proposed route for each species during winter 2009-2010. The flight line data for winter 2010-2011 was not used in the collision risk model as the purpose of this further survey was to determine if significant regular bird movements occur between the Somerset Levels and Severn Estuary SPA over the proposed route, rather than to examine potential numbers of bird collisions associated with the entire proposed overhead line.

4.2.20 A 250m buffer was applied to the proposed route, within which area all flying birds were presumed to have crossed the overhead line. This precautionary approach is in line with current guidance (NE,SNH).

4.2.21 Flight lines within 250m of the proposed route were further analysed to identify flight lines where birds flew at “risk height” (defined below).

4.2.22 Flight line data was analysed for survey locations VP1, VP2, VP4, VP6 and VP7 only. Flight line data was not used from VP5 because the section of the proposed route that was viewed from VP5 would be underground cable, which does not present a collision risk for birds. Flight line data was not used from VP3 because this VP survey location focussed on a section of discontinued route corridor located more than 2km to the east of the proposed route.

4.2.23 Collision risk modelling was undertaken for all target bird species for which flight lines were recorded at risk height within 250m of the proposed route. These target species include those which are qualifying features of the Somerset Levels and Moors SPA/Ramsar and the Severn Estuary/Ramsar as well as those species highlighted in National Policy Statement for Electricity Networks Infrastructure (EN-5), July 2011. For this project, these species include mute swan, teal, shelduck, lapwing, redshank, curlew and common snipe.

4.2.24 The approach taken here is considered to be conservative (precautionary), as the risk height used in the model was from 0 to 50m above ground, giving a vertical risk zone of 50m. In fact the vertical risk zone associated with the proposed route will be approximately 30m where lattice pylons are used. In the section of proposed route considered most likely to be associated with the Somerset Levels and Moors SPA, the T-Pylon will be used, giving an approximate vertical risk zone of approximately 11m, just over one fifth of the risk zone used in the calculation. The actual mortality rates of birds as a result of the proposed overhead line will be less than those predicted within this model.

Stage 2: calculating annual winter mortality on a zero-avoidance basis for the VP survey area

4.2.25 A minimum of 47 hours of vantage point (VP) survey were completed at each of the vantage point survey locations. This exceeds Natural England guidance of a minimum of 36hrs vantage point survey during the non-breeding season (Natural England, 2010).

4.2.26 It is apparent from survey findings that the majority of bird flight activity in winter 2009-2010 took place at dawn and dusk. Specifically, these are defined as “one hour prior to sunrise to two hours after sunrise” and “two hours prior to sunset to one hour after sunset”. Much smaller numbers of bird flights for all target species were recorded during the daytime or at night time. Empirical evidence confirms there are six hours of peak bird flight activity each day during the winter months.

4.2.27 The 47 hours of observation recorded during winter 2009-2010 was stratified to some extent so that the majority of the survey effort focussed on either the sunrise or sunset periods; the periods of peak bird flight activity. An average 30 hours of VP survey was completed at each VP survey location during these periods of peak bird flight activity.

4.2.28 Therefore it is assumed that the total number of flight lines recorded during the 2009-2010 VP survey is equivalent to five survey days i.e. if there are six hours of peak bird flight activity in a day, 30 hours observation is equivalent to five days. This equation also introduces a conservative (precautionary) approach to modelling.

4.2.29 In terms of activity of target bird species, the winter period on the Somerset Levels and the Severn Estuary is broadly equivalent to six months: mid-October to mid-April, which is equivalent to approximately 180 days. Thus if 1 bird was predicted to be affected by collision mortality in each 5 day period it is possible to predict the “zero-avoidance” mortality for the winter period by multiplying 1 by a factor of 36 which would give a total mortality for the winter period of 36 birds.

Stage 3: calculating the winter collision mortality for the entire proposed route

4.2.30 It is next necessary to “scale up” the predicted mortality for the VP Survey Area to cover the entire proposed route. A “scaling factor” is used.

4.2.31 To derive a scale factor, it is necessary to consider sections of the proposed overhead line which were not covered by 2009-2010 VP survey. The length of the proposed permanent overhead line between Bridgwater and Seabank Substation, Avonmouth including both 400kV and 132kV sections and line entry at Hinkley Point is 54.45km. This does not include the section of the proposed development which is to be underground cable or temporary sections. As two proposed overhead sections at the Hinkley Point line entries are closely parallel with each other, these are considered as a single stretch of overhead line.

4.2.32 The entire proposed route runs broadly parallel to the location of the Severn Estuary SPA/Ramsar. It is therefore possible that any flight line of a species which is a qualifying feature of the Severn Estuary SPA/Ramsar recorded over the proposed route could be associated with the Severn Estuary SPA/Ramsar. Because of this the calculated numbers of collisions for the entire route at this stage are also equated to birds associated with the Severn Estuary. NB The Somerset Levels and Moors SPA/Ramsar is considered later.

4.2.33 Viewsheds were calculated for each VP survey location using a Digital Terrain Model (DTM). It was assumed that a surveyor was 2m in height and that it was necessary to view airspace above 10m above ground level (the lower limit of the collision risk zone). It was also assumed that a surveyor was able to record bird flight lines up to 2km from the VP survey location provided survey visibility conditions were good or excellent. Using the calculated viewsheds it was possible to confirm that 12.62km of the proposed route was clearly visible from VP survey locations combined (excluding VP3 and VP5).

4.2.34 Local and migratory movements of many bird species are influenced by topographic features. Prominent topographic features such as rivers and ridges may be used as flight corridors –areas that birds tend to move along during local and migratory movements (Thompson, 1978, Faanes, 1987, Bevanger, 1994, APLIC, 2012). Overhead lines located near habitats with high avian use (such as foraging, roosting and resting sites) tend to be more frequently crossed than other overhead lines (APLIC, 2012). The individual vantage points were specifically selected to survey areas with the greatest likelihood of bird flight lines of collision risk species (including all SPA species) passing through. Vantage point survey locations were strategically positioned to cover sections of the proposed route crossing major rivers or located between important wildlife sites for birds. Because of this it is more likely that flight lines of target species would have passed through the survey areas than through the un-surveyed areas. To take account of this bias, the proposed route has been categorised into sections depending on the likelihood of bird movements crossing these locations. These sections are shown at Figure 8.26.

4.2.35 Consideration was given to the following factors when categorising the proposed route (see Figure 8.26):

- Proximity to major watercourses linking sites designated for birds;
- Proximity to any linear features (including any watercourses);
- Proximity to ridges and orientation of ridges;
- Valleys;
- Orientation of proposed route in relation to direction of likely bird movements;
- Locations of sites designated for birds, considering bird movements between sites and taking into account likely numbers of relevant bird species at sites;
- Fields assessed as moderate or high potential for feeding waders or wildfowl during Hinkley Point C Connection assessment work;

- Areas known to be used by collision risk species during desk based or field survey work.

4.2.36 Using these above factors, sections of proposed line with high, moderate and low collision risk are defined as:

- *High likelihood of bird movements*: Any sections of overhead line passing directly between the two SPAs where the route is oriented perpendicular to likely direction of bird flight lines. Any sections of overhead line passing directly over an SPA. Any sections that pass within 500m of land assessed as holding high potential for waders/wildfowl.Sections of overhead line where radar study indicated greatest numbers of bird movement occurred.
- *Moderate likelihood of bird movements*: Any sections within 500m of any SSSI designated for birds, SPA/Ramsar or sections within 500m of locations assessed as holding high potential for waders or wildfowl where line perpendicular to likely direction of bird flight lines. Sections of line passing directly over areas assessed as holding moderate potential for waders or wildfowl.
- *Low likelihood of bird movements*: Any sections of overhead line oriented parallel with likely directions of bird flight lines or which qualify for either of the other two categories.

4.2.37 The scaling factor was then adjusted to take into account the relative proportions of the entire proposed length of overhead line classed as high, moderate and low likelihood of bird movements. Moderate likelihood areas were considered to have two thirds the likelihood of observing bird movements as the high likelihood areas, and low risk areas were considered to have one third likelihood.

4.2.38 This is still considered to be a precautionary approach, including categorising the majority of overhead line south of the Mendips as ‘high likelihood of bird movement’.

4.2.39 A ‘worst case’ assessment was made by assuming that the alternative route would be selected rather than the preferred route. The alternative route is slightly longer and has slightly higher proportion of sections classed as ‘Moderate’ or ‘High’ likelihood of bird movements.

4.2.40 The figures used to calculate the scaling factor are shown in Table 4.1. For example, 26.05km of line are classed as “moderate likelihood” of bird movement. The VP surveys covered 12.6km, therefore the mortality prediction for the VP section may be scaled up by 17.19/12.6 (=1.36) to provide a prediction of mortality for the “moderate likelihood” sections of line.

4.2.41 Thus for the 54.45km of overhead line which runs broadly parallel to the Severn Estuary, taking high, moderate and low likelihood sections of overhead line into consideration the mortality predicted from observations in the VP survey area may be scaled up by a factor of 2.85.

Table 4.1. Values used to calculate scaling factor for both the entire route and the section associated with the Somerset Levels SPA/Ramsar.

Entire Line (including all line associated with Severn Estuary) **Length of VP-surveyed overhead line = 12.6km [t]**				
Likelihood of bird movement	Mortality Adjustment factor **[a]**	Length of line (km) in each likelihood category **[b]**	Adjusted length of line **[c = a x b]**	Adjusted Scaling Factor **[c / t]**
High	1	14.04	14.04	1.11
Moderate	0.66	26.05	17.19	1.36
Low	0.33	14.36	4.74	0.38
TOTAL	-	**54.45**	**-**	**2.85**
Line associated with Somerset Levels and Moors **Length of VP-surveyed overhead line = 8.35km [s]**				
Likelihood of bird movement	Mortality Adjustment factor **[a]**	Length of line in each likelihood category **[b]**	Adjusted length of line **[c = a x b]**	Adjusted Scaling Factor **[c / s]**
High	1	12.04	12.04	1.44
Moderate	0.66	8.24	5.44	0.65
Low	0.33	0.61	0.20	0.02
TOTAL	-	**20.89**	-	**2.11**

4.2.42 When assessing winter collision mortality for the section of proposed route nearest to the Somerset Levels and Moors SPA the approach to determining the proportion of proposed route covered by VP surveys is slightly different. This is because the north section of the proposed route that would start north of the Mendips at Sandford Substation is well over 10km from the Somerset Levels and Moors SPA and so bird movements associated with the Somerset Levels SPA in this northern section are much less likely. Birds associated with the Somerset Levels and Moors SPA would almost exclusively be recorded on the section of proposed route between the Bridgewater Tee and the Mendip Cable End Sealing Compound (accepting that these may birds may also be associated with the Severn Estuary SPA/Ramsar).

4.2.43 Radar tracks recorded in the radar studies undertaken by FERA indicated where bird movements most commonly crossed the proposed route within the section south of the Mendips (see Figure 8.27), although it is unknown what species these involved and the number of birds involved. WeBS data was also used to determine where birds associated with the Severn Estuary SPA/Ramsar and the Somerset Levels SPA/Ramsar most commonly use. This was then combined with consideration of factors identified in para 4.2.36. From undertaking this analysis it was determined that the greatest likelihood of bird movements occurred between the Bridgwater connection in the south and Mark in the north. This area was therefore classed as 'high likelihood of bird movements' (refer to Figure 8.27).

4.2.44 The total length of the proposed route between Bridgewater and the Mendip Cable End Sealing Compound as well as the proposed line entries at Hinkley Point is 20.89km and the proportion of this section covered by VP survey at VP1, VP2 and VP4 was 8.35km; equivalent to 40% coverage. The scaling factor was then adjusted to take into account the relative proportions of the entire proposed length of overhead line classed as high, moderate and low likelihood of bird movements. This resulted in an overall scaling factor of 2.11 for the section potentially associated with the Somerset Levels SPA/Ramsar.

Stage 4: apportioning the bird flight lines to SPAs

4.2.45 It is likely that not all of the bird flight lines recorded could be attributed to both the Somerset Levels and Moors SPA/Ramsar and the Severn Estuary SPA/Ramsar. To therefore reduce the likelihood of 'double counting' of SPA birds, for the section of overhead line south of the Mendip Hills where birds could potentially be associated with the Somerset Levels and Moors SPA/Ramsar or the Severn Estuary SPA/Ramsar, the overall numbers of flight lines of each species were divided between 1 SPA and the other based on the relative 5-year peak means (2007 to 2012) for each SPA species. Using lapwing as an example, the most recent 5-year peak mean for lapwing on the Somerset Levels SPA is 39,766 individuals, whereas for the Severn Estuary SPA it is 10,744 individuals. As a proportion of the total population of both SPA's (50,510 individuals) 79% of lapwing used the Somerset Levels and Moors SPA, whereas 21% used the Severn Estuary SPA. These proportions were then applied to the model through multiplying the result of Stage 3 for the Severn Estuary SPA by 0.21 and multiplying the result of Stage 3 for the Somerset Levels and Moors SPA by 0.79 (only for the section south of the Mendip Hills). For the section of overhead line north of the Mendip Hills it was assumed that all birds were associated with the Severn Estuary SPA/Ramsar.

4.2.46 Although there may be some interchange between SPAs It is likely that this stage still overestimates predicted effects on the two SPAs as it is likely that not all of the birds within the region are associated with either the Somerset Levels and Moors SPA or the Severn Estuary SPA. It is therefore also likely that not all of the flight lines of species for which these SPAs are designated were from individuals directly associated with either SPA.

Stage 5: applying the collision avoidance rate

4.2.47 Recorded wildfowl and waders overhead line avoidance rates are in excess of 99% and possibly even in excess of 99.9%. The collision rates for birds flying at earth wire height or lower were 0.001% for a 10km 380kV overhead line in Spain, 0.012% for a 380kV overhead line and 0.002% for a 10km 220kV overhead line (review by the California Energy Commission, 2002).

4.2.48 A greater number of studies exist for collision avoidance rates at wind farms. Recorded goose wind farm avoidance rates range from 96% to 99.9%, or even higher in some cases. Recent guidance published by SNH states that a 99.8% avoidance rate should be used when calculating collision risk for geese with windfarms (SNH, 2013).

4.2.49 Whitfield (2007) calculated avoidance rates for three different wind farms in the USA for the American golden plover and Charadrius plovers. At two of the wind farms these avoidance rates were determined to be between 99.6% and 99.97%. A worst case scenario avoidance rate was calculated as 99.19% at a third wind farm site.

4.2.50 It is difficult to be certain how comparable bird collision rates are for overhead lines and wind turbines. Both are aerial structures although wind turbine rotor blades are not static and overhead line conductors, particularly the earth wire, may be more difficult to see than rotor blades.

4.2.51 Three collision avoidance rates were applied including a lower limit of 99.9% collision avoidance, a realistic collision avoidance rate of 99.7% and a precautionary upper limit of 99.5%. Therefore if there were 500 bird flights in the risk zone, by applying the lower, middle and upper limit collision avoidance rates this would give collision mortality predictions of from 0.5, 1.5 and 2.5 bird collisions respectively.

Stage 6: identifying the five-year peak mean 2006/07-2010/11

4.2.52 The most up to date five-year peak mean was identified for each species for which collision mortality was being modelled for both the Somerset Levels and Moors SPA/Ramsar and the Severn Estuary SPA/Ramsar (Source: Holt *et al.,* 2012).

Stage 7: Calculating the percentage of a species' SPA population affected by collision mortality each year

4.2.53 To calculate the percentage of each species' SPA population affected by collision mortality the predicted mortality calculated at Stage 5 was divided by the total population size determined at Stage 6; this result was then multiplied by 100.

4.3 Winter Habitat Assessment for Birds

4.3.1 The majority of the land within the preferred corridor was assessed to hold low potential for waders and wildfowl. A small number of fields were assessed as holding moderate potential for waders and wildfowl. Only 2 fields/field groups within the preferred corridor were assessed as holding high potential for wildfowl. These included Portbury Wharf and Avonmouth Sewage Works. No areas were assessed as holding high potential for waders. The areas found to hold moderate or high potential for waders or wildfowl are detailed below in Table 4.2. The winter bird habitat assessment for waders is illustrated at Figure 8.15. The winter bird habitat assessment for wildfowl is illustrated at Figure 8.16.

Table 4.2. Land Assessed as Holding High or Moderate Potential for Waders/Wildfowl

Location	**Potential**	**Description**
Land near Avonmouth Sewage Treatment Works	High – Wildfowl Moderate - Waders	The land near the sewage treatment works contains a number of pools suitable to support moderate numbers of wildfowl on a regular basis.
Portbury Wharf	High – Wildfowl Moderate - Waders	This area includes a number of areas of wet grassland and marsh, as well as a scrape and a number of small interconnected pools. The reserve is known to support moderate numbers of wildfowl species such as wigeon, teal, mallard and Canada goose. The reserve is known to support wader species such as lapwing. A further open short pasture field to the south of Portbury Wharf was also assessed as holding

Location	Potential	Description
		moderate potential for waders.
Land at Hallen	Moderate - Wildfowl	This location contained a wet area suitable to occasionally support moderate numbers of wildfowl
Nailsea Moor (part of Tickenham, Nailsea and Kenn Moors SSSI	Moderate - Wildfowl Moderate - Waders	This area contains a number of wet grassland fields, including areas of rush pasture, divided by many ditches and rhynes. These ditches and rhynes are designated as a SSSI for their flora. The wet, open landscape provides suitable habitat for waders and wildfowl.
Acorn Lakes	Moderate - Wildfowl	Acorn Lakes consists of a small fishing lake with a few adjacent pools. This lake and adjacent land was assessed as likely to regularly support small numbers of ducks and geese such as mallard and Canada goose.
Land north of Winscombe and land north of Barton	Moderate - Wildfowl Moderate - Waders	Two field areas were found to hold moderate potential for waders. One of these areas consisted of a large open field of short grazed pasture to the north of Winscombe. This area was considered suitable for waders due to its openness and lack of disturbance. Another area north of Barton and just east of the M5 was considered to hold moderate potential for both waders and wildfowl. This area contained a number of narrow fields of wet rush pasture separated by drains, however the fields suffered significant disturbance from the nearby motorway.
Fields west of Biddisham, fields south of Rooksbridge	Moderate - Wildfowl Moderate - Waders	The fields with moderate potential for waders were pasture fields with either a high degree of wetness or openness. One open field within the preferred corridor, considered of moderate potential for both waders and wildfowl, contained a mixture of grassland and rush pasture. This area received minor disturbance from an adjacent road. Further fields assessed as holding moderate potential for wildfowl were open pasture fields with drains/ditches but were disturbed to an extent by livestock such as pigs and cattle.
Fields to the north and south	Moderate - Wildfowl	The fields categorised as holding moderate potential for waders were generally either large, open fields which were fairly dry, or

Location	Potential	Description
of Mark	Moderate - Waders	moderately open fields which were moderately wet. All of these fields consisted of short pasture. The majority of these fields were also assessed as holding moderate potential for wildfowl for broadly the same reasons, as well as factors such as proximity to open drains. These fields were generally considered likely to regularly support small numbers of mute swan.
Land at Woolavington	Moderate - Wildfowl Moderate - Waders	One field of pasture was assessed as holding moderate potential for waders due to its openness and moderate wetness. An adjacent fishing pool surrounded by reed was assessed as holding moderate potential for wildfowl.

4.4 Review of Relevant Radar Studies

4.4.1 Two radar studies have been undertaken since 2010 to assess potential impacts of two proposed wind farm sites (Black Ditch Wind Farm and Withy End Wind Farm) between the Somerset Levels and Moors SPA/Ramsar and the Severn Estuary SPA/Ramsar. Another radar study was commissioned by Natural England to assess potential impacts of works undertaken at Steart. These radar studies covered the section of the proposed route south of the Mendips and so are reviewed here to address their contribution to the Hinkley Point C Connection Project.

4.4.2 The Black Ditch radar study was undertaken during January 2011. This study commenced 3 days after the closest vantage point survey undertaken for the Hinkley Point C Connection project at the River Huntspill. The bird detection radar system was operated continuously near the proposed Black Ditch Wind Farm site for 108 hours from 20:00 on Monday 24th January to 11:59 on Saturday 29th January. The radar system was located near to the River Huntspill at ST 342 436 and collected bird movement data over a range of four nautical miles. Parts of the Somerset Levels and Moors SPA and the Severn Estuary SPA were covered by the horizontal beam, as well as the proposed wind farm site.

4.4.3 The radar was supported by two field observers who investigated bird activity detected by the radar. These observers recorded species observed, as well as date, time and flight direction. Field observers made observations from both the radar location itself as well as from various other sites. It is not known for what proportion of the radar operational time field observers were present.

4.4.4 The Withy End radar study was undertaken by the same company (FERA) as the Black Ditch wind farm radar study, and used the same methods and radar location.

4.4.5 The Withy End radar study was undertaken between the 29th January and 2nd February 2011, following the Black Ditch Wind Farm study. During the radar study temperatures dropped leading to the freezing of water bodies within the Somerset Levels and Moors SPA. Towards the end of this radar study the conditions warmed up and the water bodies thawed.

4.4.6 A radar study was also undertaken for Natural England during 2010, however this study was carried out during a period of wintery conditions including snow fall, and accurate analysis could not be carried out due to ‘clutter’.

4.4.7 The Black Ditch Wind Farm radar study detected a number of movements of birds between the two SPA sites during the radar operation. The radar indicated that movement started or finished at specific sites, and that species included wigeon, teal, pintail and tufted duck. These species were recorded within the surveyed sites during ground based observations undertaken as part of the radar study. An assumption was made by the radar analysis that the radar tracks recorded were made by these species.

4.4.8 Radar analysis suggested that a movement of duck was recorded post sunset, continuing for an hour or so between the Somerset Levels and Moors SPA and the Severn Estuary SPA. The authors of the Black Ditch Radar Study report propose that this is typical of these duck in this situation –remaining in safe, diurnal roost sites after sunset and then departing for foraging grounds on the estuary which were exposed by the low tide at that time.

4.4.9 Movements of birds were observed in the radar dataset between the Severn Estuary and Somerset Levels and Moors at high tide (between 22:36 and 02:24 during the study). This could have involved duck species induced to return to roost at sites within the Somerset Levels and Moors SPA by the high tide. However the species was not confirmed. The authors state that this could have been a movement of gulls which were also known to be roosting within the estuary during the study. The movement was interpreted as duck species however, as analysis had suggested that duck had moved from the Somerset Levels to the estuary at dusk and a return movement would be expected at some time, with no movements of ducks recorded between the SPAs during the day.

4.4.10 Although ducks were presumed to fly to and from the Severn Estuary, no activity was seen further west than the M5 motorway to the north of the radar (north of the radar is where the majority of movement occurred). To the south of the radar between Kings Sedgemoor and Pawlett Hams, radar tracks indicated bird movements from inland to coast into the estuary.

4.4.11 During the day, radar activity indicated movements of birds within the wind farm site throughout the day, however no target species were observed. These movements were therefore believed to be corvids, gulls and other common birds. No ground –based observations of ducks were recorded by field surveyors during the night time within the wind farm even though radar movements suggested these were occurring. This was attributed to the movements not being detected due to the lack of visibility caused by low light conditions.

4.4.12 The majority of duck activity was restricted to an area north of the Huntspill River. The majority of activity was observed after sunset, although again it is conceded by the authors that this may contain gull activity.

4.4.13 The number of birds involved in the movements were assumed to be proportional to the number of radar tracks recorded although this claim is unsubstantiated. A precautionary approach for determining numbers of birds involved in movements was adopted in the radar study report, assuming that all of the ducks counted within the SPA on the ground were involved in the movements recorded within the radar study, and that no double counting occurred. This gave high counts of 2840 ducks in the area north of the radar, and 1782 in the area south of the radar. There is no robust evidence however that these ducks were involved in the movements.

4.4.14 The only group of confirmed flying ducks (mallard and wigeon on 27th January) recorded by field observers during the survey was only stated as consisting of 'several' birds. A group of 100 wigeon and teal were heard, but it is not known if they were flying.

Additional Radar Analysis 2013

4.4.15 Analysis of flight speed data was undertaken by the authors of the radar study during December 2013 for a 48 hour period of all of the data to try and determine what species were involved in the flights associated with the radar tracks recorded.

4.4.16 Parameters such as the size and shape of the target, the strength of the radar echo and the speed of movement superficially suggest that it might be possible to use statistical processes to determine species with a specified level of accuracy, but in reality this is far from simple. For example, the cross-sectional area of a goose flying towards the radar might be very similar to that of a mallard flying perpendicular to the radar beam and both could return a similar signal strength as a result. The apparent shape of a target varies in the same way and is further complicated by the position of the wing in flight. The speed of flight of a bird is measured as speed over the ground by the radar, but this takes no account of the true air speed which will be influenced by wind speed aloft (e.g. a bird flying at 20m/s into a 10m/s headwind will have a measured speed of 10m/s and could thus be miss-classified if the wind speed is not known).

4.4.17 From the analysis there seems to be a 'corridor' of squares with higher average speeds (20-25m/s) crossing the overhead line both at the River Brue and further north between Southwick and Mark. This flight speed correlates with that associated with waterfowl quoted by Bruderer & Boldt (2001). This analysis has made no correction for wind speed or direction however, which could lead to potentially decreased or increased flight speeds.

4.4.18 Although the radar study indicates movements by wildfowl it is unknown the number of birds that make the movements, the species, the height at which they fly, and the regularity of which these movements are made.

4.5 Species Assessments

Bewick's Swan

4.5.1 Bewick's swan is a qualifying species for both the Severn Estuary SPA and the Somerset Levels and Moors SPA under Article 4.1 (individual species -overwinter). It is also a qualifying species for both the Severn Estuary Ramsar and the Somerset Levels and Moors Ramsar under criterion 6 (species/populations occurring at levels of international importance –winter).

Desktop Survey

4.5.2 In recent years fewer swans have utilised traditional sites in the UK; there has been some evidence of a contraction of the wintering range in an easterly direction (Calbrade *et al*., 2010). Results from the International Swan Censuses in 1995, 2000 and 2005 indicate that the UK population has declined overall from 29,500 birds to 21,500 in 2005. The peak count at the Severn Estuary in winter 2010/11 was the highest for several years (311, January) and was indicative of a cold weather response (Holt *et al.,* 2012). However, overall the trend for the last 20 years has been a general decline.

4.5.3 The Bewick's swan population associated with the Somerset Levels is cited in the relevant Natura 2000 review sheet as being 191 individuals or 2.7% of the GB population based on a 1991/92-1995/96 five-year peak mean. However this figure is out of date since there is strong evidence that Bewick's swan are visiting the west of the UK in far fewer numbers in comparison with other parts of the UK.

4.5.4 The Somerset Levels and Moors was historically one of the most favoured sites for Bewick's Swan with a historic peak of 452 birds in February 1982, before sharp declines in the use of the site occurred during the 1980's and 1990's. A peak of 63 birds in the Somerset Levels and Moors SPA in 2010/2011 represents the highest count from the SPA in recent years and is probably indicative of a cold weather response (Holt et al., 2012). The population present in the SPA no longer reaches international or national qualifying levels.

Figure 1. Trend for numbers of wintering Bewick's Swan present in the Somerset Levels and Moors (1970-2011).

4.5.5 The Ham Wall RSPB reserve manager has confirmed that only small numbers of Bewick's swan use the Ham Wall site because it is primarily a reedbed reserve and is unsuitable for Bewick's swan. A winter roost site at Shapwick Heath (Noah's Lake) is sometimes used by Bewick's swan although West Sedgemoor, further to the south, tends to attract larger numbers of Bewick's swan (Hughes, Jun 2011, pers. comm.).

4.5.6 Other personal communication with the People Engagement Officer of RSPB Ham Wall in autumn 2010 has provided further evidence that the number of Bewick's swan using the Somerset Levels has declined.

4.5.7 Attribution of this decline in the number of birds visiting the Somerset Levels and Moors SPA is difficult to establish, but is probably largely due to a redistribution of wintering swans. An increasing number of Bewick's swans that winter in the UK are now concentrated in the fenlands of Eastern England. Whereas peak counts at most sites across the UK have declined in recent years, those at the Ouse Washes and Nene Washes have increased. It is also possible that some birds have moved locally to the Severn Estuary, where the wintering population has increased by 42% in the medium term (i.e. last 10 years) to reach a peak of 311 birds in 2010/2011.

4.5.8 All records for Bewick's swan exceeding five swans between 2010 and 2013 are shown in Table 4.3. Records for Bewick's swan within the study area and the wider desktop survey area are presented at Figure 8.9.

4.5.9 66 Bewick's swan were seen on Tealham and Tadham Moors SSSI in November 2005 and 220 Bewick's swan on the Severn Estuary 6km to the north of Bristol, also in November 2005.

4.5.10 Within 1km of the Proposed Development, a single Bewick's swan was recorded on the 18th January 1997 on Rooksbridge Moor.

4.5.11 Within the wider area between 2010 and 2013, 15 Bewick's swan were at Greylake RSPB reserve on 4th February 2010. 24 Bewick's swans were recorded at Nythe Bridge in Wiltshire on 24th February 2010 approximately 12km east of Bridgwater and 2.5km north east of Moorlinch SSSI. 28 Bewick's swans were also recorded on Sutton Moor south east of Nythe Bridge on 21st February 2010.

4.5.12 A number of observations of small groups of Bewick's swan were recorded by local birdwatchers on the Somerset Ornithology Society web-site (www.somersetbirds.net) during winter 2010-2011 and during winter 2012-2013. The majority of the records were for groups of less than ten Bewick's swan which were all outside the preferred corridor.

Table 4.3 Selected Desktop Survey Records for Bewick's Swan in Winter 2010-2013

Site Name	Date/Year	Count
Steart, Bridgwater Bay NNR	8th December 2010	7
River Parett, Combwich (5km north west of Bridgwater)	26th December 2010	14
Wet Moor SSSI, east of Muchelney	30th December 2010	12
King's Sedgemoor drain	7th January 2011	6
Curry Moor (12km south of Bridgwater)	15th January 2011	11
Wet Moor SSSI, east of Muchelney	10th January 2011	12
West Sedge Moor	26th January 2011	11
Shapwick Heath RSPB reserve (Noah's Lake)	26th January 2011	12
Catcott	16th February 2011	14
Nythe Bridge, King's Sedgemoor	17th February 2011	24
Butleigh Moor (10km east of Shapwick)	22nd February 2011	12
Catcott Lows	23rd February 2011	8
Shapwick Heath RSPB reserve (Noah's Lake)	24th February 2011	9
Wet Moor SSSI, east of Muchelney	9th March 2011	7

Site Name	Date/Year	Count
(16km south east of Bridgwater)		
Nythe Bridge, King's Sedgemoor	6th March 2013	6

Migration

4.5.13 Bewick's swan migrate from their Arctic breeding grounds between October-November, to winter in coastal lowlands of northern Europe. They return between March-April. On migration they use important staging areas in Estonia and near lake Onega and the White Sea and make landfall in the UK at sites like Tyninghame Bay, Lothian, south east Scotland.

4.5.14 A satellite transmitter study was undertaken on Bewick's swan leaving their breeding grounds on the Pechora Delta in Arctic Russia in autumn 2003. The swans left their breeding grounds between the 14th and 21st October 2003. One particular Bewick's swan was successfully tracked to Welney Wildfowl and Wetland Trust (WWT) reserve in East Anglia and was shown to migrate via Estonia and Holland before finally being sighted at Welney on 27th January 2004. None of the tagged Bewick's swans were successfully followed all of the way to Slimbridge or other sites in the south west.

4.5.15 It is likely that the majority of Bewick's swan migrate to the Somerset Levels overland via Scotland, possibly Welney in East Anglia. Therefore it is likely that the majority of Bewick's swan flying to the Somerset Levels would not fly through the preferred corridor during their migration. It is possible that a small proportion of the Bewick's swan population may migrate southwards down the west coast of the UK via sites such as Martin Mere. Swans migrating in this way might perhaps be more likely to fly across the preferred corridor however WeBS data indicates numbers of Bewick's swan using west coast sites such as Martin Mere are declining in number.

Hinkley Point Bird Surveys

4.5.16 No Bewick's swan were recorded at any stage using coastal fields at Hinkley Point during the 2006 to 2009 surveys.

Winter Bird Survey 2009-2010

4.5.17 Bewick's swan was not recorded at any stage during the 2009-2010 winter bird survey. Together with the desktop survey, this suggests that Bewick's swan did not use fields within the winter bird survey area for feeding or resting in winter 2009-2010.

Vantage Point Survey 2009-2010

4.5.18 No Bewick's swan were recorded at any time during the 2009-2010 vantage point survey.

Vantage Point survey 2010-2011

4.5.19 No Bewick's swan were recorded at any time during the nocturnal 2010-2011 vantage point survey.

Winter Bird Survey 2011-2012

4.5.20 Bewick's swan were recorded on one occasion in 2012, where a group of 4 individuals were recorded 250m to the north of the preferred corridor on Nailsea Moor in March. These birds were located more than 500m north of the proposed route. As this was the only record of Bewick's swan obtained in 2012 and from previous and subsequent survey data, it is likely that Bewick's swan very rarely used habitat within the winter bird survey area for feeding or resting in winter 2011-2012, and not within the preferred corridor.

Winter Bird Survey 2012-2014

4.5.21 Bewick's swan was not recorded at any stage during the 2012-2013 winter bird survey. This suggests that Bewick's swan did not use fields within the winter bird survey area for feeding or resting in winter 2012-2013. Bewick's swan were also not recorded during the 2013 – 2014 winter bird survey undertaken south of Mark.

<u>Connection Potential Effects Assessment - Bewick's Swan</u>

Habitat Loss

4.5.22 Terrestrial feeding by Bewick's swans in the European wintering grounds is a relatively recent phenomenon (Colhouni and Day, 2002). MacMillan (1969; in Colhouni & Day, 2002) reported Bewick's swans feeding on arable land in Britain in 1968. This change in habit has been attributed to changes in agricultural practices in the British wintering grounds, particularly the shift towards arable cultivation and intensive drainage. Bewick's swan have been shown to frequent flooded pasture during the winter period (Rees, 1990). Bewick's swan tend to form larger flocks on arable fields (Rees *et al.,* 2008.

4.5.23 Desktop survey and field survey findings indicate that Bewick's swans do not regularly use fields within the study area for feeding or resting. No habitat loss from within existing designated areas that may be used by this species would arise. The temporary loss of agricultural grasslands within the power line corridor during construction would not affect habitats used by this species.

Displacement Effects

4.5.24 Desktop survey and field survey findings indicate that Bewick's swans do not regularly use fields within the study area for feeding or resting. As only 4 Bewick's swan were recorded on one occasion over 5 years of survey, it is likely that Bewick's swan very rarely use land adjacent to the preferred corridor, and do not use land within it for feeding or resting.

4.5.25 Taking into account the relatively small size of the Bewick's swan population using the study area and the lack of evidence to indicate that the swans regularly use the study area it is considered any displacement effects of the proposed connection are an insignificant impact on Bewick's swan.

Collisions during Regular Feeding Flights

4.5.26 Consultations with Welney WWT together with the findings of the literature review indicate that, although Bewick's swan are vulnerable to collisions with overhead lines, they generally manoeuvre better than whooper swan and are therefore more able to avoid aerial hazards such as overhead lines. The literature review did not reveal any information on the flight height of migrating Bewick's swan although it is likely that it will be comparable with whooper swan migration flights, suggesting that many migrating Bewick's swan will fly above overhead lines.

4.5.27 Desktop and field survey findings also suggest that Bewick's swan do not undertake local flights between feeding sites within the preferred corridor. The proximity of the preferred corridor to parts of the Somerset Levels suggests that foraging swans might fly across parts of the preferred corridor at least occasionally. However no evidence was obtained during field survey work undertaken during winter 2009-2010 or winter 2010-2011 to suggest that Bewick's swan make regular feeding flights within the preferred corridor or surrounding land.

4.5.28 While the risk of migrating Bewick's swan colliding with an overhead line in the preferred corridor is very low, the potential for collision mortality to this species cannot be discounted, and given its small wintering population on the Somerset Levels, any mortality loss could potentially be significant.

Collisions during Migration

4.5.29 Based on desktop and field survey findings during 2009 to 2011 there is little evidence to indicate that migrating Bewick's swan fly within the preferred corridor.

4.5.30 It is likely that the majority of Bewick's swan migrate to the Somerset Levels overland via Scotland and possibly Welney in East Anglia. Therefore it is likely that the majority of Bewick's swan flying to the Somerset Levels would not fly through the preferred corridor during their migration.

4.5.31 It is possible that a small proportion of the Bewick's swan population may migrate southwards down the west coast of the UK via sites such as Martin Mere. Swans migrating in this way might perhaps be more likely to fly across the preferred corridor however WeBS data indicates numbers of Bewick's swan using west coast sites such as Martin Mere are declining in number.

4.5.32 Citation sheets for the Bridgwater Bay SSSI indicate that an ecological link may exist between the Bridgwater Bay (part of the Severn Estuary SPA for which this is a cited species) and the Somerset Levels which are approximately 9km apart. A single record of seven Bewick's swan was recorded at Steart within the Bridgwater Bay on 8th December 2010 which was one of the first records of Bewick's swan in the wider area suggesting that these were recently arrived migrants (Table 9). On 26th December 2010 14 Bewick's swan were recorded flying along the River Parrett, which links the Bridgwater Bay to Kings Sedgemoor. Otherwise there is no other evidence to indicate that Bewick's swan fly between the Bridgwater Bay and the Somerset Levels during their migration flights.

4.5.33 Overall it is considered that the risk of migrating Bewick's swan colliding with an overhead line in the preferred corridor is very low. No migrating Bewick's swans were detected within the study area during 2009-2010 vantage point surveys. Neither were migrating Bewick's swan recorded during the nocturnal 2010-2011 vantage point surveys, during which survey effort was concentrated on parts of the study area located between Bridgwater Bay and the Somerset Levels.

4.5.34 While the risk of migrating Bewick's swan colliding with an overhead line in the preferred corridor is very low, the potential for collision mortality to this species cannot be discounted, and given its small wintering population on the Somerset Levels, any mortality loss could potentially be significant.

Whooper swan

Desktop survey

4.5.35 Whooper swan were recorded as being ‘present’ at Severn Beach WeBS site in January 2005. No other desktop records of whooper swan were obtained.

Whooper swan migration routes

4.5.36 A whooper swan satellite migration study has been undertaken by Dr Larry Griffin of WWT Scotland which entailed satellite tagging 15 swans at the Welney WWT nature reserve (Marshall, 2010). This study successfully followed the migration routes of two whooper swans tracked in autumn 2009 when migrating from Iceland to East Anglia. The first tagged whooper swan flew across Scotland and England overland whilst the second tagged swan flew down the east coast of the UK to Norfolk and then appeared to follow the River Great Ouse to the Ouse Washes. This study does not suggest usage of the study area.

Winter bird survey 2009-2010

4.5.37 Whooper swan was not recorded at any stage during the winter bird survey, indicating that whooper swan do not use fields within the Proposed Development for feeding or resting.

Vantage Point survey 2009-2010

4.5.38 Six whooper swan were recorded from VP2 on 17th November 2009 although the swans did not fly in the Preferred Corridor. A single whooper swan was recorded from VP3 on 9th February 2010 flying outside the Preferred Corridor and the risk zone at a height of 0-25 metres. No other whooper swans were recorded during the 2009-2010 vantage point survey.

Vantage Point survey 2010-2011

4.5.39 A single whooper swan was recorded from VP3b Old Yeo on 19th January 2011 flying south at risk height, although this bird did not fly through the Preferred Corridor A group of 4 whooper swans was recorded at night from VP3d Crippe River on 14th March 2011 although an accurate flight height could not be determined. Again these birds were not recorded flying within the Preferred Corridor. No other whooper swans were recorded during the 2010-2011 vantage point survey.

Connection Potential Effects Assessment - Whooper Swan

Displacement effects

4.5.40 Desktop survey and field survey findings confirm that whooper swan do not use fields within the study area for feeding or resting. Therefore whooper swan will not experience any displacement effects as a result of the proposed overhead line development.

Collisions during regular feeding flights

4.5.41 Desktop and field survey findings confirm that whooper swan do not undertake regular local flights between feeding sites within the study area. Therefore whooper swan are not at risk of overhead line collision when undertaking flights between their roosting sites and various feeding sites.

Collisions during migration

4.5.42 No migrating whooper swan were detected during the autumn migration period apart from six whooper swan flying close to VP2 on the 17th November 2009 and a group of four whooper swan recorded at VP3d on 14th March 2011. This is considered in the context that 48 hours of observation were undertaken at each vantage point in 2009-2010 and 39 hours of observation were undertaken in winter 2010-2011. Therefore it is concluded that whooper swan only migrate through the study area in very small numbers during their autumn and spring migration.

Mute Swan

4.5.43 Mute swan is listed as a Species/population identified subsequent to designation for possible future consideration under criterion 6 – species with peak counts in winter for the Somerset Levels Ramsar.

Desktop Survey

4.5.44 In Britain, the Mute Swan population has undergone a substantial increase in population size, rising from around 17 600 individuals in 1978 to 31 700 in 2002, and may have increased further since then (Kirby et al. 1994, Ward *et al.* 2007).

4.5.45 This 2006/07 – 2010/2011 5-year peak mean at the Somerset Levels SPA is 1,128 individuals. In summer the mute swan population on the Somerset Levels is approximately 120, probably representing about 30 breeding pairs, and 60 non-breeders. Nest sites are easily missed on the levels making it difficult to determine an accurate breeding population size (Bland*, pers comm*., October 2009).

4.5.46 Within 1km of the Proposed Development, moderate numbers of mute swan (>10 individuals) have been regularly recorded at Nailsea, Tickenham and Clevedon Moors (Peak count = 47 individuals on 25th February 2007), Kenn Moor (peak count = 24 individuals on 4th February 2006) and Portbury Wharf Nature Reserve (peak count = 20 individuals on 26th September 2005).

4.5.47 Within the wider area, between 2 and 15 pairs of breeding mute swan have been recorded within Moorlinch SSSI during the period 2004 to 2009. 9 pairs of mute swan were recorded at Grey Lake, southwest of Moorlinch SSSI in 2008.

4.5.48 Up to 14 pairs of breeding mute swan have been recorded at Ham Wall RSPB nature reserve, immediately east of Shapwick Heath SSSI and west of Glastonbury between 2004 and 2009.

4.5.49 The locations of mute swan records are presented at Figure 8.9.

Winter Bird Survey 2009-2010

4.5.50 Several small groups of mute swan were regularly recorded at Tealham and Tadham SSSI with swan numbers ranging from 43 to 64 individuals. A number of swans ranging from 16 to 51 individuals were recorded on the Tickenham, Nailsea & Kenn Moors SSSI. Smaller numbers of mute swan, never exceeding 10 individuals, were regularly observed at Biddle Street Yatton SSSI and Puxton Moor SSSI. 11 mute swans were recorded on the Catcott, Edington and Chilton Moors SSSI on the February 2010 winter bird survey visit.

Winter Bird Survey 2011-2012

4.5.51 Small groups of mute swan were recorded throughout the preferred corridor. The largest concentration of mute swans observed was of 45 birds, however these were located approximately 1km outside of the preferred corridor in a field alongside the M5, south of Kingston Seymour. The largest concentration of mute swan within 250m of the preferred corridor was a group of 9 mute swan recorded on Nailsea Moor during March.

Winter Bird Survey 2012-2013

4.5.52 Small groups of mute swan were recorded throughout the preferred corridor within 250m of the proposed route during the 2012-2013 winter bird survey. The largest group of mute swan recorded within 250m of the proposed route was a group of 12 individuals recorded south of Rooksbridge in December. The largest group recorded within the survey was a group of 39 mute swans recorded more than 1km south of the proposed route at Tickenham, Nailsea & Kenn Moors SSSI during March.

Winter Bird Survey 2013-2014

4.5.53 Small groups of mute swan were recorded in a few locations south of Mark during the 2013-2014 winter bird survey. The peak count of mute swan recorded was 13 individuals within a field just south of Mark between Butt Lake Road and Yardwell Road during Novemeber 2013. No other groups of more than 10 mute swan were recorded during the 2013-2014 winter bird survey.

Breeding Bird Survey 2012-2013

4.5.54 Mute swans were recorded throughout the preferred corridor, with 35 individuals recorded during the first visit and 47 during the second visit. Breeding was confirmed in seven locations within rhynes between Mark and Nailsea as well as at Portbury Wharf. The locations of mute swan recorded during the 2012 breeding bird survey are shown at Figure 8.17.

Vantage Point Survey 2009-2010

4.5.55 Mute swans were recorded from all vantage point locations with the exception of VP7 (Table 4.4). The greatest number of mute swans flight lines were recorded at VP3 where 76 flight lines were outside of the preferred corridor to the east. Mute swan flight lines are illustrated at Figure 8.21.

4.5.56 All of the swans observed flying through the preferred corridor at VP5 and VP6 flew within the risk zone. A family group of mute swans was regularly observed from VP4 using the ditches within the preferred corridor.

Table 4.4 Flight Activity for Mute Swan during the 2009-2010 Vantage Point Survey

Location	Total No. Flight lines	Total No. Flights Through Preferred Corridor	Total No. Preferred Corridor Flight lines Within Risk Zone	Total No. Flights Within 250m Proposed route	Total no. Flights Within 250m Proposed route At Risk Height
VP1	7	6	6	4	4
VP2	20	16	11	16	16
VP3	76	26	26	0	0
VP4	22	17	13	17	11
VP5	7	7	7	0	0
VP6	18	18	18	10	10
VP7	0	0	0	0	0

Vantage Point Survey 2010-2011

4.5.57 Mute swan were recorded from vantage points VP1 Bawdrip, VP3b Old Yeo and VP3d Crippe River during the 2010-2011 vantage point survey (see Table 4.5). The greatest number of mute swan flight lines were recorded at VP3d although none of these flight lines crossed the preferred corridor within the risk zone. From the directions of flight lines observed during the survey it is possible that 4 of these observed mute swan flight lines crossed over the proposed route to the west of the vantage point 3 locations.

4.5.58 All of the swans observed flying through the preferred corridor at VP1 and three of the flight lines from VP3b flew within the risk zone. Mute swan flight lines are illustrated at Figure 8.23.

Table 4.5. Flight Activity for Mute Swan during the 2010-2011 Vantage Point Survey

Location	Total No. Flight lines	Total No. Flights Through Preferred Corridor	Total No. Preferred Corridor Flight lines Within Risk Zone	Total No. Flights Within 250m Proposed route	Total No. Flights Within 250m Proposed route At Risk Height
VP1	2	2	2	0	0
VP2, 3a & 3c	0	0	0	0	0
VP3b	5	5	3	0	0
VP3d	13	11	0	0	0

Connection Potential Effects Assessment - Mute Swan

Displacement and Disturbance Effects

4.5.59 Mute swan are associated with man-made water bodies and water courses and are not vulnerable to disturbance by man. It is therefore highly unlikely that mute swan present within the vicinity of the Proposed Development will be affected by displacement caused by the installation of the proposed overhead line.

4.5.60 It is possible that minor temporary displacement may take place within 250m of the proposed route during construction works where it passes through Tickenham, Nailsea & Kenn Moors SSSI should these works take place during the winter period. Due to the abundance of suitable habitat in this area for mute swan it is highly unlikely that this will negatively impact this species.

Habitat Loss

4.5.61 Mute swan show a preference for a wide range of wetland and open water habitats (Snow and Perrins, 1998). They will also graze on grassland and agricultural land (Kear, 2005). Non-territorial mute swan have been shown to have a preference for grazing on pasture during the winter and spring periods (Wood et al., 2013). Fertiliser enriched pasture fields have been found to be attractive to mute swan (Vickery and Gill, 1999).

4.5.62 The Proposed Development will result in loss of small amounts of feeding habitat for mute swan through construction of access tracks, substations and pylon bases. Those areas of highest suitability for grazing mute swan are illustrated at Figure 8.16. It is highly unlikely that the amount of habitat loss would have a significant impact on feeding mute swan during either the breeding or non-breeding period.

4.5.63 Breeding habitat within the site generally comprises the network of watercourses present. As watercourses will be retained and avoided by at least 5m where possible it is highly unlikely that the Proposed Development will result in significant breeding habitat loss for mute swan.

Collision Risk for Migration and Regular Feeding Flights

4.5.64 Field survey findings confirm that mute swan do regularly fly in small numbers within the risk zone (10-50m in height) when undertaking local flights between feeding sites within the study area. However, only a relatively small number of mute swan flights were recorded within the vicinity of the Proposed Development indicating that the overall mute swan population associated with the study area is not large.

<u>Calculating Collision Risk</u>

4.5.65 The method used for the following calculations used to predict annual winter mortality for mute swan for the entire proposed route have been explained in Section 4.2.

<u>Predicting mute swan collision mortality for birds associated with Somerset Levels and Moors Ramsar population:</u>

4.5.66 To calculate the predicted mute swan collision mortality associated with the Somerset Levels and Moors Ramsar population, only vantage points south of the Mendips are considered (VP1, VP2 and VP4).

Stage 1: determining the number flight lines recorded

4.5.67 A total of **31** mute swan flight lines were recorded within 250m of the proposed route at risk height using data collected at VP1, VP2 and VP4.

Stage 2: calculating annual winter mortality

4.5.68 To calculate annual winter mortality results are multiplied by a factor of **36**. This gives a total of **1116**.

Stage 3: calculating the winter collision mortality for the entire proposed route

4.5.69 To calculate the mortality associated with the entire section of line south of the Mendip hills, taking into account areas where the likelihood of bird movements was high, moderate or low, the annual winter mortality results are multiplied by a factor of 2.11. This gives a total of **2,354.76**.

Stage 4: apportioning to the SPAs

4.5.70 It is assumed that 74% of the mute swan were associated with the Somerset Levels and Moors Ramsar. This gives a total of 1,742.52.

Stage 5: applying a Collision Risk Avoidance Rate

4.5.71 Using the lower limit **99.9%** collision risk avoidance rate it is calculated that **1.74** mute swan associated with the Somerset Levels and Moors Ramsar would be affected by collision mortality each winter.

4.5.72 Using the upper limit **99.5%** collision risk avoidance rate it is calculated that **8.71** mute swan associated with the Somerset Levels and Moors Ramsar would be affected by collision mortality each winter.

4.5.73 Using the realistic **99.7%** collision risk avoidance rate it is calculated that **5.23** mute swan associated with the Somerset Levels and Moors Ramsar would be affected by collision mortality each winter.

Stage 6: Five-year peak mean for the Somerset Levels and Moors SPA/Ramsar

4.5.74 The five year peak mean (2007/08 – 2011/12) for the mute swan population at the Somerset Levels and Moors SPA is **1,110**. Mute swan is a qualifying species for the Somerset Levels and Moors Ramsar which covers the same geographic area. It is therefore assumed that the Ramsar population is the same as the SPA population.

Stage 7: Percentage of Somerset Levels and Moors Ramsar population affected by collision mortality each year

4.5.75 Using the lower limit 99.9% collision risk avoidance rate it is calculated **that 0.16%** of the mute swan Ramsar population would be affected by collision mortality each year.

4.5.76 Using the upper limit 99.5% collision risk avoidance rate it is calculated that **0.78%** of the mute swan Ramsar population would be affected by collision mortality each year.

4.5.77 Using the realistic 99.7% collision risk avoidance rate it is calculated that **0.47%** of the mute swan Ramsar population would be affected by collision mortality each year.

Overall Assessment

4.5.78 It is considered that the effect of collision mortality of mute swan making local feeding flights is a low potential impact. Effects of collision mortality on migrating mute swan and displacement effects are assessed as being insignificant impacts.

4.5.79 Mute swan is not an SPA qualifying species for either the Somerset Levels and Moors SPA or the Severn Estuary SPA. It is however listed as a Species/population identified subsequent to designation for possible future consideration under criterion 6 – species with peak counts in winter for the Somerset Levels Ramsar.

European White-Fronted Goose

4.5.80 European white-fronted goose is a qualifying species for the Severn Estuary SPA under Article 4.2 (individual species -overwinter). It is also a qualifying species for the Severn Estuary Ramsar under criterion 6 (species/populations occurring at levels of international importance –winter).

Desktop Survey

4.5.81 European white-fronted goose is a migratory species which overwinters in the Netherlands, Belgium, England and Wales. The species leaves its Siberian breeding grounds in September and migrates via the Gulf of Finland. Return passage in Britain begins in March (Snow and Perrins, 1998).

4.5.82 The number of European white-fronted goose overwintering in the UK has been steadily declining and it is believed that this is due to a distributional shift in core wintering range in response to milder winters; a concept referred to as short stopping (Calbrade *et al.,* 2010). Concurrently numbers of European white-fronted goose in the Netherlands are increasing. The Severn Estuary is the most important site for European white-fronted goose in the UK with a five-year peak mean 2006/07-2010/11 of 580 individuals.

4.5.83 The local population of European white-fronted goose resides at the northern end of the Severn Estuary in the vicinity of Slimbridge. Movements away from this location are uncommon and this species is not regularly recorded away from this location.

4.5.84 The only record of white-fornted goose obtained within 1km of the Proposed Development was from 1976, when their presence was noted at the Severnside Work Site at Hallen.

Hinkley Point Bird Surveys

4.5.85 No white-fronted goose were recorded during the Hinkley Point Bird surveys.

Winter Bird Surveys 2009-2013

4.5.86 White-fronted goose were not recorded at any stage during any of the winter bird surveys carried out over 3 years strongly indicating that this species does not regularly use fields within the winter bird survey area for feeding or resting.

Vantage Point Survey 2009-2010

4.5.87 No white-fronted goose flight lines were recorded at any stage during the 2009-2010 vantage point survey.

Vantage Point Survey 2010-2011

4.5.88 No white-fronted goose flight lines were recorded at any stage during the 2010-2011 vantage point survey.

Overhead Line Potential Effects Assessment - European White-Fronted Goose

Habitat Loss

4.5.89 No habitat loss from within existing designated areas that may be used by this species would arise. The temporary loss of agricultural grasslands within the power line corridor during construction would not affect habitats used by this species.

Displacement and Disturbance Effects

4.5.90 The distribution of this species and its effective confinement to the upper part of the Severn Estuary essentially precludes any potential disturbance and displacement effects.

Collision Risk for Migration and Regular Feeding Flights

4.5.91 Potentially at risk if flight routes intersect with the power line corridor. However, the distribution of this species at the upper end of the Severn Estuary effectively precludes any potential risk of collision.

4.5.92 The lack of any European white-fronted goose flight lines throughout the entire 2009-2010 and 2010-2011 vantage point surveys strongly indicates that this species does not regularly fly through the study area for local feeding flights. It is possible that the species flies through the study area during its migration flights between the Severn Estuary and their Siberian breeding grounds, however the main white fronted goose wintering area is at the northern end of the Severn Estuary, and therefore interaction with the preferred corridor is unlikely. The collision risk to this species is considered to be very low since European white-fronted goose do not use the study area whilst wintering on the Severn Estuary.

Overall Assessment

4.5.93 It is considered that there will be no likely significant effect on populations of European white-fronted goose associated with the Severn Estuary SPA.

Teal

4.5.94 Teal is a qualifying species for the Somerset Levels and Moors SPA under Article 4.2 (individual species -overwinter). It is also a qualifying species for the Somerset Levels and Moors Ramsar under criterion 6 (species/populations occurring at levels of international importance –winter). Teal is also identified as a species subsequent to designation for possible future consideration under criterion 6 for the Severn Estuary Ramsar. Teal also forms part of the assemblage of wintering birds which is a qualifying feature for the Severn Estuary SPA

Desktop Survey

4.5.95 The majority of Icelandic breeding teal migrate to Britain (chiefly Scotland) and Ireland to overwinter. Breeding teal from northern Europe migrate to Britain and the Netherland to overwinter (Snow and Perrins, 1998).

4.5.96 During the non-breeding season, teal are widespread throughout Britain, favouring areas of shallow water on estuarine coastal lagoons, coastal and inland marshes, and flooded pastures and ponds (Lack 1986).

4.5.97 An all-time high count of teal was recorded at the Somerset Levels in winter 2011, consisting of 45, 884 individuals. This peak count was thought to be as a result of both favourable management of the Somerset Levels for teal, as well as the cold weather spell experienced in December and January. This cold weather may have concentrated teal in southwest England (Holt *et al.,* 2012). Teal are known to be highly susceptible to periods of severe winter weather and often show significant dispersal to warmer areas (Ridgill & Fox 1990).

4.5.98 Overall teal numbers have increase over the last four decades, with a general stabilising of the population in the UK since 2000/2001 (Crook *et al.,* 2013).

4.5.99 The majority of records south of the Mendips are associated with various parts of the Somerset Levels SPA although there are a small number of records for Bridgwater Bay. Notable records include a count of 19,216 teal at Tealham and Tadham SSSI in December 2005.

4.5.100 A local ornithologist has advised that a large and mobile teal winter population of approximately 400 birds uses the wider area, using ponds, rhynes and the Severn Estuary (Bland, *pers.* comm., October 2009).

4.5.101 Over 1,000 teal were recorded by a local birdwatcher on 13th January 2011 at Greylake RSPB reserve.

4.5.102 North of the Mendips, the areas most used by teal include pools near Avonmouth sewage works (peak count 200 indiv. In 1993) and the pools at Portbury Wharf Nature Reserve (peak count 110 birds, January and February 2008). Larger numbers have been recorded at the Severn Estuary at Portbury including a peak count of 420 individuals in 2006.

4.5.103 A number of records of teal using Nailsea Moor and Puxton Moor were also obtained, with peak counts of 58 individuals and 35 individuals respectively.

Puriton Wind Farm Bird Surveys

4.5.104 A peak count of seven teal was recorded on the proposed Puriton wind farm site in February 2009 however no teal were recorded during the 2008 breeding bird survey (Parsons Brinckerhoff, 2010). Teal were recorded flying within the wind farm site for a total of 390 seconds out of 69 hours of vantage point survey undertaken between May 2008 and April 2009. These findings indicate the relatively low importance of the preferred Corridor for teal where it crosses the Huntspill River.

Hinkley Point Bird Surveys

4.5.105 Small numbers of teal were recorded using Wick Moor during winter nocturnal surveys. Peak counts of teal using the Sewage Works pool, located approximately 250m from the closest part of the proposed development for the Hinkley Point C Connection project included 70 birds in January 2008 and 110 birds in January 2009. Elsewhere within the survey area only very small numbers of teal were recorded.

Winter Bird Survey 2009-2010

4.5.106 A peak count of 400 teal was recorded at Tealham and Tadham Moors SSSI in late January 2010. Teal were recorded at least once, usually in single figures, at all of the other SSSIs included in the winter bird survey.

Winter Bird Survey 2011-2012

4.5.107 A peak count of 5 teal was recorded at Portbury Wharf during the 2011-2012 winter bird survey. Small numbers of teal were also recorded on Nailsea Moor, including a 1 individual recorded during the nocturnal survey.

Winter Bird Survey 2012-2013

4.5.108 A peak count of 75 teal was observed within 250m of the proposed route during the 2012-2013 winter bird survey. These birds were recorded on the Brandeer Rhyne, east of Oldbridge River on Puxton Moor during January. A total of 97 teal were recorded within 250m of the proposed route during January. The largest number of teal recorded within 250m of the proposed route during any other survey visit was 34 individuals during the February visit. Less than 16 teal were recorded within this survey area during every other survey visit.

4.5.109 At Avonmouth Sewage Works (Avonmouth Pools), located more than 250m west of the proposed route, teal were regularly recorded throughout the winter bird survey. A peak count of 35 teal was recorded in this location during January 2013.

Winter Bird Survey 2013-2014

4.5.110 No teal were recorded during the 2013-2014 winter bird survey.

Breeding Bird Survey 2012

4.5.111 A single teal was recorded at the pools at Portbury Wharf, and another individual recorded at the pools at Avonmouth Sewage Works during the 2012 breeding season. It is highly unlikely that these birds bred within this area.

Breeding Bird Survey 2013

4.5.112 No teal were recorded during the 2013 breeding season.

Vantage Point Survey 2009-2010

4.5.113 The highest numbers of teal flying through the risk zone were observed at VP3 where 54 flight lines were recorded, which is equivalent to just over 1 flight line per survey hour (see Table 4.6).

4.5.114 Small numbers of teal were recorded flying across the preferred corridor from VPs 2, 4, 6 and 7. The majority of bird flights recorded at VP6 were within the risk zone, however only 15 birds were recorded within the risk zone from this vantage point during the entire survey season. The majority of these flights were near to dusk with some birds being recorded during the night time.

Table 4.6. Flight Activity for Teal during the 2009-2010 Vantage Point Survey

Location	Total No. Flight lines	Total No. Flights Through Preferred Corridor	Total No. Preferred Corridor Flight lines Within Risk Zone	Total No. Flights Within 250m Proposed route	Total No. Flights Within 250m Proposed route At Risk Height
VP1	14	14	0	7	0
VP2	2	2	2	2	2
VP3	54	0	0	0	0
VP4	2	2	2	1	1
VP5	0	0	0	0	0
VP6	15	13	13	4	4
VP7	7	7	7	7	7

Description of Teal Flight lines 2009-2010

4.5.115 The flight lines for teal relative to vantage point locations are illustrated at Drawings Figure 8.21.

Vantage Point 1:

4.5.116 Teal were only recorded in early winter, where one group flew in a northerly direction and it is expected that it flew across the proposed route to the north, although above the risk zone. A second group of birds was recorded flying to the east outside of the preferred corridor. Teal may not have been recorded in this location in the latter part of the winter due to the absence of wetlands in the immediate locality, such as ditches and small lakes.

Vantage Point 2:

4.5.117 Teal were only recorded in late winter, where one individual flew east to west close to the Huntspill River and a second individual flew southwest to the south of the Huntspill River. Both birds flew within the risk zone across the proposed route.

Vantage Point 3:

4.5.118 A total of 54 teal flight lines were recorded from VP3, with 22 flight lines recorded in early winter and 32 flight lines in late winter. The early winter flight lines were generally made of small numbers of larger groups of birds (largest group size: 16 individuals) whereas the flight lines in late winter were made by smaller groups of birds. 26 individuals were observed to fly along or closely parallel to the Huntspill River. A total of 24 teal flight lines were recorded that could possibly have either crossed the proposed route prior to or following the observation from VP3.

Vantage Point 4:

4.5.119 Teal were only recorded in late winter, where two individuals were recorded flying over the preferred corridor. Only one individual was recorded flying over the proposed route, flying in a westerly direction.

Vantage Point 5:

4.5.120 No teal were recorded from this vantage point.

Vantage Point 6:

4.5.121 Pairs of teal were occasionally recorded to fly across the preferred corridor throughout both early and late winter. The majority of birds recorded within the preferred corridor flew on a north-south orientation. Only 4 individuals were recorded flying within 250m of the proposed route, all of which were flying in an easterly direction.

Vantage Point 7:

4.5.122 Two small groups were recorded in late winter; both flew southeast across the preferred corridor within 250m of the proposed route along the River Avon.

Vantage Point survey 2010-2011

4.5.123 The highest number of teal flying through the risk zone were observed at VP3a and VP3b where 4 flight lines were recorded at each (see Table 4.7). Teal flight lines are illustrated at Figure 8.23.

4.5.124 Small numbers of teal were also recorded flying from VPs 3c and 3d. Only two birds were recorded flying within the risk zone from each of these locations.

4.5.125 From the flight lines recorded it is possible that a maximum of 20 flight lines may have crossed the proposed route either prior to or after being observed during the survey, although it is likely to be substantially less than this.

Table 4.7. Flight Activity for Teal during the 2010-2011 Vantage Point Survey

Location	Total No. Flight lines	Total No. Flights Through Preferred Corridor	Total No. Preferred Corridor Flight lines Within Risk Zone	Total No. Flights Within 250m Proposed route	Total No. Flights Within 250m Proposed route At Risk Height
VP1 & 2	0	0	0	0	0
VP3a	35	30	12	0	0
VP3b	8	8	4	0	0
VP3c	2	2	2	0	0
VP3d	19	14	2	0	0

Proposed Connection Potential Effects Assessment - Teal

Habitat Loss

4.5.126 In the context of the extensive wet grassland and wetland habitat across the Somerset Levels and the Severn Estuary available to wintering teal, the temporary loss of habitat within the preferred corridor during construction is not considered to be significant.

Disturbance and Displacement Effects

4.5.127 Field survey findings indicate that teal may make use of areas in proximity to the route corridor area for feeding or resting. Small numbers of birds are present at Portbury Wharf and Avonmouth Sewage Works (Avonmouth Pools) and potentially, if the alternative route at Portbury is selected, birds here could be subject to some disturbance.

4.5.128 This species is not considered to be particularly susceptible to displacement effects associated with overhead lines. Therefore it is considered that any displacement effects associated with teal as a result of the proposed connection will be minor.

Collision Risk for Migration and Regular Feeding Flights

4.5.129 Teal were observed in small numbers flying close to and across the route corridor during the vantage point surveys. The movements of small ducks detected in the Radar study for the proposed wind farm near West Huntspill could potentially include this species.

4.5.130 Desktop and field survey findings confirm that teal undertake some local flights across the study area when moving between feeding sites. It is possible that flights recorded at VP6 represent teal flights between the Severn Estuary and feeding areas associated with Puxton Moor SSSI and Biddle Street Yatton SSSI as well as other SSSIs based on assemblages of ditches further to the north. The River Yeo also provides a potential link between these SSSIs and the Severn Estuary which are approximately 4 to 5km apart.

4.5.131 Small groups of teal were regularly recorded on the River Crippe close to VP3d throughout winter 2010-2011 although these birds tended to fly below risk height when making local flights.

4.5.132 It is possible that wintering teal associated with the Somerset Levels may move across to Bridgwater Bay and it is considered likely that teal associated with the Somerset Levels will occasionally feed in ditches and ponds within the closest parts of the study area. It is therefore considered that there is a low potential for teal collision mortality to occur, particularly during local feeding flights.

4.5.133 It is possible that teal population exchange takes place between the Bridgwater Bay SSSI and the Somerset Levels. Field survey findings do not fully support this and it is believed that these movements are sporadic being mostly influenced by the weather rather than there being regular movements.

<u>Part A: predicting teal collision mortality for the entire proposed route (Severn Estuary SPA/Ramsar)</u>

<u>*Stage 1: determining the number flight lines recorded*</u>

4.5.134 It is calculated that a total of **14** teal flight lines were recorded within 250m of the proposed route at risk height during 47 hours of observation (VP1, VP2, VP4, VP6 and VP7).

Stage 2: calculating annual winter mortality on a zero-avoidance basis for the VP survey area

4.5.135 If it is assumed that all flights in the risk zone result in collision, to calculate annual winter mortality, results from the VP survey are multiplied by a factor of 36. This gives a total of **504** collisions.

Stage 3: calculating the zero-avoidance winter collision mortality for the entire proposed route

4.5.136 To calculate the mortality associated with the entire route, correcting for areas where the likelihood of bird movements was high, moderate or low, the annual winter mortality results are multiplied by a scaling factor of **2.85**. This gives a total of **1,436.40** collisions.

Stage 4: apportioning to the SPAs

4.5.137 The 5-year peak mean (2007/08 – 2011/12) for teal at the Severn Estuary SPA is **4,893**, whereas the Somerset Levels and Moors SPA supports **22,210** individuals. For the section south of the Mendip Hills where teal could be associated with the Severn Estuary SPA or the Somerset Levels and Moors SPA it is therefore assumed that **18%** of the teal were associated with the Severn Estuary SPA. Within the section south of the Mendips (using 3 flight lines recorded from vantage points 1,2 and 4, this gives a total of **55.40** teal collisions assuming no avoidance for the Severn Estuary SPA. Within the section north of the Mendips where 100% of flight lines were considered to be associated with the Severn Estuary SPA, using the **11** teal flight lines recorded from vantage point 6 and 7 it is calculated that **1,128.60** teal collisions assuming no avoidance. This gives a total of **1,194.00** teal collisions assuming no avoidance action (sum of sections both south of the Mendips and north of the Mendips).

Stage 5: applying a Collision Risk Avoidance Rate

4.5.138 Using the lower limit **99.9% collision risk avoidance** rate it is calculated that **1.18** teal associated with the Severn Estuary SPA would be affected by collision mortality along the entire length of the proposed route each winter.

4.5.139 Using the upper limit **99.5% collision risk avoidance** rate it is calculated that **5.92** teal associated with the Severn Estuary SPA would be affected by collision mortality along the entire length of the proposed route each winter.

4.5.140 Using the realistic **99.7% collision risk avoidance rate** it is calculated that **3.55** teal associated with the Severn Estuary SPA would be affected by collision mortality along the entire length of the proposed route each winter.

Stage 6: Five-year peak mean for the Severn Estuary SPA

4.5.141 The five year peak mean (2007/08 – 2011/12) for the teal population at the Severn Estuary SPA is **4,893**. Teal is a contributing species to the Severn Estuary SPA wintering waterfowl assemblage but it is not an SPA qualifying species.

Stage 7: Percentage of SPA population affected by collision mortality each year

4.5.142 Using the lower limit **99.9%** collision risk avoidance rate it is calculated that **0.024%** of the teal population associated with the Severn Estuary SPA would be affected by collision mortality each year.

4.5.143 Using the upper limit **99.5% collision risk avoidance** rate it is calculated that **0.12**% of the teal population associated with the Severn Estuary SPA would be affected by collision mortality each year.

4.5.144 Using the realistic **99.7% collision risk avoidance rate** it is calculated that **0.07**% of the teal population associated with the Severn Estuary SPA would be affected by collision mortality each year.

<u>Part B: predicting teal collision mortality for Somerset Levels and Moors SPA population birds:</u>

4.5.145 A proportion of the teal recorded during VP surveys should be considered as not contributing to the Somerset Levels and Moors SPA population since there are many other possible sites for teal to overwinter in the vicinity of the study area which are distant from the SPA. To take account of this it is assumed that when predicting collision mortality effects on the Somerset Levels and Moors SPA, teal flight lines recorded at VP survey locations located within 10km of the Somerset Levels SPA (VP1, VP2 and VP4) need only be considered.

<u>Stage 1: determining the number flight lines recorded</u>

4.5.146 A total of **3** teal flight lines were recorded within the proposed route at risk height using data collected at VP1, VP2 and VP4.

<u>Stage 2: calculating annual winter mortality on a zero-avoidance basis for the VP study area</u>

4.5.147 If it is assumed that all flights in the risk zone result in collision, to calculate annual winter mortality results are multiplied by a factor of **36**. This gives a total of **108** collisions.

<u>Stage 3: calculating the zero-avoidance winter collision mortality for the section associated with the Somerset Levels and Moors SPA</u>

4.5.148 To calculate the mortality associated with the section of line south of the Mendip Hills, taking into account areas where the likelihood of bird movements was high, moderate or low, the annual winter mortality results are multiplied by a factor of **2.11**. This gives a total of **227.88** collisions.

<u>Stage 4: apportioning to the SPAs</u>

4.5.149 It is assumed that **82%** of the teal were associated with the Somerset Levels and Moors SPA. This gives a total of **186.86**.

<u>Stage 5: applying a Collision Risk Avoidance Rate</u>

4.5.150 Using the lower limit **99.9% collision risk avoidance** rate it is calculated that **0.19** teal associated with the Somerset Levels and Moors SPA would be affected by collision mortality each winter.

4.5.151 Using the upper limit **99.5% collision risk avoidance** rate it is calculated that **0.93** teal associated with the Somerset Levels and Moors SPA would be affected by collision mortality each winter.

4.5.152 Using the realistic **99.7% collision risk avoidance** rate it is calculated that **0.56** teal associated with the Somerset Levels and Moors SPA would be affected by collision mortality each winter.

<u>Stage 6: Five-year peak mean for the Somerset Levels and Moors SPA</u>

4.5.153 The five year peak mean (2007/08 – 2011/12) for the teal population at the Somerset Levels and Moors SPA is **22,210**. Teal is a qualifying species for the Somerset Levels and Moors SPA.

<u>Stage 7: Percentage of SPA population affected by collision mortality each year</u>

4.5.154 Using the lower limit **99.9% collision risk avoidance** rate it is calculated that **0.001%** of the teal SPA population would be affected by collision mortality each year.

4.5.155 Using the upper limit **99.5% collision risk avoidance** rate it is calculated that **0.004%** of the teal SPA population would be affected by collision mortality each year.

4.5.156 Using the realistic **99.7% collision risk avoidance** rate it is calculated that **0.003%** of the teal SPA population would be affected by collision mortality each year.

<u>Gadwall</u>

4.5.157 Gadwall is a qualifying species for the Severn Estuary SPA under Article 4.2 (individual species -overwinter). It is also a qualifying species for the Severn Estuary Ramsar under criterion 6 (species/populations occurring at levels of international importance –winter).

Desktop Survey

4.5.158 Gadwall breeders in England are believed to be sedentary although some breeders in Scotland and Iceland do migrate to England and Ireland (Snow and Perrins, 1998).

4.5.159 Gadwall have undergone a large increase in population size within Great Britain over the last 30 years. Within the desktop search area perhaps 20 breeding pairs use the ponds at Backwell Lake and Avonmouth Sewage Works (Bland*, pers comm*., October 2009).

4.5.160 Gadwall are known to regularly use the pools at Portbury Wharf Nature Reserve, with a peak count of 20 individuals recorded in this location in December 2008.

4.5.161 Although the Severn Estuary SPA is partly designated for its gadwall population, the SPA no longer supports national or internationally important numbers of this species. This species seems to have undergone a shift in winter distribution in recent years (Holt *et al.,* 2012).

4.5.162 There are a large number of records for gadwall, the majority of which are associated with various locations in the Somerset Levels. Notable records include a count of 19,216 gadwall on the east part of Catcott, Edington and Chilton Moors SSSI in December 2005.

4.5.163 34 out of a total of 64 gadwall records obtained in 2010 concerned the eastern part of Catcott, Edington and Chilton Moors SSSI indicating the importance of this location for gadwall.

4.5.164 93 gadwall were recorded at Shapwick Heath on 9th June 2011. Over 50 gadwall were recorded at Meare Heath to the east of Shapwick Heath on 23rd September 2010 (www.somersetbirds.net).

Hinkley Point Bird Surveys

4.5.165 A single gadwall was recorded using the Avonmouth Sewage Works pool on one occasion. This pool is located 250m from the closest proposed works associated with the Hinkley Point C Connection Project.

Winter Bird Survey 2009-2010

4.5.166 Gadwall were only recorded on one occasion throughout the entire winter bird survey. This record concerned two gadwall at the Tealham and Tadham SSSI in late January 2010.

Winter Bird Survey 2011-2012

4.5.167 Gadwall were recorded at Portbury Wharf during the 2011-2012 winter bird survey, where 12 gadwall were recorded within the pool at the northern edge of the preferred corridor. Small numbers of gadwall were also recorded within the pools to the south of this area within the reserve. A group of 14 gadwall was also observed at Avonmouth Pools.

Winter Bird Survey 2012-2013

4.5.168 Gadwall were again recorded within the pools and lagoons at Portbury Wharf and Avonmouth sewage treatment works (Avonmouth Pools) throughout the 2012-2013 winter bird survey. A peak count of 13 and 16 gadwall were recorded in each of these locations.

Winter Bird Survey 2013-2014

4.5.169 No gadwall were recorded during the 2013-2014 winter bird survey.

Breeding Bird Survey 2012

4.5.170 Small numbers of gadwall recorded within the pools and lagoons at Portbury Wharf during the 2012 breeding bird survey.

Breeding Bird Survey 2013

4.5.171 No gadwall were recorded during the 2013 breeding bird survey.

Vantage Point Survey 2009-2010

4.5.172 Two gadwall were observed flying at VP2 in early December 2009, crossing the proposed route but above the risk height (See Table 4.8). The flight lines are illustrated at Figure 8.21.

Table 4.8. Flight Activity for Gadwall during the 2009-2010 Vantage Point Survey

Location	Total No. Flight lines	Total No. Flights Through Preferred Corridor	Total No. Preferred Corridor Flight lines Within Risk Zone	Total No. Flights Within 250m Proposed route	Total No. Flights Within 250m Proposed route At Risk Height
VP1 & 3-7	0	0	0	0	0
VP2	2	2	0	2	0

Vantage Point Survey 2010-2011

4.5.173 No gadwall flight lines were recorded at any stage during the 2010-2011 vantage point survey.

Connection Potential Effects Assessment - Gadwall

Habitat Loss

4.5.174 No habitat loss from within existing designated areas that may be used by this species would arise. The temporary loss of agricultural grasslands within the power line corridor during construction would not affect habitats used by this species.

Disturbance and Displacement Effects

4.5.175 Desktop survey and field survey findings confirm that gadwall do not use fields or rivers within the study area for feeding or resting during the winter period. The proposed route (Option A) lies more than 1.5km south of the closest point of Portbury Wharf where gadwall have been recorded. Construction works associated with the proposed overhead line in this location would therefore not have a displacement effect on gadwall.

4.5.176 The alternative proposed route (Option B) lies approximately 120m south of the small pools at Portbury Wharf where small numbers of gadwall have been recorded. It is possible that the small number of gadwall using these ponds could suffer short term displacement during construction works if the works were carried out during the winter period. However, as the birds would be likely to temporarily move to the lagoon located approximately 200m north of this location, it is highly unlikely that the works would negatively impact these birds.

4.5.177 The proposed route is located 250m east of the Avonmouth Sewage Treatment Works (Avonmouth Pools). It is highly unlikely therefore that any breeding or wintering gadwall using the pools at the treatment works would suffer any displacement as a result of the proposed connection.

Collision Risk for Migration and Regular Feeding Flights

4.5.178 Desktop and field survey findings also confirm that gadwall do not undertake regular local flights between feeding sites across the study area and it is believed that many gadwall stay on the Estuary for the entire winter. Therefore gadwall are not considered to be at risk of collision with the proposed overhead line. Wintering gadwall associated with the Cheddar Reservoir SSSI are not considered to be vulnerable to collision mortality with the proposed overhead line since Cheddar Reservoir is over 5km from the proposed route.

4.5.179 There is no evidence to suggest that gadwall wintering in the Somerset Levels and Moors SPA undertake regular movements that would entail birds crossing the proposed power line route. No gadwall were observed during the vantage point surveys.

4.5.180 Predicted impacts on migrating gadwall are assessed as being insignificant.

Shelduck

4.5.181 Shelduck is a qualifying species for the Severn Estuary SPA under Article 4.2 (individual species -overwinter). It is also a qualifying species for the Severn Estuary Ramsar under criterion 6 (species/populations occurring at levels of international importance –winter).

Desktop Survey

4.5.182 In winter approximately 160 shelduck have been counted on the small estuarine strips in the study area immediately north of the River Avon, and a few come further inland. In summer small numbers of birds will breed in areas close to the estuary, especially Portbury Wharf, but most of the 30 birds counted will have been non-breeders (Bland, *pers. comm*., October 2009). Shelduck use the Bridgwater Bay as a post breeding moulting ground and are present in nationally important numbers.

4.5.183 Shelduck have been recorded to use Avonmouth pools (peak count: 5 indiv.), Nailsea Moor (peak count: 2 indiv.), Portbury Wharf Nature Reserve (peak count: 18 indiv.) and Portishead Marina (peak count: 60 indiv.) on a number of occasions.

4.5.184 Five records of shelduck were obtained that concerned Greylake RSPB reserve although the highest count concerned six individuals recorded in March 2008. Another shelduck record concerned a count of 3,483 individuals in the Severn Estuary 6km north of Bristol.

4.5.185 In addition to these records a group of 11 shelduck were recorded on the proposed Puriton wind farm site within the preferred corridor in spring 2008 (Parsons Brinkerhoff, 2008).

Hinkley Point Bird Surveys

4.5.186 Small numbers of shelduck were recorded on an occasional basis in the coastal fields at Hinkley Point. These birds were found to use fields to the west of the power station, more than 500m from the proposed works associated with the connection project. Shelduck were regularly recorded within the intertidal zone off the coast of Hinkley Point, however this area also lies more than 500m from the proposed works at its closest point.

Winter Bird Survey 2009-2010

4.5.187 No shelduck were recorded at any stage during the winter bird survey indicating that shelduck do not regularly use the winter bird survey area for feeding or resting.

Winter Bird Survey 2011-2012

4.5.188 A peak count of 2 shelduck were recorded at Portbury Wharf during the 2011-2012 winter bird survey. A peak count of 5 shelduck were recorded within the pools to the northwest of Avonmouth Sewage Treatment Works (Avonmouth Pools). No shelduck were recorded within the rest of the preferred corridor indicating that shelduck do not regularly use the rest of this area.

Winter Bird Survey 2012-2013

4.5.189 Shelduck were occasionally recorded on the River Avon within 250m of the proposed route during the 2012-2013 winter bird survey. A peak count of 2 individuals was recorded in this location during January.

Winter Bird Survey 2013-2014

4.5.190 No shelduck were recorded during the 2013-2014 winter bird survey.

Vantage Point Survey 2009-2010

4.5.191 One shelduck was recorded from VP2 on 26th October. The bird crossed the proposed route but outside the risk height (see Table 4.9). The flight line is illustrated at Figure 8.21.

4.5.192 Small numbers of shelduck were also recorded throughout the survey season from VP7. A total of 16 bird flights were recorded from this Vantage Point. Of these, 12 were recorded flying within the risk zone. However these shelduck tended to fly close to the water therefore the collision risk for shelduck is considerably reduced.

Table 4.9. Flight Activity for Shelduck during the 2009-2010 Vantage Point Survey

Location	Total No. Flight lines	Total No. Flights Through Preferred Corridor	Total No. Preferred Corridor Flight lines Within Risk Zone	Total No. Flights Within 250m Proposed route	Total No. Flights Within 250m Proposed route At Risk Height
VP1 & 3-6	0	0	0	0	0
VP2	1	1	0	1	0
VP7	16	12	12	7	7

Vantage Point Survey 2010-2011

4.5.193 A small number of shelduck flight lines were recorded from VP2 only during the 2010-2011 vantage point survey. A total of 8 flight lines were recorded from this location, with 4 flight lines crossing the proposed route within the risk zone (see Table 4.10). The flight lines are illustrated at Figure 8.23.

Table 4.10. Flight Activity for Shelduck during the 2010-2011 Vantage Point Survey

Location	Total No. Flight lines	Total No. Flights Through Preferred Corridor	Total No. Preferred Corridor Flight lines Within Risk Zone	Total No. Flights Within 250m Proposed route	Total No. Flights Within 250m Proposed route At Risk Height
VP1, 3a, 3c, & 3d	0	0	0	0	0
VP2	8	8	4	8	4

Connection Potential Effects Assessment - Shelduck

Habitat Loss

4.5.194 No habitat loss from within existing designated areas that may be used by this species would arise. The temporary loss of agricultural grasslands within the power line corridor during construction would not affect habitats used by this species.

Disturbance and Displacement Effects

4.5.195 Desktop survey and field survey findings confirm that apart from at Portbury Wharf and Avonmouth Sewage Works, shelduck do not regularly use the majority of the wetlands and fields within the study area for feeding or resting. Therefore shelduck are unlikely to experience displacement effects as a result of the proposed connection.

4.5.196 The proposed route (Option A) lies more than 1.5km south of the areas at Portbury Wharf where small numbers of shelduck have been recorded. Construction works associated with the proposed overhead line in this location would therefore not have a displacement effect on shelduck.

4.5.197 The alternative route (Option B) includes installation of a short section of overhead line approximately 80m south of the lagoon at the north of Portbury Wharf, where small numbers of shelduck have been recorded. There is therefore a possibility that small numbers of shelduck will be temporarily disturbed and displaced if Option B is selected.

4.5.198 The proposed route is located more than 250m east of the Avonmouth Sewage Treatment Works pools. It is highly unlikely therefore that any shelduck using the pools at the treatment works would suffer any displacement as a result of the proposed connection.

Collision Risk for Migration and Regular Feeding Flights

4.5.199 Field survey findings confirm that shelduck do occasionally fly along the River Avon within the risk zone (10 to 50 metres). However the majority of the shelduck flew within 10 metres of the water at a height which would allow these birds to fly below the proposed overhead line. The proposals also include the removal two sections of 132kV overhead line that cross Portbury Wharf Nature Reserve which currently provide a collision risk to shelduck using this area. Therefore the overall collision risk will be reduced further.

Predicting shelduck collision mortality for birds associated with Severn Estuary SPA population:

To calculate the predicted shelduck collision mortality associated with the Severn Estuary SPA population, vantage points 1,2,4, 6 and 7 are considered.

Stage 1: determining the number flight lines recorded

A total of 7 shelduck flight lines were recorded within 250m of the proposed route at risk height using data collected at VP1, VP2, VP4, VP6 and VP7.

Stage 2: calculating annual winter mortality

To calculate annual winter mortality results are multiplied by a factor of 36. This gives a total of **252**.

Stage 3: calculating the winter collision mortality for the entire proposed route

To calculate the mortality associated with the entire section of line, taking into account areas where the likelihood of bird movements was high, moderate or low, the annual winter mortality results are multiplied by a factor of **2.85**. This gives a total of **718.20**.

Stage 4: apportioning to the SPAs

The 5-year peak mean (2007/08 – 2011/12) for shelduck at the Severn Estuary SPA is **4,285** individuals. It is assumed that 100% of the shelduck observed were associated with the Severn Estuary SPA.

Stage 5: applying a Collision Risk Avoidance Rate

Using the lower limit **99.9% collision risk avoidance rate** it is calculated that **0.72** shelduck associated with the Severn Estuary SPA would be affected by collision mortality along the entire length of the proposed route each winter.

Using the upper limit **99.5% collision risk avoidance rate** it is calculated that **3.59** shelduck associated with the Severn Estuary SPA would be affected by collision mortality along the entire length of the proposed route each winter.

Using the realistic **99.7% collision risk avoidance rate** it is calculated that **2.15** shelduck associated with the Severn Estuary SPA would be affected by collision mortality along the entire length of the proposed route each winter.

Stage 6: Five-year peak mean for the Severn Estuary SPA

The five year peak mean (2007/08 – 2011/12) for the shelduck population at the Severn Estuary SPA is **4,285**. Shelduck is a qualifying species for the Severn Estuary SPA.

Stage 7: Percentage of SPA population affected by collision mortality each year

Using the lower limit **99.9% collision risk avoidance rate** it is calculated that **0.02%** of the shelduck population associated with the Severn Estuary SPA would be affected by collision mortality each year.

Using the shelduck limit **99.5% collision risk avoidance rate** it is calculated that **0.08%** of the shelduck population associated with the Severn Estuary SPA would be affected by collision mortality each year.

Using the realistic **99.7% collision risk avoidance rate** it is calculated that **0.05%** of the shelduck population associated with the Severn Estuary SPA would be affected by collision mortality each year.

Wigeon

4.5.200 Wigeon is listed as an additional qualifying species for the Somerset Levels and Moors SPA identified by the 2001 UK SPA Review. It is also listed as a species/population identified subsequent to designation for possible future consideration under criterion 6 – species with peak counts in winter for the Somerset Levels Ramsar.

Desktop Survey

4.5.201 Wigeon in Britain tend to be resident birds although some British wigeon do make small southwest movements in the winter. Some Icelandic and North mainland European wigeon also migrate to Britain to overwinter.

4.5.202 A peak count of 26,242 wigeon was recorded within the Catcott, Edington and Chilton Moors SSSI in 2001. The 2006/07-2010/11 five-year peak mean for the Somerset Levels is 30,944 which greatly exceeds the international threshold of 15,000. A large increase in numbers of wigeon using the Somerset Levels was recorded in the winter of 2010/2011 with a peak count of 51,189 individuals. Overall trends for wigeon in the UK have been a steady increase over the last 30 years, which appears to have plateaued since 2005/2006 (Holt *et al.,* 2012).

4.5.203 Desktop survey records for wigeon strongly confirm the importance of various parts of the Somerset Levels for wintering wigeon and also the Bridgwater Bay SSSI to a lesser extent (Table 4.11). A single record for 60 wigeon was recorded on the Huntspill River between Bridgwater Bay and the Somerset Levels in February 2002.

4.5.204 Other locations to the north of the Mendips where wigeon have been recorded on a number of occasions include Avonmouth Pools (peak count: 8 indiv.), Portbury Wharf Nature Reserve (peak count: 75 indiv.) and Portbury Chapel Pill (peak count: 80 indiv.).

Table 4.1. Selected Desktop Survey Records for Wigeon 2000-2013

Site Name	Date/Year	Count
Bridgwater Bay SSSI	December 2000	700
Bridgwater Bay SSSI	January 2002	600
Huntspill River	February 2002	60
Chilton Moor Reserve	December 2001	150
Catcott Lows Reserve	Winter 2004-2005	2,500
Catcott Lows Reserve	Winter 2005-2006	1,000
Kings Sedgemoor SSSI	December 2002	2,300
Shapwick Heath SSSI	November 2001	760
Westhay Moor NNR	December 2002	230

Site Name	Date/Year	Count
Ham Wall RSPB reserve	December 2002	233
Portbury Wharf	5th October 2007	75
Portbury, Chapel Pill	10th February 2009	80
Portbury Wharf	August 2009	Up to 18
West Moor	29th December 2010	500
Catcott Lows	29th December 2010	350
Greylake RSPB reserve	13th January 2011	2000+
South Lake Moor (near Burrowbridge – 7km south east of Bridgwater)	5th February 2011	2000
Catcott	20th April 2011	2
Ham Wall RSBB reserve	April 2011	5
Kings Sedgemoor SSSI	5th February 2013	6,200
Wet Moor SSSI, east of Muchelney (16km south east of Bridgwater)	7th February 2013	1,500
Curry and Hay Moor SSSI (12km south of Bridgwater)	28th February 2013	5,750

Hinkley Point Bird Surveys

4.5.205 Very low numbers of wigeon (1 – 2 individuals) were recorded on 3 dates during the winter period on fields and ditches particularly around Wick Moor. Wigeon were not recorded to use the coastal fields on any other occasion during the Hinkley Point bird surveys.

Winter Bird Survey 2009-2010

4.5.206 Although only 11 wigeon were recorded on the Tealham and Tadham SSSI in late November 2009, wigeon numbers later increased to 700 in late January 2010 and 550 in late February 2010. 30 wigeon were recorded on the Catcott, Edington and Chilton Moors SSSI in late February 2010. Otherwise wigeon was not recorded on any of the other SSSIs covered by the winter bird survey.

Winter Bird Survey 2011-2012

4.5.207 A peak count of 17 wigeon were recorded within the large pool at the northern edge of the Portbury Wharf Nature Reserve during the 2011-2012 winter bird survey. No other wigeon were recorded elsewhere within the preferred corridor during this survey.

Winter Bird Survey 2012-2013

4.5.208 The only wigeon recorded during the 2012-2013 winter bird survey was a group of 56 individuals recorded on the large pool at the north of Portbury Wharf during March 2013.

Winter Bird Survey 2013-2014

4.5.209 A group of 38 wigeon were recorded flying south over Southwick Road during the 2013-2014 winter bird survey. The birds flew at a height of approximately 30 - 40m. No other wigeon were recorded during the 2013-2014 winter bird survey.

Vantage Point Survey 2009-2010

4.5.210 Wigeon flight lines are illustrated at Figure 8.21. No wigeon flight activity was observed at any vantage point locations with the exception of VP2 during the 2009-2010 vantage point survey (Table 4.11). A total of 57 wigeon flight lines were recorded from vantage point 2, however none of these passed within the preferred corridor. A group of 15 wigeon was recorded over 1km to the east of the proposed route outside the risk zone on 17th November at 08:30 am. A group of 42 individuals was also recorded flying south over the River Huntspill and then back north again. All of these birds flew outside of the risk height and were outside of the preferred corridor to the east. A group of 125 wigeon were recorded on the water from VP2 during December 2009; these birds located approximately 1.6km east of the closest part of the proposed route and were not observed to fly.

Table 4.22. Flight Activity for Wigeon during the 2009-2010 Vantage Point Survey

Location	Total No. Flight lines	Total No. Flights Through Preferred Corridor	Total No. Preferred Corridor Flight lines Within Risk Zone	Total No. Flights Within 250m Proposed route	Total No. Flights Within 250m Proposed route At Risk Height
VP1 & 3-7	0	0	0	0	0
VP2	57	0	0	0	0

Vantage Point Survey 2010-2011

4.5.211 A total of thirteen wigeon flight lines were observed from VP3b and VP3d Crippe River, however only two were at risk height (see Table 4.13). These flight lines are illustrated at Figure 8.23.

4.5.212 From the direction of the wigeon flight lines it is considered possible that some of the observed flight lines crossed the preferred proposed route to the west of the observed location either prior to or after they were observed.

Table 4.13. Flight Activity for Wigeon during the 2010-2011 Vantage Point Survey

Location	Total No. Flight lines	Total No. Flights Through Preferred Corridor	Total No. Preferred Corridor Flight lines Within Risk Zone	Total No. Flights Within 250m Proposed route	Total No. Fights Within 250m Proposed route At Risk Height

VP1, 2, 3a & 3c	0	0	0	0	0
VP3b	1	0	0	0	0
VP3d	12	0	0	0	0

Connection Potential Effects Assessment - Wigeon

Habitat Loss

4.5.213 In the context of the extensive wet grassland and wetland habitat across the Somerset Levels and the Severn Estuary available to wintering wigeon, the temporary loss of habitat within the preferred corridor during construction is not considered to be significant.

Disturbance and Displacement Effects

4.5.214 2009-2010 survey findings indicate that the Huntspill River is of some importance as a feeding and loafing (being inactive) area for wigeon. 2010-2011 survey findings indicate that the Crippe River is also of some value for wigeon.

4.5.215 The most recent five-year peak mean average for wigeon on the Somerset Levels SPA 2006/07-2010/11 places the population at 30,944 individuals, well in excess of the GB threshold of 15,000 (Holt *et al*., 2012). However desktop and field survey records combined only recorded 60 wigeon on the Huntspill River and 125 wigeon on the River Crippe in winter 2010-2011 (located 1.4km east of the preferred corridor at its closest point). Therefore, in the context of the Somerset levels SPA, relatively small numbers of wigeon are associated with the study area.

4.5.216 Up to 350 wigeon were recorded at Catcott Lows in winter 2010-2011 although this is unlikely to be a peak count for the site since the conservation objectives for Catcott, Edington and Chilton Moors SSSI cite a mean maximum seasonal count of 1,183 individuals.

4.5.217 The proposed route (Option A) lies more than 1.5km south of Portbury Wharf where small numbers of wigeon have been recorded. Construction works associated with the proposed overhead line in this location would therefore not have a displacement effect on wigeon.

4.5.218 It is considered that positioning an overhead line along the proposed route will have no displacement effects on wigeon.

4.5.219 Part of the alternative route (Option B) lies approximately 240m south of the lagoon at the north of Portbury Wharf where moderate numbers of wigeon have been recorded. Desktop records indicate that numbers of wigeon using Portbury Wharf occasionally reach 75 individuals, however numbers are usually much lower than this. If Option B is selected the route may therefore result in small numbers of wigeon using Portbury Wharf being disturbed or displaced.

Collision Risk for Migration and Regular Feeding Flights

4.5.220 Field survey findings confirm that wigeon do not regularly fly within the risk zone where the preferred corridor crosses the Huntspill River when undertaking local flights between feeding sites within the study area. However it is considered that small numbers of feeding flights are likely to occasionally take place on the Huntspill River closer to the Catcott, Edington and Chilton Moors SSSI.

4.5.221 It is possible that some regional movement takes places between overwintering wigeon associated with the Bridgwater Bay SSSI and the Catcott, Edington and Chilton Moors SSSI. However, no evidence was found to indicate that these movements take place outside the migration seasons.

4.5.222 Wigeon in the UK are largely resident although some birds fly to the UK from mainland Europe during the winter. However desktop and field survey have revealed no evidence of wigeon migration within the study area.

4.5.223 A radar study carried out on behalf of Ecotricity for a proposed wind farm development concluded that daily feeding flights took place of small duck species between the Somerset Levels and the Bridgwater Bay generally within 1 to 2 hours of dusk and dawn. However this study provided no clear evidence of numbers of birds or species. The study also took place at the time of the 2010/2011 vantage point survey and the radar was located near to vantage point 3. It is possible that some of these duck movements recorded were of wigeon, however the extensive vantage point work carried out for the Hinkley Connection C project found no evidence to support the suggestion that regular daily movements of wigeon take place between these areas.

4.5.224 The overall (net) collision risk for wigeon is likely to be reduced even further due to the removal of large sections of the existing 132kV overhead line between Bridgwater and Avonmouth as part of this project.

4.5.225 Therefore it is considered that the effect of collision mortality on migrating wigeon will be an insignificant impact.

Shoveler

4.5.226 Shoveler is listed as an additional qualifying species for the Somerset Levels and Moors SPA identified by the 2001 UK SPA Review. It is also listed as a species/population identified subsequent to designation for possible future consideration under criterion 6 – species with peak counts in winter for the Somerset Levels Ramsar.

Desktop Survey

4.5.227 Shoveler are mostly migratory, with British breeders moving southwards to mainland Europe generally before the end of October, whilst Icelandic breeders are thought to migrate to Britain and Ireland (Snow and Perrins, 1998).

4.5.228 Records confirm that the species both winters and breeds within several locations on the Somerset Levels (Table 4.14). Only small numbers of wintering shoveler have been recorded at the Bridgwater Bay SSSI. Shoveler are also present in important numbers on the Cheddar Reservoir SSSI immediately west of Cheddar. Shoveler are also present in nationally important numbers at Blagdon Lake (Five-year peak mean 06/07-10/11 is 168 individuals) which is approximately 6.5km southeast of Churchill substation.

4.5.229 Shoveler have been regularly recorded using the pools and sewage works at Avonmouth and Portbury Wharf Nature Reserve during the winter period. A peak count of 90 individuals was recorded at Avonmouth Pools in December 1993, and 38 individuals at the north pools in Portbury Wharf Nature Reserve during January 2009.

Table 4.3. Selected Desktop Survey for Shoveler 2000-2013

Site Name	**Date/Year**	**Count**
Shapwick Heath/Meare Heath	December 2000	290
Avonmouth Sewage Works	January 2001	59
Tealham and Tadham Moor SSSI	December 2001	4
Bridgwater Bay SSSI	January 2002	7
Catcott Lows reserve	March 2002	175
Ham Wall / Walton Heath	December 2002	185
Bridgwater Bay SSSI	December 2002	9
Catcott Lows reserve	December 2002	140
Shapwick Heath/Meare Heath	December 2002	20
Ham Wall / Walton Heath	Summer 2003	15 pairs
Westhay Moor NNR	January 2004	56
Westhay Moor NNR	July 2004	Family group
Shapwick Heath SSSI	Summer 2004	6
Catcott Lows reserve	November 2005	150
Greylake RSPB reserve	Summer 2007	2 pairs
Portbury Wharf Nature Reserve north pools	January 2009	38
Greylake RSPB reserve	January 2011	20
Ham Wall RSPB reserve	April 2011	10
Steart	November 2012	100
Wet Moor SSSI, east of Muchelney (16km south east of Bridgwater)	February 2013	70
Curry and Hay Moor SSSI (12km south of Bridgwater)	February 2013	32

Hinkley Point Bird Surveys

4.5.230 A peak count of 21 shoveler were recorded to use the Sewage Works pond to the south of Hinkley Point power station. This location is 250m from the proposed connection project works.

Winter Bird Survey 2009-2010

4.5.231 Small numbers of shoveler were recorded on the Tealham and Tadham Moors SSSI including 5 individuals in late November 2009 and 25 individuals in late January 2010. Shoveler were not recorded on any other SSSIs covered by the winter bird survey.

Winter Bird Survey 2012

4.5.232 Small numbers of shoveler were recorded on the large pool at Portbury Wharf during the 2011-2012 winter bird survey, with a peak count of 9 individuals. No shoveler were recorded elsewhere within the preferred corridor.

Winter Bird Survey 2012-2013

4.5.233 Small numbers of shoveler were recorded on the large pool at Portbury Wharf and at the Avonmouth Sewage Works (Avonmouth Pools) during the 2012-2013 winter bird survey. A peak count of 23 individuals was recorded at Portbury Wharf in March and 6 individuals at Avonmouth Pools in February.

Winter Bird Survey 2013-2014

4.5.234 No shoveler were recorded during the 2013-2014 winter bird survey.

Vantage Point Survey 2009-2010

4.5.235 No shoveler flight lines were recorded at any stage during the 2009-2010 vantage point survey.

Vantage Point Survey 2010-2011

4.5.236 Two shoveler flight lines were recorded from VP3b Old Yeo during the 2010-2011 vantage point surveys. This flight line is illustrated at Figure 8.23. The pair of birds were recorded flying east above the risk zone on the 5th January 2011. Although this pair of shoveler was recorded more than 2.5km east of the proposed route, it is possible that they had crossed the proposed route prior to this flight line observation.

<u>Connection Potential Effects Assessment - Shoveler</u>

Habitat Loss

4.5.237 The temporary loss of agricultural grasslands within the power line corridor during construction would not affect habitats used by this species.

Disturbance and Displacement Effects

4.5.238 Field survey findings indicate that shoveler do not regularly use fields or rivers within the route corridor area for feeding or resting. Small numbers of birds are present at Portbury Wharf and Avonmouth Sewage Works (Avonmouth Pools) and potentially, if the alternative route at Portbury is selected, birds at Portbury could be subject to some disturbance.

4.5.239 Desktop survey and field survey findings confirm that the only location that shoveler regularly use for feeding or resting within the preferred corridor is Portbury Wharf. Option A lies more than 1.5km south of Portbury Wharf where small numbers of shoveler have been recorded. Construction works associated with the proposed overhead line in this location would therefore not have a displacement effect on shoveler.

4.5.240 It is considered that positioning an overhead line along the proposed route will have no displacement effects on shoveler if Option A is selected.

4.5.241 The alternative route (Option B) includes a short section of overhead line located approximately 80 south of the lagoon at the north of Portbury Wharf where small numbers of shoveler have been recorded. Desktop records indicate that numbers of shoveler in this location occasionally reach 38 individuals. Due to the distance of the proposed works from this location it is possible that small numbers of shoveler will be temporarily disturbed and displaced in this location as a result of the proposed connection.

Collision Risk for Migration and Regular Feeding Flights

4.5.242 The lack of any shoveler flight lines throughout the entire 2009-2010 vantage point survey strongly indicates that this species does not regularly fly through the study area for local feeding flights. Vantage point survey findings in 2010-2011 are consistent with 2009-2010 with only two shoveler recorded.

4.5.243 Shoveler is now recognised as an additional qualifying species for the Somerset Levels and Moors SPA identified by the 2001 UK SPA Review. The most recent five-year peak mean of 1,081 exceeds the international threshold of 400 (Calbrade *et al.*, 2010), although the numbers at the Somerset Levels dropped just below this threshold in 2010/2011 (Holt *et al.,* 2012). There is no evidence to indicate that shoveler make regular movements between the Somerset Levels SPA and the Severn Estuary SPA.

4.5.244 At the beginning of this ornithological assessment it was considered that a shoveler migration route might exist between the Severn Estuary and the Cheddar Reservoir. Following the completion of the 2009-2010 vantage point survey it was surmised that the most likely migration route would follow the River Axe and other watercourses in the same locality since this would explain the lack of shoveler records at VP5 on the east side of Bleadon Hill, approximately 1km to the north of these watercourses. It is believed that if a migration corridor exists, it is unlikely to involve more than 200 shoveler.

4.5.245 The overall (net) collision risk for shoveler is likely to be reduced even further due to the removal of large sections of the existing 132kV overhead line between Bridgwater and Avonmouth as part of this project. This includes the removal of a section of overhead line that crosses Portbury Wharf –the only location where shoveler were regularly recorded during the 2009 – 2013 bird surveys.

Mallard

4.5.246 Mallard are mostly migratory but many mallard in Western Europe are resident, moving to the nearest large waterbody during severe winters. Many Icelandic breeders overwinter in Britain and Ireland. Some mallard breeders from the far north of Europe also overwinter in Britain (Snow and Perrins, 1998).

4.5.247 Mallard forms part of the assemblage of wintering birds which is a qualifying feature for the Severn Estuary SPA.

Desktop Survey

4.5.248 It is estimated that a large winter population of approximately 800 birds is present within the wider area, typically using wetland habitat. At least 200 breeding pairs are likely to summer in the same area.

4.5.249 Mallard have regularly been recorded at Avonmouth Pool, Avonmouth Hoar Gout, Portbury Wharf Nature Reserve, Portbury Chapel Pill, Yatton, Kenn Moor, Nailsea Moor, Puxton Moor and Kingston Seymour. Peak counts include 130 individuals at Capel Pill, Portbury in October 2005. Mallard are known to regularly breed at Portbury Wharf Nature Reserve, with 6 pairs recorded in 2007. In the wider area larger numbers are known to regularly breed at Ham Wall and Grey Lake RSPB reserves.

4.5.250 Selected desktop records for mallard are provided in Table 4.15.

Table 4.4. Selected Desktop Records for Mallard 2000-2013

Site Name	Date/Year	Count
Avonmouth, Hoar Gout	July 2001	49
Puxton Moor	June 2002	35
Puxton Moor	Summer 2006	3-4 pairs
Kingston Seymour	November 2003	82
Nailsea Moor	December 2003	65
Kenn Moor	December 2005	47
Ham Wall RSPB reserve	Summer 2005	38 pairs
Portbury, Chapel Pill	October 2005	130
Portbury Wharf Nature Reserve	Summer 2007	6 pairs
Yatton	December 2007	39
Grey lake RSPB reserve	Summer 2008	24 pairs

Hinkley Point Bird Surveys

4.5.251 During the surveys of the coastal fields undertaken at Hinkley Point, the pool immediately east of the sewage works, and located 250m from the closest proposed works for the Hinkley Point C Connection was the only water body in the survey area to regularly support wildfowl. Small numbers of mallard (1-8 birds) were regularly observed in the pool and on fields and ditches within the survey area. Larger groups (up to 51 birds) were observed in the intertidal area more than 500m from the proposed works.

Winter Bird Survey 2009-2010

4.5.252 A peak count of 44 mallard was recorded at Tealham and Tadham Moors SSSI in late January 2010. Mallard were usually recorded in single figures within all of the SSSIs to the north of the Somerset Levels covered by the winter bird survey.

Winter Bird Survey 2011-2012

4.5.253 Small numbers of mallard were recorded on rhynes and drains throughout the survey area during the 2011-2012 winter bird survey (Figure 8.13).

Winter Bird Survey 2012-2013

4.5.254 Small numbers of mallard were recorded throughout the survey area, with a peak count of 17 individuals recorded at the fishing lake at Woolavington. A group of 16 mallard was also recorded on the River Avon. The locations of mallard recorded are shown at Figure 8.13.

Winter Bird Survey 2013-2014

4.5.255 Small numbers of mallard were occasionally recorded within drains and on ponds throughout the 2013-2014 winter bird survey area (Figure 8.13). A peak count of 5 mallard were recorded flying across the site during the 2013-2014 winter bird survey. The peak count of mallard recorded on the ground was a group of 4 mallard on a pond to the west of Butt Lake road recorded during the December visit.

Breeding Bird Survey 2012-2013

4.5.256 Small numbers of mallard were recorded within drains and on ponds throughout the 2012-2013 breeding bird survey area (Figure 8.17).

Vantage Point Survey 2009-2010

4.5.257 A total of 332 mallard flight lines were recorded during the 2009-2010 vantage point survey. The largest number of mallard ducks was recorded from VP3 (78 flight lines) however these individuals did not pass through the preferred corridor. Approximately 90% of the flights recorded from VP1-VP7 were at risk height (0-50m). The largest number of mallard recorded from a vantage point was 76 individuals flying at risk height on a November morning. These individuals did not fly within the preferred corridor. The majority of records were between one and six individuals. However these mallard tended to fly close to the water (below 10m) therefore the collision risk for mallard is considerably reduced.

Vantage Point Survey 2010-2011

4.5.258 A total of 121 mallard flight lines were recorded during the 2010-2011 bird survey. The largest number of mallard was recorded from VP2. Approximately 55% of the flights recorded were at risk height. The majority of records were between one and two individuals.

Vantage Point Survey 2013-2014

4.5.259 A group of 4 mallard were recorded flying on one occasion during the 2013-2014 vantage point survey at Portbury. The group of birds were recorded flying north east over the proposed location of the alternative route at a height of 10-35m. No other mallard fleight lines were recorded during the 2013-2014 vantage point survey.

Connection Potential Effects Assessment - Mallard

Habitat Loss

4.5.260 In the context of the extensive wet grassland and wetland habitat across the Somerset Levels and the Severn Estuary available to wintering mallard, the temporary loss of habitat within the preferred corridor during construction is not considered to be significant.

Displacement Effects

4.5.261 Field survey findings indicate that mallard are present within the route corridor where they make use of small rhynes, ditches and rivers. Some disturbance to these birds may arise during construction leading to temporary displacement.

4.5.262 It is considered highly unlikely that the presence of the proposed overhead line would result in displacement of mallard using the various wetlands and watercourses within the study area. This is primarily due to the presence of a number of existing low voltage overhead lines to which mallard are likely to have become habituated. This ability for birds, including wildfowl and waders, to accept overhead lines close to their habitats over time is well documented (See Appendix A).

4.5.263 Mallard were observed flying close to and across the route corridor during the vantage point surveys. Some of these birds flew at potential collision risk height. The movements of small ducks detected in the Radar study for the proposed wind farm near West Huntspill could potentially include this species.

4.5.264 Many mallard flights recorded within the study area were short flights involving small groups of birds flying below the risk zone. The majority of the mallard flew within 10 metres of the water at a height which would allow these birds to fly below the proposed overhead lines It is therefore considered that mallard mortality associated with daily feeding flights would be very low.

4.5.265 It is believed that many of the mallard breeders associated with the study area are resident birds which overwinter in the locality or the wider region. No large flocks of flying mallard, which would have indicated the presence of migrants, were observed at anytime. Therefore there is not expected to be any major mallard migration associated with the study area.

4.5.266 The overall (net) collision risk for mallard is likely to be reduced even further due to the removal of large sections of the existing 132kV overhead line between Bridgwater and Avonmouth as part of this project.

Pintail

4.5.267 Pintail is listed as an additional qualifying species for the Severn Estuary SPA identified by the 2001 UK SPA Review. It is also listed as a species/population identified subsequent to designation for possible future consideration under criterion 6 – species with peak counts in winter for both the Somerset Levels and Moors Ramsar and the Severn Estuary Ramsar.

Desktop Survey

4.5.268 Breeding pintail associated with Iceland and the far north of Europe do, to some extent, overwinter in Britain (Snow and Perrins, 1998).

4.5.269 The pintail population in the UK reached a historic peak in 2005/2006 before suffering a sharp decline towards the end of the decade. Reasons for this decline are unclear (Holt *et al.,* 2012).

4.5.270 Records indicate that parts of the Somerset Levels are of some importance for wintering pintail. The 2006/07-2010/11 five-year peak mean for pintail on the Somerset Levels is 613. The 2006/07-2010/11 five-year peak mean for pintail on the Severn Estuary is 735, which exceeds the international threshold of 600. The pintail population on the Severn Estuary is therefore of international importance

4.5.271 Pintail records within 1km of the proposed development are scarce, however single birds have been occasionally recorded at Chittening Warth, the section of the Severn Estuary at Portbury, Portbury Wharf Nature Reserve and at Avonmouth Sewage Works.

4.5.272 Selected pintail records are provided in Table 4.16. The locations of pintail records are shown at Figure 8.9.

Table 4.5. Selected Desktop Survey Records for Pintail

Site Name	Date/Year	Count
Avonmouth Sewage Works	November 2000	1
Chittening Warth	January 2001	1
Ham Wall RSPB reserve	January 2002	15
Somerset Levels and Moors	2001-2006 average	697
Severn Estuary 6km north of Bristol	2001-2006 average	905
Portbury, Severn Estuary	March 2008	1
Portbury Wharf	January 2009	1
West Moor	29th December 2010	1
Shapwick Heath RSPB reserve	8th March 2011	2
Greylake RSPB reserve	14th April 2011	1

Hinkley Point Bird Surveys

4.5.273 A peak count of 182 pintail were recorded feeding in the intertidal zone to the north east of the existing Hinkley Point power station during surveys. No pintail were recorded inland at any stage during the surveys.

Winter Bird Survey 2009-2010

4.5.274 Pintail were only recorded on one occasion throughout the entire winter bird survey. This record concerned two pintail at the Tealham and Tadham SSSI in late January 2010.

Winter Bird Survey 2012-2013

4.5.275 No pintail were recorded during any of the winter bird surveys undertaken between 2012 and 2013.

Winter Bird Survey 2013-2014

4.5.276 No pintail were recorded during any of the winter bird survey visits undertaken between 2013 and 2014.

Vantage Point Survey 2009-2010

4.5.277 No pintail were recorded at any time during the 2009-2010 vantage point survey.

Vantage Point Survey 2010-2011

4.5.278 No pintail were recorded at any time during the 2010-2011 vantage point survey.

Connection Potential Effects Assessment - Pintail

Habitat Loss

4.5.279 No habitat loss from within existing designated areas that may be used by this species would arise. The temporary loss of agricultural grasslands within the power line corridor during construction would not affect habitats used by this species.

Disturbance and Displacement Effects

4.5.280 Desktop and field survey findings indicate that pintail do not regularly use fields or rivers within the study area for feeding or resting. Occasional single birds have historically been recorded at Portbury Wharf and Avonmouth Sewage Works. Pintail are therefore highly unlikely to be present within the corridor during construction. No disturbance and displacement effects on pintail are likely to arise.

Collision Risk for Migration and Regular Feeding Flights

4.5.281 Field survey findings also confirm that pintail do not undertake regular local flights between feeding sites across the study area. There is a possibility that pintail may move between the Severn Estuary and the Somerset Levels during their autumn and spring migrations, although there is no clear evidence to support this.

4.5.282 The movements of small ducks detected in the Radar study for the proposed wind farm near West Huntspill could potentially include this species, however the 2 seasons of vantage point work carried out for the Hinkley Connection C project found no evidence to support the suggestion that regular daily movements of pintail take place between these areas.

4.5.283 Any existing collision risk for pintail would be further reduced by the proposed removal of large sections of the existing 132kV overhead line between Bridgwater and Avonmouth as part of this project.

Pochard

4.5.284 Pochard forms part of the assemblage of wintering birds which is a qualifying feature for the Severn Estuary SPA.

Desktop Survey

4.5.285 Many of the breeding pochard associated with central Europe migrate south and west, some pochard reaching Britain. Other pochard in Britain are likely to be resident birds.

4.5.286 Trends in Britain and Northern Ireland indicate strong declines in the pochard population since the 1990's, with an all-time annual low in 2010/2011 (Cook *et al.,* 2013; Holt *et al.,* 2012). The decline is thought to be at least partly attributed to climate change, as this species is very susceptible to cold weather. It is considered likely that numbers will have increased further south in this species' wintering range (Holt *et al.,* 2012).

4.5.287 Within the Severn Estuary, the 2006/07-2010/11 five-year peak mean for pochard is 663.

4.5.288 The desktop survey reveal that pochard have been regularly recorded at Avonmouth Pools and Portbury Wharf Nature Reserve, with a peak count of 70 individuals in 1987 and 22 individuals in December 2007 respectively. More recent records are scarcer with fewer birds (<10 indiv.) recorded. Pochard have also been occasionally recorded at Hour Gout, Avonmouth and at Carditch Rhyne, Congresbury.

4.5.289 In the wider area, pochard, numbering up to 73 individuals, have been regularly recorded wintering at the Ham Wall RSPB reserve (see Table 4.17). Up to three pochard were recorded at Backwell Lake on three occasions in January 2009. Pochard is also a contributing species for the designation of the Cheddar Reservoir SSSI located approximately 6km east of the Proposed Development.

4.5.290 Locations of pochard records are presented at Figure 8.9.

Table 4.6. Selected Desktop Survey Records for Pochard

Site Name	Date/Year	Count
Ham Wall RSPB reserve	2009 to 2009	Up to 73
Avonmouth Sewage Works	January to March 2009	Up to 11
Avonmouth Sewage Works	July 2009	2
Backwell Lake	January 2009	Up to 3
Portbury Wharf	January and February 2009	Up to 11
Cheddar Reservoir	January 2011	1140
Ham Wall RSPB reserve	April 2011	1
Cheddar Reservoir	November 2012	300
Wet Moor SSSI, east of Muchelney	February 2013	16

Site Name	Date/Year	Count
(16km south east of Bridgwater)		
Bleadon Sewerage Works, Weston Super-Mare	March 2013	8

Hinkley Point Bird Surveys

4.5.291 Pochard were not recorded during any of the bird surveys undertaken at Hinkley Point.

Winter Bird Survey 2009-2010

4.5.292 No pochard were recorded at any stage the 2009-2010 winter bird survey.

Winter Bird Survey 2012

4.5.293 No pochard were recorded at any stage during the 2010-2011 winter bird survey.

Winter Bird Survey 2012-2013

4.5.294 The only location where pochard were recorded within 250m of the proposed route was at the fishing lake at Woolavington level. A peak count of 4 pochard was observed at this location in November. Small groups of pochard were regularly recorded at Avonmouth Sewage Works (Avonmouth Pools) during the survey, with a peak count of 8 individuals observed in this location in January. Small numbers of Pochard were also observed at Portbury Wharf (<5 individuals).

Winter Bird Survey 2013-2014

4.5.295 No pochard were recorded at any stage during the 2013-2014 winter bird survey.

Vantage Point Survey 2009-2010

4.5.296 No pochard were recorded at any time during the 2009-2010 vantage point survey.

Vantage Point Survey 2010-2011

4.5.297 No pochard were recorded at any time during the 2010-2011 vantage point survey.

Connection Potential Effects Assessment - Pochard

Habitat Loss

4.5.298 Pochard do not regularly use the study area for feeding or resting, with the exception of the Avonmouth Sewage Works. The proposed route is located more than 250m east of the Avonmouth sewage treatment works (Avonmouth Pools). It is therefore highly unlikely therefore that any pochard using the pools at the treatment works would suffer any displacement as a result of the proposed connection.

Disturbance and Displacement Effects

4.5.299 Pochard do not regularly use the study area for feeding or resting, with the exception of the Avonmouth Sewage Works (Avonmouth Pools) and Portbury Wharf. The proposed route is located more than 700m south of the Avonmouth sewage treatment works. It is therefore highly unlikely therefore that any pochard using the pools at the treatment works would suffer any displacement as a result of the proposed connection.

4.5.300 The alternative route (Option B) includes a short section of overhead line located approximately 80m south of the lagoons at the north of Portbury Wharf. Pochard have been recorded to use the lagoon at the north of Portbury Wharf, with a peak count of 22 individuals in 2007. However recent records are more scarce with fewer birds recorded. Nevertheless, if Option B is selected there is the possibility that a small number of pochard will be disturbed and temporarily displaced.

Collision Risk for Migration and Regular Feeding Flights

4.5.301 Desktop and field survey findings also confirm that pochard do not undertake local flights between feeding sites within the study area with the exception of Avonmouth Sewage Works. It is considered likely that the pochard associated with Ham Wall RSPB reserve and Cheddar Reservoir SSSI are either resident birds or migrate overland from mainland Europe without crossing the study area.

4.5.302 Flights across the route corridor are likely to be infrequent and the majority of birds are likely to remain at wintering sites and not undertake local movements on a regular basis

Tufted Duck

4.5.303 Tufted duck forms part of the assemblage of wintering birds which is a qualifying feature for the Severn Estuary SPA.

Desktop Survey

4.5.304 Tufted duck associated with southern England are chiefly resident. Some Icelandic breeding tufted duck migrate to Britain.

4.5.305 The population of tufted duck has increased in Britain over the last 40 years (Holt *et al.,* 2012). Neither the Severn Estuary or the Somerset Levels qualify as being of national importance for this species, however the population at the Severn Estuary SPA has shown a long term increase of 18% (Cook *et al.,* 2013)

4.5.306 Tufted duck have been regularly recorded at Avonmouth Sewage Works (Avonmouth Pools) and pools and at Portbury Wharf Nature Reserve. Peak counts include 41 individuals at Portbury Wharf Nature Reserve High Pool in September 2007 and 34 individuals at Avonmouth Pools in December 1999. Records elsewhere within 1km of the Proposed Development are scarce.

4.5.307 Within the wider area tufted duck, numbering up to 43 pairs, are regularly recorded breeding at the Ham Wall RSPB reserve.

Hinkley Point Bird Surveys

4.5.308 Tufted duck were not recorded during any of the bird surveys undertaken at Hinkley Point.

Winter Bird Survey 2009-2010

4.5.309 Six tufted duck were recorded at the Catcott, Edington and Chilton Moors SSSI in late February 2010. Two tufted duck were recorded at the Biddle Street Yatton SSSI in late January 2010.

Winter Bird Survey 2012

4.5.310 The largest concentration of tufted duck recorded during the 2011-2012 winter bird survey was 22 birds recorded at Portbury Wharf. A peak count of 4 tufted duck was also recorded on the pools to the northwest of Avonmouth Sewage Works. No other tufted duck were recorded during this winter bird survey.

Winter Bird Survey 2012-2013

4.5.311 Tufted duck were recorded at Avonmouth Sewage Works (Avonmouth Pools) during every visit, with a peak count of 18 individuals recorded in this location during December. A peak count of 18 tufted duck was also recorded within the pools at Portbury Wharf during March.

Winter Bird Survey 2013-2014

4.5.312 No tufted duck were recorded at any stage during the 2013-2014 winter bird survey.

Vantage Point Survey 2009-2010

4.5.313 No tufted duck were recorded at any time during the 2009-2010 vantage point survey.

Vantage Point Survey 2010-2011

4.5.314 Two tufted duck were recorded during the 2010-2011 vantage point survey. Both of these birds were observed on the 6th January 2011 flying east through across the proposed route within the risk zone. The flight line is illustrated at Figure 8.23.

<u>Connection Potential Effects Assessment - Tufted Duck</u>

Habitat Loss

4.5.315 No habitat loss from within existing designated areas that may be used by this species would arise. The temporary loss of agricultural grasslands within the power line corridor during construction would not affect habitats used by this species.

Disturbance and Displacement Effects

4.5.316 The proposed route (Option A) lies more than 1.5km south of the closest point of Portbury Wharf where tufted duck were recorded. Construction works associated with the proposed overhead line in this location would therefore not have a displacement effect on tufted duck.

4.5.317 Tufted duck were recorded both on the large lagoons in the north of Portbury Wharf and the smaller pools to the south. The alternative route (Option B) includes a short section of overhead line located between the large lagoons and the collection of smaller pools. It is possible that the small number of tufted duck using these ponds could suffer short term displacement during construction works if the works were carried out during the winter period.

4.5.318 The proposed route is located more than 250m east of the Avonmouth sewage treatment works (Avonmouth Pools). It is highly unlikely therefore that any tufted duck using the pools at the treatment works would suffer any displacement as a result of the proposed connection.

Collision Risk for Migration and Regular Feeding Flights

4.5.319 Desktop and field survey findings also confirm that tufted duck do not undertake regular local flights between feeding sites within the study area. It is considered that the majority of tufted duck in the region are local residents which do not migrate.

Goosander

Desktop survey

4.5.320 Up to 11 goosander were recorded at Backwell Lake immediately south of Nailsea, on three occasions in January 2009.

4.5.321 Goosander have been recorded wintering on the River Huntspill and the Cripps River, with a peak count of 20 individuals in December 2002, and 11 goosander in this location during February 2002. Three goosander were also recorded at Congresbury during December 2000.

4.5.322 Breeding British goosander are almost entirely resident, moving short distances (mainly within 150km) from breeding waters to lakes and sheltered estuaries. In late August and early September moulting and breeding waters are often deserted as goosander numbers build up on estuaries and some inland lakes (Snow and Perrins, 1998).

Winter bird survey 2009-2010

4.5.323 No goosander were recorded at any stage during the winter bird survey indicating that they do not use fields within the study area for feeding or resting.

Vantage Point survey 2009-2010

4.5.324 Low numbers of goosander flight lines was recorded in December 2009 and February 2010 at VP2. A total of 5 goosander flight lines were recorded low along the Huntspill River at this time (Table 4.18).

Table 4.18. Flight activity for goosander during the 2009-2010 vantage point survey.

Location	Total No. Flight lines	Total No. Flights Through Preferred Corridor	Total No. Preferred Corridor Flight lines Within Risk Zone	Total No. Flights Within 250m Proposed route	Total No. Flights Within 250m Proposed route At Risk Height
VP1, 3-4, 6-7	0	0	0	0	0

VP2	7	7	5	5	5
VP5	2	2	0	0	0

Vantage Point survey 2010-2011

4.5.325 A low level of goosander flight activity was recorded throughout the vantage point survey 2010-2011. The majority of flights were recorded from VP2 where 20 goosander flew through within 250m of the proposed route at risk height.

4.5.326 Small numbers of goosander flights were also recorded from VP1 and VP3d (Table 4.19), however none of these flights were within 250m of the proposed route at risk height.

Table 4.19. Flight activity for goosander during the 2010-2011 vantage point survey.

Location	Total No. Flight lines	Total No. Flights Through Preferred Corridor	Total No. Preferred Corridor Flight lines Within Risk Zone	Total No. Flights Within 250m Proposed route	Total No. Flights Within 250m Proposed route At Risk Height
VP1	13	13	0	0	0
VP3a, 3b & 3c	0	0	0	0	0
VP2	35	35	20	20	20
VP3d	6	0	0	0	0

Overhead line potential affects assessment - goosander

Habitat Loss

4.5.327 No habitat loss from within existing designated areas that may be used by this species would arise. The temporary loss of agricultural grasslands within the power line corridor during construction would not affect habitats used by this species.

Disturbance and Displacement effects

4.5.328 Desktop survey findings indicate that goosander overwinter on several waterbodies in the study area including Backwell Lake and the Huntspill River. The Proposed Development is located more than 1km from Backwell Lake. It is highly unlikely that goosander will suffer from disturbance or displacement from either of these locations.

Collision risk for migration and regular feeding flights

4.5.329 Field survey findings identified evidence for a small number of local flights between feeding sites on the Huntspill River with more flight lines being recorded in winter 2010-2011. It is considered likely that goosander using Backwell Lake will spend the majority of their time feeding on the lake without making local flights to other water bodies in the wider area.

4.5.330 Relatively small numbers of goosander migrate into the study area each autumn to overwinter on large water bodies and some parts of the Severn Estuary before returning to their upland breeding sites in the spring. The collision risk that the proposed overhead line presents to migrating goosander is considered to be very low.

Other wildfowl species

Desktop survey

4.5.331 Desktop records for various other wildfowl species are presented in Table 4.20.

4.5.332 Goldeneye have been recorded at Portbury Wharf Nature Reserve on a number of occasions, some birds occasionally spending the entire winter there. Goldeneye have also been recorded at Avonmouth Sewage Works, but not since the 1990's.

4.5.333 Eider have once been recorded at Chittening Warth. This record was of a single bird in March 2000.

4.5.334 Little grebe have regularly been recorded at Portbury Wharf Nature Reserve, with a peak count of 26 individuals recorded during October 2007.

4.5.335 Single scaup have occasionally been recorded at both Portbury Wharf and the Severn Estuary to the north of Portbury Wharf.

4.5.336 Long-tailed duck have been recorded on one occasion at Avonmouth Sewage Works.

4.5.337 Common scoter have been recorded on a few occasions at Portbury Wharf Nature Reserve and on the Severn Estuary to the north. A peak count of 7 individuals was recorded in the latter location during March 2006.

4.5.338 Brent goose have been recorded at Portbury on a few occasions. A peak count of 33 individuals was recorded on the section of the Severn Estuary to the north of Portbury Wharf during January 2009.

Table 4.20. Selected desktop survey records for other wildfowl species 2000-2012.

Species	Site name	Date/year	Count
Eider	Chittening Warth (Stup Pill)	March 2000	1
Little grebe	Avonmouth 'Honda Pools'	August 2000	4 juvenile
Little grebe	Kenn Moor	December 2004	2
Whooper swan	Severn Beach WeBS site	January 2005	Present
Little grebe	Nailsea, Tickenham and	February 2005	4

Species	Site name	Date/year	Count
	Clevedon Moors		
Goldeneye	Portbury Wharf Nature Reserve	April 2005	3
Common scoter	Portbury, Severn Estuary	March 2006	7
Scaup	Portbury, Severn Estuary	April 2006	1
Common scoter	Portbury, Chapel Pill	July 2006	1
Little grebe	Portbury Wharf Nature Reserve	September 2006	23
Long-tailed duck	Avonmouth Sewage Works	December 2006	1
Brent goose	Portbury, Chapel Pill	March 2007	1
Common scoter	Portbury Wharf Nature Reserve	April 2007	1
Little grebe	Portbury Wharf Nature Reserve	October 2007	26
Common scoter	Portbury, Severn Estuary	November 2007	1
Scaup	Portbury Wharf Nature Reserve	November-December 2007	1
Greylag goose	Portbury Wharf Nature Reserve	April 2008	1
Little grebe	Portbury Wharf Nature Reserve	September 2008	11
Goldeneye	Portbury Wharf Nature Reserve	Winter 2008	1
Brent goose	Portbury, Severn Estuary	January 2009	33
Goldeneye	Portbury Wharf Nature Reserve	February 2009	2

Winter bird survey 2009-2010

4.5.339 No brent goose, common scoter, eider, goldeneye, greylag goose, little grebe or scaup were observed during the 2009-2010 winter bird survey.

Winter bird survey 2012

4.5.340 A peak count of 3 little grebe were recorded using the pools at Portbury Wharf during the 2012 winter bird survey.

Winter bird survey 2012-2013

4.5.341 The only location where little grebe was recorded during the 2012-2013 winter bird survey was Portbury Wharf Nature Reserve. A peak count of two little grebe was recorded within the pools on the reserve.

Winter bird survey 2012-2014

4.5.342 No brent goose, common scoter, eider, goldeneye, greylag goose, little grebe or scaup were recorded during the 2013-2014 winter bird survey.

Breeding bird survey 2012

4.5.343 A pair of little grebe were recorded to breed within the pools at Portbury Wharf Nature Reserve during the 2012 breeding bird survey. A single little grebe was also recorded within a ditch at Kenn Moor during the first breeding bird survey. Little grebe were also recorded at the reservoir at Avonmouth Sewage Works.

Vantage Point survey 2009-2010

4.5.344 A little grebe were observed swimming within the ditches at VP3 in December 2009. A little grebe was also observed on the River Avon at VP7 in December 2009.

Vantage Point survey 2010-2011

4.5.345 No brent goose, common scoter, eider, goldeneye, greylag goose, little grebe or scaup were observed during the 2010-2011vantage point survey.

Overhead line potential affects assessment – other wildfowl

Habitat Loss

4.5.346 No habitat loss from within existing designated areas that may be used by this species would arise. The temporary loss of agricultural grasslands within the power line corridor during construction would not affect habitats used by this species.

Disturbance and Displacement Effects

4.5.347 The proposed route (Option A) lies more than 1.5km south of the closest point of Portbury Wharf where little grebe were regularly recorded. Construction works associated with the proposed overhead line in this location would therefore not have a displacement effect on tufted duck.

4.5.348 Little grebe were recorded both on the large lagoons in the north of Portbury Wharf and the smaller pools to the south. The alternative route (Option B) includes a short section of overhead line located between the large lagoons and the collection of smaller pools. It is possible that the small number of little grebe using these ponds could suffer short term displacement during construction works if the works were carried out during the winter period.

Collision Risk for Migration and Regular Feeding Flights

4.5.349 Desktop and field survey findings also confirm that brent goose, common scoter, eider, goldeneye, greylag goose, little grebe or scaup do not undertake regular local flights between feeding sites within the study area. It is considered that it would be highly unlikely that any of these species would suffer from overhead line collision from the proposed overhead line.

WADERS

Golden Plover

4.5.350 Golden plover is a qualifying species for the Somerset Levels and Moors SPA under Article 4.1 (individual species -overwinter).

Desktop Survey

4.5.351 Golden plover are partial migrants in Britain although this population overlaps golden plover that breed in continental Europe and the Mediterranean which are wholly migratory (Snow and Perrins, 1998).

4.5.352 The numbers of golden plover using the UK increased from the mid 1980's until the winter of 2005/2006 where they underwent a sharp decline. This appears to be due to a cold weather response from December onwards each year, where many golden plover were forced out of northwest Europe due to prolonged cold conditions (Holt *et al.,* 2012).

4.5.353 The five-year peak mean for the Somerset Levels 2007/08 to 2011/12 was 11,856. This still exceeds the International threshold of 9,300 birds.

4.5.354 Within 1km of the Proposed Development records of golden plover are very scarce. Records include a single bird at Kenn Moor in December 2003 and confirmed presence of golden plover (number unknown) at Hallen in 1976.

4.5.355 Selected records of golden plover within the wider area are shown presented in Table 4.21. These records confirm the importance of the Bridgwater Bay SSSI, Tealham and Tadham Moors SSSI and Shapwick Heath SSSI for golden plover in the winter. Typically around 500 golden plover are present in the Bridgwater Bay during the winter months although 1,500 have been recorded in November 2003. However much greater numbers of golden plover are associated with the Somerset Levels, particularly at Tealham and Tadham Moors SSSI and Shapwick Heath SSSI during the winter.

Table 4.21. Selected Desktop Survey Records for Golden Plover 2010-2013

Site Name	Date/Year	Count
Combwich on the River Parrett	12th October 2010	c.100
Tealham and Tadham SSSI	6th April 2010	95
Steart	22nd October 2010	150+
Greylake Sluice	5th November 2010	50+
Pawlett Hams	1st December 2010	200

Site Name	Date/Year	Count
Kings Sedge Moor	16th January 2011	250
Greylake RSPB reserve	12th February 2011	30+
Greylake RSPB reserve	24th February 2011	50+
Catcott Lows	25th February 2011	2
Tealham and Tadham SSSI	15th March 2011	12
Tealham and Tadham SSSI	22nd November 2011	25*
Steart	3rd November 2012	300
Wet Moor SSSI, east of Muchelney (16km south east of Bridgwater)	16th December 2012	50
Kings Sedge Moor	1st January 2013	1200
Greylake RSPB reserve	1st January 2013	250

*TEP field record.

Hinkley Point Bird Surveys

4.5.356 Golden plover were occasionally recorded to use inland fields at Hinkley Point during the winter bird surveys. Peak counts of 98 and 127 golden plover were recorded on fields to the west of the existing power station during February 2009.

4.5.357 Small numbers of golden plover were also recorded on the fields at night time, with a peak count of 21 individuals in one location foraging and loafing within a field to the west of the power station directly adjacent to the coast. An overall peak count of 37 golden plover were recorded within the survey area at night time. The locations where golden plover were recorded were more than 500m from the proposed connection works.

Winter Bird Survey 2009-2010

4.5.358 Thirteen golden plover were recorded at Tealham and Tadham Moors SSSI in late November 2009. Golden plover were not recorded within the SSSIs to the north of the Somerset Levels. This finding suggests that sizeable golden plover flocks do not regularly use parts of the Tealham and Tadham Moors SSSI within 1.5km of the study area.

Winter Bird Survey 2012

4.5.359 No golden plover were recorded during the 2011-2012 winter bird survey.

Winter Bird Survey 2012-2013

4.5.360 A group of 30 golden plover were recorded flying east over the proposed route south of Kenn west of the Tickenham, Nailsea & Kenn Moors SSSI on the 17th January 2013.

Winter Bird Survey 2013-2014

4.5.361 No golden plover were recorded at any stage during the 2013-2014 winter bird survey.

Vantage Point Survey 2009-2010

4.5.362 Moderate numbers of golden plover were observed at VP1 although none of these birds ever flew through the preferred corridor. Two groups of golden plover totalling 480 birds were observed circling at 50-75m to the south of Puriton, just east of the M5 Motorway and just under 200 metres west of the proposed route (Figure 8.20). Small numbers of golden plover were recorded from VP2, 3 and 7 during the vantage point surveys. All the birds recorded within 250m of the proposed route did not fly at risk height.

4.5.363 The majority of the birds recorded were single groups of birds recorded near to dusk flying at 75 metres or over, well above the risk height. One group recorded from VP7 flew high over the preferred corridor during the mid-morning.

4.5.364 It is possible that a good proportion of the golden plover which cross the study area fly at night time. It is also possible that the number of golden plover which fly through the study area has been underestimated. But even if this is true, survey results indicate that golden plover tend to fly above risk height when passing through the preferred corridor.

Table 4.22. Flight Activity for Golden Plover during the 2009-2010 Vantage Point Survey

Location	Total No. Flight lines	Total No. Flights Through Preferred Corridor	Total No. Preferred Corridor Flight lines Within Risk Zone	Total No. Flights Within 250m Proposed route	Total No. Flights Within 250m Proposed route At Risk Height
VP1	499	0	0	480	0
VP2	23	22	0	22	0
VP3	57	0	0	0	0
VP4 – VP6	0	0	0	0	0
VP7	50	50	0	50	0

Golden Plover Flight line Direction

4.5.365 The flight lines for golden plover relative to vantage point locations are illustrated in Golden plover flight lines are illustrated at Figure 8.20.

<u>Vantage Point 1:</u>

4.5.366 Golden plover were only recorded in late winter and there were no birds seen flying in the preferred corridor. Two small groups were flying to the east of the preferred corridor, one small group made a short flight in a southerly direction and the other group made a more pronounced flight in a north-easterly direction. Two large groups were circling directly east of the motorway, just within 250m west of the proposed route.

<u>Vantage Point 2:</u>

4.5.367 One individual flew east across the preferred corridor and then curved back on itself in early winter. In late winter it is likely that the group would have crossed the preferred corridor to the southeast.

Vantage Point 3:

4.5.368 Golden plover were only recorded in late winter. Two small groups flew south across the study area and one individual flew west and then curved back around and flew east. All birds were recorded to the east of the preferred corridor, and it is unlikely that any of these birds crossed the proposed route.

Vantage Points 4 to 6:

4.5.369 No golden plover were recorded from these vantage points.

Vantage Point 7:

4.5.370 No golden plover were recorded in early winter and in late winter a medium sized group flew southeast along the River Avon and high across the proposed route.

Vantage Point Survey 2010-2011

4.5.371 A single golden plover flight line was recorded on the 14th March 2011 from VP3b Old Yeo. This bird flew southeast at risk height. The flight line is illustrated at Figure 8.22. From the direction of the flight it is possible that this individual had earlier crossed the proposed route. A single golden plover was also heard calling from VP3d Crippe River on the 14th March, although no flight line was recorded.

Connection Potential Effects Assessment - Golden Plover

Habitat Loss

4.5.372 In the context of the extensive wet grassland and wetland habitat across the Somerset Levels and the Severn Estuary available to wintering golden plover, the temporary loss of habitat within the preferred corridor during construction is not considered to be significant.

Disturbance and Displacement Effects

4.5.373 It is generally considered unlikely that the presence of the proposed overhead line would result in displacement of golden plover using the study area since this species is not regularly recorded in fields within the study area.

4.5.374 Literature review findings (see Appendix A) indicate that displacement effects were identified in the non-breeding season when displacement distances of between 50 and 150 metres were observed in golden plover.

Collision Risk for Migration and Regular Feeding Flights

4.5.375 Desktop and field survey findings indicate that golden plover do not undertake regular local flights within the risk zone between feeding sites within the study area.

4.5.376 The literature review (Appendix A) indicates that golden plover demonstrate an avoidance rate of at least 99% for wind turbines and it seems reasonable to conclude that this highly manoeuvrable species will have a similar avoidance rate for overhead lines. Golden plover in the UK in general occasionally fly between feeding sites at night time however golden plover flight activity tends to be influenced by aerial structures such as wind turbines resulting in golden plover flying around aerial obstacles.

4.5.377 More intensive nocturnal vantage point surveys undertaken during winter 2010-2011 between the Severn Estuary and the north half of the Somerset Levels only detected very small numbers of golden plover. This finding provides further certainty that golden plover do not make regular flights across the study area between the Severn Estuary and the Somerset Levels.

4.5.378 Desktop survey findings indicate that the southern half of the Somerset Levels attracts greater numbers of golden plover; particularly areas such as Kings Sedgemoor. Therefore it is possible that any golden plover movements between the Severn Estuary and Kings Sedgemoor would take place to the south of the study area. This would explain the low numbers of golden plover recorded during vantage point surveys in 2009-2010 and 2010-2011.

4.5.379 Small flocks of birds were observed flying across the route corridor during the vantage point surveys. These birds flew well above potential risk height. However, there is the possibility that some birds may fly through across the proposed corridor at risk height and given the potential movement of birds between Bridgwater Bay and the Somerset Levels, the potential for collision mortality cannot be discounted.

Lapwing

4.5.380 Lapwing is a qualifying species for the Somerset Levels and Moors SPA under Article 4.2 (individual species -overwinter). It is also a qualifying species for the Somerset Levels and Moors Ramsar under criterion 6 (species/populations occurring at levels of international importance –winter). Lapwing forms part of the assemblage of wintering birds which is a qualifying feature for the Severn Estuary SPA.

Desktop Survey

4.5.381 Many lapwing that breed in upland areas in the UK move to lowland fields during the autumn months to over-winter. British numbers are also largely boosted by lapwing from Scandinavia, Eastern Europe and Russia. Some birds that breed within the UK move south to continental Europe to overwinter.

4.5.382 The winter population of lapwing within the UK increased during the mid-1980’s until the mid-1990’s before starting to fall again (Cook *et al.,* 2013). This trend was also observed at the Somerset Levels and Moors SPA, however the numbers of lapwing in the Somerset Levels in winter 2011/2012 was the greatest on-record (72,319). This is thought to be a cold weather response to harsh mid-winter freezing conditions (Holt *et al.,* 2012). Other inland sites in the UK (the Ouse Washes and Nene Washes) also recorded peak counts at this time.

4.5.383 Formerly a widespread breeding bird on the Somerset Levels the lapwing breeding population has declined almost to zero in the past twenty years (Bland, *pers comm*., October 2009). However a number of SSSI citation sheets for SSSIs within the Somerset Levels indicate that breeding lapwing still occur in a number of locations within the Somerset Levels. A few pairs of lapwing continue to breed in the Gordano Valley, between Portishead and Clevedon.

4.5.384 The Somerset Levels is considered to be one of two British sites of greatest importance for over-wintering lapwing, the other site being The Wash on the east coast (Calbrade *et al*., 2010).

4.5.385 In winter there can be large flocks of lapwing, both on farmland and on the Severn Estuary, as lapwing is a very mobile migrant species, responding rapidly to changing weather conditions.

4.5.386 Within 1km of the Proposed Development, lapwing have been regularly recorded at Avonmouth Pools, Portbury Wharf Nature Reserve, Gordano Valley, Nailsea Moor, Tickenham Moor, Kenn Moor and Puxton Moor. Occasional large numbers of up to 520 individuals have been recorded within the last 20 years, although recent records tend to be of much lower numbers than this. The greatest numbers of lapwing in the area have been recorded during the winter period, however moderate numbers of lapwing have occasionally been found at Nailsea Moor and Tickenham Moor following the end of the breeding season. Small numbers of lapwing have been recorded at Hallen Marsh in the Avonmouth Area, with a peak count of 36 individuals in March 2008 (Cresswell Associates, 2011a).

4.5.387 Lapwing have been recorded to breed at Portbury Wharf Nature Reserve (1 pair). They have also been recorded during the breeding season at Nailsea Moor, Tickenham Moor and Congresbury during RSPB breeding bird surveys undertaken in 2010 and 2011. It is possible that a small number of pairs of lapwing have bred in each of these locations during the last few years.

4.5.388 Selected records for lapwing within 1km of the Proposed Development for 2000-2013 are presented in Table 4.23. Records of lapwing in this area are presented at Figure 8.8.

Table 4.23. Selected Desktop Survey Records for Lapwing within 1km of the Proposed Development 2000-2013.

Site Name	**Date/Year**	**Count**
Nailsea Moor	December 2003	520
Puxton Moor	February 2004	30+
Kenn Moor	February 2004	123
Nailsea Moor	February 2004	50
Tickenham Moor	September 2004	30+
Nailsea	February 2005	275
Portbury Wharf Nature Reserve	Summer 2005	1 pair (breeding)
Portbury, Chapel Pill	Dec ember 2005	400
Portbury Wharf Nature Reserve	December 2005	350
Portbury, Severn Estuary	January 2005	250
Portbury, Severn Estuary	February 2005	500
Nailsea Moor	June 2005	80

Site Name	Date/Year	Count
Kenn Moor	February 2006	55
Merebank, Avonmouth	February 2006	200
Portbury, Chapel Pill	November 2006	115
Royal Portbury Dock	November 2006	65
Kingston Seymour	December 2006	250
Tickenham Moor	December 2006	62
Land to south of Avonmouth Sewage Works	January 2008	310
Portbury Wharf Nature Reserve	February 2008	120
Portbury Wharf Nature Reserve	December 2009	80

4.5.389 There are a large number of records for lapwing within the wider survey area although these records are concentrated in the vicinity of Bridgwater Bay and various locations across the Somerset Levels SPA. Notable records include a count of 10,000 in the Catcott, Edington and Chilton Moors SSSI in Winter 2004/05. More recent records include a count of 134 lapwing on the eastern side of Tealham and Tadham Moors SSSI in December 2009 and 12000 lapwing at Greylake RSPB reserve in January 2013.

4.5.390 Selected records for lapwing in the wider area for 2010-2013 are presented in Table 4.24.

Table 4.24. Selected Desktop Survey Records for Lapwing within the wider area 2010-2013

Site Name	Date/Year	Count
Combwich on the River Parrett	12th October 2010	c.100
Steart	22nd October 2010	120
Tealham and Tadham Moors	31st October 2010	300+
Greylake RSPB reserve	21st November 2010	500
Shapwick Heath RSPB reserve	21st December 2010	270
Greylake RSPB reserve	13th January 2011	3000+
Kings Sedgemoor	16th January 2011	4000+
South Lake Moor	5th February 2011	800
Catcott Lows	14th February 2011	3000
Greylake RSPB reserve	20th February 2011	2000+

Site Name	Date/Year	Count
Shapwick Heath RSPB reserve	9th April 2011	8
Tealham and Tadham Moors	23rd December 2012	800
Catcott Lows	27th December 2012	200
Greylake RSPB reserve	1st January 2013	12000
Kings Sedgemoor	7th January 2013	4000
Steart	30th January 2013	1500

Hinkley Point Bird Surveys

4.5.391 During surveys undertaken over winter 2007/2008 flocks in excess of 50 lapwing were recorded on 4 occasions within the inland survey area at Hinkley Point, with a peak count of 67 individuals on November 2007. The field in which these birds were recorded lies 250m from the proposed connection works at their closest point.

4.5.392 During the winter 2008/2009, lapwing usage was concentrated around Wick Moor and the central survey area, although only occasional usage by lapwing was observed. Peak counts of 88 lapwing and 161 lapwing were recorded during February 2009.

4.5.393 During nocturnal surveys a peak count of 14 lapwing was observed in the field to the south of the proposed substation directly adjacent to proposed connection works.

Puriton Wind Farm Bird Surveys

4.5.394 A single lapwing was recorded on the proposed Puriton wind farm site in February 2009 however no lapwing were recorded during the 2008 breeding bird survey (Parsons Brinckerhoff, 2010). Lapwing were recorded flying within the wind farm site for a total of 2,115 seconds (approximately 35 minutes) out of 69 hours of vantage point survey. This indicates the relatively low importance of the proposed corridor where it crosses the Huntspill River as a flight route for lapwing.

Winter Bird Survey 2009-2010

4.5.395 A peak number of 2,961 lapwings were recorded at the Tealham and Tadham SSSI in late February 2010 (accurate count undertaken by two TEP surveyors). Over 700 lapwing were also recorded at the Tealham and Tadham Moors SSSI in late November 2009 and late January 2010. Only sixteen lapwing were recorded at Catcott, Edington and Chilton Moors SSSI in late February 2010.

4.5.396 A peak number of 26 lapwing was recorded at Tickenham, Nailsea & Kenn Moors SSSI in late November 2009. Lapwing were recorded in single figures at Biddle Street Yatton SSSI and Kenn Church, Kenn Pier & Yew Tree Farm SSSI in late January 2010.

Winter Bird Survey 2012

4.5.397 The locations of lapwing recorded are shown at Figure 8.13. The largest single group of birds recorded during the 2012 winter birds survey was a group of 500 lapwing. However, these birds were observed outside of the preferred corridor, approximately

1km to the east of the preferred corridor on Liberty Moor, East Huntspill. The largest group of lapwing recorded within the preferred corridor was a group of 16 lapwing at the north large pool at Portbury Wharf during February.

Winter Bird Survey 2012-2013

4.5.398 The locations of lapwing recorded are shown at Figure 8.13. Small groups of lapwing were recorded throughout the 2012-2013 winter bird survey, however the majority were recorded more than 250m from the proposed route. Lapwing were recorded on Huntspill Moor (Peak count: 42 indiv.), Puxton Moor (peak count: 60 indiv.) and, towards the end of the season, at Nailsea Moor (peak count: 18 indiv.).

4.5.399 A larger group of lapwing was recorded southeast of Rooksbridge alongside the Kingsway Road during the January and February visit, located more than 500m east of the proposed route. 400 individuals were recorded in this location on the 29th January and 302 individuals on the 18th February. During February these birds were recorded to stay within this location after dark, suggesting that they roosted here overnight. The lapwing recorded during January were recorded to fly east of this location near to dusk suggesting that they likely roosted outside of the preferred corridor. No lapwing were observed in this location during March.

4.5.400 A peak count of 130 lapwing were recorded using the large pool at Portbury Wharf during January.

Winter Bird Survey 2013-2014

4.5.401 No lapwing were recorded at any stage during the 2013-2014 winter bird survey.

Breeding Bird Survey 2012

4.5.402 A peak count of 12 lapwing were recorded at Nailsea Moors and Marshes during the 2012 breeding bird survey, although it is likely that not all of these bred within this area.

Vantage Point Survey 2009-2010

4.5.403 A summary of the number of flight lines recorded at each vantage point survey location is presented in Table 4.20. The largest numbers of lapwing were recorded from Vantage Points 2, 3, 4 and 6, with the great majority of flights (except from VP2) recorded during January.

4.5.404 Of the 2,721 lapwing flight lines recorded within the preferred corridor during the 2009/2010 vantage point survey, only 37% (995) were recorded to fly at risk height.

4.5.405 The high proportion of lapwing flight lines recorded at VP3, VP4 and VP6 in January 2010 indicates that these lapwing movements are likely to have been influenced by the poor weather conditions during this month.

4.5.406 The vast majority of lapwing flights were recorded within two relatively short periods associated with dawn and dusk. For the dawn period greater numbers of lapwing flights tended to be recorded from 30 minutes before dawn to one hour 30 minutes after dawn. For the dusk period greater numbers of lapwing flights were recorded from one hour before dusk to 30 minutes after dusk. Much fewer lapwing flights were recorded during the daytime and only very low numbers of lapwing were recorded at night time. For example, no flocks of lapwing exceeding 10 individuals were ever recorded at night time.

Table 4.75. Flight Activity for Lapwing during the 2009-2010 Vantage Point Survey

Location	Total No. Flight lines	Total No. Flights Through Preferred Corridor	Total No. Preferred Corridor Flight lines Within Risk Zone	Total No. Flights Within 250m Proposed route	Total No. Flights Within 250m Proposed route At Risk Height
VP1	285	26	26	28	28
VP2	656	254	170	268	159
VP3	2,372	500	0	620	0
VP4	972	162	90	135	69
VP5	169	168	57	50	50
VP6	3,008	1181	649	54	54
VP7	631	430	3	430	3

Lapwing Flight line Direction

4.5.407 The flight lines for lapwing relative to vantage point locations are illustrated at Figure 8.20. Lapwing flight activity at VP1 was very infrequent between October and December 2009 but increased between January and April 2010 with flocks generally moving eastwards or westwards occasionally crossing the preferred corridor, but generally located to the east. Lapwing flocks were generally in single figures although flocks of up to 70 lapwing were observed.

4.5.408 Lapwing flight activity at VP2 was fairly constant throughout the period October 2009 to April 2010. Small numbers of lapwing occasionally stopped to roost within the preferred corridor to the south west of VP2.

4.5.409 Lapwing flight activity at VP3 also increased between January and April 2010 following only a small number of flock movements in October to December 2009. Lapwing observed from VP3 tended to fly across the study area without stopping although roosting lapwing were observed on nocturnal surveys. Lapwing flight activity was generally lower at VP4 and VP5 and no lapwing were observed from VP5 in the period January to April 2010. A single flock of 100 lapwing flew across the preferred corridor to the north east of VP5 on one occasion.

4.5.410 Lapwing flight activity observed from VP6 involved fairly small numbers of lapwing flocks flying across the preferred corridor. However some of the flocks observed in the period January to April 2010 numbered up to 420 birds. Small to moderate flocks of lapwing were observed settling on land 1km to the northwest of VP6 within the preferred corridor in the run up to the breeding season.

4.5.411 Apart from a single group of 3 birds crossing the proposed route at risk height in early January, the only other date when lapwing were recorded from this vantage point was on the 12st December. A total of 427 flight lines were recorded on this date passing south over the River Avon and the proposed route, however all of these birds flew well above the risk height.

Vantage Point Survey 2010-2011

4.5.412 The largest numbers of lapwing flights were recorded from Vantage Point 3d Crippe River (Table 4.21), and the great majority of these lapwing flights were recorded during January 2011. The lapwing flight lines are illustrated at Figure 8.22.

4.5.413 Only 56% of all lapwing flights recorded from vantage 3a, 3b, 3c and 3d combined flew at risk zone height.

4.5.414 Considerably fewer lapwing flights were recorded during winter 2010-2011 compared to winter 2009-2010 confirming that lapwing do not tend to take regular nocturnal flights across the study area. Furthermore the majority of lapwing flights recorded during the 2010-2011 vantage point survey were recorded near to dawn or dusk periods with very few lapwing flights being recorded at night time.

4.5.415 It was also noted that small numbers of lapwing roosted overnight in the fields close to VP3a Chilton Moor, and to a much lesser extent in the fields close to VP3d (around two birds).

Table 4.86. Flight Activity for Lapwing during the 2010-2011 Vantage Point Survey

Location	Total No. Flight lines	Total No. Flights Through Preferred Corridor	Total No. Preferred Corridor Flight lines Within Risk Zone	Total No. Flights Within 250m Proposed route	Total No. Flights Within 250m Proposed route At Risk Height
VP1	15	15	0	0	0
VP2	68	68	0	68	0
VP3A	17	13	7	0	0
VP3B	50	33	11	0	0
VP3C	54	54	11	0	0
VP3D	390	227	196	0	0

4.5.416 Survey findings at VP3d Crippe River provide further evidence to confirm that land located further east of the preferred corridor, within 1km of the Tealham and Tadham Moors SSSI and the Catcott, Edington and Chilton Moors SSSI is used at consistently greater levels by lapwing than land within the preferred corridor.

<u>Connection Potential Effects Assessment - Lapwing</u>

Habitat Loss

4.5.417 In the context of the extensive wet grassland and wetland habitat across the Somerset Levels available to wintering lapwing, the temporary loss of habitat within the preferred corridor during construction is not considered to be significant.

Disturbance and Displacement Effects

4.5.418 Desktop and field survey findings show that lapwing use parts of the study area fairly regularly, particularly within 1km of the Tealham and Tadham Moors SSSI and the Catcott, Edington and Chilton Moors SSSI, and small to moderate numbers roost during the winter period in these locations. However these areas are located more than 1km east of the preferred corridor and proposed route.

4.5.419 A peak count of 12 lapwing were recorded at Nailsea Moors and Marshes during the 2012 breeding bird survey, although it is likely that not all of these bred within this area. Lapwing have been recorded breeding in this area by the RSPB. It is possible that some disturbance of low numbers of lapwing may occur if construction works were carried out in these fields during March to August.

Collision Risk for Migration and Regular Feeding Flights

4.5.420 The method used for the following calculations used to predict annual winter mortality for lapwing for the entire proposed route has been explained in Section 4.2.

<u>Part A: predicting lapwing collision mortality for the entire proposed route (Severn Estuary SPA/Ramsar)</u>

<u>*Stage 1: determining the number flight lines recorded*</u>

4.5.421 It is calculated that a total of **915** lapwing flight lines were recorded within 250m of the proposed route during 47 hours of observation (VP1, VP2, VP4, VP6 and VP7), however only 313 flight lines were recorded flying at risk height.

<u>*Stage 2: calculating annual winter mortality on a zero-avoidance basis for the VP survey area*</u>

4.5.422 If it is assumed that all flights in the risk zone result in collision, to calculate annual winter mortality, results from the VP survey are multiplied by a factor of 36. This gives a total of **11,268** collisions.

<u>*Stage 3: calculating the zero-avoidance winter collision mortality for the entire proposed route*</u>

4.5.423 To calculate the mortality associated with the entire route, correcting for areas where the likelihood of bird movements was high, moderate or low, the annual winter mortality results are multiplied by a scaling factor of **2.85**. This gives a total of **32,114.80** collisions.

<u>*Stage 4: apportioning to the SPAs*</u>

4.5.424 The 5-year peak mean for lapwing at the Severn Estuary SPA is **10,744**, whereas the Somerset Levels and Moors SPA supports **39,766** individuals. For the section south of the Mendip Hills where lapwing could be associated with the Severn Estuary SPA or the Somerset Levels and Moors SPA it is therefore assumed that **21%** of the lapwing were associated with the Severn Estuary SPA. Within the section south of the Mendips (using

256 flight lines recorded from vantage points 1,2 and 4, this gives a total of **5,515.78** lapwing collisions assuming no avoidance for the Severn Estuary SPA. Within the section north of the Mendips where 100% of flight lines were considered to be associated with the Severn Estuary SPA, using the 57 lapwing flight lines recorded from vantage point 6 and 7 it is calculated that **5,848.20** lapwing collisions assuming no avoidance. This gives a total of **11,363.98** lapwing collisions assuming no avoidance action (sum of sections both south of the Mendips and north of the Mendips).

Stage 5: applying a Collision Risk Avoidance Rate

4.5.425 Using the lower limit **99.9% collision risk avoidance** rate it is calculated that **11.36** lapwing associated with the Severn Estuary SPA would be affected by collision mortality along the entire length of the proposed route each winter.

4.5.426 Using the upper limit **99.5% collision risk avoidance** rate it is calculated that **56.82** lapwing associated with the Severn Estuary SPA would be affected by collision mortality along the entire length of the proposed route each winter.

4.5.427 Using the realistic **99.7% collision risk avoidance rate** it is calculated that **34.09** lapwing associated with the Severn Estuary SPA would be affected by collision mortality along the entire length of the proposed route each winter.

Stage 6: Five-year peak mean for the Severn Estuary SPA

4.5.428 The five year peak mean (2007/08 – 2011/12) for the lapwing population at the Severn Estuary SPA is **10,744**. Lapwing is a contributing species to the Severn Estuary SPA wintering waterfowl assemblage but it is not an SPA qualifying species.

Stage 7: Percentage of SPA population affected by collision mortality each year

4.5.429 Using the lower limit 99.9% collision risk avoidance rate it is calculated that **0.11** of the lapwing population associated with the Severn Estuary SPA would be affected by collision mortality each year.

4.5.430 Using the upper limit **99.5% collision risk avoidance** rate it is calculated that **0.53** of the lapwing population associated with the Severn Estuary SPA would be affected by collision mortality each year.

4.5.431 Using the realistic **99.7% collision risk avoidance rate** it is calculated that **0.32** of the lapwing population associated with the Severn Estuary SPA would be affected by collision mortality each year.

Part B: predicting lapwing collision mortality for Somerset Levels and Moors SPA population birds:

4.5.432 A proportion of the lapwing recorded during VP surveys should be considered as not contributing to the Somerset Levels and Moors SPA population since there are many other possible sites for lapwing to overwinter in the vicinity of the study area which are distant from the SPA. To take account of this it is assumed that when predicting collision mortality effects on the Somerset Levels and Moors SPA, lapwing flight lines recorded at VP survey locations located within 10km of the Somerset Levels SPA (VP1, VP2 and VP4) need only be considered.

Stage 1: determining the number flight lines recorded

4.5.433 A total of **256** lapwing flight lines were recorded within the proposed route at risk height using data collected at VP1, VP2 and VP4.

Stage 2: calculating annual winter mortality on a zero-avoidance basis for the VP study area

4.5.434 If it is assumed that all flights in the risk zone result in collision, to calculate annual winter mortality results are multiplied by a factor of **36**. This gives a total of **9,216** collisions.

Stage 3: calculating the zero-avoidance winter collision mortality for the section associated with the Somerset Levels and Moors SPA

4.5.435 To calculate the mortality associated with the section of line south of the Mendip Hills, taking into account areas where the likelihood of bird movements was high, moderate or low, the annual winter mortality results are multiplied by a factor of **2.11**. This gives a total of **19,445.76** collisions.

Stage 4: apportioning to the SPAs

4.5.436 It is assumed that 79% of the lapwing were associated with the Somerset Levels and Moors SPA. This gives a total of **15, 362.15**.

Stage 5: applying a Collision Risk Avoidance Rate

4.5.437 Using the lower limit **99.9% collision risk avoidance** rate it is calculated that **15.36** lapwing associated with the Somerset Levels and Moors SPA would be affected by collision mortality each winter.

4.5.438 Using the upper limit **99.5% collision risk avoidance** rate it is calculated that **76.81** lapwing associated with the Somerset Levels and Moors SPA would be affected by collision mortality each winter.

4.5.439 Using the realistic **99.7% collision risk avoidance** rate it is calculated that **46.09** lapwing associated with the Somerset Levels and Moors SPA would be affected by collision mortality each winter.

Stage 6: Five-year peak mean for the Somerset Levels and Moors SPA

4.5.440 The five year peak mean (2007/08 – 2011/12) for the lapwing population at the Somerset Levels and Moors SPA is **39,766**. Lapwing is a qualifying species for the Somerset Levels and Moors SPA.

Stage 7: Percentage of SPA population affected by collision mortality each year

4.5.441 Using the lower limit **99.9% collision risk avoidance** rate it is calculated that **0.04%** of the lapwing SPA population would be affected by collision mortality each year.

4.5.442 Using the upper limit **99.5% collision risk avoidance** rate it is calculated that **0.19%** of the lapwing SPA population would be affected by collision mortality each year.

4.5.443 Using the realistic **99.7% collision risk avoidance** rate it is calculated that **0.12%** of the lapwing SPA population would be affected by collision mortality each year.

Redshank

4.5.444 Redshank is a qualifying species for the Severn Estuary SPA under Article 4.2 (individual species -overwinter). It is also a qualifying species for the Severn Estuary Ramsar under criterion 6 (species/populations occurring at levels of international importance –winter).

Desktop Survey

4.5.445 Redshank are resident in many areas of the UK, however the numbers are greatly boosted during the winter period by birds from Iceland and nearby Europe. During the winter period redshank is predominantly a coastal bird, frequenting mudflats and saltmarsh in estuarine and other coastal areas such as lagoons. During the breeding season redshank favour wetland habitat such as saltmarshes, flood meadows and near to lakes.

4.5.446 Wintering redshank in the UK have shown a downward trend over the last decade, although a slight rise was observed in Britain during the 2011/2012 winter (Holt *et al.,* 2012). The recent decline may be a result of a northwest shift in the wintering population, with many birds remaining closer to their Icelandic breeding grounds during the winter period (Maclean *et al.,* 2008).

4.5.447 Redshank formerly bred in the Gordano valley. This species is a winter visitor to the Severn Estuary and all along the River Avon. At least 200 birds occur in the estuarine area to the north of the River Avon within the study area although many more redshank occur on the Estuary. The 2007/2008 – 2011/2012 five-year peak mean for the Severn Estuary SPA is 2,816.

4.5.448 Almost all redshank records from within 1km of the proposed development are within the Portbury area. These include a peak count of 210 individuals at Portbury Wharf Nature Reserve in July 2007. The majority of records are from Portbury, Chapel Pill, with Portbury Wharf Nature Reserve also regularly used.

4.5.449 The majority of redshank records within the wider study area either relate to the Bridgwater Bay area or various locations within the Somerset Levels. Notable records include a count of 565 and 390 redshank at Bridgwater Bay in March 2004 and August 2004 respectively. 296 redshank were recorded in Weston Bay to the south west of Weston-super-Mare in Spring 2004. 25 redshank were recorded in Catcott, Edington and Chilton Moors SSSI in spring 2000. A single redshank was recorded at Ham Wall RSPB reserve on 23rd April 2011.

Hinkley Point Bird Surveys

4.5.450 A single redshank was recorded foraging within a coastal field during the Hinkley Point bird surveys. This location was more than 750m from the proposed connection works.

Winter Bird Survey 2009-2010

4.5.451 A single redshank was recorded at Biddle Street Yatton SSSI in late January 2010.

Winter Bird Survey 2012

4.5.452 A pair of redshank were recorded displaying on the saltmarsh adjacent to Portbury Wharf during a survey undertaken on the 13th March. These birds were not recorded to fly within the preferred corridor. The locations of redshank recorded are shown at Figure 8.13.

Winter Bird Survey 2012-2013

4.5.453 The only location where redshank were recorded during the 2012/2013 winter bird survey was on the banks of the River Avon. A peak count of 4 individuals was recorded in this location during both the February and March visit. The locations of redshank recorded are shown at Figure 8.13.

Winter Bird Survey 2013-2014

4.5.454 No redshank were recorded during the 2013-2014 winter bird survey.

Vantage Point Survey 2009-2010

4.5.455 A summary of the number of redshank flight lines recorded at each vantage point survey location is presented in Table 4.27.

4.5.456 Small numbers of redshank were recorded from VP2 and VP7 crossing the preferred corridor. All of these flights were of single birds flying within the risk zone. The flight lines are illustrated at Figure 8.20.

Table 4.9. Flight Activity for Redshank during the 2009-2010 Vantage Point Survey

Location	Total No. Flight lines	Total No. Flights Through Preferred Corridor	Total No. Preferred Corridor Flight lines Within Risk Zone	Total No. Flights Within 250m Proposed route	Total No. Flights Within 250m Proposed route At Risk Height
VP1, VPs3-6	0	0	0	0	0
VP2	1	1	1	1	1
VP7	11	11	11	11	11

Vantage Point Survey 2010-2011

4.5.457 One redshank flight line was recorded during the 2010-2011 vantage point survey. This bird was recorded flying low below risk height towards the Huntspill on the 13th April 2011 from VP2.

Connection Potential Effects Assessment - Redshank

Habitat Loss

4.5.458 Desktop and field survey findings show that redshank only occasionally use the study area during the winter period. Therefore no impact as a result of temporary habitat loss is predicted to arise.

Disturbance and Displacement Effects

4.5.459 Desktop and field survey findings show that redshank only occasionally use the study area. It is therefore highly unlikely that redshank would be displaced through the construction of the connection.

Collision Risk for Migration and Regular Feeding Flights

4.5.460 The rate of redshank flights recorded during the vantage point survey was very low and only 12 birds flew within the risk zone. It is considered that the proposed overhead line has a very low, if not negligible potential to cause redshank collision mortality.

4.5.461 The overall collision risk for redshank is likely to be reduced even further due to the removal of large sections of the existing 132kV overhead line between Bridgwater and Avonmouth as part of this project.

<u>Predicting redshank collision mortality for birds associated with Severn Estuary SPA population:</u>

To calculate the predicted redshank collision mortality associated with the Severn Estuary SPA population, vantage points 1, 2, 4, 6 and 7 are considered.

<u>*Stage 1: determining the number flight lines recorded*</u>

A total of **12** redshank flight lines were recorded within 250m of the proposed route at risk height using data collected at VP1, VP2, VP4, VP6 and VP7.

<u>*Stage 2: calculating annual winter mortality*</u>

To calculate annual winter mortality results are multiplied by a factor of 36. This gives a total of **432**.

<u>*Stage 3: calculating the winter collision mortality for the entire proposed route*</u>

To calculate the mortality associated with the entire section of line, taking into account areas where the likelihood of bird movements was high, moderate or low, the annual winter mortality results are multiplied by a factor of **2.85.** This gives a total of **1,231.20**.

<u>*Stage 4: apportioning to the SPAs*</u>

It is assumed that 100% of the redshank observed were associated with the Severn Estuary SPA.

<u>*Stage 5: applying a Collision Risk Avoidance Rate*</u>

Using the lower limit **99.9% collision risk avoidance rate** it is calculated that **1.23** redshank associated with the Severn Estuary SPA would be affected by collision mortality along the entire length of the proposed route each winter.

Using the upper limit **99.5% collision risk avoidance rate** it is calculated that **6.16** redshank associated with the Severn Estuary SPA would be affected by collision mortality along the entire length of the proposed route each winter.

Using the realistic **99.7% collision risk avoidance rate** it is calculated that **3.69** redshank associated with the Severn Estuary SPA would be affected by collision mortality along the entire length of the proposed route each winter.

<u>*Stage 6: Five-year peak mean for the Severn Estuary SPA*</u>

The five year peak mean (2007/8 – 2011/12) for the redshank population at the Severn Estuary SPA is **2,816**. Redshank is a qualifying species for the Severn Estuary SPA.

Stage 7: Percentage of SPA population affected by collision mortality each year

Using the lower limit **99.9% collision risk avoidance rate** it is calculated that **0.04%** of the redshank population associated with the Severn Estuary SPA would be affected by collision mortality each year.

Using the upper limit **99.5% collision risk avoidance rate** it is calculated that **0.22%** of the redshank population associated with the Severn Estuary SPA would be affected by collision mortality each year.

Using the realistic **99.7% collision risk avoidance rate** it is calculated that **0.13%** of the redshank population associated with the Severn Estuary SPA would be affected by collision mortality each year.

Dunlin

4.5.462 Dunlin is a qualifying species for the Severn Estuary Ramsar under criterion 6 (species/populations occurring at levels of international importance –winter).

Desktop Survey

4.5.463 Dunlin is a winter visitor to the Severn Estuary, and flocks totalling 2,500 have been recorded on estuarine mud within the study area to the north of Avonmouth although much larger numbers can occur at other sites on the Estuary (Bland, *pers. comm*., October 2009). Numbers build to a peak in December and January, and are strongly affected by weather conditions.

4.5.464 Dunlin have been in steady decline in Britain since the mid-1990's, although the two cold winters between 2009 and 2011 have seen larger numbers in Britain (Holt *et al.,* 2012). Declines in numbers in Britain have been associated with an increase in Dunlin in the Netherlands (Hornman *et al.,* 2011) probably due to climatic amelioration (Maclean et al., 2008).

4.5.465 Desktop records for dunlin are illustrated at Figure 8.8 Almost all dunlin records within 1km of the Proposed Development are from Chapel Pill, Portbury, with a peak count of 3,000 individuals in November 2007. The majority of records in this location were of between 10 and 600 individuals. Most of the larger counts were recorded in this location in December and January. Chapel Pill is located off the northeast coast of Portbury Wharf Nature Reserve, located approximately 400m north of the closest proposed works associated with the alternative route (Option B).

4.5.466 Within the wider area dunlin records mainly concern Shapwick Heath SSSI, Bridgwater Bay SSSI and Weston Bay. Notable records include a peak count of 20,000 dunlin in Bridgwater Bay in winter 2004/05. 10 dunlin were recorded on Shapwick Heath SSSI in winter 2004/05. Three dunlin were recorded on the western fringe of Catcott, Edington and Chilton Moors SSSI in November 2001, located over 2km east of the Proposed Development. Between 20 and 40 dunlin were recorded at Greylake RSPB reserve in February 2011. Four dunlin were recorded at Shapwick Heath RSPB reserve on 9th April 2011.

Hinkley Point Bird Surveys

4.5.467 No dunlin were recorded using the inland fields during the Hinkley Point bird survey work.

Winter Bird Surveys 2009-2014

4.5.468 No dunlin were recorded at any stage during any of the winter bird survey undertaken between 2009 and 2013.

Vantage Point Survey 2009-2010

4.5.469 A summary of the flight activity for dunlin is presented in Table 4.28. The only observation of dunlin was of two individuals recorded from VP 1 on 13th January 2010, where both flew through the preferred corridor at risk height during the early afternoon. This flight line is illustrated at Figure 8.20.

Table 4.108. Flight Activity for Dunlin during the 2009-2010 Vantage Point Survey

Location	Total No. Flight lines	Total No. Flights Through Preferred Corridor	Total No. Preferred Corridor Flight lines Within Risk Zone	Total No. Flights Within 250m Proposed route	Total No. Flights Within 250m Proposed route At Risk Height
VP1	2	2	2	0	0
VP2-7	0	0	0	0	0

Vantage Point Survey 2010-2011

4.5.470 No dunlin were recorded at any stage during the 2010-2011 vantage point survey.

<u>Connection Potential Effects Assessment - Dunlin</u>

Habitat Loss

4.5.471 Wintering birds do not make use of habitat within the corridor. No impact as a result of temporary habitat loss is predicted to arise.

Disturbance and Displacement Effects

4.5.472 Dunlin do not tend to occur inland, as much of their movement is restricted to coastal sites. Therefore there will be no displacement effects on dunlin.

Collision Risk for Migration and Regular Feeding Flights

4.5.473 Desktop and field survey findings also confirm that dunlin do not tend to fly within the study area. No impact as a result of collision risk is predicted to arise.

<u>Green sandpiper</u>

Desktop survey

4.5.474 Green sandpiper is a migratory species which crosses the entirety of the west Palearctic. It is essentially a freshwater species which migrates on a broad front and is rarely recorded in numbers exceeding 50 birds either during migration or at migration staging points (Snow and Perrins, 1988).

4.5.475 Green sandpiper is listed on the citation for King's Sedgemoor SSSI.

4.5.476 Green sandpiper records within 1km of the Proposed Development do not exceed a peak count of 6 individuals, recorded at Avonmouth Sewage Works (Avonmouth Pools) during January and July 2009. Elsewhere smaller numbers of typically between one and three birds have been recorded at Portbury Wharf Nature Reserve, Kenn Moor, Tickenham Moor, Hoar Gout, Puxton Moor, Congresbury Moor, Chittening Warth and Seabank Power Station and the sewage works at Lawrence Weston.

Puriton wind farm bird surveys 2008-2009

4.5.477 A single green sandpiper was recorded on the wind farm site on 29th October 2009 (Parsons Brinckerhoff, 2010).

Hinkley Point Bird Surveys

4.5.478 No green sandpiper were recorded during the Hinkley Point bird survey work.

Winter bird survey 2009-2010

4.5.479 No green sandpiper were recorded during the 2009-2010 winter bird survey.

Winter bird survey 2012

4.5.480 Green sandpiper were recorded in two locations during the 2012 surveys in March. Both records were of individual birds; the first adjacent to the Congresbury Yeo north of Hewish, and the second recorded on the banks of a drain east of Kingston Seymour. Both of these birds are likely to have been on migration.

Winter bird survey 2012-2013

4.5.481 No green sandpiper were recorded during the 2012-2013 winter bird survey.

Winter Bird Survey 2013-2014

4.5.482 No green sandpiper were recorded during the 2012-2013 winter bird survey.

Vantage Point survey 2009-2010

4.5.483 A summary of the flight activity for green sandpiper is presented in Table 4.29 below. The majority of green sandpiper flight lines were recorded at VP2 and VP3. Two birds were observed to fly within 250m of the proposed route at risk height. Both were recorded flying low along the River Huntspill.

Table 4.29. Flight activity for green sandpiper during the 2009-2010 vantage point survey.

Location	Total No. Flight lines	Total No. Flights Through Preferred Corridor	Total No. Preferred Corridor Flight lines at risk height	Total No. Flights Within 250m Proposed route	Total No. Flights Within 250m Proposed route At Risk Height
VP1	1	1	0	0	0
VP2	3	3	3	2	2
VP3	3	3	3	0	0
VP4-5 & 7	0	0	0	0	0
VP6	1	1	1	1	1

Vantage Point survey 2010-2011

4.5.484 A single green sandpiper was recorded flying along the Huntspill River on 15th April 2011. The bird was recorded at the end of the vantage point survey flying close to the water within the Puritan wind farm site. A second green sandpiper was recorded flying below ten metres along the King Sedgemoor Drain at VP1.

Connection Potential Effects Assessment – Green sandpiper

Habitat Loss

4.5.485 In the context of the extensive wet grassland, rhynes, water courses and wetland habitat across the Somerset Levels available to wintering green sandpiper, the temporary loss of habitat within the preferred corridor during construction is not considered to be significant.

Displacement effects

4.5.486 In the context of the extensive wet grassland and wetland habitat across the Somerset Levels available to wintering lapwing, the temporary loss of habitat within the preferred corridor during construction is not considered to be significant.

4.5.487 Desktop survey and field survey findings show that green sandpiper overwinter in small numbers in several locations within the study area including Avonmouth Sewage Works, Kenn Moor, Portbury Wharf, Tickenham Moor, Hoar Gout and the Huntspill River. There is very limited potential for displacement of green sandpiper.

Collision risk for migration and regular feeding flights

4.5.488 The rate of green sandpiper flights recorded during the vantage point survey was very low, although nearly all of the flights were recorded at collision risk height. Due to the low numbers of green sandpiper recorded during the vantage point survey, it is considered that if there is any risk of green sandpiper collision mortality from the proposed overhead line, the risk is very low.

Curlew

4.5.489 Curlew forms part of the assemblage of wintering birds which is a qualifying feature for the Severn Estuary SPA.

Desktop Survey

4.5.490 The curlew is mostly migratory with some birds being resident in west Europe. Autumn passage of western European curlews begins in late June and entails curlews arriving at The Wash on the east coast and the Wadden Sea on the west coast of mainland Europe to commence moulting, birds mainly arrive in July and August prior to birds dispersing to other overwintering sites such as the Severn Estuary.

4.5.491 The desktop survey has revealed that curlew winter in good numbers at the north end of the Severn Estuary with a peak count of 100 individuals at Chapel Pill, Portbury during July 2009. The next highest curlew count was of 85 individuals on the Severn Estuary north of Portbury Wharf Nature Reserve in July 2005. These birds are likely to have been arriving on autumn passage prior to dispersing to their wintering grounds.

4.5.492 Curlew were also recorded in moderate numbers at Portbury Wharf Nature Reserve (40 individuals) during the winter of 2006/2007. Curlew have occasionally been recorded at Hallen Marsh within the Avonmouth area with a peak count of 35 individuals in March 2006 (Cresswell Associates, 2011a).

4.5.493 Within the wider area curlew are known to breed in small numbers within the Somerset Levels including Ham Wall, Greylake, Kings Sedgemoor and Steart.

Table 4.30. Selected Desktop Survey Records for Curlew 2000-2013

Site Name	Date/Year	Count
Severn Estuary 6km north of Bristol	2001-2006 average	2,521
Near Ham Wall RSPB reserve	2002	2 pairs
Greylake RSPB reserve	2002	4 pairs
Kings Sedgemoor	2002	4 pairs
Ham Wall RSPB reserve	January 2003	1
Greylake RSPB reserve	2005	2 pairs
Portbury, Chapel Pill	July 2009	100
Greylake RSPB reserve	4th January 2011	1
Greylake RSPB reserve	4th March 2011	8

Steart	3rd November 2012	300

Hinkley Point Bird Surveys

4.5.494 No regular use of coastal fields by curlew was recorded during the Hinkley Point bird surveys. A peak count of 21 curlew were recorded on Wick Moor during December 2007. The proposed connection works pass through the corner of this field. 20 curlew were also recorded on a field to the west of Hinkley Point power station during January 2009, however this location is approximately 1km from proposed connection works.

Winter Bird Survey 2009-2010

4.5.495 No curlew were recorded at any stage during the 2009-2010 winter bird survey indicating that they do not use the fields within the study area during the winter period.

Winter Bird Survey 2011-2012

4.5.496 A single curlew was recorded calling within the Nailsea Moors area during the nocturnal survey. No curlew were recorded elsewhere within the study area indicating that curlew rarely use the preferred corridor.

Winter Bird Survey 2012-2013

4.5.497 The locations of curlew recorded are shown at Figure 8.13. The only location within 250m of the proposed route where curlew were recorded was on the banks of the River Avon. A peak count of 3 curlew were recorded feeding within this location during November. A small group of 2 curlew were recorded on Puxton Moor during October more than 250m from the proposed route. Curlew were also recorded at Portbury Wharf, where a group of 20 individuals was recorded flying over Sheepway towards the reserve during the January visit. Four individuals were recorded by the pools at the reserve during March.

Winter Bird Survey 2013-2014

4.5.498 No curlew were recorded at any stage during the 2013-2014 winter bird survey.

Vantage Point Survey 2009-2010

4.5.499 A summary of the flight activity for curlew is presented in Table 4.31. Single curlews or groups of two birds were occasionally seen flying up the River Avon throughout the 2009-2010 vantage point survey. The flight lines are illustrated at Figure 8.20.

Table 4.31. Flight Activity for Curlew during the 2009-2010 Vantage Point Survey

Location	Total No. Flight lines	Total No. Flights Through Preferred Corridor	Total No. Preferred Corridor Flight lines Within Risk Zone	Total No. Flights Within 250m Proposed route	Total No. Flights Within 250m Proposed route At Risk Height
VP1-6	0	0	0	0	0
VP7	14	14	9	14	9

Vantage Point Survey 2010-2011

4.5.500 No curlew were recorded at any stage during the 2010-2011 vantage point survey.

Vantage Point Survey 2013-2014

4.5.501 A single group of 8 curlew were recorded flying north from the direction of the Gordano Valley to Portbury Wharf Nature Reserve. This flight line is illustrated at Figure 8.24. The curlew flight line did not cross the proposed location of the alternative route (Option B) overhead line, but flew northwards parallel with it at a height of 10-35m and at a distance of less than 250m from the proposed overhead line. No other curlew flight lines were recorded during the 2013-2014 vantage point survey.

Connection Potential Effects Assessment - Curlew

Habitat Loss

4.5.502 Only very low numbers of wintering birds make occasional use of habitat within the corridor. No impact as a result of temporary habitat loss is predicted to arise.

Disturbance and Displacement Effects

4.5.503 Only very small numbers of curlew were recorded within the corridor during the winter season. Curlew are therefore unlikely to be present in the corridor during construction works. It is considered highly unlikely that the presence of the proposed connection would result in displacement of curlew using the study area.

Collision Risk for Migration and Regular Feeding Flights

4.5.504 Desktop and field survey findings also confirm that curlew do not undertake regular local flights within the risk zone between feeding sites within the study area. Curlew were only recorded at vantage point 7 during the 200-2010 vantage point survey. There is some evidence to suggest that curlew migrate across the study area along the River Avon. However only nine curlew observed at VP7 on the River Avon flew within the risk zone during winter 2009-2010. It is considered that the collsion risk potential for curlew with the proposed overhead line is very low. A group of 7 curlew were recorded flying from the direction of the Gordano Valley to Portbury Wharf at risk height during the 2013-2014 vantage point survey. These birds did not cross the proposed route however, and as this was the only flight line recorded, it is unlikely that curlew make regular flights across this section of the proposed overhead line.

Snipe

4.5.505 Common snipe forms part of the assemblage of wintering birds which is a qualifying feature for the Somerset Levels and Moors SPA.

Desktop Survey

4.5.506 Snipe are partially migratory to resident in the western maritime countries of Europe (Snow and Perrins, 1988). Spring migration starts in March and breeding grounds are re-occupied in April and May.

4.5.507 The desktop survey has revealed that moderate numbers of snipe occasionally winter on the saltmarsh to the north of Portbury Wharf Nature Reserve, with a peak count of 100 individuals. Moderate numbers have also been recorded at Chapel Pill, Portbury and Congresbury Moor.

4.5.508 Within the wider area, moderate numbers of snipe have been recorded at the Ham Wall RSPB reserve and common snipe breed on the Greylake RSPB reserve and Tealham and Tadham Moors SSSI (Table 4.32).

4.5.509 Snipe formerly bred in Gordano Valley, but now are merely an elusive winter visitor throughout the levels. Total numbers of snipe using the Somerset Levels during the winter may be as high as 500 birds (Bland, *pers. comm.,* October 2010).

Table 4.32. Selected Desktop Survey Records for Snipe 2000-2013

Site Name	**Date/Year**	**Count**
Portbury Wharf saltmarsh	February 2000	100
Tealham and Tadham	Summer 2002	10 pairs
Ham Wall RSPB reserve	December 2000	125
Puxton Moor	March 2002	13
Ham Wall RSPB reserve	November 2002	66
Nailsea, Tickenham and Clevedon Moor	December 2004	6
Yatton	December 2005	6
Greylake RSPB reserve	Summer 2007	5 pairs
Portbury, Chapel Pill	January 2008	36
Congresbury Moor	February 2008	22
Greylake RSPB reserve	Summer 2009	3 pairs
Greylake RSPB reserve	15th February 2011	33
Catcott Lows	27th December 2012	400
Ham Wall RSPB reserve	30th December 2012	200
Greylake RSPB reserve	1st January 2013	250
Kings Sedgemoor	5th February 2013	77

Puriton Wind Farm Bird Surveys 2008-2009

4.5.510 A peak count of 29 snipe was recorded during the winter bird survey at the wind farm site on 10th March 2009 (Parsons Brinckerhoff, 2010). However, only a peak count of two snipe was recorded during the breeding survey. Snipe were recorded flying within the wind farm site for a total of 1,155 seconds (approximately 19 minutes) out of 69 hours of vantage point survey. This indicates the relatively low importance of the preferred corridor where it crosses the Huntspill River for snipe.

Hinkley Point Bird Surveys

4.5.511 Small numbers of snipe (<10 individuals) were commonly recorded around the ditches at Wick Moor during the Hinkley Point winter bird surveys. A daytime peak count of 20 individuals was recorded to the west of the existing Hinkley Point power station during January 2009. During nocturnal surveys a peak count of 15 snipe was recorded in December, 2008 using a field at the southern end of Wick Moor.

Winter Bird Survey 2009-2010

4.5.512 A peak count of 12 snipe was recorded at Tealham and Tadham Moors SSSI in late February 2010. Four snipe were recorded at Biddle Street Yatton in late February 2010. A peak count of 7 snipe were recorded at Tickenham, Nailsea and Kenn Moors SSSI. Up to 3 snipe were recorded at Kenn Church, Kenn Pier and Yew Tree Farm SSSI.

Winter Bird Survey 2011-2012

4.5.513 A peak count of five snipe were recorded during the nocturnal bird survey within Nailsea Moor during March 2012. No other snipe were recorded during the bird survey. The locations of snipe recorded are shown at Figure 8.13.

Winter Bird Survey 2012-2013

4.5.514 The locations of snipe recorded are shown at Figure 8.13. Small numbers of snipe were recorded in scattered localities through the preferred corridor during the 2012-2013 winter bird survey. These locations included land just south of Rooksbridge, Kenn Moor, north of Barton, Woolavington, Sandford, Nailsea Moor and Portbury Wharf. The largest number of snipe recorded in any one location was 3 individuals recorded south of Rooksbridge during December.

Winter Bird Survey 2013-2014

4.5.515 No snipe were recorded during the 2013-2014 winter bird survey.

Breeding Bird Survey 2012

4.5.516 No snipe were recorded breeding within the preferred corridor during the 2012 breeding bird survey.

Vantage Point Survey 2009-2010

4.5.517 A summary of the flight activity for snipe is presented in Table 4.33 below. Snipe flight lines are illustrated at Figure 8.20. The majority of common snipe flight lines were recorded at VP3 and VP6. Most snipe flew within the risk zone, however the total number of snipe recorded during the vantage point survey was low.

Table 4.33. Flight Activity for Snipe during the 2009-2010 Vantage Point Survey

Location	Total No. Flight lines	Total No. Flights Through Preferred Corridor	Total No. Preferred Corridor Flight lines Within Risk Zone	Total No. Flights Within 250m Proposed route	Total No. Flights Within 250m Proposed route At Risk Height
VP1	1	0	0	0	0
VP2	9	8	7	8	7
VP3	21	0	0	0	0
VP4	5	5	5	5	5
VP5	0	0	0	0	0
VP6	13	8	8	1	1
VP7	6	0	0	0	0

Vantage Point Survey 2010-2011

4.5.518 A summary of the flight activity for snipe is presented in Table 4.28 below. A total of 4 flight lines were recorded at VP3a Chilton Moor and VP3d Crippe River. Only 1 of these flight lines was within the risk zone. Snipe flight lines are illustrated at Figure 8.22. No other snipe were recorded during the 2010-2011 vantage point survey.

Table 4.34. Flight Activity for Snipe during the 2010-2011 Vantage Point Survey

Location	Total No. Flight lines	Total No. Flights Through Preferred Corridor	Total No. Preferred Corridor Flight lines at Risk Height	Total No. Flights Within 250m Proposed route	Total No. Flights Within 250m Proposed route At Risk Height
VP1, 2, 3c & 3d	0	0	0	0	0
VP3a	1	1	0	0	0
VP3d	3	2	1	0	0

Connection Potential Effects Assessment - Snipe

Habitat Loss

4.5.519 In the context of the extensive wet grassland, rhynes, water courses and wetland habitat across the Somerset Levels available to wintering snipe, the temporary loss of habitat within the preferred corridor during construction is not considered to be significant.

Disturbance and Displacement Effects

4.5.520 Desktop survey and field survey findings show that snipe overwinter in small to moderate numbers on the Biddle Street Yatton and Tickenham, Nailsea and Kenn Moors SSSI. No snipe were recorded during the 2012 breeding bird survey, it is therefore highly unlikely that common snipe breed within the preferred corridor.

4.5.521 There is therefore some very limited potential for displacement of snipe from habitats in the immediate vicinity of the proposed overhead line pylon bases.

Collision Risk for Migration and Regular Feeding Flights

4.5.522 The number of snipe flights recorded during the vantage point survey was very low, although nearly all of the flights were recorded at collision risk height. It is considered that there is a low risk of snipe collision mortality from the proposed overhead line.

4.5.523 The overall collision risk for snipe is likely to be reduced even further due to the removal of large sections of the existing 132kV overhead line between Bridgwater and Avonmouth as part of this project.

4.5.524 As snipe are largely sedentary during the winter period it is considered highly unlikely that the birds recorded were associated with the Somerset Levels and Moors SPA. It is therefore also considered that the Proposed Development will not result in a negative effect on the Somerset Levels and Moors SPA snipe population.

Ringed Plover

4.5.525 Ringed plover is listed as a species/population identified subsequent to designation for possible future consideration under criterion 6 – species with peak counts in winter for the Severn Estuary Ramsar.

Desktop survey

4.5.526 There is a small but successful ringed plover breeding population in Avonmouth docks. Otherwise the ringed plover is a winter visitor to the Severn Estuary. Selected ringed plover desktop records are presented in Table 4.35.

4.5.527 Within 1km of the Proposed Development, moderate numbers of ringed plover have occasionally been recorded at the Royal Portbury Dock, Portbury Wharf Nature Reserve and at Chapel Pill (peak count 40 indiv.).

Table 4.35. Selected Desktop Survey Records for Ringed Plover 2000-2013

Site Name	Date/Year	Count

Site Name	Date/Year	Count
Chittening Warth	April 2000	12
Severn Estuary 5km north of Bristol	2001	684
Ham Wall reserve	August 2002	4
Brue Estuary	January 2004	42
Bridgwater Bay SSSI	August 2004	100
Portbury, Chapel Pill	May 2006	40
Royal Portbury Dock	August 2006	100
Portbury Wharf Nature Reserve	September 2006	35
Tealham Moor	6th April 2010	1
Shapwick Heath RSPB reserve	18th April 2010	6
Shapwick Heath RSPB reserve	30th May 2011	2
Wet Moor SSSI, east of Muchelney (16km south east of Bridgwater)	2nd October 2012	1

Puriton Wind Farm Bird Surveys 2008-2009

4.5.528 A single ringed plover was recorded on the Puriton wind farm site on 29th October 2009 (Parsons Brinckerhoff, 2010).

Hinkley Point Bird Surveys

4.5.529 No ringed plover were recorded using any of the inland fields during the Hinkley Point bird surveys.

Winter Bird Survey 2009-2014

4.5.530 No ringed plover were recorded during any of the winter bird surveys undertaken between 2009 and 2014.

Connection Potential Effects Assessment – Ringed Plover

Habitat Loss

4.5.531 Wintering birds do not make use of habitat within the corridor. No impact as a result of temporary habitat loss is predicted to arise.

Disturbance and Displacement Effects

4.5.532 Desktop survey and field survey findings show that ringed plover is strongly associated with the Severn Estuary and rarely moves inland. Therefore displacement effects on ringed plover are assessed as being an insignificant impact.

Collision Risk for Migration and Regular Feeding Flights

4.5.533 Desktop and field survey findings confirm that ringed plover do not tend to regularly fly within the study area. It is unlikely that ringed plover will undertake flight movements from the estuary inland that would place birds at potential risk. No potential for significant collision risk has been identified.

<u>Other Wader Species</u>

Desktop Survey

4.5.534 Selected desktop survey records for various waders are presented in Table 4.36.

4.5.535 Whimbrel is a spring passage migrant which uses the Severn Estuary as a feeding station, and can be seen almost anywhere on the estuary in small numbers. Whimbrel may be found in several locations within the Somerset Levels during its spring migration. Within 1km of the Proposed Development whimbrel have been recorded in moderate numbers on the Severn Estuary to the north of Portbury Wharf Nature Reserve (peak count: 33 indiv. April 2008) and occasionally in small numbers at Nailsea Moor and Kenn Moor.

4.5.536 Turnstone is a winter visitor to the Severn Estuary and may be recorded in numbers of up to 120 on the Estuary, 5km to the north of Bristol. Black-tailed godwit is also a winter visitor to the area.

4.5.537 Common Sandpiper is a spring and autumn passage migrant to the Severn Estuary and the River Avon (Bland, *pers. comm*., October 2009). Only small numbers of common sandpiper have been recorded, with a peak count of 16 individuals recorded at Chapel Pill, Portbury in August 2008.

4.5.538 Jack snipe has been recorded during the winter period in a number of locations, including Chittening Warth, Congresbury Moor, Lawrence Weston Moor, Portbury Wharf Nature Reserve, the Severn Estuary at Portbury and Hallen. A peak count of five individuals was recorded at the saltmarsh north of the Portbury Wharf Nature Reserve during December 2005.

Table 4.11. Selected Desktop Survey Records for various Waders 2000-2011

Species	**Site Name**	**Date/Year**	**Count**
Whimbrel	Hall Wall reserve	May 2000	56
Ruff	Hall Wall reserve	August 2000	12
Black-tailed godwit	Ham Wall reserve	October 2000	75
Jack snipe	Hall Wall reserve	Regular wintering site	Up to 4
Greenshank	Hall Wall reserve	Autumn migration	Up to 3
Whimbrel	Hall Wall reserve	May 2001	100

Species	Site Name	Date/Year	Count
Whimbrel	Kenn Moor	May 2002	10
Ruff	Hall Wall reserve	August 2002	2
Black-tailed godwit	Ham Wall reserve	September 2002	20
Whimbrel	Westhay Moors SSSI	May 2003	40
Whimbrel	Shapwick Heath SSSI	April 2004	97
Whimbrel	Nailsea Moor	May 2004	7
Jack snipe	Saltmarsh north of Portbury Wharf	December 2005	5
Whimbrel	Catcott Lows Reserve	Spring 2005	100
Whimbrel	Portbury Wharf Nature Reserve	April, 2006	11
Common sandpiper	Chapel Pill, Portbury	February 2008	14
Whimbrel*	Puritan wind farm site (Corridor 1)	Spring 2008	19
Whimbrel	Portbury, Severn Estuary	April 2008	33
Turnstone	Avonmouth Docks	June 2009	17
Turnstone	Royal Portbury Dock	March 2009	140
Whimbrel	Portbury Wharf	April and June 2009	Up to 12
Jack snipe	Congresbury Moor	February 2009	1
Jack snipe	Portbury Wharf	January to March 2009	Up to 3
Greenshank	Royal Portbury Dock	August 2009	1
Little ringed plover	Hoar Gout	April 2009	2
Black-tailed godwit	Royal Portbury Dock	July and August 2009	Up to 7
Black-tailed godwit	Catcott	16th January 2011	105
Black-tailed godwit	Shapwick Heath reserve	28th April 2011	100

Species	Site Name	Date/Year	Count
Black-tailed godwit	Catcott Lows	2nd April 2011	32
Ruff	Catcott	20th April 2011	3

*Record from Parsons Brinkerhoff (2008).

Hinkley Point Bird Surveys

4.5.539 A peak count of 3 whimbrel were observed on a coastal field to the west of Hinkley Point power station on 8th May 2008. This field is more than 500m from the proposed connection works. No other wader species were recorded to use the coastal fields during the bird surveys undertaken at Hinkley Point.

4.5.540 A pair of oystercatcher was recorded to breed within the survey area during the Hinkley Point breeding bird survey.

Winter Bird Survey 2009-2014

4.5.541 No black–tailed godwit, little ringed plover, whimbrel, common sandpiper or jack snipe were recorded at any stage during any of the 2009-2014 winter bird surveys.

Vantage Point Survey 2009-2010

4.5.542 The only little ringed plover was recorded at VP3 on 30th March 2010 which was a single bird flying through the risk zone. This individual did not fly through the preferred corridor.

4.5.543 The only common sandpiper was recorded at VP2 on the 20th April 2010 when a single bird was observed within the preferred corridor within the risk zone.

4.5.544 No greenshank, ruff, turnstone, black–tailed godwit, whimbrel or jack snipe were recorded at any stage during the vantage point survey.

Vantage Point Survey 2010-2011

4.5.545 A common sandpiper was recorded at VP3d on the 18th February 2011. The bird was observed flying east below risk height within the preferred corridor. Another common sandpiper was recorded at VP1 on the 15th April 2011, also flying low below risk height.

4.5.546 No greenshank, ruff, turnstone, black–tailed godwit, whimbrel or jack snipe were recorded at any stage during the vantage point survey.

Connection Potential Effects Assessment - Other Wader Species

Habitat Loss

4.5.547 Other wintering waders do not make use of habitat within the corridor. No impact as a result of temporary habitat loss is predicted to arise.

Disturbance and Displacement Effects

4.5.548 The desktop survey has confirmed that some of the waders covered in this section occur in the study area, albeit in small numbers. These waders include little ringed plover, jack snipe and whimbrel. Little ringed plover and common sandpiper were the only species recorded during the vantage point survey. Other bird species in this section, such as turnstone, are mostly coastal species. Therefore there will be no displacement effects on these wader species.

Collision Risk for Migration and Regular Feeding Flights

4.5.549 Desktop and field survey findings confirm that these wader species do not tend to regularly fly within the study area. There is some very low potential for wader collision to occur during migration periods for some of these species.

Grey heron

Desktop survey

4.5.550 British herons are mostly sedentary although some herons migrate to Ireland and the near-continent, such as France and Holland. In the winter, northern European Grey Herons arrive in eastern Britain, especially along the coast.

4.5.551 There are important heronries at Chew Valley Lake and Cleeve Hill, and at Pill, with approximately 70 breeding pairs. A minimum of 60 birds use the study area in both the winter and summer for feeding, representing about a quarter of the region’s population (Bland, pers. comm., 2009).

4.5.552 Within 1km of the Proposed Development single grey heron have been recorded in a number of locations throughout. Slightly larger numbers have been recorded on the Severn Estuary including eight individuals at Severn Beach WeBS site during 2004 and six individuals at Chittening Warth during 1999.

Winter bird survey 2009-2010

4.5.553 One grey heron was recorded at the Tealham and Tadham Moors SSSI in late February 2010. The SSSIs to the north of the Somerset Levels all have peak grey heron counts of approximately five birds with the exception of Kenn Church, Kenn Pier & Yew Tree Farm SSSI where 11 grey heron were recorded in late January 2010.

Winter bird survey 2012

4.5.554 Small numbers of grey heron were occasionally recorded throughout the survey areas at Rhynes and other watercourses.

Winter bird survey 2012-2013

4.5.555 Individual grey heron were recorded throughout the survey area, associated with watercourses and and waterbodies. These areas included; Mark, Kenn Moor, Tickenham Moor, Sandford, Yatton, East Huntspill, south of Banwell, Biddisham, Congresbury, south of Puriton, Rooksbridge, Portbury Wharf, River Avon and Hallen Marsh.

4.5.556 A peak count of 5 individuals was recorded on Mark Moor. Two individuals were also recorded at Nailsea Moor.

Winter Bird Survey 2013-2014

4.5.557 No grey heron were recorded during the 2013-2014 winter bird survey.

Vantage Point survey 2009-2010

4.5.558 A detailed analysis of heron flight activity at vantage point survey locations is presented at Appendix 6. A summary of the number of flight lines recorded at each vantage point survey location is presented in Table 48.

4.5.559 Grey heron were recorded flying through the Preferred Corridor within the risk zone at all of the vantage point survey locations, but most regularly at VPs 2 and 3. The largest number of herons was recorded flying through the Preferred Corridor in the risk zone at VP2 during January 2010. It is possible that these flights were influenced by the unusually severe weather during this month.

Table 4.37. Flight activity for heron during the 2009-2010 vantage point survey.

Location	**Total No. Flight lines**	**Total No. Flights Through Preferred Corridor**	**Total No. Preferred Corridor Flight lines at Risk Height**
VP1	10	6	5
VP2	19	17	14
VP3	14	0	0
VP4	12	12	9
VP5	2	1	0
VP6	8	8	6
VP7	4	4	3

Vantage Point survey 2010-2011

4.5.560 A summary of the number of flight lines recorded at each vantage point survey location is presented in Table 4.38.

4.5.561 Small numbers of grey heron flight lines were recorded passing through the Preferred Corridor within the risk zone at VP1, VP2 and VP3d (8 flight lines). This represents 38% of all heron flight lines recorded during the 2010-2011 vantage point survey.

Table 4.38. Flight activity for heron during the 2010-2011 vantage point survey.

Location	**Total No. Flight lines**	**Total No. Flights Through Preferred Corridor**	**Total No. Preferred Corridor Flight lines at Risk Height**
VP3a & VP3c	0	0	0
VP1	5	5	3
VP2	8	6	3

VP3b	1	1	0
VP3d	7	7	0

Connection Potential Effects Assessment – Grey Heron

Habitat Loss

4.5.562 In the context of the extensive wet grassland, rhynes, water courses and wetland habitat across the Somerset Levels available to grey heron, the temporary loss of habitat within the preferred corridor during construction is not considered to be significant.

Disturbance and Displacement effects

4.5.563 There is some limited potential for grey heron to be displaced from some parts of the Kenn Church, Kenn Pier & Yew Tree Farm SSSI however this displacement would be localised and should not affect the total number of grey heron able to use this site and other similar sites in the locality.

Collision risk for migration and regular feeding flights

4.5.564 There is some low potential for grey herons to be affected by overhead line collision during feeding flights across several parts of the study area where grey heron occur. However field surveys indicate that the grey heron population within the study area itself is not large.

4.5.565 Chew Valley Lake, located 13km to the east of the Proposed Development, and Cleeve Hill Heronry, located approximately 5km east of the Proposed Development are considered too distant for the heronries to be detrimentally affected by the proposed overhead line.

Little egret

Desktop survey

4.5.566 Little egret is rapidly increasing in the region, but this species is mostly seen in winter and has yet to breed. At present some 25 little egrets are likely to overwinter within the wider study area.

4.5.567 Within 1km of the Proposed Development individual little egret have been recorded along the Severn Estuary since 2000.

Hinkley Point Bird Surveys

4.5.568 Little egret was regularly recorded during the Hinkley Point bird surveys. This species favoured the ditches around Wick Moor, with a peak count of eight birds feeding in a field to the east of the power station directly adjacent to the coast on 22nd October 2008. This field lies more than 300m from the proposed connection works.

Winter bird survey 2009-2010

4.5.569 Two little egret were recorded at Puxton Moor SSSI in late November 2009 and single little egret were recorded at Tealham and Tadham Moors SSSI and Biddle Street Yatton SSSI on at least one occasion.

Winter bird survey 2012-2013

4.5.570 Counts of around five little egret was recorded on land to the west of Yatton during three survey visits during the 2012-2013 winter bird survey. A peak count of seven individuals was recorded adjacent to the Little River in this location during October. One count of five individuals was also recorded in this location during another visit. The second count of five individuals was recorded adjacent to the Congresbury Yeo.

4.5.571 The only other location where little egret were regularly recorded was Nailsea Moor, where a peak count of two individuals was recorded.

Winter Bird Survey 2013-2014

4.5.572 No little egret were recorded during the 2013-2014 winter bird survey.

Vantage Point survey 2009-2010

4.5.573 Little egret were observed occasionally flying at all vantage point survey locations with the exception of VP7. Usually single birds were recorded. The most little egret flight lines were recorded at VP6 where all 25 flight lines crossed the preferred corridor. However, of these 25 flight lines only 15 passed within 250m of the proposed route and 13 flew at risk height.

4.5.574 Nineteen flight lines were recorded at VP2 with the majority passing through the preferred corridor and at risk height.

Table 4.39. Flight activity for little egret during the 2009-2010 vantage point survey.

Location	Total No. Flight lines	Total No. Flights Through Preferred Corridor	Total No. Preferred Corridor Flight lines at Risk Height
VP1	7	1	0
VP2	19	17	17
VP3	3	0	0
VP4	4	4	4
VP5	12	8	8
VP6	25	25	23
VP7	0	0	0

Vantage Point survey 2010-2011

4.5.575 A summary of the number of flight lines recorded at each vantage point survey location is presented in Table 4.40.

4.5.576 Little egret were observed occasionally flying at VP1, VP2 and VP3d. Usually single birds were recorded, although a pair of birds was recorded flying on the 22nd November 2010 from VP2. Only two birds were recorded flying within the Preferred Corridor in the risk zone, and these were both recorded from VP1. Six little egret flight lines were recorded in total.

Table 4.40. Flight activity for little egret during the 2010-2011 vantage point survey.

Location	Total No. Flight lines	Total No. Flights Through Preferred Corridor	Total No. Preferred Corridor Flight lines at Risk Height
VP1	2	2	2
VP2	3	3	0
VP3a – 3c		0	0
VP3d	1	0	0

Connection Potential Effects Assessment – Little Egret

Habitat Loss

4.5.577 In the context of the extensive wet grassland, rhynes, water courses and wetland habitat across the Somerset Levels available to little egret, the temporary loss of habitat within the preferred corridor during construction is not considered to be significant.

Disturbance and Displacement effects

4.5.578 There is some limited potential for small numbers of little egret to be temporarily displaced from land to the west of Yatton near to the Little River and Congresbury Yeo. This may also occur at Nailsea Moor. However this displacement would be localised, and due to the abundance of suitable habitat for little egret surrounding these areas, it is considered that this would not be a significant impact on this species.

Collision risk for migration and regular feeding flights

4.5.579 There is some low potential for little egret to be affected by overhead line collision during feeding flights across several parts of the study area including Nailsea Moor and land to the west of Yatton. However field surveys indicate that the population of this species along the Proposed Development is small. It is highly unlikely that collision risk as a result of the Proposed Development would have a significant impact on this species.

Cormorant

Desktop survey

4.5.580 Cormorants are predominantly coastal birds, but are increasingly being observed on water bodies further inland. Many cormorants in the UK are resident, but many also disperse, with juveniles beginning to move in all directions in June and July, and adults in late July (Snow and Perrins, 1998).

4.5.581 Cormorant has a non-breeding population of up to 30 birds, which commute to Denny island or Steep Holm in the Severn Estuary to breed and roost (Bland, pers. comm., October 2009). Denny Island is 5km north west of Avonmouth and Steep Holm is 8km west of Weston-super-Mare.

4.5.582 Within 1kn of the Proposed Development cormorant have been recorded in numerous locations in the Avonmouth and Portbury area. A peak count of 23 individuals was recorded at Avonmouth Docks in July 1999. Small numbers (peak count 3 indiv.) have also been recorded at Kenn Moor.

Winter bird survey 2009-2010

4.5.583 Two cormorants were recorded at Puxton Moor SSSI and four cormorant were recorded at Tickenham, Nailsea & Kenn Moors SSSI, both in late February 2010.

Vantage Point survey 2009-2010

4.5.584 A summary of the flight activity for cormorant is presented in Table 4.41. The largest numbers were recorded at VP1 and VP5. The majority of flights recorded from VP2, VP3 and VP5 were through the Preferred Corridor and in the risk zone although only 1 flight was recorded within the risk zone from VP6. The largest single group of cormorants was recorded at VP5 in November 2009, where 15 flew across the Preferred Corridor and in the risk zone. However, the majority of recordings were of one individual.

Table 4.41 Flight activity for cormorant during the 2009-2010 vantage point survey.

Location	Total No. Flight lines	Total No. Flights Through Preferred Corridor	Total No. Preferred Corridor Flight lines at Risk Height
VP1	61	61	43
VP2	30	29	22
VP3	12	0	0
VP4	7	7	3
VP5	52	46	33
VP6	1	1	1
VP7	34	32	15

Vantage Point survey 2010-2011

4.5.585 A summary of the flight activity for cormorant is presented in Table 4.42.

4.5.586 The largest numbers were recorded at VP1 where all of the flights were through the Preferred Corridor and at risk height. The majority of cormorant flights recorded from VP2, VP3b and VP3d were also recorded within the Preferred Corridor and in the risk zone. All of the cormorants recorded were either individuals or in groups of 2 to 4 birds.

Table 4.42. Flight activity for cormorant during the 2010-2011 vantage point survey.

Location	Total No. Flight lines	Total No. Flights Through Preferred Corridor	Total No. Preferred Corridor Flight lines at Risk Height
VP1	26	26	26
VP2	12	9	6
VP3a & VP3c	0	0	0
VP3b	1	1	0
VP3d	9	9	0

Connection Potential Effects Assessment - Cormorant

Habitat Loss

4.5.587 The temporary loss of agricultural grasslands within the power line corridor during construction would not affect habitats used by this species.

Disturbance and Displacement effects

4.5.588 Cormorant at VP1 and VP2, the places where this species was recorded most regularly, were often observed perching on the pylons of existing overhead lines. Similar behaviour in cormorant has been observed on overhead lines in East Anglia. It is considered unlikely that cormorant will be displaced as a result of the proposed overhead line development.

4.5.589 Due to the low level of usage of land within the Proposed Development it is considered highly unlikely that cormorant will suffer significant disturbance or displacement as a result of this project.

Collision risk for migration and regular feeding flights

4.5.590 The vantage point survey shows that although cormorant flights were recorded during the majority of months surveyed, the flight rate was consistently low. Even at VP1 where the highest number of cormorant flights was recorded, the rate of cormorant flights within the risk zone was of less than 1 bird per hour.

4.5.591 It is considered likely that the majority of flights recorded during the vantage point surveys were of birds moving between feeding areas along the water courses. Some flights are also likely to have been between feeding areas and roost sites. The collision risk for cormorant associated with the proposed overhead line is assessed as being an insignificant impact.

Other waterbird species

Desktop survey

4.5.592 Bittern have rarely been recorded in a few locations within the wider study area during the winter period. This includes Portbury Wharf Nature Reserve, a location to the south of Nailsea and a location at Bridgwater. Single birds were recorded in each of these locations.

4.5.593 Water rail is an exceptionally elusive species in the region, which is probably more widespread than sightings indicate. Water rail are regularly present at Portbury Wharf. A water rail was recorded on Congresbury Moor in February 2009 (Bland, pers. comm., October 2009). A peak count of 3 individuals was recorded on the Severn Estuary within 1km of the Proposed Development in December 2000.

4.5.594 Moorhen is a very widespread species in the region and is present wherever there are ditches or ponds, even quite small ones. There are probably at least 500 birds in the wider study area.

4.5.595 Coot, which needs larger and deeper waters than the moorhen is present on all major ponds, and tends to dominate them. Counts are the same as for moorhen, but because they are less elusive the actual population is probably lower at about 400 birds.

4.5.596 Kingfisher are very elusive but this species breeds on most rivers in the region and there could be as many as 50 birds within the wider area. Within 1km of the Proposed Development kingfisher have been recorded at Avonmouth Docks, Avonmouth Pools, Chittening Warth, Congresbury Moor, Gordano Valley, Kenn Moor, Kingston Seymour, Nailsea, Tickenham and Clevedon Moor, Portbury Wharf Nature Reserve, Portbury Chapel Pill and Puxton Moor.

Hinkley Point Bird Surveys

4.5.597 Water rail was recorded on two occasions in February 2009 in ditches /wetland habitat to the south of the existing power stations.

4.5.598 Kingfisher was recorded on 7 survey dates during the winter period in the wetland habitat to the south of the existing power station.

4.5.599 A total of 3 pairs of moorhen were recorded to breed within the survey area during the winter period.

Winter bird survey 2009-2010

4.5.600 Peak counts of two kingfisher were recorded at Tickenham, Nailsea & Kenn Moors SSSI and single kingfishers were recorded at Puxton Moor SSSI and Kenn Church, Kenn Pier & Yew Tree Farm SSSI.

4.5.601 No water rail were observed during the winter bird survey and only low numbers of moorhen and coot.

Winter Bird Survey 2012

4.5.602 Kingfisher were recorded on the River Brue at East Huntspill during the 2012 winter bird survey. Single water rail were recorded within the pools at the north of Portbury Wharf Nature Reserve.

Winter Bird Survey 2012-2013

4.5.603 Kingfisher were recorded on the River Huntspill and the King's Sedgemoor Drain during the 2012-2013 winter bird survey. Kingfisher were also recorded on rhynes at Yatton, Puriton, Puxton Moor, Nailsea Moor, Biddisham and north of Mark.

4.5.604 Moorhen and coot were recorded in low numbers throughout the survey area generally within or near to the drains, rhynes and other watercourses.

Winter Bird Survey 2013-2014

4.5.605 No cormorant were recorded during the 2013-2014 winter bird survey.

Breeding Bird Survey 2012-2013

4.5.606 The Schedule 1 species kingfisher was recorded on the Lox Yeo river during the first survey visit. Two birds were recorded in a relatively short section of the river suggesting a pair of birds use this section of the watercourse. Kingfisher were also regularly recorded on the rhynes at Nailsea Moor.

4.5.607 Moorhen and coot were regularly recorded on drains, rhynes and other watercourses throughout the survey area.

Vantage Point survey 2009-2010

4.5.608 A great white egret was observed flying through the Preferred Corridor at VP5 above the risk zone for 20 seconds on 21st December 2009. A single water rail was observed at VP6 on 15th February 2010 although the bird was not observed flying.

4.5.609 A kingfisher was observed flying into a nest site at VP2 on 11th November 2009. Three moorhen were observed swimming within the ditches at VP3 in December 2009. Two coot were also observed on the River Avon at VP7 in December 2009.

Vantage Point Survey 2010-2011

4.5.610 Moorhen were recorded on the King's Sedgemoor Drain, the River Huntspill and the Crippe River during the 2010-2011 vantage point surveys.

<u>Connection Potential Effects Assessment - Other Waterbird Species</u>

Habitat Loss

4.5.611 There is potential for some small loss of nesting habitat for kingfisher if dense vegetation adjacent to watercourses at Yatton, Puriton, Puxton Moor, Nailsea Moor, Biddisham and north of Mark is removed.

4.5.612 It is highly unlikely that the Proposed Development will result in habitat loss for moorhen or coot as no watercourses are likely to be directly affected.

4.5.613 It is possible that small amounts of habitat loss for water rail could occur if dense vegetation adjacent to watercourses or water bodies is removed immediately south of the existing power station at Hinkley Point.

Disturbance and Displacement effects

4.5.614 There is potential for temporary disturbance and displacement of breeding kingfisher during construction if works are carried out within 20m of watercourses at Yatton, Puriton, Puxton Moor, Nailsea Moor, Biddisham and north of Mark. Kingfisher is protected under Schedule 1 of the *Wildlife and Countryside Act, 1981* making it an offence to disturb this species during the breeding season. It is also possible that small numbers of breeding coot and moorhen could be temporarily displaced if works are carried out within 10m of watercourses throughout the development.

4.5.615 It is possible that small numbers of water rail could be temporarily disturbed/displaced if works are carried out at areas of dense vegetation adjacent to watercourses or water bodies immediately south of the Hinkley Point Power Station during the winter period. It is also possible that if the alternative route is selected (Option B), works adjacent to the pools at the north of Portbury Wharf could result in temporary disturbance and displacement of small numbers of water rail.

Collision risk for regular feeding flights

4.5.616 Kingfisher, water rail, moorhen and coot are not considered to be vulnerable to be collision with overhead lines due to their tendancy to fly at low height (below collision risk height).

RAPTORS AND OWLS

Buzzard

Desktop survey

4.5.617 Buzzard has an unusually dense population in the region although it is a woodland bird. Much of the area lacks nest sites, but there are still probably at least 100 breeding pairs within the wider area (Bland, pers. comm., October 2009).

4.5.618 Within 1km of the Proposed Development buzzard have been recorded at numerous locations including Avonmouth, Cadbury Camp Lane, Chittening Warth, Congresbury, Gordano Valley, Hallen Marsh, Kenn, Kingston Seymour, Lawrence Weston Moor, Loxton, Portbury, Webbington and Winscombe.

4.5.619 Within the wider area 15 buzzard were recorded at Shapwick Heath on 20th May 2011.

Hinkley Point Bird Surveys

4.5.620 A pair of buzzard were recorded to be breeding within the vicinity of the Hinkley Point power station during the breeding bird surveys undertaken at Hinkley Point.

Winter bird survey 2009-2010

4.5.621 A peak count of four buzzard was recorded at Tealham and Tadham Moors SSSI in late January 2010. A peak count of three buzzard was recorded at Kenn Church, Kenn Pier and Yew Tree Farm also in late January 2010. A single buzzard was observed at least on one occasion at each of the other SSSIs covered by the winter bird survey.

Winter bird survey 2012-2014

4.5.622 Small numbers of buzzard were regularly recorded scattered throughout the survey area within the vicinity of the Proposed Development during winter bird surveys undertaken between 2012 and 2014 (Figure 8.13). No groups of more than two buzzard were recorded in any location.

Vantage Point survey 2009-2010

4.5.623 A summary of the number of flight lines recorded at each vantage point survey location is present in Table 4.43.

4.5.624 Buzzard were recorded at all of the vantage point survey locations on at least one occasion. Buzzard were most regularly recorded flying within the preferred corridor at VP4 and VP5, where a total of 20 flight lines were recorded at each of these locations within 250m of the proposed Route at risk height during the vantage point survey. Less than 10 buzzard flight lines were recorded within 250m of the proposed route at risk height at each of the other vantage point locations.

4.5.625 It is likely that buzzard are nesting in several locations within the study area including on Knowle Hill to the North east of VP1. Buzzard are also likely to be breeding on the wooded hill to the west of VP5 near Lowton. Buzzard were often seen foraging around VP6 and VP7.

Table 4.43. Flight activity for buzzard during the 2009-2010 vantage point survey.

Location	Total No. Flight lines	Total No. Flights Through Preferred Corridor	Total No. Preferred Corridor Flight lines Within Risk Zone	Total No. Flights Within 250m Proposed route	Total No. Flights Within 250m Proposed route At Risk Height
VP1	42	14	11	5	3
VP2	12	10	7	10	7
VP3	24	0	0	0	0
VP4	25	23	20	24	20
VP5	49	29	20	30	20
VP6	19	14	10	5	3
VP7	11	11	8	11	8

Vantage Point survey 2010-2011

4.5.626 A summary of the number of flight lines recorded at each vantage point survey location is presented in Table 4.44.

4.5.627 Buzzard were recorded at VP1, VP2, VP3b and VP3d. Only a small number of flights were recorded (12). Only 4 flights were recorded within the preferred Corridor at risk height.

Table 4.44. Flight activity for buzzard during the 2010-2011 vantage point survey.

Location	Total No. Flight lines	Total No. Flights Through Preferred Corridor	Total No. Preferred Corridor Flight lines at Risk Height
VP3a & VP3c	0	0	0
VP1	3	2	2
VP2	5	4	2
VP3b	2	0	0
VP3d	2	0	0

<u>Connection Potential Effects Assessment - Buzzard</u>

Habitat Loss

4.5.628 There is potential for small amounts of habitat loss for buzzard if it is necessary to remove mature trees to facilitate construction works. However no buzzard nests have previously been identified in areas proposed to be directly affected, therefore this potential is considered to be low.

Disturbance and Displacement effects

4.5.629 The risk of displacement to buzzard is considered to be low as the proposed route crosses open ground with few woodlands. It is possible that small numbers of breeding buzzard may be displaced if construction works take place within 50m of woodland, such as on Knowle Hill during the buzzard breeding season (March to September).

4.5.630 It is also possible that a pair of buzzard may be disturbed/displaced if works take place within the vicinity of the Hinkley Point Power Station during the buzzard breeding season.

Collision risk for regular feeding flights

4.5.631 Field survey findings confirm that foraging buzzards often tend to fly at risk height when flying within the study area. Therefore there is some potential for buzzard collision mortality to occur, particularly where the proposed overhead line is located within 50 metres of blocks of mature woodland where buzzard could potentially be breeding.

Buzzard require an area free from aerial obstacles so that they can access the nest and undertaken aerial territorial displays without risk of collision. As the only location where the overhead line passes within 50m of mature woodland is at Knowle Hill and no nests buzzard nests have been confirmed within 100m of the Proposed Development, it is highly unlikely that buzzard will be significantly impacted by collision mortality from the Proposed Development.

Kestrel

Desktop survey

4.5.632 In more northerly and westerly areas of Britain, kestrels often migrate south at the end of the breeding season, but return the following spring to form their territories. However kestrels in the south of England are sedentary.

4.5.633 The Somerset Levels represent excellent hunting ground for kestrel with a high density of breeding pairs being present within the study area (Bland, pers. comm., October 2009).

4.5.634 Within 1km of the Proposed Development kestrel have been recorded in a number of locations including Avonmouth, Chittening Warth, Portbury Wharf, Puriton, Puxton Moor, Sandford Hill and Yatton. Kestrel were recorded to breed at Lawrence Weston Moor in 1985.

Winter bird survey 2009-2010

4.5.635 A peak count of three kestrel were recorded at Biddle Street Yatton SSSI and two kestrel records were recorded at Kenn Church, Kenn Pier and Yew Tree Farm SSSI, both in late January 2010. Single kestrel were recorded on at least one occasion at Catcott, Edington and Chilton Moors SSSI and Puxton Moor SSSI.

Winter bird survey 2009-2010

4.5.636 A peak count of three kestrel were recorded at Biddle Street Yatton SSSI and two kestrel records were recorded at Kenn Church, Kenn Pier and Yew Tree Farm SSSI, both in late January 2010. Single kestrel were recorded on at least one occasion at Catcott, Edington and Chilton Moors SSSI and Puxton Moor SSSI.

Winter bird survey 2012-2014

4.5.637 Small numbers of kestrel were recorded in a few scattered localities within the vicinity of the Proposed Development during winter bird surveys undertaken between 2012 and 2014 (refer to Figure 8.13).

Vantage Point survey 2009-2010

4.5.638 Kestrels were recorded at all vantage points throughout the survey period October to April. All the recordings were of single individuals except for three pairs that were recorded at VP1 on 22nd December 2009, at VP4 on 15th February 2010 and at VP7 on 3rd March 2010. The only location from which more than 10 flight lines were recorded within 250m of the proposed route at risk height was VP7. 11 kestrel flight lines were recorded in the risk zones from this VP during the entire vantage point survey.

Table 4.45. Flight activity for kestrel during the 2009-2010 vantage point survey.

Location	Total No. Flight lines	Total No. Flights Through Preferred Corridor	Total No. Preferred Corridor Flight lines Within Risk Zone	Total No. Flights Within 250m Proposed route	Total No. Flights Within 250m Proposed route At Risk Height
VP1	8	0	0	0	0
VP2	9	6	6	6	6
VP3	4	0	0	0	0
VP4	10	10	10	10	10
VP5	17	8	7	9	8
VP6	7	4	3	1	1
VP7	17	11	11	11	11

Vantage Point survey 2010-2011

4.5.639 A summary of the flight activity for kestrel is presented in Table 4.46. A total of seven kestrel flight lines were recorded during the vantage point survey 2010-2011. None of the flight lines recorded passed within 250m of the proposed route at risk height.

Table 4.46. Flight activity for kestrel during the 2010-2011 vantage point survey.

Location	Total No. Flight lines	Total No. Flights Through Preferred Corridor	Total No. Preferred Corridor Flight lines at Risk Height
VP2, 3a & 3c	0	0	0
VP1	1	0	0
VP3b	4	0	0
VP3d	2	0	0

Connection Potential Effects Assessment - Kestrel

Habitat Loss

4.5.640 There is a low potential for kestrel breeding sites to be lost if mature trees with internal cavities are removed to facilitate development.

Disturbance and Displacement effects

4.5.641 It is possible that low numbers of kestrel may be temporarily disturbed or displaced if works take place within 10m of any mature trees or other nesting locations during the kestrel breeding season (March to the end of September).

4.5.642 Kestrel were regularly sighted south of the River Avon. There are already several overhead lines in this location that do not appear to detrimentally affect kestrel flight behaviour. Field observations in Somerset indicate that kestrels use the existing overhead line towers for perching. Therefore it is considered unlikely that displacement effects on kestrel will occur as a result of the proposed overhead line.

Collision risk for regular feeding flights

4.5.643 Field survey findings confirm that foraging kestrel often tend to fly at risk height when flying within the study area. However, this species is considered to be of low collision risk due to its low wing loading and high manoeuvrability.

Sparrowhawk

Desktop survey

4.5.644 Sparrowhawk is essentially a woodland bird, but each sparrowhawk breeding pair needs a territory of about 4km2. Sparrowhawk are likely to the less common than kestrel within the study area based on habitat availability. Sparrowhawk will, for the most part, nest on the fringes of study area where suitable nesting habitat is present, using the study area itself for hunting.

4.5.645 Within 1km of the Proposed Development, sparrowhawk have been recorded at a number of locations including Avonmouth, Gordano Valley, Portbury Wharf, Puriton and Webbington.

4.5.646 Within the wider area three sparrowhawk were recorded at Shapwick Heath on 20th May 2011.

Winter bird survey 2012-2014

4.5.647 Sparrowhawk were recorded in a few scattered localities within the vicinity of the Proposed Development during winter bird surveys undertaken between 2012 and 2014. These locations included Woolavington Levels, south of Vole, north of Rooksbridge, Barton, Banwell Wood and near to the Pools south of Chittening within Avonmouth.

Vantage Point survey 2009-2010

4.5.648 Sparrowhawk were recorded from all vantage points except VP2. All recordings were of single individuals. Flights were recorded within 250m of the proposed route at risk height from VP5, VP6 and VP7. Less than 5 flights were recorded in the risk zone from each of these locations during the entire vantage point survey.

Table 4.47. Flight activity for sparrowhawk during the 2009-2010 vantage point survey.

Location	Total No. Flight lines	Total No. Flights Through Preferred Corridor	Total No. Preferred Corridor Flight lines Within Risk Zone	Total No. Flights Within 250m Proposed route	Total No. Flights Within 250m Proposed route At Risk Height
VP1	9	1	1	0	0
VP2	0	0	0	0	0
VP3	9	0	0	0	0
VP4	1	1	0	1	0
VP5	6	5	4	5	4
VP6	6	4	4	3	3
VP7	2	2	2	2	2

Vantage Point survey 2010-2011

4.5.649 A summary of the flight activity for sparrowhawk is presented in Table 4.48. Single sparrowhawk flight lines were recorded from vantage points VP1, VP2 and VP3b. All recordings were of single individuals, and all birds flew below risk height.

Table 4.48. Flight activity for sparrowhawk during the 2010-2011 vantage point survey.

Location	Total No. Flight lines	Total No. Flights Through Preferred Corridor	Total No. Preferred Corridor Flight lines at Risk Height
VP3a, 3c & 3d	0	0	0
VP1	1	1	0
VP2	1	1	0
VP3b	1	1	0

Connection Potential Effects Assessment - Sparrowhawk

Habitat Loss

4.5.650 The Proposed Development will not result in permanent loss of any areas of woodland where sparrowhawk may potentially breed. It is considered that sparrowhawk will not suffer from habitat loss as a result of the Proposed Development.

Disturbance and Displacement effects

4.5.651 It is considered unlikely that sparrowhawk would experience displacement effects as a result of the proposed overhead line as the Proposed Development avoids mature woodland areas and sparrowhawk is primarily a woodland species.

Collision risk for regular feeding flights

4.5.652 Field survey findings also confirm that sparrowhawk do not frequently use the study area for foraging. This species is considered to be of low collision risk due to its low wing loading and high manoeuvrability. Therefore the potential for a sparrowhawk overhead line collision to occur is very low.

Peregrine

Desktop survey

4.5.653 There are peregrine breeding pairs in Avonmouth Docks, Portishead, Clevedon, Weston-super-Mare, and in working quarries on the Mendips. They maintain large territories, and range very widely. Records of peregrine were obtained at Avonmouth, Kenn Moor, Kingston Seymour, Nailsea, Tickenham and Clevedon Moor, Portbury Wharf Nature Reserve, Puxton Moor, Sandford and Yatton. Peregrine desktop records are shown at Figure 8.10.

4.5.654 Within the wider area, a single peregrine was regularly recorded at Ham Wall RSPB reserve between 2000 and 2003. Two peregrine were recorded at Shapwick Heath RSPB reserve on 20th May 2011.

Hinkley Point Bird Surveys

4.5.655 At least two peregrine were regularly recorded during the Hinkley Point winter bird surveys.

Winter bird survey 2009-2010

4.5.656 A single peregrine was recorded at Tickenham, Nailsea and Kenn Moors SSSI in late January 2010.

Winter bird survey 2012-2013

4.5.657 A peregrine was recorded with food at Congresbury during October. A pair of peregrine was recorded on a couple of occasions near to their known breeding site at Avonmouth to the north of the River Avon. A peregrine was also observed on one occasion at Sandford.

Winter bird survey 2013-2014

4.5.658 No peregrine were recorded during the 2013-2014 winter bird survey.

Breeding bird survey 2012

4.5.659 A single peregrine was recorded flying over Nailsea Moor during the second breeding bird survey visit.

Vantage Point survey 2009-2010

4.5.660 A summary of the flight activity for peregrine is presented in Table 4.49. Peregrine were recorded from all vantage points except VP6. All the recordings were of single individuals except for a group of three birds recorded from VP3. All the flights recorded at VP1 and VP2, and the majority of the flights recorded at VP4 were at risk height. The highest frequency of peregrines was recorded from VP5, where just under a third of the flights recorded were at risk height, although none of these birds passed within 250m of the proposed route.

4.5.661 Peregrine were often observed from VP2 and VP4 perching on pylons when foraging in these locations. Peregrine are believed to be nesting in a quarry to the north of VP5 just outside the Proposed Development. Peregrine are also believed to be nesting on the buildings to the north east of the River Avon.

Table 4.49. Flight activity for peregrine during the 2009-2010 vantage point survey.

Location	Total no. flight lines	Total no. flights through preferred corridor	Total no. corridor flight lines within risk zone	Total no. flights within 250m Proposed route	Total no. flights within 250m Proposed route within risk zone
VP1	2	2	2	1	1
VP2	4	4	1	1	1
VP3	2	0	0	0	0
VP4	8	7	4	7	4
VP5	16	14	6	0	0
VP6	0	0	0	0	0
VP7	3	3	1	3	0

Vantage Point survey 2010-2011

4.5.662 A single peregrine was recorded from VP2 on the 6th January 2011. The bird was flying north within 250m of the proposed route within the risk zone.

4.5.663 A single peregrine was also recorded from VP4 on the 27th October 2010. The bird flew east within 250m of the proposed route within the risk zone.

Connection Potential Effects Assessment - Peregrine

Habitat Loss

4.5.664 The Proposed Development will not result in loss of any habitat suitable for breeding peregrine.

Disturbance and Displacement effects

4.5.665 It is considered unlikely that peregrine would experience displacement effects as a result of the proposed overhead line since peregrines appear to be accustomed to overhead lines and many of their breeding sites are associated with tall buildings and quarries which are unlikely to be affected by the proposed overhead line.

4.5.666 Field observations in winter 2010-2011 indicate that this species is not displaced by overhead lines and tends to use the towers as vantage points when hunting.

4.5.667 The proposed route avoids the known peregrine breeding site at Avonmouth Docks by at least 100m. It is therefore highly unlikely that breeding peregrine will suffer from displacement as a result of the Proposed Development in this location.

Collision risk for regular feeding flights

4.5.668 Field survey findings confirm that peregrine occasionally use the study area for foraging. Observations of peregrine foraging behaviour at VP2 and VP4 confirm that peregrine regularly use existing overhead line pylons as viewpoints when seeking prey. The Proposed line will be undergrounded in the location where the majority of peregrine flight lines were recorded (VP5). This species is considered to be of low collision risk due to its low wing loading and high manoeuvrability. Therefore the potential for a peregrine overhead line collision to occur is very low.

Barn owl

Desktop survey

4.5.669 Barn owl are extremely elusive in the region but breed in the Gordano Valley, between Portishead and Clevedon, and the short grasses of the Levels provide ideal hunting ground.

4.5.670 Barn owl were recorded to nest on the Strawberry Line at Yatton in 2010.

4.5.671 Within Portbury Wharf Nature Reserve three barn owl boxes have been in place for a number of years. Barn owls were recorded to successfully breed in one of the nest boxes towards the south of the reserve during 2013.

4.5.672 Nine barn owl boxes are present along the River Huntspill within the wider area. Two of these boxes lie within 1km of the proposed route. These are located 330m east and 700m west of the proposed route. Another nest box is also located just under 1km east of the Proposed route at Congresbury Moor.

4.5.673 A nest box is currently located on Kenn Moor within 50m of an existing 132 kV overhead line and the proposed route.

4.5.674 Desktop records exist for six barn owl recorded on the Congresbury Moor east of Weston-Super-Mare in August 2009. Single barn owls were also frequently recorded at this site throughout 2009. Barn owl have also been recorded at Kenn Moor and Avonmouth.

4.5.675 Within the wider area up to 2 pairs of breeding barn owl have been recorded at Ham Wall RSPB reserve between 2000 and 2004 however it is unlikely that barn owls associated with this distant site would regularly forage within the study area (Table 4.50). Seven barn owls were recorded at the same site in July 2002 which presumably represented a family group.

Table 4.50. Selected desktop survey records for barn owl 2000-2013.

Site name	Date/year	Count
Congresbury Moor E of Weston-s-Mare	August 2009	9
Ham Wall RSPB reserve	2002-2004	Up to 2 pairs
Ham Wall RSPB reserve	July 2002	7
Nailsea Moor	May 2009	1
Nailsea Wall	June 2009	1 nest
Portbury Wharf	2013	1 pair
Yatton, YACWAG reserve	June 2010	1 nest

Hinkley Point Bird Surveys

4.5.676 A barn owl was recorded loafing in the field to the west of the existing power station in August and flying over the field directly south of the power station during March.

Winter bird survey 2009-2010

4.5.677 A single barn owl was recorded at Puxton Moor SSSI in late January 2010. Two barn owl boxes were also found within Puxton Moor SSSI although no evidence was found to indicate that these have been used for breeding in 2009.

Winter bird survey 2012-2014

4.5.678 No barn owl were recorded during winter bird surveys undertaken between 2012 and 2014.

Breeding bird survey 2012

4.5.679 Barn owl were recorded foraging low over Portbury Wharf during the second breeding bird survey visit. It is likely that a pair of birds were present in this location. Barn owl were also recorded within the Avonmouth area during the second breeding bird survey visit.

Vantage Point survey 2009-2010

4.5.680 A summary of the flight activity for barn owl is presented in Table 4.51. A total of eight barn owl flight lines were recorded, however only one of these was recorded within 250m of the proposed route. This bird was recorded flying low within the collision risk zone near to vantage point 4.

Table 4.51. Flight activity for barn owl during the 2009-2010 vantage point survey.

Location	Total No. Flight lines	Total No. Flights Through Preferred Corridor	Total No. Preferred Corridor Flight lines at Risk Height	Total No. Flights Within 250m Proposed route	Total No. Flights Within 250m Proposed route At Risk Height
VP1, 3 & 5-6	0	0	0	0	0
VP2	3	1	1	0	0
VP4	1	1	1	1	1
VP7	4	0	0	0	0

Vantage Point survey 2010-2011

4.5.681 A summary of the flight activity for barn owl is presented in Table 4.52. No barn owl flights were recorded within the Preferred Corridor at risk height. All barn owl recorded flew below risk height. Only one barn owl flight line was recorded within the Preferred Corridor.

Table 4.52. Flight activity for barn owl during the 2010-2011 vantage point survey.

Location	Total No. Flight lines	Total No. Flights Through Preferred Corridor	Total No. Preferred Corridor Flight lines at Risk Height
VP1, 3B & 3C	0	0	0
VP2	1	1	0
VP3A	1	0	0
VP3D	3	0	0

Connection Potential Effects Assessment – Barn Owl

Habitat Loss

4.5.682 If the alternative route is selected (Option B) it is possible that a barn owl nest box would be lost at Portbury Wharf. If it is necessary to move any nest boxes, they should be replaced on a two-for-one basis.

4.5.683 It is unlikely that there will be a loss of barn owl foraging habitat within the Proposed Development due to the low suitability of the habitat present within the proposed works areas. Exceptions to this include areas of rough grassland around Portbury Wharf and in the Avonmouth Area where small amounts of suitable foraging habitat may be lost through the Proposed Works, however this is highly unlikely to have a significant effect on barn owl due to the availability of suitable habitat in the surrounding area.

Disturbance and Displacement effects

4.5.684 If the alternative route is selected (Option B) it is possible that a pair of barn owl will be disturbed and displaced from one of the nest boxes where they are currently known to breed. Barn owl are protected under Schedule 1 of the *Wildlife and* Countryside *Act 1981*, making it an offence to disturb this species while they are nesting.

4.5.685 Therefore any works proposed to be undertaken within 50m of a known barn owl box will require inspection of the box for signs of current nesting activity by a licenced barn owl surveyor a maximum of 24hrs prior to works commencing. Should barn owl be found to be nesting, no works will take place within a minimum disturbance buffer distance of 50m surrounding the nest location while the nest is active.

4.5.686 It is unlikely that barn owl disturbance or displacement will take place elsewhere along the Proposed Development.

Collision risk for regular feeding flights

4.5.687 Barn owl are not a prevalent species within the study area. There is also some limited potential for barn owl associated with breeding sites at Portbury Wharf, Congresbury Moor, Puxton Moor SSSI and Environment Agency barn owl boxes associated with rivers in the study area to be affected by overhead line collision mortality. Barn owls in the UK do not migrate and will nest all year round if food is plentiful.

4.5.688 A nest box is currently located within 50m of the proposed route on Kenn Moor. However, this proposed overhead line will replace an existing overhead line in the same location. It is therefore highly likely that barn owl using this area are habituated to the presence of an overhead line in this location.

<u>Other raptor species</u>

Desktop survey

4.5.689 Desktop records for various raptor species are presented in Table 4.53.

4.5.690 Tawny Owl is essentially a woodland species and there will be very few pairs within the study area (Bland, pers. comm., October 2009).Tawny owl have been recorded within 1km of the Proposed Development at Chittening Warth, Congresbury, Huntspill Level, Kingston Seymour, Nailsea, Puxton Moor, Stone Allerton and Wraxall.

4.5.691 Little owl is elusive and declining in the region. Gordano Valley is a good site for it providing good habitat such as parkland and arable land with good hedges. There may be 30 little owl within the wider area (Bland, pers. comm., October 2009). Little owl have been recorded at Horsey Level, Huntspill Level and at Badgworth. Little owl were also recorded to breed is some old buildings east of Wharf Lane at Portbury Wharf Nature Reserve during 2012.

4.5.692 Single marsh harrier have been recorded at Portbury Wharf Nature Reserve on passage during April and August 2005. They have also been recorded at Allerton Marshes, south of Rooks Bridge during December 2004 and near to Brent Knoll during July 1993.

4.5.693 Hen harrier have been recorded at Crook Peak to Shute Shelve Hill SSSI (east of Webbington) during September 1996 and March 1996. Both records consisted of a single bird likely to be passing through on migration.

4.5.694 Merlin have been recorded at Avonmouth Sewage Works, Crook Peak, East Brent, Hallen, Portbury Chapel Pill, Portbury Wharf Nature Reserve and Puxton Moor.

4.5.695 Hen harrier and merlin have been recorded on the Ham Wall RSPB reserve in the period 2001 to 2003.

4.5.696 Three hobby were recorded at Chelvey, just south of Nailsea, in August 2009. Elsewhere within 1km of the Proposed Development hobby have been recorded at Avonmouth Sewage Works, Congresbury, Crook Peak SSSI, Portbury Wharf and Winscombe. Hobby were recorded to breed on the levels south of the Polden Hills during 2004.

4.5.697 Red kite have been recorded on Tickenham Moor and around Wraxall, 3km north of Nailsea.

Table 4.53. Selected desktop survey records for various raptors 2000-2011.

Species	Site name	Date/year	Count
Hen harrier	Hall Wall RSPB reserve	2000-2003	1
Marsh harrier	Ham Wall RSPB reserve	2000-2003	Up to 2
Merlin	Ham Wall RSPB reserve	December 2001	1
Hobby	Levels south of Polden Hills	Summer 2004	1 pair
Hobby	Chelvey, S of Nailsea	August 2009	Up to 3
Hobby	Portbury Wharf	May, July and August 2009	1
Hobby	Portbury village	July 2009	1
Hobby	Royal Portbury Dock	May 2009	1
Hobby	Yatton	May and June 2009	1
Red kite	Tickenham Moor	July 2009	1

Species	Site name	Date/year	Count
Red kite	Moat House Farm, Wraxall	April 2009	1
Red kite	Shapwick Heath	20th May 2011	1
Hobby	Shapwick Heath RSPB reserve	10th June 2011	4
Hobby	Ham Wall RSPB reserve	17th June 2011	2

Hinkley Point Bird Surveys

4.5.698 Merlin were recorded within the Hinkley point survey area on 6 occasions during the Hinkley Point winter bird surveys. It is considered that merlin only occasionally use this area. Other raptors recorded during Hinkley Point bird surveys included a commuting marsh harrier on 14 August and hobby on 20 May and 9 July 2008.

Winter bird survey 2009-2010

4.5.699 No hen harrier, marsh harrier, hobby, red kite, short-eared owl or little owl were recorded during the 2009-2010 winter bird survey. A single merlin was recorded at Tickenham, Nailsea and Kenn Moors SSSI on 25th January 2010.

Winter bird survey 2012-2013

4.5.700 A little owl was recorded at Woolavington during the 2012-2013 winter bird survey.

4.5.701 A marsh harrier was recorded flying high to the south of Mark Causeway during October. It is highly likely that this bird was on migration.

Winter bird survey 2013-2014

4.5.702 No hen harrier, marsh harrier, hobby, red kite, short-eared owl or little owl were recorded during the 2013-2014 winter bird survey.

Breeding bird surveys 2012-2013

4.5.703 A pair of little owl were recorded to successfully breed off Wharf Lane at Portbury Wharf, approximately 100m from the alternative route (Option B).

4.5.704 No hen harrier, marsh harrier, hobby, red kite, or short-eared owl were recorded during the 2012-2013 breeding bird survey.

Vantage Point survey 2009-2010

4.5.705 A short-eared owl was observed on one occasion flying at risk height.

4.5.706 A single little owl was observed on one occasion at both VP2 and VP3 although neither sighting concerned a flight through within 250m of the proposed route.

4.5.707 A single merlin was observed on three occasions at VP3 where each bird flew through at risk height but more than 2km from the proposed route. A merlin was observed on one occasion at VP1 and VP5.

4.5.708 No hobby, red kite, marsh harrier, hen harrier or tawny owl were observed at any time during the 2009-2010 vantage point survey.

Vantage Point survey 2010-2011

4.5.709 A short-eared owl was observed on hunting within the Preferred Corridor from VP3a on the 22nd November 2011. The bird was flying below risk height.

4.5.710 Little owl were heard calling from VP1, VP2 and VP3. No little owl flight lines were recorded.

4.5.711 A tawny owl was recorded flying through the Preferred Corridor from VP3a on the 22nd November 2010. The bird was recorded flying below risk height. A tawny owl was also recorded below risk height from VP1 on the 16th February 2011. Tawny owl were heard calling from all of the vantage points excluding VP3b.

4.5.712 No merlin, hobby, red kite, marsh harrier or hen harrier were observed at any time during the 2010-2011 vantage point survey.

Connection Potential Effects Assessment – Other Raptors

Habitat Loss

4.5.713 As no mature woodland s, old buildings with suitable cavities or suitable moorlands are proposed to be lost it is highly unlikely that other raptor species will be impacted by habitat loss a s a result of the Proposed Development. There is a small potential for tawny owl potential breeding sites to be lost if mature trees are lost within the development area.

Disturbance and Displacement effects

4.5.714 It is possible, but unlikely, that breeding tawny owl could be displaced as a result of the proposed overhead line in the vicinity of Knowle Hill. It is unlikely that little owl will be displaced from their known breeding location at Portbury Wharf as the proposed works associated with Option B are at least 50m from this nesting location and screened by hedgerows and trees.

4.5.715 There are no known breeding sites for any of the other raptors considered in this section which are located within the study area itself. However records for hobby in the Portbury Wharf and Yatton areas in spring 2009 indicate that small numbers of breeding hobby may be present in these locations.

Collision risk for regular feeding flights

4.5.716 Field survey findings confirm that merlin very occasionally forage within the study area. The potential for an overhead line collision to occur is considered to be very low since merlin often tend to fly below 10 metres when foraging.

4.5.717 The well known breeding hobby site at Shapwick Heath is at least 4km east of the study area and it is considered very unlikely that hobby from Shapwick Heath would forage within the study area. Although hobby are known to forage between 3 and 6.5km from their nest sites (Hardey et al., 2006) it is likely that breeding hobby associated with Shapwick Heath will spend much of their time foraging in this location.

4.5.718 It is possible that breeding hobby associated with the Portbury Wharf and Yatton areas could suffer collision mortality whilst foraging over wetlands within their home range. However hobby is a very manoeuvrable species therefore this risk is considered to be very low.

FARMLAND BIRDS

Desktop survey

4.5.719 Desktop records for various farmland bird species are presented in Table 4.54.

4.5.720 Skylark is a winter visitor and breeding resident, but breeding birds are now confined to saltmarsh and the Cotswolds with very few breeding pairs on the Levels. Counts suggest that around 200 birds are present within the study area during both the breeding and winter seasons.

4.5.721 Whitethroat is a bird of farmland and hedgerows. Counts indicate that up to 1,000 birds occur within the wider study area (Bland, pers. comm., October 2009).

4.5.722 Starling is a winter visitor, for whom the levels are a perfect habitat. Breeding numbers are declining rapidly. The winter population is estimated to be up to 10,000 and the breeding population at 3,000 within the wider area.

4.5.723 Linnet is a winter visitor likely to be present in large numbers, depending on weather and crops. The Somerset Levels provide good habitat and numbers may be 2,000. Linnet are much scarcer in the breeding season with up to 200 birds likely to be present (Bland, pers. comm., October 2009).

4.5.724 Bullfinch are an elusive resident which is associated with scrub woodland. The population estimate for this species in the Somerset Levels is likely to be in the region of 400 birds.

4.5.725 The Somerset Levels provide ideal habitat for reed bunting, but the population density is low and the bird is elusive.

4.5.726 Yellowhammer are a farmland bird species almost entirely absent from the Somerset Levels. No yellowhammer or yellow wagtail records were obtained during the desktop survey.

4.5.727 Desktop survey records confirm that grey partridge is present at Portbury and tree sparrow is known to occur east of Weston-super-Mare.

Table 4.54. Selected desktop survey records for various farmland bird species 2000-2010.

Species	**Sites recorded**	**Total Number of Records**	**Peak Count/Date/Location**
Bullfinch	Avonmouth Pools, Congresbury Moor, Clevedon, Lawrence Weston Moor, Pill, Kenn Moor, Kingston Seymour, Lamplighters Marsh, Nailsea, Sandford, Tickenham and Clevedon Moors, Portbury Wharf Nature Reserve, Puxton Moor, Winscombe, Woolavington, Yatton.	177	12 13/12/2009 Portbury Wharf Nature Reserve
Coal tit	Crook Peak	3	1 27/04/2009
Corn Bunting	Hallen	1	Present 1976
Cuckoo	Avonmouth Pools, Congresbury, Cheddar Valley Railway Walk LNR, Chittening Warth, Hallen Marsh, Kenn Moor, Lamplighters West, Lawrence Weston Moor, Nailsea Moor, Puxton Moor, Yatton	57	3 10/05/1989 Avonmouth Pools
Dartford warbler	Crook Peak	3	6 2000
Dunnock	Avonmouth Pools, Congresbury Moor, Clevedon, Crook Peak, Easton-in-Gordano, Hallen Marsh, Lawrence Weston Moor, Pill, Kenn Moor, Kingston Seymour, Lamplighters Marsh, Nailsea, Tickenham and Clevedon Moors, Portbury Wharf Nature Reserve, Puxton Moor, Sandford, Shirehampton, Winscombe, Yatton.	666	32 17/10/2005 Portbury Wharf Nature Reserve

Species	Sites recorded	Total Number of Records	Peak Count/Date/Location
Fieldfare	Avonmouth Sewage Works, Winscombe, Congresbury, Cheddar Valley Railway Walk LNR, Congresbury Moor, Clevedon, Kenn Moor, Nailsea, Tickenham and Clevedon Moors, Kingston Seymour, Portbury Wharf Nature Reserve, Puxton Moor, Winscombe, Yatton	129	1174 4/12/2004 Nailsea, Tickenham and Clevedon Moors
Goldcrest	Avonmouth Sewage Works, Banwell, Cheddar Valley Railway Walk LNR, Congresbury Moor, Clevedon, Crook Peak, Easton-in-Gordano Kenn Moor, Nailsea, Tickenham and Clevedon Moors, Tickenham Ridge, Kingston Seymour, Portbury Wharf Nature Reserve, Puxton Moor, Winscombe, Yatton	88	5 16/06/2002 Puxton Moor
Grasshopper warbler	Avalon Marshes, Kingston Seymour, Portbury Wharf Nature Reserve, Portbury Sewage Farm, Puxton Moor, Hallen.	10	9 Spring 1996 Avalon Marshes
Green woodpecker	Banwell Pools, Christen, Congresbury Moor, Crook Peak, Easton-in-Gordano, Lawrence Weston Moor, Kenn Moor, Kingston Seymour, Lamplighters Marsh, Max Bog SSSI, Nailsea, Tickenham and Clevedon Moors, Portbury Wharf Nature Reserve, Puxton Moor, Sandford, Winscombe, Yatton	192	5 25/07/2008 Portbury Wharf Nature Reserve
Grey Partridge	Drove Road Portbury, Puxton Moor	2	1 03/06/2006 Drove Road, Portbury
House Martin	Avonmouth Pools, Avonmouth Sewage Works, Congresbury, Crook Peak, Hallen, Kingston Seymour,	125	200

Species	Sites recorded	Total Number of Records	Peak Count/Date/Location
	Max Bog SSSI, Sandford, Nailsea, Tickenham and Clevedon Moors , Portbury Wharf Nature Reserve, Puxton Moor, Yatton.		09/05/1992 Avonmouth Pools
House sparrow	Throughout desktop search area	1625	49 07/02/2007 Kingston Seymour
Lesser redpoll	Portbury Wharf Nature Reserve	4	5 16/02/2009 Portbury Wharf Nature Reserve
Lesser spotted woodpecker	Priors Wood &Woodland Road, Nailsea	2	1 13/04/2005 Prior’s Wood
Linnet	Avonmouth Pools, Avonmouth Sewage Works, Biddle Street, Congresbury Moor, Cheddar Valley, Crook Peak, Yatton, Hallen, Kenn Moor, Lamplighters Marsh, Lawrence Weston Moor, Merebank, Nailsea Moor, Tickenham & Clevedon Moor, Portbury Wharf Nature Reserve, Puxton Moor, Shirehampton,	141	200 13/10/1990 Avonmouth Pools
Marsh tit	Banwell, Bristol, North Somerset, Portbury, Priors Wood, Hallen, Tickenham, Wraxall.	21	1 05/01/2003 Banwell

Species	Sites recorded	Total Number of Records	Peak Count/Date/Location
Meadow pipit	Avonmouth Pools, Avonmouth Sewage Works, Congresbury Moor, Crook Peak, Kenn Moor, Kingston Seymour, Lamplighters Marsh, Lawrence Weston Moor, Nailsea Moor, Tickenham and Clevedon Moor, Portbury Wharf Nature Reserve, Puxton Moor, Yatton.	78	50 27/03/2007 Portbury Wharf Nature Reserve.
Mistle thrush	Avonmouth Pools, Avonmouth Sewage, Clapton in Gordano, Barton Hill, Congresbury, Clevedon, Banwell, Kenn Moor, Kingston Seymour, Sandford, Lawrence Weston Moor, Max Bog, Nailsea Moor, Tickenham and Clevedon Moor, Puxton, Priors Wood, Portbury Wharf Nature Reserve, Hallen, Yatton.	70	16 19/09/1997 Barton Hill
Nightingale	Crook Peak, Lamplighters Marsh.	4	2 1997 Crook Peak
Pied Flycatcher	Yatton and Congresbury Moor.	1	1 22/04/2008
Red-backed shrike	Portbury Ashlands.	1	1 29/05/2008
Redstart	Avonmouth, Chittening Warth, Portbury Ashlands, Portbury Wharf Nature Reserve, Puxton Moor, Hallen.	22	7 13/04/2007 Portbury Wharf Nature Reserve.
Redwing	Avonmouth Pools, Banwell, Brinsea Batch, Cheddar Valley Railway, Christon Axebridge, Congresbury Moor,	132	150

Species	Sites recorded	Total Number of Records	Peak Count/Date/Location
	Clevedon, Kenn Moor, Nailsea Moor, Lawrence Weston Moor, Kingston Seymour, Max Bog, Tickenham & Clevedon Moor, Winscombe, Portbury Wharf Nature Reserve, Puxton Moor, Hallen, Shirehampton, Yatton.		October 2007 Portbury Wharf Nature Reserve
Reed Bunting	Avonmouth, Avonmouth Pools, Brinsea Batch, Bristol, Congresbury Moor, Cheddar Valley Railway, Chittening, Clapton Moor, Kenn Moor, Nailsea, Kingston Seymour, Lamplighters Marsh, Lawrence Weston Moor, Nailsea Moor, Tickenham & Clevedon Moor, North Somerset, Portbury, Portbury Wharf nature Reserve, Priory farm, Puxton Moor, Hallen, Woolavington, Yatton.	340	32 06/01/2005 Puxton Moor
Sand martin	Avonmouth Pools, Chittening Warth, Portbury Wharf Nature Reserve, Shirehampton, Hallen.	30	80 05/08/2008 Portbury Wharf Nature Reserve.
Skylark	Avonmouth Pools, Bristol, Congresbury Moor, Crook Peak, Lawrence Weston, Kenn Moor, Nailsea Moor, Tickenham & Clevedon Moor, North Somerset, Portbury Saltmarsh, Portbury Wharf Nature Reserve, Portishead Ashlands, Priors Wood, Puxton Moor, Hallen, Yatton.	158	43 30/12/2009 Portbury Saltmarsh
Song thrush	Avonmouth, Avonmouth Pools, Christon, Easton-in-Gordano, Winscombe, Congresbury, Cheddar valley Railway, Crook Peak, Lamplighters Marsh, Lawrence Weston, Max Bog, Tickenham & Clevedon Moor, Kenn, Nailsea Moor, Hallen Marsh, Poldens, Kenn Moor, Kingston Seymour, Pill, Shirehampton, Portbury Wharf	315	8 12/10/2007 Portbury Wharf Nature Reserve

Species	Sites recorded	Total Number of Records	Peak Count/Date/Location
	Nature Reserve, Puxton Moor, Brinsea, Banwell, Yatton.		
Spotted flycatcher	Banwell, Chittening Warth, Kenn Moor, Kingston Seymour, Lamplighters West, Lawrence Weston Moor, Max Bog, Nailsea, Portbury Wharf Nature Reserve, Hallen, Tickenham, Yatton.	29	11 26/08/2003 Hallen
Starling	Throughout desktop search area.	1505	600 09/02/2008 Portbury Wharf Nature Reserve
Stock dove	Avonmouth, Nailsea, Kenn Moor, Kingston Seymour, Lawrence Weston Moor, Tickenham & Clevedon Moor, Priors Wood, Puxton Moor, Portbury Dock, Hallen.	44	12 28/05/1995 Kenn Moor
Stonechat	Avonmouth Pools, Chittening Warth, Congresbury Moor, Caswell Farm, Crook Peak, Kenn Moor, Lawrence Weston Moor, Kingston Seymour, Nailsea Moor, Tickenham & Clevedon Moor, Portbury Wharf Nature Reserve, Portbury Saltmarsh, Puxton Moor, Hallen, Yatton	185	36 27/02/2008 Portbury Saltmarsh
Swallow	Avonmouth, Avonmouth Pools, Brinsea Batch, Cheddar Valley Railway Walk, Congresbury Moor, Chittening Warth, Clapton in Gordano, Land Yeo, Sandford, Kenn Moor, Kingston Seymour, Lamplighters Way, Lawrence Weston, Nailsea Moor, Tickenham & Clevedon Moor, Portbury Wharf Nature Reserve, Puxton Moor, Hallen, Bristol, Yatton.	179	300 19/04/2006 Portbury Wharf Nature Reserve

Species	Sites recorded	Total Number of Records	Peak Count/Date/Location
Swift	Avonmouth, Avonmouth Pools, Brinsea Batch, Brue Valley, Cheddar Valley Railway, Congresbury Moor, Nailsea, Lawrence Weston, Kenn Moor, Nailsea Moor, Tickenham & Clevedon Moor, Shirehampton, Puxton Moor, Hallen, Yatton.	286	65 01/08/2009 Portbury Wharf Nature Reserve
Tree Pipit	Lawrence Weston, Nailsea, Tickenham & Clevedon Moor, Puxton Moor, Hallen.	7	1 22/08/200 Puxton Moor
Tree sparrow	Avonmouth Pools, Lawrence Weston, Nailsea, Tickenham & Clevedon Moor, Puxton Moor.	28	40 06/12/1987 Avonmouth Pools
Turtle Dove	Hallen.	1	1 1976
Twite	Portbury Wharf Nature Reserve.	1	2 February 2006 Portbury Wharf Nature Reserve
Water pipit	Avonmouth Pools, Chittening Warth, Portbury Wharf Nature Reserve, Portbury Saltmarsh.	12	3 31/03/2005 Portbury Wharf Nature

Species	Sites recorded	Total Number of Records	Peak Count/Date/Location
			Reserve
Wheatear	Avonmouth, Avonmouth Pools, Chittening Warth, Congresbury Moor, Kenn Moor, Lawrence Weston, Nailsea Moor, Tickenham & Clevedon Moor, Portbury Wharf Nature Reserve, Portishead Ashlands, Puxton Moor, Hallen, Stup Pill.	109	47 26/04/1997 Chittening Warth
Whinchat	Avonmouth, Avonmouth Pools, Chittening Warth, Crook Peak, Lawrence Weston Moor, Nailsea Moor, Congresbury Moor, Portbury Ashlands, Portbury Wharf Nature Reserve, Puxton Moor, Hallen.	46	10 19/09/2004 Puxton Moor
Whitethroat	Avonmouth Pools, Biddle Street, Congresbury Moor, Cheddar Valley Railway, Chittening Warth, Clapton in Gordano, Lawrence Weston Moor, Kenn Moor, Kingston Seymour, Lamplighters Marsh, Nailsea Moor, Tickenham & Clevedon Moor, Portbury, Portbury Wharf Nature Reserve, Puxton Moor, Hallen, Yatton.	195	27 09/05/2003 Portbury
Willow warbler	Avonmouth, Avonmouth Pools, Brinsea Batch, Cheddar Valley Railway Walk, Congresbury, Chittening Warth, Crook Peak, Kenn Moor, Kingston Seymour, Lamplighters Marsh, Lawrence Weston, Max Bog, Nailsea Moor, Portbury, Portbury Wharf Nature Reserve, Puxton Moor, Hallen, Yatton.	92	13 30/08/2003 Portbury
Wood warbler	Chittening Warth, Priors Wood, Clapton in Gordano.	5	2 21/04/2003 Chittening Warth

Species	Sites recorded	Total Number of Records	Peak Count/Date/Location
Yellow wagtail	Avonmouth, Avonmouth Pools, Lawrence Weston Moor, Chittening Warth, Tickenham & Clevedon Moor, Portbury Wharf Nature Reserve, Portishead Ashlands, Hallen.	10	4 31/03/2005 Portbury Wharf Nature Reserve
Yellowhammer	Clapton in Gordano, Lawrence Weston, Nailsea Moor, Tickenham & Clevedon Moor, North Somerset, Portbury, Priors Wood, Hallen.	11	10 10/11/2003 Portbury

Hinkley Point Bird Surveys

4.5.728 Table 4.55 below shows the farmland bird species recorded breeding at Hinkley Point during the Hinkley Point breeding bird survey area.

Species	Number of Territories recorded in Survey Area	Sch 1, WCA 1981	Section 41	Red list BoCC	Amber list BoCC
Pheasant	15				
Moorhen	3				
Woodpigeon	23				
Stock dove	3				Y
Cuckoo	3		Y	Y	
Green woodpecker	2				Y
Great spotted woodpecker	2				
Skylark	58		Y	Y	
Meadow pipit	1				Y
Pied wagtail	1				
Wren	97				
Dunnock	56		Y		Y
Robin	60				
Nightingale	5-6		Y		Y
Blackbird	41				
Song thrush	16		Y	Y	
Cetti’s warbler	3	Y			
Sedge warbler	5				
Reed warbler	34				
Garden warbler	1				
Lesser whitethroat	7				
Whitethroat	70				Y
Blackcap	36				
Willow warbler	13				Y
Chiffchaff	42				
Goldcrest	4				Y
Blue tit	29				
Great tit	21				
Long-tailed tit	2				
Starling	2		Y	Y	

Species	Number of Territories recorded in Survey Area	Sch 1, WCA 1981	Section 41	Red list BoCC	Amber list BoCC
Magpie	4				
Jackdaw	1				
Carrion crow	2				
Rook	122				
House sparrow	3			Y	
Chaffinch	65				
Greenfinch	28				
Goldfinch	22				
Bullfinch	3		Y		Y
Linnet	20		Y	Y	
Yellowhammer	27		Y	Y	
Reed bunting	13		Y		Y

4.5.729 Nightingale were recorded breeding within scrub and woodland directly south of the existing power station. Between four and five pairs were estimated to breed in this location.

4.5.730 Cetti's warbler were recorded breeding on Wick Moor, as well as to the south of the proposed power station within the proposed connection works area. They were also recorded breeding near to the sewage works to the north of the proposed connection works.

4.5.731 The majority of linnet records were of birds to the west of the Hinkley Point power station located more than 500m from the proposed connection works.

Winter bird survey 2009-2010

4.5.732 Farmland bird species recorded during the 2009-2010 winter bird surveys are shown in Table 4.56. The results presented focus on protected species and Birds of Conservation Concern species.

Table 4.56. Field survey records for various farmland bird species 2010-2011.

Species	Site name	Date	Count
Bullfinch	Catcott, Edington and Chilton Moors SSSI	25th January 2010	2
Bullfinch	Biddle Street Yatton	26th January 2010	1
Bullfinch	Puxton Moor SSSI	26th January 2010	2
Bullfinch	Tickenham, Nailsea and Kenn Moors SSSI	25th January 2010	1

Species	Site name	Date	Count
Linnet	Tealham and Tadham Moors SSSI	25th January 2010	40
Reed bunting	Puxton Moor SSSI	26th January 2010	2
Reed bunting	Kenn Moor, Kenn Pier and Yew Tree Farm SSSI	25th January 2010	2
Reed bunting	Tickenham, Nailsea and Kenn Moors SSSI	25th January 2010	1
Skylark	Kenn Moor, Kenn Pier and Yew Tree Farm SSSI	1st December 2009	3
Song thrush	Catcott, Edington and Chilton Moors SSSI	25th January 2010	1
Song thrush	Biddle Street Yatton	26th January 2010	3

Winter Bird survey 2012

4.5.733 Farmland bird species recorded during the 2012 winter bird surveys are shown in Table 4.57. The results presented focus on protected species and Birds of Conservation Concern species.

Table 4.57. Birds of Conservation Concern species recorded during 2012 winter bird survey.

Species	S41	Red List (BoCC)	Amber List (BoCC)
Bullfinch	✓		✓
Cetti's warbler			
Dunnock	✓		✓
Fieldfare		✓	
Green woodpecker			✓
House sparrow	✓	✓	
Linnet	✓	✓	
Meadow pipit			✓
Mistle thrush			✓
Redwing		✓	
Reed bunting	✓	✓	
Skylark	✓	✓	

Species	S41	Red List (BoCC)	Amber List (BoCC)
Song thrush	✓	✓	
Starling	✓	✓	

4.5.734 Birds of Conservation Concern were found to be only present in low numbers across the site. Aggregations of starling were recorded in a few areas, with the largest groups recorded including a group of 550 on Huntspill Moor, 220 near to Woolavington and 130 north of Mark

Winter Bird survey 2012-2013

4.5.735 Farmland bird species recorded during the 2012-2013 and 2013-2014 winter bird surveys are shown in Table 4.58. The results presented focus on protected species and Birds of Conservation Concern species.

Table 4.58. Birds of Conservation Concern species recorded during 2012 winter bird survey.

Species	Description
Bullfinch	Bullfinch were recorded in low numbers throughout route and in moderate numbers in countryside surrounding Sandford including a group of six birds.
Black-headed gull	Moderate flocks of black-headed gull were recorded in the southern half of the route between Rooks Bridge and East Huntspill with a peak count of 55 birds to the east of East Huntspill.
Dunnock	Dunnock were recorded in low to moderate numbers along the entire length of the route.
Fieldfare	Fieldfare were recorded in moderate flocks along the length of the route with larger flocks predominantly observed in south and central regions. Two peak counts of 1000 birds were observed near East Huntspill and Mark during November.
Goldcrest	Two goldcrest were recorded north of Nailsea.
Herring gull	Herring gull were recorded in moderate flocks only in the southern half of the route with a peak count of 120 birds observed to the north of Mark.
House sparrow	House sparrow were observed along the entire route on multiple visits in small colonies associated with buldings/settlements. The highest densities were observed in the village of Barton located centrally on the route.
Kingfisher	Kingfisher were recorded in low numbers along waterways across the route. More were recorded in the southern half of the route and a peak count of two birds were recorded on the Huntspill River north of Woolavington.

Lesser black-backed gull	Lesser black-backed gull were only recorded twice between Mark and Rooks Bridge with a peak count of eight birds.
Linnet	Linnet were recorded in low to moderate numbers across the route with a peak count of 150 observed in a field 1km south of Puxton.
Lesser redpoll	Lesser redpoll were recorded on eone occasion with six birds observed east of Yatton.
Mistle thrush	Two mistle thrush were recorded in all visits in the northern half of the route east of Nailsea and Yatton.
Meadow pipit	Meadow pipit were recorded in low to moderate numbers along the route. A peak count of 16 individuals was recorded northeast of Sandford.
Reed bunting	Reed bunting were recorded across the route on multiple visits with a peak count of two birds on Nailsea Moor to the east of Nailsea.
Redwing	Redwing were recorded in moderate numbers along the route with larger flocks observed in the central and southern regions. A peak count of 500 redwing was made during November south of Mark.
Skylark	Groups of skylark were recorded at the southern end of the route with a peak count of 35 skylark recorded south of Kings Sedgemoor Drain in October 2012.
Starling	Starling were observed on multiple visits along the entirety of the route in moderate numbers. The peak count was a large flock of 3,000 birds recorded on afield 1km south of Puxton.
Song thrush	Song thrush were regularly recorded in low numbers throughout the route with a peak count of 5 birds observed southwest of Yatton.

Breeding Bird survey 2012

4.5.736 It is very difficult to fully census a bird population, and so from two visits it is likely that a certain proportion of the breeding bird population will have been under-recorded (Bibby *et al.,* 1992). This is especially true for less obvious skulking species with limited vocal periods.

4.5.737 When estimating the number of territories associated with each individual farmland bird species a precautionary approach has therefore been taken to scale up the number of likely territories within each area. The likely number of territories based on the survey results and the ecology of the species is determined, and then this number is scaled up by a factor of 2 to take into account of any under-recording.

4.5.738 The results presented focus on protected species and Birds of Conservation Concern species.

Area A

4.5.739 Area A is located at the southern end of the route corridor (illustrated at Figure 8.11). The area includes the land to the east of Puriton and to the West of Bawdrip. This area is bisected by the King's Sedgemoor Drain and also includes the Puriton Ridge.

4.5.740 During the 2012 breeding bird survey a total of 16 BoCC farmland bird species were recorded within Area A excluding waders, wildfowl and raptors. These included 9 red listed or S41 species and 10 amber listed species. These species are shown in Table 4.59. No Schedule 1 species were recorded. The locations of the BoCC species are illustrated at Figure 8.17, Inset 1.

Table 4.59. Protected and BoCC species recorded during 2012 breeding bird survey - Area A

Species	Number of Birds (1st Visit)	Number of Birds (2nd visit)	Territories (Factor of 2 applied)	Sch 1	S41	Red List BoCC	Amber List BoCC
Bullfinch		1	2		✓		✓
Dunnock	6	3	4		✓		✓
Green woodpecker	2		2				✓
Herring Gull		4	-		✓	✓	
House sparrow	4	10	8		✓	✓	
Lesser black-backed gull	1		-				✓
Linnet		3	4		✓	✓	
Mistle thrush	1	2	2				✓
Reed bunting	2	1	4		✓	✓	
Skylark	1	1	2		✓	✓	
Song thrush	1	1	2		✓	✓	
Swallow	11		8				✓
Swift		1	-				✓
Whitethroat	1	6	4				✓
Willow warbler	3		6				✓
Yellowhammer		1	2		✓	✓	

4.5.741 BoCC species were found to be present across Area A in low numbers. Buildings both within and adjacent to the site were found to be used by house sparrow colonies. Small numbers of reed bunting were found to be present near to watercourses/ditches across the area. The green lane bordered by hedgerows with trees that runs east-west through the site (Bitham Lane) was found to be used by approximately 3 pairs of willow warbler and two pairs of dunnock. Small numbers of skylark were found to breed in the open grassland and linnet were found to be present in areas of scattered and dense scrub.

Area B(i)

4.5.742 Area B(i) lies directly north of Area A and includes land between Woolavington Road in the south and Mark Causeway in the north. This area contains the River Huntspill as well as part of Mark Moor.

4.5.743 During the 2012 breeding bird survey a total of 23 BoCC species were recorded in Area B(i) excluding waders, wildfowl and raptors. These included 1 Schedule 1 species, 13 red listed or UKBAP species and 11 amber listed species. These species are shown in Table 4.60. The locations of the BoCC species are illustrated at Figure 8.17, Insets 1 & 2.

Table 4.60. Protected and BoCC species recorded during 2012 breeding bird survey-Area B(i).

Species	Number of Birds (1st Visit)	Number of Birds (2nd visit)	Territories (Factor of 2 applied	Sch 1	S41	Red List (BoCC)	Amber List (BoCC)
Bullfinch	2		4		✓		✓
Cetti's warbler		1	2	✓			
Cuckoo		3	2		✓	✓	
Dunnock	7	11	14		✓		✓
Grey partridge	1		2				✓
Herring gull	1	3	-		✓	✓	
House martin	1		1				✓
House sparrow	8	5	4 colonies		✓	✓	
Linnet	4	2	6		✓	✓	
Mistle thrush	1	1	2				✓
Redstart		1	2				✓
Reed bunting	5	1	6		✓	✓	
Stock dove		1	2				✓
Skylark	1		2		✓	✓	
Spotted flycatcher	1		2		✓	✓	
Song thrush	1	3	4		✓	✓	
Starling	14		4		✓	✓	
Swallow	21	4	16				✓

Species	Number of Birds (1st Visit)	Number of Birds (2nd visit)	Territories (Factor of 2 applied	Sch 1	S41	Red List (BoCC)	Amber List (BoCC)
Swift		1	-				✓
Whitethroat	13	3	14				✓
Willow tit		1	2		✓	✓	
Willow warbler	1		2				✓
Yellow wagtail		1	2		✓	✓	

4.5.744 The only Schedule 1 species recorded during the 2012 bird survey was a single Cetti's warbler. This bird was recorded near Ham Lane within the south west of the area. Other notable species recorded included willow tit, located near to Moormead Drove, and yellow wagtail, found just to the south of the Huntspill River. A spotted flycatcher and a redstart were recorded within the dense network of hedgerows with trees and semi-improved grassland located within the south of this area.

4.5.745 Reed bunting were found near to watercourses within this area (peak count 5) and bullfinch were recorded in bushy hedges adjacent to droves. Linnet were recorded using patches of scrub adjacent to the Huntspill River. Dunnock were regularly recorded across the survey area.

Area B(ii)

4.5.746 Area B(ii) includes land between Mark Causeway in the south and Webbington Road in the north. The route swells within this section and so includes a wider area of land in the vicinity of Vole and Rooksbridge.

4.5.747 During the 2012 breeding bird survey a total of 25 BoCC species were recorded in Area B(ii) excluding waders, wildfowl and raptors. These included 1 Schedule 1 species, 10 red listed or UKBAP species and 10 amber listed species. These species are shown in Table 4.61. The locations of the BoCC species are illustrated at Figure 8.17, Insets 3 – 5.

Table 4.61. Protected and BoCC species recorded during 2012 breeding bird survey - Area B(ii)

Species	Number of Birds (1st Visit)	Number of Birds (2nd visit)	Territories (Factor of 2 applied	Sch 1	S41	Red List (BoCC)	Amber List (BoCC)
Bullfinch	3	4	8		✓		✓
Cetti's warbler	1	1	2	✓			
Cuckoo		1	2		✓	✓	
Dunnock	12	7			✓		✓
Grasshopper warbler		1	2				
Green woodpecker	2	3	4				

Species	Number of Birds (1st Visit)	Number of Birds (2nd visit)	Territories (Factor of 2 applied	Sch 1	S41	Red List (BoCC)	Amber List (BoCC)
Grey partridge		1	2				✓
Grey wagtail	3	2	4				
Herring gull	31	2	-		✓	✓	
House martin	9	2	3				✓
House sparrow	25	24	5 colonies		✓	✓	
Lesser black backed gull	5	4	-				
Linnet	1	12	8		✓	✓	
Meadow pipit	4		-				
Mistle thrush	1		2				✓
Reed bunting	22	29	40		✓	✓	
Stock dove		1	2				✓
Skylark	16	23	40		✓	✓	
Song thrush	4	3	6		✓	✓	
Starling	2	7	4		✓	✓	
Swallow	47	35	20				✓
Swift		7	-				✓
Whitethroat	2	7	10				✓
Willow warbler	8		4				✓

4.5.748 The Schedule 1 species Cetti's warbler was recorded in one location south of Rook's Bridge during both breeding bird survey visits.

4.5.749 Moderate numbers of reed bunting were recorded at or near to ditches across area B(ii). A single grasshopper warbler was also recorded near the Mark Yeo.

4.5.750 Moderate numbers of skylark were recorded across area B(ii), generally within the larger, more open fields. A high count of 12 linnet was recorded within this area during the second visit. These birds were generally recorded near tracks and roads where hedgerows, trees and scrub were present.

4.5.751 House sparrows were recorded at farm buildings throughout Area B(ii).

Area C

4.5.752 Area C includes the section of the corridor passing through the Mendip Hills. This section passes north between Loxton and Webbington before bearing north west between Banwell and Winscombe. The northern boundary of this section is demarcated by the A368.

4.5.753 During the 2012 breeding bird survey a total of 15 BoCC species were recorded within Area C excluding waders, wildfowl and raptors. These included 8 red listed or Section 41 species and 9 amber listed species. These species are shown in Table 4.62. The locations of the BoCC species are illustrated at Figure 8.17, Insets 5 & 6.

Table 4.62. Protected and BoCC species recorded during 2012 breeding bird survey - Area C

Species	**Number of Birds (1st Visit)**	**Number of Birds (2nd visit)**	**Territories (Factor of 2 applied**	**Sch 1**	**S41**	**Red List (BoCC)**	**Amber List (BoCC)**
Bullfinch	3	2	6		✓		✓
Dunnock	10	11	16		✓		✓
Green woodpecker	4	4	4				✓
Grey wagtail	1		2				✓
Herring gull	1	4	-		✓	✓	
House sparrow	6	3	2 colonies		✓	✓	
Lesser black-backed gull		2	-				✓
Marsh tit		1	2		✓	✓	
Meadow pipit	2		-				✓
Reed bunting	2	7	12		✓	✓	
Song thrush	4	5	8		✓	✓	
Swallow	19	4	12				✓
Whitethroat	2	5	8				✓
Wiilow warbler	1		2				✓
Yellowhamm er	1	1	2		✓	✓	

4.5.754 The Schedule 1 species kingfisher was recorded on the Lox Yeo river during the first survey visit. Two birds were recorded in a relatively short section of the river suggesting a pair of birds use this section of the watercourse.

4.5.755 Other notable BoCC species include a single marsh tit that was recorded at the edge of Banwell Wood.

Area D(i)

4.5.756 Area D(i) extends north from the A368 past Sandford and through Puxton Moor. This section includes the eastern edge of Puxton Moor SSSI. The route then expands to the west of Yatton and includes part of the Biddle Street, Yatton SSSI. The northern boundary of this section is demarcated by Lampley road to the east of Kingston Seymour.

4.5.757 During the 2012 breeding bird survey a total of 22 BoCC species were recorded within Area D(i) excluding waders, wildfowl and raptors. These included 1 Schedule 1 species, 12 red listed or Section 41 species and 11 amber listed species. These species are shown in Table 4.63. The locations of the BoCC species recorded are illustrated at Figure 8.17, Insets 7 – 9.

Table 4.63. Protected and BoCC species recorded during 2012 breeding bird survey - Area D(i).

Species	Number of Birds (1st Visit)	Number of Birds (2nd visit)	Territories (Factor of 2 applied	Sch 1	S41	Red List (BoCC)	Amber List (BoCC)
Bullfinch	2	2	4		✓		✓
Cetti's warbler	2	2	4	✓			
Dunnock	11	11	20		✓		✓
Grasshopper warbler		1	2		✓	✓	
Herring gull	12	11	-		✓	✓	
House martin	5	1	2				✓
House sparrow	35	13	5 colonies		✓	✓	
Lesser black-backed gull	65	1	-				✓
Linnet	7	0	8		✓	✓	
Mistle thrush		1	2				✓
Reed bunting	5	12	15		✓	✓	
Stock dove	10		10				✓
Skylark	5	7	14		✓	✓	
Spotted flycatcher		1	2		✓	✓	
Song thrush	3	7	12		✓	✓	
Starling	14	9	4		✓	✓	
Swallow	50	23	20				✓
Swift	2	1	-				✓

Species	Number of Birds (1st Visit)	Number of Birds (2nd visit)	Territories (Factor of 2 applied	Sch 1	S41	Red List (BoCC)	Amber List (BoCC)
Wheatear	5		-				✓
Whitethroat	18	4	10				✓
Wiilow warbler	7	2	7				✓
Yellowhammer	1		2		✓	✓	

4.5.758 Only one Schedule 1 species, Cetti's warbler, was recorded within Area D(i). It is likely that 3-4 pairs of this species bred within this area within approximately 1km of the railway line. A peak count of 7 skylark was recorded during the second visit, with the majority of skylark recorded on fields near to Meer Wall on Puxton Moor. Skylark were also recorded in fields near to the railway line during both survey visits.

4.5.759 Area D(i) provided foraging for moderate numbers of swallow, with a high count of 59 birds recorded across the site. Many of the drains present were also found to support mallard. The colonies of house sparrow recorded were associated with farms and other buildings within the survey area.

Area D(ii)

4.5.760 Area D(ii) includes Tickenham, Nailsea and Kenn Moors. Part of this area is designated as a SSSI under the same name. This area bears north west north of Lampley Road and passes between Clevedon in the west and Nailsea in the east. The B3130 forms the northern boundary of this area.

4.5.761 During the 2012 breeding bird survey a total of 23 BoCC species were recorded within Area D(ii) excluding waders, wildfowl and raptors. These included 11 red listed or Section 41 species and 14 amber listed species. These species are shown in Table 4.63. The locations of the BoCC species recorded are illustrated at Figure 8.17, Insets 10 - 12.

Table 4.64. Protected and BoCC species recorded during 2012 breeding bird survey - Area D(ii)

Species	Number of Birds (1st Visit)	Number of Birds (2nd visit)	Territories (Factor of 2 applied	Sch 1	S41	Red List (BoCC)	Amber List (BoCC)
Black-headed gull	1	1	-				✓
Bullfinch		1	2		✓		✓
Dunnock	11	18	22		✓		✓
Great black-backed gull		1	-				✓
Green woodpecker	2		4				✓
Herring gull	36		-		✓	✓	

Species	Number of Birds (1st Visit)	Number of Birds (2nd visit)	Territories (Factor of 2 applied	Sch 1	S41	Red List (BoCC)	Amber List (BoCC)
House martin	1	2	2				✓
House sparrow	16	11	3 colonies		✓	✓	
Lesser black-backed gull	7	1					✓
Linnet	9	16	20		✓	✓	
Meadow pipit	1		-		✓		
Mistle thrush	1		2				✓
Reed bunting	6	18	20		✓	✓	
Stock dove	2		4				✓
Skylark	2	12	20		✓	✓	
Song thrush	2	18	8		✓	✓	
Starling	57	8	8		✓	✓	
Swallow	33	9	15				✓
Swift	1	1	-				✓
Wheatear	1		-				✓
Whitethroat	4	11	12				✓
Willow warbler	4		8				✓
Yellowhammer		1	2		✓	✓	

4.5.762 A single peregrine (Schedule 1) was recorded flying over the south eastern edge of this area near to Nailsea during the second survey visit.

4.5.763 Area Dii was found to hold a range of bird species characteristic of wetter areas. Reed bunting were recorded across the area within the many wet ditches present. It is likely that at least 8 pairs of reed bunting use this area.

4.5.764 Species characteristic of scrubby vegetation such as dunnock, linnet and whitethroat were recorded frequently. It is likely that at least 10 pairs of dunnock, 8 pairs of linnet and 6 pairs of whitethroat use this area. The majority of linnet were recorded on Nailsea Moor where they were confirmed to be breeding, as well as south of Church Lane and Cleveland Road in the north of this Area.

4.5.765 Moderate numbers of song thrush were recorded near to Clevedon, with a few families of song thrush recorded, confirming breeding.

4.5.766 Groups of house sparrow were recorded at farms and other buildings within Area Dii.

Area E

4.5.767 Area E lies between the B3130 in the south and the M5 in the north. The corridor in this area passes north west between two areas of woodland over the Tickenham Ridge.

4.5.768 During the 2012 breeding bird survey a total of 19 BoCC species were recorded within Area E excluding waders, wildfowl and raptors. These included 1 Schedule 1 species, 10 red listed or Section 41 species and 10 amber listed species. These species are shown in Table 4.65. The locations of the BoCC species recorded are illustrated at Figure 8.17, Insets 12 & 13.

Table 4.65. Protected and BoCC species recorded during 2012 breeding bird survey - Area E

Species	**Number of Birds (1st Visit)**	**Number of Birds (2nd visit)**	**Territories (Factor of 2 applied**	**Sch 1**	**S41**	**Red List (BoCC)**	**Amber List (BoCC)**
Bullfinch	1	1	2		✓		✓
Common crossbill		1	2	✓			
Dunnock	7	6	12		✓		✓
Green woodpecker	3	7	8				✓
Grey partridge		1	2		✓	✓	
Herring gull	2		-		✓	✓	
House martin	2		-				✓
House sparrow	19	6	3 colonies		✓	✓	
Lesser black-backed gull		1	-				✓
Linnet		2	4		✓	✓	
Mistle thrush		4	4				✓
Skylark	7	8	14		✓	✓	
Song thrush	5	2	6		✓	✓	
Starling		2	2		✓	✓	
Swallow	6	4	4				✓
Swift	2		-				✓
Whitethroat	2	6	6				✓
Willow warbler	8		8				✓
Yellowhammer	1		2		✓	✓	

4.5.769 Area E was found to support a range of bird species characteristic of the mixture of broadleaved woodland and open farmland prevalent within this area. These included BoCC species such as song thrush, willow warbler, green woodpecker, dunnock and bullfinch. Species including whitethroat and linnet were recorded using the shorter hedges located between the woodland areas. The majority of song thrush and willow warbler recorded were in Mogg's Wood in the east of the area. The Schedule 1 species common crossbill was recorded within a small area of woodland off Cadbury Camp Lane.

4.5.770 Skylark were recorded within the open arable land on within the north of Area E. A grey partridge was also recorded within this northern area during the second visit. A single yellowhammer was recorded using the area of meadows, woodland and hedges within the centre of the site off Cadbury Camp Lane.

Area F

4.5.771 Area F comprises section of the corridor east of Portishead that passes north of the M5 motorway and through part of Portbury Wharf Nature Reserve, at which point the corridor bears due east. The eastern boundary of the area is the Drove Rhyne.

4.5.772 During the 2012 breeding bird survey a total of 18 BoCC species were recorded within Area F excluding waders, wildfowl and raptors. These included 1 Schedule 1 species, 11 red listed or Section 41 species and 8 amber listed species. These species are s`hown in Table 4.66. The locations of the BoCC species are illustrated at Figure 8.17, Insets 13 & 14.

Table 4.66. Protected and BoCC species recorded during 2012 breeding bird survey - Area F

Species	Number of Birds (1st Visit)	Number of Birds (2nd visit)	Territories (Factor of 2 applied)	Sch 1	S41	Red List (BoCC)	Amber List (BoCC)
Bullfinch	3	4	8		✓		✓
Cetti's warbler	4	7	10	✓			
Dunnock	9	4	16		✓		✓
Green woodpecker	2	1	4				✓
Great black-backed gull		1	-				✓
Grey partridge	1		2		✓	✓	
Herring gull	43	4	-		✓	✓	
House sparrow		2	2		✓	✓	
Lesser black-backed gull	43	2	-				✓
Linnet	5	5	8		✓	✓	
Reed bunting	3	2	6		✓	✓	
Skylark		2	4		✓	✓	

Species	Number of Birds (1st Visit)	Number of Birds (2nd visit)	Territories (Factor of 2 applied)	Sch 1	S41	Red List (BoCC)	Amber List (BoCC)
Song thrush	2	2	4		✓	✓	
Starling		4	4		✓	✓	
Swallow	4	5	2				✓
Whitethroat	2	10	8				✓
Wiilow warbler	1	1	2				✓
Yellowhammer	1	1	2		✓	✓	

4.5.773 During the 2012 breeding bird survey Area F was found to support the Schedule 1 species Cetti's warbler. A high count of 7 Cetti's warbler were recorded during the second visit throughout the Portbury Wharf Nature Reserve.

4.5.774 Other notable species include a congregation of 5 linnet recorded in the scrub adjacent to the disused railway line north of Sheepway, and a single grey partridge and yellowhammer recorded just north of the M5. A pair of bullfinch are likely to breed in hedgerows/scrub near to the track north of Wharf Lane. It is possible that another pair of bullfinch breeds within scrub on the disused railway in the centre of the area.

<u>Area G</u>

4.5.775 Area G includes the Bristol Port Authority land east and north of the Drove Rhyne, as well as land at Avonmouth up until the northern end of the corridor. This section includes the section of the River Avon where it passes through the corridor. Much of this section comprises industrial land and a dense road network.

4.5.776 During the 2012 breeding bird survey a total of 21 BoCC species were recorded in Area G excluding waders, wildfowl and raptors. These included 1 Schedule 1 species, 9 red listed or Section 41 species and 13 amber listed species. These species are shown in Table 4.67. The locations of the BoCC species are illustrated at Figure 8.17, Insets 14 – 16.

Table 4.67. Protected and BoCC species recorded during 2012 breeding bird survey - Area G.

Species	Number of Birds (1st Visit)	Number of Birds (2nd visit)	Territories (Factor of 2 applied	Sch 1	S41	Red List (BoCC)	Amber List (BoCC)
Black-headed gull	3		-				✓
Bullfinch		7	6		✓		✓
Cetti's warbler	2	4	6	✓			
Dunnock	3	40	30		✓		✓
Green woodpecker		5	4				✓

Species	Number of Birds (1st Visit)	Number of Birds (2nd visit)	Territories (Factor of 2 applied	Sch 1	S41	Red List (BoCC)	Amber List (BoCC)
Grey partridge	1	1	2		✓	✓	
Herring gull	6	25	-		✓	✓	
Lesser black-backed gull		2	-				✓
Linnet	1	8	6		✓	✓	
Mistle thrush		2	4				✓
Redstart	1		-				✓
Reed bunting	1	7	6		✓	✓	
Skylark	3	9	10		✓	✓	
Song thrush	1	10	10		✓	✓	
Starling		3	2		✓	✓	
Stonechat	2		-				✓
Stock dove	1	3	2				✓
Swallow		5	2				✓
Swift	1	3	-				✓
Whitethroat	12	29	24				✓
Willow warbler	2	3	6				✓

4.5.777 The Schedule 1 species Cetti's warbler was recorded throughout the Portbury Dock area, with a peak count of 4 birds during the second visit. Reed bunting, dunnock and linnet were also recorded within the mixture of swamp, marsh and scrub recorded beneath the existing overhead line route.

4.5.778 Dunnock and whitethroat were the most abundant bird species of conservation concern, with peak counts of 40 dunnock and 29 whitethroat recorded. It is likely that both these species favour the scattered scrub, hedgerows and ornamental shrub planting prevalent throughout this area. Bullfinches were also found to frequent these areas with a peak count of 7 bullfinch recorded during the second visit. Song thrush were recorded along linear features such as tracks, roads and the railway that contained scrub as well as trees that they could use as song posts. A peak count of 10 song thrush was recorded in Area G.

4.5.779 Small numbers of skylark were recorded within Area G, on bare ground west of the Avonmouth Sewage Treatment Works and on grassland at Hallen Marsh. Another singing skylark was recorded at Stuppill Gout in the north west corner of Area G. A redstart was recorded near to the banks of the River Avon during the first visit. It is highly likely that this bird was on migration.

Breeding Bird Survey 2013

4.5.780 The BoCC species recorded within the additional areas surveyed during the 2013 breeding bird survey are presented at Figure 8.17. The 2012 breeding bird survey results of the entire survey corridor are also shown on these drawings.

4.5.781 To present the relative number of breeding bird species of these additional areas, each has been shaded according to number of bird species in those individual sections. Relative number of bird species is illustrated at Figure 8.18. The only 2013 breeding bird survey area that was found to contain moderately high numbers of breeding bird species was Hinkley Point.

4.5.782 To establish the relative conservation importance of each section, the sections have then been shaded according to the peak counts of BoCC species and protected species recorded in that location during the breeding bird survey. The breeding bird conservation value for each section is illustrated at Figure 8.19.

4.5.783 The only 2013 breeding bird survey area that was found to contain moderately high abundance of breeding BoCC/protected species was Hinkley Point.

4.5.784 The results of the 2013 breeding bird survey are detailed below.

Bridgwater T (Section A60)

4.5.785 This section lies at the southern end of the corridor at Horsey Level and is the location of the proposed Bridgwater T diversion. During the 2013 breeding bird survey a total of 3 BoCC species were recorded within the Bridgwater T survey area excluding waders, wildfowl and raptors. These included 3 amber listed species. These species are shown in Table 4.68. No protected, red list or UKBAP species were recorded in this location. The locations of the BoCC species are illustrated at Figure 8.17, Inset 1.

Table 4.68. Protected and BoCC species recorded during 2013 breeding bird survey - Bridgwater T survey area.

Species	**Number of Birds (1st Visit)**	**Number of Birds (2nd visit)**	**Territories (Factor of 2 applied**	**Sch 1**	**S41**	**Red List (BoCC)**	**Amber List (BoCC)**
Swallow		2	2				✓
Swift		3	-				✓
Whitethroat	2	2	4				✓

4.5.786 Small numbers of BoCC species were found to be present across the Bridgwater T location. A pair of whitethroat was confirmed to breed in the south of the survey area.

Webbington (Section A61, Figure 8.17*)*

4.5.787 This short section at Webbington includes the proposed location of an undergrounded section that diverts out and then back into the corridor.

4.5.788 During the 2013 breeding bird survey a total of 7 BoCC species were recorded within the Webbington survey area excluding waders, wildfowl and raptors. These included 4 red listed or Section 41 species and 4 amber listed species. These species are shown in Table 4.69. No Schedule 1 species or species associated with the Somerset Levels SPA were recorded. The locations of the BoCC species are illustrated at Figure 8.17, Inset 5.

Table 4.69. Protected and BoCC species recorded during 2013 breeding bird survey - Webbington T survey area.

Species	Number of Birds (1st Visit)	Number of Birds (2nd visit)	Territories (Factor of 2 applied)	Sch 1	S41	Red List (BoCC)	Amber List (BoCC)
Dunnock	1	0	2		✓		✓
Reed bunting	1	0	2		✓	✓	
Song thrush	1	0	2		✓	✓	
Starling	1	0	2		✓	✓	
Swallow	0	1	-				✓
Swift	0	3	-				✓
Whitethroat	1	1	2				✓

4.5.789 BoCC species were found to be present across the Webbington survey area in low numbers. No BoCC species were confirmed to breed in this area, however it is likely that a pair of whitethroat bred in hedgerows/scrub here.

AT- Route (Section A62)

4.5.790 This section includes the proposed 132kV overhead connection to a substation to the north of Sandford.

4.5.791 During the 2012 breeding bird survey a total of 3 BoCC species were recorded within the AT-Route survey area excluding waders, wildfowl and raptors. These included 3 amber listed species. These species are shown in Table 4.70. No protected species, red listed or Section 41 species were recorded here during the 2013 breeding bird survey. The locations of the BoCC species are illustrated at Figure 8.17, Inset 7.

Table 4.70. Protected and BoCC species recorded during 2013 breeding bird survey - AT Route survey area.

Species	Number of Birds (1st Visit)	Number of Birds (2nd visit)	Territories (Factor of 2 applied	Sch 1	S41	Red List (BoCC)	Amber List (BoCC)
Swallow	2	3	2				✓
Swift		1	-				✓
Whitethroat	1	1	2				✓

4.5.792 Very low numbers of BoCC species were recorded across the survey area. It is possible that a single pair of whitethroat bred within the AT-route survey area.

Churchill (Section A63)

4.5.793 This section includes a proposed extension to a substation, and two 132kV overhead line connections.

4.5.794 During the 2013 breeding bird survey, a total of 2 BoCC species were recorded within the Churchill area. These included 1 Section 41 species and 2 amber listed species. These species are shown in Table 4.71. No Schedule 1 species or red listed species were recorded. The locations of the BoCC species are illustrated at Figure 8.17, Inset 8.

Table 4.71. Protected and BoCC species recorded during 2013 breeding bird survey - Churchill survey area.

Species	Number of Birds (1st Visit)	Number of Birds (2nd visit)	Territories (Factor of 2 applied)	Sch 1	S41	Red List (BoCC)	Amber List (BoCC)
Dunnock		1	2		✓		✓
Whitethroat		1	2				✓

4.5.795 Only very low numbers of BoCC species were recorded within this area. A pair of whitethroat was confirmed to breed within the Churchill Area during the 2013 survey.

W- Route, Nailsea (Section A64)

4.5.796 This section lies to the west of Nailsea and consists of the proposed location of the 132kV undergrounding route.

4.5.797 During the 2013 breeding bird survey a total of 8 BoCC species were recorded within the W-Route survey area. These included 4 red listed or Section 41 species and 5 amber listed species. These species are shown in Table 4.72. No Schedule 1 species were recorded. The locations of the BoCC species are illustrated at Figure 8.17, Insets 11 & 12.

Table 4.72. Protected and BoCC species recorded during 2013 breeding bird survey - W Route survey area.

Species	Number of Birds (1st Visit)	Number of Birds (2nd visit)	Territories (Factor of 2 applied)	Sch 1	S41	Red List (BoCC)	Amber List (BoCC)
Dunnock	3		4		✓		✓
House martin		10	6				✓
House sparrow	8	4	8		✓	✓	
Mistle thrush	1		2				✓
Song thrush	1		2		✓	✓	
Starling	2	1	2		✓	✓	

Swallow	1	2	2				✓
Whitethroat	1	1	2				✓

4.5.798 Small numbers of BoCC species were found to be present across the W-Route survey area in low numbers. Buildings both within and adjacent to the site were found to be used by breeding house sparrow. A pair of mistle thrush and whitethroat were confirmed to have bred within the survey area during 2013.

G-Route, Avonmouth (Section A65)

4.5.799 This section lies to the east of the corridor between the M49 and M5 motorways. It is the location of a proposed undergrounded section.

4.5.800 During the 2013 breeding bird survey a total of 9 BoCC species were recorded within the G-Route survey area excluding waders, wildfowl and raptors. These included 4 red listed or Section 41 species and 7 amber listed species. These species are shown in Table 4.73. No Schedule 1 species were recorded. The locations of the BoCC species are illustrated at Figure 8.17, Inset 14 & 15.

Table 4.73. Protected and BoCC species recorded during 2013 breeding bird survey - G Route survey area

Species	**Number of Birds (1st Visit)**	**Number of Birds (2nd visit)**	**Territories (Factor of 2 applied)**	**Sch 1**	**S41**	**Red List (BoCC)**	**Amber List (BoCC)**
Black headed gull	50		-				✓
Bullfinch		1	2		✓		✓
Dunnock	2	1	4		✓		✓
Herring Gull	66		-		✓	✓	
Lesser black-backed gull	22		-				✓
Reed bunting	2		2		✓	✓	
Swallow	1		-				✓
Whitethroat	5	6	8				✓
Willow warbler	4		6				✓

4.5.801 BoCC species were found across the G-Route survey area in low numbers. The area was also found to be occasionally used by groups of foraging gulls. Two pairs of whitethroat were confirmed to breed within the survey area in 2013, and it is likely that a further 3 pairs of whithroat bred within hedgerows and scrub in this area. It is likely that at least 1 pair of dunnock bred within this survey area.

M5 – Preferred Route (Section A66)

4.5.802 This section includes an area of land to the east of the previously surveyed corridor, and follows the edge of the M5 motorway.

4.5.803 During the 2013 breeding bird survey a total of 3 BoCC species were recorded within the M5 Preferred Route survey area. These included 1 red listed or Section 41 species and 2 amber listed species. These species are shown in Table 4.74. No Schedule 1 species were recorded. The locations of the BoCC species are illustrated at Figure 8.17, Inset 15.

Table 4.74. Protected and BoCC species recorded during 2013 breeding bird survey - M5 Preferred Route survey area.

Species	Number of Birds (1st Visit)	Number of Birds (2nd visit)	Territories (Factor of 2 applied)	Sch 1	S41	Red List (BoCC)	Amber List (BoCC)
Song thrush		1	2		✓	✓	
Swallow		1					✓
Whitethroat	1	2	4				✓

4.5.804 A small number of BoCC species were found across the M5 Preferred Route survey area in low numbers. A single pair of whitethroat were confirmed to breed within the survey area in 2013.

Hinkley Point (Section A59)

4.5.805 This section lies adjacent to the Hinkley Point Power Station on the coast to the west of Highbridge. During the 2013 breeding bird survey a total of 10 BoCC species were recorded within the Hinkley Point survey area excluding waders, wildfowl and raptors. These included 5 red listed or Section 41 species and 5 amber listed species. These species are shown in Table 4.75. No Schedule 1 species were recorded. The locations of the BoCC species are illustrated at Figure 8.17, Inset 17.

Table 4.75. Protected and BoCC species recorded during 2013 breeding bird survey - Hinkley Point survey area

Species	Number of Birds (1st Visit)	Number of Birds (2nd visit)	Territories (Factor of 2 applied)	Sch 1	S41	Red List (BoCC)	Amber List (BoCC)
Dunnock	2	1	2		✓		✓
House martin	2	1	2				✓
Linnet		1	2				
Reed bunting	1		2		✓	✓	
Skylark	1	4	8		✓	✓	
Song thrush		1	2		✓	✓	

Swallow	3	12	6				✓
Whitethroat	10	2					✓
Willow warbler	1						✓
Yellowhammer	1	3	4		✓	✓	

4.5.806 BoCC species were found to be present across the Hinkley Point survey area in low numbers. Skylark were recorded within open grassland in the west of the area during 2013. A pair of whitethroat and a pair of skylark were confirmed to breed within trees and scrub within the survey area. Other BoCC species that are likely to have bred within the survey area include yellowhammer, linnet and dunnock.

Vantage Point survey 2009-2010

4.5.807 Farmland bird flight lines were not recorded during the vantage point survey since these species are not considered to be vulnerable to overhead line collision.

Vantage Point survey 2010-2011

4.5.808 Farmland bird flight lines were not recorded during the vantage point survey since these species are not considered to be vulnerable to overhead line collision.

Connection Potential Effects Assessment – Farmland Bird Species

Habitat Loss, Disturbance and Displacement effects

4.5.809 There is some potential for lowland farmland bird species to experience habitat loss, disturbance and displacement effects from the proposed overhead line if the pylons are located on suitable nesting habitat for these species. The sphere of influence of the displacement effects would be small.

4.5.810 Table 4.76 outlines the potential habitat loss, disturbance and displacement effects on all farmland bird species of conservation concern, excluding waders, wildfowl and raptors.

Collision risk for regular feeding flights

4.5.811 Passerines, which include the majority of farmland birds considered in this section, are not considered to be particularly vulnerable to collision with overhead lines (see Appendix 2). It is considered to be very unlikely that passerines will be affected by collision mortality.

4.5.812 Gulls are highly manoeuvrable in flight and are likely to avoid overhead line collisions in most circumstances apart from low light conditions during poor weather. However a recent review of overhead line collision studies identified gulls as tending to be regionally or locally susceptible to high casualties, although not to a degree that there is a significant impact on the overall species population (Haas *et al.,* 2005).

Table 4.76. Potential habitat loss, disturbance and displacement effects on all protected and BoCC farmland bird species, excluding waders, wildfowl and raptors.

Species	Areas found to occur	Potential Habitat Loss Effects	Potential Disturbance Effects
Black-headed gull	Survey Area B (Wintering groups of generally below 50 individuals recorded in a few scattered localies between the River Huntspill and Rooksbridge) Area F (Portbury Wharf)	Very few black-headed gull were recorded within 250m of the Proposed Development during the breeding season, and this species was not recorded to breed in this location. Only small to meoderate groups of this species were recorded on a few occasions in a few scattered locations during winter bird surveys. Due to the prevalence of suitable habitat within the wider area it is highly unlikely that this species will suffer significant temporary habitat loss.	Very few black-headed gull were recorded within 250m of the Proposed Development during the breeding season, and this species was not recorded to breed in this location. Only small to meoderate groups of this species were recorded on a few occasions in a few scattered locations during winter bird surveys. Due to the prevalence of suitable habitat within the wider area it is highly unlikely that this species will suffer significant disturbance or displacement effects.
Bullfinch	Throughout	Potential loss of small amounts of overgrown scrub and tall overgrown hedgerow in areas found to occur.	Small potential for temporary disturbance of nest sites if works carried out within 5m of overgrown hedges/scrub where bullfinch are known to occur during breeding season (April to September).
Cetti's Warbler	Desktop Area F (Portbury Wharf), Area C & D (Starwberry Line),	There is potential for small amounts of Cetti's warbler habitat to be lost if scrub or dense wetland vegetation is lost to the Proposed Development in areas where Cetti's warbler are known to occur. This is particularly relevant if Option B is selected within	This is a Schedule 1 species and is therefore protected against disturbance whilst nesting. There is some potential for disturbance of nest sites to occur if works are carried out within 20m of areas of dense reed or scrub during the nesting season in areas where known to occur. A nesting bird check will therefore be required in these areas prior to works commencing if undertaken during these months.

	<u>Survey</u> Area B (near Ham Lane and south of Rooks Bridge) Area D (Puxton Moor) Area F (Portbury Wharf) Area G (Portbury Docks Area H (Hinkley Point).	Portbury Wharf.	
Common crossbill	<u>Survey</u> Area E (woodland between the Chummock Wood and Mogg's Wood, near to Cadbury Camp Lane)	There is a small potential for low numbers of pairs of this species to be disturbed and displaced if works are carried out within woodland or dense vegetation between the Chummock Wood and Mogg's Wood	Common crossbill are protected under Schedule 1 of the Wildlife and Countryside Act and so are protected from disturbance during the breeding season. Common crossbill may breed at any time of year. If any tree removal is required from any woodland between the Chummock Wood and Mogg's Wood, near to Cadbury Camp Lane, a nesting bird check for common crossbill will be required of the trees a maximum of 24hrs prior to works taking place. If common crossbill are suspected to be nesting, a licenced ecologist may be required to check the nest directly. If common crossbill are established to be breeding, a minimum standoff of 20m will be applied to the nest location. This disturbance buffer may be increased at the discretion of the licenced ecologist depending on the

			proposed works and the habitats present.
Corn Bunting	Hallen	Corn bunting have not been recorded within the Proposed development area since 1976. It is highly unlikely that this species will experience any habitat loss effects from the development.	Corn bunting have not been recorded within the Proposed development area since 1976. It is highly unlikely that this species will experience any disturbance/displacement effects from the development.
Cuckoo	<u>Desktop</u> Avonmouth Pools, Congresbury, Cheddar Valley Railway Walk LNR, Chittening Warth, Hallen Marsh, Kenn Moor, Lamplighters West, Lawrence Weston Moor, Nailsea Moor, Puxton Moor, Yatton <u>Survey</u> Area B, Area H.	May experience small amounts of habitat loss if host species habitat is lost in areas where cuckoo recorded. This could be in the form of dense wetland vegetation suitable for reed bunting, or scrub suitable for nesting dunnock.	Unlikely to experience any significant disturbance effects.
Dartford warbler	Dartford warbler have been recorded at Crook Peak in recent years (outside of the Proposed	No Dartford warbler have been recorded within the Proposed Development area, and due to the lack of suitable habitat it is highly unlikely that this species is present.	This is a Schedule 1 species and is therefore protected against disturbance whilst nesting. However no Dartford warbler have been recorded within the Proposed Development area, and due to the lack of suitable habitat it is highly unlikely that this species is present. There is

	Development area).	There is therefore considered to be no potential habitat loss effects on this species.	therefore considered to be no potential disturbance effects on this species.
Dunnock	Throughout	There is potential for some loss of dunnock habitat through loss of scrub or hedges throughout the Proposed Development.	There is low potential for temporary dunnock disturbance if works are carried out within 5m of dunnock nest sites while active. Dunnock nest between March and September.
Fieldfare	Throughout	There is some potential for habitat loss for this wintering species through any loss of berry bearing shrubs, such as hawthorn.	It is highly unlikely that this species will experience any significant disturbance/displacement effects.
Grasshopper warbler	Desktop Avalon Marshes, Kingston Seymour, Portbury Wharf Nature Reserve, Portbury Sewage Farm, Puxton Moor, Hallen. Survey Area B (Mark Yeo) Area D (Puxton Moor)	If dense open vegetation is lost, particularly in wetland areas such as marshlands in areas where this species is known to occur, there is a potential for some habitat loss for this species.	If works are carried out within areas of dense open vegetation, particularly in wetland areas such as marshlands between April and September, there is a potential for some temporary disturbance of low numbers of this species.

Green woodpecker	Throughout	Potential for habitat loss if any trees or dead wood are lost through Proposed Deleopment.	There is potential for temporary disturbance/displacement of this species if works are carried out during April to July within 5m of trees containing cavities/woodpecker holes.
Grey Partridge	Desktop Drove Road Portbury, Puxton Moor. Survey Area B, E, F and G	If there is any loss of vegetated arable field margins within areas where grey partridge are known to occur there is potential for habitat loss for this species.	If works are carried out within 10m of arable field margins in the areas where grey partridge are known to occur between April and November it is possible that nesting grey partridge could be temporarily displaced.
Herring gull	Survey Area B (Wintering groups of this species recorded in a few scattered localies between the River Huntspill and Rooksbridge, with a peak count of 120 individuals) During the breeding	This species has not been recorded to breed within 250m of the proposed development. During the winter period, groups of this species were occasionally recorded in a few locations, however due to the abundance of habitat suitable for this species within the wider area it is considered highly unlikely that the Proposed Development will result in significant	This species has not been recorded to breed within 250m of the proposed development. During the winter period, groups of this species were occasionally recorded in a few locations, however due to the abundance of habitat suitable for this species within the wider area it is considered highly unlikely that the Proposed Development will result in significant disturbance or displacement of this species.

	season small numbers of this species were recorded throughout the survey area.	habitat loss for this species.	
House Martin	Throughout	As buildings are not proposed to be removed to facilitate development, it is highly unlikely that this species will suffer habitat loss.	It is highly unlikely that this species will suffer and disturbance/displacement as a result of the Proposed Development.
House sparrow	Throughout	If dense shrubs or hedgerows near to buildings are to be removed there is some potential for habitat loss for this species.	It is highly unlikely that this species will suffer significant disturbance effects as a result of the Proposed Developent.
Lesser black-backed gull	<u>Survey</u> During breeding season the majority of this species recorded were within Area D (total of 72 individuals recorded during visit 1) and Area F (total of 43 individuals recorded during first visit). The majority of these birds were contained	Lesser black-backed gull is one of the qualifying features of the Severn Estuary Ramsar. This species was not recorded to breed within 250m of the proposed development during breeding bird surveys undertaken. During the winter period, only small numbers of this species were recorded using land within 250m of the proposed development.	Lesser black-backed gull is one of the qualifying features of the Severn Estuary Ramsar. This species was not recorded to breed within 250m of the proposed development during breeding bird surveys undertaken. During the winter period, only small numbers of this species were recorded using land within 250m of the proposed development. There is abundant suitable farmland habitat within the wider area for feeding and loafing.

	in a few moderate sized groups. Only small numbers were recorded elsewhere. This species was not recorded to breed within 250m of the proposed development.	There is abundant suitable farmland habitat within the wider area for feeding and loafing. It is therefore considered highly unlikely that this species will suffer significant habitat loss as a result of the Proposed Development.	It is therefore considered highly unlikely that this species will suffer significant disturbance or displacement or habitat loss as a result of the Proposed Development.
Lesser redpoll	Historic records for wintering lesser Redpoll at Portbury Wharf	Lesser redpoll have been recording wintering at Portbury Wharf. There is a very low potential for habitat loss for this species if shrub removal is carried out at Portbury Wharf (if Option B selected).	There is a very low potential for temporary disturbance/displacement effects on this species if works are carried out at Portbury Wharf during the winter period (Option B).
Lesser spotted woodpecker	Prior's Wood, Nailsea	The Proposed Devleopment will not pass through Prior's Wood, however, small amounts of habitat loss could occur if trees containing rotting branches and dead wood are removed in the near viscinity of this area.	It is highly unlikely that this species will suffer any disturbance/displacement effects as a result of the Proposed Development.
Linnet	Throughout	There is some potential for habitat loss for this species through hedgerow loss and scrub loss.	It is possible that this species may suffer temporary displacement/disturbance effects if works are carried out within 5m of hedges/ scrub where this species is known to occur between April and September.
Marsh tit	<u>Desktop</u>	As no moist, broadleaf woodland will be removed to facilitate the	As woodland areas such as Banwell wood wilol not be directly affected by the Proposed Development it is highly

	Banwell, Bristol, North Somerset, Portbury, Priors Wood, Hallen, Tickenham, Wraxall. <u>Surveys</u> Single pair recorded at Banwell Wood (2012)	Proposed Development, this species will not suffer habitat loss.	unlikely that this species will suffer any disturbance/displacement effects.
Meadow pipit	<u>Desktop</u> Avonmouth Pools, Avonmouth Sewage Works, Congresbury Moor, Crook Peak, Kenn Moor, Kingston Seymour, Lamplighters Marsh, Lawrence Weston Moor, Nailsea Moor, Tickenham and Clevedon Moor, Portbury Wharf Nature Reserve, Puxton Moor, Yatton. <u>Surveys</u>	Meadow pipit winter within the area. It is highly unlikely that this species will suffer significant habitat loss as a result of the Proposed Development.	It is possible that small numbers of wintering meadow pipit could be temporarily displaced if works are carried out in areas of rough grassland during the winter period.

	Areas B, C and D		
Mistle thrush	Throughout.	Potential for habitat loss if trees or orchards lost to facilitate development.	Low potential for temporary disturbance/displacement if works carried out within 5m of trees between March and July.
Nightingale	Desktop Crook Peak, Lamplighters Marsh. Surveys Area H (south of Hinkley Point power station)	Potential for habitat loss if dense scrub to the south of existing Hinkley Point Power Station is removed.	Potential for temporary disturbance/displacement if works are carried out within 10m of scrub areas to south of Hinkley Point between April and July.
Pied Flycatcher	Desktop Yatton and Congresbury Moor	As no woodland areas are to be directly effected, it is highly unlikely that this species will suffer any habitat loss as a result of the Proposed Development.	It is highly unlikely that this species will suffer any disturbance/displacement effects as a result of the Proposed Development.
Red-backed shrike	Desktop Portbury Ashlands	This species is highly likely to only occasionally pass through on migration. It is therefore highly unlikely that this species will suffer any habitat loss as a result of the Proposed Develpoment.	It is highly unlikely that this species will suffer any disturbance/displacement effects as a result of the Proposed Development.
Redstart	Desktop	Potential for small amounts of habitat loss through loss of trees, orchards	Potential for temporary disturbance/displacement if works are carried out within 5m of trees, orchards and

	Avonmouth, Chittening Warth, Portbury Ashlands, Portbury Wharf Nature Reserve, Puxton Moor, Hallen <u>Survey</u> Area B (south of Mark) Area G (adjacent to River Avon)	and hedgerows in areas where known to occur.	hedgerows in areas where known to occur.
Redwing	Throughout	There is some potential for habitat loss for this wintering species through any loss of berry bearing shrubs, such as hawthorn.	It is highly unlikely that this species will experience any significant disturbance/displacement effects.
Reed Bunting	Throughout	There is potential for habitat loss if there is any removal of dense wetland vegetation, particularly along watercourses.	Potential for temporary disturbance/displacement if works are carried out within 5m of vegetated watercourses.
Sand martin	<u>Desktop</u> Avonmouth Pools, Chittening Warth, Portbury Wharf	It is highly unlikely that this species will suffer any habitat loss as a result of the Proposed Development.	It is highly unlikely that this species will suffer any disturbance/displacement effects as a result of the Proposed Development.

	Nature Reserve, Shirehampton, Hallen		
Skylark	Throughout.	It is highly unlikely that this species will suffer any habitat loss as a result of the Proposed Development.	Potential for temporary disturbance/displacement if works are carried out within large open grassland or arable fields within areas where skylark are known to occur between April and September.
Song thrush	Throughout.	Potential for small amounts of habitat loss through loss of trees, shrubs and hedgerows.	Potential for temporary disturbance/displacement if works are carried out within 5m of any tree, shrub or hedgerow between March and September.
Spotted flycatcher	<u>Desktop</u> <u>Survey</u> Area B (Woolavington Level and Huntspill Moor) Area D (Kingston Seymour)	Potential for small amounts of habitat loss through loss of trees, shrubs, hedgerows and orchards.	Potential for temporary disturbance/displacement if works are carried out within 5m of trees, hedgerows or orchards between May and August.
Starling	Throughout	If any mature trees are lost to facilitate development there it is possible that this will result in habitat loss for this species.	Potential for temporary disturbance/displacement if works are carried out within 5m of mature trees.
Stock dove	<u>Desktop</u> Avonmouth, Nailsea,	If any trees are lost to facilitate development there it is possible that this will result in small amounts of	Low potential for temporary disturbance/displacement if works are carried out within 5m of trees between March

	Kenn Moor, Kingston Seymour, Lawrence Weston Moor, Tickenham & Clevedon Moor, Priors Wood, Puxton Moor, Portbury Dock, Hallen. <u>Survey</u> Area B, D, G and H.	habitat loss for this species.	and October.
Stonechat	<u>Desktop</u> Avonmouth Pools, Chittening Warth, Congresbury Moor, Caswell Farm, Crook Peak, Kenn Moor, Lawrence Weston Moor, Kingston Seymour, Nailsea Moor, Tickenham & Clevedon Moor, Portbury Wharf Nature Reserve, Portbury Saltmarsh, Puxton Moor, Hallen, Yatton	If any rough grassland with scattered shrubs are lost, particularly within the Portbury and Avonmouth area, this could result in some habitat loss for this species.	It is unlikely that this species breeds within the Proposed Development area and unlikely that this species will suffer any displacement/ disturbance effects.

	<u>Surveys</u> Area G (Avonmouth area)		
Swallow	Throughout	As buildings are not proposed to be removed to facilitate development, it is highly unlikely that this species will suffer habitat loss.	It is highly unlikely that this species will suffer and disturbance/displacement as a result of the Proposed Development.
Swift	Throughout	As buildings are not proposed to be removed to facilitate development, it is highly unlikely that this species will suffer habitat loss.	It is highly unlikely that this species will suffer and disturbance/displacement as a result of the Proposed Development.
Tree Pipit	<u>Desktop</u> Lawrence Weston, Nailsea, Tickenham & Clevedon Moor, Puxton Moor, Hallen	There is some low potential for small amounts of habitat loss for this species on passage if trees or orchards are lost within the areas where known to occasionally occur.	It is highly unlikely that this species will suffer any disturbance/displacement effects as a result of the Proposed Development.
Tree sparrow	<u>Desktop</u> Avonmouth Pools, Lawrence Weston, Nailsea, Tickenham & Clevedon Moor, Puxton Moor.	If any mature trees within hedgerows are lost to facilitate development there is potential for some habitat loss for this species.	There is low potential for temporary disturbance/displacement to this species if works are carried out within 5m of mature trees within hedgerows in areas where this species is known to occur during April to August.

Turtle Dove	Desktop Hallen	There is only one historic record for turtle dove at Hallen from 1976. It is highly unlikely that this species will suffer any habitat loss as a result of the Proposed Development.	It is highly unlikely that this species will suffer any disturbance/displacement effects as a result of the Proposed Development.
Twite	Desktop Portbury Wharf Nature Reserve	Twite have only once been recorded at Portbury Wharf Nature Reserve. It is highly unlikely that this species will suffer any habitat loss as a result of the Proposed Development.	It is highly unlikely that this species will suffer any disturbance/displacement effects as a result of the Proposed Development.
Water pipit	Desktop Avonmouth Pools, Chittening Warth, Portbury Wharf Nature Reserve, Portbury Saltmarsh	No water pipit were recorded within the Proposed Development area, and due to the lack of suitable habitat it is highly unlikely that this species is present. There is therefore considered to be no potential disturbance effects on this species.	No water pipit were recorded within the Proposed Development area, and due to the lack of suitable habitat it is highly unlikely that this species is present. There is therefore considered to be no potential disturbance effects on this species.
Wheatear	Desktop Avonmouth, Avonmouth Pools, Chittening Warth, Congresbury Moor, Kenn Moor, Lawrence Weston, Nailsea Moor, Tickenham & Clevedon Moor, Portbury Wharf	It is unlikely that wheatear nest within the Proposed Development area. It is highly unlikely that there will be any significant wheatear habitat loss.	As wheatear are only likely to pass through the Development on migration, it is highly unlikely that significant disturbance effects will occur to this species.

	Nature Reserve, Portishead Ashlands, Puxton Moor, Hallen, Stup Pill <u>Survey</u> Area D		
Whinchat	<u>Desktop</u> Avonmouth, Avonmouth Pools, Chittening Warth, Crook Peak, Lawrence Weston Moor, Nailsea Moor, Congresbury Moor, Portbury Ashlands, Portbury Wharf Nature Reserve, Puxton Moor, Hallen.	This species may occasionally visit the Proposed Development area on passage. It is highly unlikely that this species will suffer any habitat loss as a result of the Proposed Development.	It is highly unlikely that this species will suffer any disturbance/displacement effects as a result of the Proposed Development.
Whitethroat	Throughout	Potential for habitat loss if dense low scrub or hedges are removed through development.	There is potential for temporary disturbance of small numbers of whitethroat if works carried out within 5m of dense low scrub or hedges during April to August inclusive.
Willow warbler	Throughout	Potential for small amounts of willow warbler habitat loss if areas of scrub or tall hedges are lost in areas where	Potential for temporary disturbance of small numbers of willow warbler pairs if works carried out within 5m of areas of scrub or tall hedges during April to August inclusive.

		willow warbler are known to occur.	
Wood warbler	<u>Desktop</u> Chittening Warth, Priors Wood, Clapton in Gordano	No water pipit were recorded within the Proposed Development area, and due to the lack of suitable habitat it is highly unlikely that this species is present. There is therefore considered to be no potential disturbance effects on this species.	No wood warbler were recorded within the Proposed Development area, and due to the lack of suitable habitat it is highly unlikely that this species is present. There is therefore considered to be no potential disturbance effects on this species.
Yellow wagtail	<u>Desktop</u> Avonmouth, Avonmouth Pools, Lawrence Weston Moor, Chittening Warth, Tickenham & Clevedon Moor, Portbury Wharf Nature Reserve, Portishead Ashlands, Hallen. <u>Survey</u> Area B (south of the Huntspill River)	Potential small temporary habitat losses of feeding and nesting habitat if areas of lowland pastures near watercourses are lost in areas where yellow wagtail are known to occur.	Potential for temporary disturbance to very low numbers of yellow wagtail if works carried out within fields where they are known to occur during the breeding season (April to August inclusive).
Yellowhammer	<u>Desktop</u> Clapton in Gordano, Lawrence Weston,	Potential for small losses of habitat if hedgerows, trees or scrub lost through development in areas where	Potential for small numbers of yellowhammer to be temporarily disturbed if works carried out within 5m of hedgerows, trees or scrub lost through development in areas where yellowhammer are known to occur between

	Nailsea Moor, Tickenham & Clevedon Moor, North Somerset, Portbury, Priors Wood, Hallen. <u>Survey</u> Throughout.	yellowhammer are known to occur.	April and September inclusive.

5.0 In-Combination Effects

5.1 Introduction

5.1.1 The Habitats Regulations require the competent authority to take account of other projects that may cause an effect on SPA integrity in-combination with the project under consideration. English Nature (now Natural England) guidance (EN, 1997) states that the Habitats Regulations limits the scope of the in-combination test to "other plans or projects", *i.e.* approved but uncompleted plans or projects; permitted on-going activities such as discharge consent/abstraction licences; and plans and projects which have been submitted but not yet determined. The guidance notes that it may be appropriate to consider plans and projects which have not been submitted, but for which sufficient detail exists on which to make a judgement on their impact on the European site.

5.1.2 Plans and projects were identified where an overlap in effects on the same European site receptors occurred both spatially and temporally. These effects on the receptors are then assessed when combined with any effects from the Hinkley Point C Connection project. This aspect of the HRA however relies on gaining sufficient information regarding these additional plans and projects. Where sufficient information is not currently available for a particular project and the potential impacts cannot be readily identified, these projects may be ruled out of the assessment.

5.2 Projects Considered

5.2.1 A large range of projects and plans were therefore considered within this chapter in the first instance to consider the possibility of an interaction between them and the Hinkley Connection C project regarding effects on the assessed European sites. These plans/projects were identified within the search area defined in section 2.10. These projects and plans were then condensed down to those that may potentially affect birds associated with either the Somerset Levels and Moors SPA/Ramsar or the Severn Estuary SPA/Ramsar.

5.2.2 A planning search has been undertaken to identify any major development (as defined by The Town and Country Planning (Development Management Procedure) (England) Order 2010) within a 10km radius that have either been consented or are pending determination.

5.2.3 The search also picked up a number of minor applications (i.e. minor in nature or scale) that occurred within 1km of the Proposed Development.

5.2.4 A search was also undertaken to identify all proposed Nationally Significant Infrastructure Projects in the South West area via the National Infrastructure Planning Website which are relevant to the proposed development.

5.2.5 A scoping exercise was undertaken whereby those development that had been identified as requiring consideration were either scoped ‘in’ or ‘out’ of the detailed CIA. Development considered to be below the threshold for potential cumulative interaction include those >500m from the Proposed Development and less that 100 residential dwellings or within 500m of the Proposed Development but less than 10 residential dwellings. An element of professional judgement is used when applying this criterion e.g. a major single building development (e.g. hospital, school, industrial /commercial development) is likely to have potential for cumulative impacts). Major developments within a 10km boundary e.g. major housing project (above 100 units) would be included in the master list [review against October/November 2013 approach and consultee responses].

5.2.6 Natural England advised on recently-completed projects which they felt merited consideration.

5.2.7 Because the potential zone of influence is dependent on the receptor being considered a further level of scoping was undertaken. For SPA/Ramsar bird species, projects and plans considered at this stage included all of the following within a 10km radius of the Somerset Levels and Moors SPA/Ramsar and the Severn Estuary SPA/Ramsar:

- All major infrastructure projects;
- All energy related projects, including wind farms, single wind turbines, overhead line installation or modification works, solar parks and power stations;
- Any works affecting coastal flood defences;
- Any proposed large aerial structures;
- Any large habitat creation/modification works;
- Large housing developments (>100 properties).
- Any plans/projects within SPAs.

5.2.8 Plans and projects considered at this stage are summarised below in Table 5.1. This includes a brief assessment of any potential effects resulting from the plans/projects on birds. Additional plans considered relating to the Avonmouth/Severnside area are shown in Table 5.2. Source information used to inform these Avonmouth/Severnside plans is shown in Table 5.3. The locations of the projects are shown in Figure 17.1.1.

Table 5.1. Plans and projects initially considered for in-combination assessment.

ID	Summary of Project Detail	Potential Effects
7	**Uprating of Bridgewater to Hinkley 275kV OHL to 400kV.**	Description of Potential Effect(s) Temporary bird habitat losses including hedgerows, grassland and ditches.
		Potential interaction with Hinkley Point C Connection Project No effects on species associated with Somerset Levels and Moors or Severn Estuary SPA/Ramsar identified.
8	**Somerset Primary Care Trust** Erection of a hospital with associated access, car parking, landscaping and engineering works	Description of Potential Effect(s) Permanent loss of habitats within agricultural landscape including hedgerows, grassland, arable farmland, ditches. Potential loss of habitat for ground nesting birds.
		Potential interaction with Hinkley Point C Connection Project No effects on species associated with Somerset Levels and Moors or Severn Estuary SPA/Ramsar identified. This project is scoped out of the assessment at this stage.
10	**North East Bridgwater Development** Housing development with associated community developments including schools, employment developments.	Description of Potential Effect(s) Permanent loss of habitats within agricultural landscape including hedgerows, grassland, arable farmland, ditches. Potential loss of habitat for ground nesting birds.
		Potential interaction with Hinkley Point C Connection Project No effects on species associated with Somerset Levels and Moors or Severn Estuary SPA/Ramsar identified. This project is scoped out of the assessment at this stage.

ID	Summary of Project Detail	Potential Effects
12	**Temple Farm, Chedzoy. Bridgewater** Resubmitted Construction of 2 wind turbines	<u>Description of Potential Effect(s)</u> Potential increase in assessed bird collision risk from introduction of wind turbines.
		<u>Potential interaction with Hinkley Point C Connection Project</u> As insufficient information available for the project it is scoped out at this stage
14	**Junction 23 M5** Park and Ride Facility for 1300 vehicles, freight Management Facility including, site access and highways improvements at Dunballs Roundabout (A38), landscape and ecological mitigation	<u>Description of Potential Effect(s)</u> No potential effects identified.
		<u>Potential interaction with Hinkley Point C Connection Project</u> No effects on species associated with Somerset Levels and Moors or Severn Estuary SPA/Ramsar identified. This project is scoped out of the assessment at this stage.
15-17	**Land at Former Ordnance Factory – Access, Storage and site remediation. (Huntspill Energy Park)** Development of Energy Park on former industrial site.	<u>Description of Potential Effect(s)</u> Borrow Pit, Puriton SNCI falls entirely within the identified planning applications. There is therefore the potential for the total loss of the SNCI. This includes loss of breeding and wintering bird habitat. Habitat Losses including hedgerows, scrub, marsh, semi improved grassland, ditches, trees. Potential for loss of foraging habitat for wintering birds and bird displacement. Lapwing have been recorded in surrounding area, however they were not recorded during the wintering bird survey. Suitability of the habitat within the site and surrounding area was classed as low for lapwing.

ID	Summary of Project Detail	Potential Effects
		Potential interaction with Hinkley Point C Connection Project As lapwing were not recorded using the site, and the value of the site was classed as low for lapwing, it is highly unlikely that there would be any interaction between this project and the Hinkley Connection project. This project is therefore scoped out at this stage.
18	**Hillside Farm, Woolavington Road, Puriton** Change of use from agriculture to haulage.	Description of Potential Effect(s) No potential effects identified.
		Potential interaction with Hinkley Point C Connection Project No effects on species associated with Somerset Levels and Moors or Severn Estuary SPA/Ramsar identified. This project is scoped out of the assessment at this stage.
19	**Land at Crockers Hill, Woolavington** Housing development	Description of Potential Effect(s) Permanent habitat Losses including hedgerows, and agricultural grassland.
		Potential interaction with Hinkley Point C Connection Project No effects on species associated with Somerset Levels and Moors or Severn Estuary SPA/Ramsar identified. This project is scoped out of the assessment at this stage.
20	**Land to west of 17 Higher Road, Woolavington**	Description of Potential Effect(s) Permanent Habitat Losses including hedgerows, and agricultural grassland.

ID	Summary of Project Detail	Potential Effects
	Housing development	Potential interaction with Hinkley Point C Connection Project No effects on species associated with Somerset Levels and Moors or Severn Estuary SPA/Ramsar identified. This project is scoped out of the assessment at this stage.
21	**Photovoltaic solar park, Bridgwater** Installation of Photovoltaic solar park and associated equipment	Description of Potential Effect(s) Potential for loss of foraging habitat for wintering birds and bird displacement, however no ecology survey data could be obtained for project
		Insufficient information available for the project so it is scoped out at this stage.
22	**Land at Withy Farm, East Huntspill.** Erection of five wind turbines.	Description of Potential Effect(s) *Displacement* - suggestions that wind farm may lead to disruption of links between feeding, roosting and breeding areas of Somerset Levels and Moors SPA/Ramsar and the Severn Estuary SPA/Ramsar bird species. This effect may be increased by the proposed presence of the nearby Black Ditch wind farm. It is concluded that the location of the wind farm would be unlikely to disrupt bird movements. Potential for bird collision mortality to occur from installation of wind farm. *Collision risk* - a collision mortality rate of 0.04 teal and 0.1 lapwing per year was predicted to result from this proposed windfarm.

ID	Summary of Project Detail	Potential Effects
		Potential interaction with Hinkley Point C Connection Project Vantage point surveys recorded lapwing and teal, however only low numbers were recorded, and only low levels of collision risk mortality were predicted. Due to uncertainties due to the findings of a radar study which indicated significant movements of small duck species between the Somerset Levels and the Severn Estuary, post construction monitoring will take place. If permission is granted, post construction monitoring will take place, and if significant numbers are found to collide with the wind farm turbines in combination with Black Ditch wind farm, the operation of the site may be reduced. This project will be considered further for in-combination effects.
24	**Poplar Farm, Puriton Road, West Huntspill. (Black Ditch Wind Farm)** Erection of four wind turbines.	Description of Potential Effect(s) *Displacement* - suggestions that wind farm may lead to disruption of links between feeding, roosting and breeding areas of Somerset Levels and Moors SPA/Ramsar and the Severn Estuary SPA/Ramsar bird species. This effect may be increased by the proposed presence of the nearby Withy End wind farm. It is concluded that the location of the wind farm would be unlikely to disrupt bird movements. Potential for bird collision mortality to occur from installation of wind farm. *Collision risk* - a collision mortality rate of 0.32 teal and 0.08 lapwing per year was predicted to result from this proposed windfarm

ID	Summary of Project Detail	Potential Effects
		Potential interaction with Hinkley Point C Connection Project Vantage point surveys recorded lapwing and teal, however only low numbers were recorded, and only low levels of collision risk mortality were predicted. Due to uncertainties due to the findings of a radar study which indicated significant movements of small duck species between the Somerset Levels and the Severn Estuary, post construction monitoring will take place. If significant numbers are found to collide with the wind farm turbines in combination with Withy End wind farm, the operation of the site may be reduced. This project will be considered further for in-combination effects.
25	**Bristol Road, Rooksbridge, Axbridge (Pilrow Wind Farm)** Erection of four wind turbines.	Description of Potential Effect(s) There is the potential for an increase in collision risk for species of birds through construction of wind turbines.
		Potential interaction with Hinkley Point C Connection Project Vantage point surveys recorded lapwing flying through the study area. However collision risk modelling carried out for the project predicted only negligible lapwing collision rates. Only negligible displacement effects were also predicted. This project will be considered further for in-combination effects.

ID	Summary of Project Detail	Potential Effects
26	**Bristol Water, Cheddar reservoir** Construction of reservoir including erection of two water pumping stations, ecological and infrastructure works, car parking and access, demolition of two residential properties and associated temporary construction works footbridge and works to River Cheddar Yeo.	<u>Description of Potential Effect(s)</u> No collision risk, disturbance, displacement or habitat loss effects on SPA/Ramsar species identified. The HRA for this project recorded very little usage of the site by species associated with the Somerset Levels and Moors SPA/Ramsar were identified during winter bird surveys, with peak counts of only 18 teal and 70 lapwing using the proposed development area, with these species only recorded on two occasions during the winter bird survey. The HRA also considered that these birds were unlikely to be associated with the Somerset Levels SPA/Ramsar due to the distance from these protected sites. The only species for which the Severn Estuary SPA/Ramsar is designated, recorded within the site included a single dunlin and five gadwall. The HRA stated that these species were unlikely to be associated with these protected sites due to the distance from them. However even if they were, it was not predicted that these birds recorded would be significantly disturbed or displaced by the proposed works. Possible habitat creation for duck species associated with Somerset Levels and Moors SPA/Ramsar, including teal, wigeon, pochard, gadwall, tufted duck and mallard.
		<u>Potential interaction with Hinkley Point C Connection Project</u> It is possible that the reservoir will result in an increase in habitat available for duck species associated with the Somerset Levels and Moors SPA/Ramsar. It is possible that this could lead to an increase in numbers of these birds using the reservoir, however even if this was the case it is unlikely that this would result in an increase in numbers of birds crossing the proposed overhead line as the movement would be north/south between the reservoir and the levels in the same way that current movements are likely to occur. It is therefore unlikely that there will be any interaction between this project and the Hinkley Point C Connection project.
28	**Mytle Farm, Station Road, Sandford** Construction of new packing facility.	<u>Description of Potential Effect(s)</u> Loss of Orchard Habitats.

ID	Summary of Project Detail	Potential Effects
		Potential interaction with Hinkley Point C Connection Project No effects on species associated with Somerset Levels and Moors or Severn Estuary SPA/Ramsar identified. This project is scoped out of the assessment at this stage.
34	**Bridgewater to Churchill OHL** Reconductering of existing overhead lines.	Description of Potential Effect(s) Temporary habitat losses including hedgerows, grassland ditches.
		Potential interaction with Hinkley Point C Connection Project No effects on species associated with Somerset Levels and Moors or Severn Estuary SPA/Ramsar identified. This project is scoped out of the assessment at this stage.
41	**Bristol Airport Development** Development to allow increase in passenger capacity at Bristol Airport. Includes extensive development and inclusion of 12 wind turbines.	Description of Potential Effect(s) The site lies 10.7km from the Severn Estuary SPA/Ramsar at its closest point. There is the potential for an increase in collision risk for species of birds through construction of wind turbines. Up to 40 golden plover were regularly recorded on the airfield. However all birds that pose potential collision risk with airplanes are actively discouraged from the area. Birdstrike has not been a problem to date. It is highly unlikely that the proposed development will increase collsion risk.
		Potential interaction with Hinkley Point C Connection Project No effects on species associated with Somerset Levels and Moors or Severn Estuary SPA/Ramsar identified. This project is scoped out of the assessment at this stage.

ID	Summary of Project Detail	Potential Effects
42	**Land off Dolemoor Lane to west of Shepstone Farm, Congresbury.** Construction of solar energy park.	<u>Description of Potential Effect(s)</u> Proposals will directly impact the Rhynes south of Dolemoor Lane SNCI through temporary/permanent habitat loss imcluding semi-improved grassland, species poor hedge and ditches. Disturbance of breeding birds during construction work.
		<u>Potential interaction with Hinkley Point C Connection Project</u> No effects on species associated with Somerset Levels and Moors or Severn Estuary SPA/Ramsar identified. This project is scoped out of the assessment at this stage.
43	**Land off Puxton Lane, Hewish** Construction of solar energy park.	<u>Description of Potential Effect(s)</u> Potential habitat loss including hedges, ditches, open grassland and agricultural land.
		<u>Potential interaction with Hinkley Point C Connection Project</u> No effects on species associated with Somerset Levels and Moors or Severn Estuary SPA/Ramsar identified. This project is scoped out of the assessment at this stage.
44	**Land Off Wemberham Lane, Yatton.** Construction of new industrial building with associated hardstanding and single wind turbine.	<u>Description of Potential Effect(s)</u> Potential impacts to the banks of Wemberton Lane Rhyne, part of the Congresbury Yeo, Adjacent Land and Rhynes SNCI, resulting in habitat loss and fragmentation. There is the potential for an increase in collision risk for species of birds through construction of a wind turbine.

ID	Summary of Project Detail	Potential Effects
		Potential interaction with Hinkley Point C Connection Project No effects on species associated with Somerset Levels and Moors or Severn Estuary SPA/Ramsar identified. This project is scoped out of the assessment at this stage.
45	**Land Off Wemberham Lane, Yatton.** Extension to existing warehouse and offices (complete) and erection of one wind turbine (to be completed)	Description of Potential Effect(s) The majority of the development is complete and therefore forms part of the baseline conditions, however the construction of a wind turbine is still outstanding and therefore has potential to introduce bird collision risk.
		Potential interaction with Hinkley Point C Connection Project No effects on species associated with Somerset Levels and Moors or Severn Estuary SPA/Ramsar identified. This project is scoped out of the assessment at this stage.
47	**Nailsea Emerging Sites and Policies Development Plan** Mixed use development (Local Plan)	Description of Potential Effect(s) Potential displacement and disturbance of species of waders and wildfowl using the Tickenham, Nailsea and Kenn Moors SSSI and Nailsea and Tickenham Moors SNCI Permanent loss of habitats including trees, hedgerows and ditches.
		Potential interaction with Hinkley Point C Connection Project No effects on species associated with Somerset Levels and Moors or Severn Estuary SPA/Ramsar identified. This project is scoped out of the assessment at this stage.

ID	Summary of Project Detail	Potential Effects
48	**Land at Clapton Farm, Clapton in Gordano** Construction of solar energy park SCREENING APPLICATION	<u>Description of Potential Effect(s)</u> Potential for displacement of nesting lapwing from Gordano Valley, Clapton Moor, Middle Bridge and Rhynes SNCI. <u>Potential interaction with Hinkley Point C Connection Project</u> No effects on species associated with Somerset Levels and Moors or Severn Estuary SPA/Ramsar identified. This project is scoped out of the assessment at this stage.
51	**EON Energy** Construction of a Biomass-fired renewable energy plant to include boiler house, steam turbine, electrical generator, 2 cooling towers, fuel silos and ancillary plant.	<u>Description of Potential Effect(s)</u> Possible disturbance of birds using Severn Estuary Ramsar, SAC, SPA, SSSI habitats. <u>Potential interaction with Hinkley Point C Connection Project</u> Any habitat loss, disturbance or displacement effects that could impact Severn Estuary SPA/Ramsar bird species will be considered further as part of the combined projects in the Avonmouth/Severnside area.
54	**Portbury Bulk Terminal, Portbury Dock, Easton in Gordano** Construction of 16 silos together with associated conveyors and rail loading facility in previously developed land.	<u>Description of Potential Effect(s)</u> Possible disturbance of birds using Severn Estuary Ramsar, SAC, SPA, SSSI habitats. <u>Potential interaction with Hinkley Point C Connection Project</u> No effects on species associated with Somerset Levels and Moors or Severn Estuary SPA/Ramsar identified. This project is scoped out of the assessment at this stage.

ID	Summary of Project Detail	Potential Effects
55	**Avonmouth Docks** Construction of three wind turbines.	<u>Description of Potential Effect(s)</u> The construction of three wind turbines is predicted to introduce collision risk along the north bank of the Swash Channel adjacent to the Severn Estuary SAC, SPA, Ramsar and SSSI. There is also potential for disturbance of overwintering birds within the Severn Estuary designated sites, both during construction and during operation.
		<u>Potential interaction with Hinkley Point C Connection Project</u> No predicted collision or disturbance effects on wigeon, teal or lapwing. This project will be considered further as part of the combined projects in the Avonmouth/Severnside area
56	**Former Railway Sidings Off Gloucester Road, Avonmouth Bristol.** Change of use of railway sidings to port related storage and green corridor.	<u>Description of Potential Effect(s)</u> Loss of habitats including woodland, scattered trees, dense scrub, and species rich modified neutral grassland within the Gloucester road railway sidings SNCI. Disturbance of nesting birds during construction. Loss of bird foraging habitats.
		<u>Potential interaction with Hinkley Point C Connection Project</u> Any habitat loss, disturbance or displacement effects that could impact Severn Estuary SPA/Ramsar bird species will be considered further as part of the combined projects in the Avonmouth/Severnside area.

ID	Summary of Project Detail	Potential Effects
58	**Avonmouth Docks (Bristol Deep Sea Container)** Construction of a deep sea container terminal to accommodate the existing large container ships and future Ultra Large Container Ships.	<u>Description of Potential Effect(s)</u> Loss of intertidal habitats within the Severn Estuary Ramsar, SAC, SPA, SSSI. Loss of foraging and roost sites for species of wader including qualifying species. Loss of foraging habitat for SPA species of birds due to deposition of fine sediments within habitats adjacent to the development. The project will disturb small numbers of birds associated with the Severn Estuary SPA at Avonmouth. These birds include small numbers of teal and shelduck. The works had the potential to disturb up to 1% of the SPA redshank population.
		<u>Potential interaction with Hinkley Point C Connection Project</u> Although there is the potential for some very limited disturbance to Severn Estuary wader and wildfowl species, compensation works for these effects are already being put in place (Compensation habitat creation at Steart). As there will therefore be no overall effect, this project has been scoped out at this stage.
59	**Avonmouth Docks, St Andrews Road, Avonmouth, Bristol.** Construction of Avonmouth Biomass Generation Plant.	<u>Description of Potential Effect(s)</u> Potential impacts on adjacent St Andrews Road Rhine SNCI
		<u>Potential interaction with Hinkley Point C Connection Project</u> Any habitat loss, disturbance or displacement effects that could impact Severn Estuary SPA/Ramsar bird species will be considered further as part of the combined projects in the Avonmouth/Severnside area.
60	**New Earth Solutions** (Former Britannia Zinc) Kings Weston Lane Lawrence Weston Bristol BS11 8HT Development of a Low Carbon Energy	<u>Description of Potential Effect(s)</u> Potential loss of bird habitat.

ID	Summary of Project Detail	Potential Effects
	Facility in connection with the adjoining Mechanical Biological Treatment Facility (currently under construction	Potential interaction with Hinkley Point C Connection Project Any habitat loss, disturbance or displacement effects that could impact Severn Estuary SPA/Ramsar bird species will be considered further as part of the combined projects in the Avonmouth/Severnside area.
62	**Bericote Properties Ltd** Portside (Former Rhodia Works) St Andrews Road Avonmouth Bristol BS11 9YF Redevelopment of the former Rhodia chemical works to provide a chilled distribution unit (Use Class B8) and an ancillary service centre (Use Class B2) along with associated vehicle parking, service areas, gatehouse and landscaping (Major Application)	Description of Potential Effect(s) Potential loss of bird habitat. Potential interaction with Hinkley Point C Connection Project Any habitat loss, disturbance or displacement effects that could impact Severn Estuary SPA/Ramsar bird species will be considered further as part of the combined projects in the Avonmouth/Severnside area.
55	**Portside, St Andrews Road, Avonmouth** Redevelopment of industrial site to provide a chilled distribution site, ancillary service centre with vehicle parking service areas, gatehouse and landscaping.	Description of Potential Effect(s) No effects identified. Potential interaction with Hinkley Point C Connection Project Any habitat loss, disturbance or displacement effects that could impact Severn Estuary SPA/Ramsar bird species will be considered further as part of the combined projects in the Avonmouth/Severnside area.

ID	Summary of Project Detail	Potential Effects
63	**St. Modwen Developments Limited** Land To The North Of Avonmouth Way Avonmouth Bristol Construction of an access road, together with associated landscaping and engineering works (including lighting, fencing and drainage	<u>Description of Potential Effect(s)</u> Possible disturbance effects on Severn Estuary SPA/Ramsar species.
		<u>Potential interaction with Hinkley Point C Connection Project</u> Although no further details provided on potential disturbance effects on Severn Estuary SPA/Ramsar species, this project will be considered further as part of the combined projects in the Avonmouth/Severnside area.
64	**Bristol Sewage Treatment Works** Construction of 4 turbines	<u>Description of Potential Effect(s)</u> *Collision risk* - potential for collision mortality to occur from installation of wind farm. Predicted collision mortality rates (per annum) resulting from this project are: 2.3 -11.5 teal 5.9-29.4 lapwing 1.7-8.4 mallard 0.8-3.5 shoveler *Disturbance/displacement* - potential for disturbance/displacement during construction.

ID	Summary of Project Detail	Potential Effects
		Potential interaction with Hinkley Point C Connection Project Vantage point surveys recorded both lapwing and teal flying through the study area, and low levels of collision mortality were predicted for both species. The proposed site lies more than 35km from the Somerset Levels SPA at its closest point. The population of lapwing and teal in this location are therefore considered separate to the Somerset Levels and Moors SPA population. Collision mortality rates were predicted for a number of Severn Estuary SPA/Ramsar species including lapwing and teal. This project will be considered further for in-combination effects
65	**Genco** Bristol Water Waste Treatment Works Kings Weston Lane Lawrence Weston Bristol BS11 0YS Development of plant for the sustainable recycling food waste to include a food waste reception and area and preparation plant	Description of Potential Effect(s) Potential noise effects and habitat loss. Potential interaction with Hinkley Point C Connection Project Any habitat loss, disturbance or displacement effects that could impact Severn Estuary SPA/Ramsar bird species will be considered further as part of the combined projects in the Avonmouth/Severnside area.
66	**Plot M2, Merebank Estate, Kings Weston Lane.** Development of Bristol Resource Recovery Park on former industrial site.	Description of Potential Effect(s) Potential noise effects on nearby Avonmouth Pools Nature Reserve. However noise reduction measures will be implemented to avoid disturbance of birds using that site.

ID	Summary of Project Detail	Potential Effects
		Potential interaction with Hinkley Point C Connection Project No residual effects on species associated with Somerset Levels and Moors or Severn Estuary SPA/Ramsar identified. This project is scoped out of the assessment at this stage.
67	**Plot M2, Kings Weston Lane, Avonmouth.** Change of use from industrial building to development and operation of Avonmouth Resource Park.	Description of Potential Effect(s) None identified.
		Potential interaction with Hinkley Point C Connection Project Any habitat loss, disturbance or displacement effects that could impact Severn Estuary SPA/Ramsar bird species will be considered further as part of the combined projects in the Avonmouth/Severnside area.
70	**Chittening Road, Bristol** Change of use from vacant industrial land to recycling facility.	Description of Potential Effect(s) None identified.
		Potential interaction with Hinkley Point C Connection Project Any habitat loss, disturbance or displacement effects that could impact Severn Estuary SPA/Ramsar bird species will be considered further as part of the combined projects in the Avonmouth/Severnside area.
72	**Former Shell Tanker Site** Construction of 2 wind turbines. Includes a control & switch gear/metering building, cabling, access tracks, temporary	Description of Potential Effect(s) *Collision risk* - potential for collision mortality to occur from installation of wind farm. *Disturbance/displacement* - potential for displacement during construction.

ID	Summary of Project Detail	Potential Effects
	storage compound and access to A403. Minor off-site highway improvements	Potential interaction with Hinkley Point C Connection Project A total of two lapwing flight lines were recorded during one vantage point survey. Due to the very low levels of flight activity over the site, no effect on the Severn Estuary lapwing population was predicted. No teal were recorded. The proposed site lies more than 35km from the Somerset Levels SPA/Ramsar at its closest point. The population of lapwing in this location are therefore considered separate to the Somerset Levels and Moors SPA/Ramsar population. This project will be considered further as part of the combined projects in the Avonmouth/Severnside area.
73	**Savalco Ltd, Severn Road, Chittening** Redevelopment of part of existing industrial site as bio-fuel energy plant.	Description of Potential Effect(s) None identified.
		Potential interaction with Hinkley Point C Connection Project No effects on species associated with Somerset Levels and Moors or Severn Estuary SPA/Ramsar identified. This project is scoped out of the assessment at this stage.
74	**Former Savalco Site (North), Severn Road, Avonmouth** Construction and operation of a Resource Recovery Centre including a Material Recycling Centre.	Description of Potential Effect(s) Potential disturbance of birds during construction works.
		Potential interaction with Hinkley Point C Connection Project Although no effects were identified on SPA species within the planning application, any disturbance that could potentially be caused by this project to SPA species will be considered further in context of other projects/plans proposed for the Severnside/Avonmouth area.

ID	Summary of Project Detail	Potential Effects
76	**Land at Willow Farm, Severn Road, Severnside** Construction of anaerobic digestion facility on agricultural land.	Description of Potential Effect(s) Loss of habitats including grassland, hedgerows, ditches and trees.
		Potential interaction with Hinkley Point C Connection Project Any habitat loss, disturbance or displacement effects that could impact Severn Estuary SPA/Ramsar bird species will be considered further as part of the combined projects in the Avonmouth/Severnside area.
77	**Land at Severnside Works, Severn Road, Hallen** Change of landuse for the Construction of an Energy Recovery Centre	Description of Potential Effect(s). Potential disturbance of birds using the designated sites for winter roosting and foraging.
		Potential interaction with Hinkley Point C Connection Project No effects on species associated with Somerset Levels and Moors or Severn Estuary SPA/Ramsar identified. This project is scoped out of the assessment at this stage.
78	**Land Adjacent to Severnside Works, Severn Road, Severnside** Construction of a bottom ash recycling facility.	Description of Potential Effect(s) None identified.
		Potential interaction with Hinkley Point C Connection Project Any habitat loss, disturbance or displacement effects that could impact Severn Estuary SPA/Ramsar bird species will be considered further as part of the combined projects in the Avonmouth/Severnside area.

ID	Summary of Project Detail	Potential Effects
79	**Avon Power Station** Construction of a new gas powered power station on existing industrial land	Description of Potential Effect(s) Potential disturbance of birds using the Severn Estuary SAC, SPA, Ramsar, SSSI and SNCI for winter roosting and foraging.
		Potential interaction with Hinkley Point C Connection Project Any habitat loss, disturbance or displacement effects that could impact Severn Estuary SPA/Ramsar bird species will be considered further as part of the combined projects in the Avonmouth/Severnside area.
80	**Seabank 3 Combined Cycle Gas Turbine.** Construction of Gas Turbine power station (in connection with 70.)	Description of Potential Effect(s) Potential disturbance of birds using the Severn Estuary SAC, SPA, Ramsar, SSSI and SNCI for winter roosting and foraging.
		Potential interaction with Hinkley Point C Connection Project Any habitat loss, disturbance or displacement effects that could impact Severn Estuary SPA/Ramsar bird species will be considered further as part of the combined projects in the Avonmouth/Severnside area.
81	**Future Development of Chemical Works** (Dates back to 1957/1958)	Description of Potential Effect(s) Potential disturbance of birds using the Severn Estuary SAC, SPA, Ramsar, SSSI and SNCI for winter roosting and foraging.
		Potential interaction with Hinkley Point C Connection Project This project will be considered further as part of the combined projects in the Avonmouth/Severnside area.
82	**Arcus Renewable Energy.**	Description of Potential Effect(s) An increase in cumulative bird collision risk through construction of wind turbines and new OHL sections of Hinkley Connection Development

ID	Summary of Project Detail	Potential Effects
	Erection of a single turbine.	Potential interaction with Hinkley Point C Connection Project The proposed turbine fall below set thresholds and is not within a sensitive area. An EIA was not required for the development. No effects on species associated with Somerset Levels and Moors or Severn Estuary SPA/Ramsar identified. This project is scoped out of the assessment at this stage.
85	**Land to South of Ingst Olveston.** Windfarm consisting of 3 turbines.	Description of Potential Effect(s) An increase in cumulative bird collision risk through construction of wind turbines and new OHL sections of Hinkley Connection Development.
		Potential interaction with Hinkley Point C Connection Project As insufficient information is available to make an assessment this project is scoped out at this stage.
86	**Oldbury Nuclear Power Station** Decommissioning of Oldbury Nuclear Power Station	Description of Potential Effect(s) Loss of intertidal habitats within the Severn Estuary Ramsar, SAC, SPA, SSSI. Loss of foraging and roost sites for species of wader including qualifying species. The scoping report for the power station concludes that an Appropriate Assessment may be necessary, however no such document has yet been produced.
		Potential interaction with Hinkley Point C Connection Project As insufficient information is available to assess the effects of the Oldbury Nuclear Power Station, the project is scoped out of the assessment at this stage.

ID	Summary of Project Detail	Potential Effects
87	**Oldbury Nuclear Power Station** Construction of new Oldbury Nuclear Power Station.	<u>Description of Potential Effect(s)</u> Loss of intertidal habitats within the Severn Estuary Ramsar, SAC, SPA, SSSI. Loss of foraging and roost sites for species of wader including qualifying species. Loss of foraging habitat for SPA species of birds due to deposition of fine sediments within habitats adjacent to the development. The scoping report for the power station concludes that an Appropriate Assessment may be necessary, however no such document has yet been produced.
		<u>Potential interaction with Hinkley Point C Connection Project</u> No effects on species associated with Somerset Levels and Moors or Severn Estuary SPA/Ramsar identified. This project is scoped out of the assessment at this stage.
89.	**Land North of Castle Hill Quarry, Chads Hill, Cannington** Construction of new Wind Turbine.	<u>Description of Potential Effect(s)</u> Introduction of collision risk to birds including species that are qualifying features of the Bridgewater Bay SAC, SPA, Ramsar.
		<u>Potential interaction with Hinkley Point C Connection Project</u> As insufficient information is available to make an assessment this project is scoped out at this stage.
81.	**Cannington** Park and Ride	<u>Description of Potential Effect(s)</u> Disturbance of birds using the the adjacent designated sites including the Severn Estuary SAC, SPA, Ramsar Bridgewater Bay NNR

ID	Summary of Project Detail	Potential Effects
		Potential interaction with Hinkley Point C Connection Project Due to insufficient information regarding potential impacts of this site this project is scoped out of the assessment at this stage.
91.	**Land at Steart Peninsula, Steart Drove** Creation of wetland habitats	Description of Potential Effect(s) Creation of several hundred hectares of intertidal mudflat, saltmarsh and wetland habitat providing a large increase in habitat available for SPA waders and wildfowl. Some bird disturbance is likely to occur during construction works (assumed 250m disturbance zone around works) to species using adjacent intertidal area, however extensive areas of habitat are available for birds to relocate to during construction. The only birds that occur in significant numbers in this disturbance zone are mallard and wigeon. (Severn Estuary assemblage species.
		Potential interaction with Hinkley Point C Connection Project Increase in habitat suitability near to River Parrett is likely to increase overall numbers of SPA bird species using the Bridgwater Bay area of the Severn Estuary during the winter period. This has the potential to increase movement between the Somerset Levels and the Severn Estuary during the winter period. It is also possible however that the additional provision of resources at Steart could encourage birds to remain more sedentary in these areas as additional foraging would not be necessary. As this potential effect cannot be quantified, it is not considered further in the assessment at this stage. This project has therefore been scoped out at this stage.
92	**South Bank, Outer Severn Estuary, Steart Peninsula, Bridgewater Bay** Creation of wetland habitats Compensation habitat creation at Steart for the Bristol Deep Sea Container Terminal	Description of Potential Effect(s) Temporary disturbance of birds including species of qualifying features Severn Estuary SAC, SPA, Ramsar and Bridgewater Bay NNR and SSSI. Creation of wetland habitats capable of supporting species of birds including qualifying species of designated sites listed above.

ID	Summary of Project Detail	Potential Effects
		Potential interaction with Hinkley Point C Connection Project As the Bristol compensation scheme will create intertidal habitat it is unlikely to attract significantly greater numbers of lapwing and teal or other small duck species from the Somerset levels. It is therefore unlikely that these works will increase movements of lapwing or duck species between the Somerset Levels and the Severn Estuary
93.	**Hinkley Point A Nuclear Power Station** Decommissioning of Hinkley Point A Nuclear Power Station	Description of Potential Effect(s) Disturbance of birds including species of qualifying features Severn Estuary SAC, SPA, Ramsar and Bridgewater Bay NNR and SSSI.
		Potential interaction with Hinkley Point C Connection Project As no significant disturbance of waterbirds for the Hinkley Point C Connection Project are identified, this project is scoped out at this stage.
94.	**Hinkley Point B Nuclear Power Station** On-going operation and future decommissioning of Hinkley Point B Power Station.	Description of Potential Effect(s) Disturbance of birds including species of qualifying features Severn Estuary SAC, SPA, Ramsar and Bridgewater Bay NNR and SSSI.
		Potential interaction with Hinkley Point C Connection Project As no significant disturbance of waterbirds due to the Hinkley Point C Connection Project is identified, this project is scoped out at this stage.
95.	**Hinkley Point A** Construction of intermediate level radioactive waste materials. Creation of wetland habitats	Description of Potential Effect(s) Disturbance of birds including species of qualifying features Severn Estuary SAC, SPA, Ramsar and Bridgewater BayNNR and SSSI Severn Estuary

ID	Summary of Project Detail	Potential Effects
		Potential interaction with Hinkley Point C Connection Project As no significant disturbance of waterbirds due to the Hinkley Point C Connection Project is identified, this project is scoped out at this stage.
96.	**Hinkley Point C Nuclear Power Station** Construction of Hinkley Point C Nuclear Power Station.	Description of Potential Effect(s) Loss of intertidal habitats within the Severn Estuary Ramsar, SAC, SPA, and Bridgewater Bay NNR and SSSI. Loss of foraging and roost sites for species of wader including qualifying species. Loss of foraging habitat for SPA species of birds due to deposition of fine sediments within habitats adjacent to the development. Disturbance effects to Severn Estuary SPA waterbirds during construction works on the jetty and sea wall. Small scale habitat loss is expected. This loss and disturbance is not predicted to have an impact on the available foraging resource available for Severn Estuary SPA bird species. Effect of thermal discharges from Hinkley Point C could potentially affect bivalves in the estuary, potentially depleting food resources available for Severn Estuary SPA waterbirds. However, such a decrease is likely to be small and alternative prey is plentiful. The only Somerset Levels SPA designated waterbirds that use this area include teal, wigeon and pintail, none of which feed on the bivalve in question. No impact is therefore predicted on the Somerset Levels and Moors SPA. Large numbers of golden plover (Somerset Levels and Moors SPA designated species) were recorded at Combwich, however these birds were likely to be part of the larger group of golden plover that moves around the River Parrett estuary, and re not thought to be associated with one area. No significant disturbance effects were therefore predicted

ID	Summary of Project Detail	Potential Effects
		Potential interaction with Hinkley Point C Connection Project As there are no significant disturbance impacts predicted from the Hinkley Point C Connection project on bird species for which either the Somerset Levels and Moors SPA or the Severn Estuary SPA's are designated, it is predicted that there will be no interaction between the Hinkley Point C project and the Hinkley Point C Connection project. Appropriate mitigation measures have been incorporated into the scheme to minimise potential disturbance effects. As there will therefore be no overall effect, this project has been scoped out at this stage
97.	**Land at Hinkley Point A Substation** Replacement of two existing transformers with associated switch rooms and cabling.	Description of Potential Effect(s) Potential habitat loss for birds within Hinkley SNCI including hedgerows and shrubs.
		Potential interaction with Hinkley Point C Connection Project There are no predicted effects on the Severn Estuary SPA/Ramsar or Somerset Levels SPA/Ramsar. The project is therefore scoped out at this stage.
	Meterological Mast, Highbridge Erection of a 60m high meteorological wind monitoring mast.	Description of Potential Effect(s) Potential collision risk for SPA bird species, however no ecology survey data could be obtained for project.
		Potential interaction with Hinkley Point C Connection Project As insufficient information available for the project it is scoped out at this stage.
	Middlemoor Water Park Infilling of part of existing lake, construction of running track/cycle track, installation of mechanical water skiing device, formation	Description of Potential Effect(s) Potential loss of habitat for wintering wildfowl, however no ecology survey data could be obtained for project

ID	Summary of Project Detail	Potential Effects
	of earth bund and formation of two fishing ponds	<u>Potential interaction with Hinkley Point C Connection Project</u> As insufficient information available for the project it is scoped out at this stage.
98	**Surf Telecoms** Proposal to install a new fibre optic cable route between Bridgwater and Avonmouth substations to replace the fibre optic cable which is currently installed upon 132 kV F Route which is proposed to be dismantled.	<u>Description of Potential Effect(s)</u> Potential for disturbance to breeding birds. Much of the works are to be undertaken along roads, footpaths and verges. Any effects on wintering waders and wildfowl are therefore likely to be minimal due to existing displacement from these features.
		<u>Potential interaction with Hinkley Point C Connection Project</u> Any disturbance effects on wintering waders and wildfowl are likely to be minimal and no effects on SPA species are predicted. This project is therefore scoped out of the assessment at this stage.
99	**Western Power Distribution (WPD)** WPD crossing works as a result of the Proposed Development crossing a number of 33kV, 11kV and low voltage lines (operated by WPD) that will require temporary and permanent diversions or minor temporary works during the construction phase to ensure continuity of supply.	<u>Description of Potential Effect(s)</u> Possible disturbance of birds associated with the Severn Estuary SPA/Ramsar and Somerset Levels SPA/Ramsar.
		<u>Potential interaction with Hinkley Point C Connection Project</u> Undergrounding works will be taken to the field edge to minimise disturbance. Any potential effects on bird species associated with the Severn Estuary SPA/Ramsar and Somerset Levels SPA/Ramsar will be short term and will not increase above that already predicted for the Hinkley Point C Connection Project. The project is therefore scoped out at this stage.

Table 5.2. Plans/Policies identified for further consideration within in-combination assessment

Document	Policy	Details
Site Allocations and Development Management Policies (SADMP)	DM18	Gives details of the Avonmouth and Kingsweston Levels which will remain primarily undeveloped. States that 'Development proposals consistent with the area's undeveloped status may be acceptable where they would be in accordance with all other relevant development plan policies'. It also states 'The area also contains locations with the potential for habitat creation to enhance biodiversity and mitigate the impacts of development on internationally important areas for nature conservation. Development necessary for the creation and management of such areas would also be acceptable in principle.'
	DM19	This policy provides further detailed criteria for the consideration of proposals affecting nature conservation sites and features of value in Bristol. It states that the findings of the Cresswell Study (Cresswell, 2011b) will be taken into account when determining whether proposals will affect the international designations of the Severn Estuary.
Bristol Local Plan Core Strategy	BCS4: Avonmouth and Bristol Port	This Policy states: 'Avonmouth is identified as a priority area for industrial and warehousing development and renewal. Its economic strengths will be supported whilst protecting its environmental assets and acknowledging its development constraints. Principal Industrial and Warehousing Areas will be identified and retained for industrial and warehousing uses. Development in these areas for those uses will be supported in principle. Proposals for port-related activities, manufacturing industry, logistics / distribution, waste management and other environmental technology related industries will be particularly encouraged. There may be opportunities for the development of energy from waste facilities, biomass energy and further largescale wind turbines. Development will be expected to respect the area's environmental assets and take account of its physical constraints. Proposals will be expected to contribute to both the strategic and local infrastructure necessary to mitigate any adverse impacts that would result from the development. Freight and passenger rail infrastructure sites will be safeguarded'.

Document	Policy	Details
	BCS9: Green Infrastructure	The policy states: 'The integrity and connectivity of the strategic green infrastructure network will be maintained, protected and enhanced. Opportunities to extend the coverage and connectivity of the existing strategic green infrastructure network should be taken. Individual green assets should be retained wherever possible and integrated into new development. Loss of green infrastructure will only be acceptable where it is allowed for as part of an adopted Development Plan Document or is necessary, on balance, to achieve the policy aims of the Core Strategy. Appropriate mitigation of the lost green infrastructure assets will be required. Development should incorporate new and/or enhanced green infrastructure of an appropriate type, standard and size. Where on-site provision of green infrastructure is not possible, contributions will be sought to make appropriate provision for green infrastructure off site.' 'Internationally important nature conservation sites are subject to statutory protection. National and local sites of biological and geological conservation importance will be protected having regard to the hierarchy of designations and the potential for appropriate mitigation. The extent to which a development would contribute to the achievement of wider objectives of the Core Strategy will be carefully considered when assessing their impact on biological and geological conservation. Where development would have an impact on the Bristol Wildlife Network it should ensure that the integrity of the network is maintained or strengthened.'
	BCS16: Flood Risk and Water Management	The policy states: 'The integrity and connectivity of the strategic green infrastructure network will be maintained, protected and enhanced. Opportunities to extend the coverage and connectivity of the existing strategic green infrastructure network should be taken. Individual green assets should be retained wherever possible and integrated into new development. Loss of green infrastructure will only be acceptable where it is allowed for as part of an adopted Development Plan Document or is necessary, on balance, to achieve the policy aims of the Core Strategy. Appropriate mitigation of the lost green infrastructure assets will be required. Development should incorporate new and/or enhanced green infrastructure of an appropriate type, standard and size. Where on-site provision of green infrastructure is not possible, contributions will be sought to make appropriate provision for green infrastructure off site.' 'Internationally important nature conservation sites are subject to statutory protection. National and local sites of biological and geological conservation importance will be protected having regard to the hierarchy of designations and the potential for appropriate mitigation. The extent to which a development would contribute to the achievement of wider objectives of the Core Strategy will be carefully considered when assessing their impact on biological and geological conservation. Where development would have an impact on the Bristol Wildlife Network it should ensure that the integrity of the network is maintained or strengthened.'
South	Policy CS12	This policy provides details of areas safeguarded for economic development. These areas include the Severnside Employment Area.

Document	Policy	Details
Gloucestershire Core Strategy (2013)	Policy CS35	The policy states: Land at Severnside will be safeguarded and developed for distribution and other extensive employment uses, including energy generation, broadly in line with the extant planning permissions dating from 1957 and 1958. Notwithstanding the differing planning status of individual land parcels, the Council will invite individual landowners to commit to working co-operatively through a planning performance or co-operation agreement. This should set out both a strategic framework plan for the area which takes into account the most recent government guidance and a mechanism to deliver, reconcile and mitigate development with the continue to work with landowners, Bristol City Council, the Local Enterprise Partnership and statutory agencies to provide a strategic development approach which will help to deliver development while mitigating site constraints, including flood risk, coastal protection, biodiversity, archaeology and transportation. Opportunities to enhance the sustainability of the area through, for example development of an energy grid, will also be explored and delivered where feasible. In relation to transport, the Core Strategy states the following: ' In summary, comprehensive development at Severnside/Avonmouth will require the following three major road schemes, together with local road improvements: **The M49 Junction** The principle of a junction on the M49, serving the large scale employment development at Severnside and Avonmouth (in the Bristol administrative area). **The Spine Road** It is anticipated that the spine road will become the realigned A403. A large section of the spine road has already been constructed, however, the precise alignment of the final sections to the south is not yet known. Cross-boundary working with Bristol City Council will need to ensure a suitable and sustainable linkage with the existing road network is provided. **Link Road to the M49 Junction** The alignment of the link road from the M49 junction to the spine road serving the Severnside area cannot be defined precisely until the location of the junction and the spine road alignment have been finally determined.

Table 5.3. Source Information used to inform Avonmouth/Severnside Allocations

Document	Author/Year	Details and Summary of Findings
Severnside and Avonmouth Wetland Habitat Creation Project Stage 1 and Stage 2	Cresswell Associates 2011	The purpose of the project was to assess the potential impacts of future development proposals within the Avonmouth/Severnside area on Severn Estuary SPA/Ramsar qualifying features, and to determine what mitigation measures would be needed to off-set these impacts. The project comprised a Stage 1 report, which reviewed existing ecological records, and a Stage 2 report that reviewed the 1957/1958 Severnside Planning Consent as well as the Avonmouth Employment Area and assessed the impacts these may have on birds associated with the Severn Estuary SPA/Ramsar. The Stage 2 report also reviewed potential impacts of potentially feasible wind farm sites identified within the Bristol Citywide Sustainable Energy Strategy (BCSES). The assessment addressed direct habitat loss and bird disturbance/displacement potentially affecting SPA Qualifying Species and the Qualifying Assemblage at locations within the study area which lies outside the Severn Estuary SPA and Ramsar site boundary. The Stage 2 report also provided a mitigation strategy which, if implemented would make a significant impact on integrity of the Severn Estuary SPA and Ramsar site unlikely. The study concluded that, without mitigation, future development could have a significant effect on gadwall –a qualifying species of the Severn Estuary SPA. The study also concluded that development could give rise to significant impacts on species forming part of the Severn Estuary SPA wintering bird assemblage, including teal, tufted duck, mallard, lapwing, curlew and common snipe. These effects could give rise to an adverse effect on the integrity of the SPA either alone or in-combination with other plans and projects. The mitigation strategy identified that 2.2ha of new wetland habitat would be needed to off-set potential future development impacts on wildfowl in Severnside, and 4.1ha of wetland habitat would be required to offset potential future development impacts on wildfowl in Avonmouth. The mitigation strategy also identified that to off-set potential disturbance, displacement and habitat loss impacts on wader species that form part of the Severn Estuary SPA/Ramsar population from possible future development, 46.6ha of habitat enhancement/creation would be needed for the Severnside area and 27.6ha would be needed for the Avonmouth area. The habitat enhancements would target creating open areas of grassland suitable for foraging. *A number of potential mitigation areas were proposed to supply these mitigation needs. These areas included:* • *Hallen Marsh;*

Document	Author/Year	Details and Summary of Findings
		• *former Berwick Landfill Site;* • *former Northwick Landfill Site* • *Ecological Refuge Area* The Eclogical Refuge Area includes the implementation of 38ha of land for ecology within the Severnside Area. This forms part of a Section 106 Agreement signed by ICI accompanying the granting of planning permission for the development of the first phase of the Western Approaches Business Park. This also includes the creation of a number of green corridors within the 1957-58 consented land, and the revocation of elements of the 1957 consent in respect of land along the foreshore and extending into the estuary. The approach taken within the Stage 2 report was considered highly precautionary and based on a worst case scenario. The Cresswell Report assessed a greater potential level of effect from development than is actually proposed or supported by the SADMP (Natural England, 2013).

Document	Author/Year	Details and Summary of Findings
Avonmouth and Severnside Integrated Development Infrastructure and Flood Risk Management Study	WYG, 2012	The purpose of the WYG report was to seek to identify and explore the challenges to the area's development and to identify a viable way forward that will ensure that existing infrastructure and development in the area remains sustainable and that the area achieves its full potential. This included exploring flood risk, ecology and transport. The report concluded that development of 350ha of land within the 1957/1958 Severnside Planning Consent could generate significant employment opportunities, and development of a further 60ha of land could be feasible. However it will be necessary to reduce the increasing risk of tidal flooding in the area. It will also be necessary to mitigate the impacts on ecology of the development by setting land aside for habitat enhancement measures. The WYG report also outlines proposals to raise existing flood defences within the Severnside/Avonmouth area as well as the development of new highways including a new junction with the M49 motorway and associated spine and link roads. The WYG report provided the principal evidence in respect of flooding risk that informed the Strategic Flood Risk Assessments 2 –Avonmouth/Severnside Summary Report 2011. The report stated that although the draft Severn Estuary Shoreline Management Plan 2 (SMP2) states that the short term (0-20 years) policy adopted in relation to the flood defences in the area is "hold the line". The "hold the line" position will however change with time as sea levels are predicted to rise to 2050 and beyond.
Avonmouth-Severnside Flood Management Optioneering	Atkins, 2013	*A further report was commissioned by South Gloucestershire Council, Bristol City Council and the Environment Agency and produced by Atkins to establish options for the establishment of flood defences to protect the Severnside/Avonmouth Employment Area. This study consolidates previous flood risk management options in the Severnside and Avonmouth area. The temporal scope was defined by the Proposed Developments (2012-2030) and flood risk (2010-2110).* *One of the options assessed included strategic ground raising of a number of areas within Avonmouth and Severnside to alleviate flood risk. One of these areas was a section at the southern end of Hallen Marsh alongside the railway. Various ground raising options were proposed to raise this area of land between 1m and 4m. However, ground raising was not recommended. Instead, the following options were recommended:* • *Construction of the landward perimeter wall, or seaward revetments and embankments along Avonmouth Docks (2012-2016).* • Wave recurve wall addition to the Aust to New Passage earth embankment if required (2017-2030)

5.3 In-Combination Collision Risk Effects

5.3.1 As set out in previous sections, the Proposed Development has the potential to cause some collision related mortality of waterbirds, although it is considered that, such mortality would not be any greater than that already associated with the existing overhead power line network. There is no evidence to indicate that existing collision mortality is having an impact on designated SPA/Ramsar populations.

5.3.2 Collision mortality associated with the two proposed wind farms at Black Ditch and Withy End has been calculated as part of the assessment process for these projects. The potential for collision mortality of birds forming part of the designated populations of both the Somerset Levels and Moors SPA and the Severn Estuary SPA is recognised.

Teal

Somerset Levels and Moors SPA

5.3.3 Teal is a qualifying species for the Somerset Levels and Moors SPA. Using an avoidance rate of **99.7%** the predicted collision teal mortality associated with the Somerset Levels and Moors SPA from the HPC Connection project alone is **0.56** birds, representing **0.003%** of the SPA population.

5.3.4 For the purposes of assessment we have assumed that birds at risk of collision would either belong to one or other of the two SPAs. In reality, it is more likely, given interchange between SPAs and use of the area by non-SPA population birds, that birds belong to a wider local/regional population and therefore any defined SPA population impact is considered to be precautionary.

5.3.5 In-combination with the other wind farm projects that could potentially affect teal through collision mortality and for which collision mortality for this species is predicted, a total of **0.92** teal representing **0.04%** of the Somerset Levels and Moors SPA/Ramsar would be predicted to collide with either the proposed overhead line or proposed wind farms each year. It is considered that this level of teal mortality would not have a significant effect on the integrity of the SPA or Ramsar.

5.3.6 It is considered that, due to the increased likelihood of these areas to act as flyways, 50% of teal flight lines crossing the length of overhead line south of the Mendips would cross within the areas where flight diverters will be fitted. Bird flight diverters of the type to be fitted have been found to reduce bird collision mortality by approximately 80% (APLIC 2012). After applying this 80% reduction to the 50% of flight lines, it is considered likely that, using the realistic avoidance rate, the predicted annual mortality of teal associated with the Somerset Levels and Moors SPA/Ramsar including mitigation measures would be 0.34 birds, representing 0.002% of the Somerset Levels and Moors SPA/Ramsar population.

5.3.7 The predicted In-combination annual mortality would therefore be further reduced to **0.70** teal or **0.003%** of the Somerset Levels and Moors teal population.

5.3.8 If the entire existing 132kV overhead line remained in place for a full winter period, it is considered possible that this would result in a doubling of the collision risk associated with the proposed 400kV overhead line. If this is the case, the predicted teal collision risk for 1 winter period in-combination with the additional wind farm projects (assuming these have been constructed by this winter period) would be **1.26** teal or **0.006%** Somerset Levels SPA/Ramsar population. However the 132kV overhead line to the south of the Mendips in the section associated with the Somerset Levels and Moors

SPA is not proposed to be in place during the winter period while the 400kV overhead line is in place. Therefore this in-combination impact will not arise.

5.3.9 Teal were considered by the authors of the radar studies undertaken by FERA to be involved in the bird movements recorded. This is considered further later in this assessment.

Severn Estuary SPA

5.3.10 Teal also form part of the wintering bird assemblage for which the Severn Estuary SPA is designated. For assessing in-combination effects on the Severn Estuary SPA, the Wessex Water wind farm has also been taken into account within the In-combination assessment due to its location in relation to the Severn Estuary SPA.

5.3.11 Based on the Vantage Point survey data, using a 99.7% avoidance rate the calculated annual collision mortality for teal associated with the Severn Estuary SPA is **3.55** birds, representing **0.07%** of the SPA population. In-combination with the Wessex Water wind farm, Black Ditch wind farm and Withy End wind farm this becomes a predicted annual mortality rate of between **6.21** and **15.41** teal. This equals between **0.13%** and **0.31%** of the Severn Estuary SPA teal population. This is calculated from the range of predicted mortality rates provided in the Wessex Water wind farm assessment. By far the greatest proportion of this collision risk relates to the Wessex Water wind farm.

5.3.12 As explained above, it is possible that the existing 132kV overhead line remains in place for up to four full winter period. Assuming this is the case, the predicted teal collision risk in-combination with the additional wind farm projects (assuming these have been constructed by this winter period) would be **9.61** to **18.81** teal or **0.20** to **0.38%** of the Severn Estuary SPA population. With mitigation this would be reduced to **9.46** to **18.66** birds or **0.19%** to **0.38%** of the SPA population for up to four winter periods. The greatest proportion of this predicted teal collision relates to the Wessex Water wind farm.

Wigeon

5.3.13 No wigeon were recorded flying at risk height within 250m of the proposed HPC connection overhead line during vantage points undertaken for this project. Within the HRA undertaken for the Black Ditch wind farm only 4 individuals were recorded flying within the survey area during nocturnal vantage points undertaken.

5.3.14 Based on the collision risk associated with wigeon flights observed during vantage point surveys undertaken for the HPC Connection project or any of the wind farm projects, the predicted impact of collision risk on wigeon from these projects combined is negligible.

5.3.15 Wigeon were considered by the authors of the radar studies undertaken by FERA to be involved in the bird movements recorded. This is considered further later in this assessment.

Lapwing

Somerset Levels and Moors SPA

5.3.16 Based on the Vantage Point survey data, using a 99.7% avoidance rate considered realistic for this species, it is predicted that the overhead line could result in an annual mortality of **46.09** lapwing, representing **0.12%** of the Somerset Levels and Moors SPA population. When combined with other plans and projects where collision risks have been quantified, the total predicted collision risk is only raised to **46.27** lapwing per year (**0.12%** of Somerset Levels and Moors SPA Population).

5.3.17 As is the case for the other species considered, the predicted number of lapwing collision victims each year is also likely to be an overestimation, as the collision risk zone used within the collision risk model was a zone of 50m in height (0-50m). The actual collision risk zone associated with the proposed route will be considerably less than this. In the case of the stretch associated with the Somerset Levels and Moors SPA, the collision risk zone will only be approximately a fifth of the size of the zone used in the model, due to the use of the T-Pylon.

5.3.18 When the likely effects of the proposed mitigation of installing flight diverters to key locations of the proposed overhead line are taken into account, this results in a total combined collision risk of **27.65** lapwing or **0.07%** of the Somerset Levels and Moors SPA. This predicted mortality rate is highly unlikely to have a significant effect on the integrity of the SPA.

5.3.19 If the existing 132kV overhead line remained in place for a full winter period, it is considered possible that this would result in a doubling of the collision risk associated with the proposed 400kV overhead line. If this is the case, the predicted lapwing collision risk for 1 winter period in-combination with the additional wind farm projects (assuming these have been constructed by this winter period) would be **92.36** lapwing or **0.23%** Somerset Levels SPA/Ramsar population. With mitigation this would be reduced to **73.92** birds or **0.19%** of the SPA population. However the 132kV overhead line to the south of the Mendips in the section associated with the Somerset Levels and Moors SPA is not proposed to be in place during the winter period while the 400kV overhead line is in place. Therefore this in-combination impact will not arise.

5.3.20 It is therefore considered that the Hinkley Point C Connection project will not have a significant effect on the integrity of the Somerset Levels and Moors SPA due to collision risk, either alone or in-combination with other plans or projects.

Severn Estuary SPA

5.3.21 Lapwing forms part of the wintering birds assemblage which is a qualifying feature of the Severn Estuary SPA.

5.3.22 Based on the Vantage Point survey data, using a 99.7% avoidance rate considered realistic for this species, it is predicted that the overhead line could result in an annual mortality of **27.47** lapwing, representing **0.26%** of the Severn Estuary SPA population. When combined with other plans and projects where collision risks have been quantified, including Withy End wind farm, Black Ditch wind farm and Wessex Water wind farm, the total predicted collision risk is raised to between **40.17** and **63.67** lapwing per year (based on the range estimated for the Wessex Water wind farm). This equates to between **0.37%** and **0.59%** of the Severn Estuary SPA lapwing population.

5.3.23 The apportioning of the estimated collision mortality to the SPAs is likely to be a significant overestimate as it includes for birds that form part of the wider countryside population. Even if it is assumed that the calculated total collision mortality is attributed solely to SPA populations, the predicted level of impact is unlikely to give rise to a detrimental effect at the designated population level.

5.3.24 The proposed mitigation measures including installing bird flight diverters along key locations of the HPC connection considered most likely to act as flyways along the proposed route is likely to reduce lapwing collisions by 80% within the sections where they are fitted. It is therefore likely that, using the realistic avoidance rate, the predicted annual mortality of lapwing associated with the Severn Estuary SPA, combined with other plans and projects would be between **33.55** and **57.05** birds, representing between **0.31%** and **0.53%** of the Severn Estuary SPA. This is not considered to be a significant impact.

5.3.25 The 132kV overhead line to the south of the Mendips in the section associated with the Somerset Levels and Moors SPA is not proposed to be in place during the winter period while the 400kV overhead line is in place. However as a worst case scenario, both the 400kV overhead line and the 132kV overhead line may be in place to the north of the Mendips for a maximum of 4 winter periods. Assuming that this is the case, it is considered possible that this would result in a doubling of the collision risk associated with the proposed 400kV overhead line in the section north of the Mendips, associated with the Severn Estuary SPA. The predicted lapwing collision risk in-combination with the additional overhead line and additional wind farm projects (assuming these have been constructed by this particular winter period) would be between **57.71** and **81.21** lapwing associated with the Severn Estuary SPA lapwing population (between **0.54%** and **0.76%** of the Severn Estuary SPA lapwing population). With mitigation this would be reduced to between **51.09** and **74.59** birds or between **0.48%** and **0.69%** of the SPA population. It is therefore considered that the Hinkley Point C Connection project will not have a significant effect on the integrity of the Severn Estuary SPA due to collision risk, either alone or in-combination with other plans or projects.

Radar Study

5.3.26 This next section presents some further analysis that has not previously been presented in respect of the two wind farm applications, and aims to provide an indicative (but worst case) view of potential collision risk impacts if the findings of the radar studies are taken into account

5.3.27 Teal and wigeon were the target species thought by the authors of the radar study most likely involved in movements between the Severn Estuary and the Somerset Levels. It is unknown how many birds were involved in these movements however the authors of the radar study undertaken by FERA for the Black Ditch Wind Farm estimated that based on all the wildfowl recorded within the area during the study, that between 1580 and 2840 birds could have been involved in the flight lines. This relies on counts of birds taken from key sites within the Somerset Levels and Moors and also sums peak bird counts taken on different days. The large assumption is also made that all of the birds moved. The radar study suggested that the birds involved in the movements were associated with the Somerset Levels and Moors, as this is where the flight lines originated from at the beginning of the night period.

5.3.28 To calculate a worst case scenario of the potential collision risk impacts of the Hinkley Point C Connection Project in combination with the two other wind farms considered that may also have a collision risk impact on the Somerset Levels SPA/Ramsar a model has been produced to estimate this combined impact.

5.3.1 The model makes the following ‘worst case’ assumptions:

- 2000 wildfowl moved between the Somerset levels and Moors SPA/Ramsar and the Severn Estuary SPA/Ramsar each night, all of which over the area covered by the radar study.
- As large numbers of wigeon and teal were recorded within the study it is assumed that half of the wildfowl involved in the movement were teal (1000 birds) and the other half were wigeon (1000 birds).

- The teal and wigeon moved both mad an 'outward' journey and a 'return' journey every night (2 movements per night). This therefore represents 2000 teal flight lines each night and 2000 wigeon flight lines each night.
- All of the teal and wigeon made this same journey every night during the winter period (October to March -182 day period)

5.3.2 It is likely that only a proportion of the birds flew at collision risk height, with a significant proportion likely to fly above or below the overhead line. Within the radar study carried out for Black Ditch Wind Farm, flight heights were worked out of all birds recorded near to the proposed windfarm during the day, dusk, dawn and night time. From the study it can be calculated that approximately 25% of bird tracks were recorded at a height of 10-50m during dusk, dawn and night time. If we then apply a 15m risk zone for the proposed T-pylon design in this area, it can be estimated that 9.35% of flight lines flew within the risk zone. Therefore 10% of the total number of flight lines were assumed to be at risk height. In fact the radar study stated that a significant proportion of ducks may have flown at more than 250m in height. It is therefore considered that assuming 10% of birds flew within the risk zone is a precautionary approach.

5.3.3 As the proposed overhead line only covers 80% of the diameter of the radar study area, and as a significant density of radar tracks were recorded in the area to the south where the overhead line will not be present, the predicted number of flight lines passing over proposed overhead line has been reduced by 20%. The windfarms only occupy 2.27% of the diameter each (based on rotor-swept area), and therefore the number of likely teal and wigeon flight lines predicted over each windfarm was reduced by 97.73%.

5.3.4 The radar study predicted from flight densities that 39 duck species passed over the wind farm area each night, although based on a number of assumptions this figure cannot be relied upon. If this figure was used it would give a slightly lower prediction of collision risk mortality than the one used here (710 flights over the windfarm during an entire winter period rather than the 728 flights predicted here based on area occupied).

5.3.5 The avoidance rates have then been applied at 99% avoidance for windfarms and 99.5% for the overhead line. To calculate the likely effects of the proposed mitigation it was observed that the radar activity was concentrated within some areas, with very little radar activity recorded north of Mark. From the radar track concentrations it was calculated that by far the greatest majority of radar tracks were contained within an 8km section. The proposed mitigation works (see Section 7.3 below for details of mitigation proposals) include installing bird flight diverters along 2.5km or 31% of this section. Bird flight diverters have been found to reduce bird collision mortality by 80%, therefore an 80% reduction in collision risk has been applied to 31% of the estimated flight lines. This is precautionary as it does not include likely greater concentrations of flight lines along water courses such as the River Brue (as indicated by further radar flight speed analysis).

Teal

5.3.6 The predicted mortality rates of the two wind farm projects are combined with the Hinkley Point C Connection project. The results of this for teal are shown in Table 5.2 below.

Table 5.2. Worst case scenario teal In-combination effects based on radar study findings.

	Avoidance rates used	Total combined worst case scenario predicted annual mortality rate for teal associated with Somerset Levels and Moors SPA (% of SPA population effected)
Pre HPC Connection mitigation	***Worst Case Avoidance:*** Hinkley Point C Connection: 99.5%	**145.60 (0.66%)**
	Reasonable Avoidance: Hinkley Point C Connection: 99.7%	**87.36 (0.39%)**
	Windfarms: 99% avoidance (2 x wind farms combined)	**14.56 (0.07%)**
	Total Combined (Worst Case Avoidance)	**160.16 (0.72%)**
	Total Combined (Reasonable Avoidance)	**101.92 (0.46%)**
Post HPC Connection mitigation	***Worst Case Avoidance:*** Hinkley Point C Connection: 99.5%	**109.49 (0.49%)**
	Reasonable Avoidance: Hinkley Point C Connection: 99.7%	**65.69 (0.30%)**
	Windfarms: 99% avoidance (2 x wind farms combined)	**14.56 (0.06%)**
	Total Combined (Worst Case Avoidance)	**124.05 (0.56%)**
	Total Combined (Reasonable Avoidance)	**80.25 (0.36%)**

5.3.7 The calculations above show that even in the highly unlikely ‘worst case scenario’, based on radar study findings, the in-combination assessment predicts that **0.46%** of the Somerset Levels and Moors SPA teal population would be effected by collision mortality based on a reasonable avoidance rate. Following the provision of the proposed fitting of bird flight diverters on the HPC Connection overhead line, this would be likely to be reduced to **0.36%** of the teal population of the Somerset Levels and Moors SPA.

<u>Wigeon</u>

5.3.8 As calculated for teal above, a ‘worst-case’ scenario can be calculated based on the suggestions of the radar study. The model assumes that all birds recorded on the ground during the radar study moved between the Somerset Levels and Moors and the Severn Estuary every night during the winter period and that half of these birds were wigeon. The results of this worst case scenario model based on the radar study is shown in Table 5.3 below.

Table 5.3. Worst case scenario In-combination effects on wigeon based on radar study findings.

	Avoidance rates used	**Total combined worst case scenario predicted annual mortality rate for wigeon associated with Somerset Levels and Moors SPA (% of SPA population effected)**
Pre HPC Connection mitigation	***Worst Case Avoidance:*** Hinkley Point C Connection: 99.5%	**145.60 (0.51%)**
	Reasonable Avoidance: Hinkley Point C Connection: 99.7%	**87.36 (0.31%)**
	Windfarms: 99% avoidance (2 x wind farms combined)	**14.56 (0.05%)**
	Total Combined (Worst Case Avoidance)	**160.16 (0.56%)**
	Total Combined (Reasonable Avoidance)	**101.92 (0.36%)**

	Avoidance rates used	Total combined worst case scenario predicted annual mortality rate for wigeon associated with Somerset Levels and Moors SPA (% of SPA population effected)
Post HPC Connection mitigation	***Worst Case Avoidance:*** Hinkley Point C Connection: 99.5%	**109.49 (0.38%)**
	Reasonable Avoidance: Hinkley Point C Connection: 99.7%	**65.69 (0.23%)**
	Windfarms: 99% avoidance (2 x wind farms combined)	**14.56 (0.05%)**
	Total Combined (Worst Case Avoidance)	**124.05 (0.44%)**
	Total Combined (Reasonable Avoidance)	**80.25 (0.28%)**

5.3.9 Even based on this scenario taken from worst case assumptions made from the radar study wigeon, using the realistic avoidance rate of 99.7% **0.36%** of wigeon associated with the Somerset Levels and Moors SPA would be affected by collision risk mortality each year. Even this absolute worst case scenario would be unlikely to have an adverse effect on integrity on the Somerset Levels and Moors SPA.

5.3.10 When the proposed mitigation is taken into consideration, assuming no mitigation undertaken at the proposed wind farms this is still reduced to **0.28%** of wigeon associated with the Somerset Levels and Moors SPA.

5.4 In-combination Disturbance, Displacement and Habitat Loss Effects

5.4.1 The majority of the land that could potentially be disturbed, or from which birds could be displaced from the Hinkley Point C Connection project was assessed as being of low habitat value for wintering waders and wildfowl. A small number of fields were assessed as holding moderate potential for waders and wildfowl. Only two fields/field groups within the corridor were assessed as holding high potential for wildfowl. These included Portbury Wharf and Avonmouth Sewage Works. No areas were assessed as holding high potential for waders.

5.4.2 During winter bird surveys undertaken by TEP, apart from at Portbury Wharf and Avonmouth Sewage Works (Avonmouth Pools) only small numbers of waders and wildfowl were regularly recorded within 250m of the Proposed Development (within the distance where they would be vulnerable to disturbance).

5.4.3 In its current situation, the only location where it is considered that significant disturbance could occur to species designated for either the Severn Estuary SPA/Ramsar or the Somerset Levels and Moors SPA/Ramsar is at Portbury Wharf Nature Reserve. Due to this location it is considered that there will not be any significant disturbance to the Somerset Levels and Moors SPA/Ramsar. Even in this location it is considered that, due to the presence of nearby habitat which any displaced birds could relocate to (the main pool at the north of the reserve located approximately 250m from proposed works, as well as the saltmarsh and estuary located to the north of this) the impacts to these SPA species would be negligible.

5.4.4 As the only areas identified where there is any potential for disturbance/displacement of birds is near to Portbury Wharf or Avonmouth Sewage Works, then only those projects within the Severnside/Avonmouth area that could potentially interact with birds using these areas are considered. These projects are listed as project ID 51-81 within Table 5.1. These also include Bristol Sewage Treatment Works wind farm, Avonmouth Wind farm and the Former Shell Tank Site wind farm listed in Table 5.1.

5.4.5 Each of these projects within the Severnside/Avonmouth Area will be mitigated through habitat enhancement measures provided within areas proposed within the Cresswell Report (Cresswell Associates, 2011b) as well as within the SADMP (detailed in Tables 5.2 and 5.3). The Cresswell Report assessed a greater potential level of effect from development than is actually proposed or supported by the SADMP (Natural England, 2013). It is therefore assumed that there is no residual impact remaining from these proposed projects. It is therefore considered that the potential impact of the HPC Connection project relates to its potential impact on this future mitigation work rather than the impacts of these projects directly. The interaction of the HPC Connection project with the mitigation areas is considered later within this section

Proposed Habitat Creation Measures at Hallen Marsh

5.4.6 The projects identified within the Avonmouth and Severnside Areas, shown within Table 5.1 all fall within the scope of the area assessed within the Severnside and Avonmouth Wetland Habitat Creation Project (Cresswell Associates 2011b). In fact the Cresswell report assessed more projects than are currently proposed due to carrying out the assessment on a worst case basis i.e. all land within the 1957/58 Severnside Designation and all land within the Avonmouth Employment Area would be developed. It is recognised that although there are not currently proposals to develop all of this land, due to the 1957/58 designations this could occur in the future. However, some of the land assessed by the Cresswell report has been taken out of the areas of land that may be developed. This includes a section of land south west of Avonmouth Sewage Works and a section of land north east of Avonmouth sewage works which contains a number of waterbodies. Within the west of Avonmouth a number of waterbodies including the salt rhine south of the railway are also now not to be developed. These waterbodies which now are safeguarded from development fell within the original calculations of wetland mitigation for wildfowl species such as gadwall. Natural England acknowledged that Cresswell assessed a greater potential level of effect from development than is actually proposed or supported by the SADMP (Natural England, 2013). Without the development of these areas it is likely that the required mitigation for wildfowl necessary to offset the impacts on SPA wildfowl species would actually be less.

5.4.7 Hallen marsh is one of the primary mitigation areas considered to supply the required mitigation. This area is located directly north of the railway in Avonmouth and falls within the Avonmouth and Kingsweston Levels which the SADMP states will remain primarily undeveloped (DM18).

5.4.8 In the Cresswell study assessment, the calculated mitigation required for gadwall as well as other wildfowl species also assumed that the pool in the south east corner of Hallen marsh supported wildfowl species such as gadwall, teal and mallard. During winter bird surveys carried out by TEP, no evidence was found to suggest that this was the case. If these species do therefore use this pool it is very irregularly and highly unlikely to be in large numbers.

5.4.9 In terms of grassland habitat suitable for lapwing, although the overall area being lost may be slightly smaller, it still seems reasonable to assume that the 27.6ha mitigation land for the Avonmouth Area (or 74.2ha area if Severnside Area also included) to off-set potential disturbance, displacement and habitat loss on wader species that form part of the Severn Estuary SPA/Ramsar population will still be needed. This could easily be incorporated within the 111ha of Hallen Marsh for which Policy DM18 states 'will remain primarily undeveloped. Development proposals consistent with the area's undeveloped status may be acceptable where they would be in accordance with all other relevant development plan policies'.

5.4.10 As the impacts of all of the projects associated within the Severnside/Avonmouth area project ID 51-81 within Table 5.1 would be mitigated by the mitigation measures proposed in the Cresswell report, it is considered that no in-combination effects would arise when the effects of the Hinkley Point C Connection project are combined with these plans and projects.

Outstanding Projects Not Currently Mitigated for by Cresswell Proposals

5.4.11 A number of projects were not considered within the mitigation proposals provided in the Cresswell report and potential impacts of these projects are not currently mitigated for. These plans/projects include the following:

- New M49 junction, including link road and spine road;
- Flood risk plan;

M49 Junction

5.4.12 The proposed new junction with the M49 is likely to be located approximately 1.25km north of the HPC Connection project at its closest point. The spine road also joins to Severn Road at the north of Hallen Marsh, although proposals are not yet certain for this location. It is possible that construction works associated with this project will disturb birds associated with the Severn Estuary SPA/Ramsar. It is also likely that the operation of M49 junction and associated roads will lead to an increase in traffic in the area and therefore potential displacement of SPA/Ramsar species.

Flood Risk Plan

5.4.13 Although areas of strategic land raising have previously been proposed to alleviate flood risk, these plans have not been taken forward. Instead the plans are for construction of a landward perimeter wall and embankments at Avonmouth Docks and a wave recurve wall. It is considered unlikely that these plans will have a significant effect on SPA.Ramsar species.

Wind farm projects

5.4.14 The Cresswell Stage 2 report (Cresswell Associates, 2011b) did consider the effects of the proposed windfarm projects in the Severnside/Avonmouth area in terms of habitat loss, displacement and disturbance effects, however the potential collision risk effects associated with these projects were not considered.

Impact of the HPC Connection project at Severnside and Avonmouth In-Combination with Plans for Future Habitat Enhancement Works

5.4.15 Hallen marsh is proposed to provide land for habitat enhancement to offset the potential impacts on the Severn Estuary SPA/Ramsar of proposed development within the Severnside/Avonmouth area.

5.4.16 The HPC Connection project passes along the eastern edge of Hallen Marsh adjacent to the M49 motorway, before following the Severn Road heading west to join Seabank Substation. Current usage of Hallen Marsh by waders and wildfowl is very low due to low habitat suitability, however this could substantially increase in future years due to the proposed habitat enhancement measures.

5.4.17 As previously discussed, it is likely that, certainly in the section of overhead line adjacent to the M49 motorway, the existing displacement effect of the road is likely to outweigh the potential displacement effect of the proposed 400kV overhead line. This would be the case regardless of what habitat enhancement measures were put in place to encourage waders and wildfowl into the area. In the proposed section of 400kV overhead line adjacent to the Severn Road it is also likely that the displacement effects will be balanced to some extent.

5.4.18 It is not considered that habitat enhancement works will have been carried out prior to construction works associated with the HPC Connection project take place. The construction phase of the projects is therefore not considered further in the In-combination with the greater suitability of habitat proposed at Hallen Marsh in the future. However, it is possible that the overhead line may have operational effects including some small scale displacement effects on birds using Hallen Marsh in the future, depending on the location of the habitat enhancement works.

5.4.19 To quantify the potential displacement effects the potential area from which displacement could occur has been estimated. As previously discussed, whether overhead lines have a displacement effect on waders and wildfowl and what this distance is has not yet been established by scientific research. However, in this case it has been assumed that the displacement distance from the overhead line will be 50m. This is considered to be a precautionary distance. The overall area that could be affected at Hallen Marsh has been estimated by calculating the area within 50m of the proposed overhead line that does not fall within 100m of a road, tall tree line or woodland. This gives an area of just under 3.1ha.

5.4.20 It is not possible to quantify the numbers of birds potentially displaced by the proposed overhead line, as this would depend on the location of the proposed habitat enhancement works, as well as the success of the works on attracting SPA species, both of which are currently unknown. Hill, 2001 states that balancing ponds are more useful for birds if set back from a carriageway by 100 – 200m, and that new or existing freshwater sites are more likely to attract birds if at least 200m from a road. It is therefore recommended that any future location of habitat enhancement works at Hallen Marsh is located at least 100-200m from the location of the M49 and Severn Road. This would be likely to remove the potential displacement effect of the HPC Connection project.

5.4.21 Applying a 100m internal buffer to the entire boundary of the 111ha Hallen Marsh area, results in an internal core habitat area of 65.7ha. Adding the additional potential displacement effect of the proposed overhead line (3.1ha) reduces that core habitat area to 62.6ha. The Creswell report calculates that Avonmouth (Hallen Marsh) should supply 31.7ha of mitigation (4.1ha of wetland habitats for wildfowl and 27.6ha of habitat for waders). This can easily be accommodated within the internal core habitat with a remaining 30.9ha of internal core habitat remaining to allow flexibility of provision across the remaining 5 mitigation sites identified by Creswell for mitigation requirements in Severnside (Severnside mitigation requirements were calculated by Creswell as 2.2ha for wildfowl and 46.6ha for waders).

5.4.22 The future plans for the additional M49 junction and associated link road and spine road could also have displacement effects on waders and wildfowl which were not considered within the original calculations of habitat required to mitigate for development in the area. However, as Hallen Marsh alone has more than sufficient area to provide all the Avonside mitigation requirements determined by the Cresswell report and as the Creswell report took into account developments that will not now go ahead, there may be remaining capacity within Hallen Marsh for additional offsetting for the M49 junction and/or provide flexibility of provision with the other 5 offsetting sites identified by Cresswell.

5.4.23 It is therefore considered that the potential displacement effects arising from the Hinkley Point C connection project at Hallen Marsh would not compromise delivery of SPA offsetting habitat and in turn would not constrain development of the Avonmouth/Severnside area in this respect.

5.4.24 Furthermore, in recognition of the potential loss of mitigation benefit that may result from the proposed overhead line, National Grid will commit funds via an agreement with Bristol City Council for the Severnside Offsetting Scheme. The funds will allow for 3.1ha of habitat creation/enhancement works. The habitat creation works will be undertaken by Bristol City Council as and when tenancy agreements allow.

Collision Risk at Hallen Marsh

5.4.25 It is possible that if land is enhanced in the future at Hallen Marsh, or elsewhere within the Avonmouth and Kingsweston Levels as proposed within the SADMP, then daily feeding flights of bird species associated with the Severn Estuary SPA/Ramsar could potentially increase. This could lead to an increase in collision risk with the proposed 400kV overhead line where it follows the M49 motorway. Likewise if the former Berwick Landfill Site to the east of the M49 motorway and north east of the proposed development is selected to be enhanced, this could potentially lead to an increased movement of birds crossing the eastern edge of the proposed 400kV line where it follows Severn Road.

5.4.26 It is currently not possible to predict the collision mortality rates that would result from mitigation works within the Severnside and Avonmouth Area to offset effects of future proposed development within the area. This is due to a combination of the following factors:

- Unknown when mitigation works will take place;
- Unknown extent of area that will be enhanced;

- Unknown exact locations of areas that will be enhanced;
- Unknown number of birds and species of birds that will regularly use the enhanced areas.

5.4.27 The presence of a busy road is likely to raise the flight height of bird species over this location (Kiessling *et al.,* 2003). Therefore it is likely that birds will raise their flight height where they cross the M49 motorway. Tall trees planted along the motorway will also raise bird flight height to some extent.

5.4.28 The location of the proposed 400kV overhead line is broadly parallel with two existing 275kV overhead lines. This section of overhead line will be within 250m of these two existing overhead lines. Although these two overhead lines are at the same height as each other, they will be of a slightly lower height than the proposed 400kV overhead line. It is still likely however that the existing overhead lines will act to increase the visibility of the proposed line to some extent, and may also, combined with the presence of the motorway and adjacent tree screening, act to raise the flight heights of birds, reducing potential collision risk.

5.4.29 Quinn *et al.* (2011) found significant reductions in bird collisions further than 60m from an area used by large numbers of waterbirds. As previously mentioned a combination of existing busy roads, tree lines and hedgerows would already likely displace waterbirds further from the proposed location of the overhead line than 60m, reducing the collision risk of this proposed feature.

6.0 Cumulative Effects

6.1 Summary

6.1.1 The Infrastructure Planning (Environmental Impact Assessment) Regulations 2009 ('the 2009 Regulations') require that the likely cumulative effects of proposed development(s) that fall within the scope of the EIA Regulations are assessed as part of the environmental impact assessment of that proposed development.

6.1.2 A full assessment of the potential inter-project cumulative effects from the interaction of the Proposed Development and other major development proposals in the vicinity is provided in Chapter 17 of the Hinkley Point C Connection Project Environmental Statement. This includes all consultation relating to the projects considered and how they were assessed.

7.0 Summary, Recommendations and Conclusions

7.1 Introduction

7.1.1 This document presents all the survey information obtained between 2009 and 2014 regarding bird usage of the Proposed Development area and surrounding land. This information is to inform the Hinkley Point C Connection Project Habitats Regulations Assessment (HRA) and Ecological Impact Assessment (EcIA) which should be read in conjunction with this document.

7.1.2 The main potential impacts identified from this project include:

- Collision with overhead lines arising from daily flights, typically between roosting and foraging areas or from spring or autumnal migration flights;
- Disturbance or displacement of the species from feeding grounds;
- Habitat Loss.

7.1.3 Summaries of the potential impacts on each relevant bird species is provided within this document.

7.2 Mitigation for Displacement, Disturbance and Habitat Loss

7.2.1 In order to mitigate for identified potential disturbance or displacement or habitat loss for bird species, a range of mitigation measures are proposed and are detailed within the Biodiversity Mitigation Strategy (BMS). Proposed mitigation measures relevant to birds include the following:

- All hedges/shrub/trees or dense vegetation will be retained as much as is practicable. Where these measures are not possible and works are needed to be carried out during the bird breeding season, all areas to be affected will be checked for evidence of nesting birds a maximum of 24hrs prior to the vegetation removal/tree felling works taking place. If any active bird nests are discovered these will be given a minimum standoff of 5m (this may increase depending on species/proposed works and location) where no potentially disturbing works will take place until the young have fledged and the nest vacated. A second nesting bird check would then be undertaken to ensure the tree/vegetation does not contain any further active nests prior to felling/removal works taking place.
- For any Schedule 1 species, the same above measures will apply, however any surveys will be carried out by an appropriately licenced ornithologist. As dependant young are also protected, surveyors will also take account of these and advise as appropriate.
- All retained ditches will be protected from construction activity, vehicle movements and storage of materials through the installation of Heras fencing to a minimum of 5m from the top of each ditch and water course bank. Where feasible, haul roads, working areas, laydown areas and general construction actives will maintain the 9m buffer along each from each ditch and watercourse. Within all SSSI's 9m buffers will be maintained at all times except for agreed crossing ditch points.
- All hedges/shrub/trees or dense vegetation will be re-instated following works through replacement planting using native species. For all tree felling, compensatory native tree planting at a ratio of 4:1 will be undertaken in areas appropriate to the loss of trees, subject to landowner consent.

- Any nest boxes lost through the development will be re-instated on a 2:1 basis. The replacement nest boxes will be sited in appropriate habitat as near as possible to the locations of the nest boxes to be removed.
- Any loss of wet grassland habitat will be re-instated following development works.
- Where the development passes through open fields within the listed locations during the period where an effect may occur, a nesting bird check would first need to be carried out by an ecologist to establish whether ground nesting birds such as lapwing and skylark are nesting within that location. If active bird nests are located, the nest would be marked and all potentially disturbing works within at least 20m of the nest location would be stopped until the active nest had been vacated. Prior to works in the area commencing a further nesting bird survey would be required to establish that no active bird nests were present within the area.
- Barn owls are protected under Schedule 1 of the WCA 1981 and may breed at any time of year. Any works proposed to be undertaken within 50m of a known barn owl box will require inspection of the box for signs of current nesting activity by a licenced barn owl surveyor a maximum of 24hrs prior to works commencing. Should barn owl be found to be nesting, no works will take place within a minimum disturbance buffer distance of 50m surrounding the nest location while the nest is active.
- Cetti’s warbler are protected under Schedule 1 of the WCA 1981. Any removal of dense vegetation such as reedbed adjacent to, or within 50m of a water course in the detailed locations will require a nesting bird check for Cetti’s warbler a maximum of 24hrs prior to works taking place. If Cetti’s warbler are suspected to be nesting, a licenced ecologist may be required to check the nest directly. If Cetti’s warblers are established to be breeding, a minimum standoff of 20m will be applied to the nest location. This disturbance buffer may be increased at the discretion of the licenced ecologist depending on the proposed works and the habitats present.
- Kingfisher are protected under Schedule 1 of the Wildlife and Countryside Act 1981 and so are protected from disturbance during the breeding season. A standoff of at least 5m will be applied to all watercourses. This will be increase to 9m in any SSSI. Any works within 9m of a watercourse in the detailed locations will first require a kingfisher survey to be undertaken along the proposed watercourse by an ecologist. If kingfisher are suspected of currently nesting, a further survey by a licenced ecologist would be required a maximum of 24hrs prior to works taking place to establish whether the kingfisher nest is active.
- If kingfisher are established to be breeding, a minimum standoff of 20m will be applied to the nest location. This disturbance buffer may be increased at the discretion of the licenced ecologist depending on the proposed works and the habitats present.
- Common crossbill are protected under Schedule 1 of the WCA 1981 and may breed at any time of year. If any tree removal is required from the location where common crossbill are likely to breed (Any woodland between the Chummock Wood and Mogg’s Wood, near to Cadbury Camp Lane) a nesting bird check for common crossbill will be required of the trees a maximum of 24hrs prior to works taking place. If common crossbill are suspected to be nesting, a licenced ecologist may be required to check the nest directly. If common crossbill are established to be breeding, a minimum standoff of 20m will be applied to the nest

location. This disturbance buffer may be increased at the discretion of the licenced ecologist depending on the proposed works and the habitats present.

- If any sections of bare ground of more than 0.5ha are left undisturbed (more than 50m from an active working area) for more than 1 week during the breeding season, the area should be checked for any opportunistic nesting bird species by an ecologist. If nesting birds are found, measures appropriate to the species, location and proposed works will be implemented as advised by the ecologist to ensure nests are not destroyed or disturbed while active.
- If Option B is selected, construction works within 250m of the Pools at Portbury Wharf Nature Reserve should avoid the winter period (October to March) where possible. Works in this area should avoid the months of February and March as wintering birds are particularly vulnerable during this period.

7.3 Proposals to Reduce Collision Risk

7.3.1 The majority of studies agree that the earth wire is the component of an overhead line that poses the greatest collision risk in both lower voltage and higher voltage overhead lines (Scott et al., 1972; Faanes, 1987; Bevanger, 1994; Jenkins, 2010; APLIC, 2012). This is likely due to earth wires being smaller in diameter than the conductors. Furthermore, some overhead lines have twin, triple or quadruple ‘bundles’ of conductors on each arm separated by spacers, which are also more visible than the earth wire which is always a single wire . These factors are likely to make the earth wire less visible to birds than the conductors. The earth wire is also usually located above the conductors. The visibility of the conductors allows birds in flight to take avoidance action to prevent potential collision. However, as birds will often increase their flight height in taking avoidance action, their potential risk of colliding with the earth wire is increased. It has even been suggested that another possible reason for a higher collision rate associated with the earth wire is due to the possibility that birds can detect the current passing through the conductors (Donald, 1992).

7.3.2 To reduce the overall risk of bird collisions with overhead lines, the earth wire is therefore usually targeted by measures to increase its visibility to birds in flight. In a review of published studies to date, Jenkins (2010) found that the overall findings were that any form of marker that thickens the appearance of the line by at least 20 cm, over a length of at least 10–20 cm, placed with sufficient regularity (at least every 5–10 m) on either the earth wires (preferably) or the conductors, is likely to lower general collision rates by 50–80%.

7.3.3 A large number of studies also state that potential ‘fly-ways’ (areas where bird movements may be concentrated) should be identified to target any measures such as installing bird diverters to reduce collision risk (Faanes, 1987; APLIC, 2012, Barrientos et al., 2012).

7.3.4 From the findings of the largest wire marking study undertaken to date, Barrientos et al (2012) found that wire marking using spiral diverters effectively reduced avian collision risk. It was also recommended in this study that mortality hot-spots should be identified, as taking into account the economic cost of marking, it is likely more useful to attach flight diverters to these hot-spots rather than to do it to whole sections of power line.

7.3.5 The findings of the collision risk assessment carried out for the Hinkley Point C Connection Project concluded that the overall collision risk associated with the proposed overhead line will be sufficiently low to not significantly affect the population of any bird species. Furthermore, the new overhead line may be more visible to birds than the existing 132kV overhead line (which will be removed) due to the thicker earth wire, the double configuration of conductors which are also thicker and the presence of separators along the conductors. However, given the opportunities that come with replacing the existing overhead line, National Grid propose enhancement of current conditions by installing bird diverters at key locations along the new overhead line during its construction. Thus making the new overhead line even more visible to birds.

Identifying Potential Flyways

7.3.6 The primary area of interest along the proposed Hinkley Point C Connection (HPCC) route in terms of potential for bird movements lies between the southern end of the line (west of Bawdrip), and the Mendips in the north. This section lies between the Somerset Levels and Moors SPA in the east and the Severn Estuary SPA in the west. If local movements of birds between these two SPAs were to cross the proposed overhead line at any point, it would be over this section of overhead line.

7.3.7 It has long been known that local and migratory movements of many bird species are influenced by topographic features (e.g. Welty, 1962, In: Faanes, 1987). Prominent topographic features such as rivers and other large watercourses, as well as ridges, may be used as flight corridors – areas that birds tend to move along during local and migratory movements (Thompson, 1978, Faanes, 1987, Bevanger, 1994, APLIC, 2012). For watercourses the flight lines may not be limited to the river itself, but to the river valley (Scott et al., 1972). More than 53% of bird collision mortality near to a lake in the US occurred at spans that crossed a drainage watercourse leading to the lake (Faanes, 1987).

7.3.8 From studying movements of bald eagle in the US, Faanes (1987) stated that the greatest potential for collisions with power lines exists in the mid span area where power lines cross open expanses of river (Jackson et al. 1982).

7.3.9 In respect of the HPCC, between Bawdrip and the Mendips, other than the three main watercourses that cross this area (the King's Sedgemoor Drain, the River Huntspill and the River Brue), there are few topographical features that are likely to direct bird movement These three rivers also connect the Somerset Levels and Moors SPA in the east directly with the Severn Estuary SPA in the west at Bridgwater Bay. It is also possible that the Polden Hills (including the section at Puriton) or the Mendips, act as visual cues for birds in flight.

Hinkley Point C Connection Project Vantage Point Survey 2009 – 2011 Findings

7.3.10 The findings of the vantage point surveys undertaken for the Hinkley Point C Connection project suggest that, for wildfowl at least, the majority of flight lines followed major water courses. Although many of the birds observed during the surveys flew directly over watercourses, others followed them at a distance of up to 250m and occasionally up to 500m.

7.3.11 The trends for wader species, such as lapwing, were less clear. Although some lapwing did appear to follow major watercourses, the majority of flight lines did not. It is likely, however, that many of the lapwing flights that did not follow water courses were short distance feeding flights. The trend was most clear for birds observed making long distance flights, e.g. of 2km or more in a continuous orientation, suggesting that for longer distance movements lapwing did follow the larger water courses. Very few flight lines were observed to the north of the King's Sedgemoor Drain, where the ground rises to Knowle Hill (at Puriton).

7.3.12 The interpretation of flight line activity may be partly biased as vantage points located on the banks of watercourses are to some degree more likely to record movements at the watercourses due to the close proximity to the surveyor. Although vantage points were located close to watercourses, flight lines could still be recorded up to 2km from the vantage points, reducing the potential bias towards flight lines near to watercourses.

7.3.13 It is possible that the three major water courses (King’s Sedgemoor Drain, Huntspill River and River Brue) that cross the Somerset plain in a direct route between the nearest parts of the Somerset Levels and Moors SPA and the Severn Estuary SPA are used as flight corridors by waterbirds moving between these locations. It is possible that birds may use these rivers purely as a visual tool for migration, and fly within a distance of them via which visual contact may be kept. It is also possible that birds use the Puriton Ridge as a visual cue to navigate as this ridge lies parallel with the rivers and the shortest route between the two SPAs.

7.3.14 Many studies have also highlighted that collision risk with overhead lines is greatly increased where the overhead line is located close to areas used by high concentrations of waterbirds (e.g. roosting or feeding sites). This is due to waterbirds taking a certain distance from their take-off point to gain sufficient height to avoid collision. Faanes (1987) found that the number of waterbird collisions reduced dramatically more than 400m from a location highly used by waterbirds. This suggests that 400m is a sufficient distance from high usage areas to allow waterbirds to gain sufficient height to not be at increased risk of collision with an overhead line. One study found significant reductions in bird collisions further than 60m from an area used by large numbers of waterbirds, whereas no bird collisions were found more than 500m from the water’s edge (Quinn et al. 2011).

7.3.15 Due to the low suitability of habitat along the proposed route for waterbirds it is unlikely that significant concentrations of waterbirds will be present within at least 250m of the proposed route. This is supported by survey work undertaken to date. However, waterbirds such as tufted duck and teal may be present in greater numbers on the watercourses, potentially where they pass underneath the proposed overhead line corridor. At these locations flight movements into and out of the watercourses could lead to a greater risk of collision.

Proposed location of overhead line marking devices at HPCC

7.3.16 Given that birds are known to use watercourses to navigate and that waterbirds are known to use watercourses to forage, combined with the lack of other topographical features, the King’s Sedgemoor Drain, Huntspill River and River Brue would be the most valuable locations to install overhead line marking devices to enhance current conditions.

7.3.17 The line marking device proposed by National Grid is a variation of the Swan-Flight Diverter (SFD) which comprises a spiral with its greatest diameter at the centre of the device. They are available in a variety of colours. These can be spaced at distances from 5 to 30m. A number of studies show large reductions in collision with use of this design (APLIC, 2012). This type of line marking device will be referred to as a ‘bird diverter’.

7.3.18 In addition to installing bird diverters on those conductors directly spanning the three watercourses, marking the overhead line at least 60m either side of a watercourse could also enhance conditions for birds during take-off and landing in the watercourses.

7.3.19 The proposed locations of the lengths of overhead line to be marked with bird diverters are shown in Figure 8.27 and described below:

King's Sedgemoor Drain

7.3.20 The section to be marked extends approximately 50m to the north of the King's Sedgemoor Drain and 500m to the south of the watercourse and includes two spans of overhead line. This takes into account the general absence of bird movements observed to the north. These observations are likely to be a channelling effect of both the Drain and Puriton Ridge to the north. This marked section would incorporate the great majority of flight lines that were observed crossing the overhead line from the vantage point survey work.

Huntspill River

7.3.21 The proposed section to be marked includes three spans of overhead line, extending approximately 500m either side of the Huntspill River. This marked section would incorporate the great majority of wader/wildfowl flight lines that were observed to cross the proposed overhead line location from the nearest vantage point location during survey work.

River Brue

7.3.22 The proposed section to be marked includes three spans of overhead line, extending approximately 500m either side of the River Brue. This takes into account movements of birds that could potentially 'cut the corner' between the Cripps River in the east and the River Brue or vice versa.

Other considered locations

River Avon

7.3.23 Although the route passes directly over the River Avon in a location where it forms part of the Severn Estuary SPA/Ramsar, it is considered unlikely that birds will be susceptible to collision with an overhead line at this location. This is because the proposed route closely parallels the M5 motorway bridge within 250m of this location. The multiple stimuli provided by a lit, noisy motorway bridge is likely to already lead to a significant avoidance reaction in waterbird flight lines, such that the introduction of the new overhead power line at this location would be into an environment in which flying birds are already alert and/or avoiding. It should also be noted that there is no indication that there is any significant collision mortality associated with the existing 132kV overhead line crossing of the river at this location. Locating an overhead line in the vicinity of tall bridges, and other man-made structures may also reduce the collision risk, as well as locating the line along main roads where birds usually increase their flying height (Kiessling et al., 2003). It has been suggested that birds increase their flight height at night time to reduce risk of collision with natural as well as man-made features (APLIC, 2012).

7.3.24 Birds recorded during the 2009-2010 vantage point survey were observed to either fly low along the River Avon below the bridge or high above the bridge, thus placing birds in flight at this location outside of any potential collision risk zone.

7.3.25 It is therefore considered that bird diverters will not be required on the proposed line crossing the River Avon.

7.4 Proposed Future Monitoring Work

7.4.1 In addition to the use of the T-pylon and the fitting of bird diverters it is proposed that monitoring work is carried out following installation of the 400kV overhead line. The monitoring work will focus on the section of the route where radar tracks were likely to have comprised duck species, as revealed by flight speed analysis. This section includes the section of line between the River Brue in the south and Mark in the north.

7.4.2 The monitoring will be carried out over three complete winter periods (October to March). The first winter period of monitoring will commence immediately following completion of construction of the southern section of overhead line (south of the undergrounded section of line at the Mendip Hills).

7.4.3 The timing of the commencement of the second period of monitoring will be determined upon the findings of the first year. If the first year of monitoring indicates that potentially significant numbers of collisions are occurring i.e. at numbers that are greater than those predicted or approaching the agreed threshold levels, then the second year of monitoring would be undertaken the following winter. This would enable relatively rapid confirmation of the significance of the impact to be determined and, then subsequently, for any contingency measures to then be implemented.

7.4.4 If however, there is no indication that bird collision mortality is occurring at predicted levels or approaching defined threshold, the second winter period of monitoring could be postponed for a further winter period and be carried out during the third winter period after the completion of construction of the southern section of overhead line. If there is considered to be a valid reason why the second winter period of monitoring should be postponed further (such as any known future habitat creation works) then the timing of this final year of monitoring will be discussed and agreed with Natural England and the RSPB.

7.4.5 If after two consecutive winter periods of monitoring there remains significant uncertainty as to whether collision mortality is significant (i.e. in the context of agreed thresholds), the third winter season of monitoring work would immediately follow the second winter season. This would provide three straight winter periods of monitoring. As above, in the situation where the second period revealed that collision losses were not significant, the third period of monitoring could also be postponed until a later period.

Survey area

7.4.6 The monitoring work will focus on the section of the route where radar tracks identified flight speeds above 20 metres per second, as revealed by flight speed analysis. These areas include a section of the route approximately 500m either side of the River Brue and a section of the route from Mark Causeway to 500m south of Southwick Road. As the section of the route 500m either side of the River Brue will have flight diverters fitted, it is proposed that monitoring work will not target this section.

7.4.7 Additional areas will also be monitored despite the absence of radar tracks with fast flight speeds due to their proximity to areas where flight speeds above 20m/s were recorded. These are:

- 0.6km between the River Brue diverter locations and the Mark to Southwick Road monitoring area
- 1km between the Huntspill and the River Brue diverter locations

7.4.8 A control site will also be included within the monitoring study. This section will comprise a 2.6km stretch between Woolavington Road and the Huntspill bird diverter locations. This area does not records of radar track speeds above 20 m/s and is not adjacent to any such areas, but it does lie between the Somerset Levels and Moors and the Severn Estuary. This is therefore a suitable control site.

7.4.9 In summary, three stretches of the overhead line will be monitored (see Figure 8.27) These are:

- Section 1 - Woolavington Road to the Huntspill Split (1.95km -control site);
- Section 2 – Between the River Huntspill and the River Brue bird diverter locations (1km);
- Section 3 – River Brue bird diverter locations to Mark Causeway (2.3km).

Survey method

7.4.10 The monitoring survey will commence at the beginning of October and will continue until the end of March to take into account the full winter period when species of concern associated with the Somerset Levels and Moors SPA and the Severn Estuary SPA will be present in the wider area.

7.4.11 The monitoring study will use a corpse searching method. A surveyor will walk the length of the overhead line within the search areas, walking a zigzag route to search land 150m either side of the overhead line. This is a wide search corridor, being double that used by Heijnis, 1976. This 300m wide search corridor takes into account the high flight speed exhibited by target species such as teal and wigeon.

7.4.12 This wide search corridor would also reduce any crippling loss bias. This bias occurs when birds strike the overhead line but fall outside the survey area, or are injured but able to move far enough outside of the survey area before they die to be not detected by surveyors. Smaller birds are likely to have higher crippling loss bias than larger birds (APLIC, 2012). The sizes of target species for this study are moderate to large and therefore crippling loss bias is not likely to be a major issue.

Survey frequency

7.4.13 Ponce et al., 2009 found that the accumulated number of birds removed by scavengers each day increase logarithmically, with 32% removed over the first two day period, but only 1.5% removed on a daily basis by day 28. They suggested that fortnightly to monthly searches were sufficient to detect larger bird corpses, but not smaller birds. Erickson et al. 2005 (In APLIC, 2012) cites a number of case studies with average carcass persistence times ranging from less than one to 28 days. In other cases it can be longer (Brown and Drewien 1995).

7.4.14 The target species for this study are duck species associated with the Somerset Levels and Moors SPA and/or the Severn Estuary SPA. The smallest of these species is teal for which the mean weight is 330g (BTO, 2013). On the basis that fortnightly to monthly checks for large birds are sufficient and teal (the smallest of our target species) is a medium sized bird, weekly checks are a reasonable search frequency.

7.4.15 All surveys visits will commence within 1 hour after dawn. The study visits will cover a range of weather conditions, to take into account the effect that this may have on bird collision. A locally based surveyor will be used so that they can respond quickly to differing weather conditions. At least one of the survey visits each month would aim to carry out the search following a night time where poor visibility weather conditions have occurred (e.g. fog).

Information recorded

7.4.16 During every site visit the following information will be recorded:

- Visibility;
- Wind speed;
- Wind direction;
- Weather conditions during night time prior to survey;
- Bird species and abundance within the study area.

7.4.17 During the study, for any bird carcass encountered, the following information will be noted (in line with guidance provided in APLIC, 2012):

- GPS location of the carcass in proximity to the power line;
- Species;
- Sex;
- Age: adult or juvenile;
- Date or approximate time of death;
- Probable cause of death;
- Physical injuries and conditions (e.g. broken bones, lacerations, abrasions, blood, discolorations, gunshot wounds, decomposition, feather spots, feeding by scavengers). This will include photographic evidence.

Trigger to fit additional bird diverters

7.4.18 A trigger would be determined for the monitoring work that, if reached, would determine the need for further flight diverters to be installed to reduce collision risk. This trigger would be developed and agreed with Natural England and the RSPB. Findings of the monitoring study would be discussed with Natural England and the RSPB throughout the survey.

Hallen Marsh

7.4.19 It is possible that if land is enhanced in the future at Hallen Marsh, or elsewhere within the Avonmouth and Kingsweston Levels as proposed within the SADMP, then daily feeding flights of bird species associated with the Severn Estuary SPA/Ramsar could potentially increase. This could lead to an increase in collision risk with the proposed 400kV overhead line where it follows the M49 motorway. Likewise if the former Berwick Landfill Site to the east of the M49 motorway and north east of the proposed development is selected to be enhanced, this could potentially lead to an increased movement of birds crossing the eastern edge of the proposed 400kV line where it follows Severn Road.

7.4.20 It is currently not possible to predict the collision mortality rates that would result from mitigation works within the Severnside and Avonmouth Area to offset effects of future proposed development within the area. This is due to a combination of the following factors:

- Unknown when mitigation works will take place;
- Unknown extent of area that will be enhanced;
- Unknown exact locations of areas that will be enhanced;

- Unknown number of birds and species of birds that will regularly use the enhanced areas.

7.4.21 As the nature of future collision risk associated with the proposed 400kV overhead line where it passes through Hallen Marsh is uncertain and unquantifiable, it is proposed that National Grid will provide funds to Bristol City Council (secured via a s106 agreement) to undertake bird collision monitoring. The funds will be sufficient to cover two years of bird monitoring of the overhead line between the railway line along the south of Hallen Marsh and the Severn Road in the north. The funds will be calculated using the monitoring method set out for the section of overhead line south of Mark.

7.4.22 Providing funds to Bristol City Council for this monitoring is the most suitable approach. Unlike the monitoring method south of Mark, there would be no benefit in National Grid undertaking monitoring as soon as the pylons were installed. The timeframe for habitat enhancement works are unknown as they are reliant on third party funds, related to potential future planning permissions in the Avonmouth/Severnside area. As the Local Planning Authority for this area (and the land owner of Hallen Marsh) Bristol City Council will be best placed to determine when monitoring should be undertaken.

7.4.23 Providing funds to monitor two winters takes account of habitat establishment periods and related changing use by waders and wildfowl.

7.4.24 National Grid acknowledges that Hallen Marsh habitat enhancement works may be protracted and piecemeal, as they are reliant on securing monies via s106 agreements for development elsewhere in Avonmouth/Severnside. Therefore, it is not possible to predict the period over which bird use of Hallen Marsh might significantly change. It is expected that additional funds for bird monitoring at Hallen Marsh can reasonably be secured alongside any s106 funds for habitat enhancement (as part of any off-setting agreements relating to development impacts on the SPA/Ramsar).

7.4.25 If any monitoring (whether funded by National Grid or other sources) identifies a bird collision issue then National Grid would revert to the NGET Bird Diverter Protocol. This states that where “evidence suggests that installation of diverters would significantly reduce collision risk which affects statutory interests, National Grid will seek to install diverters”.

7.4.26 Unlike the monitoring south of Mark, it is not appropriate at this stage to agree bird mortality thresholds for the fitting of bird diverters at Hallen Marsh. The unknown timescales for enhancement works at Hallen Marsh would mean any thresholds agreed now would be out of date by the time monitoring is likely to commence. National Grid will work with Natural England to agree thresholds as and when monitoring is implemented

7.5 Furthering Knowledge

Introduction

7.5.1 The radar studies undertaken in respect of the two wind farm applications to the west of the Somerset Levels indicate that dusk / dawn bird movements occur between the Somerset Levels and the Severn Estuary. However, the radar studies do not provide an indication of the species involved, specific destinations / points of departure or flight height of the birds involved.

7.5.2 Contact with the British Trust for Ornithology (BTO) has been made to discuss the feasibility of undertaking a tracking study using small, lightweight GPS devices that can be attached to birds. Such devices could be used to track and determine the nature of any movements undertaken by birds between the Somerset Levels and the Severn Estuary.

7.5.3 GPS mini-trackers weighing a few grams have been developed which can be attached to birds using a harness. Such tracking devices have already been used to track species such as black-tailed godwit and Caspian tern. These trackers record bird location and direction. They also record altitude which can be used to determine flight height of the bird. Acceleration and temperature is also recorded.

7.5.4 Heavier older versions of the device have previously been used to monitor gulls and skuas by the BTO. The BTO has stated that the new devices will be of sufficiently low weight to be used on wigeon and possibly teal (the weight of the device needs to be within 3% of the body mass). The accelerometer within the device has been redesigned with an adjustable sample rate enabling higher resolution acceleration sampling (20 or 50 samples per second). The ability to collect such a high sample rate is vital when studying smaller species with faster movements, like birds with high wing beat frequencies.

7.5.5 Current GPS devices are relatively expensive and studies inclusive of costs to trap birds, fit devices, download tracking data and undertake analysis of the data can be expensive. The BTO are undertaking trials in the summer of 2014 of new GPS devices that offer the potential for significant cost savings in comparison with the existing devices. If the trials are successful then these could become available for use relatively soon afterwards.

Proposed study

7.5.6 To increase current knowledge of how waterfowl associated with the Somerset Levels and Moors SPA/Ramsar and the Severn Estuary SPA/Ramsar use these sites and the surrounding area, it is proposed that a GPS tagging study could be undertaken.

7.5.7 The main species involved in potential movements between the Somerset Levels and Moors SPA and the Severn Estuary SPA are wigeon and teal. Wigeon and potentially teal could be fitted with GPS devices and their movements tracked over winter. The exact period would depend on the battery life of the devices available at the time. Funding would be provided to the BTO by National Grid to carry out the research.

7.5.8 Birds would be trapped in order to fit the GPS devices. Initial field work would be undertaken to determine suitable trapping locations. This initial work could also help target birds that are part of the SPA-based populations potentially moving between the sites. Some data from the radar studies is available to indicate the likely origin of duck species undertaking the movements and initial field work would be concentrated at these locations.

7.5.9 As these devices have not been fitted to wigeon and teal before, for licensing reasons any potential project is likely to be limited to a small sample size. However, based on initial results it might be possible to increase the overall sample size.

7.5.10 Specific details of such a project have yet to be worked up, but it is likely that it would involve the following components:

- Consultation with nature reserve managers and other interested parties to establish the most appropriate location(s) for field observations and potential trapping locations;

- Trapping of birds and fitting of GPS devices (under licence from Natural England);
- Monitoring of bird movements either via a static radio base station or potentially the mobile phone network. The duration of the monitoring would depend on the device used, but could potentially extend for several months or longer;
- Analysis of data and reporting.

7.5.11 The information gathered from this study could provide valuable data about how these species use the two SPAs, the flight routes undertaken and flight height of these species across land. In turn, this data could provide additional information on the potential level of collision risk that birds undertaking these movements may be subject to. This information could also be analysed against a range of geographical features to provide information highly useful not just for the Hinkley Point C Connection Project but for other projects where data on the flight behaviour of these species may be of relevance.

7.5.12 It is considered that such a study could provide valuable and interesting information to help determine the nature of any functional links for wintering migratory waterfowl between the Somerset Levels and Moors SPA/Ramsar and the Severn Estuary SPA/Ramsar sites.

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APPENDIX A: Literature Review

REVIEW OF LITERATURE ON BIRD STRIKE COLLISION WITH OVERHEAD LINES WITH SOME REFERENCE TO WIND TURBINES

Introduction

1.1 There is a considerable amount of recent research undertaken in the UK into the bird collisions and wind farms, but there are few studies related to overhead lines. However, collisions with overhead lines have been studied in the USA for at least 120 years. In a literature search of 468 references from 1876 to 1992 on avian collision and electrocution, the California Energy Commission (CEC) published 121 annotated references on overhead line impacts and 50 references on other overhead wires.

1.2 This literature review focuses on the risk of collision, rather than the risk of electrocution which is unlikely to occur in the UK due to the design of overhead lines and towers.

1.3 A number of studies of the collision impacts of overhead lines on birds refer to overhead lines as “power lines”. Both terms will be used interchangeably throughout this literature review.

1.4 Since the 1990s much information has been collected concerning the movements of birds within the UK to provide baseline information for EIAs. This has also led to a considerable amount of research into the collision risks for birds arising from wind farms. There are fewer examples of overhead line collision studies being undertaken in the UK. Notwithstanding, studies have been undertaken in the UK specifically considering bird mortality due to overhead line collision.

<u>Problems associated with existing bird collision research</u>

1.5 There are considerable problems in carrying out studies of bird collisions at overhead lines and wind farms, in particular ensuring that a high proportion of any casualties are detected and that account is taken for possible carcase removal by scavengers. At Blyth wind farm comprehensive monitoring of bird mortality was undertaken and an estimated 55% of carcasses were recorded, where as in a similar study at Zeebrugge only 10% of carcasses were found leading to difficulties estimating bird mortality rates (Percival, 2003).

1.6 Another study of bird mortality associated again with the Blyth wind farm (Still *et al.,* 1995; in Gill, Townsley & Mudge, 1996) involved five sets of overhead lines which cross an estuary 2km to the north of the wind farm. During this study searches were undertaken for collision victims within an area of 3.5 ha. Twenty one collision victims were found but unquantified scavenging of the carcasses was detected and survey effort was not defined. Attempts to obtain the original article by Still *et al.* have proven unsuccessful therefore it is not possible to confirm which species were recovered at the Blyth overhead line site.

<u>Vulnerability of different species</u>

1.7 In a review of the influence of biological, topographical and meteorological aspects upon risk of overhead line collisions a study demonstrated the vulnerability of 'poor' flyers, some raptors and other 'fast strong' flyers (Bevanger, 1995; in Gill *et al.,* 1996). Birds which fly regularly between roosting sites and feeding sites, undertake regular local migratory movements, fly in flocks, or fly during low light conditions are also vulnerable.

1.8 Birds of large body mass in relation to wing surface area (those with 'high wing loading', including ducks, geese, swans and grouse) are generally 'poor flyers' and relatively poor at manoeuvring in the air. This has been confirmed by 'hit wire' indices developed from recoveries of ringed birds in the UK (Rose & Baillie, 1989). The study indicated that mute swan and Canada goose, as well as birds of prey including merlin, peregrine, buzzard and red kite were species most vulnerable to collision with overhead lines. Passerines (songbirds) have low vulnerability to collision with overhead lines although Hirundines (swifts and swallows) are at higher risk due to their habit of congregating on wires after breeding and during migration.

<u>Overhead line collision impact studies</u>

1.9 A study in Italy reviewed data from 11 mortality censuses and compiled a list of species found among powerline victims, based on over 1,300 reported casualties (from overhead lines of various voltages, heights and types). 95 species were affected with groups including raptors, herons and other large birds being highly affected. Passerines were the least affected (Rubolini *et al*., 2005).

1.10 An investigation of 128 swan mortalities at the Ouse Washes undertaken over six winters between 1969 and 1975 (Owen & Cadbury, 1975) found that 38% (49 swans) were due to collision with power lines (The Ouse Washes was classified as a SPA in March 1993 for its internationally important bird populations which include whooper swan, Bewick swan and mute swan among others). Swan species affected by power line collision included 17 mute swans, 2 whooper swans, 28 Bewick swans and 2 unidentified swans. Owen and Cadbury mention that one of the power lines which crossed the Ouse Washes is a 400 kV transmission line although a lower voltage line was removed in 1970 and there are at least six other overhead lines which cross the Washes. Multiple collisions with power lines by Bewick swans were recorded on four occasions. It was hypothesed that the swans were more vulnerable to collision after feeding in fields encumbered by soil adhering to their feet. Other causes of swan mortality being shot (8%), lead poisoning (29%), collision with other structures (2%) and oiling (2%).On average about 3% of the mute swan and whooper swan populations and 1.4% of the Bewick swan population at the Ouse Washes died each winter (Owen and Cadbury, 1975).

1.11 The study undertaken by Owen and Cadbury (1975) does not clearly specify which of the various types of overhead line present in the locality are responsible for swan collisions at the Ouse Washes. The current reserves manager at Welney Wetland and Wildfowl Trust (WWT), which forms the north end of the Ouse Washes where most of the migratory swans are found, has been contacted regarding this matter. The reserve manager has advised that three wire 132kV trident lines cause the majority of whooper swan deaths at Welney WWT although a small number of whooper swans do die as a result of collision with larger tower based overhead lines. This infers that swan collision victims recorded during Owen and Cadbury's study were also mostly affected by 132kV trident lines rather than the larger 400kV overhead lines.

1.12 Another study attributed 11% of 119 raptor deaths recorded in sample sites at Altamont (USA) to collisions with wires including overhead lines (Orloff & Flannery, 1992; in Gill *et a*l., 1996). The voltages and heights of the overhead lines are not stated in the publication which refers to this study.

1.13 A six year study (1989 to 1995) involved regular patrols of four sections of power lines (including a mixture of 22kV – pole height 8-10 metres, 66kV – pole height 10-12 metres and 300kV – pole height 20-30 metres) in a sub-alpine area of southern Norway. The study entailed patrolling 5km of 300 kV, 2.5km of 66kV and 3.5km of 22kV overhead lines regularly throughout the six year period until a combined total of 4,000km of overhead line had been searched. The searches recovered 399 dead birds and bird remains identified as collision victims (Bevanger & Broseth, 2004). 80% of the birds found (318 birds) were ptarmigan (a 'poor flyer' species), the majority of which were found along the smaller 22kV and 66kV overhead lines. The study area was c.50km^2 in size and half of this area was typical ptarmigan habitat. The size of the ptarmigan population was estimated by recording flushed birds during searches and between 0 and 9 observations were made per 10 km per patrol were recorded. On average the minimum annual ptargiman collision rate was 5.3 birds per km power line per year. The only parameter with a predictable effect on probability of ptarmigan collisions was the height of the trees, as collision spots tended to be in places with low trees.

1.14 In the same six year study by Bevanger and Broseth (2004) at least 23 other species were identified as collision victims including most other types of birds including ducks (mallard), raptors (kestrel), waders (lapwing and golden plover) and passerines. However, the migrant fieldfare was the only species other than ptarmigan that had noticeable collision mortality (6% of the victims). The fieldfare was abundant in the study area during the migration periods however not enough recoveries were made of fieldfare or any other species to confirm if these species were particularly vulnerable to a particular type of overhead line.

1.15 Gulls are highly manoeuvrable in flight and are likely to avoid overhead line collisions in most circumstances apart from low light conditions during poor weather. However a recent review of overhead line collision studies identified gulls as tending to be regionally or locally susceptible to high casualties, although not to a degree that there is a significant impact on the overall species population (Haas et al., 2005).

1.16 Studies in South Africa indicate that instances of collisions with power lines (a range of voltages and heights) are mainly limited to bustards and various types of waterbirds including geese, ducks and waders, flamingos, storks and cranes (van Rooyen, 2001).

Wind farm collision impact studies

1.17 Studies of mortalities at Oosterbierum wind farm concerned an experimental site consisting of 18 x 300 kW turbines each with a 35m tower height and 30m rotor diameter. The findings of the study indicated that passerines were most affected, with waders next most affected and lower proportions of, ducks and gulls (Winkelman, 1992 in Gill *et al*., 1996). Most collision victims were found during the autumn or spring or after nights with poor visibility.

1.18 The habit of some species of flying in line formation may make these groups more susceptible to collision with wind farms as the leading bird negotiates through a group of turbines but followers, particularly rear birds, are more vulnerable. There is some evidence from observations of eiders at Blyth wind farm that rear birds flew critically closer to the sweep of the turbine rotors than leading birds (Still *et al.,* 1995; in Gill *et al*., 1996). This increase in collision risk associated with flocking birds may also apply to overhead lines.

1.19 Hotker *et al*., (2006) noted that species or species groups which are less wary of wind farms are more likely to be victims of collisions with turbines than species which avoid or fly around wind farms by a wide margin. Some birds of prey tend to fly straight through wind farms whilst geese and waders tend to fly around wind farms. Therefore birds of prey are regular collision victims in comparison with geese and waders which were found less regularly as collision victims.

Evidence for habituation

1.20 A number of research studies have considered the possible relationship between collision risk, habituation and learning capacity (Orloff and Flannery, 1992; in Gill *et al.,* 1996). Habituation, particularly of resident gulls, was described by Winkelman (1992; in Gill *et al*., 1996).

Conclusions: Vulnerability of different species

Most studies into the vulnerability of different species to aerial collision agree that wildfowl, waders, grouse and other large birds (e.g. herons) as well as some raptors are most vulnerable.

Ducks, geese, swans and grouse are vulnerable since they are ‘poor’ flyers with a large body mass in relation to wing surface area. Some waders and raptors are vulnerable because they tend to be fast flyers and these tend to engage in aerial courtship displays. Other raptors and some other large birds such as grey heron and cormorant are vulnerable because they tend to fly straight through areas which have aerial obstacles such as overhead lines and wind farms.

Birds which fly regularly between feeding sites and roosting sites, undertake regular local migratory movements, fly in flocks, or fly during low light conditions are also vulnerable.

Some species are more susceptible to aerial obstacles at particular heights, e.g. ptarmigan are more susceptible to collisions with lower overhead lines (8-12m).

Caution should be employed when interpreting the findings of some avian collision studies. Particularly those undertaken in Europe and the USA focussing on raptors which tend to be affected by electrocution (perching birds) as well as collision.

Determining avoidance rates

1.21 Relatively few studies have attempted to calculate collision avoidance rates for specific species since mortality numbers recorded have not taken account of the number of birds which were able to successfully navigate across the hazard during a given time period.

Factors which influence avoidance behaviour

1.22 Factors which can influence collision frequency include the age of the bird, weather factors such as strong winds or decreased visibility due to low cloud or fog, terrain characteristics and overhead line routeing (lines that cross the flight paths of birds), overhead line specification (larger structures can sometimes be more hazardous) and human activity which may cause birds to panic.

1.23 Pendlebury (2006) describes a number of different factors which can influence wind turbine collision avoidance rates displayed by geese at different sites. Factors which could equally apply to overhead lines are described below:

- Topography of the site, which may affect flight lines and flight-heights used by the geese;
- Weather conditions, such as frequency of fog, low cloud or heavy rain;
- Numbers of geese using the site and the surrounding area (avoidance rates can be density dependent – Note: Pendlebury does not specify if a greater number of birds leaves to higher avoidance rates or vica versa);
- Proximity to geese roosting and feeding sites, which are likely to affect flight behaviour;
- Seasonality in site-use, for example, avoidance at a site used regularly across the winter may differ from migration periods when large numbers of geese may fly through the site over a relatively short period;
- The effects of habituation over time.

Collision avoidance rates for wildfowl and overhead lines

1.24 A number of collision rates for different overhead lines in various countries are presented in a review by the California Energy Commission (2002). Three of the studies concerned wildfowl collision rates estimated for sites near important wildfowl areas in Spain. The collision rates for birds flying at ground wire height or lower were 0.001% for a 10km 380kV line in Spain, 0.012% for a 380kV line and 0.002% for a 10km 220kV line. These findings strongly indicate that the avoidance rate for wildfowl in relation to overhead lines of various types is greater than 99.9%.

Collision avoidance rates for wildfowl and wind farms

1.25 One study of two wind farm sites in North America reported mortality rates to be zero although it is not stated what the size of the goose population was at these sites (Patterson 2006, in Pendlebury 2006).

1.26 The available studies on geese currently suggest that avoidance at wind farms is high. Several studies agree that insufficient data are available currently to estimate reliable values representative of all potential wind farm sites (Pendlebury, 2006). Previous guidance from SNH (Band *et al*., 2006) stated a precautionary avoidance of 95% although this is challenged by Pendlebury (2006) who calculated avoidance rates of 99% at three different sites and 96% at a fourth site. Other research at other existing wind farms indicates that avoidance rates typically well in excess of 99% were more accurate for geese species (Percival, 2000; in Lawrence Environmental Consultants, 2004).

1.27 In May 2013 SNH produced further guidance which explained that it is increasingly apparent that use of an avoidance rate of 99% in collision risk models did not reflect levels of mortality that were being detected at operational wind farms. The consequence of this was that using an avoidance rate of 99% in a collision risk model was likely to exaggerate mortality. Therefore SNH has revised their guidance and have proposed a new avoidance rate of 99.8% to reflect the improved evidence base available on goose collisions with operational turbines.

1.28 In a study at a major spring staging area in Gotland where 3,700 barnacle geese were feeding and roosting in close proximity to 69 wind turbines, no collisions were reported despite the geese regularly flying close to the turbines (Percival, 1998, in Lawrence Environmental Consultants, 2004).

1.29 The potential collision risk for whooper swans in relation to a proposed wind farm in Overgaard in Denmark was studied by Larsen and Clausen (2002). It was concluded that it seems likely that whooper swans will be fully capable of avoiding wind turbines during daylight and good visibility, as has been found with other species (Winkelman, 1992). Larsen and Clausen (2002) determined that whooper swans are particularly prone to collisions during evening flights, as these took place in poor light conditions whereas early morning flights took place in full daylight.

1.30 Recent research using radar has demonstrated the likely reason why waterfowl collision rates with wind turbines appear to be relatively low ((Dirksen *et al.*, 1998, Tulp *et al.,* 1999), in Lawrence Environmental Consultants, 2004). Flocks of various wintering diving duck species were tracked by radar whilst flying at night. On moonlit nights it was observed that the duck flocks frequently approached quite close to the wind turbines but then appeared to fly around the turbines prior to flying through the rotor blades indicating that the ducks were able to detect the turbines and avoid them. On darker nights without moonlight the ducks maintained a safer distance from the turbines indicating that the ducks were aware of the presence of the turbines thus completely avoiding the wind farm when visibility was limited.

1.31 A more recent study investigated whether long-lived geese (migratory geese; species not specified) and ducks (common eider) can detect and avoid a large offshore wind farm by tracking their diurnal migration patterns with radar (Desholm & Kahlert, 2005). It was found that the percentage of flocks entering the wind farm area decreased significantly (by a factor 4.5) from pre-construction to initial operation. At night, migrating flocks were more prone to enter the wind farm but counteracted the higher risk of collision in the dark by increasing their distance from individual turbines and flying in the corridors between turbines. Overall, less than 1% of the ducks and geese migrated close enough to the turbines to be at any risk of collision.

1.32 Hotker *et al.* (2006) explain that the phenomenon of migrating birds or birds flying between roosts and feeding areas adjusting their flight paths to avoid aerial structures is not uncommon. Some studies identify this behaviour as an impact on birds because the birds have to fly greater distances around obstacles. This avoidance behaviour included bird flocks altering flight direction or height, so that birds flew around or above wind farms. In some cases bird flocks turned around completely or broke formation at the sight of a wind farm. Many species display this behaviour although it is particularly common with geese although some birds, such as cormorant, grey heron, ducks, buzzard and kestrel were less willing to alter their flight behaviour.

1.33 It is difficult to be certain how comparable are bird collision rates for overhead lines and wind turbines since there are some obvious differences between each type of aerial structure. The most obvious difference is the movement of turbine blades and the static nature of overhead lines. A further difference is that overhead lines present a continuous horizontal obstacle between supports with vertical space above and below (including space between phases on conductors suspended from tower or pylon supports), whereas turbines have horizontal and vertical space between turbine supports and the blades' swept path. However both structures essentially form an aerial barrier which can affect birds flying at a range of different heights. It might be reasonable to infer that the movement associated with wind turbine blades makes them a greater hazard to flying birds because there is the possibility of birds being 'taken by surprise' and perceiving the risk after it is too late to undertake avoidance behaviour. However it can perhaps also be argued that the conductors associated with overhead lines, and particularly the earth wire, are more difficult to see than the wind turbine rotor blades which are often broader.

1.34 The collision avoidance rates presented in this literature review for overhead lines and wind turbines appear to suggest that wildfowl collision rates for wind farms are sometimes comparable with collision rates for overhead lines although in some studies wind farm collision avoidance rates can be lower, i.e. 96% compared to 99.9%. However this comparison should be treated with caution since the only wildfowl collision rates for overhead line presented in this literature review relate to three studies undertaken in Spain.

Collision avoidance rates for shorebirds

1.35 Whitfield (2007) calculated avoidance distances for three different wind farms in the USA for the American golden plover and *Charadrius* plovers. These avoidance rates were determined to be 99.63 to 99.78% at Buffalo Ridge, 99.6% to 99.97% at Foote Creek Rim, and similar results for the third wind farm. A worst case of 99.19% was also calculated for Foote Creek Rim. The similarity between the different avoidance rates derived from shorebirds gives an indication that they may be broadly applicable.

1.36 Shorebirds are frequently active at night and nocturnal behaviour can be different to diurnal behaviour (e.g. choice of roost and feeding sites). Whitfield (2007) argues that it is appropriate to argue that nocturnal activity of wintering shorebirds should be considered as a part of wind farm proposal EIAs. However Whitfield suggests that nocturnal collision risk should be taken in the context that the displacement of roosting birds evident from the distribution of roosting shorebirds during the daytime would also be repeated during the night time. Therefore collision risk at night time is no greater because the shorebirds will have become aware of the aerial obstacles during the daytime.

Collision avoidance rates for raptors

1.37 A study was undertaken at a site on the straits of Gibraltar to determine the level of collision mortality associated with a wind farm and an adjacent overhead line (Barrios & Rodriguez, 2004). Mortality caused by wind turbines was found to be greater than that caused by the overhead line. Collision mortality involved mostly resident species including griffon vultures, (0.15 individuals per turbine per year) and common kestrel (0.19 individuals per turbine per year). Mortalities were not associated with either structural attributes of wind farms or visibility. Vulture collisions were recorded mostly in the autumn and the winter and were aggregated on slopes which the griffon vultures were using for lift when soaring. Kestrel deaths occurred during their annual peak abundance in summer and were concentrated around one turbine located in favourable kestrel hunting habitat.

Conclusion: Collision avoidance rates

As well as the species concerned a number of other factors can influence collision rates including the weather, topography and possibly the effects of habituation.

Recorded wildfowl and waders overhead line avoidance rates are in excess of 99% and possibly even in excess of 99.9%.

Many studies agree that wind turbine avoidance rates by geese are high although several studies suggest that there is insufficient data to provide a reliable blanket avoidance rate which can be applied for all existing and proposed wind farms.

Recorded goose wind farm avoidance rates range from 96% to 99.9%, or even higher in some cases.

It is therefore suggested that the 95% precautionary avoidance rate is often quoted by some is not appropriate in all circumstances. The results of collision impact models tend to be greatly influenced by the avoidance rates applied to the models. Therefore it is inappropriate to use a 95% precautionary avoidance rate in all situations unless it can be demonstrated that there are other contributory factors influencing collision rates at a given site, such as regular low cloud causing poor visibility at time when the geese are flying.

SNH revised their guidance in May 2013 to state that an avoidance rate of 99.8% should be used with collision risk models when predicting collision mortality of wind farms on geese species.

Whooper swans are particularly vulnerable to aerial collision during low-level light conditions, such as during evening flights.

There is evidence to suggest that wildfowl (ducks, geese and possibly waders) are able to detect wind turbines on moonlit nights and will even avoid areas where wind turbines are present on darker nights.

The phenomenon of birds adjusting their flight lines to avoid aerial structures is not uncommon in wildfowl. This behaviour can have lead to increased energy consumption in some cases potentially leading to increased mortality due to fatigue. Cormorant, heron and some raptors do not tend to exhibit this behaviour.

Some studies indicate that the collision mortality associate with wind turbines tends to be higher than that associated with overhead lines.

It is difficult to be certain how comparable are bird collision rates for overhead lines and wind turbines. Both are aerial structures although wind turbine rotor blades are not static and overhead line conductors, particularly the earthwire, may be more difficult to see than rotor blades.

Flight heights of wildfowl during local flights and migration

1.38 By observing local flights between feeding and roosting sites a study determined that whooper swan flight altitude varied between 5 and 45 metres, although the majority of flocks flew between 5 and 30 metres above the ground (Larsen and Clausen, 2002). However this pattern of flight altitudes may differ where longer distance movement or migration is involved (Pennycuick *et al*., 1999). Larsen and Clausen (2002) found that swans using the Overgaard proposed wind farm site tended to fly at heights which would make them more vulnerable to collisions with large wind turbines (rotor height 35m to 101m) compared to smaller wind turbines (rotor height 21m to 69m). They determined that 38% of swans flew at rotor height for smaller turbines and only 13% of swans flew at rotor height for large turbines.

1.39 Pennycuick *et al*., (1996) studied the flight behaviour of seven migrating whooper swans using satellite tracks. This study revealed that none of the swans flew any higher than necessary for terrain clearance when crossing land. Two of the swans were recorded flying at heights of between 500 and 1,700 metres above sea level (ASL) when crossing the ocean, with evidence of small climbs in lee waves (stationary waves in the atmosphere). The other five swans flew very low over the ocean, sometimes stopping to rest on the water. The swans migrated by day and also by night when there was either a full moon or clear skies free of low cloud.

1.40 This research contradicted a previous study by Cramp (1977; in Pennycuick *et al.,* 1996) which concluded that whooper swans fly at great heights on migration and low or moderate heights during local journeys. However Alererstam (1981; in Pennycuick *et al.,* 1996) observed whooper swans migrating in the autumn along the coast of Sweden near the ocean's surface, flying up to a few hundred metres when crossing land. Pennycuick concluded that whooper swans were not able to gain great heights when on migration without the help of lee waves. This finding was also supported by similar findings for the mute swan (Hedenstrom & Alerstam (1992: in Pennycuick *et al.,* 1996).

1.41 Another study focused on pink-footed geese roosting and feeding sites around the Wyre Estuary in Lancashire. A series of 36 hours of observation were undertaken from three separate vantage point locations during winter 2007-08. During the survey 12,454 pink-footed individual goose flights were recorded of which 29% were flying at 0 to 25m, 31% were flying at 25 to 50m, 26% were flying at 50 to 75 metres, 13% were flying at 75 to 100 metres and 1% were flying at over 100 metres (TEP Report 1338.008, unpublished). The geese skeins flew lower (below 50 metres) during the dusk, when presumably returning to their roost.

1.42 During a study of the duck species wigeon flight patterns around Walney Island it was found that 66.3% of birds flew up to 10 metres and 327 birds (82.4%) flew at a height no greater than 15 metres. Although the maximum height recorded was 30 metres, only six birds (1.5%) were recorded above 25 metres (Cramp *et al*., 1977; in Walney Bird Observatory, 2006).

Conclusions: Flight heights of wildfowl during local flights and migration

A study of pink-footed geese flights between roost and feeding sites revealed that the geese were equally likely to fly at 0 to 25 metres, 25 to 50 metres and 50 to 75 metres. The geese were less likely to fly at 75 to 100 metres and rarely flew at heights of greater than 100 metres during daytime. Pink-footed geese also tended not to fly at heights greater than 50 metres at dusk.
One study confirmed that the majority of whooper swans made local flights at heights of between 5 and 30 metres.

Another study showed that migrating whooper swans only fly as high as they need to ensure terrain clearance. Another study revealed that the majority of whooper swans crossing the ocean fly very low.

Whooper swans migrate in the day time and also at night time during periods where there is a full moon or cloud free skies.

Another study found that wigeon rarely fly above 25 metres over water.

Does mortality from collision impact detrimentally affect individual bird populations?

1.43 There are very few studies of the effects of aerial collisions on bird populations that provide long term data using standardised, systematic assessments (Drewitt & Langston, 2008). Despite this lack of data it is apparent that bird collisions with overhead lines and wind farms do occur. It is therefore important to understand the effects of this mortality on bird populations.

1.44 A number of studies have made attempts to estimate how many bird collisions take place on the national or regional scale such as Koops (1987, in Drewitt & Langston, 2008) who predicted that the 4,600 km of overhead lines in the Netherlands cause between 750,000 and 1 million bird collisions annually. A fact sheet produced by the American Wind Energy Association states that 1.25 million birds die from collision with aerial structures in the USA each year including towers, stacks and buildings. Erickson and colleagues (2001; in Drewitt & Langston, 2008) used overhead line estimates predicted by Koops to estimate collision rates for the 800,000 bulk transmission lines in the USA, excluding distribution lines, and stated a range of 130 to 174 million bird collisions annually. However, Drewitt and Langston warned that this was likely to be an underestimate due to distribution lines not being considered in the calculation.

1.45 Almost all studies of bird mortality from collisions with overhead lines conclude that the effects of collision mortality are not sufficient to affect populations at the national scale (Drewitt & Langston, 2008; Bevanger & Broseth, 2004). However, locally or regionally at least, collision mortality might be significant at the population level for some species.

1.46 There are a very small number of cases reported where power line collision has caused significant mortality of globally threatened species. Crivelli, Jerrentrup & Mitchev (1988) reported at least 49 Dalmatian pelicans found below overhead lines in northern Greece at a major wintering location for the species between October 1985 and March 1987. The overhead lines were between the main feeding and roosting areas, and the majority of birds killed were immature (93%).

The overhead line causing the mortality was 1.7km in length and the lines design involved three parallel wires on pylon towers 10 metres high which were set 150 metres apart. Using band recoveries of birds banded (colour plastic engraved bands) in Greece and Bulgaria, as a part of an international study of the population dynamics of Dalmatian pelican, it was estimated that the additional mortality observed in this study would cause a decrease of between 1.3 and 3.5% in the number of breeding pairs in Greece and Bulgaria by the time sexual maturity is reached (3 years old). Since the removal of the power line in November 1986, no dead pelicans have been found (Crivelli *et al.,* 1988). The Dalmatian pelican is currently an IUCN red list category species, as evaluated by BirdLife International, which is classified as vulnerable. Global population estimates for Dalmatian pelican range from 10,000 to 13,900 pelicans (www.birdlife.org).

1.47 Evidence of impacts on bird populations of other groups is more scant although a study of nesting terns at Zeebrugge in Belgium revealed that additional mortality of at least 1.5% was occurring in two tern species as a result of turbine collision. The Zeebrugge wind farm site is located on the eastern port breakwater and is composed on 25 turbines (10 x 200kW, 12 x 400kW and 3 x 600kW). As with large birds of prey, seabirds such as terns are long-lived and it was concluded that the increased mortality observed could have a serious impact on the population levels (Dierschke *et al.,* 2003; in Drewitt & Langston, 2008). A study of the same tern colony at Zeebrugge in 2004 and 2005 confirmed 161 tern collisions mainly affecting common tern and sandwich tern (Everart & Stienen, 2007). The mean number of terns killed per turbine in 2004 and 2005 was 6.7 per turbine per year. The collision probability for common terns crossing the wind farm was calculated to be 0.110 to 0.118% for flights at rotor height, giving an avoidance rate of c.99.9%.

1.48 Van Rooyen (2001) explains that although collision mortality rarely affects healthy populations with good reproductive success, collisions can be biologically significant to local populations and endangered species. The example of the African wattled crane is given where if only one bird were killed due to collision, that event would have an effect on the population potentially affecting the species at the local level or greater.

1.49 Mattiasson (1999; in Californian Energy Commission, 2002) noted that overhead line collision mortality in swans in Sweden was probably sufficiently high to be a significant cumulative factor when considered with other human-induced fatality factors. Mathiasson (1993) states that different studies indicate that 19 to 38% of the Swedish mute swans are killed by collision with electrical wires. The relative frequency of killed swans is not related to the density or type of electric wires in the landscape, but to where in the landscape the wires are constructed, and to the time of when mass movements of swans occur.

1.50 Drewitt and Langston (2008) consider the issue of whether or not collision mortality with man-made structures is sufficiently great to cause population declines or prevent population recovery at priority sites. It is concluded that that there are very few studies which consider the issue of population level effects. The strongest evidence for collision mortality affecting bird populations comes from studies of particularly vulnerable species, most notably large birds of prey which are vulnerable to collision and are long-lived with low productivity (i.e. K-strategists – r/K selection theory relates to the selection of combinations of traits that trade off the quantity and quality of offspring to promote success in particular environments) and are thus less able to compensate for collision losses. The clearest study relates to golden eagles in Altamont Pass where almost 5,000 wind turbines were installed over several decades resulting in the greatest concentration of wind turbines in the world. Golden Eagle collision rates are so high that the site relies purely on migration to maintain the population level, e.g. golden eagles were seriously affected at Altamont pass because the topography funnelled the birds towards the wind farm. Immature eagles are particularly vulnerable to collision immediately following fledging (Drewitt and Langston, 2008).

1.51 Morrison & Pollock (1997; in Hotker et al., 2006) determined that increased mortality of young birds can more easily be compensated for by increased reproduction rates, than can increased adult mortality. This finding was to some extent demonstrated in population simulations where losses of short-lived species could be readily compensated for by increased reproduction rates. Hotker *et al*., (2006) expressed the view that for species whose population is not at carrying capacity or whose reproductive rates are limited due to other factors, for example, habitat quality or climate factors, it is impossible to compensate for additional losses due to wind farms. However Hotker was clearly considering this matter in relation to a species natural ability to recover without the benefit of habitat quality improvement by external means. It was also noted that specific assessments also have to consider other cumulative risks. Furthermore, unlike death by natural causes, wind farm collision victims may be fitter birds that play a more important role contributing to the productivity of a bird population. It is considered reasonable to assume that these findings can also be applied to overhead lines.

Conclusions: Does mortality from collision impact detrimentally affect individual bird populations?

Nearly all studies of bird mortality from collisions with overhead lines conclude that the effects of collision mortality are not sufficient to affect populations at the national scale.

Populations of certain vulnerable species, most notably large birds of prey, which are vulnerable to collision and long-lived with low productivity (K-strategists), are less able to compensate for collision losses.

A small number of studies have demonstrated that aerial structures can negatively influence the population and contribute to population limitation although this has only been observed for a small number of species including golden eagle, ptarmigan and Dalmatian pelican.

Each proposed wind farm or overhead line must be considered on a case by case basis taking into account other factors such as topography, i.e. golden eagles at the Altamont Pass, and prevalent weather conditions.

One study of overhead line collision mortality in swans in Sweden concluded that it was probably sufficiently high to be a significant cumulative factor when considered with other human-induced fatality factors.

Impact reduction

Location and orientation

1.52 Drewitt and Langston (2008) state that location is the single most important factor in minimising collision impacts with aerial structures. There is a hierarchy of approaches to risk minimisation, avoidance, mitigation and compensation (Langston & Pullan, 2003; in Drewitt & Langston, 2008).

1.53 Hotker *et al*., (2006) also found that wind farm location was the biggest factor affecting bird collision rates although they found a statistically insignificant relationship between turbine hub height and collision rate. In certain cases it may be appropriate that power lines, wind farms and other structures should be located away from wetlands, river crossings and other areas where large numbers of vulnerable bird population are present such as communal roosting/feeding areas and migratory flyways (California Energy Commission, 2002). In a study of a riverine crane roost site it was determined that a buffer of 100 metres would be sufficient to protect cranes using the roost site from overhead line collisions.

1.54 There is evidence to suggest that the higher collision rates recorded for the thinner earth wires may be attributable to the greater visibility of the thicker conductive wires (Alonso *et al.*, 1994 in Scottish Natural Heritage, 1996).

1.55 There is a suggestion in this literature that orientating power lines parallel to flight lines may reduce collision and electrocution risk (Scott, Roberts & Cadbury, 1972; in Scottish Natural Heritage, 1996).

Flight diverters

1.56 A global review of the causes and mitigation of avian collision mortality undertaken by Jenkins (2010) considered various measures to mitigate risk of overhead line collision including reviewing the placement of proposed new lines, removing the earth wire, or fitting the earth wire with flight diverters. All of these options were considered to reduce bird collision frequency overall by at least 50% to 60%. It may be reasonable to assume that combining two or more of these mitigation options would reduce bird collision frequency by more than 60%.

1.57 Another review of the results of studies in which transmission or distribution wires were marked and conducted a meta-analysis to examine the effectiveness of flight diverters in reducing bird mortality. The study found that bird mortality was 78% lower at sites where line marking was employed (Barrientos *et al*., 2011)

1.58 A study into the use of conductor-marking and static or earth wire-marking on overhead lines in Spain (involving 380kV, 132kV and 13kV overhead lines) found that spiral markers on the earth wire reduced collisions across three study sites (Janss & Ferrer, 1998). Black crossed bands on conductor wires were also effective for many species with the exception of the vulnerable Great Bustard. Conductor marking comprising thin black strips did not reduce mortality.

1.59 Another study was undertaken to evaluate the effectiveness of earth wire marking in reducing bird mortality through collision with a power transmission line in south western Spain (Alonso *et al.,* 1994). Corpse searches were regularly undertaken during one winter before the introduction of coloured PVC spirals and during one winter afterwards. Flight intensity and collision frequency decreased respectively by 61% and 60% at marked spans compared to the same spans prior to marking, while there was no significant change in collision frequency at spans left unmarked. After marking, the percentage of birds flying between the cables decreased and that flying above them increased.

1.60 A study of mute swan 132kV overhead line collisions at Abberton Reservoir SPA revealed that following regular collisions in 2004 to 2006, including 21 collisions in 2006, the installation of 500 flight diverters reduced collision mortality to zero in 2008 (Frost, 2008).

1.61 Another study focussed on the sensory ecology of birds and how they perceive aerial obstacles in the landscape (Martin, 2011). A sensory ecology framework was established to assess why flying birds collide with prominent structures such as power lines, under conditions of both high and low visibility. The study particularly considered how birds move their heads in flights, in pitch and yaw, as well as how some birds have binocular vision whilst others have lateral vision. It was established that some bird species were likely to be temporarily blind to collision risks ahead of them, for example when a bird of prey is searching the ground for prey. Further even if birds are looking ahead their vision may not be in high resolution. High resolution in avian lateral and frontal vision can be adjusted to focus on movement rather than the detection of high spatial detail. Birds only have a restricted range of flight speeds that can be used to adjust to adjust their rate of gain of visual information as the sensory challenges of the environment change. It is argued that it may be more appropriate in some cases to place hazard warnings on the ground rather than on the obstacle itself. Warning or diversion and distraction solutions may need to be tailored to individual species.

Conclusions: Impact reduction

Overhead line location, and possibly Proposed route, are the greatest factors affecting bird collision rates.

In some instances it is advisable to avoid having overhead lines within wetlands, river crossings and other areas where large numbers of vulnerable bird population are present such as communal roosting/feeding areas and migratory flyways.

The higher collision rates recorded for thinner earth wires may be attributable to the greater visibility of the thicker conductive wires.

Certain types of flight diverters, such as PVC spirals, have been proven to effectively reduce overhead line collisions on a number of sites.

8.1 Displacement impacts on birds caused by wind farms and overhead lines

The possible effects of displacement caused by disturbance

1.62 The effects of wind turbines and other physical landscape elements on field utilisation by wintering pink-footed geese were studied on a Danish farmland landscape (Larsen and Madsen, 2000). Apart from wind turbines a variety of potentially disturbing landscape elements were present including overhead lines, windbreaks, roads and settlements. The study revealed that there was an avoidance distance of 100 metres from wind turbines in rows and 200 metres for wind turbines in clusters. At the landscape level the combined effect of physical elements other than wind turbines caused an effective loss of 68% of the total field area ($40km^2$). It was calculated that wind turbines would cause an additional 4% effective loss of the total field area (or 13% of the land available to the geese after other physical elements had been taken into account). It was concluded that the habitat losses associated with the turbines could be minimised if the wind turbines were located near to existing physical features which already affect how much land is available to the geese.

1.63 It is likely that collision risk to swans, geese and other bird species would decrease if a proposed overhead line, wind farm or similar structure was to cause these birds to be displaced due to disturbance related effects (Larsen & Clausen, 2002).

1.64 A study was undertaken of bird abundance data from 19 globally-distributed wind farms using meta-analysis (Stewart *et al*., 2007a). This study demonstrated that following the construction of wind farms Anseriformes (geese) experienced greater declines in abundance than other taxa, followed by Charadriiformes (waders), Falconiformes (falcons) and Accipitriformes (hawks), and Passeriformes (perching birds). The study also concluded that although wind farms may have significant biological impacts, especially over longer time scales, the evidence base provided by existing studies is poor and more long term impact assessments are required (Stewart *et al*., 2007b).

1.65 A recent study across 12 large (14 to 42 turbines) upland wind farms in Scotland and northern England concluded that seven breeding species underwent reductions in abundance following the installation of turbines (Pearce-Higgins *et al.,* 2009). Bird distribution was assessed using regular surveys during the breeding season. The survey area extended up to 1km away from turbine bases excluding areas of enclosed grassland, forest and felled forest. The study found that golden plover, curlew, snipe, buzzard, hen harrier, meadow pipit and wheatear all underwent reduced densities of between 15 and 53% within 500 metres of the turbines. No reduced abundance was observed for several other species including kestrel and lapwing. Some evidence of reductions in bird abundance was also identified for access tracks although no evidence was found to show that bird abundance was reduced close to overhead lines although overhead lines were only present on 7 out of 12 of the wind farms. Finally, there was no evidence that raptors altered their flight height when close to wind turbines. It was not possible to determine whether the reductions in bird abundance were due to a behavioural displacement or the effects of collision mortality, or both. No overall displacement from transmission lines were recorded within the study.

1.66 A detailed review was undertaken by Hotker *et al.,* (2006) of a large number of studies into the displacement effects of wind farms on various bird species. The data used showed much variation with some high standard deviations in some cases however some trends were clearly apparent. Despite the high degree of variation, avoidance distances during the breeding season were smaller than outside the breeding season. Only a small number of wader species, including black-tailed godwit, avoided wind turbines during the breeding season.

1.67 Greater avoidance distances from wind farms were generally observed outside the breeding season, especially in birds which require open habitats such as geese, ducks and waders (Hotker *et al.,* 2006). Geese were particularly sensitive showing avoidance distance of several hundred metres. Further examination of the data indicates that a number of studies identified displacement distances of between 250 and 450 metres for geese although no details for individual species are provided. Some studies also identified wind farm displacement distances of between 50 and 150 metres for lapwing and golden plover during the non-breeding season. Notable exceptions when examining displacement distances included grey heron, birds of prey (especially buzzard and kestrel), oystercatcher, gulls, starling and crows which continued to use land close to wind farms during the non-breeding period.

1.68 Hotker *et al*. (2006) also considered the issue of birds habituating to the presence of wind farms over time and concluded that in 45% of the studies examined good evidence of habituation was observed over time during the breeding season. Species shown to demonstrate habituation in at least one study included wigeon, mallard, eider, common scoter, buzzard, kestrel, oystercatcher, golden plover and lapwing. However the opposite trend, where distances between the birds and the wind farm increased, was identified in white-fronted goose, buzzard, curlew, golden plover, lapwing and oystercatcher, again at least in one study.

1.69 Another study into the displacement effects of wind farms on golden plover and other Charadrii waders came to the same conclusion that roosting non-breeding golden plover are displaced by wind farms although breeding birds are less likely to be displaced. Hotker *et al.* (2006; in Whitfield 2007) identified a typical displacement distance of 135 metres for non-breeding golden plover but variation was considerable ranging from less than 50 metres up to 850 metres. It was suggested that for bird species for which displacement was more likely, the barrier effect was also more likely.

1.70 A study was undertaken at the Tunø Knob offshore wind park in Kattegat, Denmark, to determine what effect wind turbines have on the local common eider population. This study demonstrated that eider ducks avoid flying close to or into the wind park. This may have resulted in a reduction in habitat availability within and around the wind park. The study also concluded that the disturbance effect of the revolving blades is negligible during daylight hours but highlights the need for studies to be undertaken during hours of darkness and conditions of poor visibility. Interestingly, another study by Petterson and Stalin (2003; in Percival, 2003) concerned an offshore wind farm at Utgrunden, where over 500,000 eider flights through the wind farm study area were observed without a single wind turbine collision having been seen. Contrastingly Dirksen et al. (1998; in Percival, 2003) showed that pochard and tufted duck flew regularly through a wind farm in the Netherlands at night under moon light but flew around turbines at a greater distance from them when dark or foggy.

Conclusions: Displacement impacts on birds

The findings of one study indicated that overhead lines can displace pink-footed geese by 100 metres. However in that study overhead lines were grouped with features such as roads, buildings and shelterbelts when assessing displacement effect. This suggests that the displacement effect of an overhead line can be reduced by positioning sections of overhead line close to existing physical features, such as roads and hedgerows, which are already having a deleterious effect on the amount of land which is available to the geese.

Several studies have identified displacement distances of between 200 and 450 metres at wind farms for geese. Some waders, notably golden plover and lapwing, have been displaced distances of between 50 and 150 metres.

A review of data from several studies concluded that geese are most prone to displacement caused by wind turbines, followed by waders and then raptors.

Avoidance distances for birds affected by wind turbines tend to be greater during the non-breeding period compared to the breeding period.

A range of species have shown habituation to the presence of wind turbines allowing those species to use land closer to wind turbines whilst other species have shown the opposite trend. In some cases both trends have been demonstrated in the same species, such as is the case with oystercatcher.

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Appendix 8G – National Grid Bird Flight Diverters Protocol

National Grid's Protocol on Bird Diverters

Kings Lynn B Connection DCO

January 2014 v.2

Summary

As part of the King's Lynn B Connection DCO approval the Inspector considered National Grid's Protocol on Bird Diverters. This was submitted as a response to a question from the Inspector on the 22nd May 2013. The issue under examination was the need for monitoring of the line for bird collisions having considered the risk posed. The Secretary of State also considered the approach set out in the Protocol and concluded in light of these established procedures '*that adequate safeguards already exist without the need to impose further requirements'.* Projects should be aware of this Protocol and make reference to it where appropriate in future project development.

Background

1. National Grid operates the national electricity transmission network in accordance with its obligation under Section 38 and Schedule 9 of Electricity Act 1989 to have regard to effects on the environment.

2. National Policy Statement EN-5 refers to the risks posed to birds by overhead lines at paragraphs 2.7.1 – 2.7.8. It notes that large birds such as swans and geese may collide with overhead lines associated with power infrastructure, particularly in poor visibility. The Statement advises that applicants will need to consider whether a proposed line will cause such problems, giving consideration to feeding and hunting grounds, migration corridors and breeding grounds.

3. EN-5 advises that careful siting of a line away from, or parallel to, but not across, known flight paths can reduce the numbers of birds colliding with overhead lines considerably and that diverters which consider the conditions, the characteristics of the line and pylons and the species of birds may also reduce risk of collisions. This statement sets out National Grid's approach to the use of bird diverters on its overhead lines.

Bird Diverters

4. An overhead line comprises conductors which transmit electricity and an earthwire which offers protection from lightning strikes and can also carry a communications cable. The conductors (wires) used to transmit electricity hang from the arms of the pylons via insulators. These are often hung in bundles of two, three or four conductors with spacers between them at intervals. The conductors of high voltage overhead lines are more visible and pose less risk to birds than the much smaller diameter earthwire which on an overhead line constructed using steel lattice pylons is suspended from the peaks of pylons. Bird diverters, also known as deflectors, can be fitted to the earthwire of overhead lines.

5. There are different designs of diverters and some of National Grid's overhead lines have 'orange ball' diverters installed which are visible from a long distance. The much smaller 'spiral' bird diverter is now more commonly used. It is effective in making the line visible to birds but has much less effect on the landscape and in views.

6. It is easier and safer to install diverters on the earthwire of overhead lines when the line is being built. The diverters can be installed as the earthwire is being fixed and before electricity is switched to run through the conductors.

7. It is also possible to install diverters on the earthwire of an existing overhead line. This is undertaken generally by workers in a winch hanging from a helicopter or there may be opportunities to install them when the line is temporarily out of service for maintenance (during an 'outage').

Considering Bird Diverters on New Overhead Lines

8. National Grid's publication 'Our approach to the design and routeing of new transmission lines' explains the matters which it considers when developing a new overhead line route. It seeks to avoid sites designated for

their high nature conservation value, such as sites of Special Scientific Interest, Special Protection Areas and Ramsar sites which may be important to birds.

9. National Grid consults in each case with the statutory nature conservation organisation (SNCO) and interested parties about possible impacts on sites designated for bird interest and on bird species, particularly large birds as advised by EN-5, such as swans and geese, and also other species that may be susceptible to collision risk.

10. National Grid is aware of the potential for distress caused by collisions, including where birds affected are not protected species, and will also consider relevant local factors on a case-by-case basis (for example waterfowl on water bodies visited by the public, racing pigeons).

11. Diverters can reduce the risk of bird collisions, but they also introduce additional landscape and visual impacts because they make the earthwire more visible. Diverters also require additional installation and maintenance activities which can introduce further risk. The installation of diverters will be considered when there is a clear benefit in terms of avoidance of harm to statutory interests or significant local interests.

12. Diverters do not always reduce collisions and their use is most appropriate where an overhead line crosses bird flyways or is near features that attract birds, such as water bodies or feeding areas.

13. Installation will be considered on the basis of evidence of collision risk and how efficient diverters would be as a solution.

14. National Grid will carry out appropriate surveys to assess collision risk, considering available information and, where required, specific site surveys.

15. The survey findings will influence the choice of route corridor and alignment for a new overhead line aiming to avoid routes that introduce significant collision risk (embedded mitigation). The advice of the relevant SNCO will be sought.

16. The use of bird diverters will be proposed where it will result in the avoidance of an adverse effect on statutory interests (sites or species). The design and the positions of diverters on the earthwire will be specified taking account of the species concerned and the availability and suitability of different styles of diverter.

17. Where there is little or no risk of collisions affecting statutory interests, diverters will not be proposed.

18. Where available evidence suggests that collisions may occur, but there is uncertainty over whether statutory interests would be affected, National Grid will propose a period of post-construction monitoring of the overhead line leading to a possibility that diverters may need to be retrofitted. A protocol for monitoring will be included in the application so that it is clear that installation of diverters may be an outcome of the consent.

19. National Grid will consider the risk of collisions affecting non-statutory interests on a case-by-case basis, taking account of representations from the SNCO, the relevant local authority and other interested parties. National Grid's consideration may lead to a proposal to install diverters; to a proposal for monitoring prior to taking a decision; or to not install diverters.

Installing Bird Diverters on Existing Overhead Lines

20. National Grid acknowledges that birds may collide with existing overhead lines when the risk was not foreseen at the time of application. The risk of collisions may arise due to changes in behaviour of birds because of alterations in land use or climate over time or may be due to shorter-term incidents such as flooding of fields due to neglect of drainage.

21. Where evidence of a sustained pattern of collisions is brought to its attention, National Grid will take advice from professional ornithologists, the relevant SNCO and if appropriate from other relevant bodies such as the Royal Society for the Protection of Birds and the local planning authority. If statutory interests are potentially affected, National Grid will consider a contribution to the reasonable cost of assembling further evidence.

22. If the problem can be addressed at source, such as amending cropping patterns, improving drainage or moving a feature attracting birds, National Grid will bring this to the attention of the relevant landowner or managing agency (such as Environment Agency or internal drainage board). It will liaise with them to investigate possible change to remove or reduce the source of bird attraction and risk of collision.

23. If the problem cannot be addressed at source, and evidence suggests that installation of diverters would significantly reduce collision risk which affects statutory interests, National Grid will seek to install diverters. It will undertake any environmental assessment and seek to obtain any additional consents or landowner agreements that may be required (installation of diverters is generally ‘permitted development’ on existing lines). The installation of diverters may be delayed until National Grid’s operational arrangements allow safe working.

24. If non-statutory interests are affected, National Grid will seek to install diverters if it considers that the benefits outweigh the risks and costs of installation taking account of its statutory duties.

NATIONAL GRID PROTOCOL ON BIRD DIVERTERS: CASE STUDIES
Case Study: 4ZM Overhead Line near Welney Reserve This 400 kilovolt overhead line was built in 1966 and crosses the Wildfowl and Wetland Trust's Welney Reserve which has extended and managed over many years to increase its attractiveness to swans, geese and other birds. The reserve is in the Ouse Washes Special Protection Area which was designated for its importance to birds in 1993. In 1990 National Grid was alerted to bird collisions with the overhead line during a period of foggy weather with greatly reduced visibility it began liaising with the Wildfowl and Wetland Trust. Bird diverters were designed and subsequently installed over 16 spans of overhead line in 1995.
Case Study: Spalding Connection The connection of the Spalding power station to the national electricity transmission system required a new 400 kilovolt overhead line across the River Welland near Spalding in Lincolnshire to be built in 2002. The risk of swans colliding with the line was recognised and diverters were fitted to the span which crosses the river
Case Study: Second Yorkshire Line National Grid installed a 400kV overhead line between Lackenby, Picton and Shipton in 1995 after receiving consent and having undertaken studies that indicated no adverse effects on birds were anticipated. After the line was in operation, users of pigeon lofts near one section reported that young birds flew into the earthwire causing distressing casualties. Following investigation, National Grid installed spiral diverters to the earthwire in 2005 which addressed the problem.
Case Study: South Humber Bank National Grid installed a new 400kV overhead line on the South Humber Bank in Lincolnshire in 1996. An assessment of bird collision risk was undertaken and it was anticipated that there would be low risks of bird collision due to the new line being parallel to the river and avoiding crossing known 'flyways' at a height where collisions may occur. Due to some uncertainty regarding this conclusion, a period of monitoring was undertaken following construction of the line. Bird activity and behaviour in the vicinity of the new line was monitored and demonstrated that there was no evidence of adverse effects on biodiversity arising from collisions with the new line.

Appendix 8H – Bat Surveys

PLANNING DESIGN ENVIRONMENT

Hinkley Point C Connection Project
Environmental Statement Volume 5.8.2
Ecology Appendix 8H
Bat Technical Report

February 2014
1979.40.008
Version B

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Hinkley Point C Connection Project
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1.0 Introduction

1.1 Ecological baseline surveys to inform the Hinkley Point C Connection commenced in 2009 across two Route Corridor options, and the scope of surveys has subsequently been progressively refined to focus on the preferred corridor and ultimately the final Order Limits, which encompasses the selected route alignment and associated working areas. As a whole, the ecological surveys were scoped in consultation with relevant statutory bodies and the Biodiversity Thematic Group, taking into account the habitats present and the potential effects of the Proposed Development.

1.2 Bat surveys were undertaken by Greena Ecological Consultancy in 2010, 2012 and 2013 and the information provided herein is based on the Greena data and reports.

1.3 Surveyors in 2010 were Tereza Rush, Geoff Billington, Marie Steggall, Danielle Linton, Elizabeth Bradshaw, Huma Pearce and Jacqueline Warren. The surveyors in 2012 and 2013 were Geoff Billington, James Sweetman, Tereza Rush, Paul Kennedy, Sarah Jupp, Steve Davison and Eleanor Frew. Of the surveyors listed above 9 surveyors hold Natural England class licence of CL2 or higher.

1.4 The survey scope was informed by the findings of the desk study, review of habitats within the landscape that may be suitable for bats to roost, forage, commute or migrate, and also took into account those that may be impacted by the Proposed Development, e.g. through habitat loss or fragmentation.

1.5 The survey objective was to identify the presence of bat species across the route including identifying habitats likely to be used by SAC bat populations and determining whether trees along the length of the proposed route supported bat roosts and the status of any roosts identified. Survey findings have been used throughout the development of the Hinkley Point C Connection Project to inform scheme design and ensure proposals meet the requirements of relevant legislation.

2.0 Legislation

2.1 All species of bat and their breeding sites or resting places (roosts) are protected under Regulation 41 of The Conservation of Habitats and Species Regulations 2010 and Section 9 of the Wildlife and Countryside Act 1981. In summary, it is an offence for anyone to:

- Intentionally or deliberately kill, injure or capture (take) bats;
- Deliberately disturb bats (this particularly relates to disturbance that is likely to impair their ability to survive, breed or reproduce, or to rear or nurture their young);
- Impair their ability to hibernate or migrate;
- Affect significantly the local distribution or abundance of the species to which they belong;
- Damage, destroy or obstruct access to bat roosts;
- Possess or transport bats or any parts of a bat, unless acquired legally; and
- Sell, barter or exchange bats, or parts of bats.

2.2 A roost is defined as any structure or place used by bats for shelter or protection. Bats tend to be loyal to roosts year after year, but change roosts seasonally and according to the weather or their breeding status. Therefore the legal opinion is that the roost is protected whether or not the bats are present at the time

2.3 The following table is extracted from the Bat Conservation Trust website (updated October 2011) and identifies the national and international status of the resident UK bat species.

Table of legal and conservation status of UK bat species

Species	Legislation / Convention													
	Bern Convention Appendix II	Bonn Convention Appendix II	WCA	Habitats Directive Annex IV	Habitats Directive Annex II	Habs Regs 1994 (as amended) *Scotland*	Conservation of Habs & Species Regs 2010	Conservation Regs (N Ireland) 1995	CROW Act 2000	NERC Act 2006	Wild Mammals Protection Act	UK BAP Priority species	IUCN Red List*	EUROBATS Agreement
Greater horseshoe bat	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	LC	✓
Lesser horseshoe bat	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	LC	✓
Daubenton's bat	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓		LC	✓
Natterer's bat	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓		LC	✓
Whiskered bat	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓		LC	✓
Brandt's bat	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓		LC	✓
Bechstein's bat	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	NT	✓
Alcathoe bat	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓		DD	✓
Noctule	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	LC	✓
Leisler's bat	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓		LC	✓
Serotine	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓		LC	✓
Common pipistrelle	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓		LC	✓
Soprano pipistrelle	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	LC	✓
Nathusius' pipistrelle	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓		LC	✓
Brown long-eared bat	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	LC	✓
Grey long-eared bat	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓		LC	✓
Barbastelle	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	NT	✓
Greater mouse-eared bat	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓		LC	✓

*IUCN categories: LC is Least Concern, NT is Near Threatened, DD is Data deficient; see www.iucnredlist.org for more details.

3.0 Method

3.1 Desk Study

3.1.1 Existing records of bats and information of designated wildlife sites supporting bats were collated through the wider ecological desk study for the project. Bat data was supplied by Somerset Environment Records Centre (SERC) and Bristol Environmental Records Centre (BREC) and through review of wildlife site citations, published surveys, papers and reports.

3.2 Tree Roost Surveys

Ground based assessments

3.2.1 Ground-based assessments of individual trees for their potential to support bat roosts were carried out during winter whilst trees were not in leaf. Surveyors used binoculars, digital cameras, GPS, tuneable heterodyne detectors, mobile or fixed broadband detectors, sound recorders, torches and data loggers as appropriate.

3.2.2 All trees occurring within 100m of the proposed scheme were investigated from ground level to determine those with potential to support bats, including those with features such as: thick ivy, splits, holes, cracks, flaking bark and cavities. Trees were assessed as High, Moderate or Low potential to support roosting bats and the following details were recorded for trees with high potential:

- Location (eight figure grid reference)

- Location (description)
- Height, location and orientation of potential features
- Access notes were recorded (including inaccessible features due to lack of anchor for ladder or rope, structurally insecure or hazardous hanging branches)
- Photograph

3.2.3 The ground based assessments were initially carried out between December 2012 and January 2013. As the development proposals were updated, additional areas for survey were identified. Ground based assessments of the trees in these areas were undertaken in March 2013. Surveys were undertaken when extensive canopy cover was absent therefore making bat roosting features easier to identify. 437 trees were identified as having High or Moderate bat roost potential and were taken forward for further survey.

Aerial inspections

3.2.4 Aerial inspections were undertaken of 348 trees classed has having High or Moderate potential (or trees where restrictions to initial assessment were identified). The remaining trees in these categories were unsafe or not possible to climb and a few areas (<5% of the route) were not surveyed where access permission had not been established. Inspections were undertaken by suitably qualified climbers and licensed bat consultants from May through to August 2013. Surveyors investigated potential roost features identified during ground based assessments. Records of any field signs (bats, droppings, scratching or stains) were made and trees assessments were updated accordingly. Following aerial inspection, these trees were divided into four categories.

a. No bat potential, i.e. tree discounted;
b. Confirmed roost;
c. No confirmed evidence of roosting although Medium or High potential remains; and
d. Tree could not be climbed.

3.2.5 All trees in categories b to d (totalling 123 trees) were then subject to targeted nocturnal roost surveys through 2013. The roost survey method was devised with due consideration of the 2012 Bat Conservation Trust (BCT) guidelines.

Emergence/re-entry surveys

3.2.6 Dusk and dawn roosting surveys were undertaken between the months of May and September 2013 to optimize the likelihood of recording bats. Dusk activity surveys commenced no less than 0.5hr before sunset and finished no less than 1.5hrs after sunset. Dawn surveys commenced no less than 1.5hrs prior to sunrise and finished between sunrise up to a maximum of 1hr after sunrise (to allow at least 20mins after the last bat was recorded before completion of survey).

3.2.7 Bat activity surveys in both 2010 and 2012 experienced very poor weather conditions at the beginning of the bat season (April and May). As such it was agreed to miss monitoring in April and May and to include October if weather conditions were suitable. In 2013 weather conditions in April were again relatively cold with regular overnight frosts. However, weather in May was suitable for roost emergence surveys. The weather conditions during the dusk/dawn roost activity surveys were carefully monitored and were not undertaken if it was considered too cold or if rainfall was thought likely to impact bat activity levels.

3.2.8 Surveyors were located adjacent to the selected trees to record if any bats flew out of or into a tree roost.

3.2.9 123 trees were subject emergence/re-entry surveys. Each tree was subject to up to three dusk emergence/dawn re-entry surveys, dependent on the level of potential (Medium or High) or evidence identified (bat droppings recorded during aerial inspection, bats present during aerial or initial nocturnal surveys). The number of dusk/dawn surveys was dependent on a number of factors:

- Tree with Medium potential was subject to 2 dusk/dawn surveys.
- Tree with High potential and/or ivy were subject to 3 dusk/dawn surveys.
- Tree with a non-accessible features were subject to 3 dusk/dawn surveys.
- Roost confirmed during emergence/ re-entry survey was subject to 3 dusk/dawn surveys.
- Roost confirmed during aerial surveys and containing bats at the time were subject to 3 dusk/dawn surveys.
- Roost confirmed during aerial surveys by presence of bat droppings only was subject to 1 survey (aiming to confirm species for the requirements of Natural England).

3.3 Activity Transects

3.3.1 Activity transects were undertaken in 2010 and in 2012. Transect surveys in 2010 were undertaken prior to a decision being made over the preferred corridor for the connection. Transects were spread across all corridor options but were concentrated within sections of the corridor options that fell within the 4km consultation zone for the North Somerset and Mendip Bats SAC (which supports greater and lesser horseshoe bats). In consultation with Natural England (NE) and Larry Burrows of Somerset County Council (SCC), the survey zone was extended to include a 4km buffer on the Mendip Limestone Grasslands SAC (which has greater horseshoe bats as a qualifying feature) and a 4km buffer on any known horseshoe roosts in an around the designated sites. This totalled 13 transect routes within these 4km buffers and a 14th transect was added near Tickenham Ridge in response to conversations between NE, SCC and Geoff Billington over potential for movements of Annex II bat species across the wooded ridge in this location.

3.3.2 The 2010 transect surveys used public rights of way. Of the fourteen transect routes twelve were walking, one driving and one a mix of walking and driving. The fourteen transects totalled 118.4km and were surveyed twice each month during suitable weather conditions, from June to October 2010 with due consideration for best practice guidelines of the time (BCT, 2007[1]).

3.3.3 Following selection of the preferred route corridor, ten additional transects totalling 96.7km were surveyed from June to October in 2012. The transect routes were largely selected to cover sections of the preferred route corridor not surveyed in 2010 (either because they were outside the 4km buffers or due to insufficient public access). However, additional transect routes were selected within the 4km buffer zones to provide a second year of data where high impacts were judged to be possible. These locations included the Mendips AONB where consultee comments indicated a high desire for undergrounding, Sandford where technical studies indicated a substation might be located and Tickenham Ridge where the mature wooded habitats and presence of existing infrastructure indicated it might be difficult to avoid woodland loss.

3.3.4 The names and descriptions of the 2010 and 2012 transect routes are provided in **Tables 1 and 2**.

3.3.5 During both the 2010 and 212 surveys each transect was walked at steady pace twice each month between June and October, with the exception of extensive sections of roads which were driven with bat detector continuously recording at 10mph. Due to very poor weather conditions at the beginning of each bat season and due to the process of finalising routes of transects, as well as based on experience from previous years, it was agreed (with NE and SCC) to avoid monitoring in April and May and to include October instead when weather conditions were suitable. Local experience had shown that bats are frequently highly active in this month in south west England.

3.3.6 Transect surveys started approximately one hour after sunset to ensure that the majority of bats had emerged from their roosts, and the activity of all bat species, including those that are more light sensitive and can emerge late after sunset, was included in monitoring. All transects were walked in suitable weather for bat emergence and foraging, avoiding wet and windy conditions and low temperatures. Starting point of each transect remained mainly unchanged throughout the survey period.

3.3.7 The majority (>90%) of the transect routes were walked. Surveyors were using frequency division and time expansion handheld bat detectors Pettersson D240X or Pettersson D1000X that has high speed data acquisition (HSDA). Dual mode heterodyne and frequency division bat detectors Batbox Duet were used on some transects in 2010 and as additional detectors on some transects in 2012, Avisoft HSDA detector was also used in 2010. Bat calls were recorded for further analysis where required. Computer software BatSound and BatScan were used to analyse recorded bat calls.

Table 1: 2010 Bat Transect Route Descriptions

2010 Transects	Description
1. Badgworth	Transect 1 (12.5km) was the south-most transect along the scheme in 2010. The route started on the A38 in Badgworth and continued south on a public road and a field track between crop fields and cattle grazed fields onto Allerton Moor following a public right of way path along Allerton Moor Rhyne and later Blackford Moor Drove. Majority of the route spread amongst cattle and sheep grazed fields and hay fields. With the exception of a small section in the north, the entire transect was not affected by artificial lighting and the settings offered ideal conditions for bat foraging.
2. Webbington	Transect 2 (5.5km) was split into several parts because of the disconnected public right of way of paths and roads. The north section followed approximately half of Max Mill Lane at Winscombe. Max Mill Lane has low level of traffic and is bordered in places by high hedgerows. The next section followed a field track and a public right of way path between Barton and the Lox Yeo River. Fields along the route were mainly hay fields. The following section ran along the Barton Road, minimally affected by traffic, to Webbington. The route was very close to the M5 and the noise and light pollution connected with this main traffic artery in the area could negatively affect bat foraging there. The south-most section followed a quiet road between horse and cattle grazed fields, without any influence of traffic and a field track as a continuation of the Biddisham Lane along the River Axe. The section was quiet, not affected by artificial lighting and offering ideal conditions for bat foraging.
3. Banwell	Transect 3 (6.4km), followed the cycle path along the former disused Strawberry Line railway from Sandford to Sandford Batch cemetery. With the exception of the north-most part of this stretch of the route, which is affected by the traffic on the A368 and artificial lighting installed around the Sandford care-home, the remaining section is very quiet, running in the former railway cutting, bordered by tall hedgerows and surrounded by hay and crop fields and beside woodland, offering ideal conditions for bat foraging. The west branch of the north loop of the transect was around the edge of Banwell wood, a large broadleaved woodland. Both branches of the loop connected to a public right of way path between cattle grazed and crop fields, crossing the A371, and continuing west through similar field use towards Max Mill Lane. The majority of the transect is not affected by artificial light and ideal for bat foraging with the exception of: section of A368, A371 crossing and lighting around Sandford Care Home.

2010 Transects	Description
4. Puxton to Sandford	Transect 4 (11km) started north of Puxton, following the Oldbridge River and then looping back towards Puxton across hay fields, joining Puxton Road with minimal influence of traffic, before heading north-east across cattle grazed and crop fields around Box Bush Farm. One branch of the transect followed Puxton Lane, Drove way and Nye Road to Sandford, the roads having low level traffic use. The other branch of the loop followed a field track along the Liddy Yeo, before turning south-east towards Sandford across mainly cattle grazed fields and old orchards. Both branches met on the busy A368, affected by traffic noise and light. The north-most section, the middle section north of Box Bush farm and the west branch of the south section of this transect offered ideal conditions for bat foraging.
5. Dolemoor	Transect 5 (4.3km), offered ideal foraging conditions for bats all along the route. Starting on a cycle path, The Cheddar Valley Railway Walk, bordered by tall hedgerows, turning west across sheep grazed fields and through tall vegetation surrounding the Trout Farm and across hay fields before following the field track along Brandeer Rhyne onto Dolemoor Lane and heading south on the Meer Wall track between two large wet ditches surrounded by sheep, horse and cattle grazed fields. The shielded location, limited disturbance by noise or artificial lights and the presence of slow-flowing water along the majority of the route added to the ideal foraging area for bats.
6. Brinsea	About a half of transect 6 (6.5km) followed public roads, starting on Brinsea Batch and King Road, both moderately affected by traffic and following the quiet Honeyhall Lane south of the Mendip Spring Golf Club before turning south onto a loop across cattle grazed and crop fields towards Churchill. These fields, as well as fields in the north loop across cattle grazed and hay fields south of Brinsea Green Farm, were not affected by noise of light pollution and served as a good foraging ground for bats. A small broadleaved woodland in the south of the transect along Duck Street formed a sheltered place with ideal foraging conditions. The west-most part of the transect followed a field track known as Common Lane, surrounded by crop and cattle grazed fields.
7. Rolstone	Majority of transect 7 (6.4km) was following public roads and could therefore be surveyed from a vehicle. These parts included the busy A370, affected by busy traffic at all times, the quieter West Rolstone Road and Silvermoor Lane, moderately busy Wolvershill Road and quiet Summer Lane before crossing the busy A371 and following quiet tracks around Banwell Hill broadleaved woodland towards Yarberry. A small loop in the north section of the transect, north of Rolstone was walked along cattle grazed fields and hay fields, followed by a small part across a horse grazed field by Rolstone Farm, a small part around cattle grazed fields north of Laurel Farm and a small section in the south through a wooded area by Yarberry. While the north part of the transect did not offer ideal conditions for bats and the south-most part was affected by the traffic of the M5 motorway, majority of quiet roads and tracks surrounded by tall hedgerows and trees offered good foraging habitat.

2010 Transects	Description
8. Hewish	The entire route of transect 8 (5.6km) along busy roads affected by traffic at all times and the entire route, was surveyed from a vehicle. The transect ran along the A370 from where it forked off the River Yeo to north of Puxton Park. The north-west branch crossed the railway in west Hewish and continued towards the M5. Despite no parts of the route offered good foraging habitat for bats, several sections were more sheltered by tall vegetation making bat commuting and foraging possible.
9. Yatton	The route of transect 9 (12.2km) was entirely shielded from artificial lighting, however the north part followed close to the M5 and was therefore affected by the heavy traffic. The route, ran across cattle and horse grazed fields, hay fields, crop fields and wetland west of Yatton, starting on the Strawberry Line, a disused part of former railway, later to follow Binhay Rhyne, the Oldbridge River, the Little River and numerous wet ditches and locks between them. Majority of the route follows a public right of way path; a small part of it runs on a field track beside Wemberham Lane Rhyne. The whole extent of the transect offers good conditions for bat foraging, although some parts were relatively exposed.
10. North End	A vast majority of the transect 10 (10km) was surveyed from a vehicle, because most of the transect was on moderately busy public roads: North End Road, Kennmoor Road, Moor Road, B3133 Kenn Road and quieter section of road Claverham Drove. The north section of the transect comprised mainly of walking across arable fields and several cattle grazed fields, a short section off Kennmoor Road followed a meadow and cattle grazed field. The transect was not ideal an foraging habitat; however, some parts were sheltered and allowed for bat commuting and foraging, he presence of tall vegetation and small broadleaved plantations in the area improved the overall habitat.
11. Tickenham	The route of transect 11 (8km) covered first part of one of the most wooded areas along the proposed route of the connection as well as a vast area of field systems among wet ditches around Tickenham. Following edges of small broadleaved woodlands in the north and cattle grazed and crop fields surrounding Stone-edge-Batch, later to cross cattle grazed fields around the Middle Yeo Drain and heading towards Tickenham Boundary Rhyne, Parish Brook in Nailsea and ten Feet Rhyne in the south, near West End. Although fields in this area were often exposed, sheltered areas and the north part of the transect offered ideal conditions for bat foraging. Majority of the transect is not affected by artificial light.
12. Young Wood	Transect 12 (5.7km) spread south of Nailsea, mainly including Youngwood Lane, Netherton Wood Lane and Chelvey Road. Most sections were surveyed from a vehicle, several shorter walking parts followed edges of cattle grazed fields and small broadleaved woodlands, as well as tall hedgerows creating ideal conditions for bat

2010 Transects	Description
	foraging. The surveyed roads were quiet and not affected by traffic to a great extent.
13. Wraxhall & Backwell Common	The south part of the transect 13 (3.7km) was surveyed both from a vehicle and by walking although several sections. The driveable parts of transect 13 included Station Road in Nailsea, Backwell Common Road and Backwell Bow. All roads with the exception of Station Road were quiet with low traffic levels; Station Road was moderately affected by traffic. Walking parts in the south section followed cattle and horse grazed fields and part of the route led beside the Land Yeo stream. The north section followed a busier stretch of the B3130 before diverting across cattle grazed fields toward the Land Yeo. All walking parts covered ideal habitat for bats to forage in.
14. Portbury	Transect 14 (15.2km) covered a large stretch of land between Portbury Docks and the B3128, including a large wooded area of Prior's Wood and several roads, including Sheepway, Caswell Lane and Caswell Hill, all moderately affected by traffic, and busy Whitehouse Lane and Clevedon Road, both affected by busy traffic at all times. Transect 14 passes under the M5 and some sections were close to the motorway affected by constant traffic. The west branch of the northern section of the transect ran across the Portishead Nature Reserve containing large water bodies and tall vegetation creating ideal habitat for foraging bats. The east branch of the northern section led between tall hedgerows and trees and was surrounded by cattle grazed fields from the west but in the east adjacent to a large dock storage area causing light pollution of this section of the transect. The route between Sheepway and Caswell Lane followed cattle grazed fields with numerous wet ditches, often bordered by mature vegetation, forming sheltered and good habitat for foraging bats. Further south the route split into three branches, the western one was largely affected by traffic but exposed to wind; the middle branch followed a road mainly surrounded by tall and mature vegetation creating a good commuting corridor and the eastern branch led through Prior's Wood, good foraging habitat for bats. The Gordano Road path provides a sheltered bat foraging site. The south section if the transect route followed a busy road before turning west beside small broadleaved woodlands with good shelter and foraging opportunities. The transect in south-east was subject to several route changes, because new rights of way routes were being put into place during the time of the survey period in order to accommodate the expanding Noah's Ark zoo. The final route followed crop fields in that area and extended towards mixed woodland.

Table 2: 2012 Bat Transect Route Descriptions

2010 Transects	Description
1. Avonmouth	Transect 2 (8.8km) the majority of the transect included roads within the Avonmouth industrial estate, including a small walked section on grazed land between the sewage works and wet ditches along the M49. Most of the route was affected by artificial light with the exception of the footpath section and darker Lawrence Weston Road. Only the off road walking part of the route offered good foraging habitat for bats.
2. Tickenham Hill	The transect (17.7km) was split into three parts: marked blue, green and yellow for the ease of communication over access and survey scheduling. Blue transect covered the north part of the Tickenham Hill route, including grazed and crop fields north of the M5, road of Caswell Hill and between Caswell Hill and The Gordano Round. The north section of the blue transect ran along hedgerows between grazed fields with cattle present for most of the time when surveys were carried out. No artificial lighting occurs in this area. Caswell Lane and Caswell Hill have moderately busy traffic levels. The south part of the transect route follows undisturbed crop fields, a part of this transect was on transect 14 from 2010. Green transect was further split into three separate sections, starting with the area of Noah's Ark zoo in the north-east. The route ran across the grounds of the wildlife park – mainly crop fields and field tracks, borders broadleaved woodland and a broadleaved newly created plantation. The route was very little affected by artificial lighting. The north-west section included Whitehouse Lane that had moderately busy traffic, edges of crop fields, as well as Cadbury Camp Lane and a large grazed field with sheep present most of the time during surveys. The south section spread north and south of Clevedon Road, crossed mainly crop fields with the exception of one cattle grazed field and follows the edge of Summerhouse Wood, broadleaved woodland. Apart from Clevedon Road itself, the route was not affected by artificial lighting. A part of this transect 3 was on transect 11 and transect 14 from 2010. Yellow transect spread between the north-west and the south part of green transect. The route ran through cattle grazed and crop fields and followed the edges of several broadleaved woodlands. It was not affected by artificial lighting and the majority of the transect offered ideal for bat foraging habitat.
3. Sandford	The transect (14.7km), was split into three parts defined North-east, North-west and South for the ease of communication over access and survey scheduling. The North-east transect covered apple orchards around Nye Road and cattle grazed fields around the disused Strawberry Line railway between Nye Road and Station Road. Hay fields lay west of Mead Lane and again south of the A368.

2010 Transects	Description
	The A368 and the southern part of Mead lane were the only sections affected by artificial lighting. Cattle grazed fields and orchards along the route of the transect created ideal conditions for bat foraging. Some parts of this transect corresponded with transect 4 from 2010. The North-west transect crossed mainly cattle grazed fields and hay fields between Drove Way and Mead Lane. It was not affected by artificial lighting and offered ideal conditions for bat foraging. Originally this transect included horse grazed fields of Westleigh farm, these fields were removed from the survey due to no access being granted. The South transect route ran along cattle grazed, hay and crop fields between the A368 and Banwell Road. It also follows the edge of Banwell Wood, large broadleaved woodland. The entire route is not affected by artificial lighting with the exception of Banwell Road / Castle Hill itself which can be affected by moderate levels of traffic. The entire route lies in an ideal area for bat foraging. A large part of the route of this transect corresponded with transect 3 surveyed in 2010.
4. AONB	The transect (13.7km), was split into two parts marked North and South for the ease of communication over access and survey scheduling. The North transect was a natural continuation of transect 4 South, running along hay, crop and cattle grazed fields between Banwell Road and Max Mill Lane, then continuing along cattle grazed fields in the south-west direction. Majority of the route was not affected by artificial lighting and follows for the most part an uninterrupted continuous hedgerow, forming an ideal commuting route for bats. All fields were surrounded by tall hedgerows offered good foraging conditions. The original route included the farm land further west and connected onto the South part of transect 5 but part of the route had to be removed from the route because no access was refused. The east part of this transect corresponded with the west-most part of transect 3 surveyed in 2010. While the northern part of the South transect extended along crop and cattle grazed fields parallel with Barton Road it offered good foraging conditions for bats. The southern part very closely follows the M5 and the cattle grazed fields around it. This part of the transect was to a large extent affected by both, the light and the noise caused by heavy traffic (based on University of Leeds' study under the leadership of Professor John Altringham, bats are affected in their foraging by motorway traffic up to 1.6km distance from the motorway, Journal of Applied Ecology).
5. Rooks Bridge	The route of transect 6 (8.3km), followed wet cattle grazed fields along its entire way. Cattle were present on most fields during the survey period. This transect was badly affected by flooding, surface water was present on the ground surface during the majority of surveys in 2012, leading to perhaps reduced numbers of insects available and potentially lower foraging activity. This would only affect moths and beetle prey items.

2010 Transects	Description
	The section around the A38 and Rooks Bridge village was mainly affected by artificial lighting and moderate level of traffic.
6. Mark	More than half of the route of transect 7 (5.7km) consisted of roads and these parts were surveyed from car. The section following the B3139 was moderately affected by traffic. The northern walking section through cattle and sheep grazed fields and was not affected by artificial lighting. The section between Northwick Road and Vole Road offered good foraging opportunities for bats.
7. East Huntspill	Majority of transect 8 (9.8km), was surveyed from a vehicle due to most of the route being on public roads, starting on Southwick Road in the north-east part of the transect, then following the B3139 which is named Church Road on the crossing of the River Brue. The route then followed Merry Lane until reaching the Merry Farm. In the north-south direction the transect continued to the Huntspill River with a loop in the west-east direction from Chapel Lane to Burtle Road – this was the only part of the transect that had to be walked on a public right of way path following mainly grazed fields. A small section of this loop had to be abandoned for the remainder of the surveys because of dogs being let loose and out of control at night, disturbing other properties in the area. The River Brue and the Huntspill River and the south part of the transect are good bat foraging habitat.
8. Woolavington	Transect 9 (8.8km) directly followed on from transect 8 from the south of the River Huntspill, along the Causeway and turning westwards around Woolavington through crop fields and very wet ground in an apple orchard, crossing Woolavington Road and continuing south along crop and hay fields and following the edge of Eleven Acre Covert and Knowle Hill, both broadleaved woodlands. The route then joined the busy A39 largely affected by traffic noise and light. The field and woodland parts of the transect offered good foraging habitat for bats.
9. Rolstone & Nye	The route of transect 10 (6.4km) started with a loop along a field track known as Ball Barn Lane and Hatches Lane, then turned north along a meadow and onto cattle grazed fields. The next section of the transect followed public roads and was usually surveyed from a vehicle. The level of traffic was very low in this part of the transect. Another walking section continued from The Lower Gout Farm. The section of the transect beside the River Banwell were sheltered, offering good conditions for bat foraging. The last walking section of transect 10 was formed by the stream of Liddy Yeo until the junction with the Towerhead Brook. This part was also well sheltered and ideal for bats. A wooded area around Rookery Farm added to the quality of bat

2010 Transects	Description
	habitat. Majority of this transect was little affected by artificial lighting. Part of transect 10 corresponded with transect 4 from 2010.

3.4 Static Detector Surveys

3.4.1 In line with 2012 BCT guidelines, static detector surveys were also carried out alongside the 2012 transects, targeting areas of potential high impact based upon observations on habitat suitability that were made during the extended Phase 1 surveys and taking account of relevant site designations and potential impacts from the developing scheme design. Detectors were set in 19 locations, constantly recording bat activity between sunset and sunrise for five consecutive nights at each position and repeated once a month during June, July, August, September and October 2012, totalling 475 nights of recording . Static detector positions are shown in **Figure 8.32**.

3.4.2 Batcorder static bat detectors with HSDA recording between sunset and sunrise for minimum of 5 consequent nights each month per location (95 sessions of 5 days recording).

3.4.3 Batcorder was the only truly calibrated bat detector system available in the world in 2012. Each detector is set to same sensitivity as any another unit (an Anabat calibration system is also now available). So any repeat surveys can be recorded at exactly the same sensitivity, facilitating consistent results will be obtained from any Batcorder unit whether over a single or over several seasons.

3.4.4 Batcorder allows species identification including percentage probability of certainty of species identification. The percentage probability was individually checked for all rare bat species occurring on the transects (Barbastelle, Greater Horseshoe bat, Lesser Horseshoe bat, Bechstein's bat, Leisler's bat and Myotis alcathoe as well as Nathusius pipistrelle) and only records exceeding 70% certainty of identification were considered valid, all other recordings were summarised to species group or as unidentified bat species.

4.0 Results

4.1 Desk Study

4.1.1 15 UK bat species are known to be resident in Somerset (14 of which are confirmed as breeding in the county) and records of all species except for Nathusius' pipistrelle and Bechstein's were identified in the desk study search area.

- Horseshoe bats – both horseshoe species were recorded. Greater horseshoe *Rhinolophus ferrumequinum* records were identified close to Banwell, Sandford, Yatton, and Nailsea. Lesser horseshoe *R.hipposideros* records have been provided at Hinkley Point Power Station, Banwell, Sandford, Yatton, North End and Nailsea.
- Barbastelle *Barbastella barbastellus* – a single desktop record was provided to the north of Tickenham.

- Long-eared bats – brown long-eared *Plecotus auritus* records were numerous and widespread. Two records of grey long-eared *Plecotus austriacus* dating from 1992 and 1993 were provided at Hinkley Point Power Station.
- Pipistrelle bats – records of common and soprano pipistrelles *Pipistrellus pipistrellus* and *P.pygmaeus* were numerous and widespread throughout the route corridor. There are, however, no desktop records of Nathusius' pipistrelle *P.nathusii* along the route corridor.
- Bats of the *Nyctalus* genus – noctule *Nyctalus noctula* records were numerous and widespread, with a cluster of records around Yatton and Congresbury. Records of Leisler's bat *Nyctalus leisleri* were provided near Yatton, north of Nailsea and east of Avonmouth.
- Serotine *Eptesicus serotinus* records were numerous and widespread with a cluster of records around Yatton.
- Bats of the *Myotis* genus – Daubenton's *Myotis daubentonii*, Natterer's *Myotis nattereri,* whiskered *Myotis mystacinus* and Brandt's bat *Myotis brandtii* records were numerous and widespread with a prominent cluster of Daubenton's records to the north of Puxton close to Oldbridge River.

4.1.2 Bat activity transect surveys had been undertaken of the Portbury Wharf Nature Reserve by the Avon Wildlife Trust. The transect largely fell within the Order Limits, following hedgerows and ditches, and passing close to the ponds within the SNCI. The surveys recorded at least five species. The majority of bat activity during each survey was of common and soprano pipistrelle. A number of noctule and serotine passes were also recorded across the surveys and a single pass of a Myotis bat was recorded in August.

4.1.3 Avon Wildlife Trust has recorded the presence of a lesser horseshoe roost in a building and several pipistrelle roosts in bat boxes on trees at the Portbury Wharf nature reserve.

4.2 Tree Roost Surveys

4.2.1 The survey findings are illustrated on **Figure 8.25**. Following the daytime ground-level and aerial inspections, 123 trees were subject to nocturnal roost surveys. Bat roosts were identified in 21 trees (**Table 3**) all of which fall within or adjacent to the Order Limits.

4.2.2 Tree 21aB was recorded with 21 whiskered bats roosting on the 22 August, 10 on 10 September and 18 on 15 September; accordingly Tree 21aB was classed as a maternity roost. This tree, based on the growth form and condition, was also considered to have potential as a hibernation roost. Tree 21aB lies on the southern edge of Chisland Covert (semi-natural broad-leaved woodland) and adjoins a strong network of hedgerows that surround parcels of semi-improved neutral grassland.

4.2.3 12 trees were recorded with singleton bats emerging or returning to roost – Trees 1a and 553 (Natterer's), Trees 17, 86a, 91a and 115a (soprano pipistrelle), Trees 36, 118, 135a, 367 and 461 (common pipistrelle) and Tree 425 (pipistrelle sp.). Eight of these offered at least some potential to support hibernating bats. Eight roosts were identified through the presence of droppings alone; no bats were recorded emerging or returning to roost at the time of survey. These are Tree 63 (Myotis sp.), Tree 366 (long-eared bat) and Trees 106a, 122, 183a, 19, 250 and 653 (all pipistrelle sp.). Six of which offered at least some potential for hibernation. The status of each roost was classed based on the potential roost features present as well as the number of droppings and number of bats recorded. Status ranged from use by individual bats on an occasional to use by low numbers, potentially on a regular basis, which is typically associated with summer day (Used during the day to rest in by males and/or non-breeding females) or night roosts (where bats rest between periods of foraging activity during the night), or possibly a transitional roost (where bats may be present during the spring or autumn between hibernation and maternity seasons).

4.2.4 Bats have a natural propensity to utilise a range of roost features throughout the year, some of which may be used on an opportunistic basis by single bats. Following the dusk/dawn surveys there were a total of 85 trees categorised as having High potential to support roosting bats that fall within the Order Limits but where no bat roosts were found. In acknowledgement of the dynamic nature of tree roosts and tree roosting bats, these remain categorised as High roost potential and will be treated accordingly in any future works.

Table 3: Summary of Bat Tree Roosts Identified 2012-2013

Tree Ref.	Location	Grid ref.	Bat Species	**No. Bats Seen	Roost Status
1a	Section F (Portishead)	ST 48641 75111	Natterer's	1	Individual bats, occasional use

Tree Ref.	Location	Grid ref.	Bat Species	**No. Bats Seen	Roost Status
17	Section B (Somerset Levels & Moors South)	ST 34132 41952	Soprano pipistrelle	1	Individual, potentially on regular basis *
21aB	Section A (Puriton Ridge)	ST 33036 40920	Whiskered	21, 10, 18	Maternity *
36	Section B (Somerset Levels & Moors South)	ST 35633 44857	Common pipistrelle	1	Individual, occasional (*)
63	Section B (Somerset Levels & Moors South)	ST 36583 48337	*Myotis*	0	Individual, occasional
86a	Section F (Portishead)	ST 48519 75756	Soprano pipistrelle	1	Individual, occasional
91a	Section F (Portishead)	ST 48483 76294	Soprano pipistrelle	1	Low numbers, potentially on regular basis *
106a	Section G (Avonmouth)	ST 51522 78013	Pipistrelle	0	Individual, potentially on regular basis *
115a	Section F (Portishead)	ST 48577 76392	Soprano pipistrelle	1	Low numbers, potentially on regular basis *
118a	Section F (Portishead)	ST 48525 76510	Common pipistrelle	1	Low numbers, potentially on regular basis *
122	Section C (Mendip Hills AONB)	ST 39593 57400	Pipistrelle	0	Low numbers, potentially on regular basis *
135a	Section D (Somerset Levels and Moors North)	ST 45798 69996	Common pipistrelle	1	Individual, occasional (*)
183a	Section D (Somerset Levels and Moors North)	ST 41319 59726	Pipistrelle	0	Low numbers, potentially on regular basis (*)
191	Section D (Somerset Levels and Moors North)	ST 41208 59738	Pipistrelle	0	Low numbers, potentially on regular basis *
250	Section D (Somerset Levels and Moors North)	ST 41584 60491	Pipistrelle	0	Individual, potentially on regular basis *
366	Section D (Somerset Levels and Moors North)	ST 41956 67963	Long-eared bat	0	Individual, occasional
367	Section D (Somerset Levels and Moors North)	ST 41962 67959	Common pipistrelle	1	Individual, occasional

Tree Ref.	Location	Grid ref.	Bat Species	**No. Bats Seen	Roost Status
415	Section D (Somerset Levels and Moors North)	ST 44321 69706	Pipistrelle	1	Low numbers, potentially on regular basis *
461	Section E (Tickenham Ridge)	ST 47039 72304	Common pipistrelle	1	Individual, potentially on regular basis *
553	Section B (Somerset Levels & Moors South)	ST 37442 52684	Natterer's	1	Individual, occasional
653	Section G (Avonmouth)	ST 50536 75935	Pipistrelle	0	Low numbers, potentially on regular basis *

* Tree has potential to act as a hibernation roost / (*) limited potential only

** Multiple numbers relate to different nocturnal surveys

4.2.5 **Table 4** below summarises the results of the emergence surveys of the trees where bat roosts were found.

Table 4: Summary of trees found to have roosting bats

Tree	Species	Droppings	Bats seen	No. of Surveys	Emergence Surveys		
					1st	2nd	3rd
1a	Myotis nattereri	n/a	1	3	25/07/2013	27/08/2013	13/09/2013
17	Pipistrellus pygmaeus	n/a	1	3	22/07/2013	24/08/2013	11/09/2013
21aB	Myotis mystacinus	n/a	21, 10, 18	3	22/08/2013	10/09/2013	15/09/2013
36	Pipistrellus pipistrellus	n/a	1	3	23/07/2013	23/08/2013	16/09/2013
63	Myotis spp.	1	n/a	2	N	N	12/09/2013
86a	Pipistrellus pygmaeus	n/a	1	4	26/07/2013	28/08/2013	14/09/2013
91a	Pipistrellus pygmaeus	n/a	1	4	27/07/2013	27/08/2013	14/09/2013
106a	Pipistrellus spp.	10+	n/a	2	N	N	04/09/2013
115a	Pipistrellus pygmaeus	n/a	1	3	26/07/2013	28/08/2013	15/09/2013
118a	Pipistrellus pipistrellus	n/a	1	4	26/07/2013	28/08/2013	14/09/2013
122	Pipistrellus spp.	10+	n/a	2	N	08/08/2013	No access
135a	Pipistrellus pipistrellus	n/a	1	3	14/08/2013	08/09/2013	21/09/2013
183a	Pipistrellus spp.	10+	n/a	2	N	N	05/09/2013
191	Pipistrellus spp.	2	n/a	2	N	N	05/09/2013
250	Pipistrellus spp.	1	n/a	2	N	N	06/09/2013
366	Plecotus spp.	20+	n/a	2	N	N	30/08/2013
367	Pipistrellus pipistrellus	n/a	1	3	16/07/2013	13/08/2013	30/08/2013
415	Pipistrellus spp.	n/a	1	4	19/07/2013	06/09/2013	20/09/2013
461	Pipistrellus pipistrellus	n/a	1	3	31/07/2013	31/08/2013	21/09/2013

Tree	Species	Droppings	Bats seen	No. of Surveys	Emergence Surveys		
					1st	2nd	3rd
553	Myotis nattereri	n/a	1	4	20/08/2013	11/09/2013	18/09/2013
653	Pipistrellus spp.	1	n/a	2	N	N	15/09/2013

4.2.6 The results in the **Table 4** have been compiled from information produced by Greena Ecological Consultancy. Where the dates are coloured red this shows the occasions on which the bats were seen emerging from, or entering, the tree.

4.2.7 In trees where the presence of a roost was ascertained from the aerial inspection through the presence of droppings, only one dusk/dawn roost activity survey was required to attempt to ascertain the bat species. Descriptions of bat tree roosts are provided in **Table 5**.

Table 5: Tree roost descriptions

Tree ID	Description
Tree 21aB	The tree is located to the south-east of Puriton, approximately 500m northeast of the A39 and 700m south of Woolavington Road. The ash tree lies at the edge of an area of semi-natural broad-leaved woodland known as Chisland Covert and adjoins a good network of hedges surrounding parcels of semi-improved neutral grassland.
Tree 17	The tree is located to the north-west of Woolavington, approximately 375m north of Woolavington Road and 520m west of Causeway. This is a dead ash tree, approximately 3 to 10m tall, with numerous cavities located on the edge of a parcel of improved grassland adjacent to a network of hedges.
Tree 36	The tree is located to the east of East Huntspill in an area identified as Huntspill Moor approximately 1.2km east of the B3141. This is a hawthorn tree, approximately 1.5 to 4m tall, situated within a hedge line between parcels of improved grassland and poor semi-improved grassland.
Tree 63	The tree is located to the north-west of Mark, to the south-east of Northwick and approximately 600m north of Northwick Road. This is a willow tree, approximately 1 to 2m tall, with numerous splits and situated within a hedge line between parcels of improved grassland.
Tree 553	This tree is located to the east of Rooks Bridge and on the edge of Tarnock, approximately 120m north of the A38. This is an ash tree, approximately 3 to 12m tall, situated within a cluster of scattered broad-leaved trees within an area of improved grassland.
Tree 122	The tree is located to the north of Barton, approximately 1.8km west of Winscombe and 1.2km east of the M5. This is an oak tree, approximately 12m tall, with a split in the trunk and is situated within a hedge line separating two parcels of semi-improved grassland.
Tree 183a	The tree is located on the western outskirts of Sandford, approximately 170m north of the A368. This is an apple tree situated along a hedge line of scattered broad-leaved trees adjacent to parcels of poor semi-improved grassland. The tree is approximately 600m northeast of North Somerset & Mendip Bats SAC and Banwell Ochre Caves SSSI.
Tree 191	This tree is also located on the western outskirts of Sandford, approximately 210m north-west of the A368. This is a willow tree with numerous cavities, approximately 1.0 to 1.8m tall. It is situated along a

Tree ID	Description
	hedge line of scattered broad-leaved trees adjacent to parcels of poor semi-improved grassland. The tree is approximately 600m northeast of North Somerset & Mendip Bats SAC and Banwell Ochre Caves SSSI.
Tree 250	This tree is located to the north of Sandford, approximately 800m north of the A368 and 200m west of Nye Road. This is an aspen tree with a split limb approximately 2.5m tall. The tree is situated within a parcel of improved grassland and is approximately 1.4km northeast of North Somerset & Mendip Bats SAC and Banwell Ochre Caves SSSI.
Tree 366	This tree is located approximately midway between Yatton to the south and Kenn to the north approximately 550m east of Kenn Road. This is an ash tree with holes where a limb has been trimmed. It is approximately 2 to 3m tall and is located within a hedge line between two parcels of arable land.
Tree 367	This tree is located approximately midway between Yatton to the south and Kenn to the north approximately 550m east of Kenn Road. It is situated in close proximity to tree 366. This is an ash tree approximately 1 to 6m tall and is located within a hedge line between two parcels of arable land.
Tree 415	This tree is located approximately 1.5km west of Nailsea and approximately 430m north of Nailsea Wall Lane. This is a willow tree with a hollow trunk, approximately 1 to 6m tall. The tree is located within a hedge line between two parcels of arable land.
Tree 135a	This tree is on the western edge of Nailsea lying immediately adjacent to Engine Lane. This is an ash tree approximately 1.5 to 4m tall located within an area of modified neutral grassland.
Tree 461	This tree is located approximately 1km north of Nailsea, approximately 330m north of Tickenham Hill and 1km southeast of the M5. The tree is an ash tree with a split limb, approximately 2 to 8m tall. The tree is located within an area of semi-improved neutral grassland.
Tree 1a	This tree is located approximately 1km south-east of Portishead, approximately 345m north of the M5 and 330m south of the A369. This is a hawthorn approximately 1 to 3m tall and it is located alongside a ditch between 2 parcels of semi-improved neutral grassland.
Tree 86a	This tree is located approximately 600m south-west of Portishead, approximately 320m north of the A369 and 220m south of Sheepway. This is a dead ash tree with a hollow core and limbs. It is located within an area of semi-improved neutral grassland.
Tree 91a	This tree is located to the east of Portishead, approximately 260m north of Sheepway and within Portbury Wharf Nature Reserve. This is an oak tree with numerous holes, splits, scars and woodpecker holes, it is approximately 5 to 7.5m tall. The tree is situated within a hedge line between 2 parcels of semi-improved neutral grassland.
Tree 115a	This tree is also located within Portbury Wharf Nature Reserve to the east of Portishead and approximately 330m north of Sheepway. This is an oak tree with flaking bark and numerous holes approximately 4 to 6m tall. The tree is situated within a hedge line between 2 parcels of semi-improved neutral grassland.
Tree 118a	This tree is also located within Portbury Wharf Nature Reserve to the east of Portishead and approximately 420m north of Sheepway. This is an ash tree with a split and a woodpecker hole and is approximately 6.5 to 8m tall. The tree is situated within a hedge line between 2 parcels of semi-improved neutral grassland.

Tree ID	Description
Tree 653	This tree is located in close proximity to Portbury alongside a disused railway approximately 300m north of junction 19 of the M5 and 100m west of Royal Portbury Dock Road. This is a willow tree with several holes approximately 1.6 to 3.0m tall. The tree is situated within an area of plantation broad-leaved woodland.
Tree 106a	This tree is located adjacent to the docks at Avonmouth approximately 550m south of the junction of the A4 and A403. This is a willow tree with a split in a limb which is approximately 5.5m tall. The tree is situated within an area of dense continuous scrub with scattered broad-leaved trees.

4.3 Activity Transects

Weather

4.3.1 Weather conditions were recorded for each night when a transect survey took place. **Tables 6 and 7** show date of survey, transects surveyed on that night, start and end temperature in degrees Celsius, cloud in % cover and wind in Beaufort scale.

Table 6: Weather information for 2010 surveys

Date	Transects	Start temp.	End temp.	Cloud	Wind
June 2010					
06/06/2010	1	13	9	30	2
08/06/2010	14	15	13	40	0
10/06/2010	2	14	7	80	2
11/06/2010	2, 3	13	11	70	0
14/06/2010	13	14	12	60	2
15/06/2010	4, 6, 7	10.5	7	50	0
16/06/2010	5, 8, 9, 10,11, 12,	13.5	12	25	0
21/06/2010	1	14	11	0	1
22/06/2010	2, 5	16	11	0	0
23/06/2010	3, 4, 7, 8, 10	16	13	50	0
24/06/2010	4, 6	14	11	0	0
25/06/2010	9	16	11	0	0
26/06/2010	14	17	12	0	0
28/06/2010	13	18	16	30	0
29/06/2010	8, 12	16	15	70	1
July 2010					
06/07/2010	5	17	14	40	1
07/07/2010	4, 6	17.5	15	100	0
12/07/2010	3, 8, 9, 10, 12	17.5	16	100	0
13/07/2010	7, 9, 11	16	14	80	2
17/07/2010	14	15	13	0	1
18/07/2010	2, 13	16	12	30	0
19/07/2010	1	17	13	20	0
22/07/2010	4, 7, 8, 9, 11	14	11	70	0

Date	Transects	Start temp.	End temp.	Cloud	Wind
23/07/2010	5, 7	14	12	30	2
24/07/2010	4	18	16	100	0
25/07/2010	3	18	17	90	1
26/07/2010	2	18	17	70	1
28/07/2010	10, 12, 14	14	11	30	1
29/07/2010	6	13	10	50	1
30/07/2010	1	17	16	100	1
31/07/2010	13	16	13	80	0
August 2010					
01/08/2010	9, 14	16	12	60	2
02/08/2010	5, 7, 13	15	11	20	1
03/08/2010	2, 3	16	14	50	1
05/08/2010	1, 8	16	11	40	1
06/08/2010	6	17	15	100	2
07/08/2010	4	16	15	60	1
09/08/2010	10, 11, 12	17	16	90	1
11/08/2010	4, 7, 8, 10, 12	15	10	10	1
13/08/2010	9	16	13	80	1
14/08/2010	5, 7	15	11	40	1
15/08/2010	3	17	16	60	1
16/08/2010	4, 6, 7, 8	18	16	80	2
17/08/2010	10, 12	14	10	0	2
23/08/2010	2	13	10	70	3
24/08/2010	4	17	13	60	1
29/08/2010	14	12	11	90	2
30/08/2010	1	9.5	8.5	50	0
31/08/2010	11, 13	15	8	20	0
September 2010					
02/09/2010	3	14	11	80	1
03/09/2010	5, 7	14	13	30	1
04/09/2010	9, 10, 12	16	14	80	1
05/09/2010	4, 7, 8	15	14	60	1
07/09/2010	6	14	12	80	1
08/09/2010	1	14	13	40	1
09/09/2010	2	14	13	60	1
10/09/2010	14	17	16	90	2
11/09/2010	11, 13	16	13	30	1
12/09/2010	3	15	13	50	1
14/09/2010	5	16	14	70	0
15/09/2010	9	12	9	50	1
16/09/2010	10, 12	12	9	40	1
17/09/2010	4	11	8	40	1
19/09/2010	6	14	12	40	0
20/09/2010	11, 14	14	12	20	1

Date	Transects	Start temp.	End temp.	Cloud	Wind
21/09/2010	2	14	13	0	1
23/09/2010	13	14	13	80	0
24/09/2010	1,7, 8	12	10	100	2
25/09/2010	7	9	7	40	1
October 2010					
06/10/2010	14	13	11	40	1
07/10/2010	7	11	10	100	1
09/10/2010	5	14	12	70	1
10/10/2010	3	14	10	20	1
11/10/2010	9	12	8	30	1
12/10/2010	1, 2	8	6	70	2
13/10/2010	10, 12, 13	8	6	0	0
14/10/2010	4, 6	7	6	100	1
15/10/2010	1, 4, 7, 8	12	11	70	1
16/10/2010	14	10	8	30	1
17/10/2010	9	8	6	30	1
18/10/2010	3	12	11	80	1
21/10/2010	4	8	7	30	0
22/10/2010	5, 7	10	8	60	0
23/10/2010	6	8	6	40	0
26/10/2010	13	13	12	100	1
29/02/2010	2	13	11	80	0
30/10/2010	11	12	13	100	1
31/10/2010	1, 4, 7, 8, 10, 12	9	9	90	0

Table 7: Weather information for 2012 surveys

Date	Transects	Start temp.	End temp.	Cloud	Wind
June 2012					
18/06/2012	2, 5N, 5S, 7, 8	14	10	20	1
19/06/2012	8,9	15	14	20	0
22/06/2012	2, 3Y, 4NE, 4NW	14	12	10	3
24/06/2012	4NE, 4NW, 4S,6, 8, 9,10	13	13	30	3
25/06/2012	1, 3B, 3G, 10	16	14	80	2
26/06/2012	5N, 5S, 7, 8	18	18	100	0
27/06/2012	1, 4NE, 4NW, 4S, 10	15	15	80	0
28/06/2012	3G, 6, 9	17	16	60	3
29/06/2012	3B, 3Y, 3G	16	16	70	2
July 2012					
02/07/2012	1	14	12	30	1
04/07/2012	2, 4S, 5N, 5S	13	11	0	0
05/07/2012	3B, 3Y, 3G	17	15	20	0
08/07/2012	6, 9	18	16	60	2
09/07/2012	4NE, 4NW, 7, 8, 10	14	13	40	2

Date	Transects	Start temp.	End temp.	Cloud	Wind
14/07/2012	2, 5N, 5S	14	12	90	1
15/07/2012	1, 4S	15	14	80	2
17/07/2012	4NE, 4NW, 10	19	17	70	1
18/07/2012	8, 9	14	13	70	2
19/07/2012	3B, 3Y, 3G	15	14	80	1
20/07/2012	7	14	13	30	1
27/07/2012	6	19	16	50	1
30/07/2012	3G	17	14	0	2
August 2012					
01/08/2012	4NE, 10	17	15	80	2
02/08/2012	4NW	16	15	90	2
03/08/2012	4S	17	17	100	3
04/08/2012	5N,	16	14	80	2
05/08/2012	1, 2	15	15	100	1
06/08/2012	4G, 5S	17	14	30	2
07/08/2012	9	15	13	60	1
08/08/2012	6	18	16	60	0
09/08/2012	3Y	19	15	30	0
10/08/2012	7, 8	19	17	70	0
14/08/2012	3B, 3G	19	14	20	2
17/08/2012	5S,	18	15	50	3
18/08/2012	10	17	16	80	1
19/08/2012	8	18	14	40	1
21/08/2012	4NE, 4NW	16	15	90	1
22/08/2012	9	17	14	30	3
24/08/2012	4	13	12	70	1
25/08/2012	1, 5N	16	15	80	2
26/08/2012	3B, 3G	16	14	70	2
27/08/2012	2	14	13	80	2
28/08/2012	6	17	15	90	1
29/08/2012	3Y	13	12	20	2
September 2012					
01/09/2012	4NE, 4SW	16	14	80	3
02/09/2012	4S	16	15	80	2
04/09/2012	3B, 3G	17	14	10	1
05/09/2012	5N, 5S	13	11	20	0
06/09/2012	3Y	14	12	60	1
07/09/2012	1, 2	15	14	50	1
08/09/2012	7, 8	17	13	20	1
09/09/2012	9	18	13	30	2
10/09/2012	6, 10	14	13	100	2
15/09/2012	4NW, 4S	12	11	100	2
17/09/2012	7, 8	12	10	90	2
18/09/2012	9, 10	13	11	70	2

Date	Transects	Start temp.	End temp.	Cloud	Wind
19/09/2012	4NE	11	9	80	2
20/09/2012	5N	12	10	80	1
21/09/2012	6	12	11	100	1
22/09/2012	1, 2, 5S	10	7	100	1
24/09/2012	3B, 3G	9	8	100	0
27/09/2012	3Y	13	11	80	1
October 2012					
01/10/2012	4NE, 4NW, 10	13	12	100	2
02/10/2012	1	14	12	80	3
03/10/2012	4S	11	10	100	2
04/10/2012	7	10	8	100	1
05/10/2012	8	9	9	100	2
06/08/2012	2, 5S	10	7	50	1
07/10/2012	5N	10	6	0	1
08/10/2012	6	9	9	70	1
09/10/2012	9	10	9	40	1
10/10/2012	3G	11	8	50	1
11/10/2012	3Y	12	11	30	3
12/10/2012	3B	10	8	40	3
15/10/2012	10	10	7	40	2
16/10/2012	7, 8	9	8	60	3
17/10/2012	9	12	10	40	3
18/10/2012	1, 2	12	11	70	2
19/10/2012	6	11	8	30	0
20/10/2012	5N	10	7	50	0
21/10/2012	5S	9	6	50	1
22/10/2012	3B, 3G	11	10	80	1
23/10/2012	4NW	12	11	80	1
24/10/2012	3G	12	12	90	2
25/10/2012	3Y	10	8	70	2
26/10/2012	4S	6	5	30	2
30/10/2012	4NE	9	6	20	2

4.3.2 Bat species recorded during transect surveys are marked as points on maps. Each species has its own symbol. Due to the scale of the mapping required for the survey, points represent species records encountered roughly every 30 metre section rather than individual bat passes. Furthermore, if two or more bats of the same species foraged in the same area, only one symbol was used marking the occurrence of species rather than individuals. If the same species was recorded in a section longer than 30 metres, another point was entered in the map.

4.3.3 The findings of the transect surveys are presented in the following Figures:

- **Figure 8.26** Bat Transect results – Annex II Bat Species 2010
- **Figure 8.27** Bat Transect results – Annex II Bat Species 2012

- **Figure 8.28** Bat Transect results – Pipistrelle Bat Species 2010
- **Figure 8.29** Bat Transect results – Pipistrelle Bat Species 2012
- **Figure 8.30** Bat Transect results – Other Bat Species 2010
- **Figure 8.31** Bat Transect results – Other Bat Species 2012

4.3.4 A total of 12 confirmed bat species were recorded during the activity surveys, including alcathoe which had not previously been recorded in the county. A description of the activity of each species is provided in the following paragraphs. Graphs presenting the proportional spread of each species on each transect is provided in **Figures 1 to 31**. Bat activity 'hotspots', correlating to high species diversity and/or particularly high contact counts of a single species, are shown in **Figure 8.33.**

4.3.5 Overall, the survey results emphasise the importance of this area to bats particularly wooded areas, water bodies, farm land, hedgerows and sheltered areas within the transect routes for bat commuting and foraging. Riparian habitats, especially where bordered by a mosaic of habitats, were shown to be key feeding areas for a range of bat species. Many bat species rely on linear features in landscape when commuting between their roost and foraging areas; hedgerows and treelines, together with riparian corridors, are considered the most important natural linear features for bats in the landscape.

Horsehoe bats

4.3.6 Somerset is a stronghold for greater and lesser horseshoe bats and both species were recorded across much of the route, albeit in very low numbers for much of the route. Numerous contacts of greater horseshoe bats were recorded from Webbington in the south and the M5 motorway in the north, including in the vicinity of the designated bat SAC sites.

4.3.7 Lesser horseshoe bats had a similar distribution to GHS, except for the notable absence of LHS from Puxton to Stone Edge Batch, before re-appearing in the field records from northwest Nailsea.

Barbastelle

4.3.8 Limited records of barbastelle were recorded across the survey area. Contacts were mostly recorded on the west and north western edge of Nailsea in both 2010 and 2012, and on one occasion in 2012 on Woolavington Transect in the south.

Long eared bats

4.3.9 Long-eared bats have a particularly quiet echolocation and, despite brown long-eared being one of the most common and widespread UK species, is typically under-recorded during transect surveys. Correspondingly, a relatively low number of contacts were recorded across the survey area, although these were widespread across the survey area. Long-eared activity could not be determined to species level and whilst brown long-eared is common across the UK, grey long-eared is also known to occur in the county and may be included within the activity recorded (preferred habitats , as for brown long-eared, include woodland, orchards, pasture with trees, tree lines and hedgerows).

Pipstrelle bats

4.3.10 Common and soprano pipistrelle activity was typically abundant across the majority of surveyed areas, with high numbers of passes associated with most transects and thes by far the dominat species. In contrast, Nathusius' pipistrelle, known to be scarce in the county, was recorded with very few contacts on only the Portbury and Brinsea Transects.

Noctule, Serotine and Leisler's bats

4.3.11 Nyctalus bats, typically far-flying and loud calling species, were recorded throughout the survey area. Records of noctule and serotine were clustered at Tickenham Ridge (southern end of Portbury Transect), Puxton Moor (Dolemor, Hewish and Yatton Transects), Kenn Moor (North End Transect) and south of Nailsea (Youngwood Lane Transect). Leisler's activity was confirmed north of Nailsea close the Land Yeo (Wraxhall and Nailsea Transects), with occasional passes also north of Banwell (Puxton to Sandford Transect) and at Portbury.

Myotis bats

4.3.12 Activity of Myotis bats was predominantly grouped as echolocations are difficult to accurately identify to species level, particularly when flying in or near clutter. Daubenton's and Natterer's, both relatively common and widespread species, were confirmed. A single record of alcathoe was also confirmed in 2012 (just east of the M5, close to Wolvershill Manor on Banwell Hill to Roleston Transect), representing a new species for the county. The species has relatively recently been distinguished in the UK, first recorded in 2010 and the current picture indicates widespread national distribution, albeit at low occurrence.

4.3.13 **Figures 1 to 14** illustrate the bat species recorded on each of the 2010 transects. **Figure 15** compares monthly activity levels across all 2010 transects.

Figure 1: Proportional presence of bat species on transect 1 - Badgworth (2010)

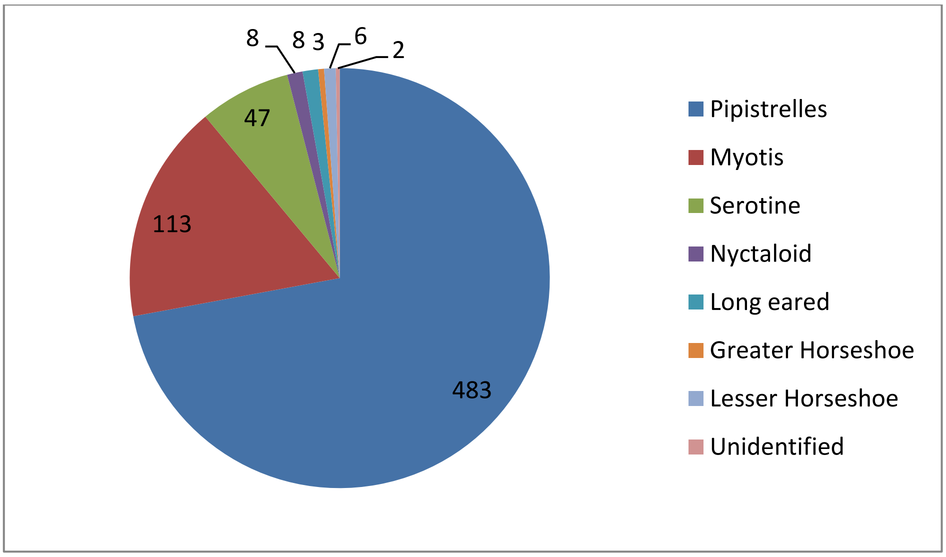


Figure 2: Proportional presence of bat species on transect 2 - Webbington (2010)

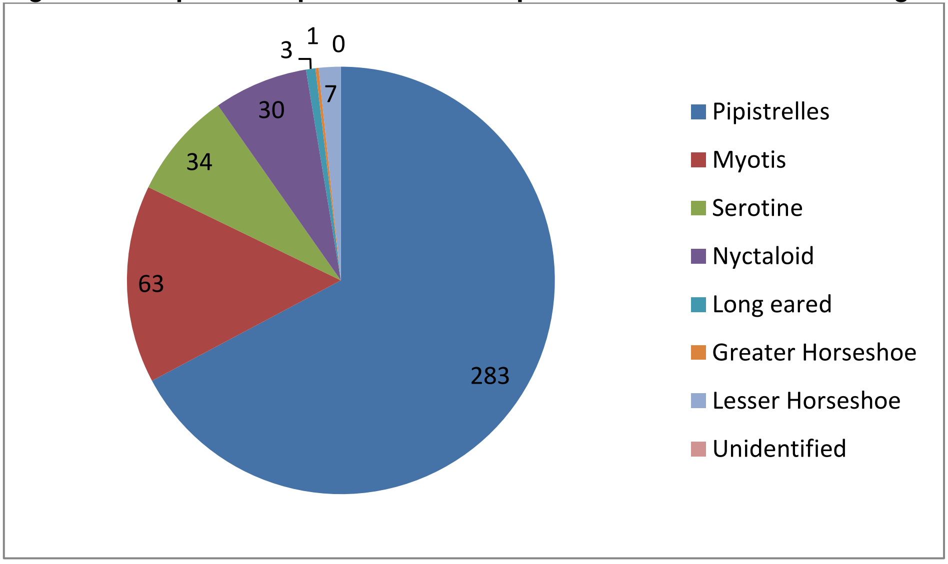


Figure 3: Proportional presence of bat species on transect 3 – Banwell (2010)

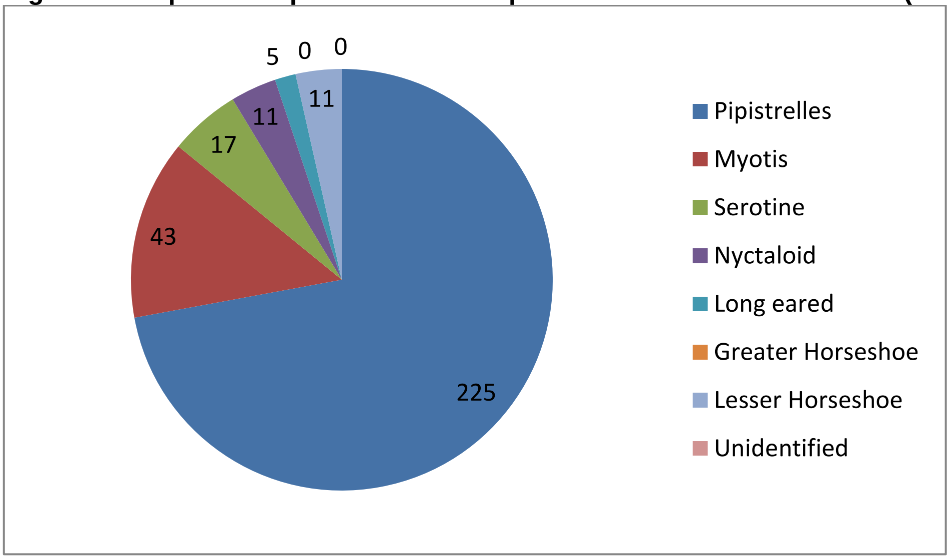


Figure 4: Proportional presence of bat species on transect 4 – Puxton to Sandford (2010)

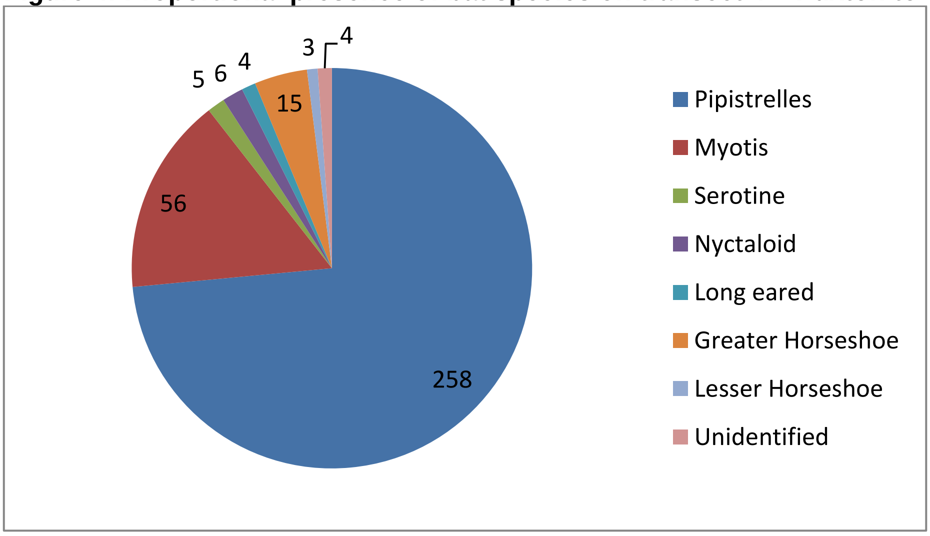


Figure 5: Proportional presence of bat species on transect 5 – Dolemoor (2010)

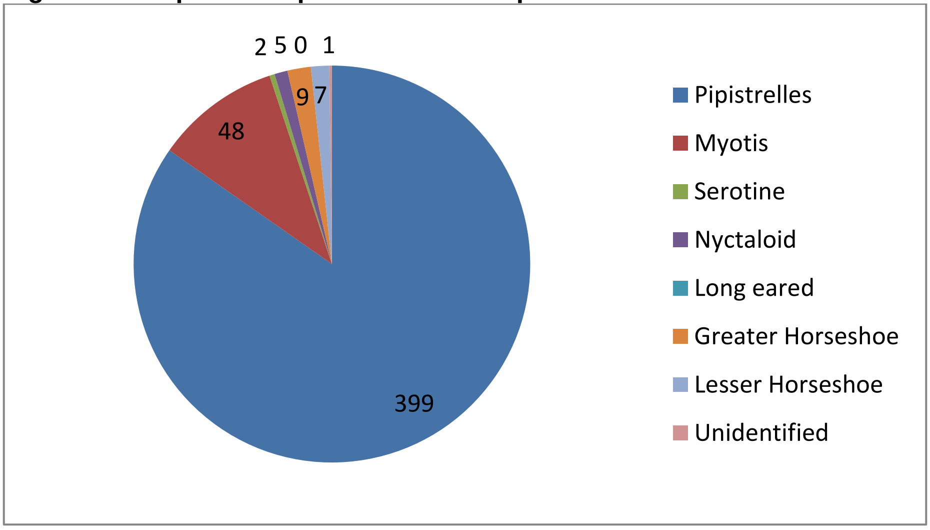


Figure 6: Proportional presence of bat species on transect 6 – Brinsea (2010)

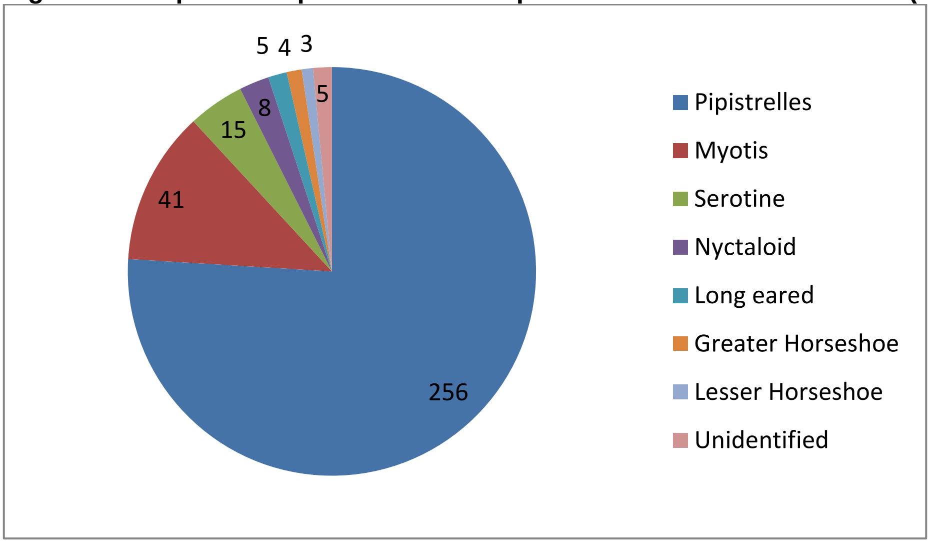


Figure 7: Proportional presence of bat species on transect 7 – Rolstone (2010)

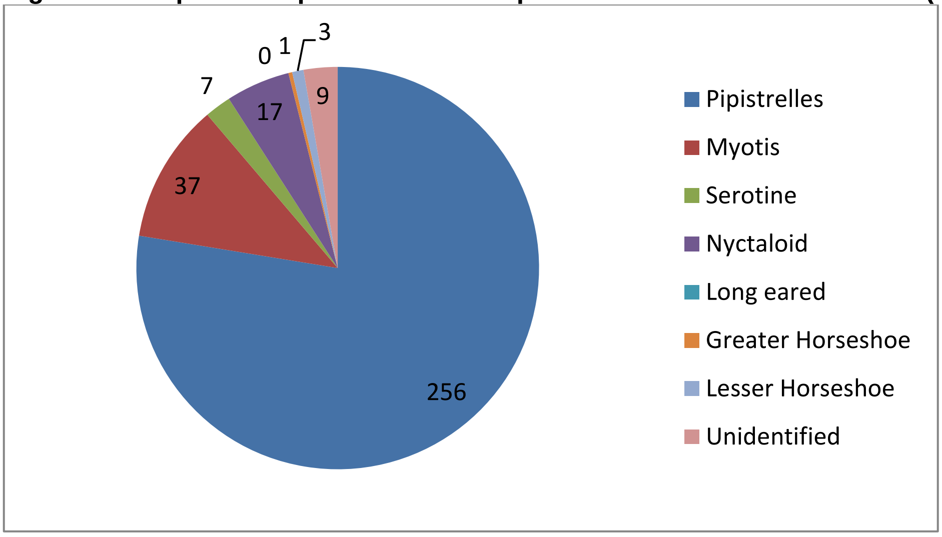


Figure 8: Proportional presence of bat species on transect 8 - Hewish (2010)

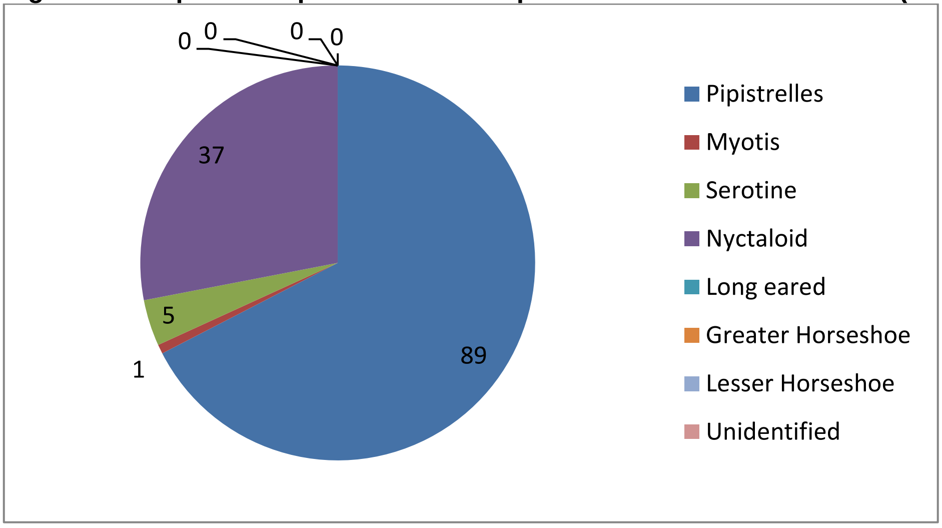


Figure 9: Proportional presence of bat species on transect 9 – Yatton (2010)

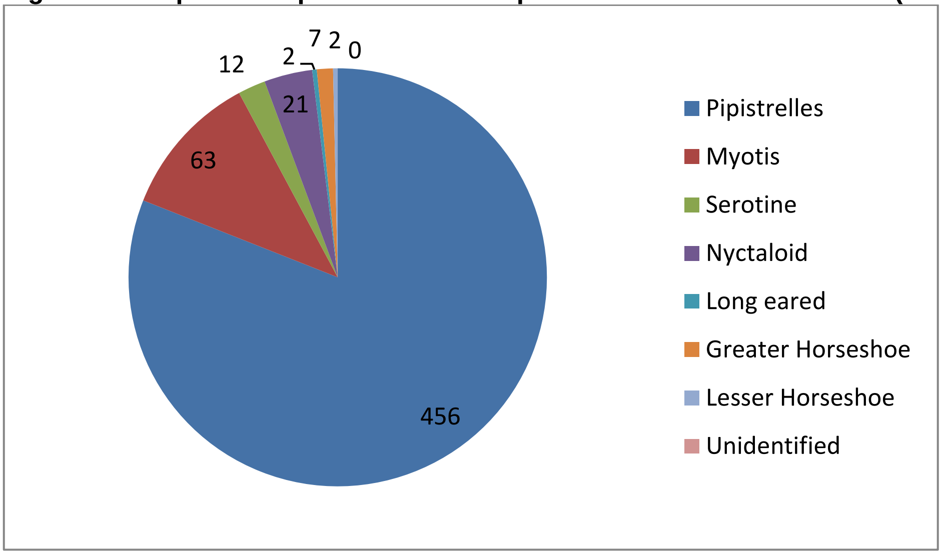


Figure 10: Proportional presence of bat species on transect 10 – North End (2010)

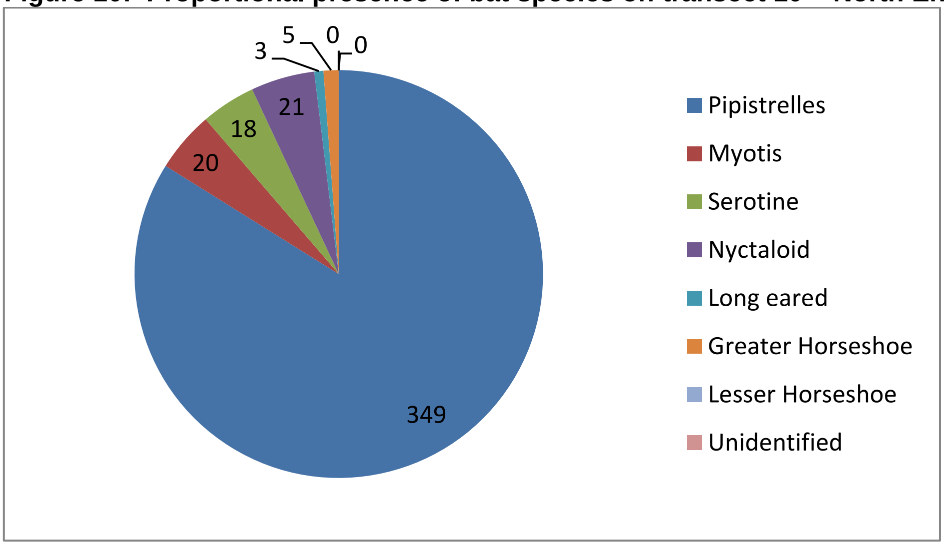


Figure 11: Proportional presence of bat species on transect 11 – Tickenham (2010)

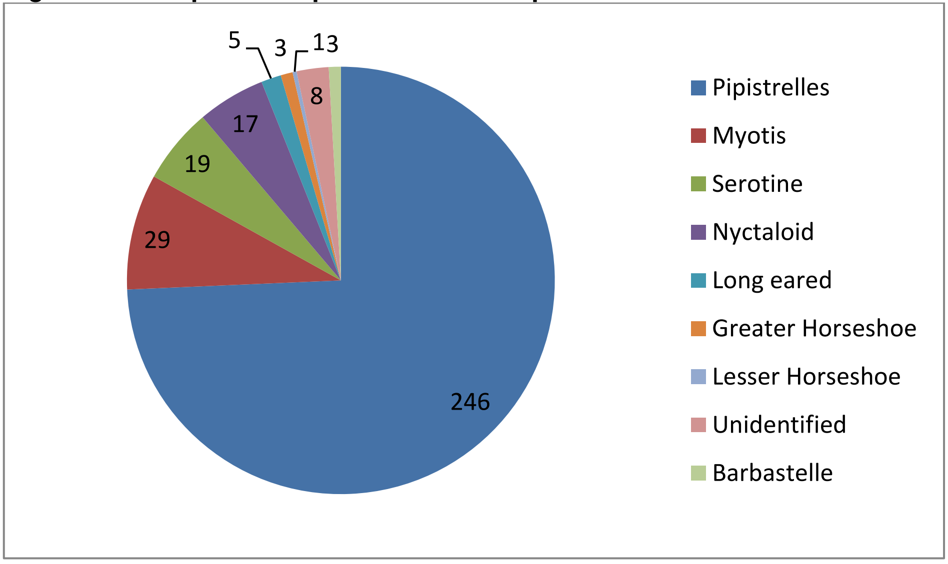


Figure 12: Proportional presence of bat species on transect 12 – Young Wood (2010)

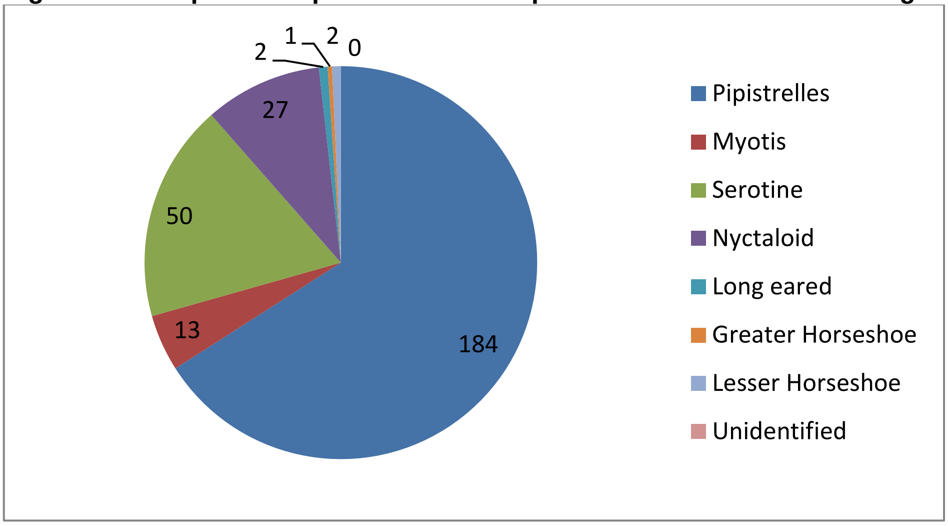


Figure 13: Proportional presence of bat species on transect 13 – Wraxhall & Backwell Common (2010)

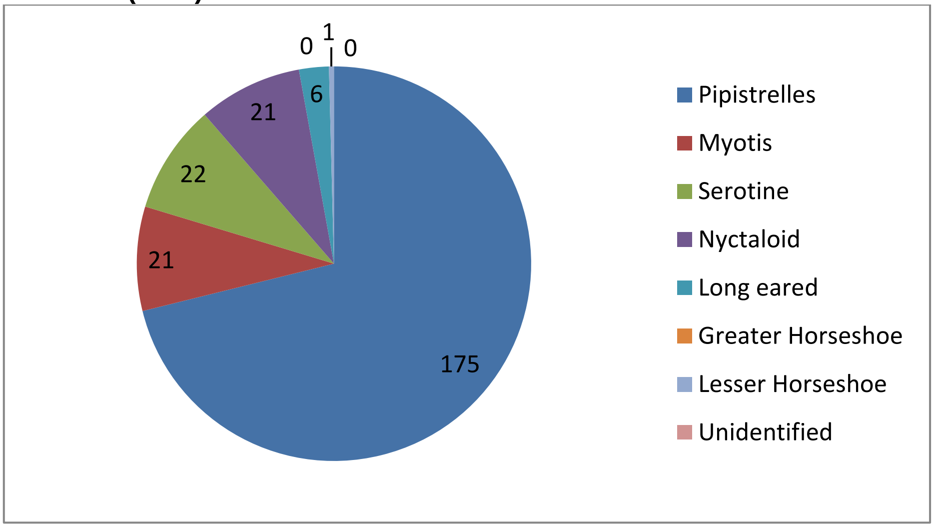


Figure 14: Proportional presence of bat species on transect 14 – Portbury (2010)

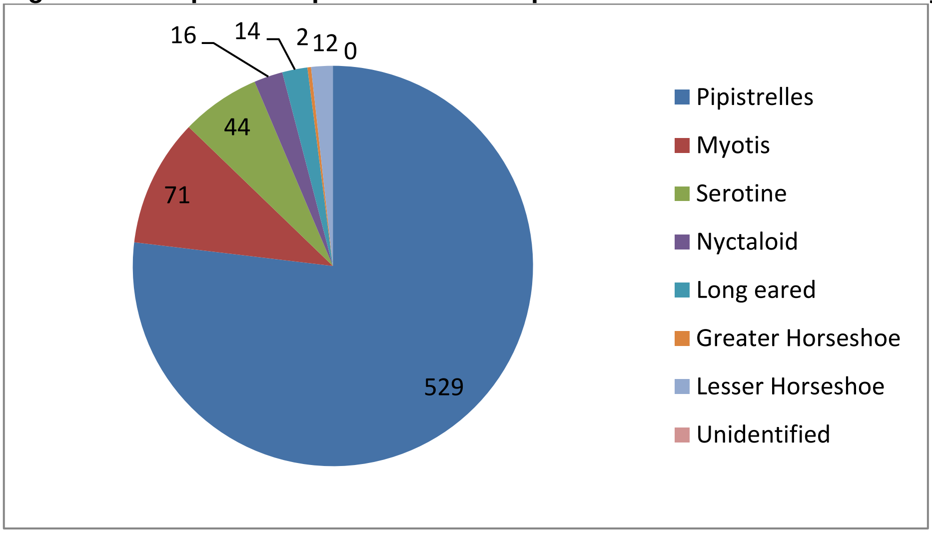


Figure 15: Seasonal activity along all transects in 2010

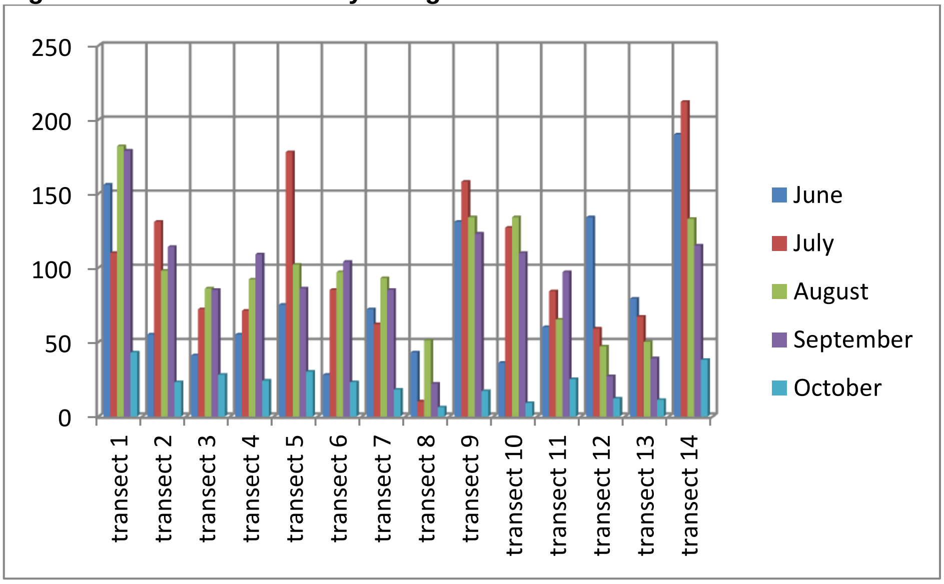
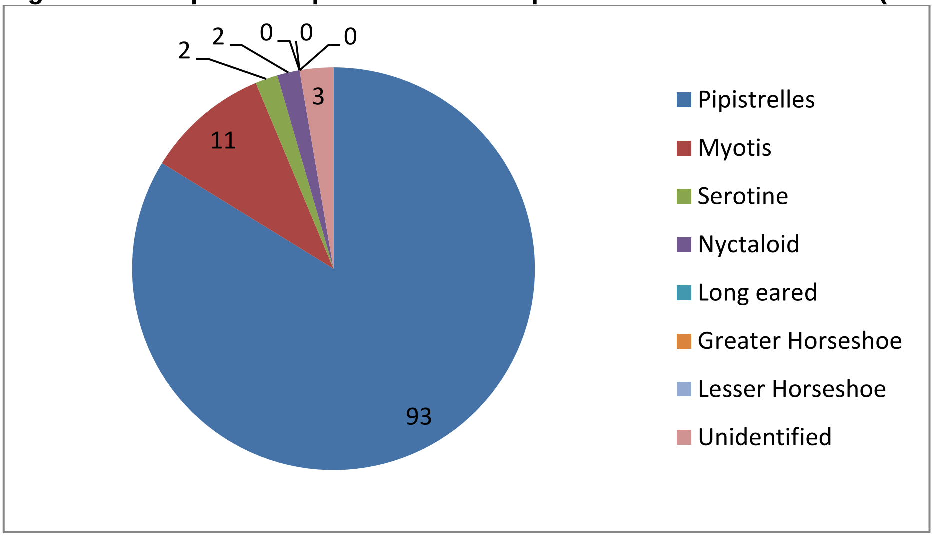


Figure 16: Proportional presence of bat species on transect 1 - Aust (2012)



4.3.14 **Figures 16 to 30** provide a graphic illustration of bat species recorded on each of the 2012 transects. **Figure 31** compares monthly activity levels across all 2012 transects.

Figure 17: Proportional presence of bat species on transect 2 – Avonmouth (2012)

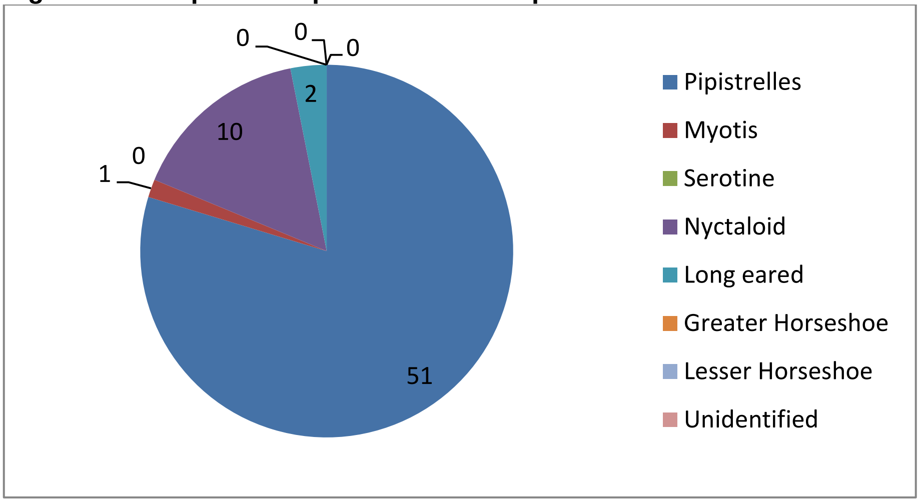


Figure 18: Proportional presence of bat species on transect 3 – Tickenham Ridge north (2012)

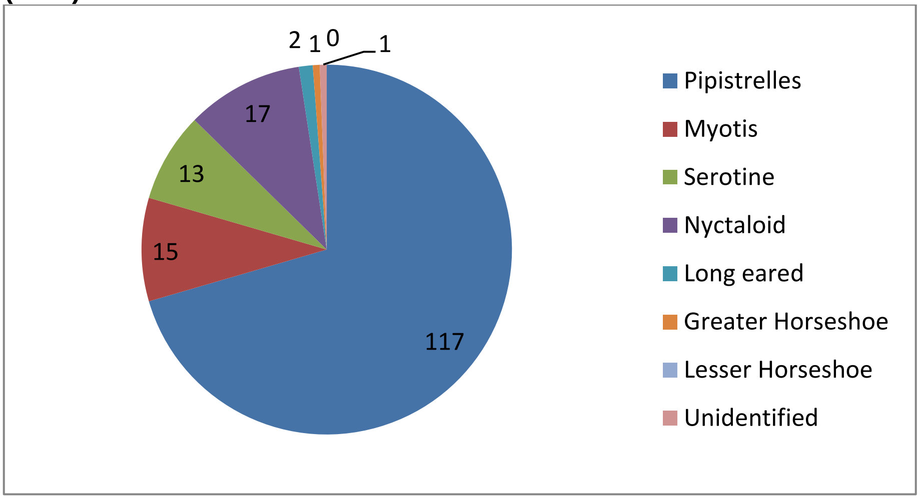


Figure 19: Proportional presence of bat species on transect 3 – Tickenham Ridge middle (2012)

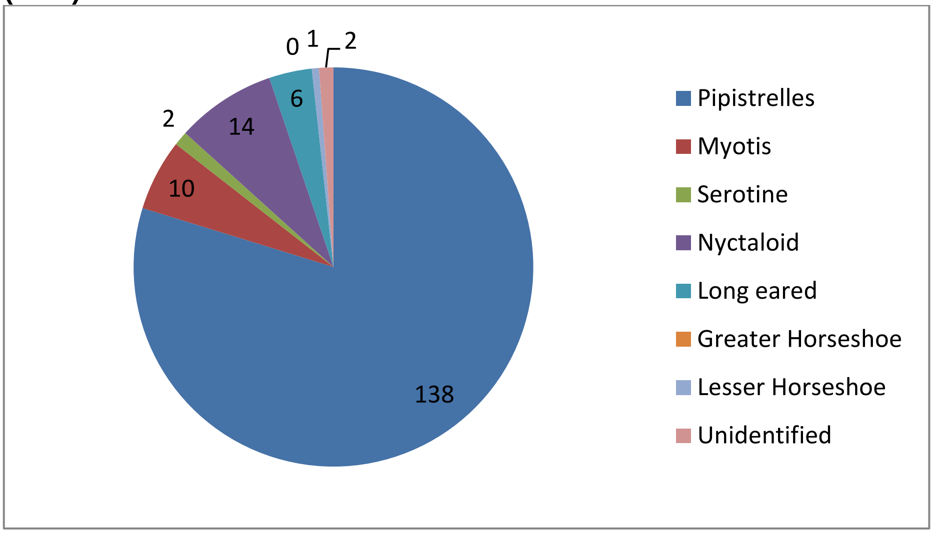


Figure 20: Proportional presence of bat species on transect 3 - Tickenham Ridge south (2012)

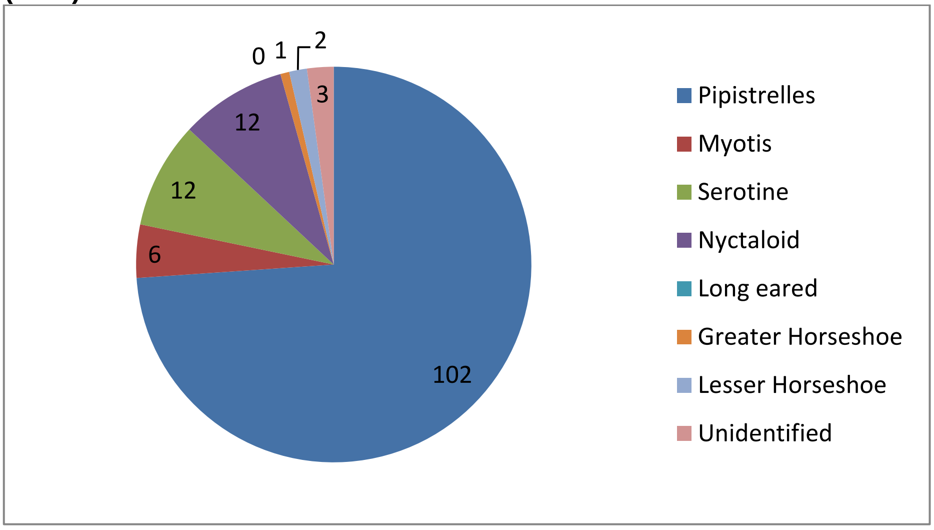


Figure 21: Proportional presence of bat species on transect 4 Sandford northeast (2012)

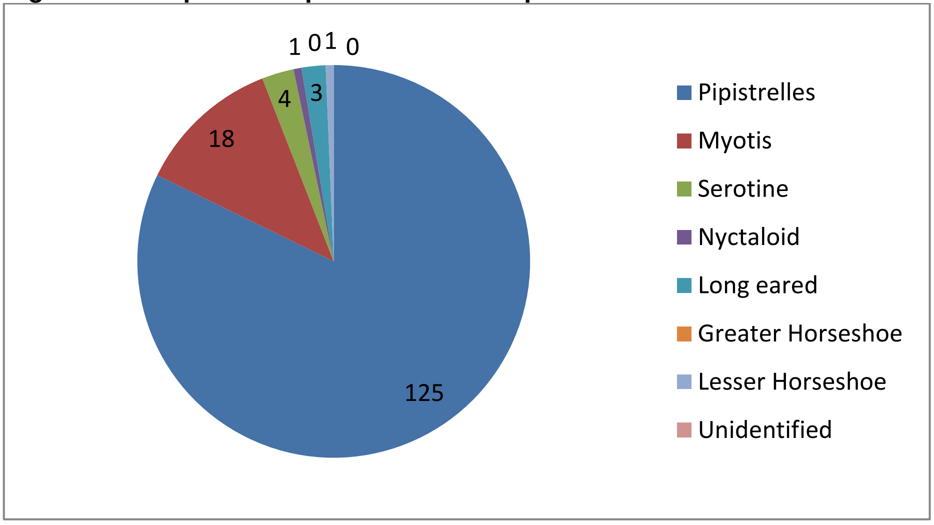


Figure 22: Proportional presence of bat species on transect 4 - Sandford northwest (2012)

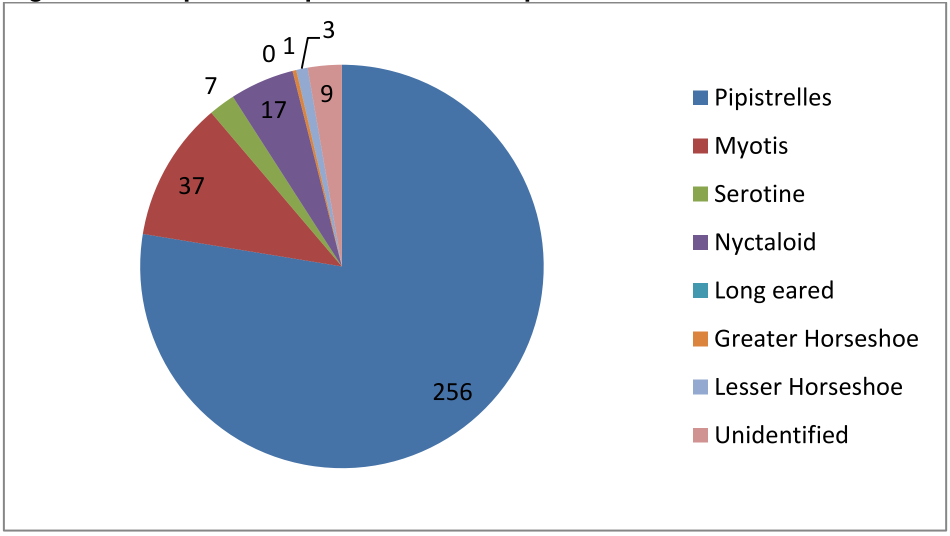


Figure 23: Proportional presence of bat species on transect 4 - Sandford south (2012)

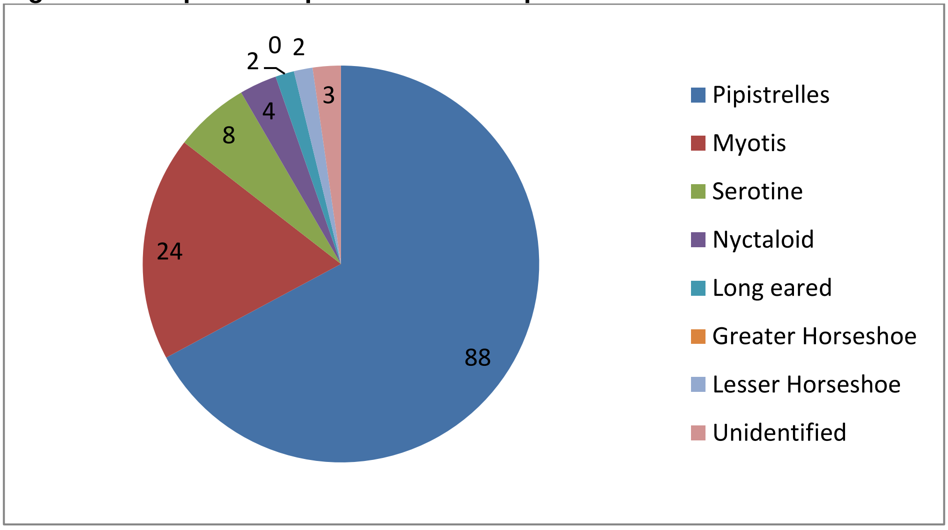


Figure 24: Proportional presence of bat species on transect 5 - AONB north (2012)

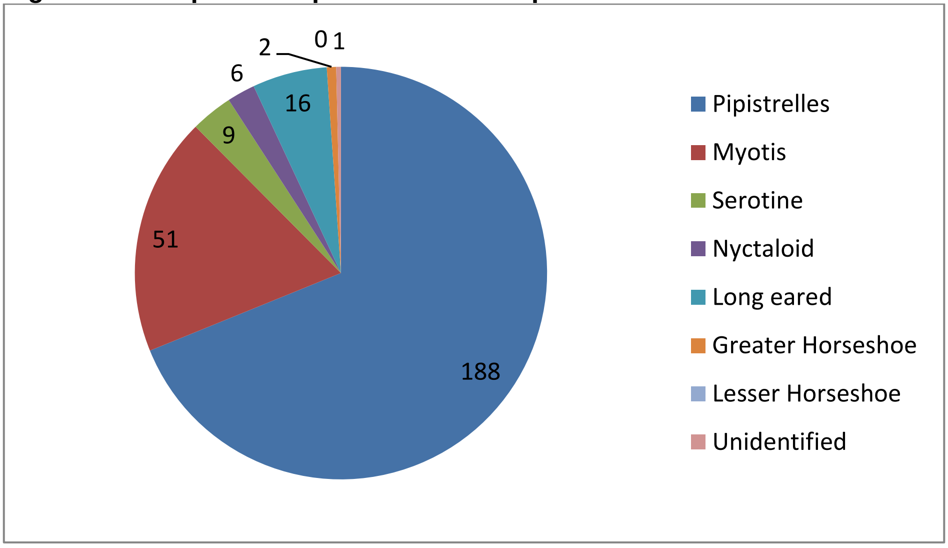


Figure 25: Proportional presence of bat species on transect 5 - AONB south (2012)

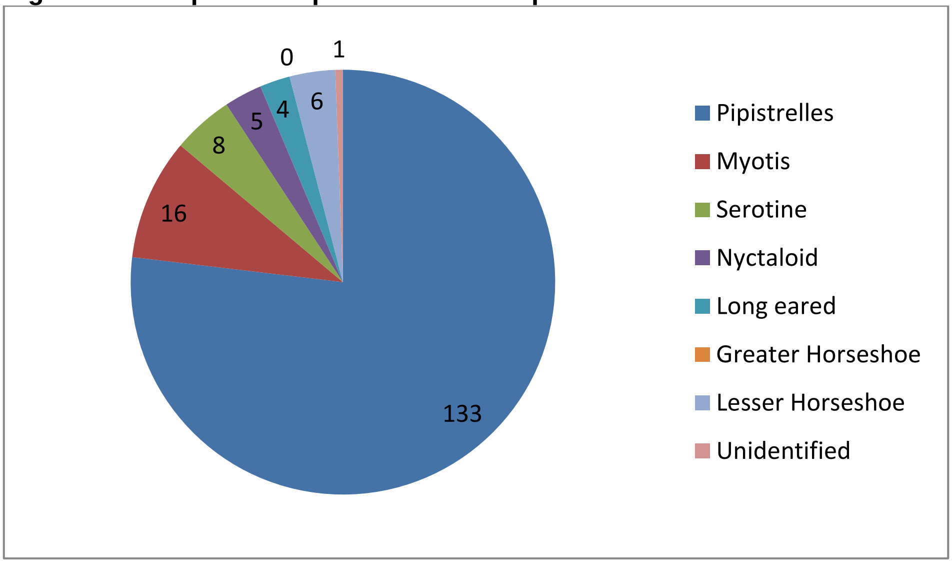


Figure 26: Proportional presence of bat species on transect 6 – Rooks Bridge (2012)

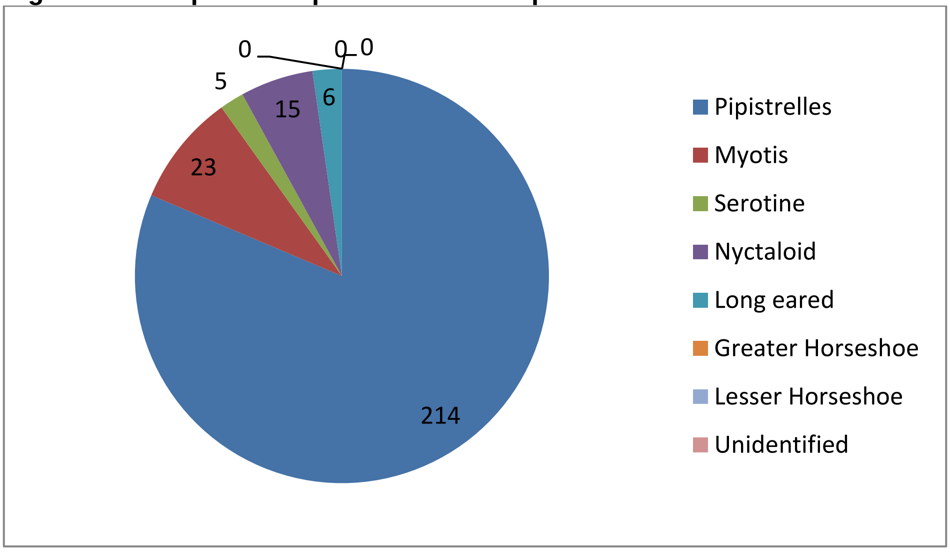


Figure 27: Proportional presence of bat species on transect 7 – Mark (2012)

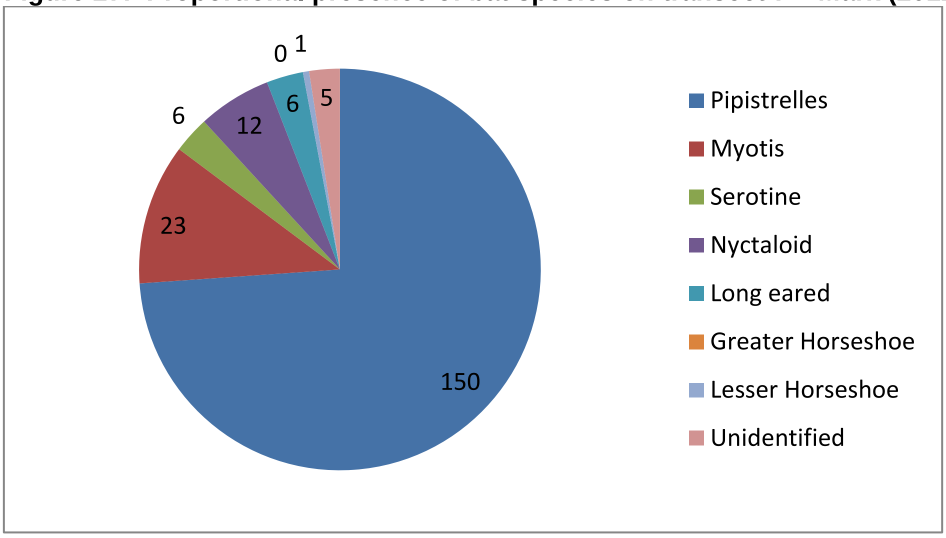


Figure 28: Proportional presence of bat species on transect 8 – East Huntspill (2012)

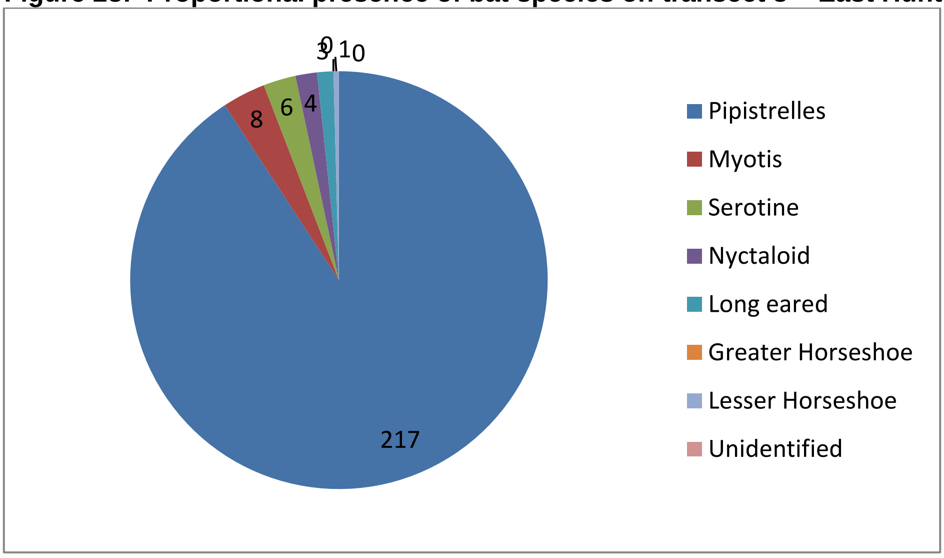


Figure 29: Proportional presence of bat species on transect 9 – Woolavington (2012)

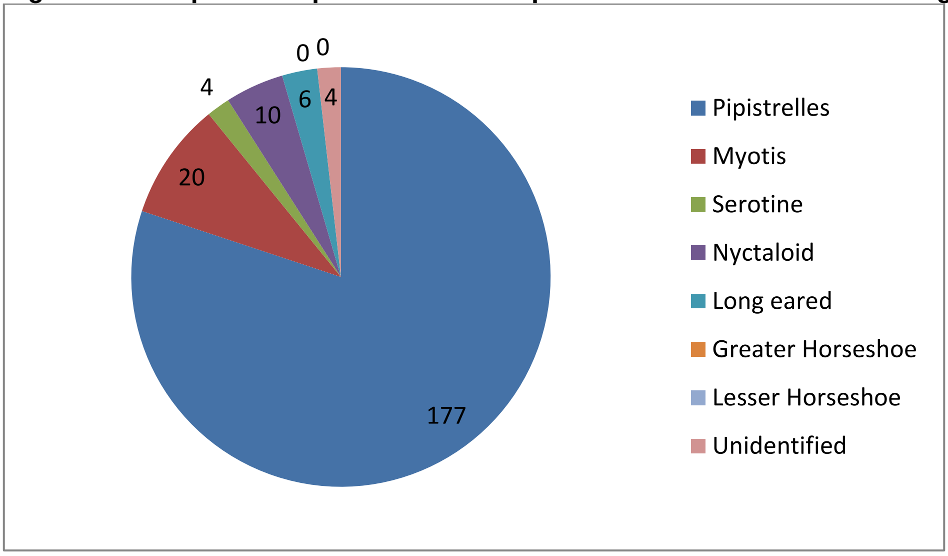


Figure 30: Proportional presence of bat species on transect 10 – Rolstone & Nye (2012)

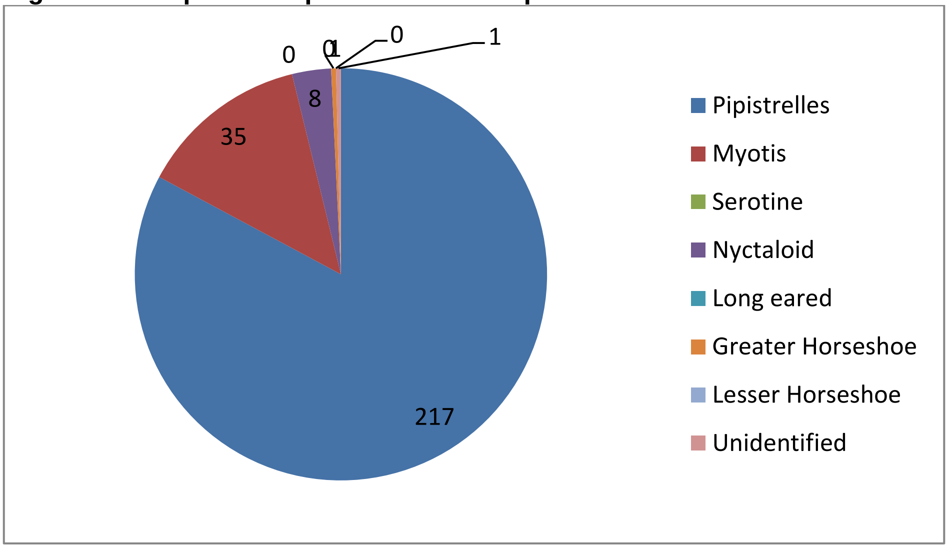
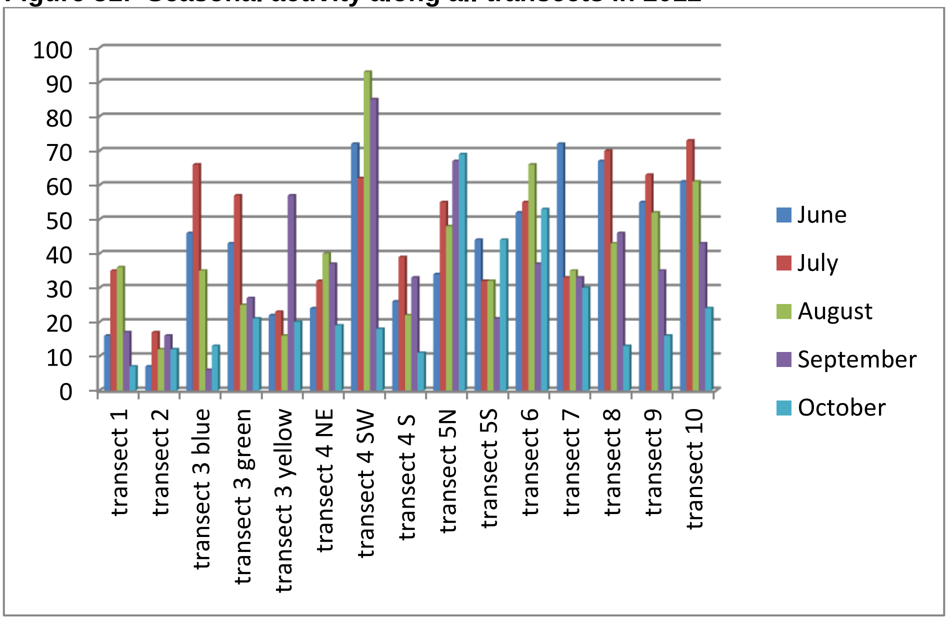


Figure 31: Seasonal activity along all transects in 2012



4.3.15 The pie charts (**Figures 1 to 30**) provide a transect by transect review of species assemblages including relative frequency of species encounters. However, as the transects are relatively long, crossing multiple habitats and passing various landscape features, a finer level of data presentation is required to understand how species are using the landscape. This is provided through the mapping of transect routes and point locations of bat contacts per month (**Figures 8.26 through to 8.31**).

4.3.16 Due to the high number of bat contacts and multiple visits, the Figures can be difficult to decipher if viewing more than one or two species at a time. As an attempt to identify and quantify potential bat 'hot spots' across the landscape the following criteria was applied and is presented in **Figure 8.33**:

- **Criteria 1**= Locations with ≥20 bat contacts of pipistrelle species AND ≥5 bat contacts from any other species.
- **Criteria 2**= Locations with ≥4 bat species.
- **Criteria 3**= Locations meeting BOTH Criteria 1 and Criteria 2.

4.3.17 The highest level of bat assemblage (Criteria 3) was identified at several locations across the transects:

- along the River Axe just south of the Mendip Limestone Grasslands;
- within the fields between Webbington and Banwell;
- along Meer Wall Rhyne at Puxton Moor
- along tree and ditch lined field boundaries near North End;
- near the River Kenn south of Nailsea;
- hedgerows between Tickenham Ridge and Priors Wood; and
- large drain between A369 and M5 motorway, Portbury.

4.4 Static Detector Surveys

4.4.1 The dates and weather conditions for all static surveys in June, July, August, September and October 2012 are presented in **Tables 8, 9, 10, 11 and 12**.

Table 8: Weather records for static placements in June 2012

Static Location	Date	Temperature (C)		Rain (mm)	Sunrise	Sunset
		Max	Min			
3 - all areas	25/06/2012	21	11	0	04:55	21:32
3 - all areas	26/06/2012	19	13	1	04:56	21:32
3 - all areas	27/06/2012	22	15	1	04:56	21:32
3 - all areas	28/06/2012	24	15	1	04:57	21:32
3 - all areas	29/06/2012	19	14	3	04:57	21:32
4.1, 4.2, 4.3, 4.5	25/06/2012	21	11	0	04:56	21:32
4.1, 4.2, 4.3, 4.5	26/06/2012	19	13	1	04:57	21:32
4.1, 4.2, 4.3, 4.5	27/06/2012	22	15	1	04:57	21:32
4.1, 4.2, 4.3, 4.5	28/06/2012	24	15	1	04:58	21:32
4.1, 4.2, 4.3, 4.5	29/06/2012	19	14	3	04:58	21:32
4.4	22/06/2012	16	10	6	04:55	21:32
4.4	23/06/2012	17	11	9	04:56	21:32
4.4	24/06/2012	19	11	9	04:56	21:32

4.4	25/06/2012	21	11	0	04:56	21:32
4.4	26/06/2012	19	13	1	04:57	21:32
4.6, 4.7	20/06/2012	22	9	4	04:55	21:32
4.6, 4.7	21/06/2012	18	11	26	04:55	21:32
4.6, 4.7	22/06/2012	16	10	6	04:55	21:32
4.6, 4.7	23/06/2012	17	11	9	04:56	21:32
4.6, 4.7	24/06/2012	19	11	9	04:56	21:32
5 - all areas	20/06/2012	22	9	4	04:55	21:32
5 - all areas	21/06/2012	18	11	26	04:55	21:32
5 - all areas	22/06/2012	16	10	6	04:55	21:32
5 - all areas	23/06/2012	17	11	9	04:56	21:32
5 - all areas	24/06/2012	19	11	9	04:56	21:32

Table 9: Weather records for static placements in July 2012

Static Location	Date	Temperature (C)		Rain (mm)	Sunrise	Sunset
		Max	Min			
3 - all areas	16/07/2012	16	12	9	05:13	21:21
3 - all areas	17/07/2012	21	14	1	05:15	21:20
3 - all areas	18/07/2012	19	14	13	05:16	21:18
3 - all areas	19/07/2012	19	13	0	05:17	21:17
3 - all areas	20/07/2012	19	12	0	05:18	21:16
4 - all areas	09/07/2012	19	13	1	05:06	21:27
4 - all areas	10/07/2012	19	11	2	05:07	21:26
4 - all areas	11/07/2012	19	12	2	05:08	21:25
4 - all areas	12/07/2012	16	9	11	05:10	21:24
4 - all areas	13/07/2012	19	13	4	05:11	21:24
5 - all areas	03/07/2012	16	15	9	05:01	21:30
5 - all areas	04/07/2012	20	13	4	05:02	21:30
5 - all areas	05/07/2012	21	12	0	05:03	21:29
5 - all areas	06/07/2012	18	12	10	05:04	21:29
5 - all areas	07/07/2012	17	12	9	05:04	21:28

Table 10: Weather records for static placements in August 2012

Static Location	Date	Temperature (C)		Rain (mm)	Sunrise	Sunset
		Max	Min			
3 - all areas	09/08/2012	25	16	0	05:48	20:44
3 - all areas	10/08/2012	25	15	0	05:49	20:43
3 - all areas	11/08/2012	25	14	0	05:51	20:41
3 - all areas	12/08/2012	22	15	4	05:52	20:39
3 - all areas	13/08/2012	21	16	4	05:54	20:37
4 - all areas	02/08/2012	20	13	11	05:38	20:57
4 - all areas	03/08/2012	20	12	1	05:39	20:55
4 - all areas	04/08/2012	21	13	17	05:41	20:54
4 - all areas	05/08/2012	19	13	15	05:42	20:52
4 - all areas	06/08/2012	20	11	0	05:44	20:50

5.1, 5.2, 5.3	24/08/2012	17	13	3	06:12	20:14
5.1, 5.2, 5.3	25/08/2012	21	15	8	06:13	20:12
5.1, 5.2, 5.3	26/08/2012	19	11	0	06:15	20:10
5.1, 5.2, 5.3	27/08/2012	18	13	15	06:16	20:08
5.1, 5.2, 5.3	28/08/2012	20	13	5	06:18	20:06
5.4, 5.5, 5.6	17/08/2012	22	16	11	06:01	20:29
5.4, 5.5, 5.6	18/08/2012	23	16	1	06:02	20:27
5.4, 5.5, 5.6	19/08/2012	24	16	0	06:04	20:25
5.4, 5.5, 5.6	20/08/2012	21	15	0	06:05	20:23
5.4, 5.5, 5.6	21/08/2012	21	14	5	06:07	20:21

Table 11: Weather records for static placements in September 2012

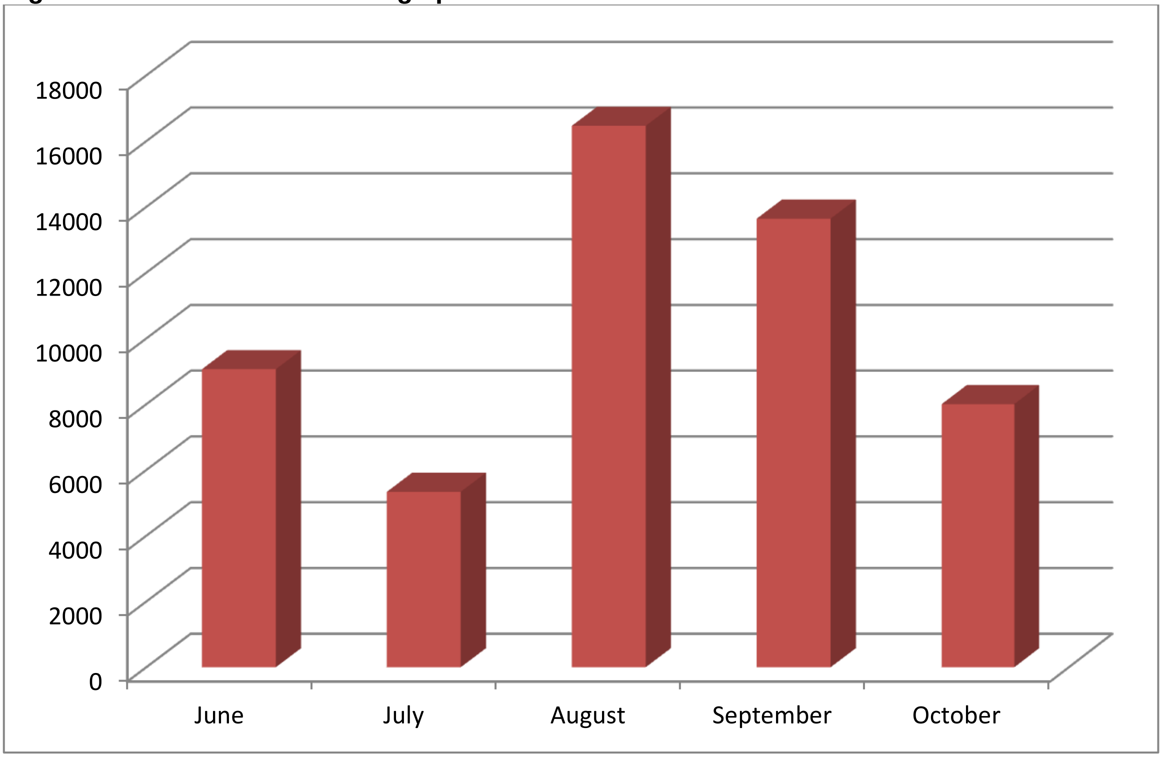
Static Location	Date	Temperature (C)		Rain (mm)	Sunrise	Sunset
		Max	Min			
3 - all areas	21/09/2012	17	9	0	06:56	19:12
3 - all areas	22/09/2012	15	6	0	06:57	19:09
3 - all areas	23/09/2012	10	8	25	06:59	19:07
3 - all areas	24/09/2012	15	9	68	07:00	19:05
3 - all areas	25/09/2012	14	9	10	07:02	19:02
4.1, 4.3, 4.5, 4.6, 4.7	02/09/2012	19	14	0	06:26	19:55
4.1, 4.3, 4.5, 4.6, 4.7	03/09/2012	21	12	0	06:27	19:53
4.1, 4.3, 4.5, 4.6, 4.7	04/09/2012	21	14	0	06:29	19:51
4.1, 4.3, 4.5, 4.6, 4.7	05/09/2012	20	10	0	06:31	19:49
4.1, 4.3, 4.5, 4.6, 4.7	06/09/2012	20	8	0	06:32	19:46
4.4	07/09/2012	21	10	0	06:34	19:44
4.4	08/09/2012	23	9	0	06:35	19:42
4.4	09/09/2012	23	8	0	06:37	19:40
4.4	10/09/2012	21	15	1	06:38	19:37
4.4	11/09/2012	17	10	2	06:40	19:35
4.2	14/09/2012	19	11	1	06:45	19:28
4.2	15/09/2012	17	8	0	06:46	19:26
4.2	16/09/2012	17	12	4	06:48	19:24
4.2	17/09/2012	17	11	2	06:50	19:21
5 - all areas	07/09/2012	21	10	0	06:34	19:44
5 - all areas	08/09/2012	23	9	0	06:35	19:42
5 - all areas	09/09/2012	23	8	0	06:37	19:40
5 - all areas	10/09/2012	21	15	1	06:38	19:37
5 - all areas	11/09/2012	17	10	2	06:40	19:35

Table 12: Weather records for static placements in October 2012

Static Location	Date	Temperature (C)		Rain (mm)	Sunrise	Sunset
		Max	Min			
3 - all areas	26/10/2012	8	3	2	07:54	17:55
3 - all areas	27/10/2012	9	1	0	06:56	16:53
3 - all areas	28/10/2012	11	0	7	06:58	16:51
3 - all areas	29/10/2012	13	7	5	06:59	16:49
3 - all areas	30/10/2012	10	6	0	07:01	16:48
4 - all areas	03/10/2012	15	8	17	06:27	18:53
4 - all areas	04/10/2012	14	6	6	06:29	18:51
4 - all areas	05/10/2012	14	8	24	06:31	18:49
4 - all areas	06/10/2012	15	6	11	06:32	18:46
4 - all areas	07/10/2012	14	4	0	06:34	18:44
5 - all areas	19/10/2012	13	7	0	06:53	18:17
5 - all areas	20/10/2012	14	6	1	06:54	18:14
5 - all areas	21/10/2012	11	4	0	06:56	18:12
5 - all areas	22/10/2012	13	11	2	06:58	18:10
5 - all areas	23/10/2012	13	12	1	06:59	18:07

4.4.2 The location of static survey points and a graphs bat activity levels split by species and month, are displayed for each static location on **Figure 8.32**. Figure 32 illustrates bat activity levels recorded each month during the static surveys.

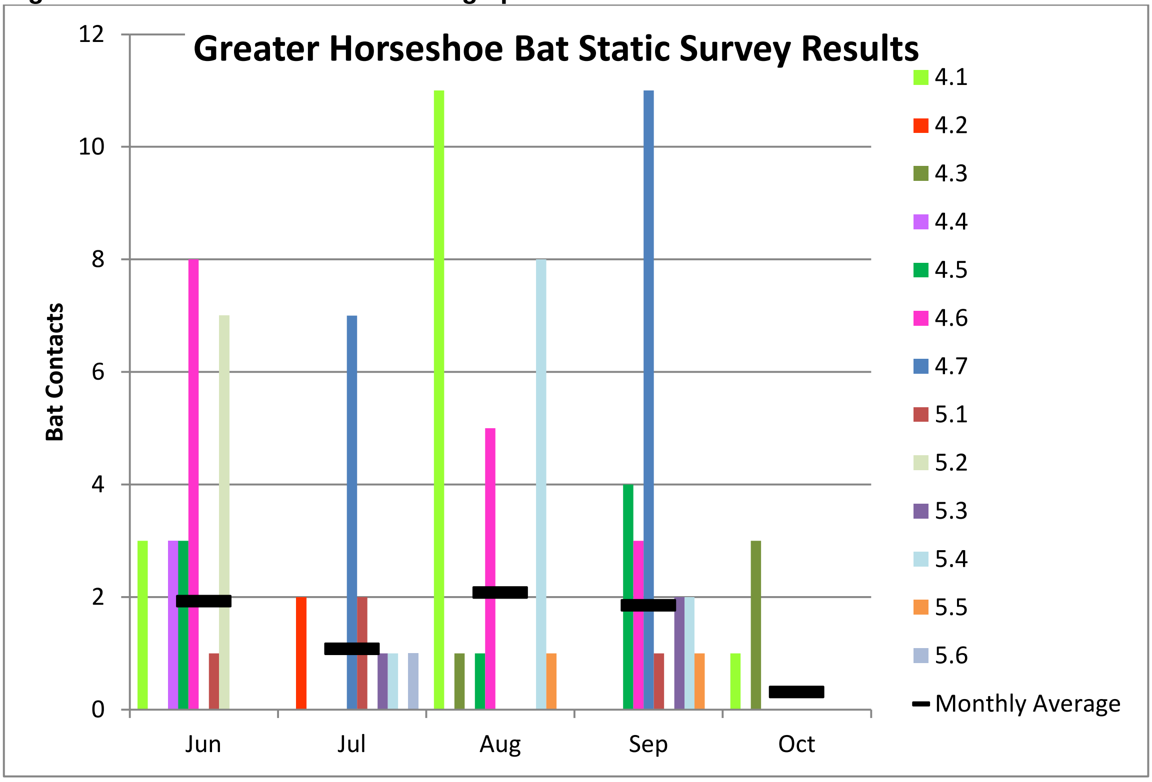
Figure 32: 2012 static recordings per month across all static locations



4.4.3 Lesser Horseshoe bat records and greater horseshoe bat records have been extracted from static locations along transects 4 and 5. These locations fall within the 4km greater horseshoe buffer zone from the North Somerset & Mendip Bats SAC and the Mendip Limestone Grasslands SAC. The results are shown at **Figures 33 and 34.**

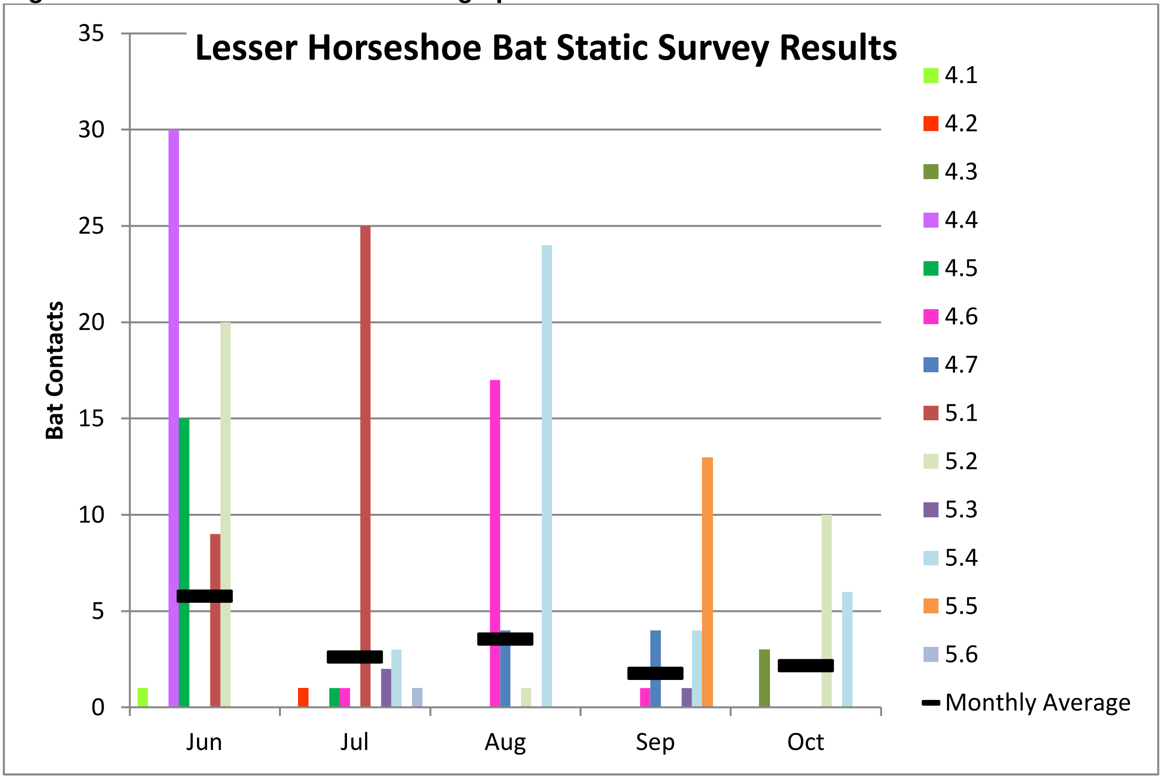
4.4.4 Use of each hedgerow by greater horseshoe (GHS) bats appears to vary across the months, but cumulative GHS numbers recorded at each static location across all 5 nights survey remain relatively low (max 11 bats across 5 days at any one location). Within these low numbers, bat activity at five static points 4.1, 4.6, 4.7, 5.2 and 5.4 were relatively high (7 or more bats recorded in at least one month). A further five static points (4.2, 4.3, 4.4, 4.5 and 5.1) had above monthly average GHS bat activity (although the monthly average was never higher than 2 bats).

Figure 33: 2012 GHS static recordings per month across 4km buffer zone



4.4.5 Use of each hedgerow by lesser horseshoe (LHS) bats also appears to vary across the months, but cumulative LHS numbers recorded at each static location across all 5 nights survey are higher than for GHS (max 30 bats across 5 days at any one location). Within these low numbers, bat activity at six static points 4.4, 4.5, 4.6, 5.1, 5.2 and 5.4 were relatively high (15 or more bats recorded in at least one month). A further three static points (4.3, 4.7 and 5.5) had above monthly average LHS bat activity (although the monthly average was never higher than 6 bats).

Figure 34: 2012 LHS static recordings per month across 4km buffer zone



4.4.6 Bechstein's is also an Annex II bat species, although the Proposed Development is not within core range of any SAC's designated for Bechstein's. As previously mentioned, records from the desktop and transect survey were limited. The static surveys also generally recorded low numbers, with none recorded by the statics near Tickenham Ridge.

4.4.7 No more than two bats were recorded each month for most statics in and adjacent to the AONB. The exception being statics 4.5 and 4.4 where 16 bats were recorded on each static in June and July respectively (**Figure 34**). These statics are located on the northern edge of the Sandford substation footprint and compound area, just south of the underground cable route.

4.4.8 Barbastelle is the fourth and final Annex II bat species resident in the UK. Barbastelle were more widespread than Bechstein's in the desktop and transect survey data, but were still not prevalent. Along the statics in and adjacent to the AONB, average Barabstelle contacts each month were <2 in June, July and October. But two spikes of activity were recorded in August (138 contacts) and September (78 contacts) on statics 5.5 and 5.6 respectively which are both on the narrow stretch of land between Webbington and the M5 motorway **Figure 36**).

4.4.9 Barbastelle bats were also recorded on statics in the Tickeham Ridge area, but to a much lesser degree. Barbastelle were only picked up on 3 of the 5 transects at this location (**Figure 37**) with static 3.5 recording the most contacts (6 in June, 5 in July and 10 in September. Static 3.5 is on the edge of Moggs Wood where the 400kV will traverse the ridge and the 132kV will be indergrounded and HDD used to cross the road.

Figure 35: 2012 Bechstein's static recordings per month across 4km buffer zone

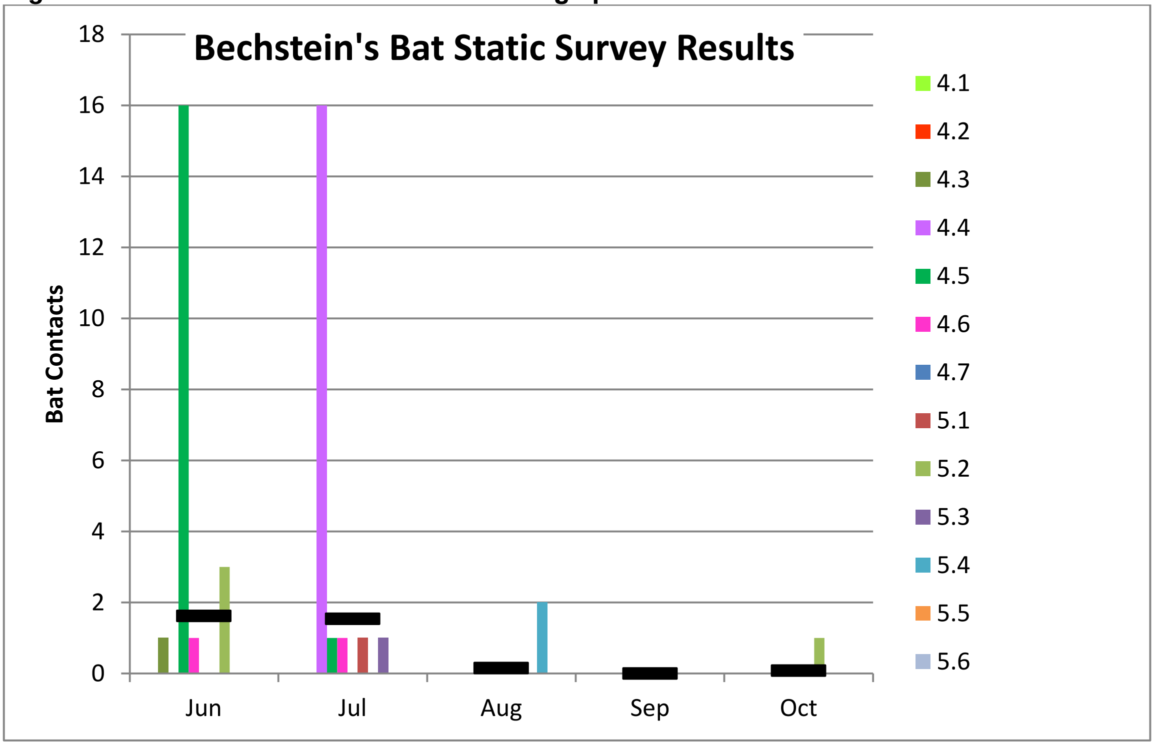


Figure 36: 2012 Barbastelle static recordings per month across 4km buffer zone

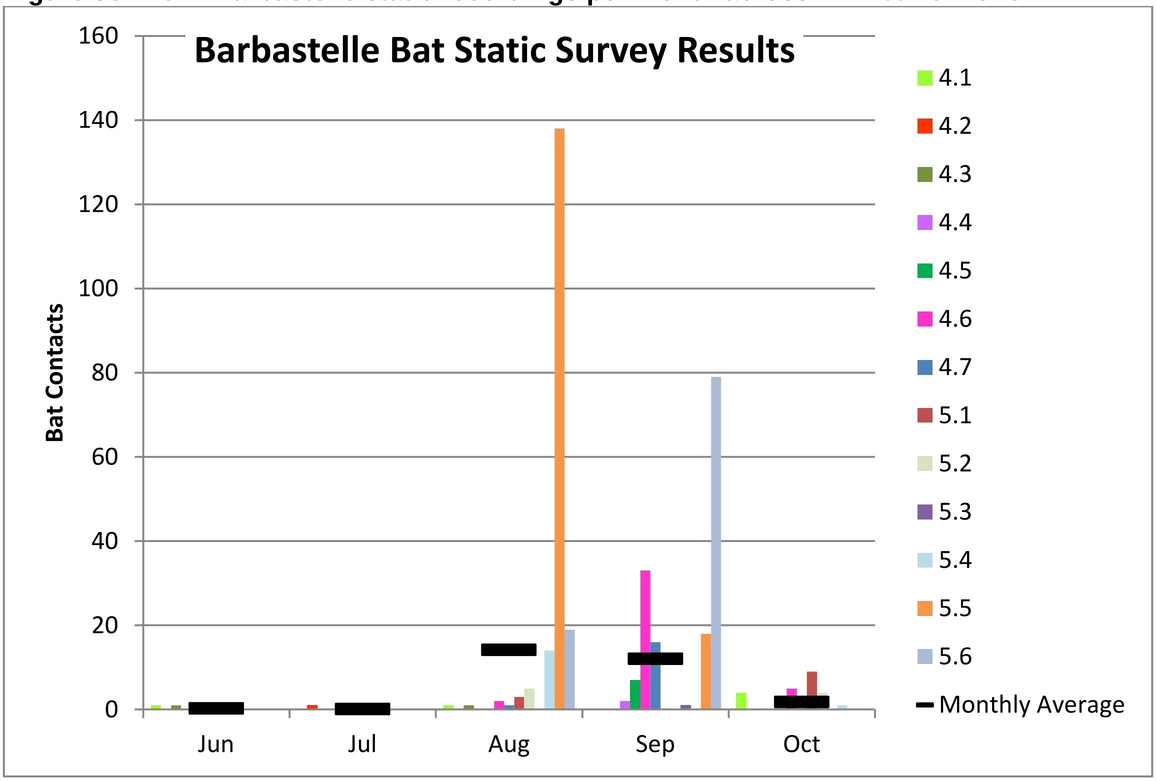
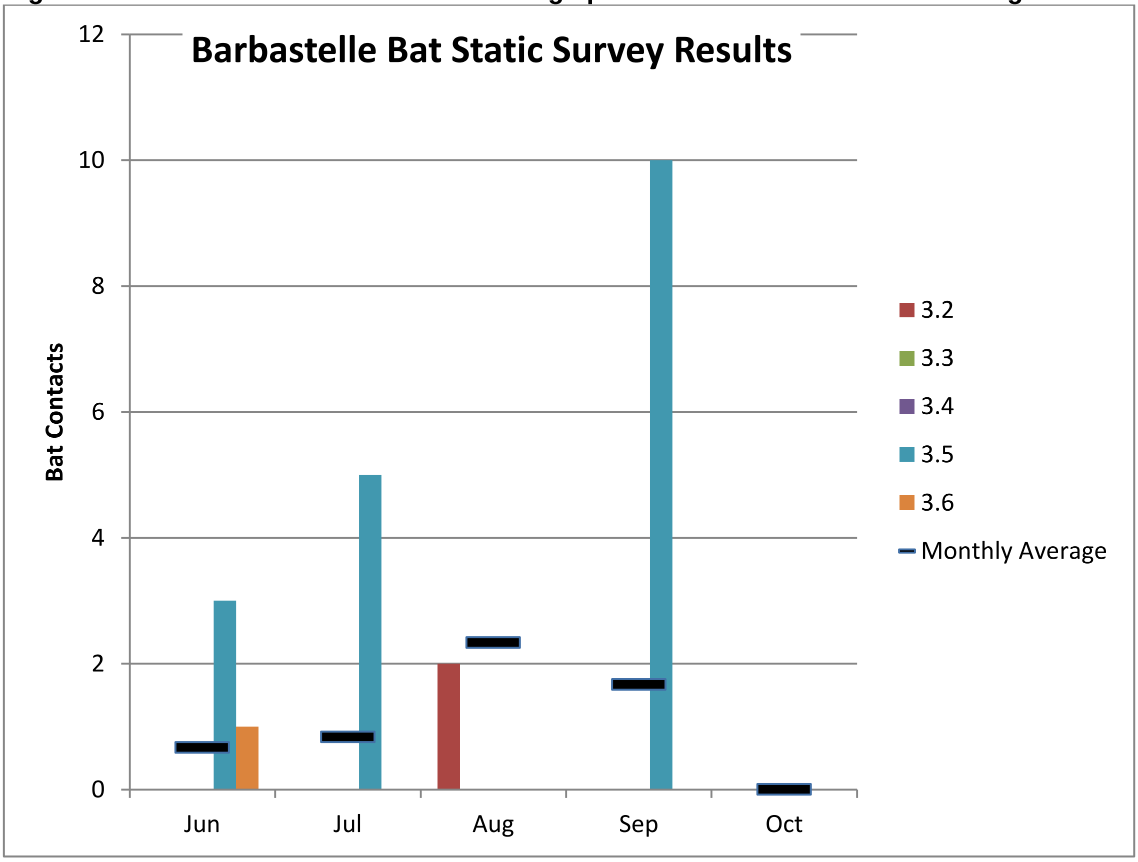


Figure 37: 2012 Barbastelle static recordings per month across Tickenham Ridge



5.0 Discussion

5.1 The conservation value of each tree roost has been assessed with due consideration for Wray, S. *et al*. (2010)[2], taking into account the local status of the species and the roost type. The whiskered bat is widespread within the county[3] although classed as 'rarer' nationally (Wray, 2010). Taking into account the limited number of known maternity roost records for the species and criteria for CWS designation[4], the roost is considered to most closely fit the category of County value. All other non-breeding roosts of the relatively common species – two Natterer's roosts, four soprano pipistrelle, five common pipistrelle and one pipistrelle sp. are each of Local value.

5.2 Regarding bat activity recorded outside of roost surveys, valuation of bats as receptors takes into account national and international as well as this local status. Somerset is a stronghold for horseshoe bats which is seen to complement rather than counter their protection under international law. Given the level of activity recorded of each species across the survey area, within the ecological zone of influence for the North Somerset & Mendip Bats SAC and Mendip Limestone Grasslands SAC, both species are attributed International value, and outwith, County value.

5.3 Barbastelle is listed in the Somerset BAP as 'very rare' in the county. Very few barbastelle passes were recorded during the field surveys, however, as an Annex II species associated with the Exmoor and Quantock Oakwoods SAC, which lies some 6.5km to the south west (just at the 7km ecological zone of influence for the SAC and this species), barbastelle is attributed County value.

5.4 Leisler's, Nathusius' pipistrelle and grey long-eared are listed in the Somerset BAP as 'very rare', a trend which was generally borne out in the activity surveys carried out, although in relative terms Leisler's activity was more frequently and widely recorded. Bechstein's, which with barbastelle is an Annex II species associated with the Exmoor and Quantock Oakwoods SAC, is listed as 'rare' along with Brandt's bat. Whilst limited confirmed activity of either species was recorded, passes of Myotis bats may include some of these two species (preferred habitats include woodland, wetter areas, treelines and hedgerows). Confirmed records of Leisler's and Nathusius' pipistrelle were recorded either in areas of elevated species assemblage or alongside other, similar valued species. Therefore, these species are attributed County value.

5.5 Other Myotis bats confirmed present include Daubenton's, Natterer's and (through roost surveys alone) whiskered, all of which are listed as 'widespread' in the Somerset BAP, and alcathoe (as yet unlisted). Serotine and noctule are listed as 'local', whilst common and soprano pipistrelles, together with brown long-eared bats are listed as 'common'. Pipistrelle activity was typically abundant and widespread across the survey area, reflecting the national trend. These species, and habitats supporting relatively high levels of their activity, are therefore attributed Local value, unless otherwise occurring as part of an elevated assemblage.

6.0 Literature Review

6.1 Status of Species

6.1.1 There are at least 16 species of bat resident in the UK, fifteen of the UK's bat species are known to be resident in Somerset, of which 14 are confirmed as breeding in the County. These are Greater Horseshoe, Lesser Horseshoe, Daubenton's, Whiskered, Brandt's, Natterer's, Bechstein's, Common Pipistrelle, Soprano Pipistrelle, Nathusius' Pipistrelle, Serotine, Noctule, Leisler's, Brown Long-eared, Grey Long-eared and Barbastelle. The Somerset Biodiversity Action Plan includes a joint Species Action Plan for all bat species recorded throughout the county. Table 3 summarises the information provided in the LBAP regarding local status of resident species.

6.1.2 Greater and lesser horseshoe, pipistrelle, Bechstein's and barbastelle bats are listed under Section 74 of the Countryside and Rights of Way Act 2000 and are Section 41 NERC Act 2006 priority species. Soprano pipistrelle (common pipistrelle having been removed), noctule and brown long-eared bat species were added to the UK BAP priority species list in 2007 (now Section 41 of the NERC Act 2006).

6.1.3 Greater and lesser horseshoe, Bechstein's, serotine, barbastelle and grey long-eared bats are priority species and these are regarded as the species for which Somerset is most important. Lesser horseshoe, greater horseshoe and barbastelle are also Annex II bat species.

6.2 General habitat requirements

6.2.1 Several habitats are particularly important for forging bats. These mainly include freshwater, woodland, grassland and linear features. Less suitable habitats still provide foraging sites and can attract a number of bat species but the following features are of key importance although there are intra-specific (Table 13) variations:

- Continuous treelines and hedgerows provide connectivity of the landscape for bats commuting between their roosts and foraging areas. Areas of scrub have been found to be important bat foraging sites particularly Gorse and Buddleija.
- Rivers and streams provide excellent feeding grounds for bats and bankside vegetation provides habitats for insect prey and valuable cover whilst foraging.
- Woodland and wooded areas are more sheltered and often warmer than the surrounding open space. They provide many different types of insects and high degree of cover for bats.
- Unimproved pasture, grazed by cattle, sheep or horses provides insects species that might be important food source for some species.
- More intensively managed grassland might still have large numbers of insects but fewer species, which could lead to food shortages at certain times of year.
- Orchards and parkland provide additional feeding opportunities for species that feed in semi-open habitats such as woodland edges and glades.
- Mature single trees can provide important foraging and roosting opportunities if they form part of a connecting framework of hedgerows.

Table 13: Summary of status and main habitats of bats in Somerset

Species	Local status	Main habitats	
		Habitat & Feeding	Roosting
Greater Horseshoe *Rhinolophus ferrumequinum*	Local	Pasture and meadows with broadleaved woodland and scrub. Flight path corridors between roost and feeding areas of woodland edge, large hedgerows, tree lines, vegetated stream banks.	Summer - Old buildings, undisturbed buildings with unrestricted access points, caves, disused mines, cellars and tunnels Winter – Underground in caves, mines, tunnels and cellars
Lesser Horseshoe *Rhinolophus hipposideros*	Local	Woodland, parkland and large hedgerows over 5 metres high, with permanent pasture, also bankside vegetation. Flight path corridors between roost and feeding areas of large continuous hedgerows, tree lines, woodland edge, vegetated stream banks.	Summer – Lofts of old buildings, occasionally unused rooms and warm cellars. Winter – Undisturbed caves, cellars and mines
Daubenton's *Myotis daubentonii*	Widespread	Smooth water sheltered by trees on both banks. Rivers, canals, lakes, reservoirs, also ponds, pools and ditches. Seasonally in broadleaved woodland. Corridors between roost and feeding areas of hedgerows and watercourses.	Summer – predominately holes and fissures in trees but also buildings, tunnels and bridges. May use bat and bird boxes. Winter - caves, mines and cellars.
Whiskered *Myotis mystacinus*	Widespread	Narrow rivers, bankside vegetation, also woodland rides, parks and hedgerows. Corridors between roost and feeding areas of hedgerows, tree lines, woodland edge, vegetated stream banks.	Summer - Buildings and probably tree holes and crevices. May use bat and bird boxes. Winter - Caves, mines, cellars and tunnels.

Species	Local status	Main habitats	
		Habitat & Feeding	**Roosting**
Brandt's *Myotis brandtii*	Rare	Woodland – damp areas or close to water. Both broadleaved and coniferous woodland, forest edge and clear felled areas. Corridors between roost and feeding areas of hedgerows and tree lines.	Summer - Buildings and probably tree holes and crevices. May use bat boxes. Winter - Caves, mines, cellars and tunnels.
Natterer's *Myotis nattereri*	Widespread	Broadleaved and wet woodland. Found along woodland edges, tree lines, inside large hedgerows, over water and around single trees - alongside agricultural land. Corridors between roost and feeding areas of large hedgerows, tree lines, woodland edge, vegetated stream banks. Field borders with mature trees to provide suitable night roosts.	Summer - Old buildings, bridges, tree crevices, cattle sheds. May use bat and bird boxes. Winter - Caves, mines, cellars, tunnels and bare rock
Bechstein's *Myotis bechsteinii*	Rare	Mainly deciduous and wet woodland, occasionally parkland. Mature coppice. Corridors between woodland blocks of tree lines and hedgerows. Retention of old trees.	Summer - Tree holes and crevices. May use bat boxes. Winter - Caves, mines, cellars and tunnels. Possibly tree holes and crevices.

Species	Local status	Main habitats	
		Habitat & Feeding	Roosting
Common Pipistrelle *Pipistrellus pipistrellus*	Common	Bankside habitats (particularly lakes, wide rivers and large ponds), parks, broadleaved woodland, hedgerows, tree lines. Will feed around white street lighting. Corridors between roost and feeding areas of hedgerows and tree lines but may cross gaps of up to 200 metres.	Summer - Buildings including houses in semi urban areas, dead and decaying trees with ivy and loose bark. May use bat boxes. Winter - Stone walls, wall cavities, caves, mines, cellars and tunnels.
Soprano Pipistrelle *Pipistrellus pygmaeus*	Common	Bankside habitats (particularly lakes, wide rivers and large ponds), parks, broadleaved woodland, hedgerows, tree lines. Will feed around white street lighting. Corridors between roost and feeding areas of hedgerows and tree lines but may cross gaps of up to 200 metres.	Summer - Buildings including houses in semi urban areas, dead and decaying trees with ivy and loose bark. May use bat boxes. Winter - Stone walls, wall cavities, caves, mines, cellars and tunnels.
Nathusius' Pipistrelle *Pipistrellus nathusii*	Very rare	Large areas of water such as rivers, lakes and reservoirs. Woodland and tree lines. Stone walls used by males for territorial singing.	Summer - Tree holes and crevices. May use bat and bird boxes. Winter - Tree holes and crevices, buildings.

Species	Local status	Main habitats	
		Habitat & Feeding	Roosting
Serotine *Eptesicus serotinus*	Local	Unimproved cattle pasture, unimproved grassland such as meadows, parkland, cemeteries, village greens, golf courses, and playing fields. Also woodland edge, hedgerow, tree lines, single trees, and areas of calm water. Will feed around white streetlights and sewage treatment works.	Summer - Buildings in rural and semi rural areas. Especially fond of roof spaces with a chimneybreast. May use bat boxes. Winter - Caves, mines, cellars and tunnels. Occasionally in summer roost site.
Noctule *Nyctalus noctula*	Local	Over open areas such as open water and wetlands. Cattle pasture, open woodland, woodland edge, parks and open farmland near lakes. Mature trees. Dead wood with woodpecker holes. Freshwater habitat with good water quality. Will feed around white street lighting.	Summer - Tree holes, especially woodpecker holes in fungal infected trees. May use bat boxes. Winter - Tree holes, especially woodpecker holes in fungal infected trees, occasionally buildings or rock crevices.
Leisler's *Nyctalus leisleri*	Very rare (no known roost in Somerset)	Over open habitats, such as rivers, lakes and ponds, coastal marshes, beaches, pasture and meadow, hedgerows and woodland clearings, above woodland canopies and along woodland edges. Will feed around white street lighting.	Summer - Tree holes, such as woodpecker holes, and crevices. More rarely in buildings or between timbers. May use bat and bird boxes. Winter - Tree holes, such as woodpecker holes, and crevices.

Species	Local status	Main habitats	
		Habitat & Feeding	Roosting
Brown Long-eared *Plecotus auritus*	Common	Broadleaved woodland. Also wet woodland, small groups of trees, woodland edge, orchards, garden shrubs, bankside vegetation, parkland with scattered trees and coniferous woodland. Corridors between roost and feeding areas of large hedgerows, tree lines, woodland edge, vegetated stream banks.	Summer – Tree holes, crevices and behind loose bark. Houses, other buildings. May use bat boxes. Winter - Caves, mines and cellars. Tree holes.
Grey Long-eared *Plecotus austriacus*	Very rare	Small open woods, woodland edges, parkland, orchards, gardens, open meadows, orchards and pasture with trees. Corridors between roost and feeding areas of hedgerows, tree lines, woodland edge, vegetated stream banks, fences.	Summer - Houses, especially lofts, other buildings. Caves and mines used by single males. Winter – Rock crevices, caves, cellars or crevices in stone walls. Occasionally a house martin’s nest.
Barbastelle *Barbastella barbastellus*	Very rare	Wooded river valleys, over water and woodland edges. High overgrown hedgerows, scrub, uncut grassland and heather moorland, saltmarsh, gardens and areas with low lighting. Maintain woodland corridors between roost and feeding areas of hedgerows, watercourses and tree lines.	Summer - Cracks in trees and branches and spaces under bark, holly understorey. Occasionally buildings. Rarely uses bat boxes. Winter – Crevices in trees and walls of buildings. Caves and old mines.

6.3 Annex II Listed Bats

Designations

6.3.1 Three European sites with bats as a qualifying or primary reason for designation lie within 10km of the proposed development (**Figure 8.34**). The bat species listed under these sites cover all of the four UK species of Annex II listed bats: greater horseshoe, lesser horseshoe, barbastelle and Bechstein's. A further six bat SACs lie within 50km of the Proposed Development (**Figure 8.34**). There are a further twenty bat SAC sites within England and Wales (but >50km from the Proposed Development). **Table 14** lists all SAC sites in England and Wales which have one or more Annex II bat species as a qualifying or primary reason for designation.

Table 14: Bat SACs in England and Wales

SAC Site Name	Location	Approx. Proximity	GHS	LHS	Barb	Bech
Sites within 10km of the Proposed Development						
North Somerset and Mendip Bats	Bath and North East Somerset; North Somerset; Somerset	<0.5km	P	P		
Mendip Limestone Grasslands	North Somerset; Somerset	<0.5km	Q			
Exmoor and Quantock Oakwoods	Devon; Somerset	6.5km			P	Q
Sites within 50km of the Proposed Development						
Hestercombe House	Somerset	11km		P		
Wye Valley Woodlands	Monmouthshire; Gloucestershire; Herefordshire	12km		Q		
Wye Valley and Forest of Dean Bat Sites	Monmouthshire; Gloucestershire	14km	P	P		
Mells Valley	Somerset	27km	P			
Bath and Bradford – on-Avon Bats	Bath and North East Somerset; Wiltshire	30km	P	Q		P
Bracket's Coppice	Dorset	35km				P
Sites >50km from the Proposed Development						
Usk Bat Sites	Monmouthshire; Powys	51km		P		
Chilmark Quarries	Wiltshire	>50km	P	Q	P	P

SAC Site Name	Location	Approx. Proximity	GHS	LHS	Barb	Bech
Limestone Coast of South West Wales	Swansea; Pembrokeshire	>50km	P			
Pembrokeshire Bat Sites and Bosherston Lakes	Pembrokeshire	>50km	P	Q		
North Pembrokeshire Woodlands	Pembrokeshire	>50km			P	
Meirionnydd Oakwoods and Bat Sites	Gwynedd	>50km		P		
Glynllifon	Gwynedd	>50km		P		
Tanat and Vyrnwy Bat Sites	Denbighshire; Powys	>50km		P		
Gwydyr Forest Mines	Conwy	>50km		Q		
South Hams	Devon; Torbay	>50km	P			
Beer Quarry and Caves	Devon	>50km	Q	Q		P
St Albans Head to Durlston Head	Dorset	>50km	Q			
Eversden and Wimpole Woods	Cambridgeshire	>50km			P	
Mottisfont Bats	Hampshire	>50km			P	
Ebernoe Common	West Sussex	>50km			P	P
Singleton and Cocking Tunnels	West Sussex	>50km			Q	Q
The Mens	West Sussex	>50km			Q	
Paston Great Barn	Norfolk	>50km			P	
Mole Gap to Reigate Escarpment	Surrey	>50km				Q
Briddlesford Copses	Isle of Wight	>50km				P

Key: GHS = greater horseshoe; LHS = lesser horseshoe; Barb = barbastelle; Bech = Bechstein's

Ecology of Annex II Bats Species

Barbastelle

Roosting

6.3.2 Barbastelle bats are a tree roosting species, primarily using shallow roosting spaces such as peeling bark. Tree roosts are primarily located within woodlands with a dense understorey that provides some protection from climatic conditions (maintains humidity, keeps wind low and buffers temperature changes) (Greenaway & Hill 2005)[5].

Foraging

6.3.3 Barbastelle bats roost in woodlands but tend only to forage in this habitat in the very early part of the night, using the cover until full darkness. Radio tracking studies of barbastelle bats have recorded a range of commuting distances to foraging grounds:

- Average maximum distances bats travelled to foraging areas at two SACs: 5.2km to 7.11km (Greenaway 2008)[6];
- Total bat flight distances to foraging areas ranged from 1km to 20km (Zeale et al 2012)[7];
- Average range span of female bats was 8km, with some individuals travelling up to 20km (Zeale 2011)[8]; and
- Mean maximum distance bats travelled was 5km with a range of 4km to 6.3km (Cornes 2005)[9].

6.3.4 On this basis barbastelle bat can be scoped out as a receptor for any SACs greater than 20km from the Proposed Development with core habitat areas likely to be within 4km to 7km from roost locations. This leaves the Exmoor and Quantocks Oakwoods SAC as the only designation with barbastelle as a primary or qualifying feature within the ecological zone of influence. All other barbastelle SACs are over 50km away.

Bechstein's

Roosting

6.3.5 Bechstein's bat is a tree roosting species which often uses old woodpecker holes. These deep cavities mean roosts are often found in relatively exposed hedgerow trees. Roost sites are moved on a regular basis and colonies often divide and regroup depending on the size of available roost cavities.

Foraging

6.3.6 Bechstein's bats roost in woodlands and also tend to forage in this habitat. Radio tracking studies of Bechstein's have recorded a range of commuting distances to foraging grounds:

- The majority of flight time is spent within the woodland, although some individuals travelled up to 3.8km (Anon date unknown)[10]; and
- Mean commuting distances between roosts and foraging grounds 0.7km with a maximum distance of 1.14km (Fitzsimmons et al 2002)[11].

6.3.7 On this basis Bechstein's bat can be scoped out as a receptor for any SACs greater than 4km from the Proposed Development. There are no designations with Bechstein's as a primary or qualifying feature within this ecological zone of influence. The closest SAC is Exmoor and Quantocks Oakwoods over 6km away (other sites are over 30km away).

Greater Horseshoe

Roosting

6.3.8 Greater horseshoe maternity roosts are predominately in old buildings but sometime are in caves and mines (English Nature 2003)[12]. Winter roosts are in caves, mines, tunnels and cellars. Maternity roosts require canopy cover and other vegetation cover in the immediate area. This can reduce ambient light levels and allow early emergence and can provide a food source close to the roost. Roosts also require good habitat links to the wider landscape.

6.3.9 This species also uses night roosts, usually associated with foraging grounds, sometime several in a single night. They can utilise a number of structures including open stables, garages and derelict buildings. There are also records of ivy cover on trees being used.

Foraging

6.3.10 Radio tracking studies of greater horseshoes have recorded a range of commuting distances to foraging grounds:

- Bats at Buckfast Caves SSSI regularly commuted 6km to foraging areas and some individuals travelled up to 8km (Billington 2004)[13];
- Bats at Caen Valley Bats SSSI regularly commuted 5km form the roost and some individuals travelled over 7km (Billington 2003)[14];
- Bats at Chudleigh Caves and Woods SSSI regularly commuted 5km form the roost and some individuals travelled over 7km (Billington 2003)[15]; and
- Bats at Dean Hall in the Forest of Dean regularly commuted at least 9km to foraging areas (Billington 2008)[16].

6.3.11 In addition the studies looking at adults, several researchers have found that juveniles initially hunt within 1 km of the maternity roost and are highly dependant on cattle pasture (Ransome, 1996)[17].

6.3.12 Ancient semi-natural woodland, cattle grazed pasture and associated hedgerows are important foraging habitats for this species. Beetles form an important constituent of the greater horseshoe diet including various types of dung beetle (Ransome 1996).

6.3.13 Natural Resources Wales (then Countryside Council for Wales) commissioned a review of literature on lesser and greater horseshoe bats (Billington & Rawlinson,2006)[18] which summarised that both species of horseshoe bat "utilise regular flight paths, which can extend over considerable distances". They also concluded that both species fly close to the ground along flight paths choosing to fly under or close to vegetation where possible and reducing flight height on encountering gaps in vegetation (maintaining height when light levels were low, <1lux). These species also actively avoid lit areas when commuting and foraging.

6.3.14 On this basis greater horseshoe bat can be scoped out as a receptor for any SACs greater than 10km from the Proposed Development. However, North Somerset & Mendip Bats SAC and Mendip Limestone Grasslands SAC and fall within this ecological zone of influence.

6.3.15 The next closest site is the Wye Valley and Forest of Dean Bat Sites, which is 14km away but on the other side of the Severn Estuary which may have a barrier effect. The next closest sites are Mells Valley SAC 27km away and Bath and Bradford-on-Avon Bats SAC over 30km away. These two SACs will be considered further for greater horseshoe bats, given the potential for long distance movements between maternity roosts and mating sites. Long-term ringing studies suggest movements occur between component sites of the Bath and Bradford-on-Avon Bats SAC and other SACs within 50km. The next furthest SAC for this species is over 50km away from the Proposed Development and although there are very rare records of bats travelling up to 110km, effects at such distances for such low movements is unlikely to have a significant effect.

Lesser Horseshoe

Roosting

6.3.16 Although originally cave roosting species, summer roosts of lesser horseshoe bats are overwhelmingly found in roof spaces or large rural buildings including houses and stable blocks. Whereas winter roost are often caves, mines, tunnels and cellars. As with greater horseshoes, vegetation cover near to the roost and good links to the surrounding landscape are also important for lesser horseshoe maternity roosts.

6.3.17 As with greater horseshoes, lesser also use night roosts which can important for conserving energy during the night, but it is thought they can also be used as a satellite roost when foraging at distance from the main roost.

Foraging

6.3.18 Radio tracking studies of lesser horseshoes have recorded a range of commuting distances to foraging grounds:

- A study in Monmouthshire recorded most bats staying within 600m of the nursery roost, although one bat foraged 4.2km from the roost (Bontadina et al 2002)[19];
- Hibernation roosts are typically within 5km of the maternity roost (Schofield & Mitchel-Jones 2004)[20];
- Bats fly an average of 2km from summer roosts (Knight 2006)[21]; and
- A study at Hestercombe House SAC found bat foraging distances from 1km to 4km with the majority remaining within 2km of the roost (Duverge 2009)[22].

6.3.19 Lesser horseshoe bats forage in broadleaved woodland, wet woodland, wet pasture and parkland. They favour short damp grass (where crane flies are found) and watercourses ponds and marshes to forage (due to the associated invertebrate communities).

6.3.20 On this basis lesser horseshoe bat can be scoped out as a receptor for any SACs greater than 5km from the Proposed Development. Only the North Somerset & Mendip Bats SAC falls within this zone. The next closest SACs for these species are Hestercombe House (11km from the southern extent) and Wye Valley Woodlands SAC and Wye Valley & Forest of Dean Bat Sites SAC (12km and 14km respectively from the northern extent). Furthermore, the Wye Valley SACs are separated from the Proposed Development by the Severn Estuary, which is between 2km and 3.5km wide at the nearest crossing point and is considered a barrier to commuting bats especially given the relatively short average foraging distances for this species. Although bats are known to cross the estuary further north, the river is significantly narrower further north. Bats have been known fly between Woodchester Mansion, Stroud to hibernacular roost in the Forest of Dean crossing the Severn Estuary, but where it is only 150m wide.

6.4 Bats and Lighting

6.4.1 Light levels (natural and artificial) influence bat behaviour in a number of ways and this varies between species. High light levels can delay or prevent emergence from roosts, can discourage use of commuting and foraging habitat, or conversely for some species can encourage bat foraging. Furthermore, bats are thought to be more vulnerable to predation in high light levels which may be why researchers have recording reduced activity in full moon conditions.

Foraging

6.4.2 Artificial lighting has been shown to attract insects and some species of bat utilise artificial lights as foraging grounds. However, research suggests this could be at the detriment to other bat species (who are sensitive to lighting) due to the ‘vacuum effect’ of the lights pulling insects from surrounding habitats[23].

Fragmentation

6.4.3 The slower flying bats such as barbastelle, horseshoes, and Myotis species (including Bechstein’s) tend to avoid street lighting[24]. Research by Bristol University replicated street lighting (average 53.09 lux) along unlit hedgerows to identify behavioural responses. Bats flew through the lights on 42% of observations, 30% turned around, 26% flew over or through the hedge and only 2% flew wide or high around the lights[25]. It is suggested that the absence of bats flying along the unlit side of the hedge during the experiment was the result of raised light levels (mean 4.17 lux as opposed to unlit mean of 0.45 lux). Incidental observations suggested that where bat turned around, they found alternative routes (rather than returning to their roosts).

6.4.4 The result of this behavioural response could be an increase in flight time (longer distances covered between foraging grounds and roost sites) or otherwise energetically more expensive flights (routes lacking shelter from wind or rain)[26]. Bats could be vulnerable to this increased energy expenditure for example during lactation or preparing for hibernation. Another result of disruptions to preferred flyways could be increased predation rates, if alternative routes are more open then bats could be more vulnerable to bird predation, particularly slow flying juveniles. In chronic instances these effects could result in roost abandonment.

Lighting options

6.4.5 Recent research in the UK and the Netherlands has investigated how bats respond to different lighting types. LEDs have been cited as bat-friendly due to the absence of UV (UV attracts insects and is disturbing to many bat species), however recent studies have shown no significant difference in behavioural response (compared with high pressure sodium lighting) from lesser horseshoe or Myotis species[27]. This response (despite absence of UV) is likely due to high emissions within the blue region of the spectrum. Other experiments have compared varying light colours and found lower bat passes with white or green lighting compared with darkness and no difference between amber and darkness[28]. It is therefore suggested that LEDs would be beneficial in preventing the vacuum effect on insect prey, but narrowband amber LEDs would be preferred if seeking to maintain commuting routes. The Dutch Roads Agency and LEDexpert have patented an Amber LED Bat Lamp and Philips have created the ClearField lamp

6.4.6 The following Box replicates recommendations from the Bat Conservation Trust Statement on the impact and design of artificial light on bats (May 2011):

Design recommendations for wildlife-friendly lighting include:

1. Do not "over" light. This is a major cause of obtrusive light and is a waste of energy. Use only the minimum amount of light needed for safety. There are published standards for most lighting tasks, adherence to which will help minimise upward reflected light.

2. Eliminate any bare bulbs and any light pointing upwards. The spread of light should be kept near to or below the horizontal.

3. Use narrow spectrum bulbs to lower the range of species affected by lighting.

4. Use light sources that emit minimal ultra-violet light. Insects are attracted to light sources that emit ultra-violet radiation.

5. Reduce light-spill so that light reaches only areas needing illumination. Shielding or cutting light can be achieved through the design of the luminaire or with accessories, such as hoods, cowls, louvers and shields to direct the light.

6. Reduce the height of lighting columns. Light at a low level reduces ecological impact. However, higher mounting heights allow lower main beam angles, which can assist in reducing glare.

7. For pedestrian lighting, use low level lighting that is directional as possible and below 3 lux at ground level.

8. Use embedded road lights to illuminate the roadway and light only high-risk stretches of roads, such as crossings and merges, allowing headlights to take up the slack at other times.

9. Limit the times that lights are on to provide some dark periods for wildlife.

10. Use lighting design computer programs and professional lighting designers to predict where light spill will occur.

6.5 Bats and Habitat Fragmentation

Fragmentation effects

6.5.1 Linear habitat features can be used by bats for a number of reasons[29] which are not mutually exclusive and include:

- Navigational aid
- Foraging habitat
- Shelter from wind and rain
- Protection from predation

6.5.2 Severance of habitats is an important consideration and most widely reported in relation to road schemes. The behavioural response of bats to this fragmentation and resultant effect on the population varies with species (i.e. species specific flight behaviour) and site specific conditions such as importance of the fragmented habitat feature, the ability for bats to move through the wider landscape and the distance to a maternity roost[30].

Fragmentation mitigation

6.5.3 The Highways Agency undertook a review of bat mitigation that had been implemented for road schemes[31]. Because reporting and monitoring of mitigation was not standardised it was difficult to make firm comparisons or conclusions as to the relative benefits of different mitigation approaches. However, use of temporary flyways during construction was wide ranging and included use of containerised trees, plastic webbed fencing and camouflage netting. Limited monitoring reported both successful and unsuccessful examples three of these designs.

6.5.4 Permanent solutions included verge-side fencing or earth banks (to encourage bats to fly above traffic), culverts, wire ‘bridges’, wildlife bridges and manipulation of roadside habitats to discourage bats from foraging on verges and/or encourage them to use bat crossing points. Permanent mitigation is usually associated with a greater degree of monitoring and this has indicated that wire bridges are not generally used by bats, that low flying species such as horseshoes will return to road level after traversing roadside fencing but will remain high if earth banking is used, that culverts can be successful if associated lighting and landscaping is designed to encourage use.

6.5.5 Appropriate mitigation should take account of the various uses a bat may make of linear habitat feature and seek to recreate these in the permanent solution.

6.6 Bats and Climate Change

6.6.1 In the UK current trends indicate an increase in overall temperatures and a decrease in overall precipitation (exhibited as a decrease in summer and an increase in winter). Springs are expected to commence earlier and winters later.

6.6.2 Changes in climatic conditions could affect UK bats in a number of ways. The timing of hibernation may alter and hibernation periods may reduce with the increased temperatures, as may the availability of sufficiently cool and stable hibernation roost sites. Changes in habitat types and associated prey availability throughout the year may affect bat foraging and have resultant implications on survival through hibernation and on breeding success.

6.6.3 The changing climate may also expand the range of bat species currently restricted to the south and may also make the UK more suitable for some of the European species not currently resident in the UK. Nathusius' pipistrelle may already be responding to climate change, recent records of this species indicate an expansion matching such predictions (Lundy et al. 2010[32]).

6.6.4 Rebelo et al 2010[33] predicted the potential distribution of bat species in Europe for periods between 2020 and 2100. Mediterranean and Temperate groups of bats appeared more tolerant (compared with northern latitude species) of temperature increases. However, the projections did vary with the climate change scenarios applied and the models did not take account of habitat availability or species interactions.

6.6.5 Research has indicated that lesser and greater horseshoe bat populations in the UK have recovered as a result of the recent mild winters (Ransome 1989[34]) and that greater horseshoe bat numbers have also been shown to increase after a period of warm springs (Ransome & McOwat 1994[35]). However, the picture may be more complicated, for example any changes in hibernation will need to be matched by prey availability and if bats emerge from hibernation earlier in the year (due to high spring temperatures) then subsequent cold periods could result in raised mortality levels (Jones et al. 2009[36]).

6.6.6 The potential effect of climate change on bats is unlikely to interact with the effects on bats resulting from the Proposed Development. Potential climate change effects are considered in the long term (circa 20 years onwards) whereas effects resulting from the development are short to medium term and relate to construction disturbance and habitat loss. Construction phase disturbance through noise, vibration and lighting will not persist into the operational phase. Grassland habitats should be re-established within a year of completion. Replacement hedge and tree planting is likely to have a longer-term impacts as these habitats take longer to mature, but are still expected to be functioning (with regard to bat use at least) within 20 years.

6.6.7 Landscaping proposals around Sandford substation and the Cable Sealing End compounds represent the only significant change in current habitat conditions that will persist into the long term operational phase. To offset the permanent footprint of these structures, the landscape surrounding the sites have been designed to provide an increased diversity of habitats and therefore are likely to provide enhanced conditions on the baseline once established. The habitats and species mixes have been chosen to reflect local conditions and will use local seed stock. Therefore no specific effects of climate change are predicted on the establishment or persistence of these new habitats, they are expected to be available for bats to use in the future.

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Appendix 8I – Dormouse Survey

PLANNING DESIGN ENVIRONMENT

Hinkley Point C Connection Project
Environmental Statement Volume 5.8.2
Ecology Appendix 8I
Dormouse Survey

February 2014

1979.40.016

Version B

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DORMOUSE SURVEY

1.0 Introduction

1.1 A data search did not identify any hazel dormouse, *Muscardinus avellanarius* records within the Route Corridor. However it did reveal several dormouse records at three locations (Mendips AONB, East of Yatton and Tickenham Ridge) within 1km of the Route Corridor boundaries. Although woodland habitat within the Route Corridor is sparse, there are several areas where woodland is present adjacent to the Route Corridor boundaries where hedgerows are prevalent across the landscape.

1.2 The Proposed Development has the potential to impact this species (if present) through loss and fragmentation of habitats. Fragmentation impacts can result in population collapse by preventing access to foraging grounds to such a level that individual areas of dormouse habitat can no longer sustain viable populations. Fragmentation impacts may also result over the long term through a reduction in gene exchange through isolation of populations. Due to this potential for impacts, dormouse surveys were undertaken.

1.3 Surveys for dormouse were carried out between April and November 2012 across the Route Corridor to inform the design of the Proposed Development.

2.0 Legal Protection

2.1 Dormice and their breeding sites and resting places are protected under Regulation 41 of the Conservation of Habitats and Species Regulations 2010 and Section 9 of the Wildlife and Countryside Act 1981. It is an offence for anyone to deliberately disturb, capture, injure or kill them. It is also an offence to damage or destroy their breeding or resting places, to disturb or obstruct access to any place used by them for shelter. Dormouse is also listed within Section 41 of The Natural Environment and Rural Communities (NERC) Act 2006. Section 40(1) of the Act states that each public authority "must, in exercising its functions, have regard, so far as is consistent with the proper exercise of those functions, to the purpose of conserving biodiversity", with particular regard to the Section 41 habitats and species.

3.0 Method

<u>Site selection</u>

3.1 To determine the scope of the survey known dormouse records were obtained from the following sources:

- National Biodiversity Network (NBN)
- North Somerset Council
- Bristol Environmental Records Centre (BRERC)
- Somerset Environmental Records Centre (SERC)
- The National Dormouse Monitoring Project (who confirmed that their records were held by the BRERC and SERC)

3.2 These dormouse records were mapped over woodland and hedgerow habitat data within the preferred Route Corridor and up to1km from the Corridor boundaries. This habitat data was obtained from the following sources:

- National Grid habitat walkover surveys
- Habitat Inventory Data
- Ordnance Survey mapping data
- Aerial images

3.3 Although the data search did not identify any dormouse records within the Route Corridor it did reveal several dormouse records at three areas within the 1km buffer; the Mendips AONB, Tickenham Ridge/Priors Wood and a nationally significant population East of Yatton. Targeted searches for publically available data in respect of these populations were also sought from the NBN Gateway, the Wildlife Trusts, Woodland Trust, Nailsea Nature, YACWAG, Bristol Naturalists and Mendips AONB websites. Information obtained for these areas is presented in Table 1.

Table 1: Dormouse Records

Dormouse Records
Mendips AONB
The searches revealed that populations of hazel dormouse are found across the Mendips AONB west of the Route Corridor. The strongest populations are found within The Perch SSSI and the Cheddar Complex SSSI, approximately 8km from the Proposed Development. The National Dormouse Monitoring Programme (NDMP) was founded in The Perch and Cheddar Woods sites and the area remains a regional stronghold for dormice. The Somerset Wildlife Trust Mendips Living Landscape Project conducted nest tube surveys between 2009 and 2011 at King's Wood, Broad Knoll and Crook Peak in woodlands within 1km to the south of and adjacent to the undergrounding section of the route, finding dormice in all locations[i]. These areas are connected to the Cheddar and Perch sites via Cheddar Woods SSSI, Axbridge Hill & Fry's Hill SSSI and the Crook Peak to Shute Hill SSSI where records of dormouse exist[ii]. At the southern end of the undergrounding route species-poor intact hedges and trees and a few native species-rich hedges connect to small pockets of woodland on Crook Peak and Barton Hill (where dormouse records exist) and plantation woodland adjacent the M5. At Sandford Batch (northwest of the Cheddar populations) dormouse records exist within 250m east of the Proposed Development. Within the Order Limits in this area there are several native species-rich intact hedgerows extending to Banwell Wood (semi-natural broad-leaved woodland) along the western edge of the Order Limits.
Tickenham Ridge/Prior's Wood
Dormice records exist for swathes of woodland within 1km of the route on both the north and south edges of Tickenham Ridge. These areas include Prior's Wood, an Avon Wildlife Trust reserve, formerly part of the Tyntesfield Estate which incorporates both ancient woodland and plantation. A nest-tube survey by the Avon Wildlife Trust during the 'Dormice on your Doorstep' Project in 2003 also found dormice at their Tickenham Hill reserve on the north side of the Ridge[iii]. Within an area approximately 500m west of existing dormouse records at Westhill on the south of the ridge the Woodland Trust has also recently found dormouse at a site at Towerhouse Wood[iv]. Where the Proposed Development travels along the centre of the ridge between Stone Edge Batch and Cadbury Camp Lane, the mainly semi-natural broad-leaved woodland is outside the Order Limits but connected on either side by native species-rich and species-poor intact hedgerow and trees. Small pockets of woodland (e.g. Abbot's Horn) encroach into the Order Limits. At the northern end of the ridge the Order Limits cross a very small section of Prior's Wood, where records for hazel dormouse exist within 250m. The habitat here is a mixture of semi-natural broad-leaved woodland, continuous bracken and scattered scrub. A single dormouse record exists near Sheepway and within 500m the order limits cross a few species-poor intact hedges linked to an area.

Dormouse Records
East of Yatton
There is a regional stronghold of dormouse outside the 1km Route Corridor buffer zone to the east of Yatton and to the north of the Churchill substation at King's Wood SSSI. King's Wood is a SSSI designated as one of the largest areas of ancient woodland remaining in North Somerset. The dense understorey supports a nationally important population of hazel dormouse with one of the highest densities in the UK. King's Wood lies within the Somerset and Mendips SAC and is connected to Goblin Combe SSSI which is part of the National Dormouse Monitoring Programme (NDMP). In 2009 Goblin Combe recorded the most dormice across 233 NDMP sites surveyed that year; with an average of 33 dormice per 50 nest boxes.[v] These areas are over 2km east and north of the Proposed Development and separated by the village of Yatton. There is also a single NBN record located west of Yatton within 2km of the Proposed Development.

3.4 One further record was identified within the 1km Route Corridor buffer zone, this was within residential development at Portishead, southwest of Portbury Wharf nature reserve. However, on further investigation it was revealed this was not a confirmed record but was reported as "maybe dormouse described as orange, round and cute, caught by cat".

3.5 Primary dormouse survey locations were determined by selecting sites within the Route Corridor that had woodland or hedgerow habitats potentially linking to dormouse records within the 1km buffer zone.

3.6 Precautionary dormouse survey locations were determined by selecting sites within the Route Corridor that had woodland areas within and adjacent to (within 1km of) the Route Corridor.

3.7 Research has traditionally reported that dormice are reliant on deciduous woodland (primarily hazel coppice). Where woodland blocks are small, dormouse populations may use several woodland blocks together with interconnecting hedgerows. However recent studies have identified dormouse in a number of habitats including hedgerow, scrub, conifer plantation, heathland and gardens. Although the value of these habitats in supporting long term dormouse populations is largely unknown, there are fewer records associated with them. As an additional precaution it was decided to select further survey locations outside of the Primary and Precautionary survey locations.

3.8 Control dormouse survey locations were selected on the basis of a preference for the following characteristics where they could be found:

- Mature hedgerows
- Species-rich hedgerows
- Outgrown or tall hedgerows
- Hedgerows within a strongly connected network with these characteristics

3.9 Hedgerow habitats were selected over other habitats for this group of survey locations because scrub habitat within the Route Corridor is largely associated with the woodland and hedgerow habitats, conifer plantations had already been included in the Primary and Precautionary survey locations and there are no heathland habitats or significant reedbeds within the Route Corridor.

3.10 Following this desk-based assessment, dormouse surveyors undertook a reconnaissance survey of the Route Corridor to ground truth the desk based assessments and to refine the exact location of survey transects.

3.11 Using the above criteria 28 sites were selected for dormouse survey. These are described in Table 2 and their location together with dormouse records are provided on **Figures 8.41.1 to 8.41.10**.

Table 2: Dormouse Survey Locations

Dormouse Survey Locations		
Site ID	Location	Reason for Selection
Primary Dormouse Survey Locations (12 sites)		
9 & 10	Webbington	There are a few small parcels of woodland outside the Corridor around Barton, Crook Peak and Webbington. There are dormouse records associated with these habitats. Hedgerows within the Corridor in this area are species poor but there are areas of plantation woodland around the M5 motorway between Webbington and Loxton (sites 9 and 10).
14 - 17	Banwell	Sandford Wood ancient woodland is present approximately 500m east of the Corridor at Sandford and there are dormouse records associated with this habitat. Ancient woodland and broadleaf woodland is also present on the west side of the corridor at Banwell (site 15). A small area of woodland extends into the Corridor and hedgerows leading from this wood cross the Corridor (sites 14 and 16).
23 -28	Tickenham Ridge	Prior's Wood (site 28) borders the east of the Corridor between Portbury and Wraxall. It comprises ancient woodland, broadleaf woodland and a strip of conifer plantation. There are dormouse records associated with this woodland and hedgerows extend from this woodland into the corridor (sites 26 and 27) potentially linking to Tickenham Ridge woodland habitats on the west side of Whitehouse Lane. There are a number of broadleaf and conifer woodland blocks around the Towerhouse Wood and West Hill area (north of Nailsea) and there are dormouse records associated with these habitats. Further north on the opposite side of the B3128 road and extending into the southern edge of the Corridor is Mogg's Wood (site 25) a broadleaf woodland. Southwest of Mogg's Wood and outside the Corridor is Summerhouse Wood ancient woodland, from which species-poor hedgerows extend into the Corridor. North of the Corridor is the wooded escarpment of Tickenham Ridge with extensive broadleaf and ancient woodland areas. Chummock Wood Complex (site 24) and the smaller Abbot's Horn and Round Wood (both site 23) extend into the Corridor.
Precautionary Dormouse Survey Locations (10 sites)		
1 & 2	Knowle	There are no dormouse records in this area, but there is woodland habitat within the buffer zone and a few small woodland blocks present within the Corridor with connecting species-rich hedgerows (sites 1 and 2).

Dormouse Survey Locations		
Site ID	Location	Reason for Selection
11 – 13	Winscombe	There are no dormouse records in this area and woodland is absent from the corridor. However, there are small blocks of woodland scattered around Winscombe within the 1km buffer zone with potential distant links to the hedgerow network and a wooded stream within the Corridor (sites 11, 12 and 13). This area is located between the Banwell and Webbington Primary survey locations.
18	Sandford	Although there are no woodlands or dormouse records within the Route Corridor or buffer zone, there are records further south at Sandford Wood. As a precaution a series of hedgerows (site 18) were surveyed.
19 – 22	Nye to Northend	Although there are no woodlands or dormouse records within the Route Corridor or buffer zone, there is a collection of dormouse records further afield in the east (associated with the Kings Wood and Brockley Wood areas). These records appear to be largely separated from the Route Corridor by the developments of Yatton and Congresbury. As a precaution a selection of significant hedgerows/tree lines were surveyed at four sites (sites 19 to 22).
Control Dormouse Survey Locations (6 sites)		
3 - 5	Woolavington	There are no dormouse records in this area, no woodland habitat within the Corridor and only a small woodland block within the buffer zone. Hedgerows in three locations were selected for survey (sites 3, 4 and 5).
6	Southwick	There are no dormouse records in this area, no woodland habitat within the Corridor and only a few small orchards within the buffer zone. Hedgerows in one location were selected for survey (sites 6).
7 & 8	Vole to Rooksbridge	There are no dormouse records in this area, no woodland habitat within the Corridor or the buffer zone. Hedgerows in two locations were selected for survey (sites 7 and 8).

Nest tube survey

3.12 Nest tube surveys were selected to determine dormouse presence/absence within the selected sites. There are several other methods that can be used to detect dormouse but these were not appropriate to the aims and conditions of this survey. For example nut hunts can be successful in determining presence in woodlands or other habitats with fruiting hazel but this is rare within the survey area. Hair tube surveys are less effective and not recommended for determining presence/absence. Nestbox surveys can also be used but these are generally only recommended for long term monitoring studies have shown they can take a year post installation before being utilised by dormouse.

3.13 Natural England's guidance on dormouse survey effort contained within both the Dormouse Conservation Handbook (2nd Edition) and the Interim Natural England Advice Note[vi] recommends that at least 50 nest tubes are used to sample a site and that these should be spaced at approximately 15-20m apart.

3.14 The guidance also advises that the checking of nest tubes is undertaken on a monthly or bi-monthly basis. To ensure adequate survey effort, the "score" should be no less than 20. The guidance advises that an assumed absence cannot be based on a score less than this. The Index of Probability table provided in the Dormouse Conservation Handbook (recreated in Table 2 below) was used to ensure survey effort (density/number of nest tubes and length of deployment) was sufficient to determine absence. The index uses 50 nest tubes as standard.

3.15 Groups of 50 nest tubes were erected at 15-20m intervals, at each survey location, during April/May 2012 and were removed during October/November 2012. During the deployment period, nest tubes were inspected at least every two months. The chosen survey methodology was consistent with Natural England's guidance and ensured that the "score" for the survey was not less than 20.

3.16 Installation and checking of nest boxes was led by licensed surveyors.

Table 3: Index of Probability

Natural England's Index of Probability	
Month	**Index of Probability (of finding dormice in nest tubes in any one month)**
April	1
May	4
June	2
July	2
August	5
September	7
October	2
November	2

3.17 Natural England's guidance including their Interim Advice Note (2011) states that the results of a presence/absence survey "should be used alongside habitat survey data for the site and published research to provide an estimate of the population."

3.18 Natural England was contacted to confirm the correct approach for undertaking dormouse population estimates. David Trump, Natural England's dormouse licensing expert, confirmed to TEP (via email on 29/06/2012) that undertaking presence/absence surveys in combination with published habitat densities is the correct approach to determining dormouse population densities, in the event that their presence is confirmed during survey.

<u>Survey Limitations</u>

3.19 At one of the selected survey sites (Site 2) evidence of vandalism was noted, with eight tubes having their wooden inserts removed. These were replaced and the vandalism did not reoccur.

3.20 At Site 7 the majority of the nest tubes had been displaced and damaged by cattle. It was considered that if dormice were present, and took up occupancy of the tubes, that they could be injured by livestock. There was also a risk that the cattle could be harmed by ingesting nest tube materials. The decision was made to remove the nest tubes from this location after the first visit. It is not considered that this would present a significant limitation to the survey as this was a control survey location.

4.0 Results

4.1 A summary of the survey findings together with a photograph of the each survey site is provided in Table 4. Further information of the findings of each survey visit is provided in Table 5.

4.2 Wood mice, and their nests, were commonly recorded throughout the survey area. However, even though potentially suitable areas of dormouse habitat were present within the survey areas, no confirmed, or conclusive, evidence of dormice was recorded during the survey.

4.3 At one location, site 8 (off Pill Road) in the Vole to Rook's Bridge survey area, one nest was found to display characteristics of a poorly structured dormouse nest, such as the type sometimes used by lone male dormice. However, no obvious weaving of nesting materials was apparent and it was considered more likely that the nest had been created by wood mice, as there were a large number recorded in close proximity and the nearest desktop dormouse record was approximately 5km to the north. The results of the dormouse survey are presented in Table 3.

4.4 Much of the Route Corridor provided very limited opportunities for dormouse. Although hedgerow field boundaries can be extensive across the landscape they do not represent good dormouse habitat. In particular the landscape in the south from the Huntspill River to the River Axe and in north from Puxton Moor to Tickenham Moor is characterised by species-poor well managed hedgerows associated with ditches and rhines. Such hedgerows provide a poor foraging resource for a species that needs a range of seasonal food sources during their active season and in preparation for winter hibernation.

4.5 Although even species poor hedgerows can be important in connecting parcels of more valuable habitat, (and even providing some degree of foraging), these examples are unlikely to act as a wildlife corridor as there are no apparent high quality dormouse habitats (such as woodland) in the locality.

4.6 In some instances the hedgerows in this landscape are outgrown and appear to provide a potentially significant habitat feature, but on closer inspection individual hedgerows are found to be gappy. At a distance, the presence of parallel field boundary hedgerows can create the illusion of a significant hedgerow feature but on closer inspection the fragmented nature of these hedgerows is apparent. Although some studies have shown dormouse moving across open ground, it is still generally accepted that they will seek to remain arboreal through their active periods and will avoid crossing gaps in tree cover.

4.7 Another feature of the landscape that is counter-indicative for dormouse is the wet ditches frequently found along the base of the hedgerows. These reduce opportunities for hibernation. Even in the absence of ditches immediately beneath hedgerows, much of the landscape is subject to winter flooding. The typical hibernation habits of dormouse would make them susceptible to flooding and indicate against long term population survival in this landscape. This is reflected in the existing spread of record for this species which is associated with higher ground.

4.8 In addition to the descriptions and photographs of the survey sites provided in Table 4, a photographic record of the landscape along the route is provided at **Figures 8.42.1 to 8.42.10**.

Table 4: Dormouse Survey Results

Dormouse Survey Results				
Site ID	Habitat Description	Desktop Data	Surveys Results	Site Photograph
1 Eleven Acre Covert and hedges	Small broadleaved woodland, lacking in understorey vegetation, on south facing hillside with connecting hedges. Hedges are sparsely vegetated, but do form a contiguous network.	Nearest record approximately 30km to the north.	No evidence of dormouse recorded. Wood mouse (*Apodemus sylvaticus*) nests were present in two tubes along with nest material.	
2 Chisland Covert and The Dems	Two primarily broadleaved woodlands on a south facing hill with connection via native hedges. There is evidence of heavy grazing by cattle in The Dems, probably accounting for the lack of understory and general poor structure. Chisland Covert has a similar lack of understory, however it is fenced and there is no evidence of grazing.	Nearest record approximately 30km to the north.	No evidence of dormice was recorded.	

Dormouse Survey Results				
Site ID	Habitat Description	Desktop Data	Surveys Results	Site Photograph
3 Woolavington Road	Series of connected hedges, enclosing pasture, dominated by hawthorn and over ditches. The hedges are mature, with some incorporating standard trees.	Nearest records are approximately 25km to the north.	No evidence of dormice was recorded. Sixteen nest tubes contained wood mouse nests, with three having wood mice present.	
4 South Huntspill	Series of mature connected hedges, dominated by hawthorn (*Crataegus monogyna*), over ditches. The hedges form a network enclosing grazing pasture.	Nearest record is approximately 15km to the north.	No evidence of dormice was recorded. Three nest tubes contained wood mice and nests.	
5 East Huntspill	Series of connected hedges, dominated by mature hawthorn with some willow and blackthorn, some over ditches. A network of hedges enclosing grazing pasture.	Nearest record is approximately 15km to the north.	No evidence of dormice was recorded. One nest tube contained a wood mouse and nest.	

Dormouse Survey Results				
Site ID	Habitat Description	Desktop Data	Surveys Results	Site Photograph
6 Southwick Road	Series of mature connected hedges, dominated by hawthorn with some blackthorn, some over ditches, enclosing grazing pasture.	Nearest record is approximately 10km to the north.	No evidence of dormice was recorded.	
7 Old Vole Farm	A network of parallel hedges, situated over ditches, which are dominated by hawthorn.	Nearest desktop record is approximately 6km to the north.	No evidence of dormice was recorded.	
8 Off Pill Road	A series of mature, connected hedges (some over ditches) dominated by hawthorn. The hedgerow network encloses grazing pastures.	Nearest desktop record approximately 5km to the north.	No evidence of dormice was recorded. One nest had some features of a poorly structured dormouse nest (with no obvious weaving of materials) as sometimes used by lone males. But this was not conclusive and large numbers of wood mice and their nests were present nearby in 18 nest tubes.	

Dormouse Survey Results				
Site ID	Habitat Description	Desktop Data	Surveys Results	Site Photograph
9 Off Sevier Road	Immature planted woodland, adjacent to motorway, with ash (*Fraxinus excelsior*), field maple (*Acer campestre*) and hazel (*Corylus avellana*) present. Woodland is connected to a mature, hawthorn-dominated hedge which encloses grazing pasture.	Three dormouse records nearby, with the nearest (feeding remains from 2003) being located approximately 1km to the north east of the site.	No evidence of dormice was recorded. Twelve nest tubes contained wood mouse nests.	
10 Off Sevier Road	Immature planted woodland, adjacent to motorway, with ash, field maple and hazel present. Woodland is connected to a mature, hawthorn-dominated hedge which encloses grazing pasture.	Three dormouse records nearby, with the nearest (feeding remains from 2003) being located approximately 1km to the north east of the site.	No evidence of dormice was recorded. Sixteen next tubes contained wood mouse nests and seven of these had wood mice present.	
11 Off Max Mill Lane	A network of mature hedges, dominated by hawthorn, which encloses grazing pasture. Most of the hedgerows are associated with ditches.	Nearest records of dormice (feeding remains from 2003) are approximately 1km to the south of the site.	No evidence of dormice was recorded. Five nest tubes contained wood mouse nests, with two of these having animals present.	

Dormouse Survey Results				
Site ID	Habitat Description	Desktop Data	Surveys Results	Site Photograph
12 Off Max Mill Lane	Adjacent to site 11, also comprises a network of mature hedges dominated by hawthorn, which encloses grazing pasture. Most of the hedgerows are associated with ditches.	Nearest records of dormice (feeding remains from 2003) are approximately 1km to the south of the site.	No evidence of dormouse was recorded. Thirteen nest tubes contained wood mouse nests, with four wood mice being present.	
13 Off Banwell Road	A network of mature hedges, dominated by hawthorn, which encloses grazing pasture. Most of the hedgerows are associated with ditches.	Nearest record of dormice is approximately 1.5km to the north east where a dead animal was recorded in 2001.	No evidence of dormouse was recorded. Seventeen nest tubes contained wood mouse nests with nine of these having wood mice present.	
14 Banwell Hill	Primarily deciduous woodland on a hill with connecting hedges linking it to the wider landscape which is predominantly grazed pasture. There is evidence of some woodland management, such as coppicing, the understory is limited to occasion patches of holly (*Ilex aquifolium*) or bramble (*Rubus fructicosus* agg).	Nearest record of dormice (dead animal) is located approximately 700m to the east of the site.	No evidence of dormouse was recorded.	

Dormouse Survey Results				
Site ID	Habitat Description	Desktop Data	Surveys Results	Site Photograph
15 Near Banwell Hill, east of Banwell Road	Series of hedges in arable/grazing farmland, connected to a large woodland (Banwell Hill) to the north. The hedgerows are dominated by hawthorn, with one section of double hedge running from north to south at the eastern end of the site.	Nearest record of dormice (dead animal recorded in 2001) is approximately 500m to the east.	No evidence of dormouse was recorded.	
16 Near Banwell Hill	A network of hedgerows, enclosing both arable and grazed farmland, which is connected to woodland to the west (Banwell Hill).	Nearest record of dormice is approximately 400m to the east.	No evidence of dormice was recorded. Twelve nest tubes contained wood mouse nests, with two of these having animals present.	
17 Strawberry Line	Site comprised of two distinct sections. Both sections contain a series of hedges bordering footpaths with species present including hawthorn, field maple, elder (*Sambucus nigra*), ash, hazel, bramble and crab apple (*Malus* sp.).	Nearest record (dead animal recorded in 2001) is approximately 1km to the south	No evidence of dormice was recorded. Four nest tubes contained wood mouse nests with one of these having a wood mouse present.	

Dormouse Survey Results				
Site ID	Habitat Description	Desktop Data	Surveys Results	Site Photograph
18 Nye Farm	A network of ditches, dominated by hawthorn, in grazed farmland. Many hedgerows are associated with ditches.	Nearest record (dead animal recorded in 2001) is located approximately 2km to the south.	No evidence of dormice was recorded. Nineteen nest tubes contained wood mouse nests and nine of this had animals present.	
19 Off Weston Road	A network of hedgerows, mostly in association with ditches, within grazed pasture that are dominated by hawthorn, but with bramble, rose (*Rosa* sp), willow (*Salix* sp) and blackthorn also present.	Nearest records of dormice are approximately 5km to the north and also to the south.	No evidence of dormice was recorded. Thirty three nest tubes contained wood mouse nests with eleven having animals present.	
20 Off Weston Road	A network of hedgerows in grazed farmland, dominated by blackthorn (*Prunus spinosa*), but also with hawthorn and rose. The hedgerow becomes sparse in the north.	Nearest records are approximately 5km to the north and also to the south.	No evidence of dormice was recorded. Thirty one nest tubes contained wood mouse nests with fourteen of these having animals present.	

Dormouse Survey Results				
Site ID	Habitat Description	Desktop Data	Surveys Results	Site Photograph
21 Off Lampley Road	A network of mature hedgerows, dominated by hawthorn with blackthorn, elder, rose and wild privet (*Ligustrum vulgare*).	Nearest record is approximately 6km to the north east.	No evidence of dormice was recorded. Thirteen nest tubes contained wood mouse nests, with six animals present.	
22 Off Lampley Road	A network of hedgerows, mostly in association with ditches, within grazed pasture that are dominated by hawthorn. There is also a small patch of woodland adjacent to a nursery with field maple, willow, hazel, hawthorn and Lombardy Poplar (*Populus nigra* 'Italica').	Nearest record is approximately 6km to the north east.	No evidence of dormice was recorded. Fourteen nest tubes contained wood mouse nests, with two animals present.	
23 Round Wood & Abbot's Horn	Two broadleaved woodlands, connected to a larger area of woodland via hedges. Abbot's Horn has been heavily grazed resulting in an absence of understorey vegetation. Round Wood also has a limited understorey.	Nearest record (hibernating animal recorded in 2006) is located approximately 1.5km to the east.	No evidence of dormouse was recorded.	

Dormouse Survey Results				
Site ID	Habitat Description	Desktop Data	Surveys Results	Site Photograph
24 Chummock Wood	Broadleaved woodland with sparse understorey, except at the periphery of the wood.	Nearest record (hibernating animal recorded in 2006) is located approximately 1km to the east.	No evidence of dormice was recorded.	
25 Mogg's Wood	A large area of mixed woodland, mainly deciduous in composition with connectivity to a surrounding network of hedgerows and other woodland. The canopy within the wood is dense which limits the extent of the understorey.	Nearest dormouse record (hibernating animal recorded in 2006) is only 200m to the east.	No evidence of dormice was recorded.	
26 Noah's Ark Zoo	Two species-rich hedges connected to woodland to the east. Main species represented are hawthorn, blackthorn, holly, bramble, sycamore (*Acer pseudoplatanus*), willow and hazel.	Nearest dormouse records (feeding remains in Prior's Wood recorded in 1997) are 1.3km to the north east.	No evidence of dormice was recorded. Six nest tubes contained wood mouse nests with five animals present.	

Dormouse Survey Results				
Site ID	Habitat Description	Desktop Data	Surveys Results	Site Photograph
27 Noah's Ark Zoo	A network of hedgerows, connected to the Zoo, with ash, sycamore, hawthorn and elder.	Nearest dormouse records (feeding remains in Prior's Wood recorded in 1997) are 1.2km to the north east.	No evidence of dormice was found. Fifteen nest tubes contained wood mouse nests	
28 Prior's Wood Wildlife Trust Reserve	Mixed (predominantly deciduous) woodland. The structure of the wood looks to be suitable for dormice, with a diverse and well-developed understorey.	Record of dormouse feeding remains within wood (east of survey site) from 1997.	No evidence of dormice was found.	

Table 5: Field Survey Data

Field Survey Data [Numbers refer to individual nest tube ID]					
Visit	Date	Dormouse nest	Other	Missing tubes	Comments
Site 1					
1	02/07/2012		44 woodmouse nest		
2	22/09/2012		44 woodmouse nest	20	
3	23/10/2012		31, 45 woodmouse nest	3,4	
Site 2					
1	02/07/2012				
2	22/09/2012				Vandalism, eight wooden inserts had ends snapped off. These were replaced.
3	23/10/2012				
Site 3					
1	02/07/2012				33 is low
2	22/09/2012		13, 26, 28, 38, 42, 49 possible woodmouse nest 48 woodmouse in nest	44	37 feeding remains of slowberry nuts, suggest woodmouse
3	23/10/2012		1, 7, 17, 28, 29, 31, 38, 41, 42, 50 woodmouse nest 6, 8, 36 Mixed leaves 9, 49 woodmouse adult & nest 13 woodmouse 40, 45, 48 fine grass nest material	18, 44	16, 25, 32, 37, 46 feeding remains
Site 4					
1	02/07/2012			45	
2	25/09/2012		22, 30-32 woodmouse & nest	5	Missing wood 19, 29, 50
3	23/10/2012		30, 31, 32 woodmouse		
Site 5					
1	09/07/2012			15, 28, 48	
2	22/09/2012		12 woodmouse and nest	15, 22, 28, 38, 39	7, 14, 16, 26, 31, 36, 48 wood missing, replaced
3	23/10/2012				
Site 6					
1	03/07/2012		7 & 20 brown leaves		
2	22/09/2012		45 nest with dried & fresh leaves, no structure		5 feeding remains, knawed hawthorn stones, inconclusive 8, 29, 30, 34, 41, 49 wood missing replaced
3	07/11/2012		18, 36 woodmouse nest 33, 48 woodmouse in nest		
Site 7					
1	03/07/2012	All tubes removed due to disturbance by livestock.			
Site 8					
1	03/07/2012			34	
2	25/09/2012		9, 21, 23, 30, 31, 32, 35, 37, 46, 47, 48, 50 woodmouse & nest	19, 24	
3	21/10/2012		4, 9, 14, 21, 23, 26, 30, 32, 35, 37, 42, 43, 46- 48, 50 woodmouse nest 9, 32, 45 woodmice	6, 24, 25, 27	7 woodmouse feeding remains 25, 38, 44 wood missing (final visit not replaced) 31, 36, 39 on ground

Field Survey Data [Numbers refer to individual nest tube ID]					
Visit	Date	Dormouse nest	Other	Missing tubes	Comments
Site 9					
1	03/07/2012				
2	23/09/2012		33, 40 shredded bark, no structure, brown leaves	15	2 fresh leaves
3	22/10/2012		2, 4, 11, 20, 22, 27-40, 44, 45, 48-50 woodmouse nest	1, 5-9, 16, 18, 41	
Site 10					
1	03/07/2012				
2	23/09/2012		27, 45, 48 adult woodmouse with nest of mixed dried & fresh leaves 28, 42 mixture of dry & fresh leaves 29-33, 35,36,39 mainly green leaves (38, 40, 41 also adult woodmouse)	5-9	11 brown leaves 20 & 22 mixture of dried & fresh leaves
3			2,3, 45 woodmouse nest 31, 38, 40 woodmouse nest with adults		33 feeding remains 44 nesting bird
Site 11					
1	04/07/2012		9 woodmouse and nest	14, 28	
2	23/09/2012		8, 13, 31 nest present 34 woodmouse and nest present	40	2, 6, 7, 21 feeding remains
3	21/10/2012			16-18, 22, 35, 36	
Site 12					
1	04/07/2012			16, 18, 22, 35, 36, 38, 43	
2	23/09/2012			16-18, 22, 36, 38	
3	21/10/2012		2, 3, 8, 9, 13, 26, 27, 31, 34, woodmouse nest 4, 29, 36, 37 woodmice in nest 20 woodmice adults	40	7, 16, 21 bird feeding remains 10 feeding remains
Site 13					
1	04/07/2012				
2	24/09/2012		14, 18, 22, 31 Woodmouse & nest 19, 21, 33, 36 nest (probably woodmouse)	17, 35, 42,45	14 feeding remains
3	21/10/12		13, 2, 23, 24, 37 nest with woodmice in 14, 18, 19, 5 , 30, 31, 33, 35, 36, 38, 40 woodmouse nest	16, 26, 42, 49	15, 44 wood missing (final visit, not replaced)
Site 14					
1	04/07/2012				
2	24/09/2012				
3	22/10/2012				

Field Survey Data [Numbers refer to individual nest tube ID]					
Visit	Date	Dormouse nest	Other	Missing tubes	Comments
Site 15					
1	06/07/2012				
2	24/09/2012		1, 9 woodmouse present & nest 13 nest (probably woodmouse)	41,42	
3	22/10/2012		1, 3, 4, 6, 7, 9, 11, 44, 46 Woodmouse nest 8,12 woodmouse also 13 old woodmouse nest 15 woodmouse only	42	5 fine nest material (moss & grass) 14 shredded bark
Site 16					
1	06/07/2012				
2	24/09/2012		9, 38 nest (probably woodmouse) 10 woodmouse & nest	1, 5, 26	
3	22/10/2012		2, 10, 12, 14, 38, 42, 44 woodmouse nest 10, 39 adult also present 9 old woodmouse nest	1, 5	
Site 17					
1	09/07/2012			1, 25, 37, 39, 45	
2	25/09/2012		13 woodmouse nest	1-4, 21, 27, 35, 39,43,	
3	22/10/2012		19 wood mouse nest 21 woodmouse nest & adult 47 mixed leaves	35,39	
Site 18					
1	05/07/2012			2, 25, 33, 41, 44, 45	
2	24/09/2012		5, 23, 32, 35 woodmouse & nest	9, 22, 25, 37, 41, 44, 45	
3	07/11/2012		8, 13, 14, 23, 26, 28, 29, 30, 35 woodmouse nest 6, 12, 32, 34, 49 woodmouse in nest 3, 4 old woodmouse nest	9, 25, 42, 44	16, 17 grass nest 27 feeding remains
Site 19					
1	09/07/2012			37	Nest contains mixture of fresh and dead leaves
2	24/09/2012		3, 33 woodmouse & nest 17,19 woodmouse 35, 36, 41, 47 nest (probably woodmouse)		7, 10, 12, 15 few green leaves in
3			7, 11, 15, 20, 21, 24, 33, 34, 37, 39 35, 41, 49 woodmouse nest 25, 30, 31, 36, 45, 47 nest with woodmouse 6, 9, 10, 14, 18, 19, 40, 43 nest material 3, 23 old woodmouse nest		

Field Survey Data [Numbers refer to individual nest tube ID]					
Visit	Date	Dormouse nest	Other	Missing tubes	Comments
Site 20					
1	09/07/2012			2	
2	24/09/2012		5, 40, 48 woodmouse & nest	2,3	
3			18, 17, 16, 15, 40, 39, 38, 3, 34, 46, 42, 49, 26, 23 woodmouse nest 11, 10, 8, 6, 30, 27, 43, 44, 47, 50, 25 adult woodmouse in nest 36, 2 nest material 48 old nest		37, 2, 32 feeding remains
Site 21					
1	08/07/2012			10, 34	
2	25/09/2012		12, 28, 43, 45 woodmouse nest 14, 20, 49 woodmouse and nest	24, 25, 32, 35	
3	06/11/2012		15, 17, 27, woodmouse in nest 25, 31 woodmouse nest 34 old woodmouse nest		
Site 22					
1	08/07/2012				
2	25/09/2012		15 woodmouse nest	32	15 feeding remains
3	06/11/2012		2, 3, 20, 22, 23, 37, 43, 45, woodmouse nest 6, 19 woodmouse in nest 28, 33, 48, 49 old woodmouse nest		9, 11 loose green leaves
Site 23					
1	05/07/2012			22, 42	
2	25/09/2012			21, 42, 45	
3	24/10/2012			41	
Site 24					
1	05/07/2012			5, 26	
2	26/09/2012			5	26 missing wood, replaced
3	24/10/2012			5	
Site 25					
1	05/07/2012				
2	25/09/2012				
3	24/10/2012				
Site 26					
1	10/07/2012			24, 25, 27, 28, 33, 34, 35, 41	43 to 50 couldn't be accessed due to flooding
2	27/09/2012		32, 35 woodmouse nest	1, 3-6, 8, 9, 14, 24-27, 42, 44, 47,	13, 22, 28, 29, 35, 36 feeding remains
3	24/10/2012		22, 25, 35, 37, 44 woodmouse nest (2 adults) 32 old woodmouse nest	23,26	35 feeding remains at

Field Survey Data [Numbers refer to individual nest tube ID]					
Visit	Date	Dormouse nest	Other	Missing tubes	Comments
Site 27					
1	10/07/2012			20,23, 32	
2	27/09/2012		1, 23, 26, 30, 42, 45, 49 nest (probable woodmouse)	20, 22, 27, 29, 38	48 woodmouse feeding remains
3	4/10/2012		1, 6, 30, 41-50 woodmouse nest 10 old woodmouse nest	2,22	9, 14, 27 old feeding remains food
Site 28					
1	10/07/2012			19,26	
2	27/09/2012			4, 19, 26, 35	
3	06/11/2012			4	

5.0 REFERENCES

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[vi] Natural England Advice Note; *Dormice surveys for mitigation licensing – best practice and common misconceptions* (2011)