

**Lower Mill Estate, Cotswold Water Park
Ecological Monitoring 2019 - 2020
Lower Mill Estate
27 May 2020**



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	Project information
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EXECUTIVE SUMMARY

This report sets out the findings of ecological monitoring surveys undertaken at the Lower Mill Estate (LME) which is located within the Cotswold Water Park (CWP).

As part of the agreed Section 106 Agreement (Cotswold District Council CT.6641/J), Schedule 2 requires that the developer must undertake a series of audits to “.. measure the success or otherwise of the implementation of nature conservation control and mitigation measures”.

This report presents the findings of the monitoring surveys for the period 2019 – 2020 and the results are summarised below:

Wintering Waterbirds

Twelve surveys were carried out (bi-monthly) between October 2019 and March 2020. The peak count overall for the five priority species was 443 on visit 5 (16th December 2019) in February 2019 which is lower than the peak count of priority species last year (525). Mean counts for four of the five LME priority species decreased from the previous winter with matching counts only recorded for coot (counts had previously increased for this species). Results from this survey suggest that the majority of species recorded decreased in number (mean) from the counts last winter. Of note was pintail which had a big increase, while pochard had a big decrease this year. The lower numbers generally this winter may be due to the mild but extremely wet weather. Water levels in Farmhouse Lake, Freeth Mere, Somerford Lagoon and Flagham Fen were unusually high and difficulty surveying all banks will also have contributed to the lower numbers. Compared to the previous winter, the mean count for the total water bird assemblage decreased from to 696 in 2018/2019 to 545 this winter. The peak count also dropped, from 869 to 780.

Breeding Waterbirds

Five monthly surveys were carried out between April and August 2019. Overall, the number of waterbirds breeding at LME appears to be stable, although there is considerable fluctuation from year to year with a minimum number of five species in 2003 and a maximum of 14 species in 2011. The total number of species regularly breeding dropped from a peak of 14 in 2011, to a consistent level of 10 species in 2016, 2017 and 2018 and with a slight increase to 12 recorded in 2019. The additional species this year were greylag goose and common tern. Between 2007 and 2019 the number of species has varied between five and fourteen.

Based on the annual totals in the last five years most species appear to be stable with the only species still showing a decline being the mute swan. A bittern was recorded on two occasions and a great white egret at Swillbrook Lakes on one occasion.

Breeding Terrestrial Birds

The terrestrial bird surveys were undertaken in two parts; LME and Swillbrook Lakes (SWBL). Both areas were surveyed on the same visit, but for consistency with previous reports the results have been separated.

Lower Mill Estate

The number of species confirmed as breeding has increased in 2019 from 19 species last year to 21 species this year. Including probable breeders this is from 23 to 24 species. The total number of territories held (including confirmed and probable) was 156 last year and 157 this year.

Birds recorded to breed in 2019 that did not breed last year included pied wagtail and reed warbler.

Blackcap, Cetti's warbler, reed warbler and song thrush all had significant increases in breeding numbers this year. Great tit, reed bunting and sedge warbler all decreased.

Swillbrook Lakes

The number of species confirmed as breeding has decreased in 2019 from 15 species last year to 14 species this year. Including probable breeders this has reduced from 19 to 17 species. The total number of territories held (including confirmed and probable) in 2019 was 63 which is the same as the two previous years counts.

Reed warbler was recorded to breed on site in 2019 despite not being recorded in 2018. Species that were not recorded to breeding in 2019 were dunnoek, great spotted woodpecker and long tailed tit.

Reed warbler, willow warbler and wren breeding territories all increased in 2019, while blackcap, Cetti's warbler, dunnoek and robin all decreased.

Nightingale

The nightingale surveys were undertaken in May (three surveys) 2019. One nightingale was heard singing from dense cover to the north-east of Mill Lake. This was recorded outside the LME boundary. It was noted that the location was very close to the location of one of the records from 2018. Nightingales were not recorded on either of the night surveys. Further areas of dense scrub would benefit this species.

Reed Bunting and Reed Warbler

Specific surveys were repeated in 2019 to map the locations of reed bunting and reed warbler. Eight individual sightings and five territories of reed buntings were recorded. The sightings and territories were spread across LME with no concentrations of sightings. Reed bunting were recorded in Swillbrook Lakes this year unlike last year. However overall, there were less sightings. In 2018 only three sightings were recorded on the south-east corner of Somerford Lagoon. Sightings and territories increased in both number and distribution in 2019 with four individual sightings and nine territories recorded. Reed warbler were recorded on almost all lakes within the LME. The next surveys are planned for spring and early summer 2020.

House Martin

248 occupied nests were recorded in 2019 which is an increase to the number of nests recorded in 2018 (196 nests), The numbers of nests are therefore still increasing and the increase in nests recorded in 2019

were predominantly in Clearwater. This is very positive given that house martin are listed on the Amber list of birds of conservation concern. No new nests were observed on buildings that have been built over the last three years. These properties comprise more wooden cladding and less of the rendered wall style which the house martin seem to favour.

Tern Rafts

The tern rafts on Somerford Lagoon (1) and Swillbrook Lakes (1) were monitored for the third year running in 2019. The three rafts produced up to seven black headed gulls attempting to nest producing two young and six pairs of common tern producing 13 young which are greater numbers than last 2018. Monitoring will continue in 2020.

Bats

The three bat lofts at Clearwater, Howell's Mere No.1 and No.2 were surveyed for the presence of bats in July 2019. No evidence of use by bats was recorded during the surveys. Previous ad hoc use has been recorded in 2015 and 2016 in the two Howells's Mere buildings but bat evidence has yet to be recorded in the Clearwater bat loft. No evidence of use by bats was recorded in the bat boxes under the bridges at location 2 and 3, with bat box 1 unavailable for survey.

Amphibians

Four surveys were undertaken between April and mid-June 2019 using three survey methods. Great crested newts were recorded in four ponds during the amphibian surveys with low populations recorded in ponds 6, 7, 8 and 10. Pond 4 previously supported GCN but none were recorded this year. This may be due to the continued presence of fish at this pond. Pond 9 had GCN previously and high turbidity at this pond may have affected visibility of GCN with none being recorded this year. A good diversity of amphibian species was present throughout the ponds. Lower numbers of common toad were recorded but the majority of frogs and toads may have completed their breeding cycle prior to the commencement of surveys. Common toads are usually found in good numbers across the Estate.

Brown Hairstreak

Surveys for brown hairstreak butterfly eggs were undertaken by members of Gloucestershire Butterfly Conservation on the 15th November 2019. The hedgerows along the edge of Swill Meadow were searched but flooding hampered efforts in November 2019 and February and March 2020 with 90 eggs were recorded but more likely to be present. A brief search of an area of blackthorn by the HFG ecologist, revealed six eggs. A new record of Brown hairstreak was found along the banks of Swillbrook Lakes, opposite Lakeshore Reserve on Lower Mill Estate and is very encouraging. Blackthorn is now incorporated into all hedgerow mixes in the development so it is hoped that the brown hairstreak population will eventually spread through the developed areas too. Surveys are due again in 2020.

1 Introduction

1.1 PLANNING HISTORY AND LEGAL OBLIGATIONS

- 1.1.1 The monitoring site (Figure 1) forms part of the Cotswold Water Park (CWP). Several lakes which lie within and adjacent to the boundary of the site are of national importance for wintering waterfowl.
- 1.1.2 Outline planning permission for the comprehensive development of the Lower Mill Estate (LME) was granted by Cotswold District Council (CDC) in February 1999 (Reference: CT.6641/J). Subsequent permissions (both outline and detailed) have increased the permitted capacity of vacation units and allowed the construction of other (related) developments.
- 1.1.3 The original outline planning permission was granted subject to a Section 106 Agreement (S.106), with all subsequent permissions replicating the terms of the original agreement or amending it through Deed of Variation.
- 1.1.4 Obligation 24 of Schedule 2 of the S.106 Agreement requires that the developer must undertake a series of audits, to "... *measure the success or otherwise of the implementation of nature conservation control and mitigation measures.*"

1.2 MONITORING OBJECTIVES

- 1.2.1 The objectives of the biodiversity audits were identified in the LME Nature Conservation Audit Document (Scott Wilson, 2001) as follows:
 - To determine whether the development is causing changes to the abundance and distribution of target species; and
 - To provide data upon which informed decisions can be made on enhancement measures and Estate management prescriptions.
- 1.2.2 Target groups/species were originally selected by Scott Wilson using the following established criteria for carrying out ecological monitoring and assessment (Sutherland, 1998). These require that target species should be:
 - Key indicators of impact or habitat change, the behaviour and responses of which are indicative of the community as a whole;
 - Easily identifiable as a species or group; and
 - Likely to be present in sufficient numbers each year for census.
- 1.2.3 In addition, established and easily reproducible survey techniques were adopted to monitor target species.
- 1.2.4 Based upon these criteria (and following some refinements since 2001), the following species/groups currently form the basis of the S.106 audits across the whole of LME, including Swillbrook Lakes (SWBL):
 - Aquatic macrophytes (every 4 years);
 - Wintering and breeding waterbirds (annually);
 - Breeding terrestrial birds (annually);

- House Martin & nightingale (annually);
- Bat roosts (annually);
- Amphibians (every two years, alternating with dragonfly surveys); and
- Dragonflies & damselflies (every two years, alternating with amphibian surveys).

1.2.5 As a result of the timing requirements for the aquatic macrophytes and the non-S106 great crested newt ponds, there are no results within this report for these surveys.

1.2.6 A number of waterbird species have also been selected as target (priority) species for the specific purpose of informing the management of the Estate. They were selected because of the nationally important numbers of each species present in the Cotswold Water Park as a whole in winter. The target waterbird species are as follows:

- Coot (*Fulica atra*);
- Gadwall (*Anas strepera*);
- Great crested grebe (*Podiceps cristatus*);
- Pochard (*Aythya ferina*); and
- Tufted duck (*Aythya fuligula*).

1.2.7 A wildfowl abundance report was undertaken in 2017 (Davidson-Watts Ecology Ltd) which demonstrated that between 1999/2000 and 2014/15 the target populations increased markedly, relative to the 1999/00 to 2001/02 baseline. It then fell steadily, reaching a low point in 2006/07 and exceeding the 20% threshold before returning to baseline levels in 2008/9. Following this, there was a decline with current levels standing at a 47% decrease. The decrease has been greater than the 20% threshold level for three of the past five years. There have been substantial reductions in the mean peak counts for the target species coot and great crested grebe. These decreases have been somewhat compensated for by an increase in numbers of tufted duck and a small increase in numbers of gadwall. However, overall there has been a decrease in the mean peak of target species at LME by 29% with a continuing distributional shift to the south and east, away from areas of development.

- Further monitoring surveys have been carried out between 2011 and 2019 and the general report structure, methodologies and results have been followed and replicated where possible to ensure consistency of approach and resulting monitoring data for later comparisons. These reports include:
- Cotswold Water Park Society (December 2011): Pond Surveys, House Martin Surveys, Nightingale Surveys and Bat Surveys Spring/Summer 2011.
- Cotswold Water Park Society (December 2011): Dragonfly and Damselfly Surveys Spring/Summer 2011;
- Cotswold Water Park Society (April 2012): Breeding Songbird and Waterbird Surveys of Swillbrook Lakes Reserve Spring/Summer 2011;
- Cotswold Water Park Society (July 2012): Pond Surveys, House Martin Surveys and Nightingale Surveys Spring/Summer 2012.
- Cotswold Water Park Society (April 2012): Wintering Waterbird Surveys Winter 2011-12.
- Cotswold Water Park Society (September 2012): Breeding Songbird and Waterbird Surveys of Swillbrook Lakes Reserve Spring/Summer 2012.

- Cotswold Water Park Society (July 2012): Pond Surveys, House Martin Surveys and Nightingale Surveys Spring/Summer 2012.
- Cotswold Water Park Society (October 2012): Breeding Songbirds and Breeding Waterbird Surveys Spring/Summer 2012.
- Cotswold Water Park Society (April 2013): Wintering Waterbird Surveys Winter 2012-13;
- The Landmark Practice 2014: Ecological Monitoring Report 2013 – 2014 for Lower Mill Estate;
- The Landmark Practice 2016: Lower Mill Estate, Cotswold Water Park Ecological Monitoring 2014 -15;
- The Landmark Practice 2016: Lower Mill Estate, Cotswold Water Park Ecological Monitoring 2016 -16;
- Davidson-Watts Ecology Ltd (2017) Lower Mill Estate, Cotswold Water Park Ecological Monitoring 2016 – 2017;
- Davidson-Watts Ecology Ltd (2018) Lower Mill Estate, Cotswold Water Park Ecological Monitoring 2017 – 2018; and
- Davidson-Watts Ecology Ltd (2018) Lower Mill Estate, Cotswold Water Park Ecological Monitoring 2018 – 2019.

2 Wintering Waterbirds

2.1 METHODS

- 2.1.1 The wintering waterbird survey followed methods used in the Wetland Bird Survey (WeBS) Core Counts (Gilbert et al. 1998). Counts were made of all wetland species seen or heard on all wetland habitats around the LME lakes from suitable vantage points (Bibby et al. 2000). Vagrant species, introductions and escapes were also included. All were carried out in suitable weather conditions using high quality Leica binoculars and Kowa telescope. The vantage points used along the transect route are shown in Figure 2. The surveys were carried out by Alan Crane on behalf of Davidson-Watts Ecology Ltd.
- 2.1.2 The count point on the Southern bank of Freeth Mere was not used this year due to access being restricted by flooding. The East bank point was also not used, but two points were established on the West bank. On Swillbrooks lake the point at the Eastern end was discontinued as bankside vegetation now obscures the view. A new point was established at the south-eastern corner of the lake. The areas of flooding are shown on Figure 3.
- 2.1.3 No allowance has been made within this survey for secretive species which are likely to have been under-recorded.
- 2.1.4 12 surveys were carried out on the lakes at LME between October 2019 and March 2020. The dates of the surveys were -
- Visit 1 - 15/10/2019
 - Visit 2 - 29/10/2019
 - Visit 3 - 12/11/2019
 - Visit 4 - 25/11/2019
 - Visit 5 - 16/12/2019
 - Visit 6 - 23/12/2019
 - Visit 7 - 06/01/2020
 - Visit 8 - 21/01/2020
 - Visit 9 - 03/02/2020
 - Visit 10 - 18/02/2020
 - Visit 11 - 02/03/2020
 - Visit 12 - 23/03/2020

2.2 RESULTS

- 2.2.1 The results for the wintering waterbird survey are summarised in Table 1 below. All species with a mean count of 10 or more are included, in descending order of the mean count for the period. Mean counts are rounded to the nearest whole number. LME target species for the purposes of priority monitoring, and those on the Birds of Conservation Concern Amber and Red lists (BoCC4) are identified.

- 2.2.2 A full detailed list of results for all species on all lakes is provided in Appendix A. Appendix B provides the details of LME priority species for individual lakes which are further illustrated on Figure 3.

Table 1: Wintering waterbird counts 2019 / 2020

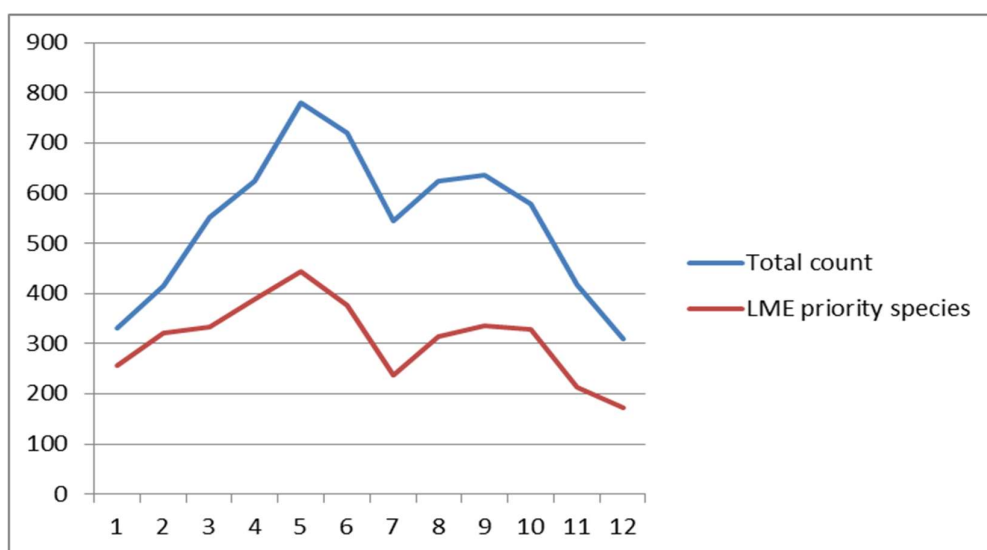
Species		Counts		
Common	Scientific	Min	Peak	Mean
Tufted duck	<i>Aythya fuligara</i>	27	329	198
Coot	<i>Fulica atra</i>	33	142	80
Mallard *	<i>Anas platyrhynchos</i>	14	119	61
Wigeon *	<i>Anas penelope</i>	11	132	71
Teal *	<i>Anas crecca</i>	0	84	23
Mute swan *	<i>Cygnus olor</i>	6	28	12
Red crested pochard	<i>Netta rurina</i>	0	39	13
Great crested grebe	<i>Podiceps cristatus</i>	17	37	24
Goldeneye *	<i>Bucephala clangula</i>	0	27	12
Canada goose	<i>Branta canadensis</i>	0	34	12

LME priority species * BoCC Amber listed

- 2.2.3 In 2019/2020 10 species had a mean count of 10 or over. This is down from 14 last year. Cormorant, pochard, gadwall and goosander were not recorded in 2019/20.
- 2.2.4 Other birds recorded with a mean count of less than 10, in alphabetical order, were:
- cormorant (*Phalacrocorax carbo*) 8,
 - gadwall (*Anas strepera*) 8,
 - goosander (*Mergus merganser*) 5,
 - grey heron (*Ardea cineria*) 4,
 - great white egret (*Ardea alba*) <1,
 - greylag goose (*Anser anser*) 1,
 - kingfisher (*Alcedo atthis*) <1,
 - little egret (*Egretta garzetta*) 1,
 - little grebe (*Tachybaptus ruficollis*) 1,
 - moorhen (*Gallinula chloropus*) 7,
 - pintail (*Anas actua*) 3,
 - pochard (*Aythya ferina*) 3 and
 - shoveler (*Anas clypeata*) 1.
- 2.2.5 Cormorant, goosander, mute swan, red crested pochard and teal all had noticeably lower mean counts compared to last winter. Wigeon and pintail had higher counts. No shelduck were recorded again this year.
- 2.2.6 The species count was the same for the second year running with a count of 23 and the same bird species were recorded.

- 2.2.7 The maximum number of species recorded over the whole site in a single visit was 19 (slightly lower than last year) and was recorded on visits 5 (16th December 2019) and 9 (3rd February 2020). The minimum was 13 species which were recorded during visit 1 (15th October 2019) which was the same species count and survey number as last year. This is most likely due to the fact that birds are still arriving on site for the winter at this time.
- 2.2.8 The peak count for the total water bird assemblage (excluding gulls) was 780 on visit 5 (16th December 2019) which is lower than the peak recorded last winter of 869.
- 2.2.9 The peak count overall for the five priority species was 443 on visit 5 (16th December 2019) in February 2019 which is lower than the peak count of priority species last year (525). This is summarised in Figure 1.

Figure 1: LME peak water bird counts October 2019 to March 2020



- 2.2.10 Compared to the previous winter, the mean count for the total water bird assemblage decreased from 696 in 2018/2019 to 545 this winter. The peak count also dropped, from 869 to 780.
- 2.2.11 Water levels were extremely high throughout these surveys due to an unusually wet winter. There was flooding on all but the last visit. This made it impossible to walk around Freeth Mere as the banks, paths and field at the Southern end of the lake were under water. The path between Flagham Fen and Freeth Mere was flooded on all visits. Flooding also occurred around Farmhouse Lake and Swillbrooks Lakes. It is likely that this contributed to the lower numbers recorded during this season.
- 2.2.12 Further to this, the whole of the Cotswold Wildlife Park is being re-designated by Natural England as a Site of Special Scientific Interest (SSSI). This is in part due to the difficulty in setting specific lakes as a SSSI as birds naturally move between lakes at different times of day or when disturbed. The expansion in number of lakes across the park and these fluctuations are a contributing factor to the declines in wintering water birds that have been observed at LME.

- 2.2.13 Locally it is thought that the increase in flooded areas provided more options for feeding and loafing areas. Cleveland Lakes nearby recorded record numbers of many birds over winter while other lakes saw hardly any. The extra flooded fields etc would have provided perfect habitat for dabbling ducks (gadwall, Pochard, tufted duck) and may have contributed to the lower numbers seen.
- 2.2.14 This winter the lakes only froze on one occasion (Visit 8 21st January 2020) with thin ice observed on the smaller, sheltered lakes including Howells Mere and Clearwater. The larger lakes were not recorded to freeze during the surveys in winter 2019/2020.
- 2.2.15 Mean counts for four of the five LME priority species had decreased from the previous winter with identical counts only recorded for coot (which increased last year). The results are shown in Table 2 below.

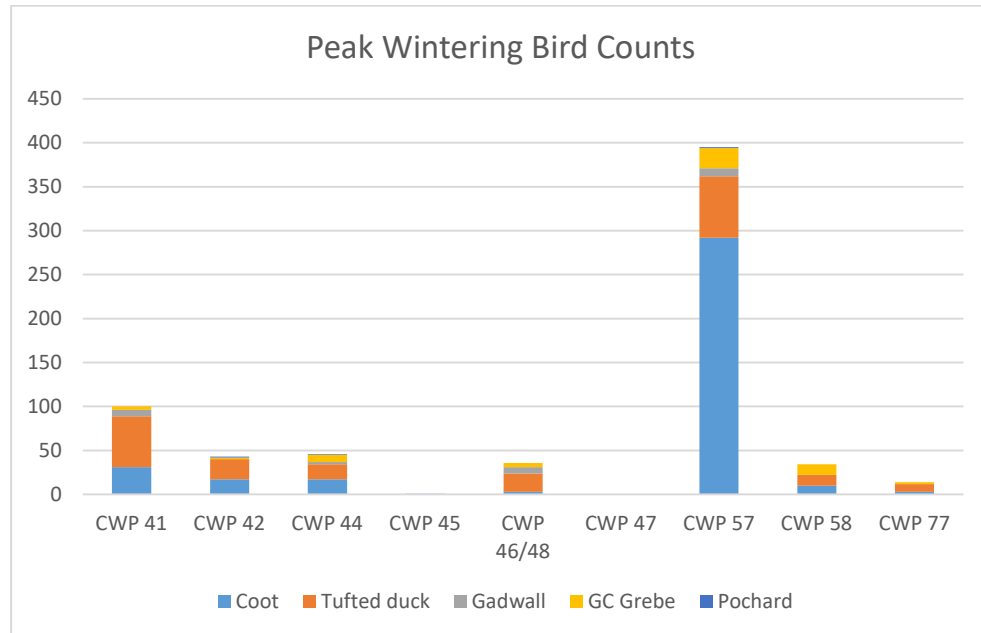
Table 2: Mean counts for the five target species.

Species	Count	% increase/decrease
Coot	198 same	0
Gadwall	16 down to 8	50% decrease
Great crested grebe	28 down to 24	14% decrease
Pochard	20 down to 1	95% decrease
Tufted duck	143 down to 80	44% decrease

- 2.2.16 Results from this survey suggest that most of the species recorded decreased in number (mean) from the counts last winter. Pintail had a big increase, while pochard had a big decrease this year. The lower numbers generally this winter may be due to the mild but extremely wet weather. Water levels in Farmhouse Lake, Freeth Mere, Somerford Lagoon and Flagham Fen were unusually high and difficulty surveying all banks will also have contributed to the lower numbers.
- 2.2.17 Somerford Lagoon supported the highest bird numbers (432 peak, 253 mean). The maximum number of species recorded was 13 on visit 5. Freeth Mere followed with a peak of 244 and a mean of 112 (maximum species count 9 on visits 5 and 7). Flagham Fen had a peak of 49 and a mean of 26 (maximum species count 9 on visit 10) and supported a very similar number of birds to Farmhouse Lake with a peak of 49 and mean of 24 (maximum species count 9 on visit 8). Last year Flagham Fen regularly held a good number of wigeon but this year no wigeon were recorded on this lake with all birds recorded on Freeth Mere.
- 2.2.18 Swillbrook lakes had peak count of 167 with a mean of 79 (maximum species count 14 on visits 5, 6 and 7). This was the highest number of species on a single visit for the LME site, but had decreased compared to last year. Of particular note:
- 27 pintail (*Anas acuta*) were recorded visit 9, fairly evenly split between Freeth Mere and Somerford Lagoon. Just 2 were recorded in the previous survey.
 - Five snipe (*Gallinago gallinago*) were flushed from the area between Somerford Lagoon and Flagham Fen on visit 8.
 - A water rail (*Rallus aquaticus*) was heard but not seen at Somerford Lagoon on visits 5 and 6.

2.2.19 The spread in the target species over the lakes is shown in Chart 1 below.

Chart 1: Peak target wintering bird counts



3 Breeding Waterbirds

3.1 METHODS

- 3.1.1 Breeding waterbirds were surveyed according to Gilbert et al (1998), using 5 visits. The survey dates were:
- 15 April 2019;
 - 13 May 2019;
 - 10 June 2019;
 - 8 July 2019; and
 - 12 August 2019.
- 3.1.2 The surveys were carried out by Alan Crane on behalf of Davidson-Watts Ecology Ltd.
- 3.1.3 The breeding bird surveys since 2006 have been extended into July or August to provide better estimates for species that have a long breeding season or which tend to breed later in the year, such as great crested grebe, tufted duck and red-crested pochard (*Netta rufina*) (Harris, 2012a).
- 3.1.4 A pre-determined survey route was followed (Figure 4), stopping at suitable vantage points. Direct evidence of breeding activity was recorded, for example the presence of active nests or recently hatched young.
- 3.1.5 In addition, the following criteria were also used to judge whether birds were territorial or not (i.e. where direct evidence of breeding was lacking):
- Confirmed - recorded on 3 consecutive visits in the same location;
 - Probable - recorded on 2 visits in the same location (consecutive or alternate visits); and
 - Possible - recorded on one occasion only.
- 3.1.6 In the case of scarce and/or secretive species (e.g. gadwall and moorhen), single records were considered sufficient to determine 'probable' breeding. It should be noted that the use of this classification, which was introduced in 2007, may have resulted in slight increases in numbers of breeding pairs reported when compared with earlier (pre-2007) surveys (Harris, 2012a).

3.2 RESULTS

- 3.2.1 The results of the LME and SWBL breeding waterbird surveys are summarised in Table 3 below, and locations of breeding birds / nests/ broods are shown in Figures 5 to 6. Where two figures are given, the lower (minimum) figure is the confirmed number of territories/pairs, whereas the higher (maximum) figure also includes probable territories/pairs.

Table 3: Lower Mill Estate and Swillbrook Breeding Waterbirds 2019

	Lake (Territories / pairs)									
Species	41	42	44	45	47	57	58	77	SWBL	All
Black headed gull (A)	0	0	0	0	0	0 - 7	0	0	0-1	0-7
Common tern (A)	0	0	0	0	0	0	0	0	6	6
Coot	4 - 6	2 - 3	5	0	0	3 - 6	2	2	2	20 - 26
Great crested grebe	2 - 3	2 - 3	1	0	0	3 - 6	1	0 - 1	1 - 2	10 - 17
Greylag Goose (A)	0	0	0	0	0	0	0	0	1	1
Mallard (A)	1 - 3	1	0	0	1	1 - 4	1	0 - 1	2 - 4	7 - 15
Moorhen	1	0-1	0	1	1	1 - 3	0	1 - 2	1	6 - 10
Mute swan	1	0	0	0-1	0	0	0	1	1	6
Red crested pochard	0	0	0	0	0	1	0	0	0	1
Tufted duck (A)	2-3	0-2	1	0	0	0 - 4	0	0 - 1	0 - 1	3 - 12
Total	11 - 17	5 - 10	7	1 - 2	2	9 - 31	4	4 - 8	14-19	58 - 102
Species	6	5	3	2	2	7	3	6	10	10

Lake references: 41 Freeth Mere; 42 Farmhouse Lake; 44 Mill Lake; 45 Clearwater Lake; 47 Howell's Mere; 57 Somerford Lagoon; 58 Flagham Fen; 77 Spinney Lake.

A = amber list species (BoCC)

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- 3.2.2 Clearwater had a lower bird count for a second year running compared to previous years with two species recorded in both 2018 and 2019 compared to five in 2017 and four in 2016 and birds recorded on the central island only. The same distribution was recorded in Howells Mere where bird counts were also low, but the number of species was increased to two for the second year running. The numbers and species diversity at the remaining lakes were all comparable to the last few years with no obvious changes to bird numbers or species diversity overall. The distribution of birds on the other lakes was also comparative to last year with some species recorded in alternative lakes to last year but not affecting overall numbers.
- 3.2.3 Other species noted included hobby (*Falco subbuteo*), grey heron (*Ardea cinerea*) including juveniles, sand martin (*Riparia riparia*) and cuckoo (*Cuculus canorus*). The majority of these could potentially breed in suitable habitat at Lower Mill Estate.
- 3.2.4 Historical comparisons covering the period 2004 to 2018 are presented for each lake in Appendix C. Overall, the number of waterbirds breeding at LME appears to be stable, although there is considerable fluctuation from year to year (Appendices C, D and E). The total number of species regularly breeding dropped from a peak of 14 in 2011, to a consistent level of 10 species in 2016, 2017 and 2018 and with a slight increase to 12 recorded in 2019. The additional species this year were greylag goose and common tern. Between 2007 and 2019 the number of species has varied between five and fourteen.

- 3.2.5 Based on the annual totals in the last five years most species appear to be stable. Black headed gull, coot, gadwall, mallard, great crested grebe, tufted duck and moorhen have shown stable populations. Therefore, the only species that are declining overall are mute swan.

Swillbrook Lakes

- 3.2.6 The Swillbrook Lakes results were comparable to last year with 15 to 20 pairs / territories recorded (Appendix F). The site continues to be used by species such as coot, mallard, moorhen and great crested grebe. The species diversity is higher for the second year running with 10 species recorded. This is partially due to the common tern that are using the new tern rafts. The distribution of birds was predominantly on the western half of the lake with no breeding birds recorded on the eastern arm.
- 3.2.7 A bittern (*Botaurus stellaris*) was heard 'booming' at Swillbrooks Lakes on 14th May 2019. On 11th June 2019 a bittern (presumably the same bird) was heard just off site north-east of Mill Lake. A bittern was heard booming off the north-west corner of Lake 42 on 28th May 2019. A further record of bittern was provided via a photograph of a bird flying from Freeth Meere to the reedbeds of Somerford Lagoon on 1st June 2019.
- 3.2.8 A great white egret (*Ardea alba*) was present at Swillbrook Lakes on May 2nd.

4 Breeding Terrestrial Birds

4.1 METHODS

Breeding Bird Surveys

4.1.1 This year the whole site was surveyed on single visits. The transect route is given in Figure 4. Results for the two parts, LME and Swillbrook Lakes, have been separated for consistency with previous reports. A shortened version of the British Trust for Ornithology (BTO) Common Birds Census (Gilbert et al, 1998) was adopted. The observer followed a pre-determined route that encompassed most of the field boundaries and/or water bodies, recording all bird registrations (birds seen or heard) on a large-scale field map. The start and end points were varied to prevent the same sections being visited at the same times of day. Standard BTO species codes and symbols were used for field recording. The surveys were carried out by Alan Crane on behalf of Davidson-Watts Ecology Ltd.

4.1.2 Six visits were undertaken. The survey dates were:

- 16th April;
- 14th May;
- 28th May;
- 11th June;
- 9th July and
- 22nd July 2018.

4.1.3 All visits were made early in the morning (beginning before 07:00) and were undertaken in good weather conditions with low wind speed.

4.1.4 Once all the surveys had been completed, territory maps were drawn up using the BTO's guidelines (Marchant, 1983), allowing the number of territories of each species present to be estimated. This data was tabulated for presentation below.

4.1.5 Clusters of registrations (singing males in most cases) were classified as 'confirmed' breeding territories where a species was present on three or more visits. Clusters containing two registrations were classified as 'probable' breeding territories providing they occurred within a reasonably close timeframe (i.e. they did not span more than four visits).

Nightingale Surveys

4.1.6 Three surveys were undertaken for nightingale with one night survey and two dawn surveys. These were supplementary to the breeding terrestrial bird surveys and were undertaken on the following dates:

- 14th May 2019 between 04:00 and 06:00;
- 17th May 2019 between 12:00 and 02:00; and
- 27th May 2019 between 04:00 and 06:00.

- 4.1.7 Nightingales typically arrive at the CWP in early spring, most often during the third week of April, with females and additional males arriving at the beginning of May (Harris, 2012b). The survey method consisted of noting the positions of all singing males using standard BTO recording codes, in suitable habitat across the whole of the Lower Mill Estate. Survey maps were then analysed to determine territory boundaries. The surveys were carried out by Alan Crane on behalf of Davidson-Watts Ecology Ltd. A map of the transect route taken is shown on Figure 9.

House Martin Surveys

- 4.1.8 House martin (*Delichon urbicum*) surveys were undertaken on the 9th July 2019. The surveys were carried out by Alan Crane on behalf of Davidson-Watts Ecology Ltd.
- 4.1.9 All properties were fully examined for nests, using binoculars where required. All walls and eaves were assessed and the presence of nesting birds both in nest boxes and natural (built) nests were recorded. Nest sites were categorised as follows:
- Definitely occupied nests (DON) – adults and/or juveniles present;
 - Apparently occupied nests (AON) – e.g. fresh mud or faeces noted and no cobwebs across the entrance hole, but no birds present at the time of survey; and
 - Apparently unoccupied nests (AUN) – mainly old (including damaged) nests from previous years, showing no signs of current occupancy.

Reed Warbler and Reed Bunting

- 4.1.10 To meet the requirements of the S106 agreement, the locations of the reed warbler (*Emberiza schoeniculus*) and reed bunting (*Acrocephalus scirpaceus*) were mapped separately during the breeding waterbird surveys in 2019.

Tern rafts

- 4.1.11 New tern rafts were installed in 2017 which were obtained using S106 funding. These included two rafts on Somerford Lagoon (for use by black-headed gulls *Chroicocephalus ridibundus*) and one raft on Swillbrook Lakes (for common terns). The locations of the rafts are shown in Figure 14. The rafts were observed from the bank using high quality Leica binoculars and a Kowa spotting scope. Observations were made whilst carrying out the breeding water bird surveys on 13th May, 10th June, 8th July and 12th August 2019.

4.2 RESULTS

Terrestrial Breeding Bird Surveys

Lower Mill Estate

- 4.2.1 The 2019 breeding data again shows an increase from 2007, followed by a decrease and for the last four years, the numbers have stabilised. National data from the British Trust for Ornithology (BTO) State of UK Birds 2017 shows that many migratory birds are arriving earlier and leaving later and have positive trends in population size whereas species that have not altered their migratory timings are in decline. It is possible that the increase in temperatures due to climate change (almost 1°C temperature rise since 1980) may be affecting prey availability with earlier breeding missing peak prey availability as well as a shift northward in species distributions.

4.2.2 Results for the LME (excluding Swillbrook Lakes) are presented in Table 4 below, Appendix G and Figure 7.

Table 4: LME Breeding Terrestrial Birds in 2019

Species		Territories / pairs		
Common name	Scientific name	Confirmed	Probable	Total
Blackbird	<i>Turdus merula</i>	5	4	9
Blackcap	<i>Sylvia atricapilla</i>	17	7	24
Blue tit	<i>Cyanistes caeruleus</i>	7	5	12
Bullfinch (A)	<i>Pyrrhula pyrrhula</i>	1	2	3
Chaffinch	<i>Fringilla coelebs</i>	4	3	7
Chiffchaff	<i>Phylloscopus collybita</i>	4	3	7
Cuckoo (R)	<i>Cuculus canorus</i>	0	0	0
Dunnock	<i>Prunella modularis</i>	2	3	5
Garden warbler	<i>Sylvia borin</i>	5	4	9
Great tit	<i>Parus major</i>	1	1	2
Greenfinch	<i>Chloris chloris</i>	0	1	1
Long-tailed tit	<i>Aegithalos caudatus</i>	1	1	2
Pied wagtail	<i>Motacilla alba</i>	1	0	1
Reed bunting (A)	<i>Emberiza schoeniculus</i>	3	0	3
Reed warbler	<i>Acrocephalus scirpaceus</i>	6	2	8
Robin	<i>Erithacus rubecula</i>	7	4	11
Sedge warbler	<i>Acrocephalus schoenobaenus</i>	3	0	3
Song thrush (R)	<i>Turdus philomelos</i>	2	4	6
Whitethroat	<i>Sylvia communis</i>	2	3	5
Willow warbler	<i>Phylloscopus trochilus</i>	2	1	3
Wren	<i>Troglodytes troglodytes</i>	20	3	23
Total		93	51	144
Species		19	17	20

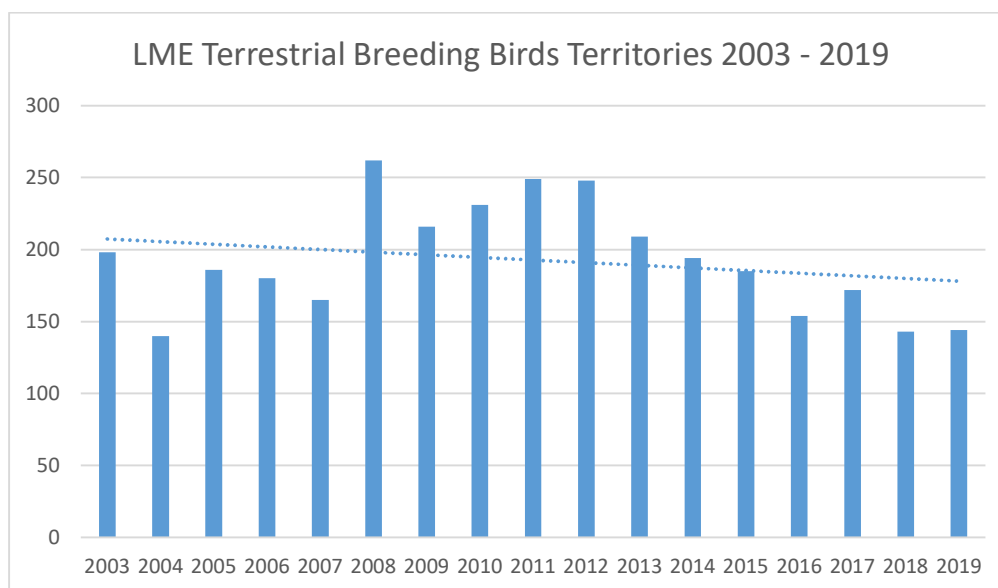
A = Amber list species (BoCC- Eaton et al 2009) R = Red list species

4.2.3 Of the main species monitored, 144 pairs/territories were recorded representing 20 species which is almost identical to last year. The dominant species remained the wren (*Troglodytes troglodytes*) with 20 territories and blackcap (*Sylvia atricapilla*) with 17 territories with blue tit

(*Cyanistes caeruleus*) and sedge warbler (*Acrocephalus schoenobaenus*) dropping below 10 territories this year.

- 4.2.4 Willow warbler (*Phylloscopus trochilus*) was recorded for a second year running after being absent in 2016 and 2017. Other species of note were a slight increase of Cetti's warbler (*Cettia cetti*) territories for the second year running with five confirmed territories which is listed on Schedule 1 Wildlife and Countryside Act 1981. No evidence green woodpecker (*Picus viridis*) or kingfisher (*Alcedo atthis*) breeding was recorded in 2019.
- 4.2.5 Other terrestrial bird species with probable or confirmed territories, but excluded from the table above for consistency with previous reports were:
- Cetti's warbler (*Cettia cetti*) - five confirmed territories and one probable territory;
 - Goldcrest (*Regulus regulus*) – one probable territory;
 - Goldfinch (*Carduelis carduelis*) – three confirmed and two probable territories; and
 - Great spotted woodpecker (*Dendrocopos major*) – one probable territory.
- 4.2.6 A number of other species, listed below, were recorded as present during the breeding season and are likely to have been breeding in suitable habitat within the Estate or on the boundary:
- Hobby (*Falco subbuteo*);
 - Carrion crow (*Corvus corone*);
 - Magpie (*Pica pica*); and
 - Jackdaw (*Corvus monedula*).
- 4.2.7 No passage migrants were recorded during the terrestrial breeding bird surveys undertaken in 2019.
- 4.2.8 On 13th May 2019, 13 hobbies were observed over Somerford Lagoon. On the same day a cuckoo was heard but not seen within the lake boundaries.
- 4.2.9 A bittern (*Botaurus stellaris*) was heard booming during the second survey (14th May 2019) at Swillbrooks Lakes. A bittern was also heard during the following survey (11th June 2019) booming off site, north-east of Mill Lake.
- 4.2.10 Historical comparisons with previous years (and species trends) are given in Appendix G and illustrated in chart 2 below. The number of regularly occurring species in 2019 is similar to the numbers of previous years after a recent dip to 17. The number of territories/pairs recorded is almost identical to 144 which continues to reflect a decline compared to counts from recent years of 172 (2017) and 194 (2014). This may reflect disturbance from the building works that is now sited away from these main lakes and therefore we are seeing stabilisation.

Chart 2: LME Terrestrial Breeding Bird Territories 2003 to 2019



- 4.2.11 The previous increases in territories had been driven by higher numbers of reed warbler and garden warbler, and to a lesser extent, increases in blackcap, bullfinch, chiffchaff, song thrush, garden warbler and whitethroat numbers which were thought to be due to an increase in these habitats on site. The majority of terrestrial bird territories are shown to be stable from the survey results in 2019. Increases have been shown for again for reed warbler, blackcap and whitethroat, and decreases for great tit and sedge warbler.
- 4.2.12 Great tit territories have declined this survey and this is in line with current species population trends (BTO Bird Trends 2019) which have been declining recently and is thought to be linked to adult survival rather failure at the egg or chick stage.
- 4.2.13 Sedge warbler territories were recorded to be declining which is in line with national trends ((BTO Bird Trends 2019) and thought to be linked nationally to changes in adult survival rates related to changes in rainfall on their wintering grounds.
- 4.2.14 Cetti's warbler territories are increasing on site which is also in line with current national trends and a direct result of the milder winter conditions and therefore considered at least partly to be linked to climate change.
- 4.2.15 Song thrush, reed bunting and bullfinch have statistically significant declining trends nationally long-term but are showing short-term increases (over a ten-year period) therefore it is encouraging to see the species also doing well at LME.
- 4.2.16 Song thrush were predominantly recorded around the lakes in the south-east quarter of the site with a wider distribution throughout site for bullfinch and reed bunting.

Swillbrook Lakes

- 4.2.17 The results for Swillbrook Lakes are presented in Table 5 below and in Appendix H and Figure 8. The numbers of regularly occurring species appears stable, ranging between 17 and 20

over the last four years. The numbers of territories also remained stable at 63 pairs/territories in 2019.

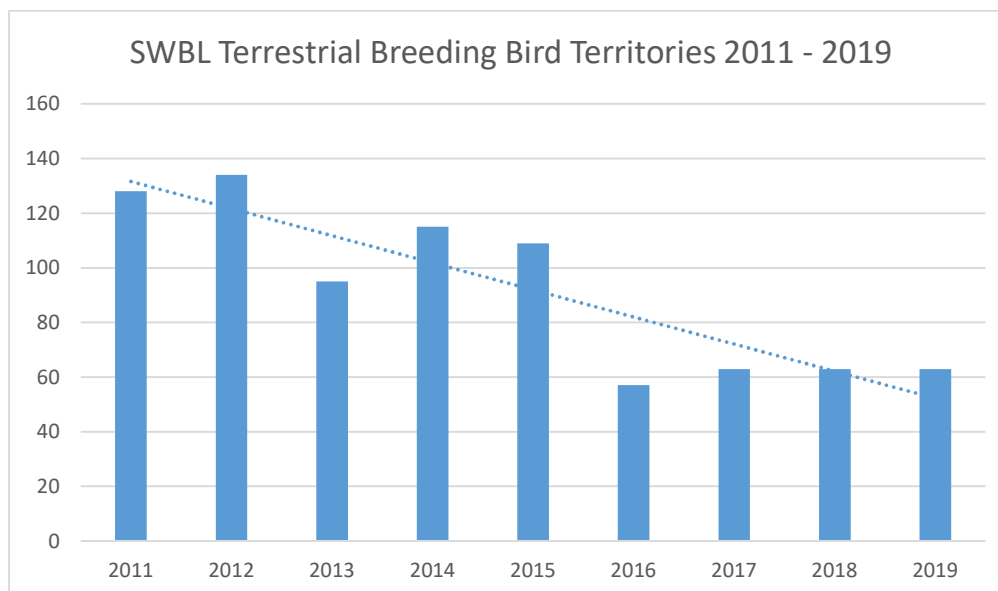
Table 5: SWBL Breeding Terrestrial Birds 2019

Species		Territories / pairs		
Common name	Scientific name	Confirmed	Probable	Total
Blackbird	<i>Turdus merula</i>	2	1	3
Blackcap	<i>Sylvia atricapilla</i>	6	1	7
Blue tit	<i>Cyanistes caeruleus</i>	3	2	5
Bullfinch (A)	<i>Pyrrhula pyrrhula</i>	0	1	1
Cetti's warbler	<i>Cettia cetti</i>	1	0	1
Chaffinch	<i>Fringilla coelebs</i>	2	0	2
Chiffchaff	<i>Phylloscopus collybita</i>	5	2	7
Cuckoo (R.)	<i>Cuculus canorus</i>	0	0	0
Dunnock	<i>Prunella modularis</i>	0	0	0
Garden warbler	<i>Sylvia borin</i>	3	0	3
Goldcrest	<i>Regulus regulus</i>	0	2	2
Goldfinch	<i>Carduelis carduelis</i>	0	0	0
Great spotted woodpecker	<i>Dendrocopos major</i>	0	0	0
Great tit	<i>Parus major</i>	3	0	3
Greenfinch	<i>Chloris chloris</i>	0	0	0
Green woodpecker	<i>Picus viridis</i>	0	0	0
Long-tailed tit	<i>Aegithalos caudatus</i>	0	0	0
Reed bunting (A)	<i>Emberiza schoeniculus</i>	1	1	2
Reed warbler	<i>Acrocephalus scirpaceus</i>	1	0	1
Robin	<i>Erithacus rubecula</i>	3	0	3
Sedge warbler	<i>Acrocephalus schoenobaenus</i>	2	1	3
Song thrush (R)	<i>Turdus philomelos</i>	4	0	4
Whitethroat	<i>Sylvia communis</i>	0	0	0
Willow warbler	<i>Phylloscopus trochilus</i>	0	0	0
Wood pigeon	<i>Columba palumbus</i>	0	2	2
Wren	<i>Troglodytes troglodytes</i>	14	0	14
Total		50	13	63
Species		14	9	17

4.2.18 Kingfisher were not recorded to be breeding at SWBL in 2019.

4.2.19 Chart 3 below illustrates the downward trend of breeding bird territories in the SWBL since 2011 but with territory numbers stabilising over the last four years.

Chart 3: SWBL Terrestrial Breeding Bird Territories 2011 to 2019



4.2.20 Following declines in previous years, it now appears that the numbers are beginning to stabilise at SWBL with total territories being the same (63) for the last three years. Historical comparisons with previous years are given in Appendix H. The number of regularly occurring species in 2018 is slightly lower than last year (2017) at a count of 17 species with cuckoo, dunnoek, goldfinch, great spotted woodpecker, jay, long-tailed tit, tree creeper, whitethroat and wood pigeon being absent this year. Reed warbler were recorded after being absent last year.

4.2.21 Song thrush (red listed) were recorded on all banks of Swillbrook Lakes, reed bunting was recorded on the north and south banks (amber listed) and bullfinch was recorded on the east bank (amber listed). This is shown in Figure 8.

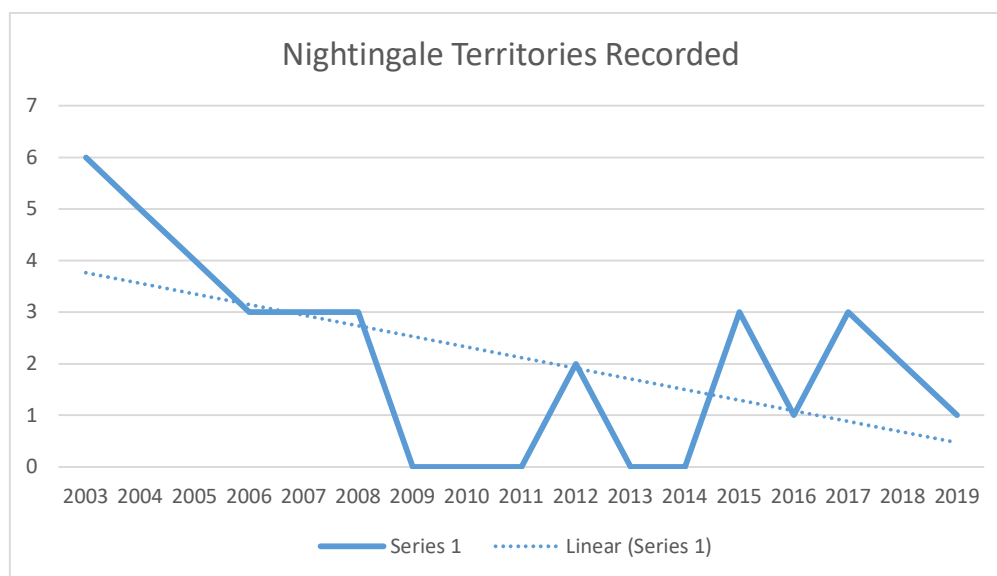
Nightingale Surveys

4.2.22 During 2019, one nightingale was heard singing from dense cover to the north-east of Mill Lake. This was recorded outside the LME boundary. The approximate position of the nightingale is shown in Figure 9 and it was noted that the location was very close to the location of one of the records from 2018. Nightingales were not recorded on either of the night surveys.

4.2.23 Previously, three nightingale territories were recorded in 2017 and two in 2018. Surveys since 2009 had found no nightingale territories, apart from a peak in 2012 when additional survey effort was applied as a result of the National Nightingale Survey (BTO,2014) and 2015 when three (probably four) territories were recorded. Chart 4 below demonstrates that the population trend still appears to be in decline since 2003 but the increase in territories after 2016 is encouraging. Nightingale are therefore still present within LME but the positive survey results of 2015 should be treated with caution at this stage. All opportunities for habitat management

and creation that benefits nightingale should be taken, especially in the areas where they were previously recorded to the south-west and south of the site.

Chart 4: Nightingale Territories 2003 to 2019



House Martin Surveys

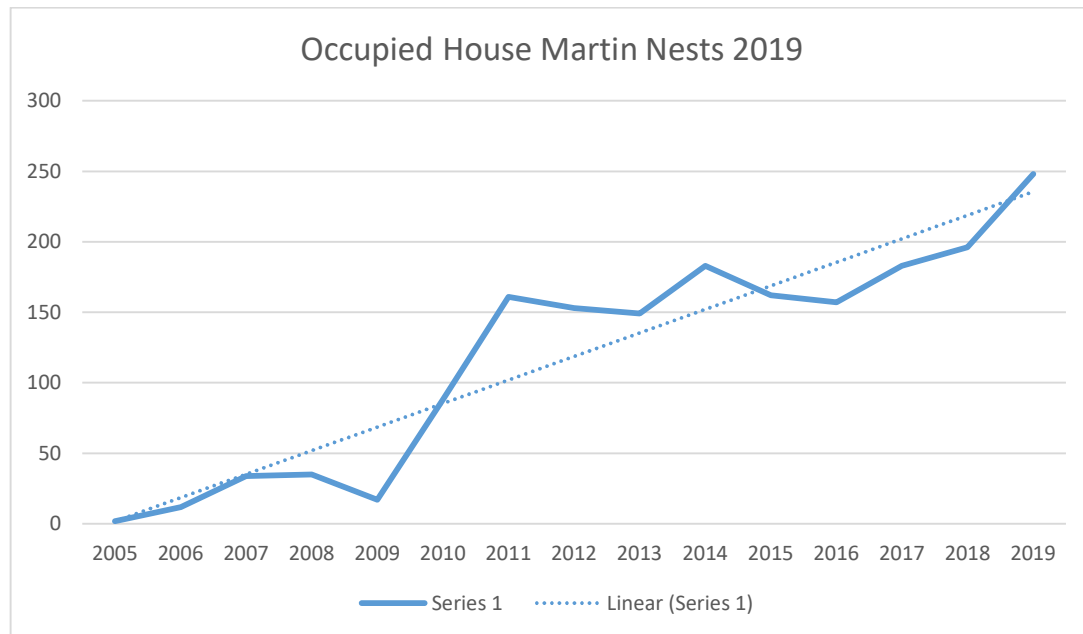
4.2.24 Results for the house martin surveys are summarised in Table 6 below.

Table 6: House Martin Nests in 2019

Area	Confirmed occupied	Apparently occupied	Apparently unoccupied
Mill Village	15	34	8
Clearwater	78	88	34
Howells Mere	8	21	42
Total 2019	101	147	84
Total 2018	109	87	75

4.2.25 248 occupied nests were recorded in 2019 which is an increase to the number of nests recorded in 2018 (196 nests), 2017 (183 nests), 2016 (157 nests) and 2015 (162 nests). Chart 5 below shows that the numbers of nests is therefore still increasing and the increase in nests recorded in 2019 were predominantly in Clearwater. This is very positive given that house martin are still listed on the Amber list of birds of conservation concern. No new nests were observed on buildings that have been built over the last three years. These properties comprise more wooden cladding and less of the rendered wall style which the house martin seem to favour.

Chart 5: Occupied House Martin Nests 2006 to 2019



Reed Bunting and Reed Warbler

- 4.2.26 The survey map for the distribution of reed buntings in 2019 is included in Figure 10. Eight individual sightings and five territories were recorded. The sightings and territories were spread across LME with no concentrations of sightings. Reed bunting were recorded in Swillbrook Lakes this year unlike last year. However overall, there were less sightings with 13 sightings/territories recorded in 2019, 26 sightings in 2018 with and 34 sightings in 2017. This is in line with the BTO records for 2019 (<https://www.bto.org/our-science/projects/ringing-scheme/ringing-surveys/constant-effort-sites/ces-results/preliminary-0>).
- 4.2.27 The survey map for the distribution of reed warbler in 2019 is included in Figure 11. In 2018 only three sightings were recorded on the south-east corner of Somerford Lagoon. Sightings and territories increased in both number and distribution with four individual sightings and nine territories recorded. Reed warbler were recorded on almost all lakes within the LME. These numbers are closer to the 17 sightings that were recorded in 2017.

Tern rafts

4.2.28 The results for the tern raft surveys are shown in Table 7 below and the raft locations are shown in Figure 14.

Table 7: Tern Raft Surveys

Date	Tern Raft 1	Tern Raft 2	Tern Raft 3
13 th May 2019	7 black headed gull AONs*	5 black headed gull AONs	Raft empty
10 th June 2019	7 black headed gull AONs + 2 young	6 black headed gull AONs	7 common tern AONs, 1 black headed gull AON
8 th July 2019	2 black headed gulls	Raft empty	6 adult common tern, 13 juvenile common tern
12 th August 2019	Raft empty	Raft empty	Raft empty

*AONs (apparently occupied nests) are usually defined as well-constructed nests, attended by at least one adult and capable of holding an egg (even if nest contents are unknown, or the nest is known to be empty). Seabird monitoring handbook for Britain and Ireland - (P.M. Walsh, D.J. Halley, M.P. Harris, A. del Nevo, I.M.W. Sim, & M.L. Tasker).

4.2.29 In summary, the three rafts produced up to seven black headed gulls attempting to nest producing two young and six pairs of common terns producing 13 young.

4.2.30 In 2018, the two rafts produced 9 to 12 common tern fledglings and four black headed gull fledglings.

4.2.31 In 2017, the three rafts produced two confirmed tern fledglings, one possible common tern fledgling and seven possible black-headed gulls' fledglings.

5 Bat Lofts and Boxes

5.1 METHODS

- 5.1.1 Internal and external surveys of the three bat lofts were undertaken on 22nd July 2019. The surveys were undertaken towards the end of the bat breeding season to allow for the accumulation of droppings throughout the year. The locations of the three lofts are shown in Figure 12.
- 5.1.2 An internal and external search was undertaken using binoculars, endoscope and Clu-lite torches to identify any roosting bats or evidence of roosting. All potential roosting sites were examined and any characteristic field signs of bats, for example accumulations of droppings or obvious scratch/wear marks were also identified where possible.
- 5.1.3 The exterior building search was combined with internal searches of all parts of the building (where safely accessible) to search for signs of bats, including droppings, urine staining, feeding remains (for example, large accumulations of moth wings), and individual bats.
- 5.1.4 Two pairs of bat boxes in two locations were also checked for evidence of use by bats (shown in Figure 12).
- 5.1.5 The inspection survey was undertaken by accredited agent Alan Crane under registration number 2015-12209-CLS-CLS and followed guidance as provided in the Bat Conservation Trust Good Practice Guidelines (Collins, J. (ed), 2016). The survey commenced at 10:00 and the weather conditions were 18c, dry and clear skies with wind speeds of Beaufort scale 0.

5.2 RESULTS

- 5.2.1 Clearwater Bat Loft is located at SU0212294026 and was constructed within the Clearwater Phase. It consists of a converted loft space over a refuse store with a chimney-style access point that allows access for lesser horseshoe bats. No evidence of use by bats was recorded externally, in the chimney access, within the voids or within the purpose-built baffle boards in July 2019.
- 5.2.2 Howells Mere Bat Loft (No. 1) is located at SU0220894001 and is adjacent to the Howells Mere phase of the development. It consists of a converted loft space over a refuse store with a chimney style access directly into the loft space. No evidence of use by bats was recorded in this roof void in 2018 or 2019. Several areas of bat droppings were found in this roof void in August 2017.
- 5.2.3 Howells Mere Bat Loft (No. 2) – is located at SU0221398313 and was constructed within the Howells Mere phase of the development. It consists of a converted loft space above a refuse store and bats can access the loft via specially constructed bat tiles in the roof which favour crevice loving bats such as pipistrelle bats and *Myotis* bats. No evidence of use by bats was recorded externally, in the chimney access, within the voids or within the purpose-built baffle boards. A small number of old bat droppings were recorded in this bat loft in 2015 but no droppings were recorded after 2016 including this survey.

5.2.4 The bat box survey results were as follows:

- Bat box location 1 – no boxes were present.
- Bat box location 2 - no evidence of use by bats was found in the two bat boxes at location 2 and the bat box was clean.
- Bat box location 3 – no evidence of use by bats was found in the two bat boxes at location 1 and the bat box was clean.

5.2.5 Dense reed growth was noted near bat boxes 2 and the surveyor commented that the boxes may be more accessible if the growth was cut back.

5.2.6 It should be noted that the bat boxes surveyed as part of the requirements for this report were specifically designed to be located under bridges. Other bat boxes which have been installed around Lower Mill Estate are also monitored separately and are well-used.

6 Amphibians

6.1 METHODS

- 6.1.1 Surveys were undertaken on 5th April, 17th April, 23rd May and 4th June 2019.
- 6.1.2 Surveys were undertaken of 10 ponds and the locations of the ponds are shown in Figure 13. All ponds were surveyed using three survey methods which were torchlight surveying, egg search and netting. All surveys commenced one hours after dusk.
- 6.1.3 The surveys were carried out by Jade Flear O'Rourke on behalf of Davidson-Watts Ecology Ltd under Class Licence Registration Number 2018-33247-CLS-CLS.

6.2 RESULTS

- 6.2.1 The weather conditions during the surveys were as follows:
- 5th April 2019 – 10°C, wind speed Beaufort scale 2, 4/8 cloud cover, no rain, min 8°C at end;
 - 17th April 2019 - 17°C, wind speed Beaufort scale 1, 4/8 cloud, no rain, min 10°C at end;
 - 23rd May 2019 – 18°C, wind speed Beaufort scale 2, 4/8 cloud, no rain, min 12°C at end; and
 - 4th June 2019 - 18°C, wind speed Beaufort scale 1, 2/8 cloud cover, no rain, min 15°C at end.
- 6.2.2 The survey results are summarised in Table 8 below and full data including historical data gathered between 2012 and 2019 is included in Appendix I.

Table 8: Summary of Amphibian Survey Results 2019

Pond	GCN Present/Absent	GCN Maximum Count	Other Amphibians/Fish
1	Absent		Fish
2	Absent		7 smooth newts Fish
3	Absent		6 smooth newts Toad tadpoles Fish
4	Absent		Fish
5	Absent		4 smooth newts 1 frog
6	Present	2 male, 2 female GCN	5 smooth newts
7	Present	3 male 2 female GCN	6 smooth newts
8	Present	2 male, 2 female GCN	8 smooth newts 1 frog Fish
9	Absent		One frog
10	Present	1 male GCN	2 smooth newts 1 frog 1 toad Fish

- 6.2.3 Great crested newts were recorded in four ponds during the amphibian surveys with low populations recorded in ponds 6, 7, 8 and 10. The locations of the GCN ponds are shown in Figure 13. Pond 4 previously had GCN but none were recorded this year. This may be due to the continued presence of fish at this pond. Pond 9 had GCN previously, none this year but very turbid (5 on all surveys) so may have been missed due to poor visibility of survey
- 6.2.4 No GCN eggs were found during the egg searches (smooth were found) and this may be a result of the presence of fish in some ponds, or the absence of suitable egg laying vegetation. GCN are therefore likely to be present throughout all suitable terrestrial habitats in the 250m surrounding these ponds and careful consideration should be given to any habitat management in these areas to ensure that GCN are not killed, injured or disturbed.
- 6.2.5 A good diversity of amphibian species were present throughout the ponds although common toad were only recorded in one pond and toadpoles in another. More common toads would have been expected given the presence of fish in some ponds which predate on newt and frog spawn but not toad spawn. However, the majority of frogs and toads may have completed their breeding cycle prior to the commencement of surveys. Common toads are usually found in good numbers across the Estate.
- 6.2.6 Fish were recorded in ponds 1, 2, 3, 4 and 10.
- 6.2.7 The surveyor noted that pond 2 had significant clearance around the southern bank which meant that survey on this side of the pond was not possible.
- 6.2.8 Pond 4 has now been connected to Howells Mere lake as per planning requirements. This pond will therefore be removed from future monitoring.

7 Brown Hairstreak

- 7.1.1 Surveys for Brown hairstreak butterfly eggs were undertaken by members of Gloucestershire Butterfly Conservation on the 15th November 2019. The hedgerows along the edge of Swill Meadow were searched with a total of 90 eggs being found. Due to flooding, only half of the hedgerow could be surveyed in November and flooding continued to hamper efforts in February and March. It is, therefore, likely that many more eggs would have been found had it been possible to access the rest of the hedgerows surveyed in the previous years. A brief search of an area of blackthorn by the HFG ecologist along the banks of Swillbrook Lakes, opposite Lakeshore Reserve, revealed 6 eggs. This is a new record of Brown hairstreak on Lower Mill Estate and is very encouraging. Blackthorn is now incorporated into all hedgerow mixes in the development so it is hoped that the Brown hairstreak population will eventually spread through the developed areas too. Surveys are due again in 2020.

8 Recommendations

8.1 WINTERING WATERBIRDS

- 8.1.1 Increasing the area of reedbed could be of benefit to birds such as water rail both wintering and breeding. It would also benefit breeding birds such as reed, sedge and Cetti's warblers, and maybe even attracting bittern to overwinter and potentially breed. A bittern was heard booming around site in spring 2019.
- 8.1.2 The creation of graded, shallow margins around some edges of the lakes could encourage wintering waders.

8.2 BREEDING BIRDS

Breeding waterbirds

- 8.2.1 The development of greater areas of reed bed would be beneficial to summer warblers and water rail and would provide greater cover for species such as coot and moorhen. The clearance around the water's edge would most likely affect some of the timid waterbirds that require cover for shelter. All clearance is done on rotation and outside of the breeding bird season as detailed in the Landscape and Ecological Management Plan. New reed beds are proposed for Minety Lake and around the edges of Spinney Lake.
- 8.2.2 Further to this, shallow margins or wet scrapes may encourage wintering waders including lapwing.
- 8.2.3 Boat surveys may be beneficial to enhance the breeding waterbird surveys as areas of the shoreline of several lakes are inaccessible for survey and nesting birds may be missed. This is particularly the case for Swillbrook Lakes.

Breeding Terrestrial Birds

- 8.2.4 Hundreds of sand martins were recorded during the terrestrial and breeding bird surveys in 2018 around Somerford Lagoon. Two artificial sand martin boxes have subsequently been installed on the eastern bank of Somerford Lagoon in February 2020.

Nightingale

- 8.2.5 Modification of the survey scope and methods should be considered, including the possibility of acoustic monitoring at key sites. As stated in the 2015 monitoring report, nightingale are well known niche specialists, therefore it is important that the right mixture of ages of suitable habitat is maintained in the long-term (which can be secured through appropriate habitat management). There is good tree canopy connectivity throughout the site, but further areas of dense scrub would be beneficial both to nightingales and other species.

8.3 BATS

- 8.3.1 Consideration could be given to leaving static loggers in the bat lofts on two separate occasions (pre- and post-birth) for periods of five nights to capture any visiting bats and night roosting bats. This would help with any further species-specific refinements to the lofts in the future and should be considered if use of the bat lofts by bats increases.
- 8.3.2 Checks for evidence of use by bats could be undertaken at separate times of the year, for example in October at the end of the bat season.

8.4 AMPHIBIANS

- 8.4.1 Pond 6 had a mature ash adjacent to it which was negatively affecting the pond and made it difficult to survey. The surveyor advised that the tree needs to be lifted and fallen branches into the pond removed.
- 8.4.2 The banks of pond 7 are steep which limits abilities for survey.
- 8.4.3 Pond 10 had a working pump during the third and fourth survey. The pond does not currently hold water and the pump is required to rectify this. An appropriate filter should be installed on the pump given the presence of protected and notable amphibian species.

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Figure 1 Estate Context Plan

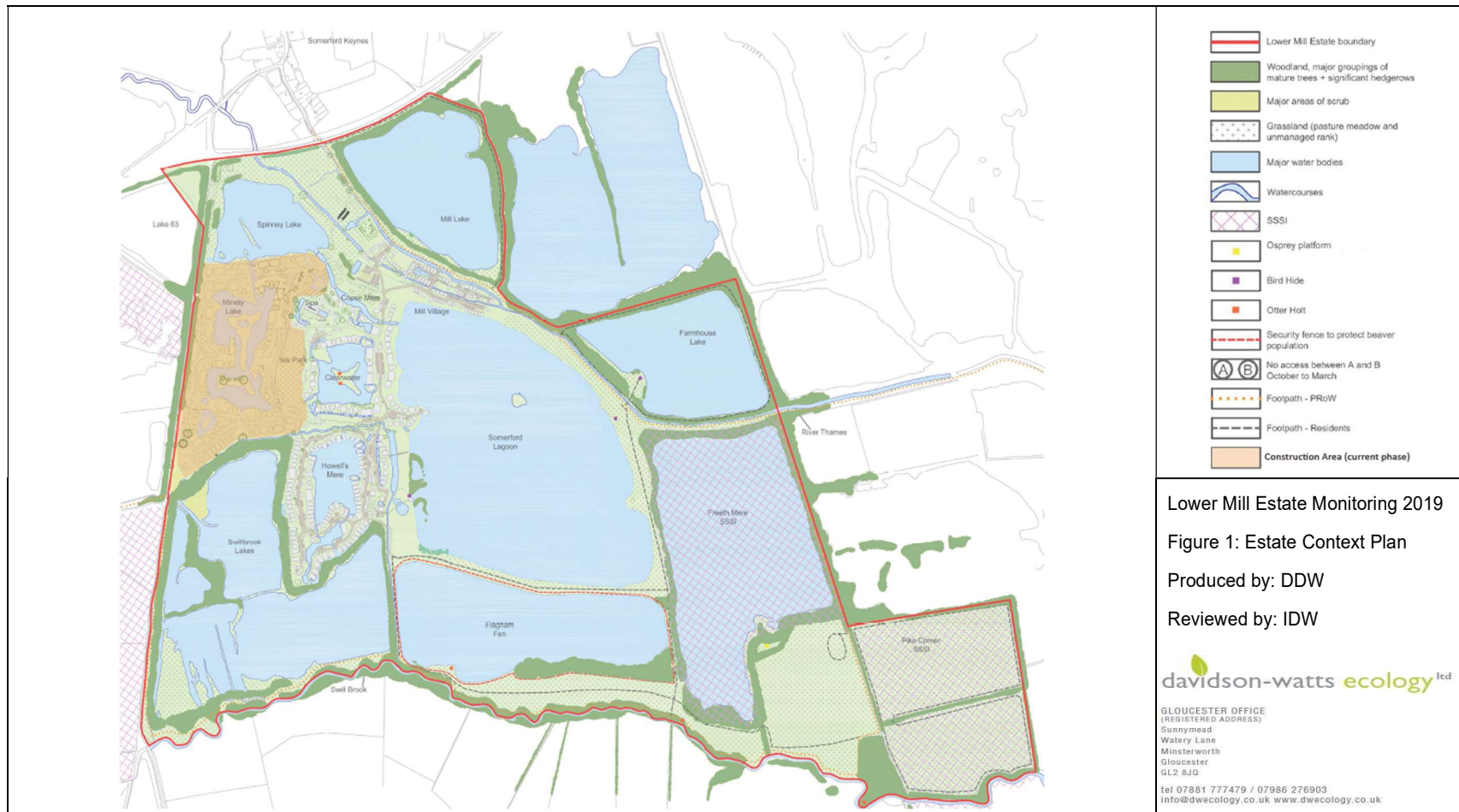


Figure 2 Wintering Waterbirds Vantage Points

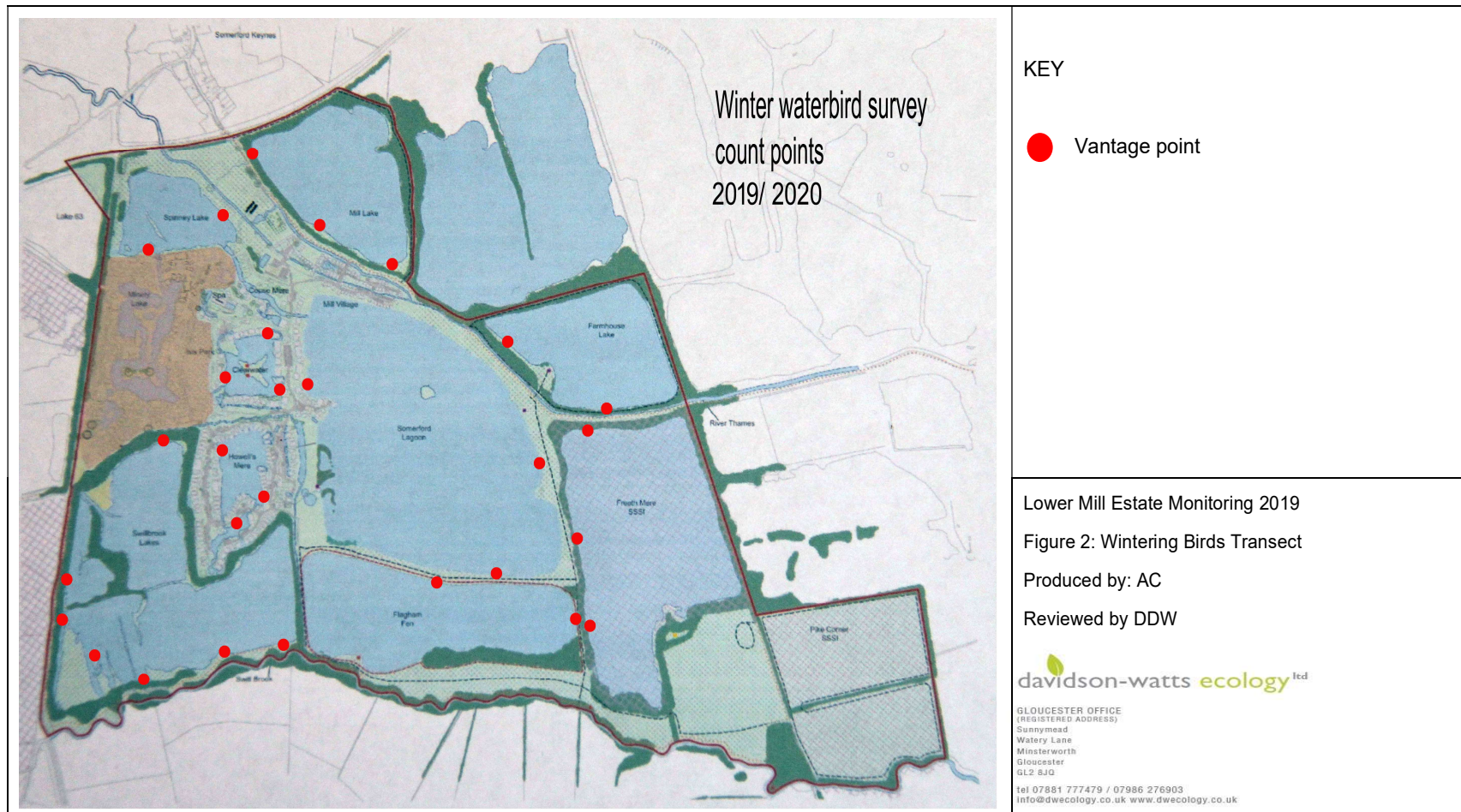


Figure 3 Winterring Waterbirds

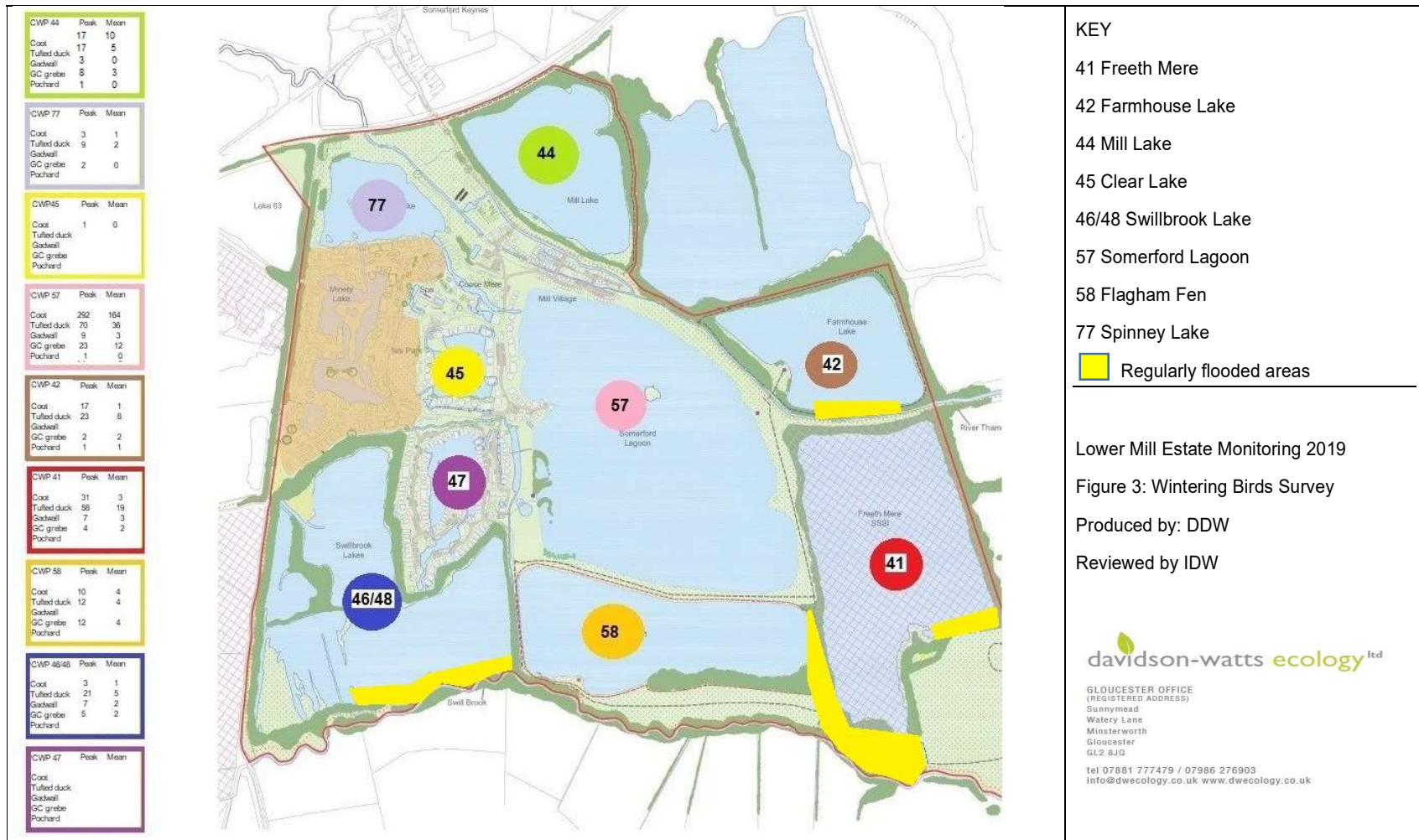


Figure 4 Breeding Bird Surveys Transect Route

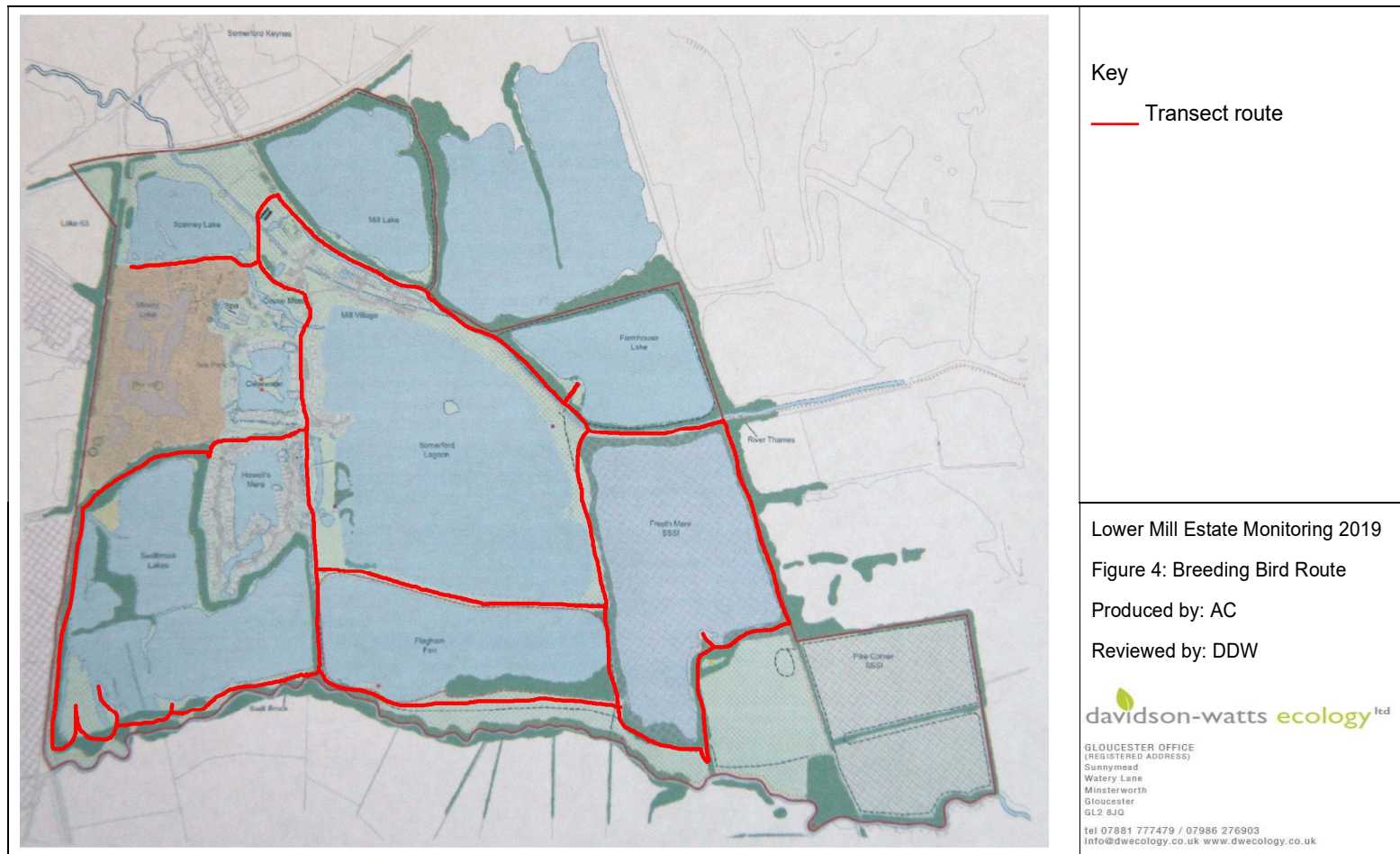


Figure 5 Breeding Waterbirds (LME)

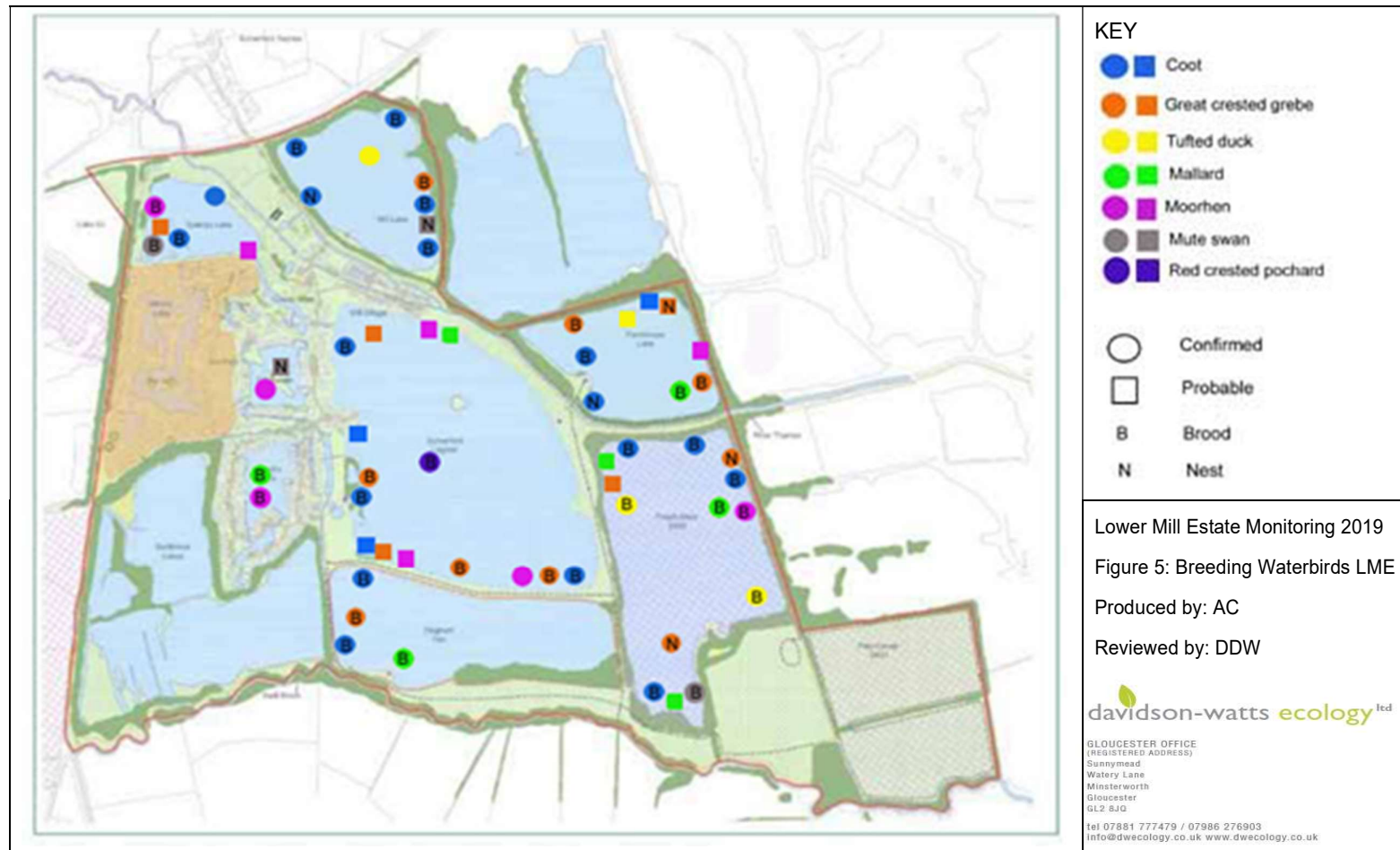


Figure 6 Breeding Waterbirds (Swillbrook Lakes)

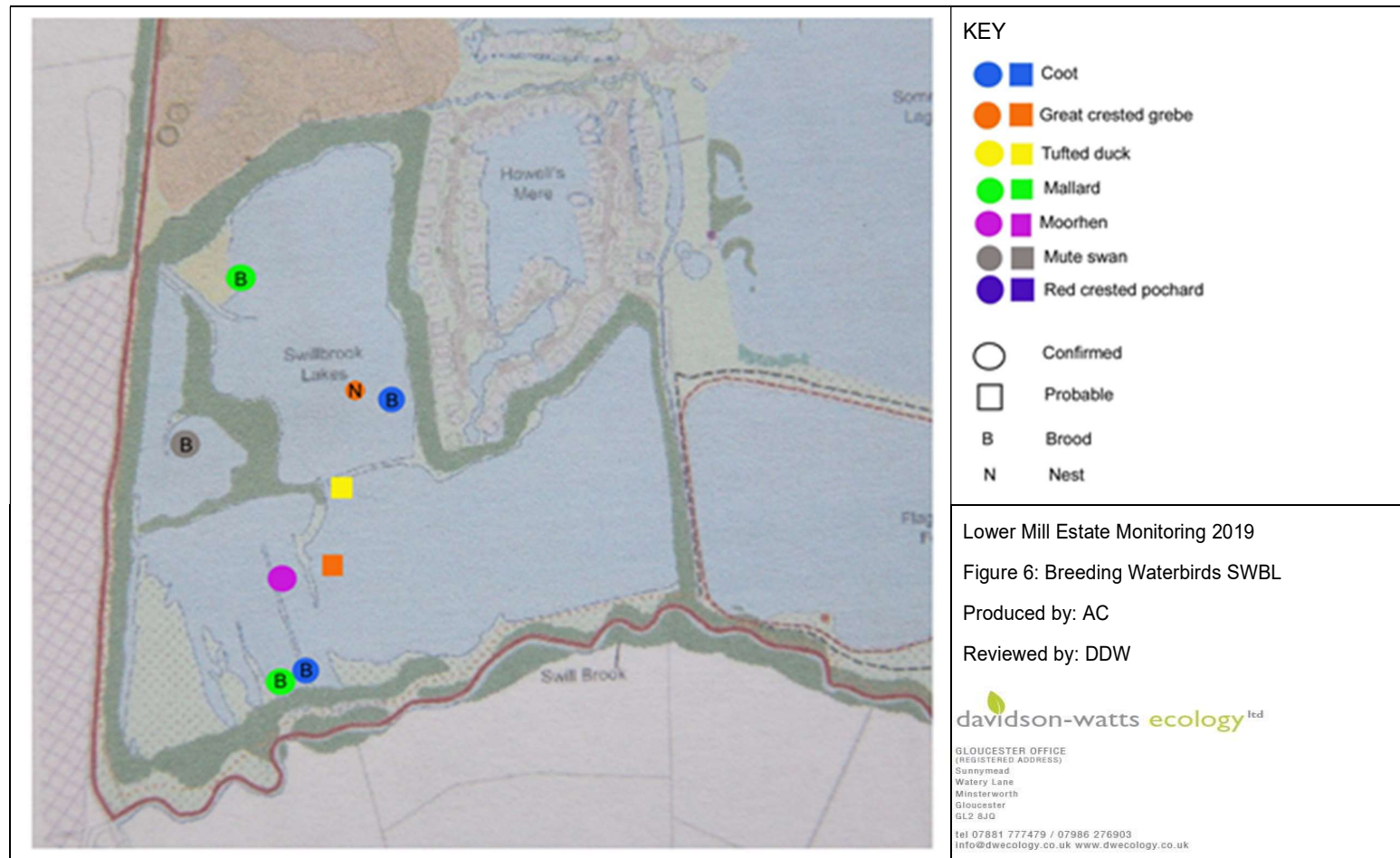


Figure 7 Red and Amber Species (LME)

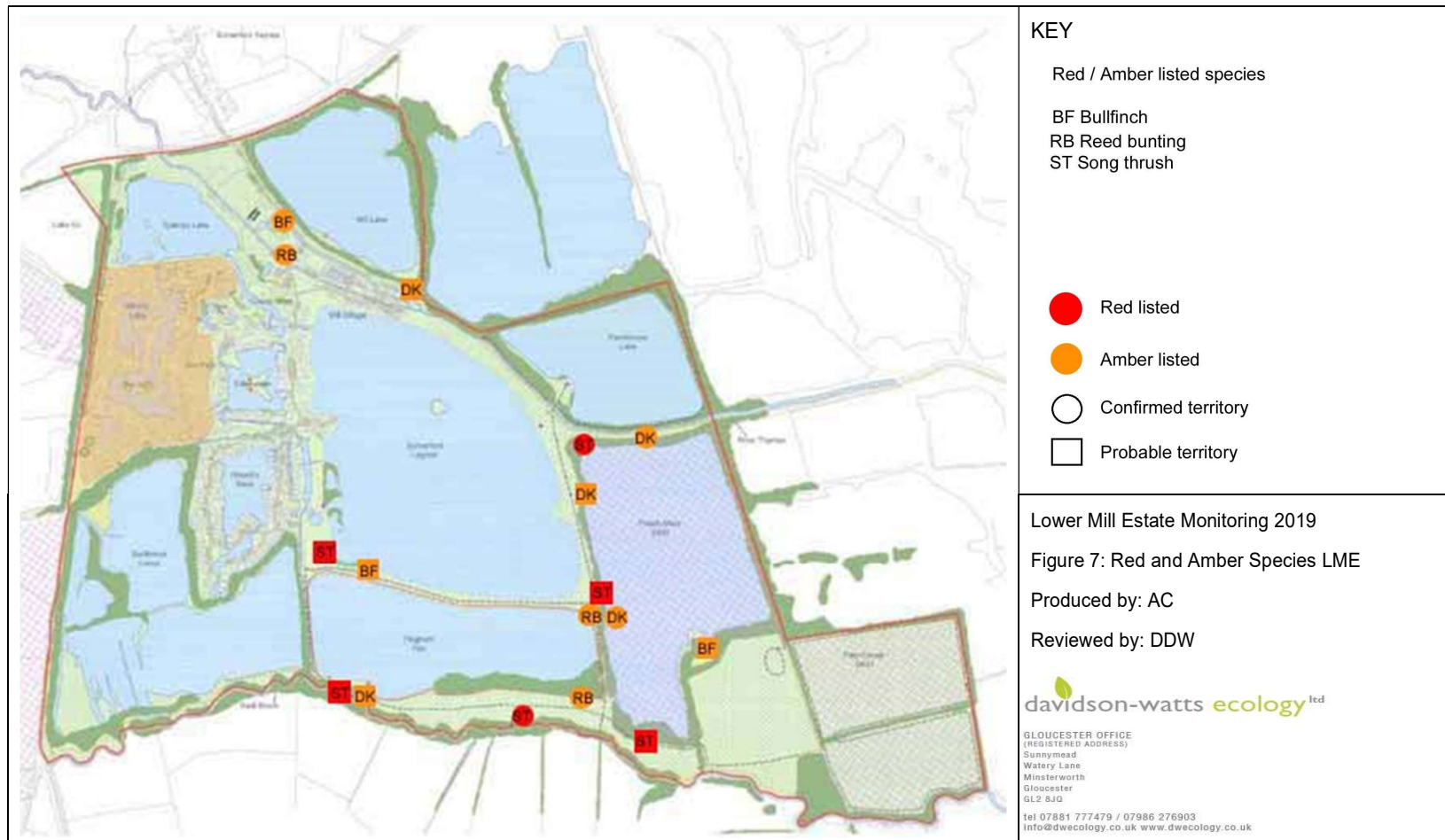


Figure 8 Red and Amber Species (Swillbrook Estate)

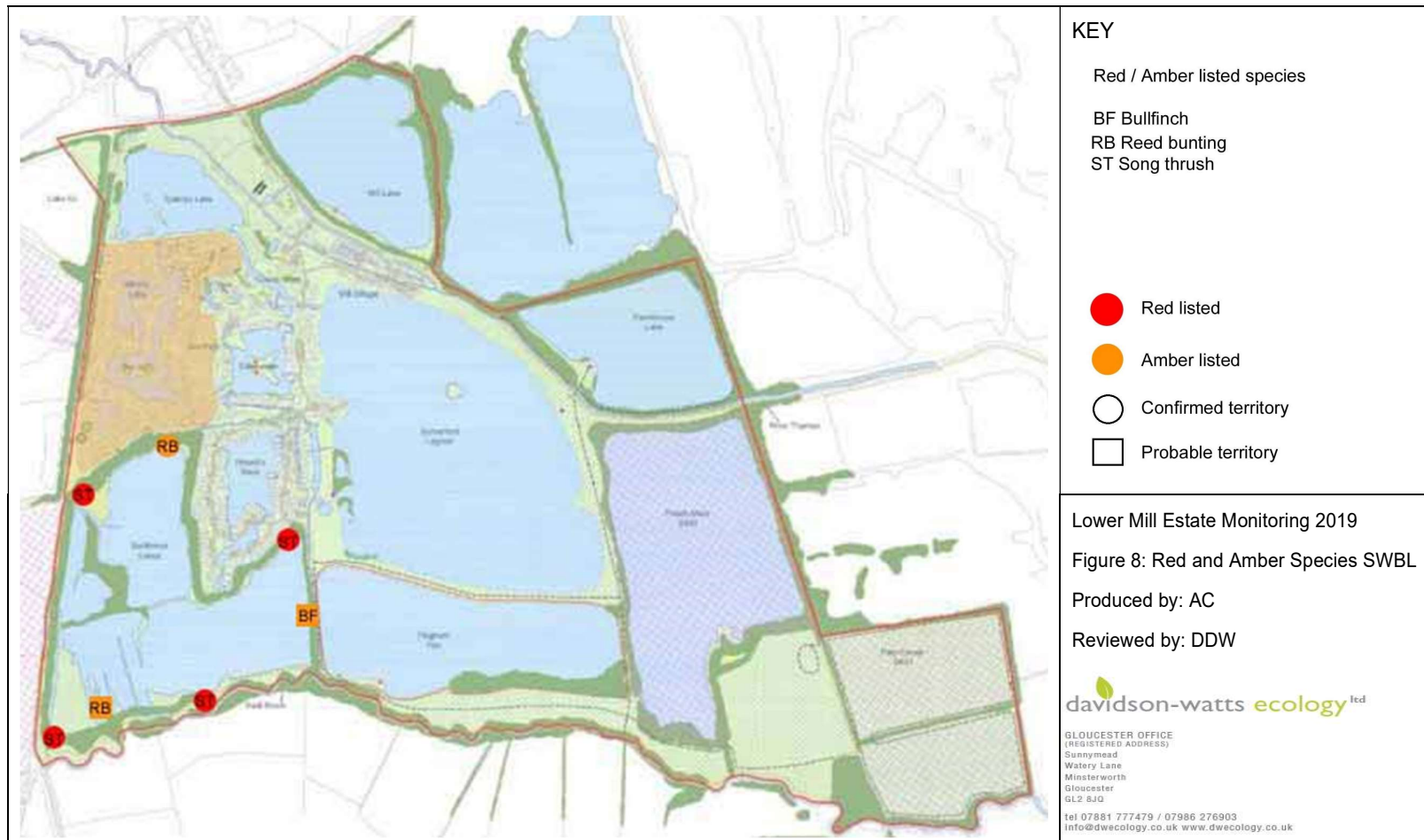


Figure 9 Nightingale Transect and Results

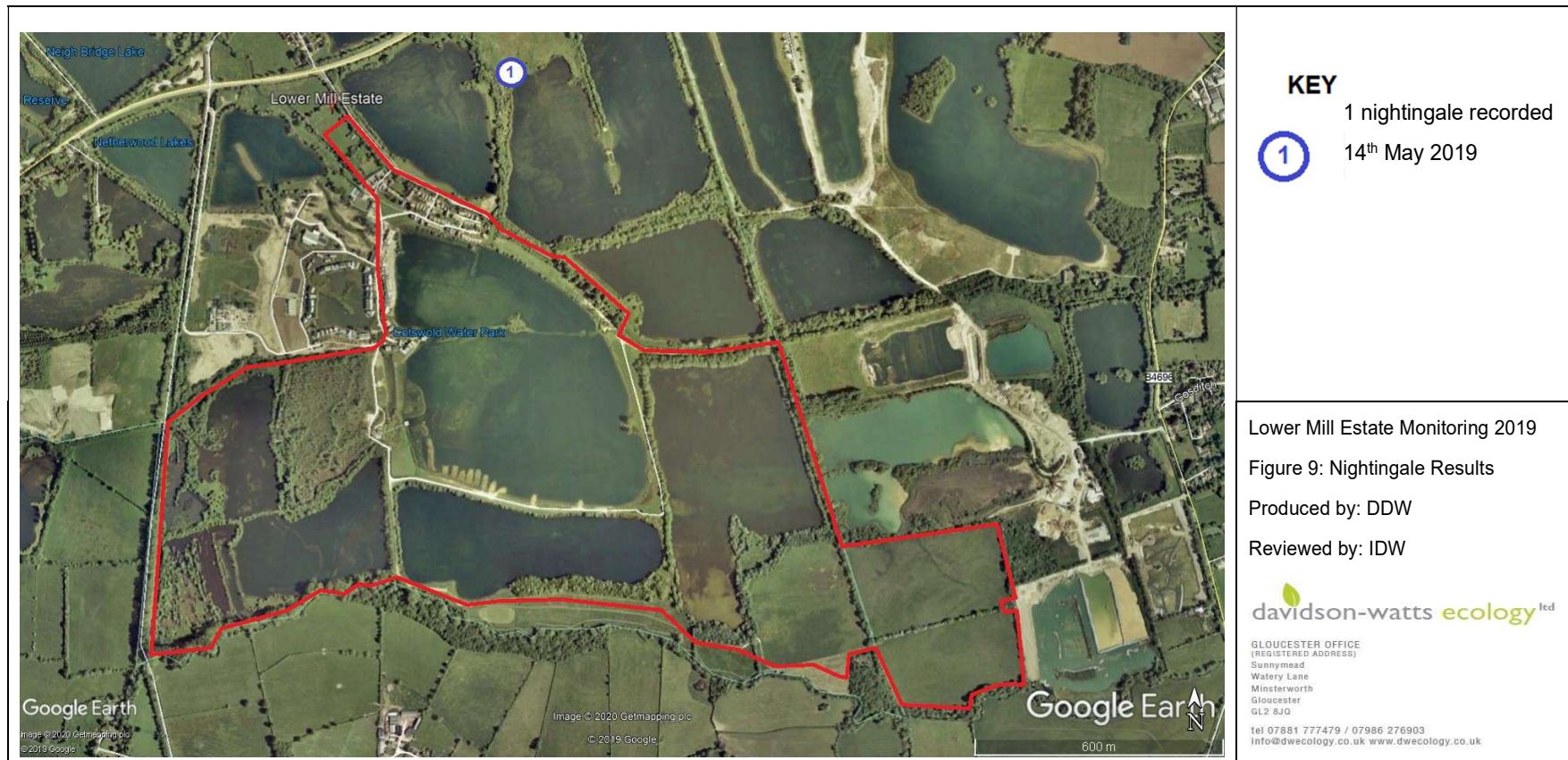


Figure 10 Reed Bunting Locations

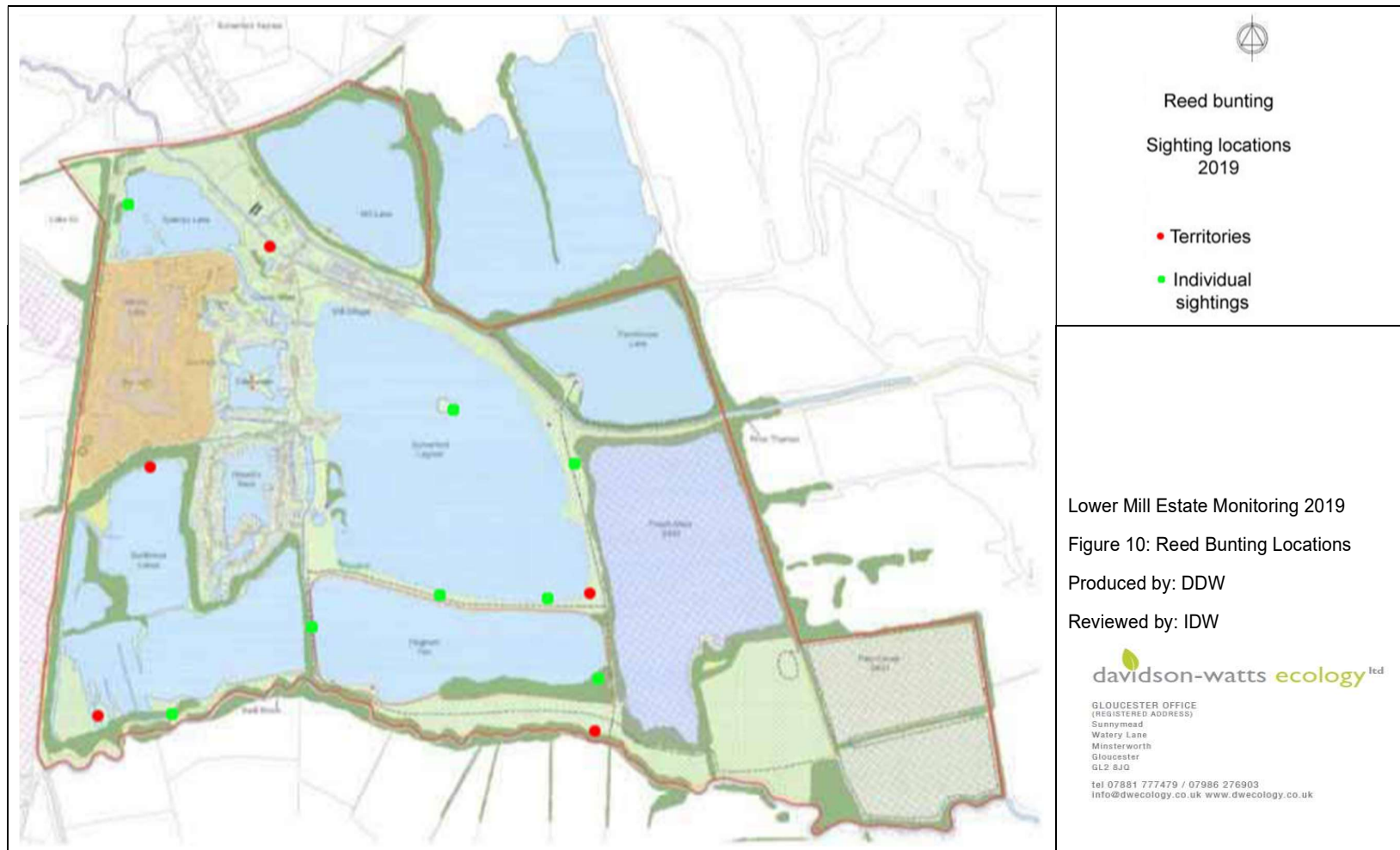


Figure 11 Reed Warbler Locations

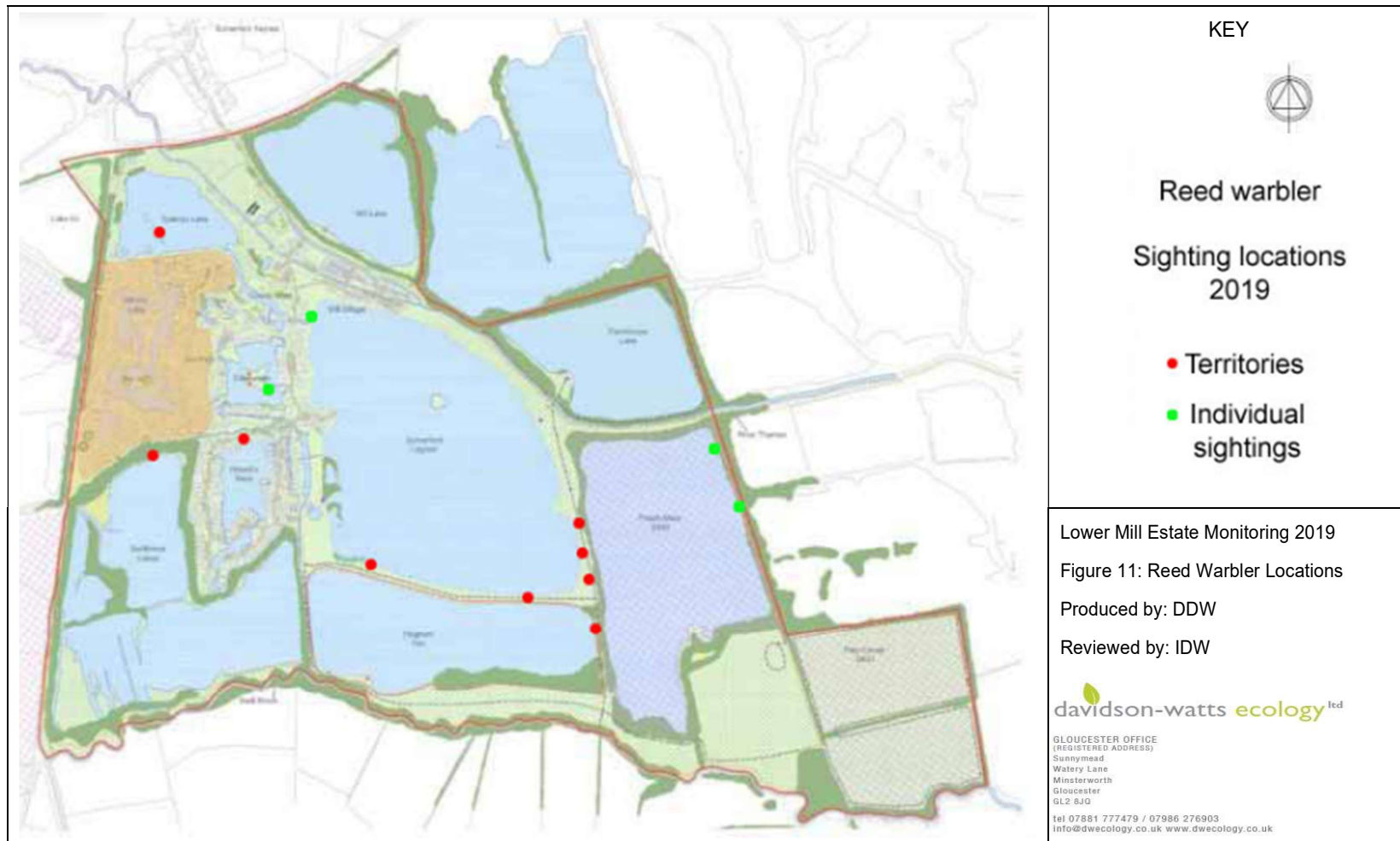


Figure 12 Bat Loft and Box Locations under Bridges

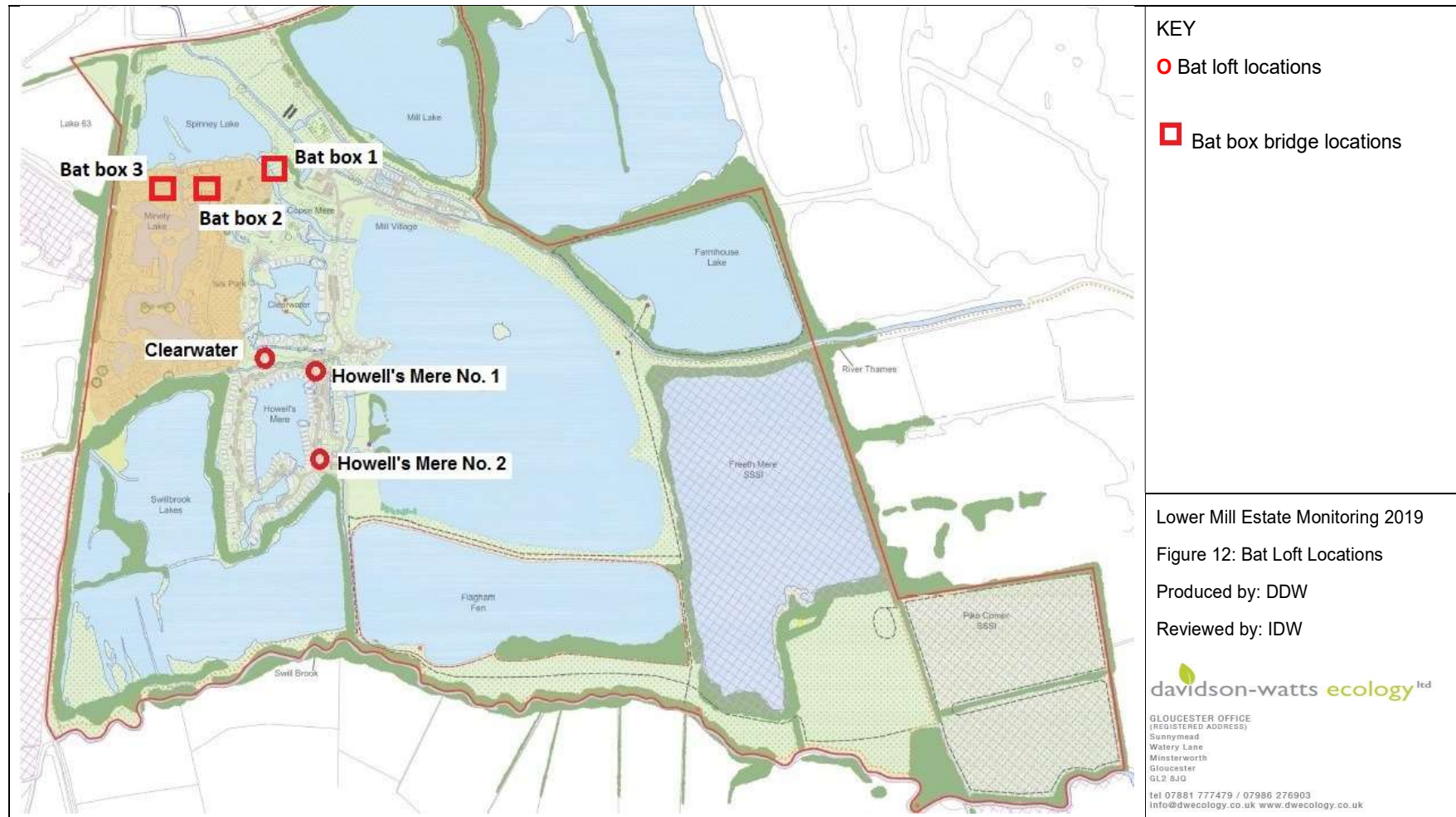


Figure 13 Great Crested Newt Pond Locations



Figure 14 Tern Raft Locations



Appendix A Wintering Waterbirds 2019 – 2020

	2019						2020								
	Oct		Nov		Dec		Jan		Feb		Mar				
Species	1	2	3	4	5	6	7	8	9	10	11	12	Min	Peak	Mean
Coot	191	269	236	283	329	280	152	182	179	161	83	33	33	329	198
Gadwall	8	3	11	10	10	14	3	11	7	8	4	4	3	14	8
Great crested grebe	30	20	26	21	20	21	25	26	23	17	22	37	17	37	24
Pochard		1		1	1		2				1		0	1	1
Tufted duck	27	28	60	73	83	62	55	95	127	142	104	96	27	142	80
Canada goose			20	8	21	18	34	12	4	6	9	10	0	34	12
Cormorant	9	11	6	13	8	5	9	18	12	5	6	3	3	18	8
Goldeneye		1	1		5	3	25	17	24	19	27	16	0	27	12
Goosander		10	3	5	6	6	3	6	12		3		0	12	5
Grey heron	3	2	6	6	8	4	4	4	3	3	1	3	1	8	4
Great white egret									1				0	1	0
Greylag goose									4	3	2	3	0	4	1
Kingfisher			1		1		1			1			0	1	0
Lapwing													0	0	0
Little egret			3	1	4			1	1	1			0	4	1
Little grebe	1	1			2	5		1		1			0	5	1
Mallard	14	26	80	91	119	113	59	80	54	37	32	25	14	119	61
Moorhen	2	1	3	6	11	12	6	17	7	3	10	4	1	12	7
Mute swan	28	11	9	11	15	12	11	8	10	6	10	17	6	28	12
Pintail								9	27				0	27	3
Red crested pochard			17	11	5	2	12	13	27	18	39	17	0	39	13
Scaup													0	0	0
Shelduck													0	0	0
Shoveler	5	4	5			2							0	5	1
Teal	2		3	27	60	35	84	19	18	16		8	0	84	23
Wigeon	11	28	63	58	72	127	61	104	95	132	64	32	11	132	71
Total	331	416	553	625	780	721	546	623	635	579	417	310			
Species	13	15	18	16	19	17	17	18	19	18	16	15			

Appendix B LME Priority Species Lake by Lake

Lake 41 Freeth Mere

Species	Peak	Mean
Coot	31	3
Gadwall	7	3
Great crested grebe	4	2
Pochard		
Tufted duck	58	19

Lake 42 Farmhouse Lake

Species	Peak	Mean
Coot	17	1
Gadwall		
Great crested grebe	2	2
Pochard	1	0
Tufted duck	23	8

Lake 44 Mill Lake

Species	Peak	Mean
Coot	17	10
Gadwall	3	0
Great crested grebe	8	3
Pochard	1	0
Tufted duck	17	5

Lake 45 Clearwater Lake

Species	Peak	Mean
Coot	1	0
Gadwall		
Great crested grebe		
Pochard		
Tufted duck		

Lakes 46/48 Swillbrook Lakes

Species	Peak	Mean
Coot	3	1
Gadwall	7	2
Great crested grebe	5	2
Pochard		
Tufted duck	21	5

Lake 47 Howell's Mere

Species	Peak	Mean
Coot		
Gadwall		
Great crested grebe		
Pochard		
Tufted duck		

Lake 57 Somerford Lagoon

Species	Peak	Mean
Coot	292	164
Gadwall	9	3
Great crested grebe	23	12
Pochard	1	0
Tufted duck	70	36

Lake 58 Flagham Fen

Species	Peak	Mean
Coot	10	4
Gadwall		
Great crested grebe	12	4
Pochard		
Tufted duck	12	4

Lake 77 Spinney Lake

Species	Peak	Mean
Coot	3	1
Gadwall		
Great crested grebe	2	0
Pochard		
Tufted duck	9	2

'0' in the Mean indicates a mean of >1
A blank box indicates no birds observed

Appendix C LME Breeding Waterbirds 2004 – 2019

Lake 41 Freeth Mere	Year															
Species	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Black headed gull (A)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Canada goose	0	0	0	0	0	0	0	0	0-1	0	0	0	0	0	0	0
Common tern (A)	0	0	0	0	0	0	0	0	0	0	0 to 3	0	0	0	0	0
Coot	10	6	1	5 - 12	6 - 8	8	8 - 11	12 - 16	5 - 8	9 - 11	6 - 10	4-5	3 - 4	3 - 8	2 - 7	4-6
Gadwall (A)	0	1	1	1 - 2	0	1	3	0 to 4	0	0	0	0	0	0 - 2	0	0-1
Great crested grebe	3	2	1	3 - 7	3 - 4	1 - 3	3 - 4	6 - 8	2 - 3	3 - 5	5 - 7	9	3	3 - 5	4	2-3
Greylag goose (A)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lapwing	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Little grebe	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Little ringed plover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mallard (A)	7	7	3	1 - 3	4 - 7	3 - 5	2 - 3	2+	0 - 3	0 - 5	2 - 3	2-3	0	1 - 7	3	1-3
Moorhen	1	1	1	1	0 - 1	0 - 1	1	1	0 - 2	0	0 - 1	2-3	2	3	1	1
Mute swan	0	0	0	1	1	0 - 1	1	1	1	1	1	2	2	1	1	1
Red crested pochard	0	0	0	0	0	0 - 2	0 - 1	1 - 2	0 - 1	0	0	0	0	0	0	0
Ruddy duck	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Shelduck	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tufted duck (A)	0	2	4	1 - 4	1 - 3	1	2	8 - 10	0	1 - 4	0	0-1	1 - 2	1	1 - 4	2-3
Water rail	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	21	19	13	13 - 30	15 - 24	14 - 22	21 - 27	31 - 44	8 - 18	14 - 26	14 - 25	19-23	11 - 13	12 - 27	12 - 20	11-18
Species	5	6	7	7	6	8	9	8	7	5	6	6	5	7	6	7

Lake 42 Farmhouse Lake	Year															
Species	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Black headed gull (A)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Canada goose	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Common tern (A)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Coot	4	4	7	6	10	9 - 10	9 - 10	9 - 10	9	4 - 6	1 - 5	3-5	3	2 - 6	4 - 5	2-3
Gadwall (A)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0-1
Great crested grebe	2	1	1	1	1	2	2	2	1 - 2	1	1	2	1	1	2	2-3
Greylag goose (A)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lapwing	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Little grebe	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Little ringed plover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mallard (A)	1	7	2+	1	1	1	3 - 4	1 - 3	0	2	3	0	1	1 - 3	1 - 2	1
Moorhen	0	1	1	2	1	1	1	1	1	2	1	1-3	0 - 1	0 - 1	0	0-1
Mute swan	1	1	1	1	1	1	1	1	1	0 - 1	1	0	0	0	0	0
Red crested pochard	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ruddy duck	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Shelduck	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tufted duck (A)	0	1	0	0	0	1	0 - 1	2 - 4	0 - 1	1 - 2	0	0-1	2	0 - 2	1 - 3	0-2
Water rail	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	8	15	12+	11	14	9 - 11	16 - 19	16 - 21	12 - 14	10 - 15	7 - 12	6-11	7 - 8	4 - 13	9 - 13	5-11
Species	4	6	5	5	5	6	6	6	5	6	5	4	5	5	4	6

Lake 44 Mill Lake	Year															
Species	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Black headed gull (A)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Canada goose	0	0	0	0	0	0 to 1	0	0	0	0	0	0	0	0	0	0
Common tern (A)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Coot	5	11	7	9 - 14	9	12	9 - 10	10	8 - 11	5 - 7	2 - 4	4	2 - 3	1 - 4	3 - 5	5
Gadwall (A)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Great crested grebe	1	1	1	1	1	1 - 2	2	2	1	1	2	1	1	3	1	1
Greylag goose (A)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lapwing	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Little grebe	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Little ringed plover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mallard (A)	1	1	1	1 - 2	1 - 2	2	3 - 5	0	0 - 1	0 - 1	0	1	0	0	0	0
Moorhen	0	2	2	3	1 - 2	3	2	2	1	0 - 1	0 - 1	2	1	0 - 2	1	0
Mute swan	0	1	1	1	1	1	1	1	1	0	0	0	0 - 1	0	1	0-1
Red crested pochard	0	0	0	0	1	0	1	0 - 1	0	0	0 - 2	0	0	0	2	0
Ruddy duck	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Shelduck	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tufted duck (A)	0	1	1	0	0	1	0 - 1	1 - 2	1	1 - 2	0	0-1	0 - 1	0 - 2	1 - 2	1
Water rail	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	8	17	13	15 - 21	14 - 16	20 - 22	17 - 21	16 - 18	12 - 16	7 - 12	4 - 9	8-9	4 - 7	4-11	9 - 13	7-8
Species	3	6	6	5	6	7	7	6	6	5	4	5	5	4	6	4

Lake 45 Clearwater	Year															
Species	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Black headed gull (A)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Canada goose	0	1	1	3	0	0	0	0 - 1	0	0	0	0	0	0	0	0
Common tern (A)	0	0	2	1	1	0	0	0	0 - 1	0	0	0	0	0	0	0
Coot	0	3	1	3	3	2	2	3	1	2 - 3	0	1-2	0 - 1	1	0	0
Gadwall (A)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Great crested grebe	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Greylag goose (A)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lapwing	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Little grebe	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Little ringed plover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mallard (A)	0	0	0	0	1	0	0	1	0 - 1	0 - 1	1	0-1	0 - 1	0 - 1	0	0
Moorhen	0	2	1	2	1	0 - 1	1	1	2	0 - 1	0	2-3	1	2	1	1
Mute swan	0	0	1	1	1	1	1	0 - 1	1	1	1	1	1	0 - 1	0	0-1
Red crested pochard	0	0	0	0	0	1	0 - 1	0	1	0	0	0	0	1	0	0
Ruddy duck	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Shelduck	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tufted duck (A)	0	0	0	0	1 - 2	0 - 1	0 - 1	0	0 - 1	0	0	0	0	0	0 - 1	0
Water rail	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	6	6	11	8 - 9	6 - 9	4 - 6	5 - 7	5 - 8	3 - 6	2	4-7	2 - 4	4 - 6	1 - 2	1-2
Species	0	3	5	6	6	5	5	5	7	4	2	4	4	5	2	2

Lake 47 Howells Mere		Year														
Species	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Black headed gull (A)	No data collected						0	0	0	0	0	0	0	0	0	0
Canada goose							0	0	0	0	0	0	0	0	0	0
Common tern (A)							0	0	0	0	0	0	0	0	0	0
Coot							1	3	1	0 - 1	1	2	2 - 3	0	1	0
Gadwall (A)							0	0	0	0	0	0	0	0	0	0
Great crested grebe							0	0	0	0	0	0	0	0	0	0
Greylag goose (A)							0	0	0	0	0	0	0	0	0	0
Lapwing							0	0	0	0	0	0	0	0	0	0
Little grebe							0	0	0	0	0	0	0	0	0	0
Little ringed plover							0	0	0	0	0	0	0	0	0	0
Mallard (A)							0	1	0	0 - 1	0	0	1	0	0 - 1	1
Moorhen							0	0	0	0	0	1	1	0	0 - 1	1
Mute swan							1	1	0 - 1	1	1	1	1	1	0	0
Red crested pochard							0	0	0	0	0	0	0	0	0	0
Ruddy duck							0	0	0	0	0	0	0	0	0	0
Shelduck							0	0	0	0	0	0	0	0	0	0
Tufted duck (A)							0	0	0	0	0	0	0	0	0	0
Water rail							0	0	0	0	0	0	0	0	0	0
Total							2	5	1 - 2	1 - 3	2	4	5 - 6	1	0 - 1	2
Species							2	3	1	3	2	4	4	1	2	2

Lake 57 Somerford Lagoon	Year															
Species	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Black headed gull (A)	0	0	0	0	3 - 4	4 - 5	6 - 9	10	5 - 10	8 - 12	c11	0	9	3	1	0-7
Canada goose	2	2	3	1 - 3	5 - 7	1 - 5	1 - 5	1 - 2	0 - 1	0	0	0	0	0	1	0
Common tern (A)	0	2	1	3 - 5	3 - 6	1 - 4	2 - 3	3 - 4	1 - 2	2 - 3	0 - 3	0	0 - 3	1	0	0
Coot	20	9	8+	4 - 8	10 - 11	23 - 24	21 - 23	10 - 16	6 - 13	11 - 15	2 - 7	3-4	3 - 5	4 - 6	7 - 10	3-6
Gadwall (A)	0	2	0	1	1	0 - 1	2	0 - 1	0	0	0	0	0	0	0	0
Great crested grebe	3	1	3	3 - 5	4	2 - 5	6 - 9	6 - 8	3 - 4	3 - 4	3 - 4	1	3	2 - 4	3 - 5	3-6
Greylag goose (A)	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Lapwing	0	0	0	0	0	0	0 - 1	0 - 1	0	0	0	0	0	0	0	0
Little grebe	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Little ringed plover	0	1	0 - 1	0	1	1	0	0	0	0	0	0	0	0	0	0
Mallard (A)	3	3	4	4 - 5	1 - 3	1 - 2	1 - 3	2 - 5	1 - 2	0 - 2	4	3-5	0 - 1	1 - 5	1 - 3	1-4
Moorhen	2	1	1+	1 - 2	4	2 - 3	3	2	2	3	3	4-6	1 - 3	1 - 2	4 - 5	1-3
Mute swan	2	0	1	1	1	1	2	1	1	1 - 2	2	0	1 - 2	0	1	0
Red crested pochard	2	1	1	0 - 2	2 - 4	1 - 6	3 - 4	0 - 1	0 - 1	0	0 - 1	0	0	0	0	1
Ruddy duck	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Shelduck	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Tufted duck (A)	0	7	3	2 - 8	2 - 3	2 - 3	0 - 10	3 - 10	1 - 6	0 - 3	3	2-3	1	0 - 1	0 - 3	0-4
Water rail	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	34	29	26	20 - 40	38 - 50	39 - 60	47 - 74	39 - 62	20 - 42	28 - 44	28 - 43	13-19	18 - 27	12-22	18 - 29	9-31
Species	7	10	11	10	13	11	12	13	10	8	9	5	8	7	8	7

Lake 58 Flagham Fen	Year															
Species	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Black headed gull (A)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Canada goose	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Common tern (A)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Coot	3	4	2	9 - 10	11 - 13	10 - 13	10 - 13	18	10 - 11	12	3 - 6	4-5	3 - 4	3-6	1	2
Gadwall (A)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Great crested grebe	2	1	1	1 - 2	4	2 - 3	2 - 3	2	2	2	1	3	1	1	0 - 1	1
Greylag goose (A)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lapwing	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Little grebe	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Little ringed plover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mallard (A)	3	4	2	1 - 2	1	1 - 2	3 - 4	3 - 4	1	1 - 3	2	0	0 - 1	1	1	1
Moorhen	1	1	1	1 - 3	1	1	1	0	0	0	0 - 1	1-2	1	0	0	0
Mute swan	1	0	1	1	1	0	0	0	1	0	0	0	0	0	0	0
Red crested pochard	0	1	0	0	0 - 1	2	2	1 - 2	1	0	0	0	1	0	0	0
Ruddy duck	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Shelduck	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tufted duck (A)	1	0	0	2 - 4	1 - 2	0 - 2	1 - 2	1 - 2	0 - 1	0	0	0	0	0 - 1	0 - 2	0
Water rail	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	11	11	7	15 - 22	19 - 23	15 - 24	16 - 24	25 - 28	15 - 17	13 - 15	6 - 10	8-10	6 - 8	5-9	2 - 5	4
Species	6	5	5	6	7	6	6	5	6	2	4	3	5	4	4	3

Lake 77 Spinney Lake	Year															
Species	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Black headed gull (A)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Canada goose	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Common tern (A)	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Coot	7	3	3	4 - 8	7	7	5	4	3	4	1 - 2	1-2	1	1-2	1	2
Gadwall (A)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0 - 1	0
Great crested grebe	1	1	1	1	1	1	0 - 1	1	1	1	0	2	0	0-1	0 - 1	0-1
Greylag goose (A)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lapwing	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Little grebe	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Little ringed plover	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Mallard (A)	1	3	3	1	1 - 2	0 - 1	2	1 - 2	0	0 - 1	0 - 1	2	1	1	0 - 1	0-1
Moorhen	0	1	1	2	1	0 - 1	0	1	0	0	1 - 2	4	0 - 2	0-2	1 - 2	1-2
Mute swan	0	1	1	1	0	1	1	1	1	1	0 - 1	1-2	0	0-1	1	1
Red crested pochard	0	0	0	0	0	0 - 1	0	0	0	0	0 - 1	0	0	0	0	0
Ruddy duck	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Shelduck	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tufted duck (A)	1	3	2	3	3 - 4	0 - 1	3 - 4	1 - 3	1 - 2	2	0 - 1	0	1	1	0 - 1	0-1
Water rail	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	10	13	11	13 - 17	14 - 16	9 - 14	11 - 13	10 - 13	6 - 7	8 - 9	2 - 10	8-12	3 - 5	3-8	3 - 8	4-8
Species	4	6	6	6	5	7	5	7	4	5	6	5	4	6	7	6

Appendix D LME Breeding Waterbirds (All Lakes) 2001 to 2006

	<i>Year</i>				
Species	2001	2003	2004	2005	2006
Black headed gull (A)	0	0	0	0	0
Canada goose	0	0	0	0	0
Common tern (A)	0	0	1	3	3
Coot	45	95	49	39	29
Gadwall (A)	0	0	0	3	1
Great crested grebe	16	39	12	7	8
Greylag goose (A)	0	0	0	0	0
Lapwing	0	0	0	0	0
Little grebe	0	0	0	0	0
Little ringed plover	0	0	0	0	0
Mallard (A)	14	26	16	15	15
Moorhen	7	0	4	10	10
Mute swan	7	36	5	6	6
Red crested pochard	0	0	0	0	0
Ruddy duck	0	0	0	0	1
Shelduck	0	0	0	0	0
Tufted duck (A)	13	11	2	14	10
Water rail	0	0	0	0	0
Total	183	207	92	107	91
Species	6	5	7	8	9

Explanatory note: The breeding waterbird surveys were carried out by Scott Wilson in 2001 and by CWPSoc/Trust from 2003. In 2007, the method of estimating the number of territories/pairs was changed. Therefore, the results from 2007 onwards are presented separately in Appendix E below.

Appendix E Breeding Waterbirds (All Lakes) 2007 – 2019

	Year													
Species	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Trend
Black headed gull (A)	0	3-4	4-5	6-9	10	5-10	10	11	0	9	3	1	3	Stable
Canada goose	4-6	5-7	1-7	1-5	1-3	0-1	1	0	0	0	0	1	1	Stable
Common tern (A)	4-6	5-6	1-4	2-3	3-4	1-3	2-3	0-6	0	0-3	1	0	1	Stable
Coot	40-58	57-61	70-71	66-75	69-80	43-57	47-59	16-35	26-33	17-24	15-33	20-32	15-33	Stable
Gadwall (A)	2-3	1	1-2	5	0-5	0	0	0	0	0	0-2	0 - 1	0-2	Stable
Great crested grebe	10-14	14-15	9-16	14-20	19-23	10-13	11-14	12-15	24	9	10-15	10-14	10-15	Stable
Greylag goose (A)	0	1	0	0	0	0	0	0	0	1	0	0	1	Stable
Lapwing	0	0	0	0-1	0-1	0	0	0	0	0	0	0	0	-
Little grebe	0	0	0	1	1	0	0	0	0	0	0	0	0	-
Little ringed plover	1	1	1	0	0	0	0	0	0	0	0	0	0	-
Mallard (A)	9-12	10-17	8-14	15-20	11-18	2-8	3-16	12-14	11-18	4-6	5-18	6-11	5-18	Stable
Moorhen	12-17	9-11	6-11	9	8	6-8	5-7	5-9	19-30	7-12	6-12	8-11	6-12	Stable
Mute swan	7	6	5-7	8	6-7	7-8	5-7	6-7	9-10	5-7	2-4	4	2-4	Declining
Red crested pochard	0-2	3-6	1-14	6-9	2-6	2-4	2-3	0-4	0	1	1	2	1	Stable
Shelduck	0	0	0	0	1	0	0	0	0	0	0	0	0	-
Tufted duck (A)	8-16	8-14	5-10	5-21	16-31	3-12	5-13	3-4	3-9	5-7	2-8	3-16	2-8	Stable
Water rail	1	0	0	0	0	0	0	0-2	0	0	0	0	0	-
Total	98-143	123-150	112-162	134-186	147-198	79-142	91-133	65-156	92-124	58-79	45-97	55-93	47-99	Stable
Species	12	13	12	13	14	10	10	9	6	10	10	10	12	Stable

Appendix F SWBL Breeding Waterbirds 2011 – 2019

	Date									Trend
Species	2011	2012	2013	2014	2015	2016	2017	2018	2019	
Canada goose	1	0-1	0-1	P	0	P	0-1	1	0-1	Stable
Coot	10-13	3-7	8-10	2-6	4	1-2	1-3	2	1	Stable
Gadwall (A)	0	0	0	0	0	0	0	0	0	
Great crested grebe	3	3-5	4-5	2-4	6	1-2	1-2	1-2	1-2	Stable
Greylag goose (A)	0-1	0-1	P	P	0	1	0	1	1	Stable
Mallard (A)	3	1-2	7-9	3	3-6	1	0-1	1	2-4	Stable
Moorhen	0-1	1-2	3-8	6-4	2-6	0	1-3	1-2	1	Stable
Mute swan	1	1	1-2	1	4	1	2	1	1	Stable
Red crested pochard	0	P	0	0	0	0	0	0	0	
Tufted duck (A)	2	0-2	0-2	0	1-3	1	0-2	0-1	0-1	Stable
Water rail	0	0	0	0-2	0	0	0	0	0	
Total	20-25	9-22	23-35	8-20	20-29	8-10	5-14	18 - 21		Stable
Species	8	8	7	6	6	7	7	10		Increasing

Appendix G LME Breeding Terrestrial Birds 2003 – 2019

Species	Territories / pairs																	
Common name	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Trend*
Blackbird	19	6	7	8	6	11	8	9	8	12	13	13	16	12	6	8	9	S
Blackcap	11	11	15	19	17	28	15	22	32	29	25	23	24	18	18	19	24	I
Blue tit	14+	16	18	20	8	9	9	12	5	10	4	7	7	15	17	17	12	S
Bullfinch (A)	2	0	2	2	2	3	2	3	2	2	2	1	0	1	3	4	3	S
Chaffinch	12	10	12	17	11	24	12	14	12	16	13	9	13	8	8	7	7	S
Chiffchaff	10	10+	5	4	4	7	5	13	15	11	12	11	9	9	7	5	7	S
Cuckoo (R.)	2	3	3	2	2	2	2	2	2	2	1	1	1	0	1	1	0	S
Dunnock (A)	7	3	8	5	13	15	11	8	5	4	5	7	6	5	7	5	5	S
Garden warbler	2	4	4	5	2	8	14	10	20	20	19	18	17	6	12	8	9	S
Great tit	10	5	11	10	6	9	9	7	11	8	2	6	4	3	7	8	2	D
Greenfinch	4	2	1	2	2	2	2	2	2	3	3	5	0	0	1	1	1	S
Long-tailed tit	2	7	2	1	3	3	2	4	5	3	3	2	1	3	1	2	2	S
Pied wagtail	1	0	2	2	1	1	2	1	1	3	3	1	0	0	1	0	1	S
Reed bunting (A)	20	13	20	22	15	17	10	10	10	8	6	9	3	9	6	7	3	S
Reed warbler	11	2+	9	8	14	36	33	49	49	27	18	16	14	4	5	3	8	I
Robin	22	8	13	19	18	31	24	10	12	21	21	20	26	19	22	8	11	S
Sedge warbler	10	6	14	9	4	12	10	9	13	9	9	8	7	15	15	10	3	D
Song thrush (R)	4	6	4	2	2	2	6	7	8	10	7	11	9	3	4	4	6	S
Whitethroat (A)	4	0	0	1	2	4	1	2	9	8	9	5	2	3	5	2	5	S
Willow warbler (A)	2	1	1	0	1	2	0	1	4	1	2	0	0	0	0	1	3	I
Wren	23	22	31	19	29	33	39	36	24	39	31	21	26	21	26	26	23	S
Total	198	140	186	180	165	262	216	231	249	248	209	194	185	154	172	143	144	S
Species	21	18	20	20	21	21	20	21	21	21	22	22	18	17	20	19	20	

*Trend - D Decreasing I Increasing S Stable

Appendix H SWBL Breeding Terrestrial Birds 2011 to 2019

Species	Territories / pairs									
Common name	2011	2012	2013	2014	2015	2016	2017	2018	2019	Trend
Blackbird	3	3	3	7	7	2	3	4	3	S
Blackcap	15	16	15	11	13	8	7	10	7	D
Blue tit	4	4	2	2	7	4	7	6	5	S
Bullfinch (A)	2	1	0	1	3	2	1	3	1	S
Cetti's warbler	0	2	0	6	0	0	2	2	1	I
Chaffinch	6	5	7	9	3	2	0	1	2	S
Chiffchaff	10	8	7	1	10	5	6	6	7	S
Cuckoo (R.)	1	1	1	0	1	0	0	0	0	D
Dunnock (A)	4	3	4	7	3	2	1	1	0	D
Garden warbler	11	6	7	2	5	2	2	2	3	D
Goldcrest	0	3	1	1	1	2	2	2	2	S
Goldfinch	1	2	1	0	1	0	0	0	0	D
Great spotted woodpecker	1	1	1	3	1	0	1	1	0	S
Great tit	4	6	2	1	2	2	2	2	3	S
Green woodpecker	1	1	1	1	0	0	1	0	0	D
Jay	1	1	0	1	0	0	0	0	0	D
Long-tailed tit	3	3	1	1	1	0	2	1	0	D
Reed bunting (A)	6	7	2	10	0	2	3	1	2	D
Reed warbler	11	11	4	0	5	2	0	0	1	D
Robin	4	10	6	8	16	7	6	5	3	D
Sedge warbler	2	1	1	1	0	1	1	2	3	S
Song thrush (R)	5	5	3	1	3	1	2	3	4	S
Tree creeper	4	3	0	1	0	0	0	0	0	D
Whitethroat (A)	2	1	2	13	1	0	1	0	0	D
Willow warbler (A)	2	0	2	21	1	2	1	1	2	S
Wood pigeon	8	6	8	7	8	0	0	0	0	D
Wren	15	22	15	11	17	11	12	10	14	S
Total	128	134	95	115	109	57	63	63	63	
Species	26	27	23	26	23	17	20	19	17	

Appendix I GCN Survey Results 2012 to 2019

Survey site	Pond No.	Great Crested Newt					Smooth Newt					Common Frog					Common Toad				
		2012	2013	2015	2017	2019	2012	2013	2015	2017	2019	2012	2013	2015	2017	2019	2011	2012	2013	2015	2019
Spa pond	1						2					5					5	3			
Eco pool	2									2	7	1	S				1	2			
Clearwater	3						1	3	10	6	6	10	1	1			5	6	5		Tad
Nightingale Walk	4				2		15	80	18			1	1	2			1	1	1		
Pond B	5								14	2	4			1		1				1	
Pond 10	6				10	4	1		5	2	5			1	1						
Pond 11	7			1	1	5		3	2	3	6						1	15	3		
Pond 8	8					4			9		8	3	1			1				4	
Pond A	9				4				13	1				1		1					
Mill Village	10					1				2	2	2				1	n/s	3	S	1	2
Total		0	0	1	17	14	11	19	86	71	38	8	22	3	6	4	13	30	9	6	2
No. pools with amphibians		0	0	1	4	4	3	5	4	8	7	4	7	5	6	4	6	6	4	3	2

n/s not surveyed

S spawn

Tad Tadpoles