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Hodder WTW AMP6 Renovation Project

Stocks Reservoir Bird Report

08 August 2019

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Executive summary

Mott MacDonald Bentley was appointed by United Utilities to conduct a study, to include a breeding bird survey at Stocks Reservoir ahead of proposed renovation works at Hodder WTW which are to include the raising of the water levels within Stocks Reservoir.

A desk study was conducted which included a review of any existing bird records and a Breeding Bird Survey (BBS), which focused on the usage of Stocks Reservoir by waterbird (wildfowl and wader) species. Three survey visits were conducted within the breeding season survey period (1 April to 31 July 2019).

A total of 24 waterbird species were recorded during the surveys. Notable species recorded during the surveys included the following:

- Three species listed in Section 41 of the NERC Act 2006.
- One species listed on Schedule 1 of the WCA.
- Three Red List Birds of Conservation Concern.
- Nine Amber List Birds of Conservation Concern.

Stocks Reservoir is also shown to be an important site important for migratory and over wintering wildfowl and wader species.

Only the potential impacts of the works to raise the water level within Stocks Reservoir are discussed.

The potential impacts discussed include:

- Disturbance of breeding birds;
- Loss of habitats used for breeding;
- Disturbance of migratory and/or over wintering species;
- Loss and fragmentation of foraging habitat; and
- Incidental mortality.

Recommendations for mitigation include are provided, including:

- Avoidance
  - Re-filling of reservoir water levels should be undertaken outside of the breeding bird season.
- Minimisation
  - Implementation of BS 5228-1:2009+A1:2014 ‘Code of practice for noise and vibration control on construction and open sites’.

1 Introduction

1.1 Background

Mott MacDonald Bentley was appointed by United Utilities to conduct a study, to include a breeding bird survey at Stocks Reservoir ahead of proposed renovation works at Hodder WTW, which are to include the raising of the water levels within the adjacent Stocks Impoundment Reservoir. The survey aims to assess the potential impacts of the works on wild birds (waterbirds), to identify potential constraints imposed by legislation and policy related to the protection of wild birds, and provides recommendations for mitigation, habitat creation and enhancement where appropriate.

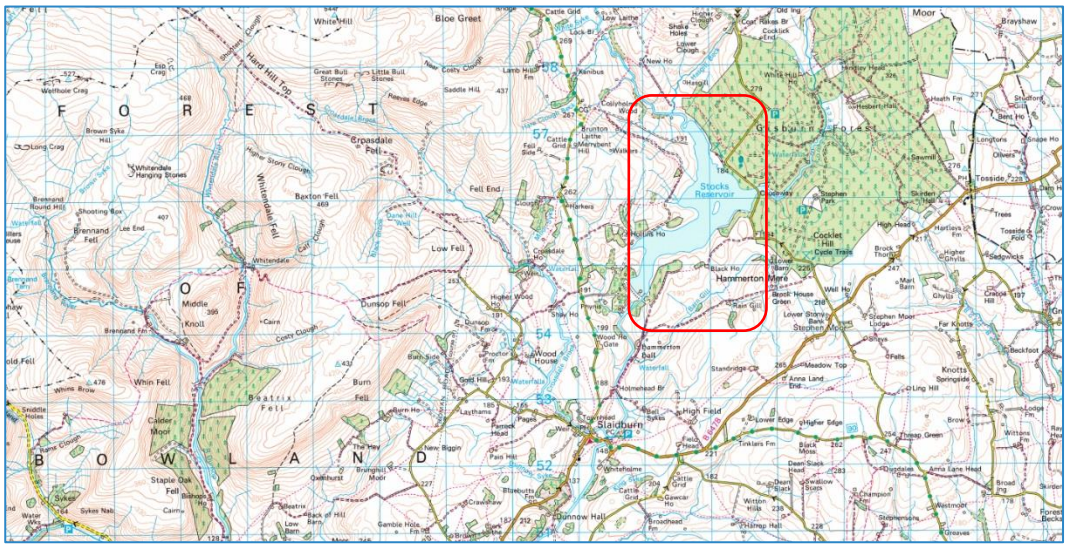
1.2 Site Description

Stocks Reservoir is located at the head of the Hodder Valley within the Forest of Bowland, northeast Lancashire, approximately 14 km north of Clitheroe at grid reference SD 730560. (Figure 1.)

It is approximately 3km long and varies in width from 200m to over 1.2km and contains one permanent small island. When full the reservoir covers an area of 192ha and holds up to 12 billion litres of water, collected continuously from a 3750ha catchment area.

As the only large water body for some distance, Stocks Reservoir is known to be important to migratory and over wintering wildfowl and wader species and is regularly monitored by members of the East Lancashire Ornithologists Club from two hides situated along the north eastern shore. The reservoir is also used for seasonal fly fishing (bankside and from boats), however, fishing is not permitted within the northern third of the reservoir, in an area informally designated as a ‘wildlife reserve’.

Figure 1: Site location



Source: Contains Ordnance Survey data © Crown copyright and database right 2019.

1.3 Aims and Objectives

The aim of this report is to provide details of all wild birds recorded using Stocks Reservoir during the breeding season survey period (1 April to 31 July) defined by Gillings et al (2013), and in particular those species which:

- The Local Planning Authority has a duty to conserve the species or its habitats on site (Section 41 NERC Act 2006).
- Have additional protection when nesting (WCA Schedule 1 species).
- Are listed as either red or amber in terms of conservation concern (BoCC4)
- The presence of wild bird species on site during the breeding season will likely result in a constraint to the works; and
- Mitigation is likely to be required to avoid, reduce or manage any negative effects.

The objectives are to:

- Identify constraints imposed by statutory instruments related to the protection of wild birds;
- Assess the potential impacts of the proposed works on wild birds.
- Provide recommendations for mitigation, habitat creation and enhancement where appropriate.

1.4 Proposed works

The proposed development comprises increasing the capacity of Stocks Reservoir by raising the level of the overflow weir by 300mm which will give a top water level of 180.87m above ordinance datum (mAOD). This will be carried out either by using pre-cast coping units or in-situ concrete construction. This will be confirmed during detail design. Whilst carrying out the works the reservoir will need to be drawn down to approximately 177.5mAOD, however the works will be carried out in summer months when water levels are relatively low. The works will take approximately 6-7 weeks to complete.

Additionally, works will occur around the Hodder Water Treatment Works (WTW) including:

- Process trial to establish feasibility of upgrading and optimising the existing multi-flow lamella operation. Start on site was May 2019, the construction works will take approximately three weeks.
- Replacement of existing Bells first stage pressure filters with a new filtration process. This will be a rapid gravity filter system with 8 tanks at 85m^2 area per tank along with associated pipework and housing. New clean backwash tanks will also be constructed along with two dirty wash-water storage tanks. These works will be constructed in an area of existing trees which will need to be cleared.
- Works to the Lime Dosing process include providing flushing points on the dosing lines up and downstream of the pre-coagulation pumps, amending the arrangement and control system of the existing pumps and replacing the pre-manganese contactor dosing pumps.

1.5 Legislation

The Wildlife and Countryside Act 1981 (as amended) and The Conservation of Habitats and Species Regulations 2017 (as amended) form the cornerstones for species and habitat protection in England and Wales. In the UK all wild birds, their nests and their eggs are protected by the Wildlife and Countryside Act 1981 (as amended). Offences under this Act include:

- Intentionally killing injuring or taking any wild bird;
- Intentionally taking, damaging or destroying the nest of any wild bird whilst it is in use or being built; and
- Intentionally taking or destroying the egg of any wild bird.

Birds listed on Schedule 1 of the Wildlife and Countryside Act 1981 (as amended) have further protection making it an offence to intentionally or recklessly disturb any wild bird listed on Schedule 1 while it is nest building, or at/near a nest containing eggs or young, or to disturb the dependent young of such a bird.

The UK Biodiversity Action Plan (UK BAP) 1994 – 2010 has been superseded by the UK Post-2010 Biodiversity Framework covering the period 2011 - 2020. UK BAP priority habitats and species were used to form the basis for the statutory list of habitats and species of 'principal importance for the conservation of biodiversity in England' under Section 40 of the Natural Environment and Rural Communities (NERC) Act 2006.

Section 41 of the NERC Act 2006 requires public bodies, including local authorities, 'to have regard to the conservation of biodiversity in England' when carrying out their normal functions. The list of species of 'principal importance for the conservation of biodiversity in England' (Section 41) guides public bodies in implementing their duty. The Local Authority therefore must consider the impact on biodiversity of the proposed development. The recommendations section of this report illustrates ways in which this Biodiversity Duty can be met.

The Local Planning Authority (LPA) must also have regard to the conservation of biodiversity when carrying out their normal functions and ensure the potential impacts on protected species and habitats from the proposed development have been fully assessed and appropriate mitigations proposed. Section 118 of the National Planning Policy Framework 2018 (NPPF), which relates to conserving and enhancing the natural environment, requires Local Authorities in England to apply, inter alia, the following principles:

- If significant harm resulting from a development cannot be avoided (through locating on an alternative site with less harmful impacts), adequately mitigated, or, as a last resort, compensated for, then planning permission should be refused;
- Development proposals where the primary objective is to conserve or enhance biodiversity should be permitted;
- Opportunities to incorporate biodiversity in and around developments should be encouraged
- Planning permission should be refused for development resulting in the loss or deterioration of irreplaceable habitats, including ancient woodland and the loss of aged or veteran trees found outside ancient woodland, unless the need for, and benefits of, the development in that location clearly outweigh the loss. Therefore, the assessment of the potential impacts on protected species and habitats must be finalised prior to planning permission and must be submitted with the planning application.

1.5.1 Species of conservation concern

In addition to statutory protection, British bird species in the UK are also classified according to their conservation status including their inclusion on the Red and Amber lists of *Birds of Conservation Concern 4* (Eaton *et al,* 2015). (BoCC)

Bird species in the red and amber lists will be subject to at least one of the relevant factors as listed below:

Red list criteria

- Globally threatened.
- Historic population decline in the UK during the period 1800-1995.
- Severe (at least 50%) decline in the UK breeding population over last 25 years, or longer-term period (the entire period used for assessments since the first BoCC review stating in 1969).
- Severe (at least 50%) contraction of UK breeding range over last 25 years, or the longer-term period.

Amber list criteria

- Species with unfavourable conservation status in Europe.
- Historical population decline during the period 1800-1995 but recovering; population size has more than doubled over last 25 years.
- Moderate (25-49%) decline in breeding population over last 25 years, or the longer-term period.
- Moderate (25-49%) contraction of breeding range over last 25 years, or the longer-term period.
- Moderate (25-49%) decline in non-breeding population over last 25 years, or the longer-term period.
- Rare breeder; 1-300 breeding pairs in UK.
- Rare non-breeder; less than 900 individuals.
- Localised; with at least 50% of UK breeding or non-breeding population in 10 or fewer sites, but not applied to rare breeders or non-breeders.
- Internationally important; at least 20% of European breeding or non-breeding population in UK (NW European and East Atlantic Flyway populations used for non0breeding wildfowl and waders respectively).

Green list

- Species that occur regularly in the UK but do not qualify under any of the above criteria.

2 Methodology

2.1 Desk Study

A desk study was conducted which included a review of any existing bird records including:

- 2018 Breeding Bird Survey data (Bowland Ecology, 2018.)
- Stocks Bird Reports 2016-2018 (East Lancashire Ornithologists Club, supported by United Utilities and RSPB).
- BTO Wetland Bird Survey (WeBS) data. (www.bto.org/our-science/projects/webs)
- BTO Bird Atlas 2007-2011. (Balmer *et a*l, 2013.)

2.2 Breeding Bird Survey

A Breeding Bird Survey was undertaken during the 2019 breeding season. Field methods were based on the British Trust for Ornithology's Common Bird Census (Marchant, 1983).

2.2.1 Survey area

The study area (Figure 1) has been defined as the area of land take (footprint) of the project and the zone of influence (ZoI). The ZoI "is the area over which ecological features may be subject to significant effects as a result of a proposed project and associated activities" (CIEEM, 2016). For this project the ZoI is the footprint of the Project. The ZoI takes into account the likelihood that an increase or changes to the water levels and will likely be confined to low-lying marginal areas being impacted.

The survey area included the entire periphery of Stocks Reservoir including the inlets of the River Hodder and Bottoms Beck. The survey area was designed to capture usage of the reservoir by waterbirds (wildfowl, waders etc.) only, as the proposals to raise the water level of the reservoir are unlikely to lead to the loss or change to significant areas of terrestrial habitat or affect terrestrial species.

2.2.2 Defining a Survey Route

The survey route was devised to enable the surveyor to walk around the perimeter of the reservoir site. The route was walked on each of three visits but the starting point and direction was reversed on alternate visits to avoid potential temporal bias (Marchant, 1983).). Due to the size of the reservoir, each survey visit was undertaken over two consecutive mornings.

2.2.3 Visit Timing

Three survey visits (Table 1) were conducted within the breeding season survey period (1 April to 31 July) defined by Gillings et al. (2013).

In order to maintain a relatively consistent ability to detect breeding bird activity, the surveys were conducted where practicable in optimal or near optimal conditions and avoided periods of heavy rain and/or strong wind.

Table 1: Survey metadata

Visit	Date	Start / Finish Time (BST)	Temp ºC	Total Cloud Cover (Oktas)	Wind Direction & Speed (Beaufort Scale)	Precipitation	Surveyor
1	24.04.19	0700-1130	18	1	E 2	Nil	Richard Forrester
	25.04.19	0700-1100	17	1	SE 3		
2	21.05.19	0645-1100	19	1	NW 2	Nil	Richard Forrester
	22.05.19	0700-1130	21	2	NW 1		
3	26.06.19	0700-1130	22	3	SW 2	Nil	Richard Forrester
	27.06.19	0730-1200	22	4	SW 2		

2.2.4 Recording Data

Birds identified by sight or sound were registered on 1:2500 Ordnance Survey maps. The number of birds of each species was recorded with breeding evidence (Table 2) based on the standard list of conventions described in Sharrock (1974) and Gillings et al. (2013).

Table 2: Summary of breeding evidence categories

Possible	Probable	Confirmed
Observed in suitable nesting habitat.	Pair observed in suitable nesting habitat.	Distraction display or injury feigning.
Singing male in suitable breeding habitat.	Permanent territory presumed through registration of territorial behaviour (song etc.) from many individuals on one day.	Used nest or eggshells.
	Courtship and display.	Recently fledged young.
	Visiting probable nest site.	Adults entering or leaving nest site or adults seen incubating.
	Agitated behaviour or calls suggesting probable presence of nest or young nearby.	Adult carrying faecal sac or food for young.
	Nest building or excavation.	Nest containing eggs.
		Nest with young.

Source: Based on Sharrock, 1974

2.2.5 Professional Competence

The surveys were conducted by a competent surveyor (Richard Forrester) in accordance with the requirements of BS 42020:2013 (The British Standards Institute, 2013).

2.3 Constraints and Limitations

The size of the reservoir required each survey visit to be spread over two consecutive mornings. Due to the highly mobile nature of many of the species, this increased the chance that some species numbers have been over estimated, however, additional effort to avoid doubling counting was used.

2.4 Species Excluded from Analysis

Species observed during surveys but excluded from the analysis include:

- Non-native species, including those protected under the Game Act 1831 (as amended) but likely to be derived from a self-sustaining population;
- Non-native species considered to be under the permanent or temporary control of man;
- Species observed flying over the site and not actively hunting or foraging; and
- Species where no breeding evidence was observed on any of the survey visits.

2.5 Nomenclature

The English vernacular and scientific bird names used in this report follows that of the 8th Edition of the British Ornithologists' Union official list of species recorded in Great Britain as at June 2013 (Harrop et al. 2013).

3 Results

3.1 Summary of Breeding Bird Survey results

A total of 24 waterbird species were recorded during the surveys. A full species list is provided in Table A1 in Appendix A.

Notable species recorded during the surveys included the following: (note that some species are cited in more than one statutory and conservation categories):

- Three species listed in Section 41 of the NERC Act 2006.
- One species listed on Schedule 1 of the WCA.
- Three Red List Birds of Conservation Concern.
- Nine Amber List Birds of Conservation Concern.

Table 3 provides a summary of the total number of waterbird species with the probability of breeding on site (Table 2 gives the criteria for each of the breeding evidence categories).

Table 3: Number of bird species with evidence or likelihood of breeding in the site

Breeding Status	Number of Species
Confirmed breeding species	6
Probable breeding species	9
Possible breeding species	6

3.2 Breeding species

3.2.1 Confirmed

Six species were confirmed to be breeding within the survey area. These include three notable species (Amber listed), oystercatcher (*Haematopus ostralegus*), greylag goose (*Anser anser*) and mallard (*Anas platyrhynchos*). Others included common species such as Canada goose (*Branta canadensis*), sand martin (*Riparia riparia*)and moorhen (*Gallinula chloropus*).

Breeding was confirmed in all instance with the observation of recently fledged juveniles.

3.2.2 Probable

Nine species are assessed to be probable breeders within the survey area. These include notable species such as the amber listed teal (*Anas crecca*) and common sandpiper (*Actitis hypoleucos*), the red listed lapwing (*Vanellus vanellus*) and herring gull (*Larus argentatus*) and Schedule 1 listed little ringed plover (*Chradrius dubius*). Others included coot (*Fulica atra*), grey heron (*Ardea cinerea*), goosander (*Mergus merganser*) and red-breasted merganser (*Mergus serrator)*, and also

Breeding was assessed as possible in most instances with the observation of pairs of birds in suitable habitat.

3.2.3 Possible

A further four species are assessed to be possible breeders within the survey area; great crested grebe (*Podiceps cristatus*), tufted duck (*Aythya fuligula*), and the amber listed redshank (*Tringa totanus*), black-headed gull (*Chroicocephalus ridibundus*) lesser black-backed gull (*Larus fuscus*) and great black-backed gull (*Larus marinus).*

3.3 Observations (Breeding bird survey)

3.3.1 Spatial distribution of notable species (breeding)

The approximate central location of notable breeding territories within the survey are is given in Appendix B.

Schedule 1 Species

- **Little ringed plover** is a summer visitor to Stocks Reservoir and was recorded on all three survey visits, with a maximum count of seven individuals recorded in April. At least two probable breeding territories were identified, including one on the island and one on the shore adjacent to the fly fishing.

Section 41

- **Lapwing** (and Red list) is resident at Stocks Reservoir and was recorded on all three survey visits, with a maximum count of 25 individual recorded in June distributed throughout the northern end of the reservoir including the island and particularly around the Hodder Inlet. Individuals were recorded displaying nesting behaviour such as agitated calls mobbing and display flights, and at least three probable nesting attempts were identified.
- **Herring gull** (and Red list) are a common wintering species at Stocks Reservoir, and some birds can remain to breed. A single pair was recorded in June, where it is likely that a breeding attempt was made on the island.

Amber List Birds of Conservation Concern (BoCC)

- **Greylag goose** are a common resident breeder at Stocks Reservoir with numbers peaking in June and July. Recorded on all three survey visits, this species is one of the most abundant species to frequent the reservoir with a maximum count of approximately 350 individuals recorded in June, forming large flocks towards the northern end of the reservoir. Breeding was confirmed by the observation of recently fledged young.
- **Mallard** are a common resident breeder at Stocks Reservoir, at least seven incidences of breeding were confirmed with observations of recently fledged young on all three survey visits. The reservoir also supports large gatherings of moulting birds and a large over wintering population with numbers growing from July onwards, with 1100 individuals reported from December 2018.
- **Teal** is a common resident species at Stocks Reservoir. A maximum of four individuals (2 pairs) was recorded in May, frequenting bays along the reservoirs western shore. The reservoir also supports a large over wintering population with numbers growing from July onwards, with 500 individuals reported from December 2018.
- **Oystercatcher** are a regular summer visitor and breeding species at Stocks Reservoir. A maximum count of eighteen individuals was recorded in May. Six probable breeding

territories were identified mainly within the northern half of the reservoir. Breeding was confirmed by an active nest located along the reservoir dam at the southern end of the reservoir and with the observation of at least one chick on the island.

- **Common sandpiper** is a regular summer visitor to Stocks reservoir. A maximum of 12 (6 pairs) individuals was recorded in May, distributed around the whole reservoir, and probable nesting occurred at various locations.
- **Black-headed gull** have historically nested in a large colony on the island in the centre of Stocks Reservoir. Numbers of birds within the colony have been dramatically reducing in recent years from a peak of 1200 nests in 2014 and 2015, to 700 in 2016, lowering to 500 in 2017, and falling again to 190 nests in 2018 which were all abandoned in May. A maximum count of 20 birds was recorded in May, but none were present in June. This suggests that the colony has suffered a complete collapse, with 2019 perhaps being the first year when no nesting attempts are recorded. The reservoir continues to support a very large over wintering population, for example 11,000 individuals were recorded in March 2018.
- **Lesser black-backed gull** are a common species at Stocks reservoir, often supporting large numbers of roosting birds and non-breeding birds, however small numbers of birds do breed on the island gull colony. A maximum count of 60 individuals was recorded in May.
- **Great black-backed gull** can be present at Stocks Reservoir in small numbers with records from all months. A maximum count of eight individuals (mainly juvenile/first winter birds) was recorded in April and a single pair was observed in May and June, with breeding suspected on the island.

3.3.2 Spatial distribution of notable species (non-breeding)

- **Black-tailed godwit** (*Limosa limosa)* are regularly recorded in small numbers as passage migrants during spring and autumn. A maximum of four individuals in breeding plumage were recorded in April around the Hodder Inlet at the northern end of the reservoir, this being consistent with the group being passage birds.

3.3.3 Spatial distribution of other species (breeding)

- **Canada goose** are a common resident breeder at Stocks Reservoir with numbers peaking in June and July. Recorded on all three survey visits, this species is one of the most abundant species to frequent the reservoir with a maximum count of approximately 300 individuals recorded in June, forming large flocks comprising of adults and juveniles towards the northern end of the reservoir. Breeding was confirmed by the observation of numerous active nests and recently fledged young.
- **Goosander** are resident at Stocks Reservoir with small numbers being recorded in most months. A single pair was recorded on the eastern side of the reservoir close to Bottoms Beck in May.
- **Red-breasted merganser** are a summer visitor and occasional breeding species at Stocks Reservoir. A maximum count of five individuals (four male and one female) was recorded in May, with a single pair recorded in June towards the northern end of the reservoir. Although green listed in the UK, breeding red-breasted merganser is notable for England.
- **Sand martins** are a common summer visitor to Stocks Reservoir. Breeding is known to occur at a site along the River Hodder upstream of the reservoir. Over 100 individuals were recorded foraging over the reservoir in April, in the area known as New Close Bay on the western side of the reservoir.

3.3.4 Spatial distribution of other species (non-breeding)

- **Little Egret** are a recent addition to the Stocks Reservoir list and have been recorded in small numbers in previous years, mainly during summer months. A maximum of seven individuals was recorded together at the Hodder Inlet in June.
- **Cormorant** are a year-round resident at Stocks Reservoir and are known to roost in trees around the Hodder Inlet and on the island. A maximum count of twelve individuals was recorded in May.

3.4 Overwintering and Migratory Species

3.4.1 Migratory waders

At spring/autumn passage Stocks Reservoir often attracts high numbers of migratory waders. On occasion as many as eleven species of wader have been recorded to be present (on Spring passage) at the same time (East Lancs. Ornithologists Club). Species recorded on passage include:

- Grey plover (*Pluvialis apricaria*);
- Ringed plover (*Charadrius hiaticula*);
- Whimbrel (*Numenius phaeopus*);
- Bar-tailed godwit (*Limosa lapponica*);
- Black-tailed godwit (*Limosa limosa*);
- Turnstone (*Arenaria interpres*)
- Knot (*Calidris canutus*);
- Curlew sandpiper (*Calidris ferruginea*)
- Temminick's stint (*Calidris temminkii*);
- Sanderling (*Calidris alba*);
- Dunlin (*Calidris alpina*);
- Little stint (*Calidris minuta*);
- Pectoral sandpiper (*Calidris melanotos*); and
- Greenshank (*Tringa nebularia*).

3.4.2 Over wintering wildfowl

Up to 30 species of wildfowl can be encountered during an average winter at Stocks Reservoir. Large numbers of common species such as Canada geese, greylag geese, mallard and teal are regularly recorded, see Table 4. Other species recorded in fewer numbers or less frequently include:

- Whooper swan (*Cygnus cygnus*);
- Pink-footed goose (*Anser brachy*rhynchus);
- Barnacle goose (*Branta leucopsis*), (annually returning feral flock);
- Wigeon (*Mareca penelope*);
- Pintail (*Anas acuta*);
- Pochard (*Aythya ferina*);

- Tufted duck (*Aythya fuligula*);
- Long-tailed duck (*Clangula hyemalis*);
- Common scoter (*Melanitta nigra*);
- Goldeneye (*Bucephala clangula*); and
- Red-throated diver (*Gavia stellata*).

3.4.2.1 Winter peak count data (common species)

Table 4: Overwintering wildfowl counts 2016-2018

Species	2016 (Peak Month)	2017 (Peak Month)	2018 (Peak Month)
Greylag goose	242 (Dec)	284 (Dec)	350 (Nov)
Canada goose	240 (Jan)	306 (Jan)	259 (Nov)
Barnacle goose	51 (Jan)	57 (Jan)	50 (Dec)
Wigeon	130 (Jan)	120 (Dec)	71 (Mar)
Teal	432 (Jan)	300 (Jan)	500 (Dec)
Mallard	456 (Dec)	700 (Dec)	1100 (Dec)
Pintail	538 (Jan)	46 (Dec)	17 (Dec)
Pochard	23 (Jan)	11 (Dec)	13 (Dec)
Tufted duck	69 (Jan)	49 (Nov)	48 (Dec)
Goldeneye	15 (Jan)	44 (Dec)	58 (Dec)

Source: Stocks Bird Report 2016-2018 (East Lancashire Ornithologists Club).

4 Conclusions and Recommendations

4.1 Potential Impacts on birds

Only the potential impacts of the works to raise the water level within Stocks Reservoir are discussed in this report and are summarised below.

The potential impacts may include, but are not limited to:

- Disturbance of breeding birds;
- Loss of habitats used for breeding;
- Disturbance of migratory and/or over wintering species;
- Loss and fragmentation of foraging habitat; and
- Incidental mortality.

The resulting effects may include:

- A reduction in species richness and/or abundance;
- Displacement of birds from areas used for breeding;
- Displacement of over wintering/migratory birds;
- Displacement of birds from areas used for foraging; and
- Reduced productivity

4.1.1 Disturbance of breeding birds

Depending on the scale, nature and the time of year at which they occur, the construction works to raise the overflow weir in Stocks Impounding Reservoir could potentially lead to the disturbance of nesting birds, in particular the Schedule 1 listed little ringed plover, if these are nesting near to the works.

Disturbance of this species when nesting or with dependent young would be an offence under the Wildlife and Countryside Act 1981 (as amended).

For this and other species, extended disturbance can have an adverse impact on the fitness of individuals, and thereby negatively impacting a population over a period of time if alternative sites are not available. Extended disturbance may also cause adult species to abandon their nest sites and, or dependant young, thus leading to increased mortality.

4.1.2 Loss of habitats used for breeding

The levels of water within Stocks Reservoir can fluctuate widely through the course of any ‘normal’ year, experiencing a draw-down of water levels during spring and summer months and re-filling during autumn and winter. The proposed works aim to increase the capacity of Stocks Reservoir by raising the level of the overflow weir by 300mm which will give a top water level of 180.87m above ordinance datum (mAOD). It is likely that the new water level will only be achieved in winter months, where inundation of low-lying areas will have no negative impacts upon breeding waterbirds.

Assuming that the new maximum water level is achieved regularly, this will presumably lead to less draw-down in spring and summer months, leading to the exposure of less substrates attractive to some species of nesting bird and potentially leading to the localised loss or

displacement of some species. For example, Lapwing are known to have greater breeding success during dry years when the reservoir experiences greater levels of draw-down exposing large areas of suitable nesting habitat for this species.

It is likely, however, that lapwing and the other species breeding around the periphery of Stocks Reservoir will adapt to any changes in water levels during the bird breeding season, as they presumably do currently due to the existing fluctuations in water levels from one year to the next. It is also possible that less summer draw down may be advantageous to some species, for example great crested grebe, which are known for failed breeding attempts during dry years, where water levels drop to levels unable to support emergent vegetation relied upon by this species for successful nest building.

4.1.3 Disturbance of over wintering/migratory species

The works are scheduled to be undertaken during summer months and are not anticipated to affect migratory or overwintering species.

4.1.4 Loss and fragmentation of foraging habitat

A possible reduction in summer draw down (as discussed previously) could potentially lead to the loss and/or fragmentation of foraging habitat, not only for resident/breeding species, but also for passage migrants.

Assuming that the new maximum water level is achieved regularly, this will presumably lead to less draw-down in spring and summer months, leading to the exposure of less substrates, i.e. mud, attractive to some species of waders. For example, at spring passage as many as eleven species of wader have been recorded to be present at the same time. The number of passage waders is affected by the amount of drawdown and hence exposed mud. (East Lancashire Ornithologists Club).

It is likely, however, that over extended time periods, the newly inundated land may take the form of the current habitat, balancing the loss of inundated areas. Presumably water levels will continue to fluctuate as they do currently, with some years exposing more or less mud substrates as the next, presumably the numbers of migrant waders will continue to fluctuate accordingly.

4.1.5 Incidental mortality

Depending on the scale, nature and the time of year at which they occur, the construction works to raise the overflow weir in Stocks Impounding Reservoir could potentially damage/harm active birds' nests/chicks/fledglings if present within the working zones. For example, an active oystercatcher nest was identified along the dam structure potentially within the zone of influence of future works, and where there is an increased chance of this species or others being present during the works (if undertaken during the breeding season).

4.2 Mitigation

Recommendations for mitigation are given below.

4.2.1 Disturbance of breeding birds

As the works to raise the overflow weir are scheduled to be undertaken during summer months, suitable nesting habitat should be checked immediately prior to commencement of the works by

an ecologist (no more than 48 hours) in order to confirm no nesting and/or dependent birds are present. Should an active nest or dependant fledgling of a Schedule 1 species be found (e.g. little ringed plover), works must be postponed or undertaken outside a distance which could cause disturbance, until it has been confirmed through robust monitoring that any young birds have completely fledged and become independent.

To minimise noise from construction and associated activities, measures will be implemented in accordance with BS 5228-1:2009+A1:2014 'Code of practice for noise and vibration control on construction and open sites.

4.2.2 Loss of breeding habitat and damage to active bird nests

Drawdown and refilling of reservoir

Although no impacts are anticipated from the increase in water levels, with the reservoir only anticipated to reach it new maximum during winter months. Likewise, the reservoirs natural spring/summer drawdown occurs at a rate where nesting waterbirds on the whole are able to adapt to. However, the eventual 're-filling' of the reservoir has the potential to damage and/or destroy active birds' nests if established on exposed substrates (through flooding) which would constitute an offence under the Wildlife and Countryside Act 1981 (as amended). It is therefore recommended that refilling of the reservoir is planned to be undertaken outside of the main bird breeding season (September to February) (Natural England, 2015). If it is preferable to refill the reservoir during the breeding season, suitable nesting habitat upon the exposed reservoir substrates should be checked immediately prior (no more than 48 hours) in order to confirm no nesting birds are present. Should an active nest(s) be found, refilling of the reservoir must be delayed until all young birds have fledged.

4.2.3 Incidental mortality (Damage and/or Destruction of Active Birds' Nests)

Construction activities have the potential to damage and/or destroy active birds' nest which would constitute an offence under the Wildlife and Countryside Act 1981 (as amended).

Suitable nesting habitat should be checked immediately prior by an ecologist (no more than 48 hours) in order to confirm no nesting birds are present. Should an active nest be found, an exclusion area around the nest site should be established and works within that area ceased until all young birds are fledged.

4.3 Possible Enhancements

The following enhancement measures are recommended. The implementation of some or all of these measures will be required to provide net gains to biodiversity as required under the NPPF 2018.

- Potential enhancement for breeding birds such as clearance of scrub on the islands to increase the habitat available for breeding birds and plant with soft rush *Juncus effusus*.
- Installation of bunds to create a permanent wetland for migratory and wintering birds to the north of the reservoir.
- Installation of stock fencing on the island to stop Canada geese *Branta canadensis* accessing certain areas to increase the survival rate of other breeding birds.

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Appendices

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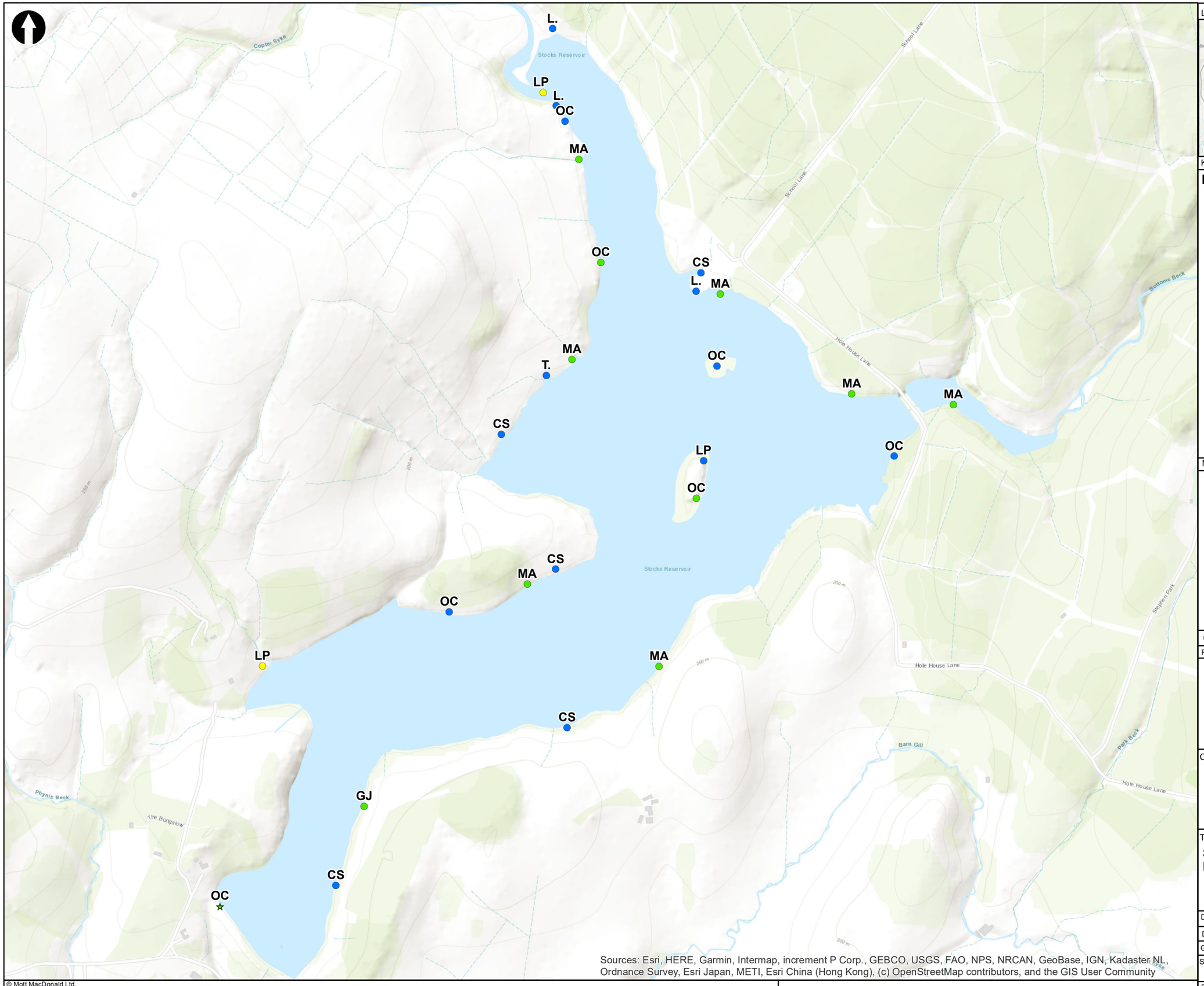
A. Species List

Table A1: Species Recorded During Survey Visits

British Vernacular Name	Scientific Name	Schedule 1	Section 41	Birds of Conservation Concern	Breeding Evidence
Canada goose	*Branta canadensis*			Green	Confirmed
Greylag goose	*Anser anser*			Amber	Confirmed
Mallard	*Anas platyrhynchos*			Amber	Confirmed
Teal	*Anas crecca*			Amber	Probable
Tufted duck	*Aythya fuligula*			Green	Possible
Goosander	*Mergus merganser*			Green	Probable
Red-breasted merganser	*Mergus serrator*			Green	Probable
Great crested grebe	*Podiceps cristatus*			Green	Possible
Grey heron	*Ardea cinerea*			Green	Probable
Little egret	*Egretta garzetta*			Green	Non-breeder
Cormorant	*Phalacrocorax carbo*			Green	Non-breeder
Moorhen	*Gallinula chloropus*			Green	Confirmed
Coot	*Fulica atra*			Green	Probable
Oystercatcher	*Haematopus ostralegus*			Amber	Confirmed
Lapwing	*Vanellus vanellus*		x	Red	Probable
Little ringed plover	*Charadrius dubius*	x		Green	Probable
Black-tailed godwit	*Limosa lapponica*		x	Red	Non-breeder/Migrant
Common Sandpiper	*Actitis hypoleucos*			Amber	Probable
Redshank	*Tringa totanus*			Amber	Possible
Black-headed Gull	*Chroicocephalus ridibundus*			Amber	No Evidence
Great black-backed gull	*Larus marinus*			Amber	Non-breeder
Herring gull	*Larus argentatus*		x	Red	Probable
Lesser Black-backed Gull	*Larus fuscus*			Amber	No Evidence
Sand martin	*Riparia riparia*			Green	Confirmed

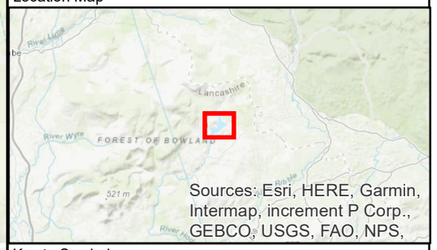
B. Distribution of Notable Breeding Birds



Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

0 0.25 0.5 Km

Location Map



Key to Symbols

Breeding Status

- ★ Confirmed nest location
- Confirmed breeding (unknown location)
- Probable breeding
- Possible breeding

CS - Common Sandpiper
GJ - Greylag Goose
L. - Lapwing
LP - Little Ringed Plover
MA - Mallard
OC - Oystercatcher
T. - Teal

Notes

Rev	Date	Drawn	Description	Ch'k'd	App'd
01	29/07/19	RC	For Information	RC	RF

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Title

Stocks Reservoir BBS
Distribution of notable breeding birds

Designed	R. Carmichael		Eng Check	R. Clisham	
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GIS Check	J. Irons		Approved	R. Forrester	

Scale at A3	Status	Rev	Security
1:10,000	FI	01	STD

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