

# WILD FRONTIER ECOLOGY

Upper Nene Valley Gravel Pits SPA



**Bird Disturbance Study**

March 2023

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The data which we have prepared and provided is accurate, and has been prepared and provided in accordance with the CIEEM's Code of Professional Conduct. We confirm that any opinions expressed are our best and professional bona fide opinions.



This report conforms to the British Standard 42020:2013 Biodiversity - Code of practice for planning and development.

- 1. Non-technical Summary ..... 3
- 2. Background ..... 5
- 3. Relevant Legislation and Policy ..... 9
- 4. Methods ..... 13
- 5. Results ..... 27
- 6. Summary of Key Findings..... 104
- 7. Recommendations ..... 112
- 8. Constraints ..... 114
- 9. Conclusion ..... 115
- 10. Acknowledgements ..... 116
- Appendix 1. Photographs..... 117
- Appendix 2. Survey Details ..... 132



## 1. Non-technical Summary

1. Wild Frontier Ecology Ltd. (WFE) was commissioned by three local planning authorities (West Northamptonshire Council, North Northamptonshire Council and Bedford Borough Council) to undertake a disturbance study on seven gravel pit sites in the Upper Nene Valley Gravel Pits (UNVGP) Special Protection Area (SPA), formally classified in 2011. The SPA is designated for wintering bird species and a waterbird assemblage numbering over 20,000 individuals. Bittern, coot, cormorant, gadwall, golden plover, great-crested grebe, lapwing, mallard, mute swan, pochard, shoveler, tufted duck and wigeon are the qualifying features of the waterbird assemblage and the SPA. These were defined as key species within the study. A Visitor Access Study has also been undertaken by Footprint Ecology.
2. Growth is expected across Northamptonshire over the next 20 years. Both North and West Northamptonshire Local Plans are currently being prepared and more information about the level and location of growth will become more definite over the next year or so. It is likely that the growth will add to the recreational pressure on the SPA. Natural England (NE) recognises this and proposed this study to look at the current impacts on the qualifying features of the SPA.
3. The study monitored seven locations; water bodies at Clifford Hills Gravel Pits (Unit 1), Earls Barton West (Unit 2), Earls Barton Central (Unit 3), Ditchford East (Unit 5), Stanwick Lakes (Unit 6), Ringstead Gravel Pits (Unit 7) and Thrapston (Unit 8). Surveys took place between January to March 2022 and October to December 2022 at the seven sites. Human disturbance on wintering birds has been well studied in the UK and it has been shown that disturbance can have detrimental impacts on bird species. Vantage Point surveys were carried out to assess any impacts from usage of the seven sites. These involved recording human activities on the site and birds' responses to the disturbance.
4. Human usage of each location, access routes, winter bird numbers and levels of disturbance caused by each activity to the qualifying features of the SPA were studied. The usage of sites on weekdays and weekends, and different times of day, were compared.
5. Walkers with and without dogs were the most frequent users at the five publicly accessible locations. Unit 5 was found to have the highest levels of recreational site usage and also held relatively high numbers of wintering waterfowl. However, screening by vegetation of most of the lakes from paths, habituation of the birds and the separation distances from the footpaths where certain key species were foraging/loafing meant this site is not under major pressure from recreation. This has also been found to be the case at Units 6 and 7 where numbers of key species are also relatively high.
6. High levels of recreational site usage were also recorded at Unit 1, where there is an open basin without screening from vegetation, where site users were recorded using routes off the main circular path, and closer to the waterbody. This site is therefore considered to be under the greatest pressure from recreational activities.
7. Wildfowling was also recorded at Unit 1 on four occasions and is a regular occurrence at this site over winter. This activity caused severe disturbance on every occasion, leading to major impacts to key species.
8. Unit 3 was also shown to have high levels of recreational activities, mainly dog walking and walking. However, the numbers of key bird species present here were the lowest recorded out of the seven sites. Low numbers of key species were also





recorded at Unit 2 and Unit 8 which are both private sites. Unit 2 includes Grendon Lakes which is used for functions such as wedding fairs. Disturbance from water-skiing was recorded at Unit 2. Unit 8 includes two fisheries with activity by anglers causing the highest level of disturbance at this site.

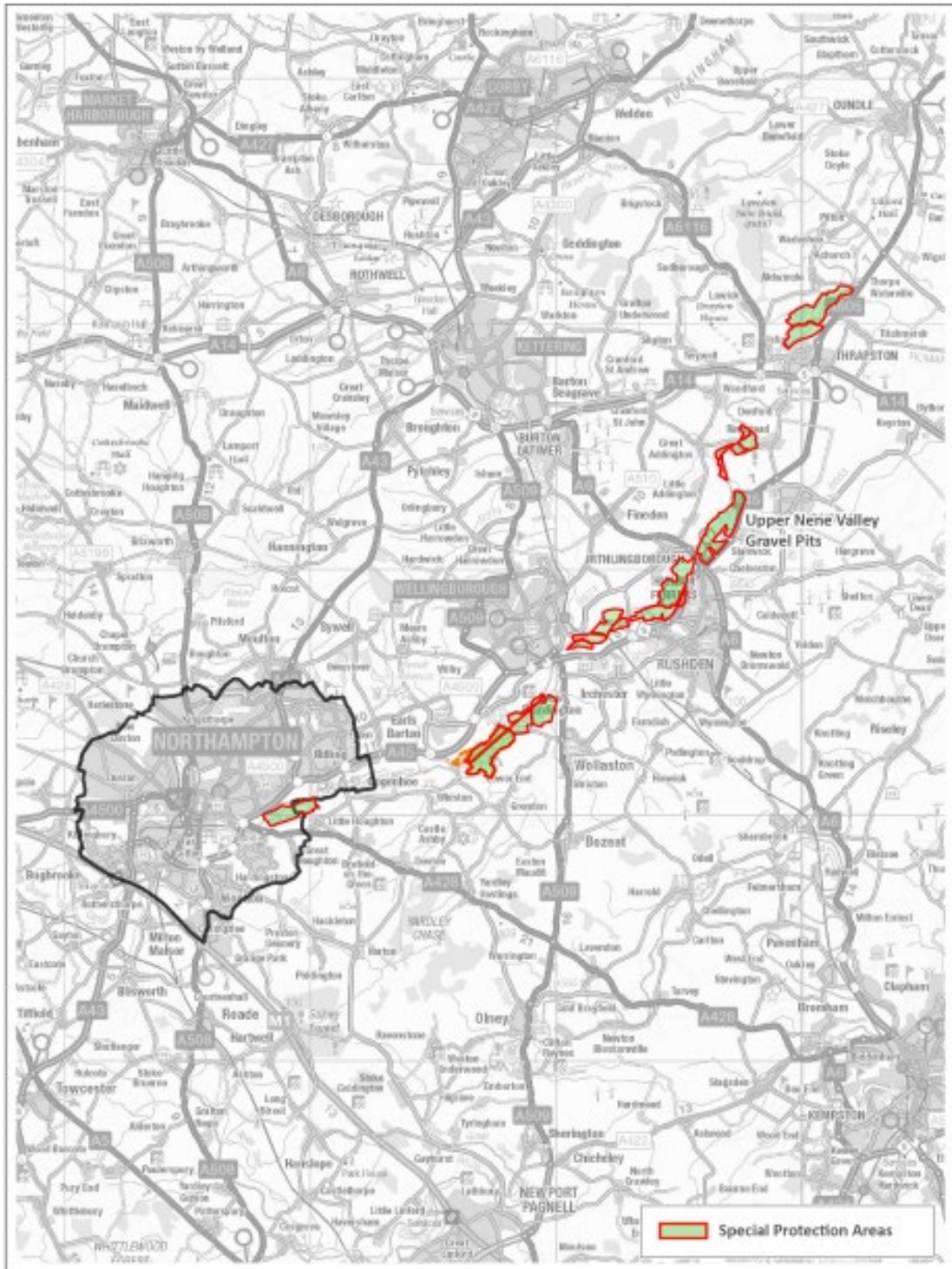
9. Recommendations to mitigate adverse effects include having dogs on leads; especially in areas where birds are more likely to be disturbed. Any site users would be advised to act responsibly when near wildlife, and signage is advised to inform the public on sensitive areas and ensure dogs are on leads. Discussion with site owners/managers throughout the SPA is also advised to explore opportunities for disturbance reduction, particularly at sites where there is a legacy of pre-designation activities.
10. Site specific measures are also advised, particularly at Unit 1 with several proposed methods in the form of additional signage, personnel on site acting as rangers to encourage responsible use and barriers across unofficial paths to prevent the public entering the basin to reduce impacts of disturbance to key species and to the SPA.



## 2. Background

11. West Northamptonshire Council, North Northamptonshire Council and Bedford Borough Council commissioned Wild Frontier Ecology (WFE) to carry out a disturbance study of wintering water birds in the Upper Nene Valley Gravel Pits (UNVGP) Special Protection Area (SPA) (see Figure 1). The tender stated:
12. *“The Upper Nene Valley Gravel Pits SPA (UNVGP SPA) is a chain of disused gravel pits stretching for 35km between Northampton and Thrapston. The SPA was designated in 2011 and is of European importance for its populations of wintering waterbirds, including golden plover, gadwall, bittern, cormorant, tufted duck, pochard, great-crested grebe, mallard, mute swan, coot, wigeon, lapwing, and shoveler.*
13. *The Nene Valley is also a key visitor destination both for tourists and local residents; development and tourism proposals will lead to increasing numbers of people visiting the area and there is a need to ensure that people can visit the Valley without causing disturbance to wintering birds.*
14. *The majority of the SPA was judged to be in favourable condition when designated. However only 40% is currently in favourable condition (as assessed by Natural England against the site’s conservation objectives) and Natural England identify the whole site as being “at risk” from increasing levels of recreation disturbance. A 2014 study identified visitor access and activity patterns, to provide evidence for the North Northamptonshire Joint Core Strategy 2011-2031. Since then many new homes have been built, and visitor activity information is required to support strategic planning in North Northamptonshire, West Northamptonshire and Bedford Borough Councils.*
15. In addition to visitor access, the effects of recreational pressure on many sites within the SPA are already well known. However there are a number of locations where the effects of recreational pressure are not well understood. To fill this evidence gap, disturbance surveys are required at seven locations within the UNVGP SPA.”

**Figure 1:** Location and Boundary of Upper Nene Valley Gravel Pits SPA (as provided by client)



### Upper Nene Valley Gravel Pits Special Protection Area

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## 2.1 Human Disturbance

17. Disturbance can be defined as the influence on a bird's behaviour or survival, caused by human activity or the presence of humans in the environment. There is a broad range of studies which have reviewed the effects of disturbance across a range of species<sup>1,2</sup>; demonstrating a range of impacts in different circumstances to different species. There is growing evidence that human disturbance is a major contributing factor linked to population declines across a variety of European bird species<sup>3</sup>.
18. The majority of studies to date have focused on the behavioural effects demonstrated during a disturbance event such as birds taking flight<sup>4</sup>, changing their foraging behavior or being more vigilant<sup>5</sup>. While a few have analysed the physiological impacts, such as changing levels of stress hormones or heart rate. However, quantifying the extent to which disturbance can impact upon the population size of a given species remains a challenge<sup>6</sup>.
19. Where disturbance is observed or suspected, there is often a lack of clarity about whether the type or level of disturbance is significant enough to cause an effect on the integrity of an SPA or SAC. It can therefore be unclear in some cases whether remedial action is required. Where mitigation measures have been introduced to reduce disturbance levels, the success of the mitigation is sometimes unknown, as the significance of impacts of ongoing observed disturbance has remained unclear due to a lack of post-intervention monitoring. A lack of accurate pre-intervention data can also hinder the future successful management of a given site.
20. A critical issue for UK nature conservation is how to accommodate increasing pressure for new homes and developments without compromising the integrity of protected sites. Increased access and recreational disturbances are relevant issues associated with new developments. The issues are not, however, straightforward. Access to the countryside is often thought to be crucial to the long-term success of nature conservation projects, with wider benefits (often termed 'ecosystem services') such as increased awareness, health and wellbeing<sup>7</sup>. Meanwhile nature conservation bodies and government policies are encouraging people to spend more time outside. Additionally, access to many sites is a legal right with open access and an extensive Public Rights of Way network. On some of the UNVGP sites, wintering or breeding SPA bird numbers are lower than expected and public access-related disturbance is one of a number of possible reasons behind this. Balancing recreational demands and nature conservation is therefore increasingly a challenge on many UK sites.

<sup>1</sup> Woodfield, E. & Langston, R. (2004) Literature Review on the Impact of Bird Populations of Disturbance Due to Human Access on Foot. *Royal Society for the Protection of Birds, Sandy, Beds.*

<sup>2</sup> Lowen, J., Liley, D., Underhill-Day, J. & Whitehouse, A.T. (2008) Access and Nature Conservation Reconciliation: Supplementary Guidance for England

<sup>3</sup> Møller, A.P. (2008) Flight Distance and Population Trends in European Breeding Birds. *Behavioural Ecology*, **19**, 1095-1102.

<sup>4</sup> Thomas, N.S., Caldow, R.W.G., McGrorty, S., Le V. dit Durell, S.E.A., West, A.D. & Stillman, R.A. (2004) *Bird Invertebrate Prey Availability in Poole Harbour.*

<sup>5</sup> Randler, C. (2006) Disturbances by Dog Barking Increase Vigilance in Coots *Fulica Atra*. *European Journal of Wildlife Research*, **52**, 265-270.

<sup>6</sup> Weimerskirch, H., Shaffer, S.A., Mabile, G., Martin, J., Boutard, O. & Rouanet, J.L. (2002) Heart Rate and Energy Expenditure of Incubating Wandering Albatrosses: Basal Levels, Natural Variation, and the Effects of Human Disturbance. *J Exp Biol*, **205**, 475-83.

<sup>7</sup> Firbank, L., Bradbury, R.B., McCracken, D.I. & Stoate, C. (2013) Delivering multiple ecosystem services from Enclosed Farmland in the UK. *Agriculture, Ecosystems & Environment*, **166**, 65-75.

## 2.2 Upper Nene Valley Gravel Pits

21. The Upper Nene Valley Gravel Pits SPA/Ramsar site is legally protected by the Conservation of Habitats and Species Regulations 2017 (the 'Habitats Regulations'). Growth is expected across Northamptonshire over the next 20 years. Both North and West Northamptonshire Local Plans are currently being prepared and more information about the level and location of growth will become more definite over the next year or so. It is likely that the growth will add to the recreational pressure on the SPA. This will generate particular pressure on the SPA<sup>8</sup>, even if the developments are well outside the boundary of the site, as growing numbers of people will seek recreation opportunities and public access. This negative pressure has been recognised by Natural England, who consider the Upper Nene Gravel Pits SPA to be 'at risk' from increasing recreational disturbance. Therefore, a careful balancing act is required to cater for this increased recreational demand without compromising the integrity of this SPA.

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<sup>8</sup> Coyle, M. & Wiggins, S. (2010) *European Marine Site Risk Review*. Natural England Research Report, Natural England.

### 3. Relevant Legislation and Policy

#### 3.1 Statutory and Non-statutory Site Designations

22. The sites under consideration in this report are as follows:

##### 3.1.1 Upper Nene Valley Gravel Pits SPA

23. The Upper Nene Valley Gravel Pits qualifies under **Article 4.1** of the European Wild Birds Directive (2009/147/EEC) by supporting populations of European importance. This Directive has been transposed into UK legislation by the Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019. This covers the following:

- Bittern *Botaurus stellaris*

24. Internationally important numbers of this species winter in the Upper Nene Valley Gravel Pits which was 2.0% of the total British wintering population when the SPA was classified in 2011<sup>9</sup>.

- Golden plover *Pluvialis apricaria*

25. The site supports internationally important numbers of golden plover during the winter months and when the SPA was classified this represented 2.3% of the North-western European population<sup>9</sup>.

- Gadwall *Mareca strepera*

26. In 2011, 2% of the North-western Europe population of this species winter in the SPA. This is internationally important numbers<sup>9</sup>.

- An assemblage of 20,000 wintering waterbirds<sup>9</sup>

27. The following species are within this assemblage as they either winter in nationally important numbers or Nene Valley numbers are 2000 individuals or more:

- Wigeon *Mareca penelope*
- Mallard *Anas platyrhynchos*
- Shoveler *Spatula clypeata*
- Pochard *Aythya ferina*
- Tufted duck *Aythya fuligula*
- Great-crested grebe *Podiceps cristatus*
- Mute swan *Cygnus olor*
- Cormorant *Phalacrocorax carbo*
- Coot *Fulica atra*

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<sup>9</sup> Available at Upper Nene Valley Gravel Pits SPA Conservation Objectives Supplementary Advice, <http://publications.naturalengland.org.uk/publication/5495529882517504> (Accessed 11th January 2023)





- Lapwing *Vanellus vanellus*

### 3.1.2 Site of Special Scientific Interest

28. The Upper Nene Valley Gravel Pits is also designated as a Site of Special Scientific Interest (SSSI) of which all qualifying features of the SPA are also classified under.

### 3.1.3 Upper Nene Valley Gravel Pits Ramsar Site

29. The Upper Nene Valley Gravel Pits is designated under the Ramsar Convention. Gadwall qualifies for this outright and the 20,000-waterbird assemblage comes under this level of protection.

## 3.2 Species Designation and Protection

### 3.2.1 Bittern

30. Bittern is protected under Schedule 1 (Part 1) of the UK Wildlife and Countryside Act 1981 as well as Annex II/1 of the Wild Bird Directive as has been transposed into UK legislation by the Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019. It is Amber-listed as a Species of Conservation Concern in Britain.

31. Bittern is a qualifying feature of the UNVGP SPA.

### 3.2.2 Coot

32. Coot is protected under Schedule 2 (Part 1) and Schedule 3 (Part 3) of the UK Wildlife and Countryside Act 1981 as well as Annex II/1 and Annex III/2 of the Wild Bird Directive as has been transposed into UK legislation by the Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019. It is Green-listed as a Species of Conservation Concern in Britain.

33. Coot is a qualifying feature of the UNVGP SPA.

### 3.2.3 Cormorant

34. Cormorant is protected under Schedule 2 (Part 1) and Schedule 3 (Part 3) of the UK Wildlife and Countryside Act 1981 as well as Annex II/1 and Annex III/2 of the Wild Bird Directive as has been transposed into UK legislation by the Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019. It is Green-listed as a Species of Conservation Concern in Britain.

35. Cormorant is a qualifying feature of the UNVGP SPA.

### 3.2.4 Gadwall

36. Gadwall is protected under Schedule 2 (Part 1) and Schedule 3 (Part 3) of the UK Wildlife and Countryside Act 1981 as well as Annex II/1 and Annex III/2 of the Wild Bird Directive as has been transposed into UK legislation by the Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019. It is also Amber-listed as a Species of Conservation Concern in Britain, with the UK hosting 20-30% of the European non-breeding population and is listed as a Species of European Conservation Concern (SPEC 3).

37. Gadwall is a qualifying feature of the UNVGP SPA.





### 3.2.5 Golden Plover

38. Golden Plover is protected under Schedule 2 (Part 1) and Schedule 3 (Part 3) of the UK Wildlife and Countryside Act 1981 as well as Annex II/1 and Annex III/2 of the Wild Bird Directive as has been transposed into UK legislation by the Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019. It is Green-listed as a Species of Conservation Concern in Britain.

39. Golden plover is a qualifying feature of the UNVGP SPA.

### 3.2.6 Great crested grebe

40. Great crested grebe is afforded general protection under the UK Wildlife and Countryside Act 1981 and is Green-listed as a Species of Conservation Concern in Britain.

41. Great crested grebe is a qualifying feature of the UNVGP SPA.

### 3.2.7 Lapwing

42. Lapwing is protected under Schedule 2 (Part 1) and Schedule 3 (Part 3) of the UK Wildlife and Countryside Act 1981 as well as Annex II/2 of the Wild Bird Directive as has been transposed into UK legislation by the Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019. It is also Red-listed as a Species of Conservation Concern in Britain.

43. Lapwing is a qualifying feature of the UNVGP SPA.

### 3.2.8 Mallard

44. Mallard is protected under Schedule 2 (Part 1) of the UK Wildlife and Countryside Act 1981 as well as the Annex II/1 and Annex III/2 of the Wild Bird Directive as has been transposed into UK legislation by the Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019. Mallard is Amber-listed as a Species of Conservation Concern in Britain.

45. Mallard is a qualifying feature of the UNVGP SPA.

### 3.2.9 Mute swan

46. Mute swan is Green-listed as a Species of Conservation Concern in Britain, with the UK hosting 20-30% of the European non-breeding population.

47. Mute swan is a qualifying feature of the UNVGP SPA.

### 3.2.10 Pochard

48. Pochard is protected under Schedule 2 (Part 1) and Schedule 3 (Part 3) of the UK Wildlife and Countryside Act 1981 as well as the Annex II/1 and Annex III/2 of the Wild Bird Directive as has been transposed into UK legislation by the Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019. Pochard is ed-listed as a Species of Conservation Concern in Britain and is also listed as Vulnerable on the International Union for Conservation of Nature (IUCN) Red List of Threatened Species in 2021.

49. Pochard is a qualifying feature of the UNVGP SPA.

### 3.2.11 Shoveler



50. Shoveler is protected under Schedule 2 (Part 1) and Schedule 3 (Part 3) of the UK Wildlife and Countryside Act 1981 as well as Annex II/1 and Annex III/2 of the Wild Bird Directive as has been transposed into UK legislation by the Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019. It is also Amber-listed as a Species of Conservation Concern in Britain, with the UK hosting 30-40% of the European non-breeding population.

51. Shoveler is a qualifying feature of the UNVGP SPA.

#### 3.2.12 Tufted duck

52. Tufted duck is protected under Schedule 2 (Part 1) and Schedule 3 (Part 3) of the UK Wildlife and Countryside Act 1981 as well as Annex II/1 and Annex III/2 of the Wild Bird Directive as has been transposed into UK legislation by the Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019. Tufted duck is Green-listed as a Species of Conservation Concern in Britain.

53. Tufted duck is a qualifying feature of the UNVGP SPA.

#### 3.2.13 Wigeon

54. Wigeon is protected under Schedule 2 (Part 1) and Schedule 3 (Part 3) of the UK Wildlife and Countryside Act 1981 as well as Annex II/1 and Annex III/2 of the Wild Bird Directive as has been transposed into UK legislation by the Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019. It is also Amber-listed as a Species of Conservation Concern in Britain, with 50-60% of the UK non-breeding population being localised to less than 10 sites.

55. Wigeon is a qualifying feature of the UNVGP SPA.

#### 3.2.14 Further Relevant Legislation

56. Section 28 of the Wildlife and Countryside Act (1981) outlines the following regards persistent offenders causing intentional or reckless disturbance to the qualifying features above:

57. “(6) A person (other than a section 28G authority acting in the exercise of its functions) who without reasonable excuse—

- (a) intentionally or recklessly destroys or damages any of the flora, fauna, or geological or physiographical features by reason of which land is of special interest, or intentionally or recklessly disturbs any of those fauna, and
- (b) knew that what he destroyed, damaged or disturbed was within a site of special scientific interest, is guilty of an offence and is liable [F8 on summary conviction, or on conviction on indictment, to a fine].

58. [F9(6A) A person (other than a section 28G authority acting in the exercise of its functions) who without reasonable excuse—

- (c) intentionally or recklessly destroys or damages any of the flora, fauna, or geological or physiographical features by reason of which a site of special scientific interest is of special interest, or
- (d) intentionally or recklessly disturbs any of those fauna, is guilty of an offence and is liable on summary conviction to a fine not exceeding level 4 on the standard scale.]”



## 4. Methods

### 4.1 Field Surveys

59. Field survey work was designed to collect data on the following:

- Human activity levels
- Standardised bird count data at the survey locations
- Behavioural observations reflecting the response of birds to human activity

60. The approach to the surveys was agreed and confirmed with the Local Planning Authorities (West Northamptonshire Council, North Northamptonshire Council and Bedford Borough Council).

61. Detailed observations of birds and their responses to disturbance were collected at seven locations (shown in Figure 2.1):

- Unit 1 (Clifford Hills Gravel Pits) Lake D1
- Unit 2 (Earls Barton West) Lake G7
- Unit 3 (Earls Barton Central) Lakes H9 and H10
- Unit 5 (Ditchford East) Lakes L2, L13 and L16 (western half only)
- Unit 6 (Stanwick Lakes) Lakes M11, M16, M21 and M23
- Unit 7 (Ringstead Gravel Pits) Lake N5
- Unit 8 (Thrapston and Titchmarsh) Lakes P5 and P9

62. Unit 1 is located with the boundary of West Northamptonshire Council. All other Units are within the boundary of North Northamptonshire Council.

63. All Units were surveyed twice per month between January and March 2022 inclusive, and from October to December 2022. All surveys were completed by suitably experienced ornithologists: Andrew MacKay (AM), Dr Ben Croxtall PhD MChem (Hons) (BC), Chris Green BSc (CG), Dave Farrow (DF), Graham Riley BSc ACIEEM (GR), Lucy Hadingham MSci (LH), Ptolemy McKinnon BSc MSc (PM), Philip Farndon BSc (PF), Richard Taylor (RT), Robert Bullock (RB) and Robert Yaxley BSc (Hons) CEcol CEnv MCIEEM (RY). The surveyors used suitable optics including binoculars and telescope to aid their visual identification of birds.

64. Each survey location had three vantage points, which were visited 12 times throughout the survey period for two hours at a time. The number of visits was split between weekdays and weekends (7 weekday and 5 weekend surveys) at all sites except Unit 2. Weekday and weekend surveys were split equally at Unit 2 with an aim to gather more data on activities at weekends occurring at Grendon Lakes, which is a venue for occasions such as wedding fairs and does not have public footpath access. Surveys were also undertaken at varying times of the day to reflect the average recreational site use throughout the week and across the winter period.

65. The vantage points and focal areas for each survey location can be viewed in Figures 2.2 to 2.8. Each has a buffer displaying 100m zones which each surveyor could use to judge distances.



66. Vantage points were approached carefully and once set up, bird species and disturbances were recorded. Focal areas for each survey encompassed as great a viewable area of water as possible within a 500m arc from the Vantage Point. Other studies have used a 500m radius from the Vantage Point as the maximum distance at which surveyors could confidently count birds<sup>10</sup>, reliably estimate the distance between the birds and disturbance sources and record human activity levels. Photos of Vantage Point locations are shown in Appendix 1 and survey schedule is shown in Appendix 2.

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<sup>10</sup> Ross, K. & Liley, D. (2014) Humber Winter Bird Disturbance Study. *Humber Management Scheme / Footprint Ecology*.



Figure 2.1: Upper Nene Valley Gravel Pits SPA Unit Locations

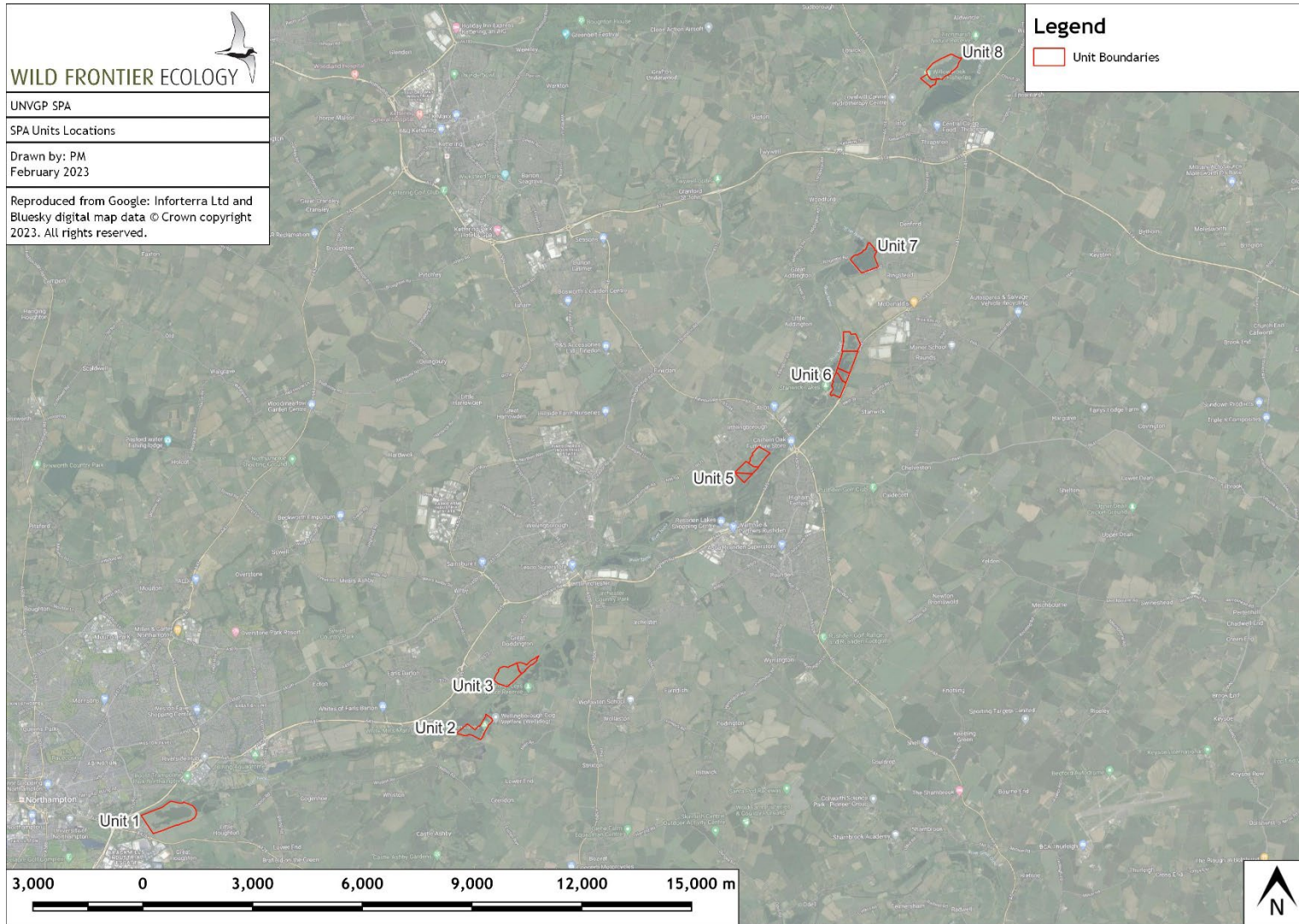




Figure 2.2: Unit 1 Vantage Point Locations (Lake D1)

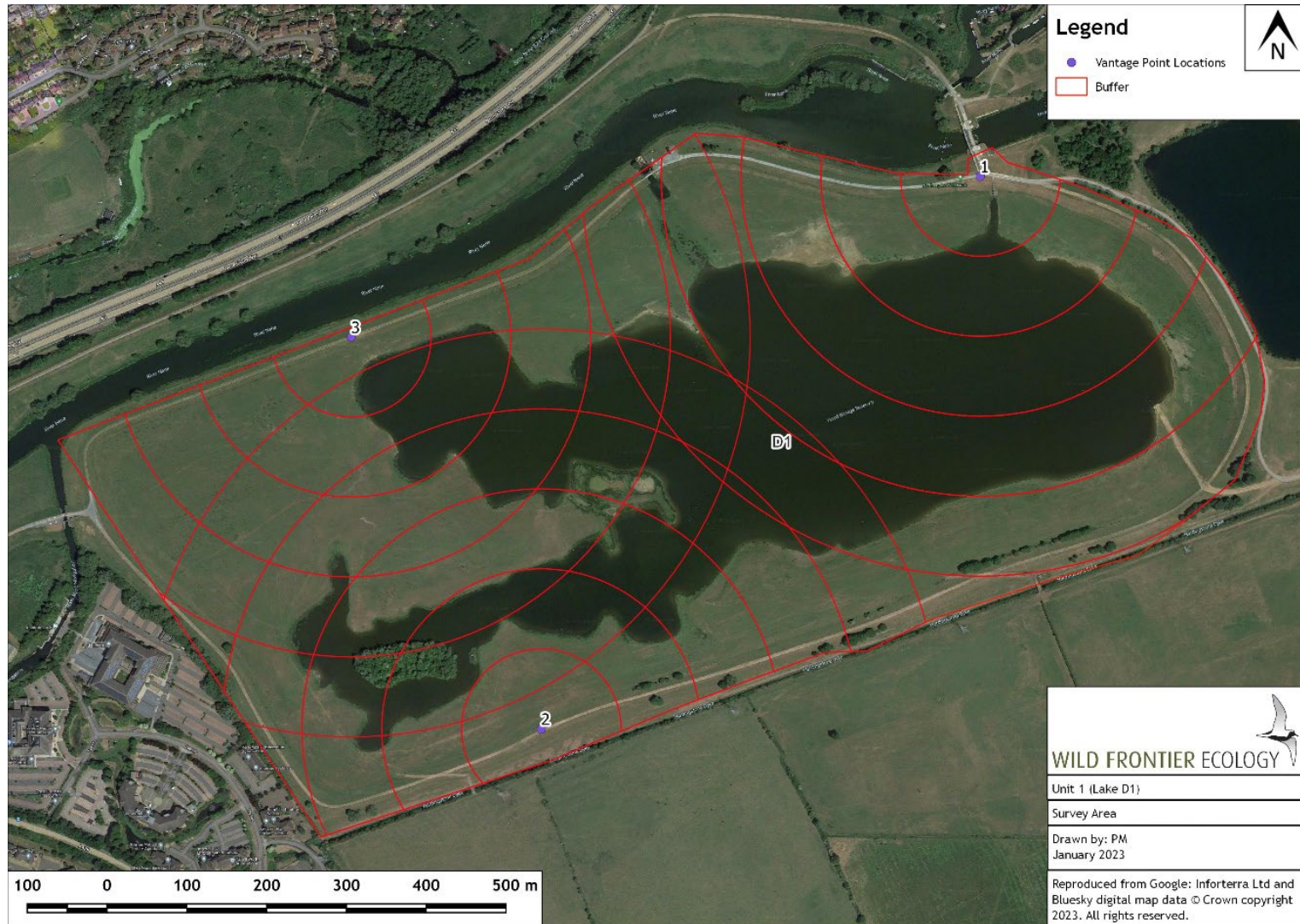




Figure 2.3: Unit 2 Vantage Point Locations at Lake G7

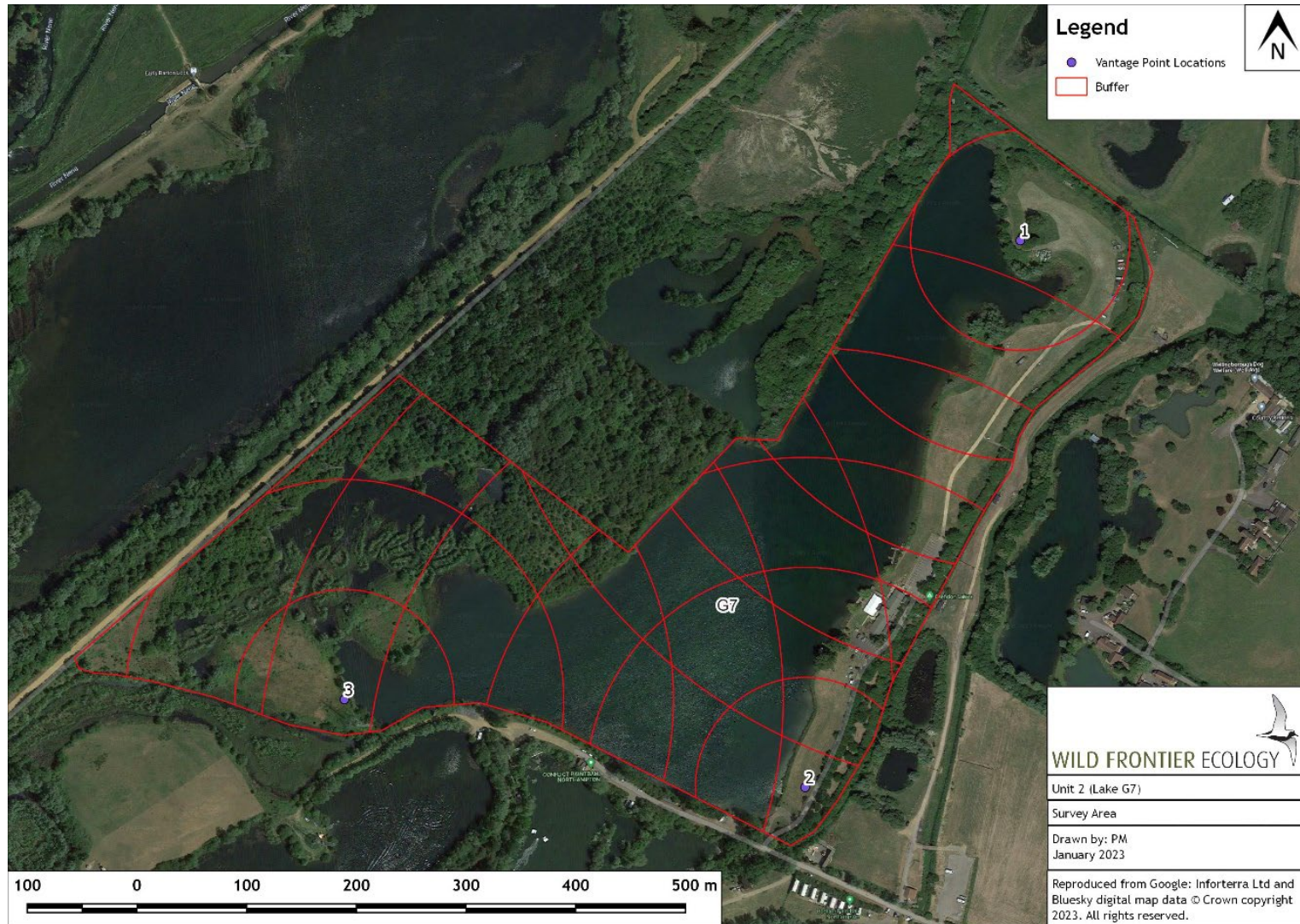




Figure 2.4: Unit 3 Vantage Point Locations at Lakes H9 and H10

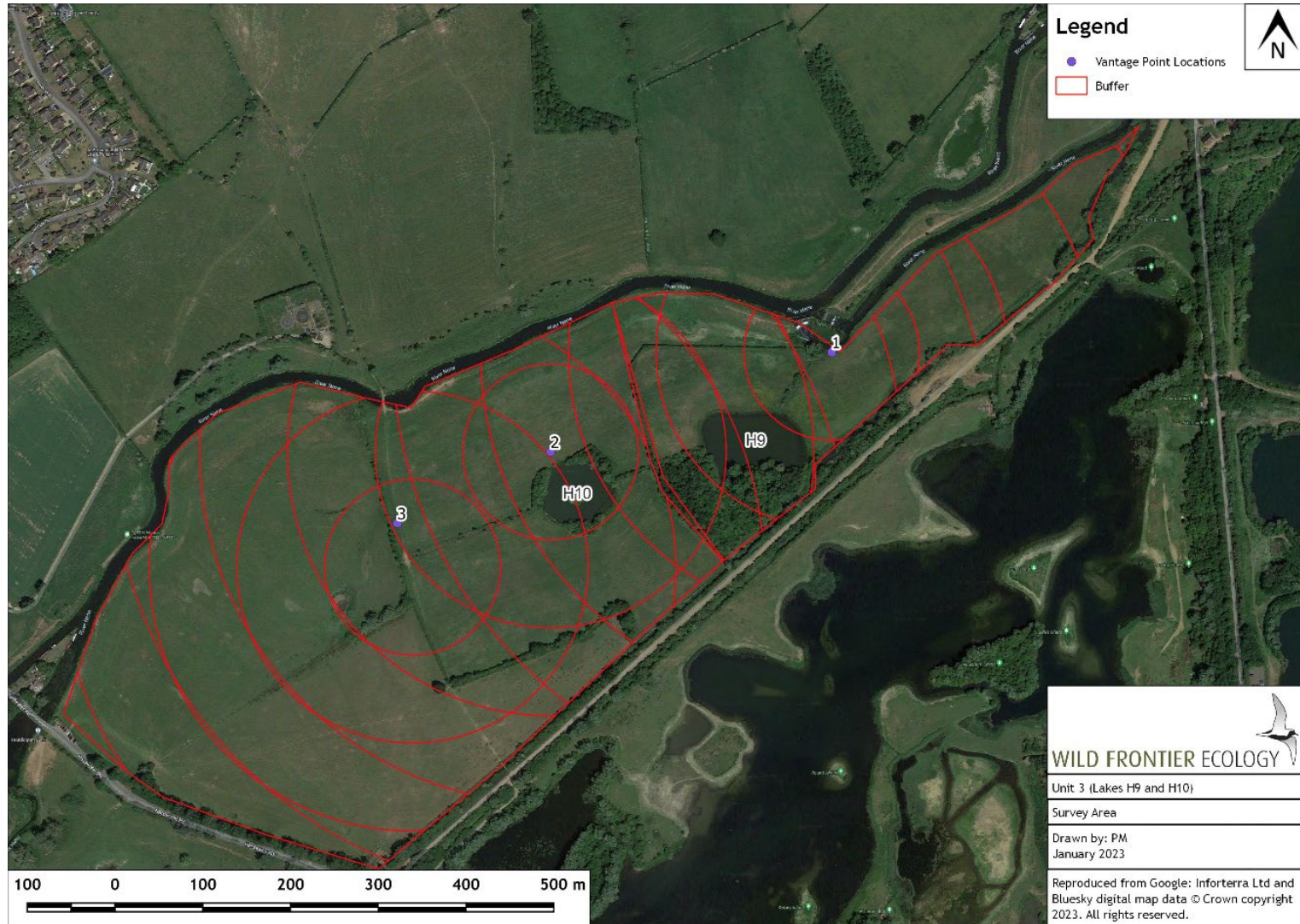




Figure 2.5: Unit 5 Vantage Point Locations at Lakes L12, L13 and L16

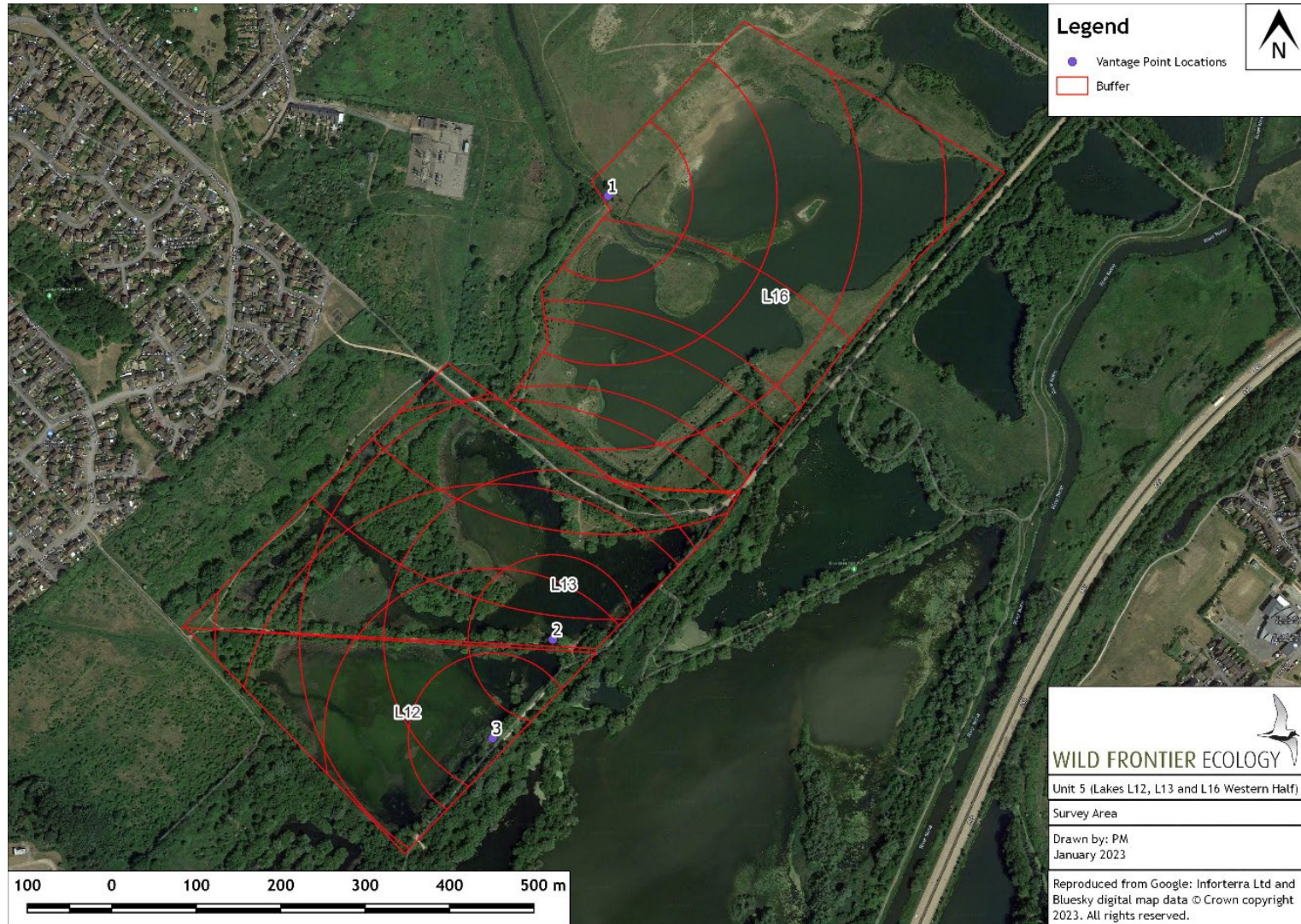






Figure 2.6: Unit 6 Vantage Point Locations at Lakes M11, M16, M21 and M23





Figure 2.7: Unit 7 Vantage Point Locations at Lake N5

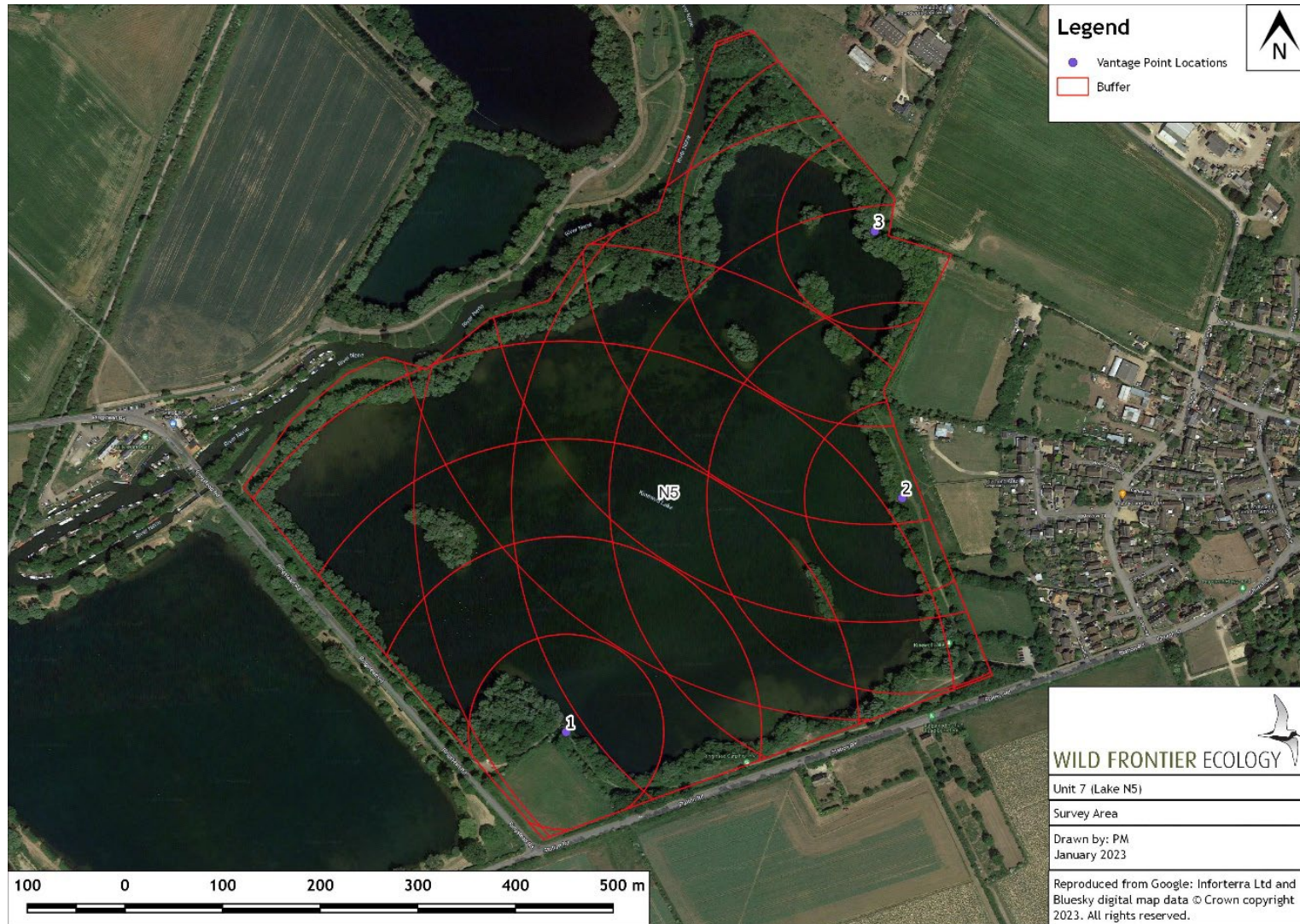
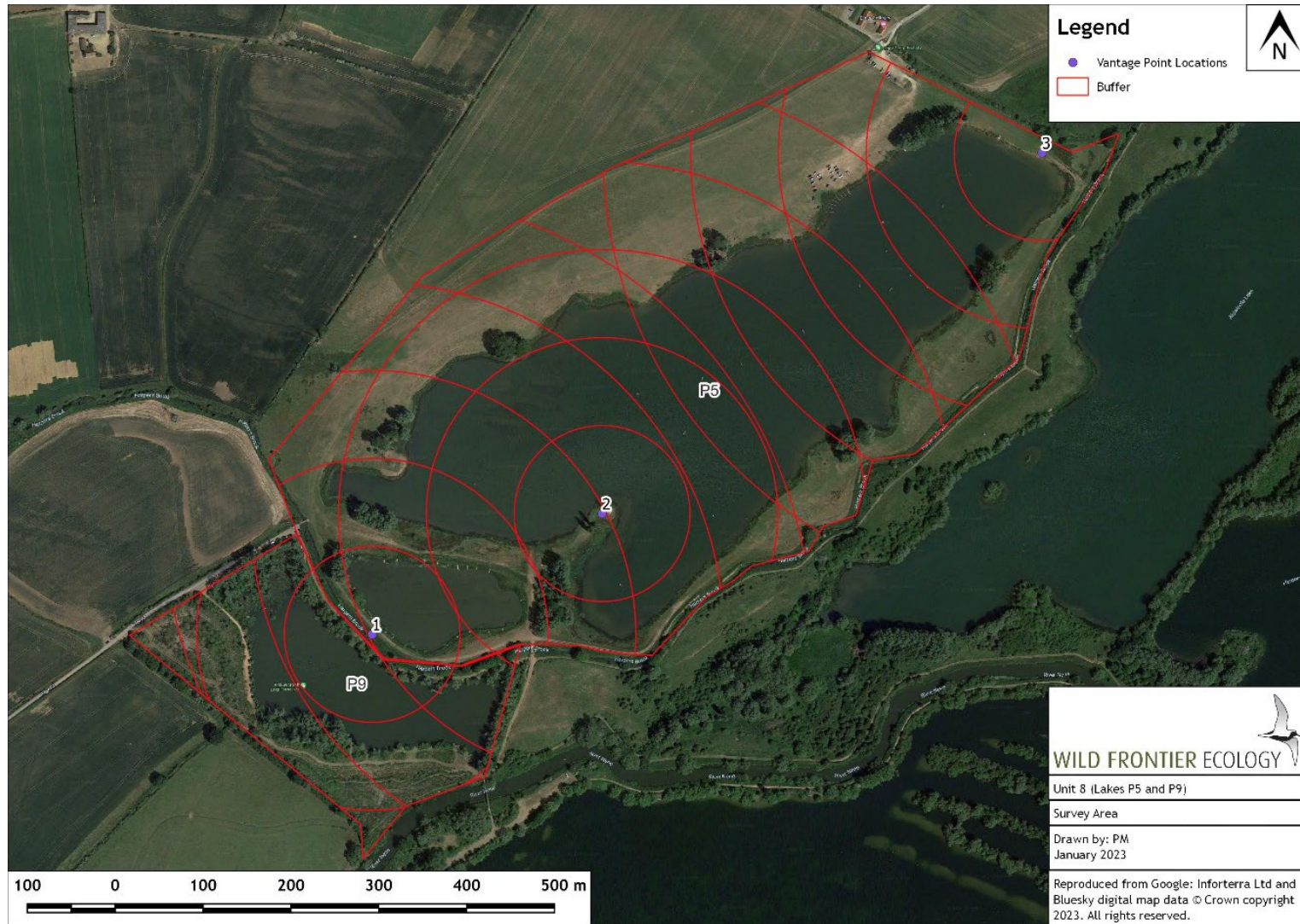




Figure 2.8: Unit 8 Vantage Point Locations at Lakes P5 and P9



## 4.2 Recreational activity

67. During each two-hour survey, all activities and events observed at the site were recorded. Events included any human related activities (recreation, vehicle etc.) that occurred within 200m<sup>11, 12</sup> of the focal area, whether or not they are considered to elicit a behavioural response from the birds present. Activities were recorded regardless of whether birds were present at the site or not, to allow comparison of relative activity levels between survey points and dates. Events included activity type (see Table 1.1), group size (people and dogs), time, location/route taken and other details such as the presence of raptors as well as the bird behavioural response.
68. Activity type was recorded using a set of standardised codes, (see Table 1.1). Where the codes are not relevant then the surveyor will simply describe the activity, ensuring that all disturbance events are accounted for. In some case, more than one code may be used to describe a single event (e.g. jogger with dog off lead).
69. Prior to analysis, cases with multiple codes were simplified under the following criteria:
70. Dog walkers with dogs both off and on lead were classified as “dog off lead” as this is the category likely to cause the greatest disturbance. If a dog was taken off its lead at any point during a single dog walking event, this was also classified as “dog off lead”.

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<sup>11</sup> Liley, D. & Fearnley, H. (2012) Poole Harbour Disturbance Study. Footprint Ecology / Natural England.

<sup>12</sup> Liley, D. & Fearnley, H. (2011) Bird Disturbance Study, North Kent 2010-2011. Footprint Ecology / Greening the Gateway.

71. The “Other” category was used to describe disturbance events that do not fit into any of the specified categories, or unidentified sources of disturbance.

**Table 1.1:** Standardised codes used for describing potential disturbance events

Description	Code
Air-borne (drone, microlights, helicopters, planes etc)	Ab
Birdwatcher	B
Cycling	C
Canoe	Ca
Children playing	Cp
Dog walker	Dw
Dog on lead	Dl
Dog off lead	Dx
Fishing	F
Horse riding	H
Jogger	J
Motor vehicle	Mv
Other	O
Raptor	R
Sailing (incl. Laser/dinghy, wind surfing, kite surfing etc)	S
Walking (without dog)	W
Wildfowling	Wf





### 4.3 Recording bird disturbance

72. Recreational activities (and other events such as the presence of raptors) were classed as ‘potential disturbance events’ if they occurred within 200m of birds in the focal area or elicited an observable response from birds within the focal area. For each species and each potential disturbance event within 200m, the following parameters were recorded:
73. **Count** of each species present within 200m of event.
74. **Behaviour** of the birds (prior to the disturbance event), simply categorised as F (feeding) or R (roosting/preening/loafing).
75. **Response** of the birds (see Table 1.2) ultimately observed. Due to the high numbers of activities during a two-hour vantage point, whenever “No Response” was observed, this was noted without recording the parameters below (which were only recorded during a disturbance).
76. **Distance:** for any disturbance that occurred, this distance was the maximum from one individual to the disturbance event.
77. **Distance displaced**, i.e. the distance any bird(s) walked/swam/flew when disturbed. In cases where it was not possible to record the displacement distance of the birds (i.e. if they flew out of sight), the distance was left blank.
78. **Duration of disturbance**, total time until disturbed birds resumed their pre-disturbance behaviour.
79. When multiple species were present during a disturbance event, multiple observations were recorded.

**Table 1.2:** Response categories for birds following potential disturbance events

Response	Code
No response	NR
Alert, heads up, no change in birds’ position	A
Alert birds walked/swam short distance and resumed previous behaviour	W/S
Birds flew short distance (<50m) and resumed previous behaviour in general area	FS
Birds took flight of more than 50m	F

80. To ensure measures were consistent and accurate when recording bird counts and distances:
81. Surveyors were provided with aerial photographs and maps of each survey location which were overlaid with distance bands.



82. If the surveyor found evidence of other recreational activities that might be occurring but were not actually witnessed such as off-roading or shooting, they were recorded.

#### 4.4 Analysis

83. Activity types were totalled for all sites. Any disturbances caused by the surveyor were ruled out, as well as by raptors and other non-human related activities e.g. mammal predator or other bird species, to give an overview of disturbance caused by the public.
84. All statistical analysis was conducted using R (release 4.2.1) and Microsoft Excel. Appropriate statistical analysis was undertaken of the data to determine any relationships between type of disturbance and level of disturbance. With response data, the probabilities of a disturbance taking place was modelled using a logistic regression, with the disturbance response (No Response or Yes, including Alert, Walk/Swim, Fly Short, Fly) being the dependent variable. This was tested using a general linear model (GLM).

#### 4.5 Mapping

85. Formal public rights of way around each site were mapped in GIS. The directions and routes being walked by users of the sites were marked down on a printed map by the surveyor, which in turn was digitised into a GIS layer in the office. Routes were colour coded simply as Red (high), Amber (moderate) and Green (low) to convey the levels of footfall at each site and the number of disturbances caused in different areas, respectively at each site. Similarly, the locations of waterbird species observed were labelled on to a paper map and digitised upon returning to the office. This included qualifying species of the SPA and SSSI, including the 20,000 waterbird assemblage.



## 5. Results

### 5.1 Site Usage

**Table 2:** Number of records of each activity type at each site

Activity Type	Unit 1	Unit 2	Unit 3	Unit 5	Unit 6	Unit 7	Unit 8	Total
Air-borne	1	13	30	2	0	0	4	50
Birdwatching	8	0	12	5	11	7	0	43
Cycling	21	1	1	168	52	1	1	245
Cycling with Dog(s) on lead	1	0	0	0	0	0	0	1
Canoeing	0	0	1	0	0	0	0	1
Dog walking with Dog(s) on lead	103	0	49	22	105	127	14	420
Dog walking with Dog(s) off lead	153	6	211	330	7	113	44	864
Fishing	0	1	3	7	0	15	82	108
Fishing with Dog off lead	0	0	0	0	0	0	3	3
Horse riding	0	0	0	0	2	0	0	2
Jogging	73	0	3	126	42	1	2	247
Jogging with Dog(s) on lead	1	0	1	1	0	0	1	4
Jogging with Dog(s) off lead	5	0	2	1	0	0	1	9
Motor vehicle	8	101	3	4	4	0	1	121
Motor vehicle with Dog off lead	1	0	0	0	0	0	0	1
Other/unknown	1	17	12	2	1	0	0	33
Raptor	7	27	38	2	23	27	4	128
Walking	293	14	203	505	162	123	71	1371
Wildfowling	4	0	0	0	0	0	1	5
<b>Total</b>	<b>680</b>	<b>180</b>	<b>569</b>	<b>1175</b>	<b>409</b>	<b>414</b>	<b>229</b>	<b>3656</b>

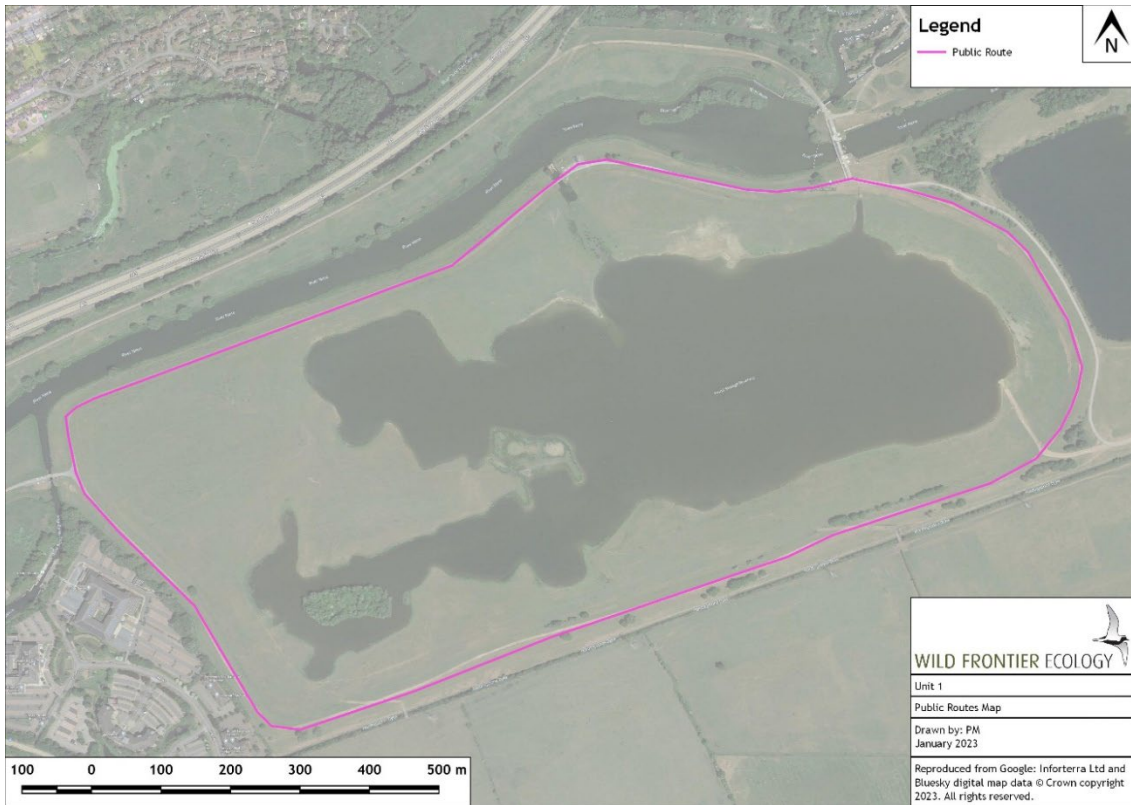
86. Table 2 shows the number of occasions each activity was recorded at each site. Across all sites, walking was the most common activity being recorded 1371 times across all sites. Unit 5 was the most heavily used site, with disturbance activities recorded 1175 times occurring here. Wildfowling occurred at Unit 1 and there was a single record of a man with a shotgun at Unit 8. Wildfowling is defined as the hunting of a bird species such as ducks or geese for sport or food, so does include shooting of wildfowl in the case of this study. The wildfowling at Unit 1 is a regular occurrence at this site. Fishing was most commonly recorded at Unit 8 where two fisheries are based, Elinor Trout Fisheries and Willowbrook Lake Fisheries.

87. Figures 3.1 to 3.7 show where public routes are located at each site, and where disturbances to birds are likely to occur and be viewed from a vantage point (locations shown in Figures 2.2 to 2.8). Unit 2 is not publicly accessible as this is a private site, but there are vehicle access tracks to Grendon Lakes Clubhouse and to two Paintball sites, which are shown in Figure 3.2. Unit 8 includes public footpaths outside of the



fisheries present on site, but informal routes were also used within the fisheries, particularly around Lake P5.

**Figure 3.1:** Unit 1 routes used by the public



**Figure 3.2:** Unit 2 routes used by the public (vehicle access)

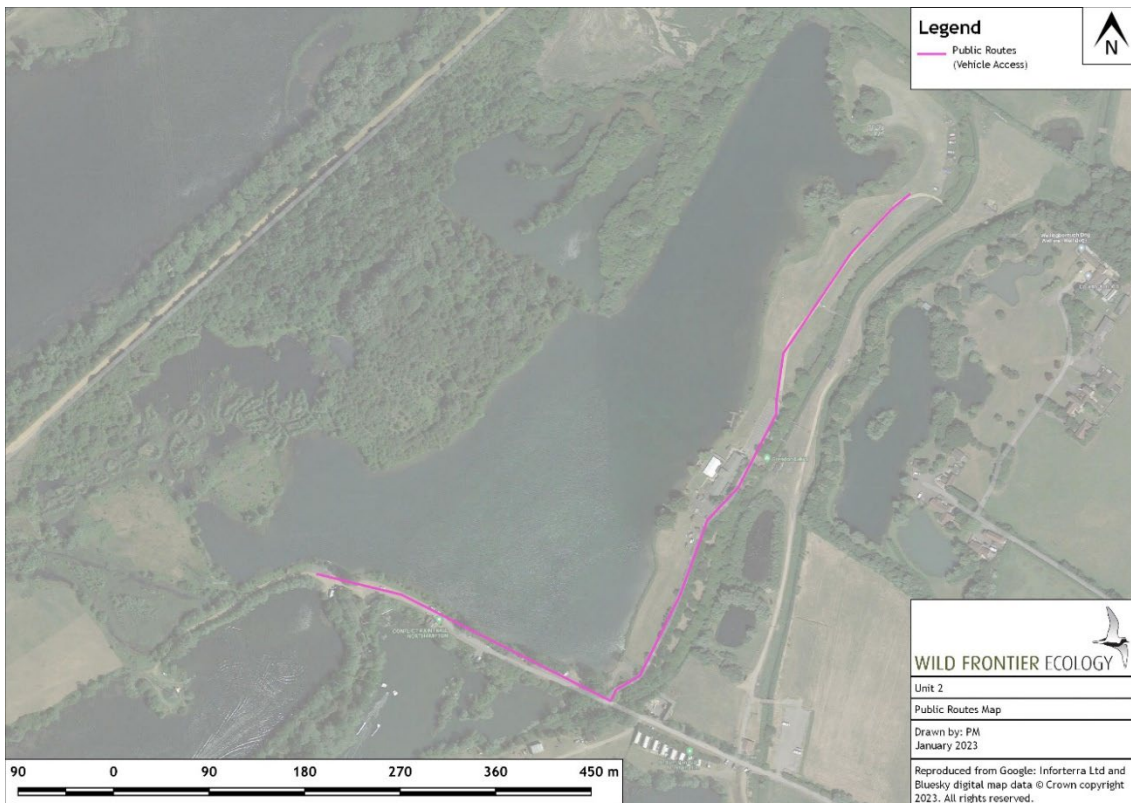






Figure 3.3: Unit 3 routes used by the public

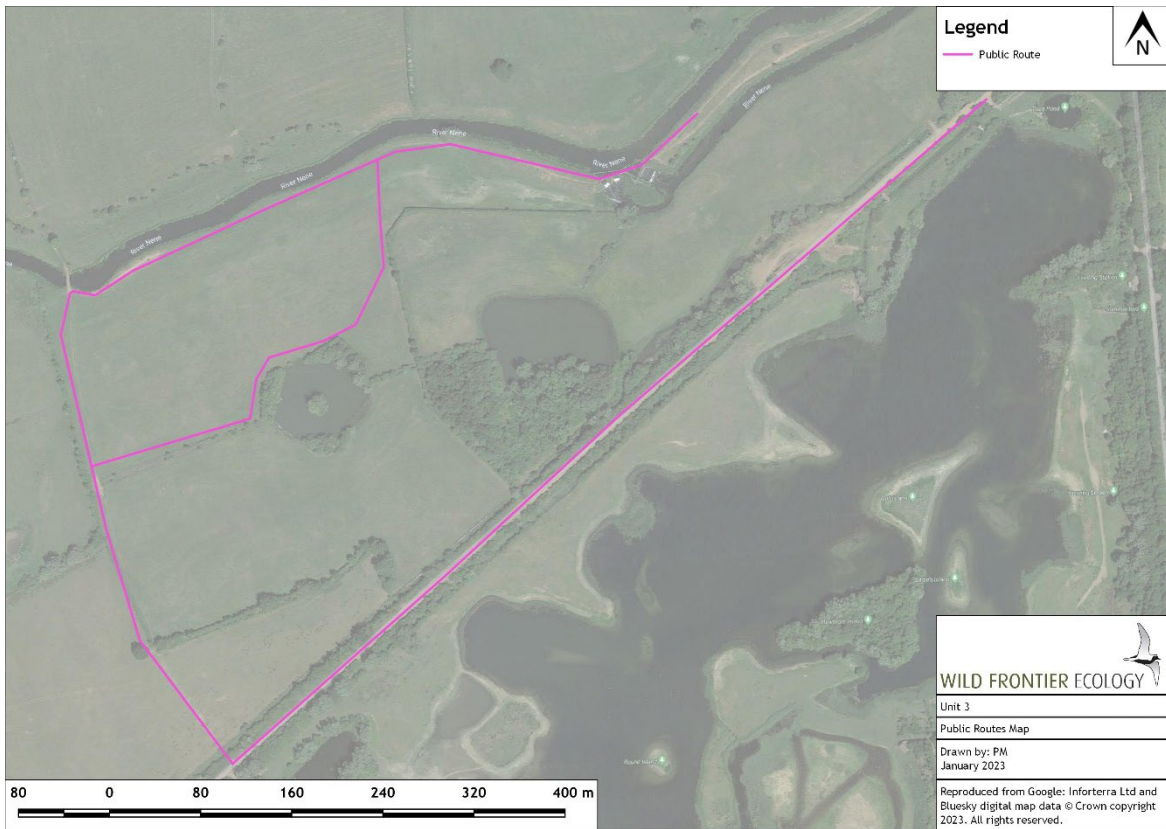
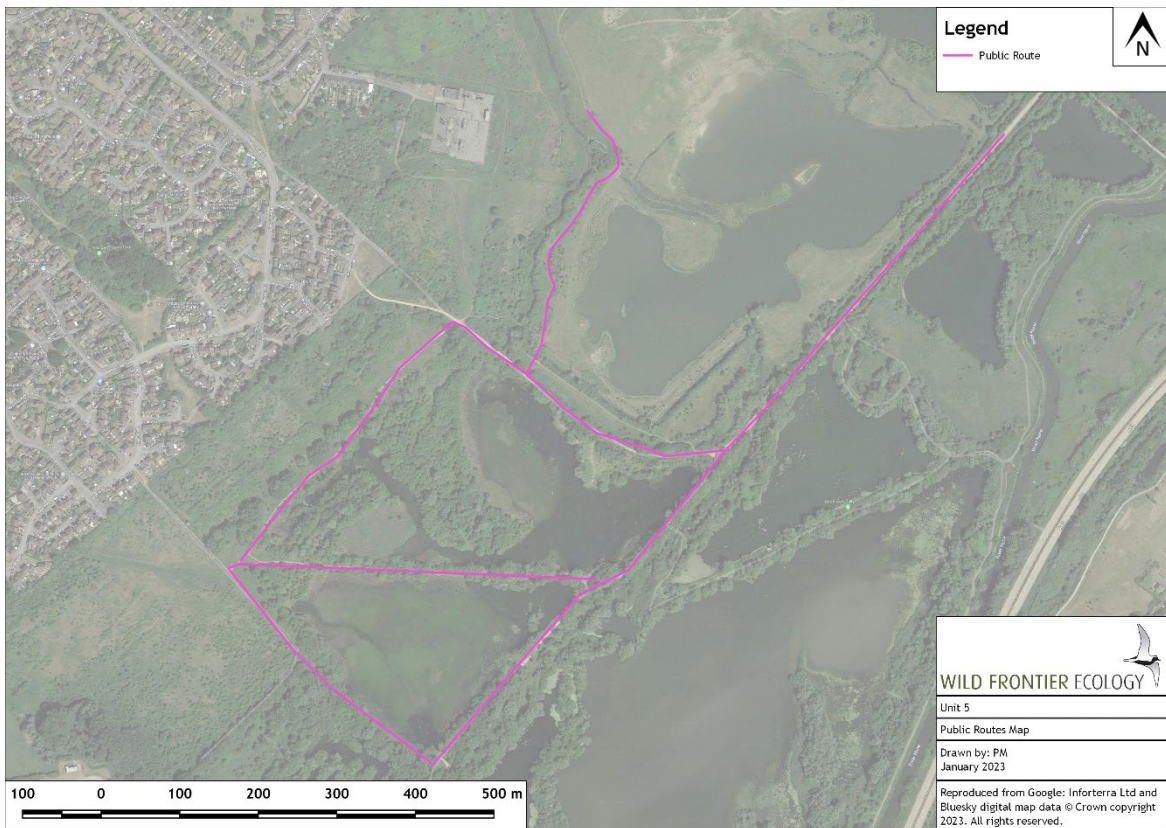


Figure 3.4: Unit 5 routes used by the public





**Figure 3.5:** Unit 6 routes used by the public

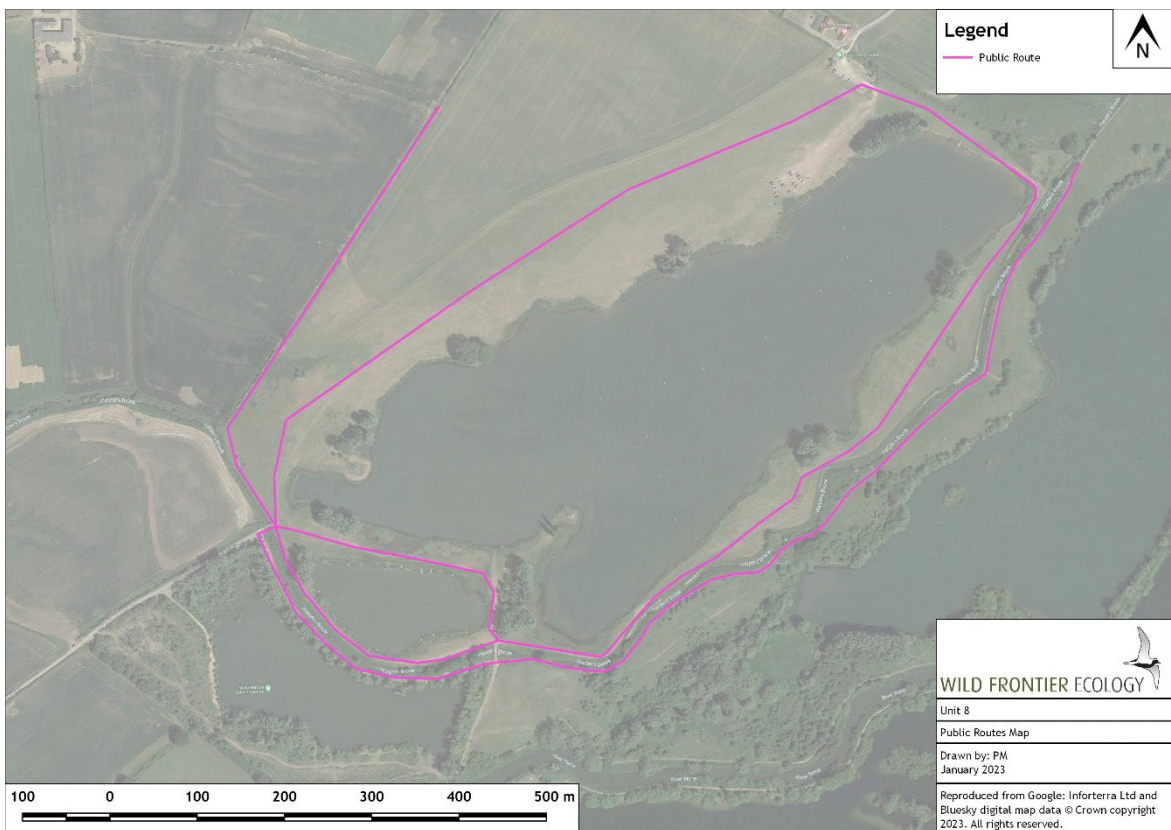




Figure 3.6: Unit 7 routes used by the public



Figure 3.7: Unit 8 routes used by the public



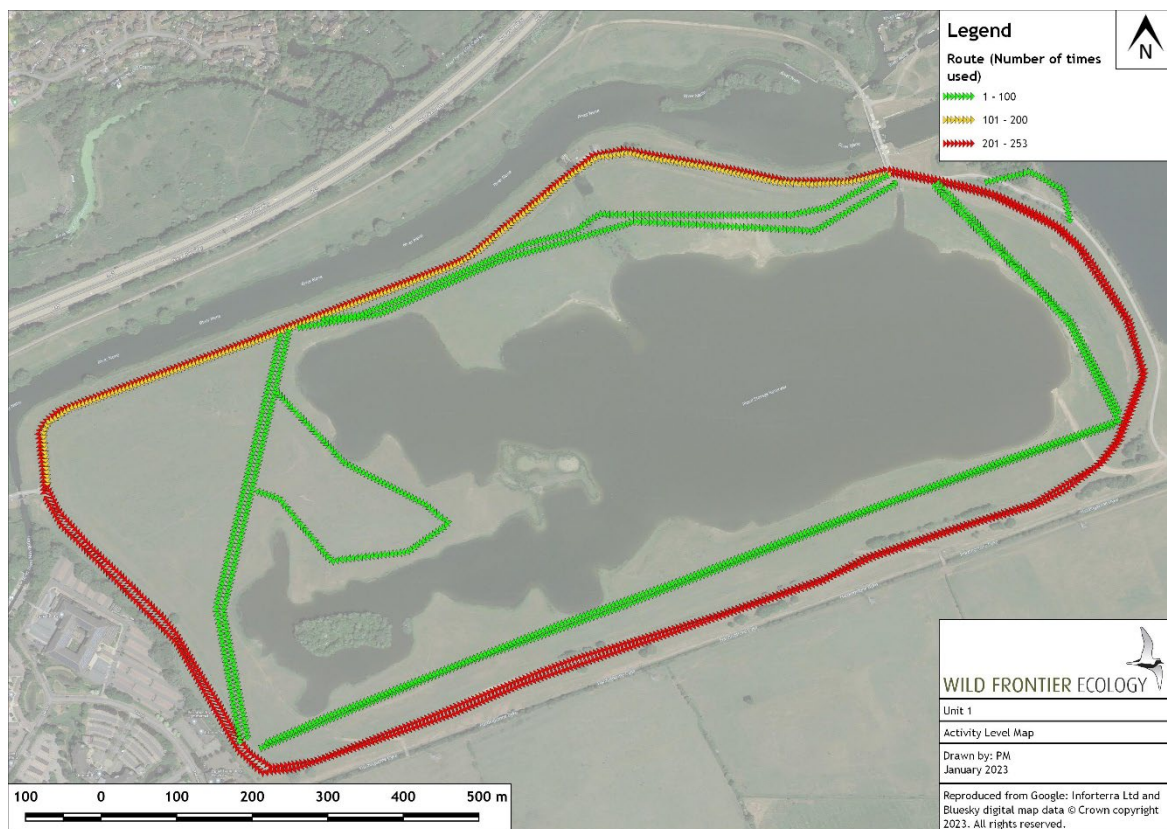


### 5.1.1 Area-based Site Usage

88. Figures 4.1 to 4.7 show the routes where human related activity occurred over the seven sites. Each site has a green (low), amber (medium) and red (high) colour category for the number of times this route was used respective to each site. These are all land-based disturbances. Unit 8 contains two fisheries with the majority of activity recorded being fishing, therefore static locations of fishing from platforms and boats is also shown in Figure 4.7.

#### Unit 1

**Figure 4.1:** Areas of recorded ground-based activity at Unit 1 (Lake D1)



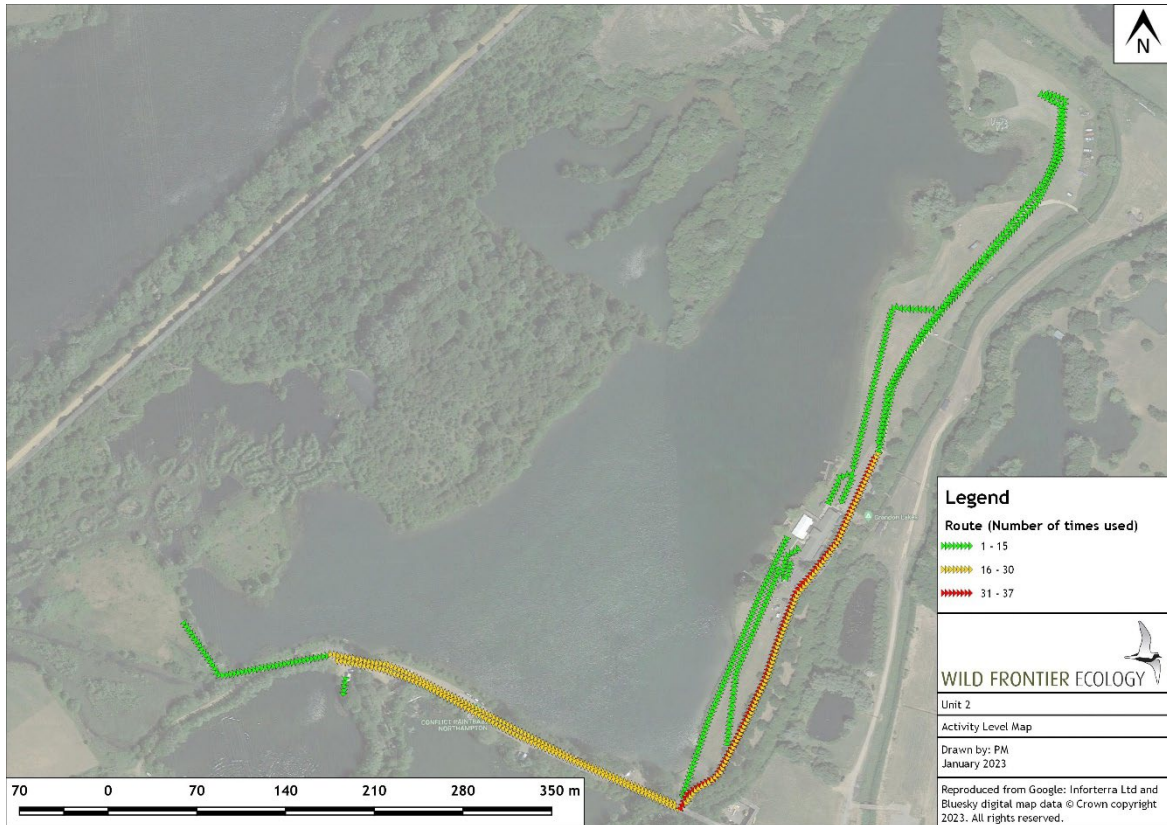
89. Figure 4.1 shows the majority of activity occurred on the path around the top of the basin around Lake D1. Informal routes were used all around Lake D1 as shown by the routes closer to shore. Routes were taken within the basin, off the main circular path on 48 occasions.

90. Activity in the form of boats used for wildfowling did occur on Lake D1. These were not mapped due to the varied movement of boats that occurred across most of the lake. Four occurrences of wildfowling were recorded, including boats on the water, wildfowling in vehicles and wildfowling walking around the edge of the lake. The green route on the northeast side of the main path around Lake D1 was used by a wildfowler on one occasion. More information is given on this activity in Section 5.4 of this report.



## Unit 2

**Figure 4.2:** Areas of recorded ground-based activity at Unit 2 (Lake G7)

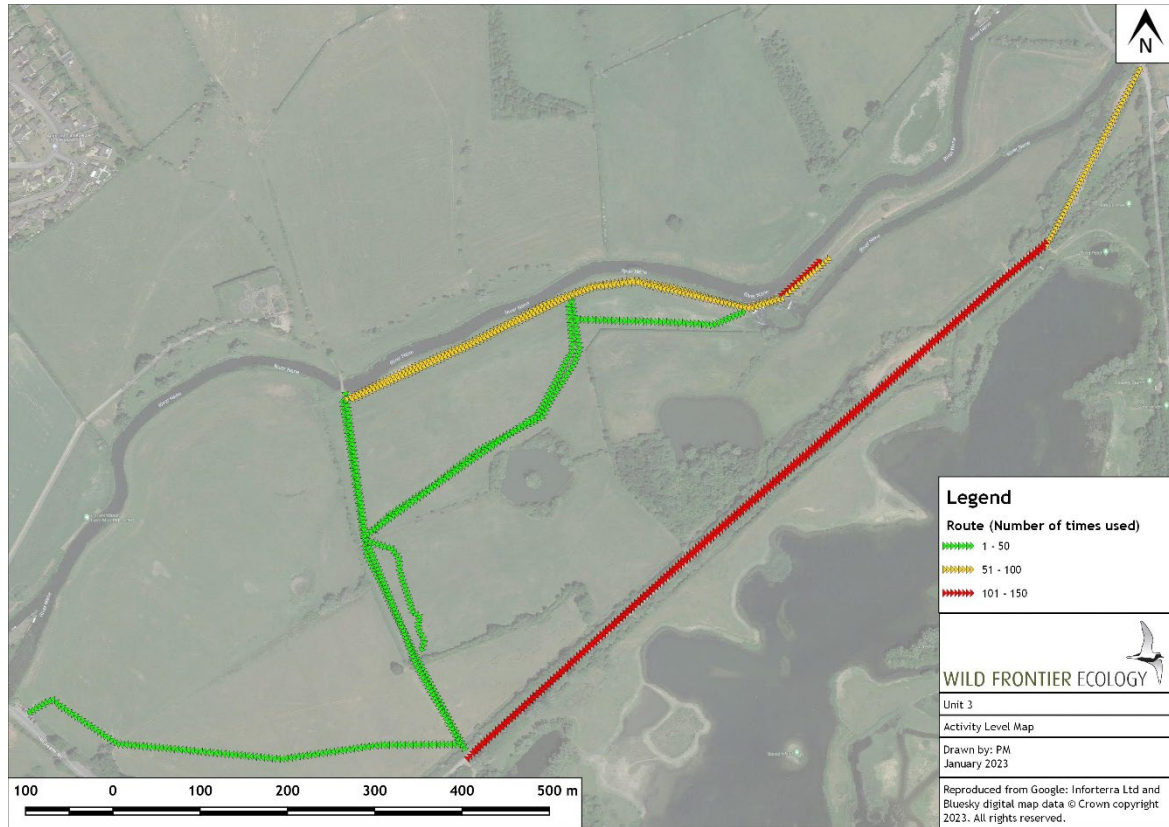


91. Figure 4.2 shows the majority of activity occurred on the tracks on the south-east edge of Lake G7. As there is no public access to this site, this was mainly use of these tracks by vehicles accessing facilities at Grendon Lakes (the clubhouse and paintball sites). Staff members and residents on site were recorded on the other routes, with activities including walking dogs off leads to the north of the clubhouse.
92. This site also recorded water-skiing on two survey days (four records in total). This activity is not mapped due to the variability of direction, covering most of Lake G7. More information on this is given in Section 5.4 of this report.



Unit 3

Figure 4.3: Areas of recorded ground-based activity at Unit 3 (Lakes H9 and H10)



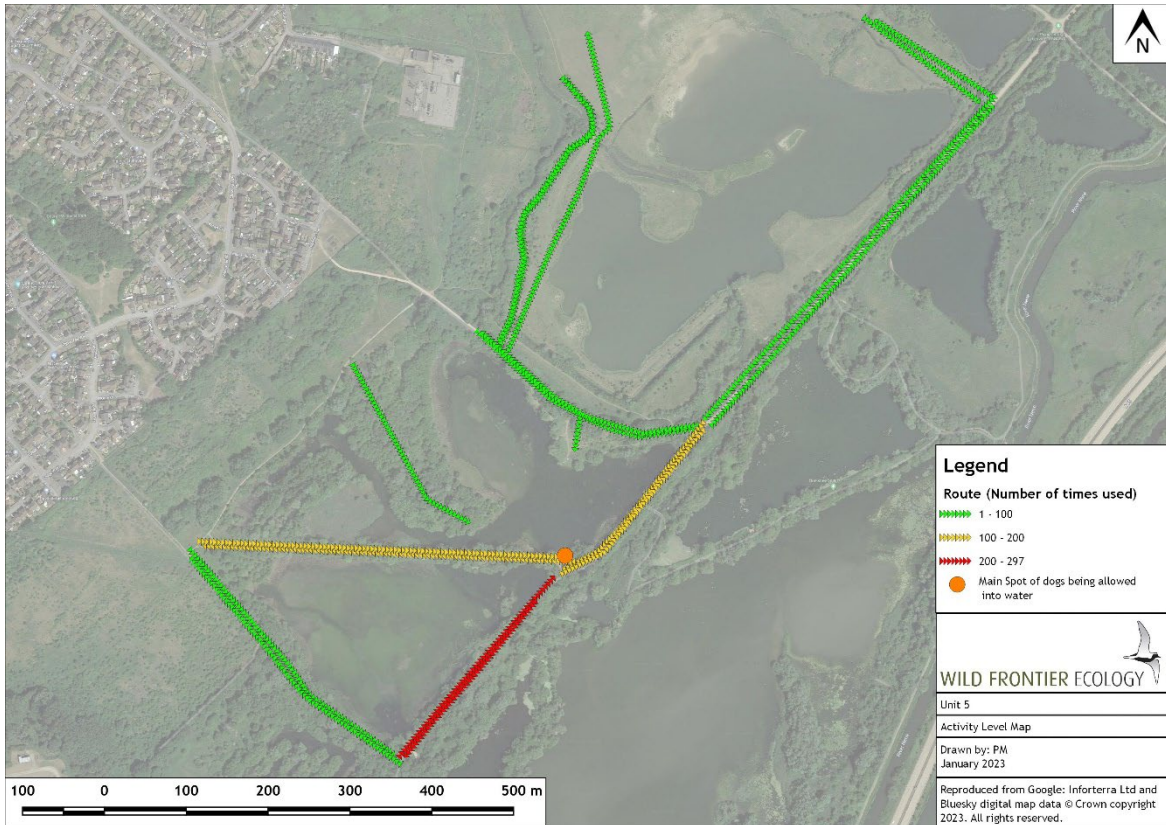
93. Activity was mainly along public footpaths at Unit 3, particularly the old railway running along the southern boundary of Unit 3 where this route was recorded being used 248 times during the surveys. The path along the river was also used often, with 190 records of activity along the northern edge of Unit 3.





Unit 5

Figure 4.4: Areas of recorded ground-based activity at Unit 5 (Lakes L12, L13 and L16)



94. Figure 4.4 shows the highest levels of activity around lakes L12 and L13. The path along the south-east side of Lake L12 was recorded to be used 558 times. The peninsula on the north-west side of Lake L13 was used on one occasion by an angler.

95. An area where dogs are let into the water was recorded beside VP2 as shown on Figure 4.4 (see Photo 18).



### Unit 6

**Figure 4.5:** Areas of recorded ground-based activity at Unit 6 (Lakes M11, M16, M21 and M23)



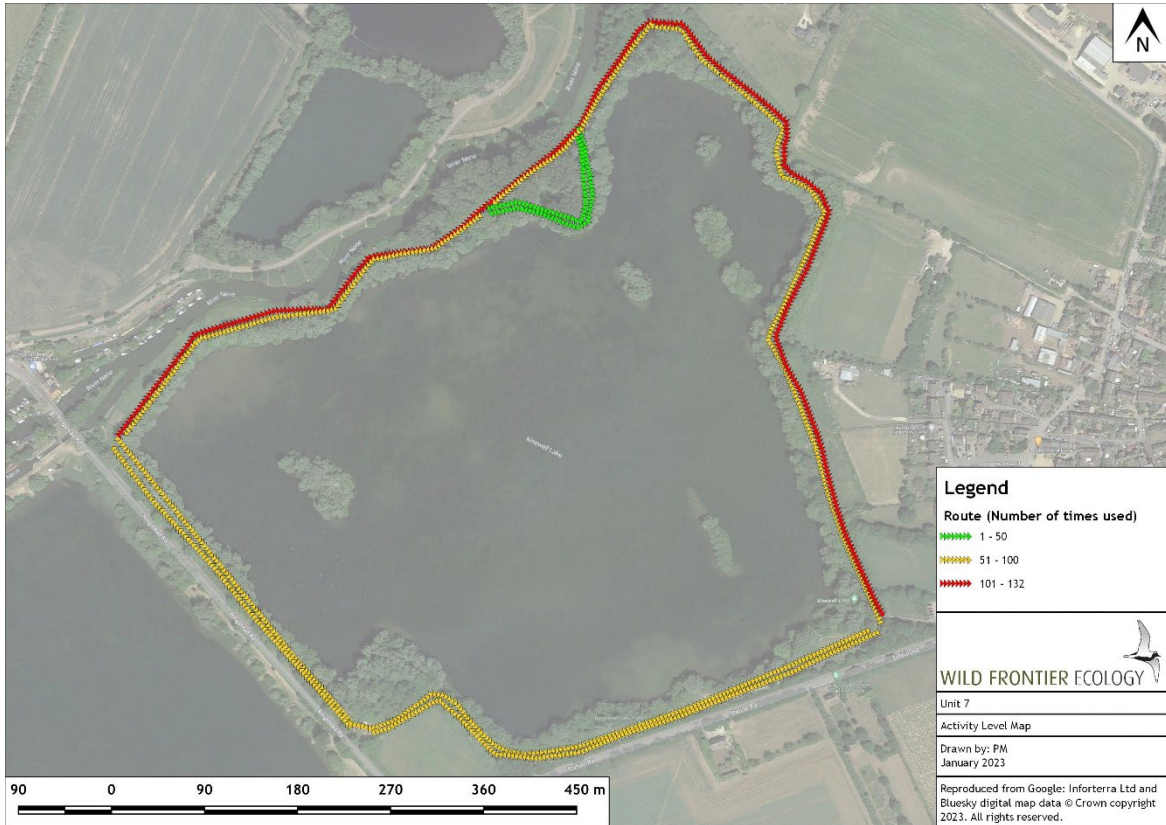




96. The majority of activity at Unit 6 was at the southern end of the site, closest to the Stanwick Lakes visitor centre and car park. The highest number of records from one area was 153 along the route between Lakes M11 and M21.

**Unit 7**

**Figure 4.6:** Areas of recorded ground-based activity at Unit 7 (Lake N5)



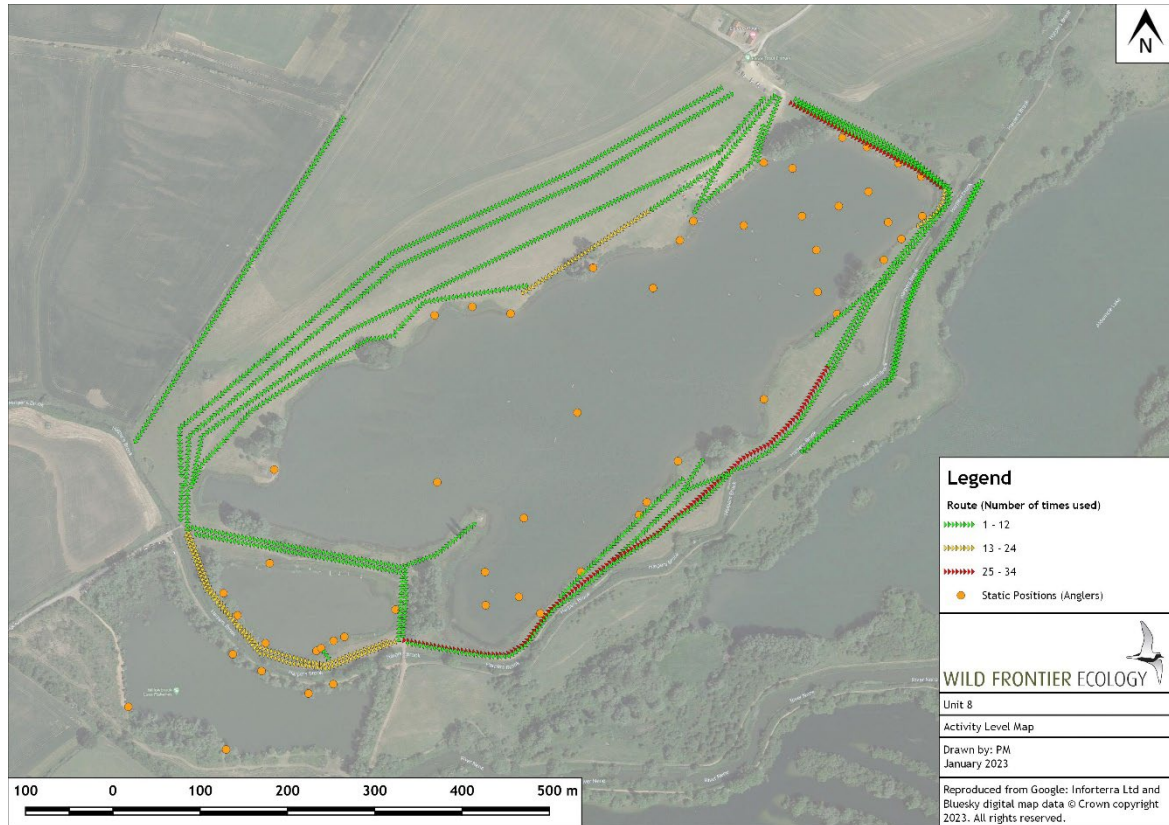
97. Figure 4.6 shows activity was well distributed on the main path around Lake N5 at Unit 7.





## Unit 8

**Figure 4.7:** Areas of recorded ground-based activity at Unit 8 (Lakes P5 and P9)



98. Figure 4.7 shows most activity was recorded around Lake P5. This mainly comprised the movement of anglers at Elinor Trout Fishery. Static positions of anglers on bank and on boats are shown on Figure 4.7 where anglers were situated for a whole vantage point survey. Water-based activity is not mapped due to the variation in direction taken by the boats distributed across the larger lake of P5.

99. P9 is within Willowbrook Fishery where anglers stand on platforms and this lake was partially hidden by trees.

## 5.2 Time-related Site Usage

### 5.2.1 Time of Week

100. Tables 3.1 to 3.7 compare disturbance from different activity types on weekdays and at the weekend over the seven sites. Due to more weekday surveys being undertaken at six of the seven sites, rates of disturbance are given. These are the number of times each disturbance was recorded per survey. A survey is the three vantage points (two hours each) undertaken during a single day, which equates to six hours in total at all seven sites.

#### Unit 1

**Table 3.1:** Comparison of Weekday and Weekend disturbance at Unit 1

Activity	Number of disturbances on Weekdays	Weekday Rate of Disturbances (disturbances/survey)	Number of disturbances on Weekends	Weekend Rate of Disturbances (disturbances/survey)
Air-borne	0	0.00	1	0.20
Bird-watching	4	0.57	4	0.80
Cycling	10	1.43	11	2.20
Cycling with Dog(s) on lead	0	0.00	1	0.20
Dog walking with Dog(s) on lead	54	7.71	49	9.80
Dog walking with Dog(s) off lead	78	11.14	75	15.00
Jogging	28	4.00	45	9.00
Jogging with Dog on lead	0	0.00	1	0.20



Activity	Number of disturbances on Weekdays	Weekday Rate of Disturbances (disturbances/survey)	Number of disturbances on Weekends	Weekend Rate of Disturbances (disturbances/survey)
Jogging with Dog off lead	3	0.43	2	0.40
Motor vehicle	8	1.14	0	0.00
Motor vehicle with Dog off lead	0	0.00	1	0.20
Other/ Unknown	0	0.00	1	0.20
Raptor	3	0.43	4	0.80
Walking	168	24.00	125	25.00
Wildfowling	4	0.57	0	0.00
<b>Total</b>	<b>360</b>	<b>51.43</b>	<b>320</b>	<b>64.00</b>

101. Table 3.1 shows that walking (without dogs) was the most common disturbance overall, but also on both weekdays and weekends.

102. Recorded activity on weekends and weekdays was relatively even. The rate of Dog walkers recorded was higher at weekends. Dog walkers had their dogs off lead equally during weekends and weekdays. Of the three most common disturbances, both dog walking ('on lead' and 'off lead') and jogging were recorded at a higher rate on weekends. The most common disturbance, from walkers without dogs, was recorded at a similar rate on both weekdays and weekends.

103. The overall rate of disturbance was higher at weekends than on weekdays at Unit 1.



**Unit 2****Table 3.2:** Comparison of Weekday and Weekend disturbance at Unit 2

Activity	Number of disturbances on Weekdays	Weekday Rate of Disturbances (occurrences/survey)	Number of disturbances on Weekends	Weekend Rate of Disturbances (occurrences/survey)
Air-borne	12	2.00	1	0.17
Cycling	1	0.17	0	0.00
Dog walking with Dog(s) off lead	5	0.83	1	0.17
Fishing	1	0.17	0	0.00
Motor vehicle	83	13.83	18	3.00
Other/ Unknown	4	0.67	13	2.17
Raptor	22	3.67	5	0.83
Walking	11	1.83	3	0.50
<b>Total</b>	<b>139</b>	<b>23.17</b>	<b>41</b>	<b>6.83</b>

105. Table 3.2 shows the activity of motor vehicles comprised the greatest number of recorded disturbances at Unit 2. 'Other' activities which included a wedding fair and water-skiing was recorded more often at weekends than weekdays. This was the only activity category which occurred more at weekends at Unit 2 with most other records of disturbance occurring on weekdays.

106. Dogs were always recorded off the lead at Unit 2 on both weekdays and weekends.

**Unit 3****Table 3.3:** Comparison of Weekday and Weekend disturbance at Unit 3

Activity	Number of disturbances on Weekdays	Weekday Rate of Disturbances (occurrences/survey)	Number of disturbances on Weekends	Weekend Rate of Disturbances (occurrences/survey)
Air-borne	19	2.71	11	2.20
Birdwatching	8	1.14	4	0.80
Cycling	0	0.00	1	0.20
Canoeing	0	0.00	1	0.20
Dog walking with Dog(s) on lead	17	2.43	32	6.40
Dog walking with Dog(s) off lead	82	11.71	129	25.80
Fishing	0	0.00	3	0.60
Fishing with Dog off lead	0	0.00	1	0.20
Jogging	1	0.14	2	0.40
Jogging with Dog(s) on lead	0	0.00	1	0.20
Jogging with Dog(s) off lead	0	0.00	2	0.40

Activity	Number of disturbances on Weekdays	Weekday Rate of Disturbances (occurrences/survey)	Number of disturbances on Weekends	Weekend Rate of Disturbances (occurrences/survey)
Motor vehicle	2	0.29	1	0.20
Other/Unknown	5	0.71	7	1.40
Raptor	23	3.29	15	3.00
Walking	90	12.86	113	22.60
<b>Total</b>	<b>247</b>	<b>35.29</b>	<b>323</b>	<b>64.60</b>

107. The overall rate of disturbance was higher at weekends than on weekdays at Unit 3.
108. The majority of disturbances were higher on weekends than on weekdays. There were particularly high numbers of dog walker occurrences (dogs off leads recorded 129 times, dogs on leads recorded 32 times) and walkers (recorded 113 times) on weekend surveys compared to numbers recorded on weekday surveys. The number of birdwatching disturbances was higher on weekdays (eight times on weekdays compared to four times on weekends).



**Unit 5****Table 3.4:** Comparison of Weekday and Weekend disturbance at Unit 5

Activity	Number of disturbances on Weekdays	Weekday Rate of Disturbances (occurrences/survey)	Number of disturbances on Weekends	Weekend Rate of Disturbances (occurrences/survey)
Air-borne	2	0.29	0	0.00
Bird-watching	3	0.43	2	0.40
Cycling	67	9.57	101	20.20
Dog walking with Dog(s) on lead	22	3.14	0	0.00
Dog walking with Dog(s) off lead	140	20.00	190	38.00
Fishing	2	0.29	5	1.00
Jogging	37	5.29	89	17.80
Jogging with Dog(s) on lead	1	0.14	0	0.00
Jogging with Dog(s) off lead	0	0.00	1	0.20
Motor vehicle	3	0.43	1	0.20
Other/Unknown	1	0.14	1	0.20
Raptor	2	0.29	0	0.00

Activity	Number of disturbances on Weekdays	Weekday Rate of Disturbances (occurrences/survey)	Number of disturbances on Weekends	Weekend Rate of Disturbances (occurrences/survey)
Walking	213	30.43	292	58.40
<b>Total</b>	<b>493</b>	<b>70.43</b>	<b>682</b>	<b>136.40</b>

109. The overall rate of disturbance was almost double at weekends compared to weekdays at Unit 5. This was the highest level of weekend disturbance at any of the seven sites.

110. Walkers, dog walkers with dogs off lead, cycling, fishing and jogging were all recorded more on weekends than on weekdays. All dog walkers with dogs on leads were recorded on weekdays.

## Unit 6

**Table 3.5:** Comparison of Weekday and Weekend disturbance at Unit 6

Activity	Number of disturbances on Weekdays	Weekday Rate of Disturbances (occurrences/survey)	Number of disturbances on Weekends	Weekend Rate of Disturbances (occurrences/survey)
Air-borne	0	0.00	0	0.00
Bird-watching	5	0.71	6	1.20
Cycling	14	2.00	38	7.60
Dog walking with Dog(s) on lead	42	6.00	63	12.60
Dog walking with Dog(s) off lead	1	0.14	6	1.20
Horse riding	0	0.00	2	0.40
Jogging	26	3.71	16	3.20

Activity	Number of disturbances on Weekdays	Weekday Rate of Disturbances (occurrences/survey)	Number of disturbances on Weekends	Weekend Rate of Disturbances (occurrences/survey)
Motor vehicle	2	0.29	2	0.40
Other/ Unknown	1	0.14	0	0.00
Raptor	18	2.57	5	1.00
Walking	85	12.14	77	15.40
<b>Total</b>	<b>194</b>	<b>27.71</b>	<b>215</b>	<b>43.00</b>

111. The rate of disturbance was higher at weekends than on weekdays at Unit 6.
112. Walkers, dog walkers with dogs off lead and cycling were recorded more on weekends than on weekdays.



**Unit 7****Table 3.6:** Comparison of Weekday and Weekend disturbance at Unit 7

Activity	Number of disturbances on Weekdays	Weekday Rate of Disturbances (occurrences/survey)	Number of disturbances on Weekends	Weekend Rate of Disturbances (occurrences/survey)
Air-borne	0	0.00	0	0.00
Bird-watching	4	0.57	3	0.60
Cycling	0	0.00	1	0.20
Dog walking with Dog(s) on lead	69	9.86	58	11.60
Dog walking with Dog(s) off lead	61	8.71	52	10.40
Fishing	1	0.14	14	2.80
Jogging	0	0.00	1	0.20
Raptor	17	2.43	10	2.00
Walking	58	8.29	65	13.00
<b>Total</b>	<b>210</b>	<b>30.00</b>	<b>204</b>	<b>40.80</b>

113. The number of disturbances on weekdays and weekends was relatively even, but the rate of disturbances was higher at the weekend than on weekdays at Unit 7.

114. Walkers were recorded more on weekends than weekdays. Dog walkers (both with dogs on lead and off lead) were relatively similar proportionately on both weekdays and weekends. There was little difference proportionately between records of birdwatching on weekdays and weekends.

115. The majority of fishing was recorded on weekends.

**Unit 8****Table 3.7:** Comparison of Weekday and Weekend disturbance at Unit 8

Activity	Number of disturbances on Weekdays	Weekday Rate of Disturbances (occurrences/survey)	Number of disturbances on Weekends	Weekend Rate of Disturbances (occurrences/survey)
Air-borne	3	0.43	1	0.20
Cycling	0	0.00	1	0.20
Dog walking with Dog(s) on lead	5	0.71	9	1.80
Dog walking with Dog(s) off lead	26	3.71	18	3.60
Fishing	32	4.57	50	10.00
Fishing with Dog off lead	0	0.00	3	0.60
Jogging	0	0.00	2	0.40
Jogging with Dog(s) on lead	0	0.00	1	0.20
Jogging with Dog(s) off lead	0	0.00	1	0.20
Motor vehicle	0	0.00	1	0.20
Raptor	1	0.14	3	0.60
Walking	34	4.86	37	7.40

Activity	Number of disturbances on Weekdays	Weekday Rate of Disturbances (occurrences/survey)	Number of disturbances on Weekends	Weekend Rate of Disturbances (occurrences/survey)
Wildfowl-ing	0	0.00	1	0.20
<b>Total</b>	<b>101</b>	<b>14.43</b>	<b>128</b>	<b>25.60</b>

116. The rate of disturbance was higher on weekends at Unit 8 with more fishing, dog walkers and walkers recorded on weekends compared to weekdays.
117. The rate of disturbance of dog walkers with dogs off lead was relatively similar on weekdays and weekends.



### 5.2.2 Time of Day

118. Tables 4.1 to 4.7 compares disturbance at different times of day on weekdays and at the weekend over the four sites.

#### Unit 1

**Table 4.1:** Disturbance occurrences over various times of day at Unit 1

Time	Number of disturbances on Weekdays	Time	Number of disturbances at Weekends
Before 10am	129	Before 10am	88
10am-Midday	80	10am-Midday	65
Midday-2pm	76	Midday-2pm	55
2pm-4pm	62	2pm-4pm	93
After 4pm	13	After 4pm	19

119. Most disturbances at Unit 1 occurred before 10am on weekdays and between 2pm and 4pm on weekends.

**Unit 2****Table 4.2:** Disturbance occurrences over various times of day at Unit 2

Time	Number of disturbances on Weekdays	Time	Number of disturbances at Weekends
Before 10am	8	Before 10am	9
10am-Midday	43	10am-Midday	17
Midday-2pm	36	Midday-2pm	13
2pm-4pm	50	2pm-4pm	2
After 4pm	2	After 4pm	0

120. Most disturbances at Unit 2 occurred between 2pm and 4pm on weekdays and 10am and midday on weekends.

**Unit 3****Table 4.3:** Disturbance occurrences over various times of day at Unit 3

Time	Number of disturbances on Weekdays	Time	Number of disturbances at Weekends
Before 10am	16	Before 10am	33
10am-Midday	67	10am-Midday	118
Midday-2pm	88	Midday-2pm	103
2pm-4pm	73	2pm-4pm	67
After 4pm	4	After 4pm	1

121. Most disturbances at Unit 3 occurred between midday and 2pm on weekdays, and between 10am and midday on weekends.



**Unit 5****Table 4.4:** Disturbance occurrences over various times of day at Unit 5

Time	Number of disturbances on Weekdays	Time	Number of disturbances at Weekends
Before 10am	66	Before 10am	171
10am-Midday	211	10am-Midday	274
Midday-2pm	141	Midday-2pm	187
2pm-4pm	75	2pm-4pm	50
After 4pm	0	After 4pm	0

122. Unit 5 had the highest recorded number of disturbance incidents across all sites (see Table 4.4). The majority of these occurred between 10am and midday on weekdays and weekends.

**Unit 6****Table 4.5:** Disturbance occurrences over various times of day at Unit 6

Time	Number of disturbances on Weekdays	Time	Number of disturbances at Weekends
Before 10am	19	Before 10am	25
10am-Midday	78	10am-Midday	72
Midday-2pm	51	Midday-2pm	83
2pm-4pm	45	2pm-4pm	35
After 4pm	1	After 4pm	0

123. Most disturbances at Unit 6 occurred between 10am and midday on weekdays and midday and 2pm on weekends.

**Unit 7****Table 4.6:** Disturbance occurrences over various times of day at Unit 7

Time	Number of disturbances on Weekdays	Time	Number of disturbances at Weekends
Before 10am	24	Before 10am	34
10am-Midday	80	10am-Midday	72
Midday-2pm	60	Midday-2pm	51
2pm-4pm	46	2pm-4pm	47
After 4pm	0	After 4pm	0

124. Most disturbances at Unit 7 occurred between 10am and midday on weekdays and weekends.

**Unit 8****Table 4.7:** Disturbance occurrences over various times of day at Unit 8

Time	Number of disturbances on Weekdays	Time	Number of disturbances at Weekends
Before 10am	28	Before 10am	43
10am-Midday	36	10am-Midday	34
Midday-2pm	29	Midday-2pm	41
2pm-4pm	8	2pm-4pm	10
After 4pm	0	After 4pm	0

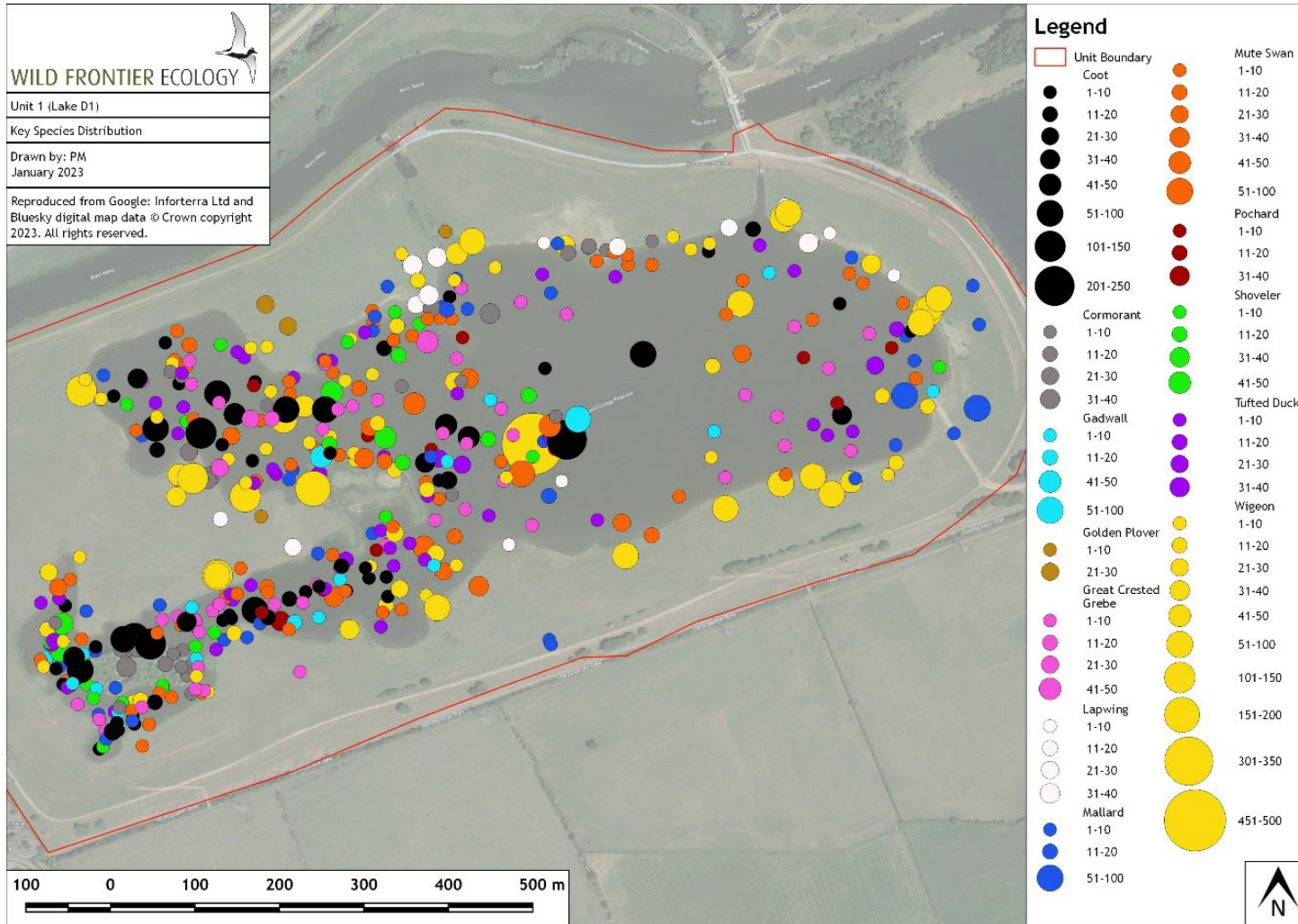
125. Most disturbances at Unit 8 occurred between 10am and midday on weekdays and before 10am on weekends.

### 5.3 Water Bird Mapping

126. Figures 5.1 to 5.7 show the key bird species recorded at each site and the size of flocks. Twelve bird species which are qualifying features of the SPA were recorded during the study. Of these, six were found on all seven sites: coot, cormorant, mallard, mute swan, tufted duck, wigeon. Gadwall and great crested grebe were recorded at all sites except Unit 3. Pochard and shoveler were recorded at all sites except Unit 3 and Unit 8. Golden plover was only recorded at one site, Unit 1.
127. Thirty-four other species (not qualifying features of the SPA) were recorded over the seven sites. In addition, feral mallards were recorded at Unit 3. Feral greylag geese were recorded at Unit 2.

Unit 1

Figure 5.1: Distribution and size of flocks of key species recorded at Unit 1 (Lake D1) over the survey period (January-December 2022)







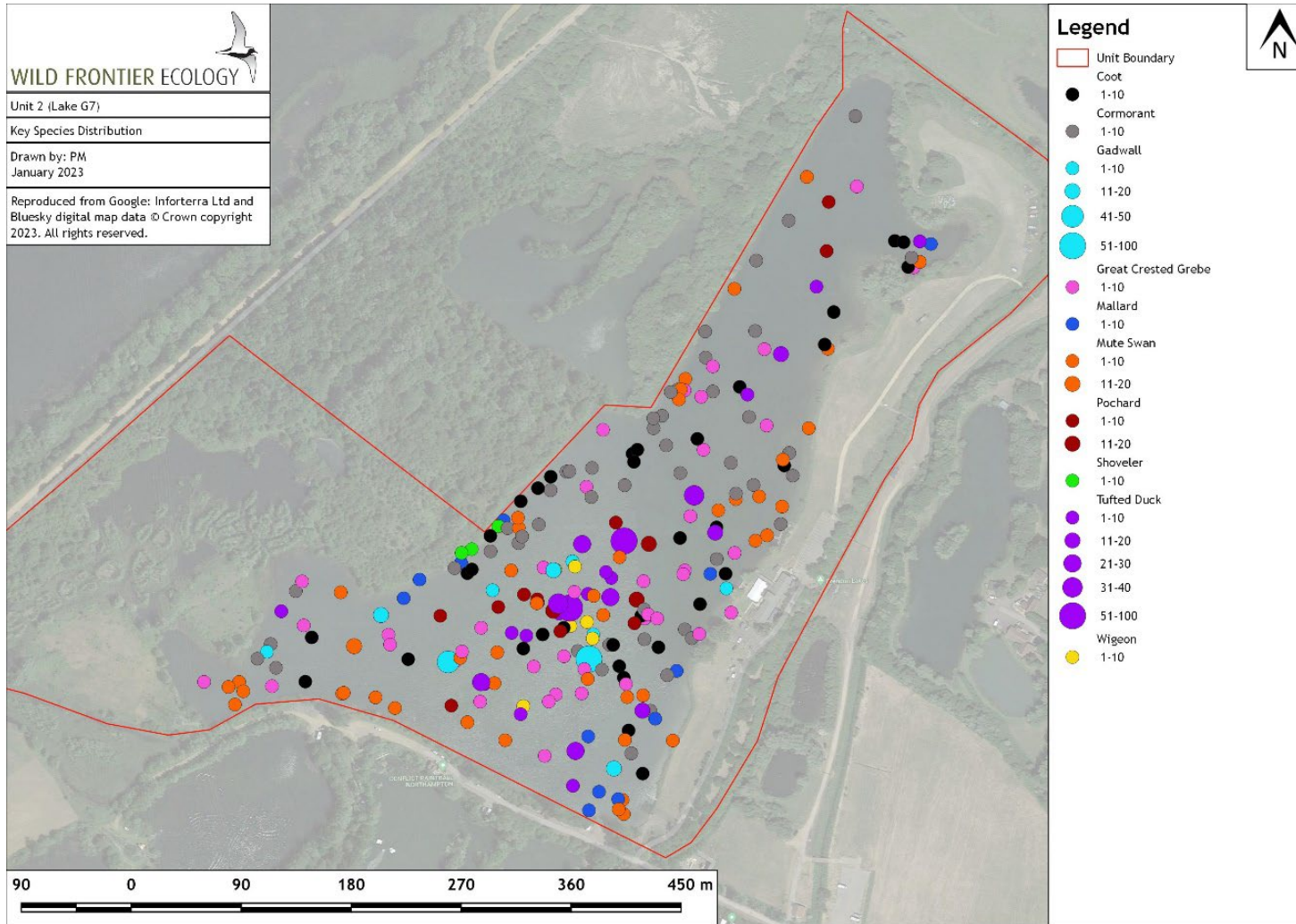
128. Unit 1 shows an aggregation of key species at the western end of Lake D1. As seen in Figure 5.1, coot, tufted duck and wigeon were recorded over the majority of Lake D1 including wigeon foraging on the banks of the lake.
129. Unit 1 is the only site of the seven where golden plover was recorded. They were recorded on the north-west bank of Lake D1 and the peninsula at the western end of Lake 1. Lapwing, another wader and a species with which golden plover associates, was recorded mainly on the northern bank of lake D1. Both of these species were recorded in relatively low numbers with max counts of 36 lapwing on 12<sup>th</sup> January 2022 and 46 golden plover on 26<sup>th</sup> February 2022.
130. On 17th December 2022, the largest survey count of wigeon (a flock of 480 individuals) and the largest count of coot (a flock of 226 individuals) were recorded. These flocks were in the centre of the lake due to most of the lake being frozen over and this being the only location with open water. Figure 5.1 shows larger flocks of both these species distributed across Lake D1. Excluding when the lake was mostly frozen, key species preferred areas closer to the banks.
131. Mallard recorded at Unit 1 were not recorded with BTO code 'ZF' (refers to domestic mallard) but many of these can be considered feral and not part of the 20,000 waterbird assemblage as mallard are released within the Clifford Hill Gravel Pits complex for shooting<sup>13</sup>.

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<sup>13</sup> Personal Communication with Robert Bullock - Surveyor (3<sup>rd</sup> November 2022)

Unit 2

Figure 5.2: Distribution and size of flocks of key species recorded at Unit 2 (Lake G7) over the survey period (January-December 2022)

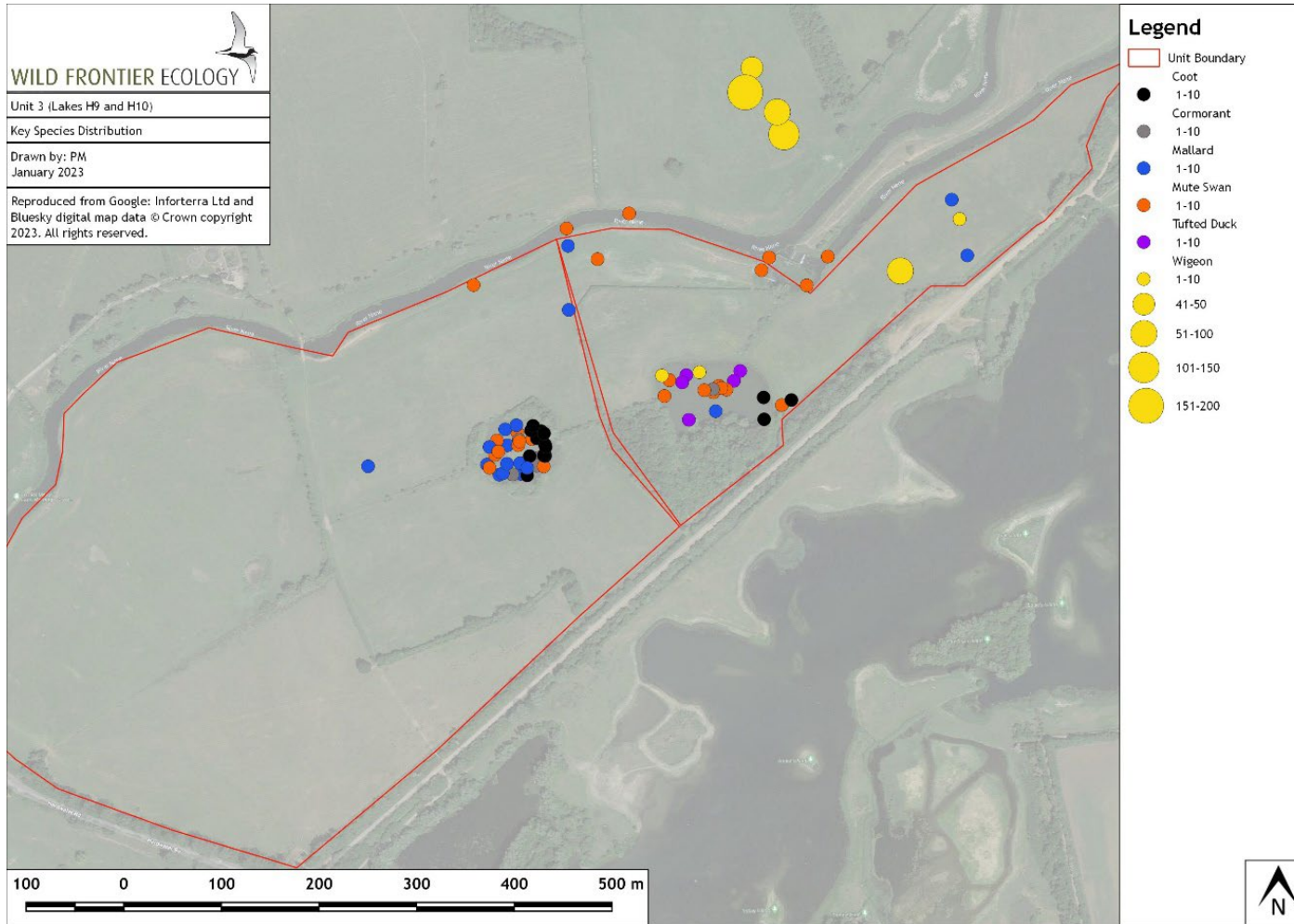




132. Key species are well distributed across Lake G7, but there was a focal area in the middle where the majority of species were recorded, particularly pochard and tufted duck. One shoveler was recorded from all three vantage points on one survey day on the western side of Lake G7.
133. The largest number of tufted duck recorded on surveys was recorded at Unit 2. This was a flock of 85 recorded on 30<sup>th</sup> January 2022 along with high numbers of other key species recorded on this visit including 60 gadwall. A maximum of six wigeon were recorded on two visits, 30<sup>th</sup> January and 15<sup>th</sup> February 2022.
134. Coot, cormorant, great crested grebe and mute swan were recorded more often, but in smaller numbers at Lake G7.

Unit 3

Figure 5.3: Distribution and size of flocks of key species recorded at Unit 3 (Lakes H9 and H10) over the survey period (January-December 2022)





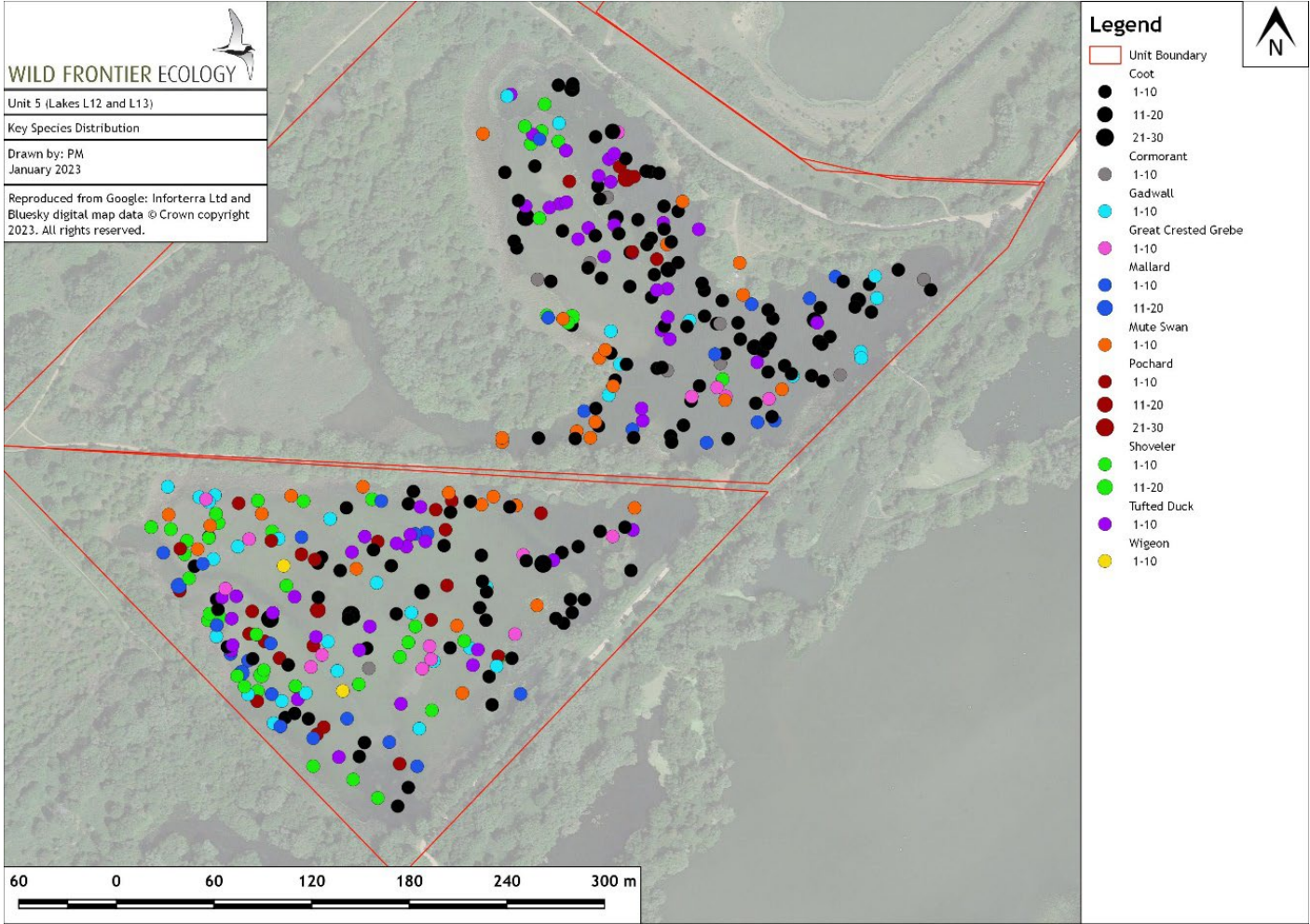


135. Of all the sites, the fewest number of key species (six) were recorded at Unit 3. These were coot, cormorant, mallard, mute swan, tufted duck and wigeon. These were mostly in low numbers and on or close to Lakes H9 and H10.
136. Tufted duck were only recorded on Lake H9, with the highest count of this species (six individuals) recorded on 24<sup>th</sup> February.
137. The grassland to the east of H9 provided a foraging area for wigeon with 54 individuals recorded here on 24<sup>th</sup> February 2022 from VP1, and two individuals in a similar location on 6<sup>th</sup> March 2022. On the final survey (17<sup>th</sup> December 2022), 250 wigeon were recorded foraging in the field to the north of the River Nene, outside of the Unit 3 boundary. Both of these grassland areas have no public access.
138. Mallard and mute swans were more widely distributed across the site with these species being recorded on the banks of the River Nene. Mallard were also recorded within grassland to the west and north of Lake H10 and to the east of Lake H9.



Unit 5

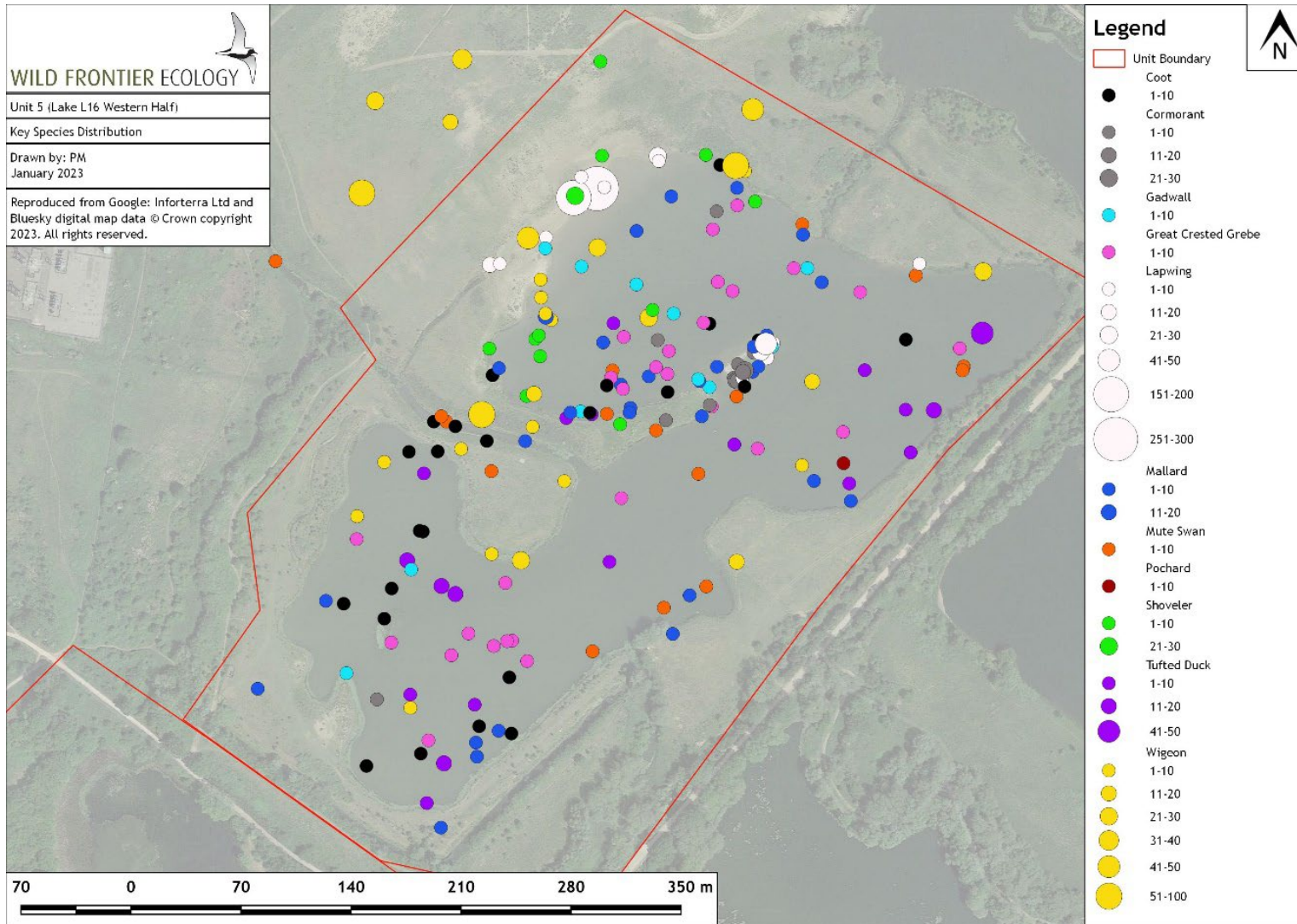
Figure 5.4: Distribution and size of flocks of key species recorded at Unit 5 (Lakes L12 and L13) over the survey period (January-December 2022)





139. Figure 5.4 displays the distribution of the ten key species recorded on Lakes L12 and L13 with key species relatively well distributed across these lakes. The highest count of pochard was 26 individuals on 22<sup>nd</sup> December 2022.
140. Shoveler appeared to favour Lake L12 compared to Lake L13 with shoveler recorded on every visit to this waterbody. On L12, this species is shown by Figure 5.4 to favour the western side of the lake.

**Figure 5.5:** Distribution and size of flocks of key species recorded at Unit 5 (Lake L16) over the survey period (January-December 2022)





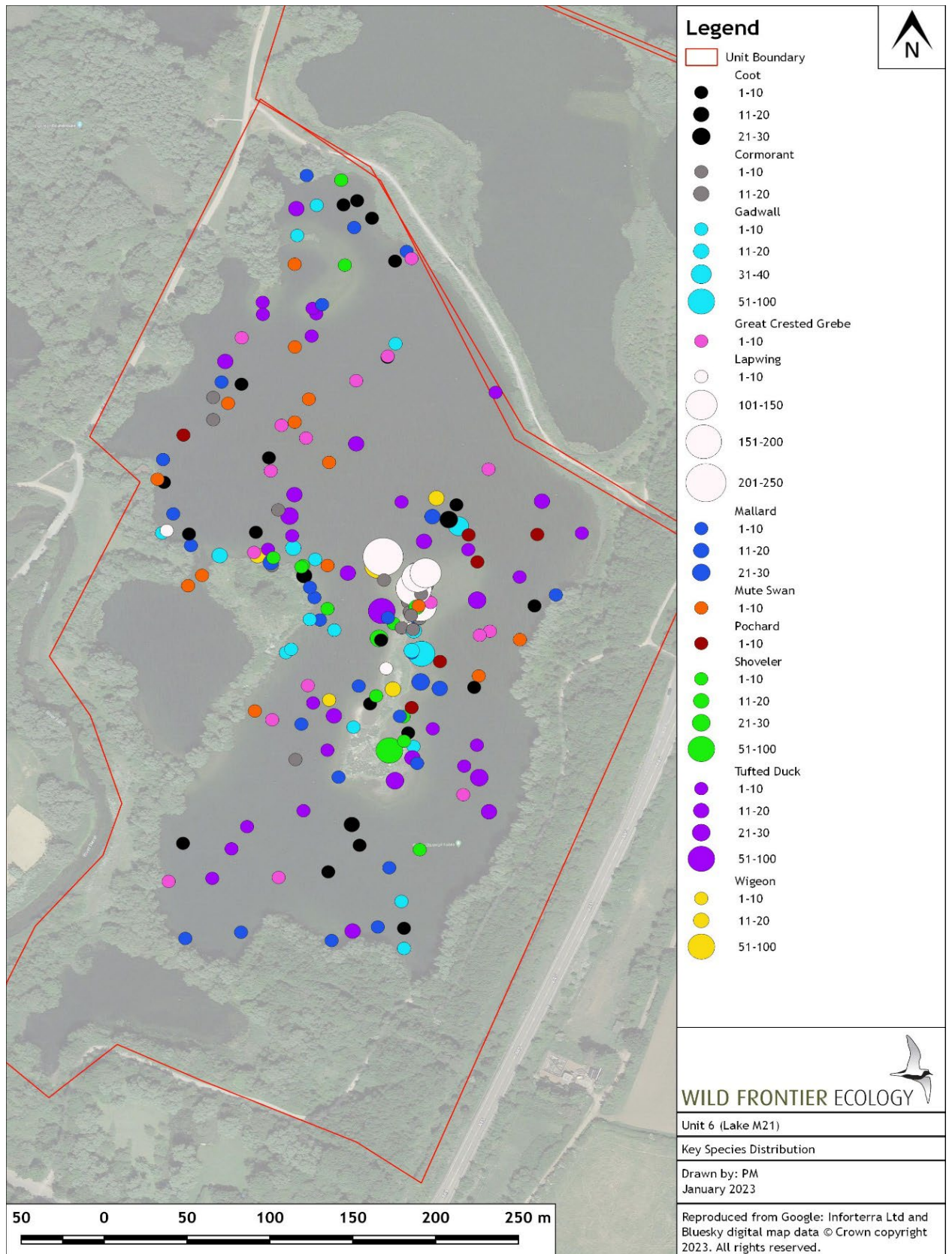


141. Figure 5.5 shows the distribution of lapwing and wigeon at Unit 5 was mainly restricted to Lake L16. The highest count of lapwing was 300 individuals on 4<sup>th</sup> December 2022, the highest across all sites. The highest wigeon numbers (100 individuals) were recorded on the northern bank of Lake L16 on two surveys, 10<sup>th</sup> January 2022 and 17<sup>th</sup> March 2022.
142. Most of the nine other key species recorded on Lake L16 showed no preference in location. Shoveler were an exception to this as this species was only recorded in the northern part of Lake L16.



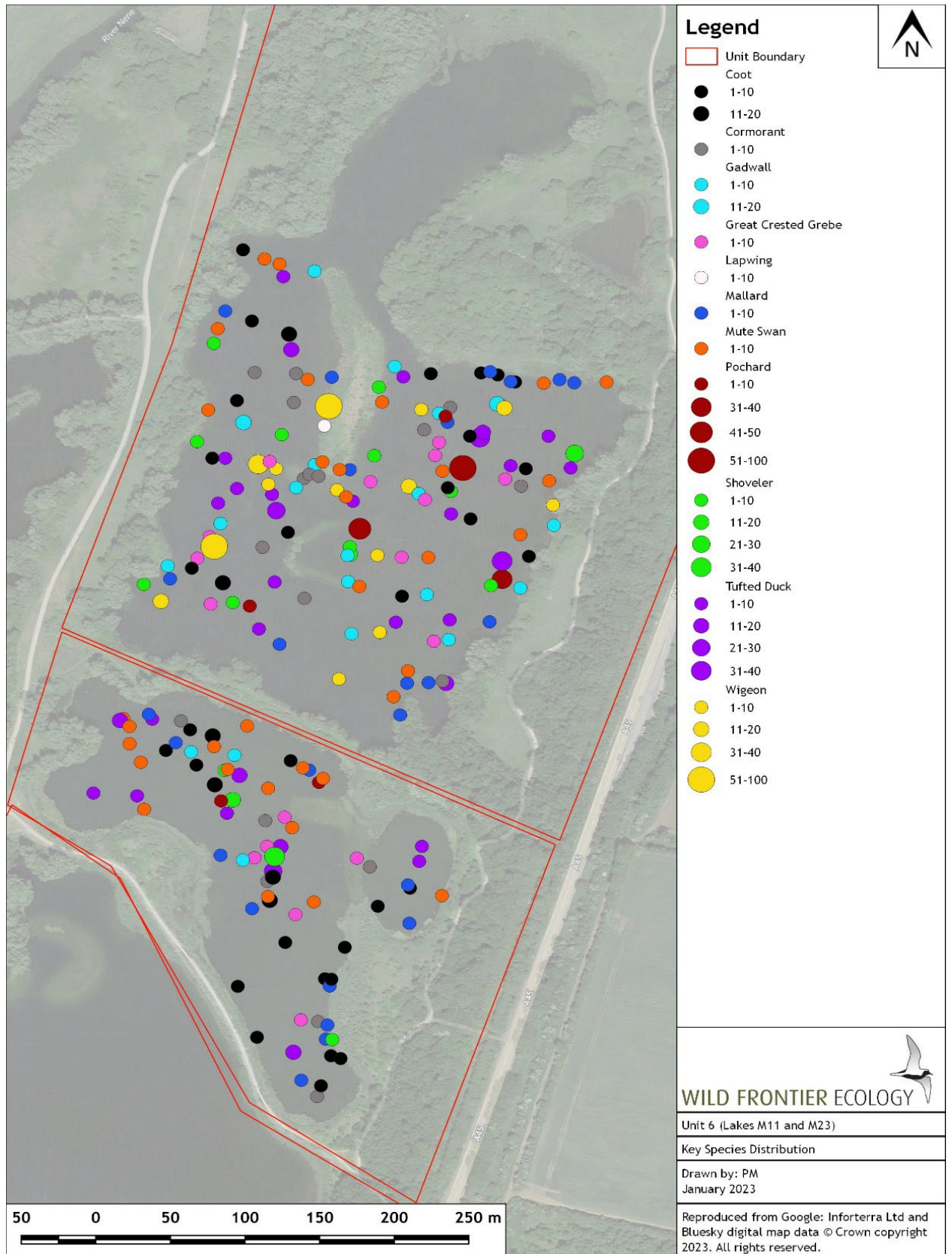
Unit 6

Figure 5.6: Distribution and size of flocks of key species recorded at Unit 6 (Lake M21) over the survey period (January-December 2022)





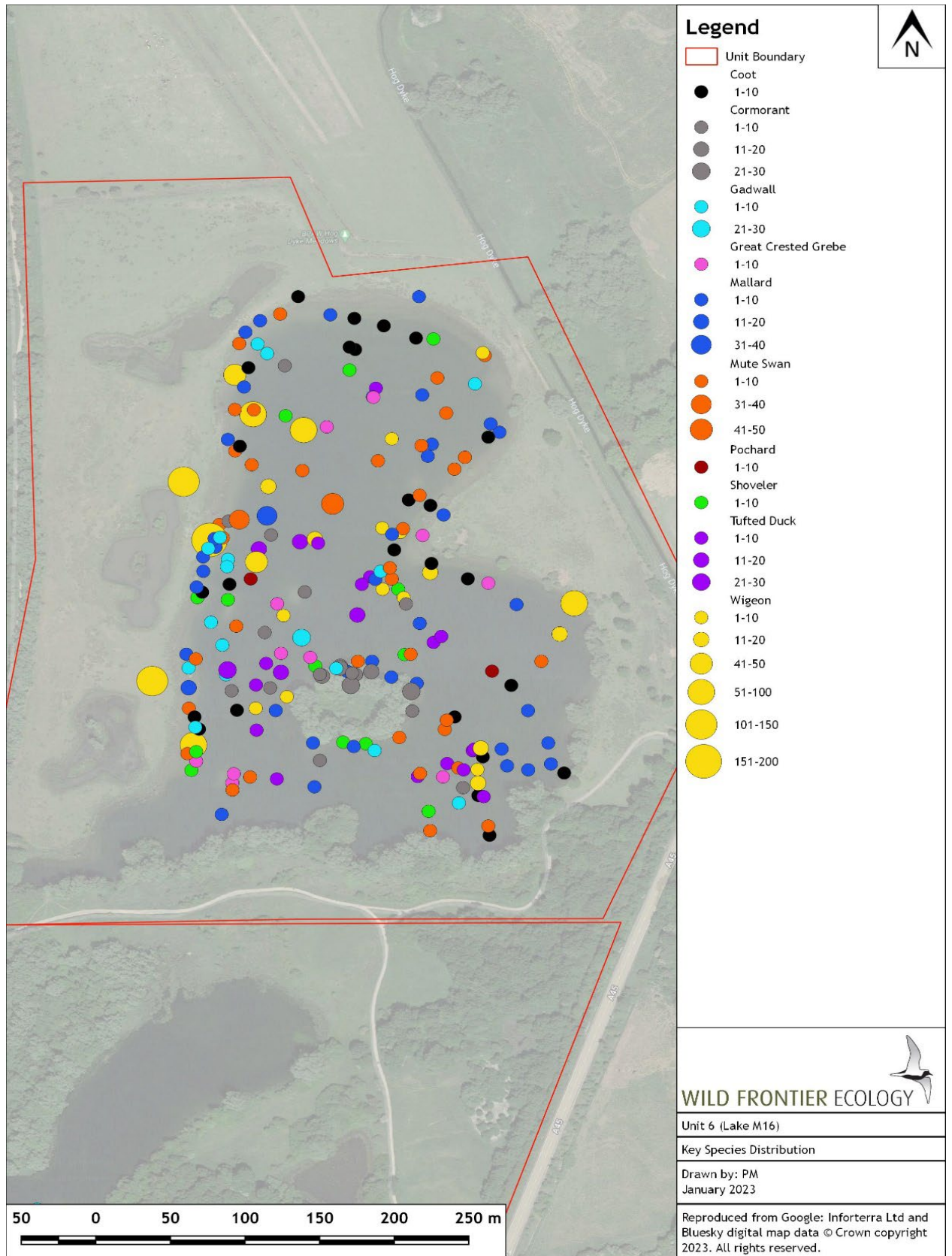
**Figure 5.7:** Distribution and size of flocks of key species recorded at Unit 6 (Lakes M11 and M23) over the survey period (January-December 2022)







**Figure 5.8:** Distribution and size of flocks of key species recorded at Unit 6 (Lake M16) over the survey period (January-December 2022)



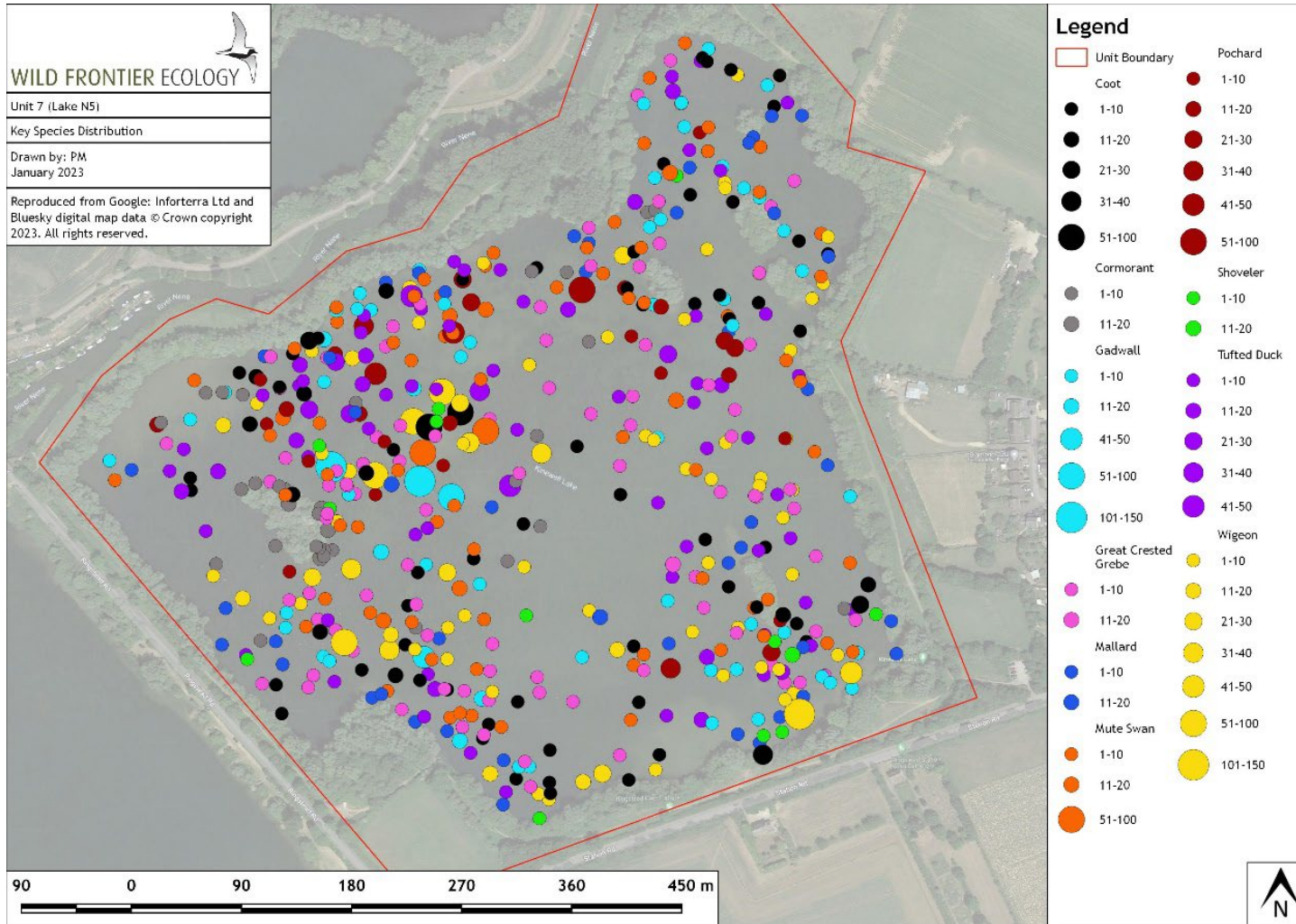




143. The highest count of lapwing at Unit 6 was a total of 219 individuals recorded on the island close to the centre of Lake M21 on 23<sup>rd</sup> January 2022. This was a preferred location for lapwing (see Figure 5.6) at Unit 6 with only one other record of lapwing on another lake (one individual on 30<sup>th</sup> October on Lake M23).
144. The highest count of shoveler across all sites was recorded at Unit 6 on 30<sup>th</sup> October 2022 comprising 51 individuals located on the island in the centre of Lake M21 as shown in Figure 5.6.
145. As shown in Figure 5.7, there was a constraint on surveys on Lake M23 as the northern end could not be seen from VP2, hence no birds being recorded there. On 23<sup>rd</sup> January 2022, the highest count of pochard across all seven sites (85 individuals) was recorded on Lake M23.
146. Figures 5.6-5.8 show ten of the eleven key species (coot, cormorant, gadwall, great crested grebe, mallard, mute swan, pochard, shoveler, tufted duck and wigeon) recorded at Unit 6 to be relatively well distributed across the lakes. Most wigeon were recorded on Lake M16 with the highest count at Unit 6 (152 individuals) recorded on 20<sup>th</sup> November 2022 (see Figure 5.8). Figure 5.8 shows wigeon to favour the west side of Lake M16.

Unit 7

Figure 5.9: Distribution and size of flocks of key species recorded at Unit 7 (Lake N5) over the survey period (January-December 2022)

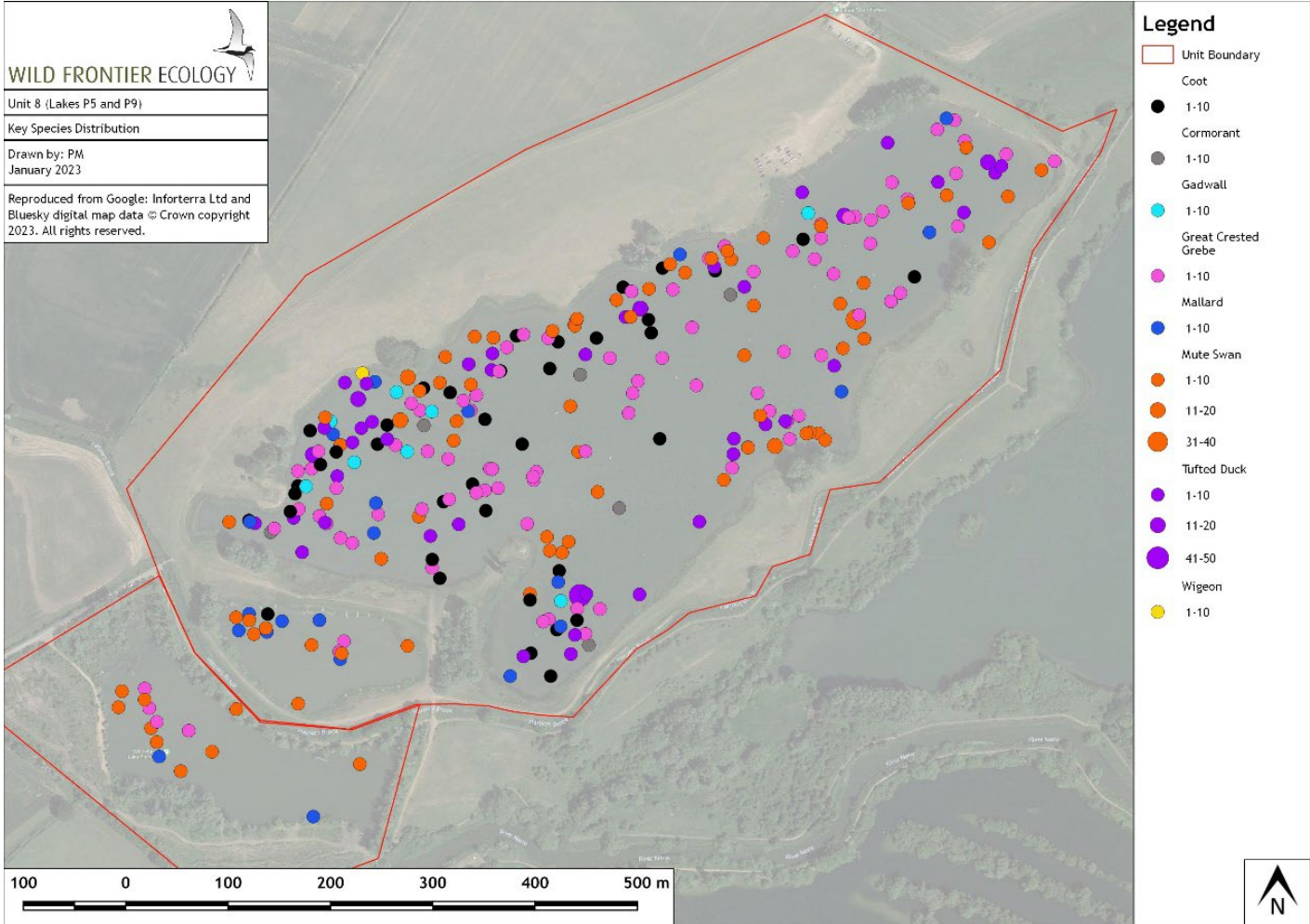




147. Figure 5.9 shows all ten key species recorded at Unit 7 to be relatively well distributed across Lake N5 with no distinct preferences to particular areas. The only area where key species were largely absent is the centre of Lake N5.
148. The highest count of any key species at Unit 7 was 129 wigeon recorded on 30<sup>th</sup> October 2022 close to the southern bank of Lake N5. Other notable counts at Unit 7 include 116 gadwall and 69 mute swans on 17<sup>th</sup> December 2022 (both highest counts of those two key species across all seven sites), and 53 pochard on 24<sup>th</sup> February 2022.

Unit 8

Figure 5.10: Distribution and size of flocks of key species recorded at Unit 8 (Lakes P5 and P9) over the survey period (January-December 2022)







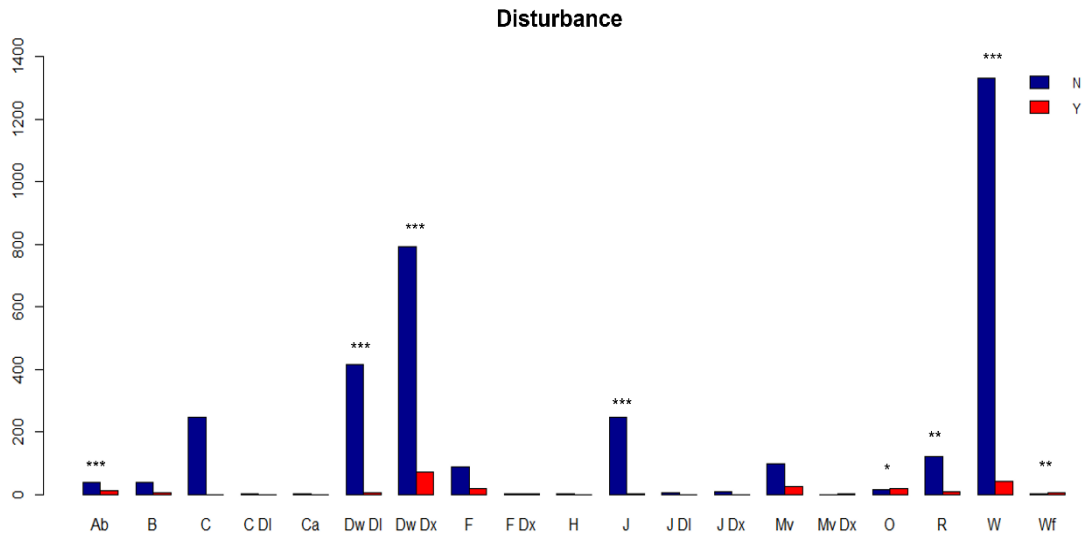
149. Figure 5.10 shows that only three key species were recorded using Lake P9, great crested grebe, mallard and mute swan. These three species were recorded more often on Lake P5, particularly the larger lake of the two situated in the northern half of Unit 8.
150. P5 includes two lakes, with four species using the smaller, southern lake: coot, great crested grebe, mallard and mute swan. These species plus cormorant, gadwall, tufted duck and wigeon were also recorded using the larger lake of P5. On this larger lake, all species except gadwall and wigeon were relatively well distributed. However, the southern two bays of this lake are shown to be preferred by the key species recorded at Unit 8 (see Figure 5.10).
151. No more than ten individuals of coot, cormorant, gadwall, great crested grebe, mallard and wigeon were recorded on any single vantage point survey. Wigeon was only recorded once at Unit 8, one individual on the northern bank of the western bay of the larger of the P5 lakes on 3<sup>rd</sup> February 2022.
152. The highest count of mute swan at Unit 8 was 32 individuals on 23<sup>rd</sup> January 2022. These were recorded close to the eastern bank of the largest lake at Unit 8. The highest count of tufted ducks at Unit 8 was 45 individuals on 12<sup>th</sup> January 2022, recorded in the southern bay of the largest lake.



## 5.4 Disturbance to Birds

153. Figure 6 shows the responses of birds to the different activity types across all seven sites including any statistical significance of probability that a response will be caused by a particular activity.

**Figure 6:** Numbers of responses and no responses of birds to different disturbances



Levels of Statistical Significance: \*\*\*  $p < 0.001$  \*\*  $p < 0.01$  \*  $p < 0.05$

154. As covered in Section 5.1, walking was the most common activity. The majority of these walking disturbances elicited no response in birds (1330 times) compared to 41 times when birds responded. Dog walking with a dog off lead elicited the highest number of responses (75 times) when this was recorded, just over half as often as walking. Both of these activities were found to have a high statistical significance ( $p < 0.001$ ) in the probability of the activity causing a response rather than it being down to chance (see Figure 6). This high level of statistical significance was also found with 'Air-borne', 'Dog walking with dog(s) off lead' and 'Jogging' categories. A lower statistical significance (but still statistically significant) was found in 'Other' ( $p < 0.05$ ), 'Raptor' ( $p < 0.01$ ) and 'Wildfowling' ( $p < 0.01$ ) activities. Despite being recorded more than many other activities like 'Air-borne', 'Other' and 'Wildfowling' and eliciting more disturbance responses, the probability of motor vehicles eliciting a disturbance response was not statistically significant.

155. Table 5 shows the chance of each of these statistically significant activities causing disturbance.



**Table 5:** Percentage chance of an activity causing disturbance where probability of a response being elicited was statistically significant

Activity	% chance of causing disturbance
Air-borne	5.78
Dog walking with Dog(s) on lead	24.82
Dog walking with Dog(s) off lead	33.99
Jogging	1.63
Other/unknown	274
Raptor	25.97
Walking	11.91
Wildfowling	647

156. Dog walking with dog on and off lead have higher chances of causing disturbance compared to most other activities. Dog walkers with dogs off lead (33.99%) are more likely to cause disturbance than when dogs are on leads (24.82%). 'Other' and 'Wildfowling' have chances of causing disturbance over 100% due to a higher number of responses ('Other'=17; 'Wildfowling'=4) elicited by these activities compared to no responses ('Other'=16; 'Wildfowling'=1), with the overall low number of records skewing these percentage chances.

#### 5.4.1 Key Species Reactions to disturbances

157. Tables 6.1 to 6.7 show the number of times each reaction was exhibited by the key species at the seven sites. The percentages display the percentage of times each response was shown by a species.

158. Over all sites, the majority of activity led to no response. This amounted to 97% of disturbances at Unit 1, 76.5% at Unit 2, 97.2% at Unit 3, 99.7% at Unit 5, 99.6% at Unit 6, 99.7% at Unit 7 and 90% at Unit 8. The highest number of flight responses exhibited by key species was at Unit 1, 115 in total. Key species responded by walking or swimming away from a disturbance most often at Unit 2 (recorded 80 times).

**Table 6.1:** Reaction occurrences of Key Species to disturbances at Unit 1

	NR	A	W/S	FS	F	Total
Coot	444 (96.3%)	0	6 (1.3%)	4 (0.9%)	7 (1.5%)	461
Cormorant	346 (98%)	0	0	0	7 (2%)	353
Gadwall	306 (96.5%)	0	0	2 (0.6%)	9 (2.8%)	317
Golden Plover	71 (93.4%)	0	1 (1.3%)	3 (3.9%)	1 (1.3%)	76
Great Crested Grebe	498 (98.6%)	0	1 (0.1 %)	3 (0.6%)	3 (0.6%)	505



	NR	A	W/S	FS	F	Total
Lapwing	250 (98%)	0	0	0	5 (2%)	255
Mallard	536 (96.6%)	0	5 (0.9%)	2 (0.3%)	12 (2.2%)	555
Mute Swan	598 (97.9%)	0	4 (0.7%)	4 (0.7%)	5 (0.8%)	611
Pochard	247 (98.8%)	0	0	0	3 (1.2%)	250
Shoveler	20 (74.1%)	0	0	1 (3.7%)	6 (22.2%)	27
Tufted Duck	468 (97.3%)	0	2 (0.4%)	2 (0.4%)	9 (1.9%)	481
Wigeon	607 (95.1%)	0	4 (0.6%)	1 (0.2%)	26 (4.1%)	638
<b>Key Species Total</b>	<b>4,391 (97%)</b>	<b>0</b>	<b>23 (0.5%)</b>	<b>22 (0.5%)</b>	<b>93 (2%)</b>	<b>4,529</b>



**Table 6.2:** Reaction occurrences of Key Species to disturbances at Unit 2

	NR	A	W/S	FS	F	Total
Coot	7 (30.4%)	7 (30.4%)	8 (34.8%)	0	1 (4.3%)	23
Cormorant	129 (88.4%)	5 (3.4%)	8 (5.5%)	0	4 (2.7%)	146
Gadwall	1 (11.1%)	0	8 (88.9%)	0	0	9
Great Crested Grebe	93 (81.6%)	8 (7%)	11 (9.6%)	2 (1.8%)	0	114
Mallard	60 (85.7%)	4 (5.7%)	5 (7.1%)	0	1 (1.4%)	70
Mute Swan	79 (80.6%)	4 (4.1%)	10 (10.2%)	3 (3.1%)	2 (2%)	98
Pochard	3 (15%)	4 (20%)	13 (65%)	0	0	20
Shoveler	0	0	5 (100%)	0	0	5
Tufted Duck	55 (77.5%)	4 (5.6%)	9 (12.7%)	0	3 (4.2%)	71
Wigeon	2 (40%)	0	3 (60%)	0	0	5
<b>Key Species Total</b>	<b>429 (76.5%)</b>	<b>36 (6.4%)</b>	<b>80 (14.3%)</b>	<b>5 (0.9%)</b>	<b>11 (2%)</b>	<b>561</b>

**Table 6.3:** Reaction occurrences of Key Species to disturbances at Unit 3

	NR	A	W/S	FS	F	Total
Coot	190 (99%)	1 (0.5%)	1 (0.5%)	0	0	192
Cormorant	68 (98.6%)	0	0	0	1 (1.4%)	69
Mallard	179 (98.4%)	1 (0.5%)	1 (0.5%)	0	1 (0.5%)	182
Mute Swan	282 (94.9%)	6 (2%)	4 (1.3%)	0	5 (1.7%)	297
Tufted Duck	75 (98.7%)	0	0	0	1 (1.3%)	76
Wigeon	51* (96.2%)	0	0	0	2 (3.8%)	53
<b>Key Species Total</b>	<b>845 (97.2%)</b>	<b>8 (0.9%)</b>	<b>6 (0.7%)</b>	<b>0</b>	<b>10 (1.2%)</b>	<b>869</b>

\*Also flocks recorded outside of survey area foraging on Visit 12 which were not disturbed by any activity (48 occurrences of activity recorded on that visit)

**Table 6.4:** Reaction occurrences of Key Species to disturbances at Unit 5

	NR	A	W/S	FS	F	Total
Coot	1150 (99.1%)	1 (0.1%)	8 (0.7%)	2 (0.2%)	0	1161
Cormorant	450 (100%)	0	0	0	0	450
Gadwall	814 (100%)	0	0	0	0	814
Great Crested Grebe	658 (99.8%)	0	1 (0.2%)	0	0	659
Lapwing	67 (100%)	0	0	0	0	67
Mallard	868 (99.7%)	2 (0.2%)	0	0	1 (0.1%)	871
Mute Swan	1076 (100%)	0	0	0	0	1076
Pochard	657 (99.7%)	1 (0.2%)	1 (0.2%)	0	0	659
Shoveler	842 (99.9%)	1 (0.1%)	0	0	0	843
Tufted Duck	1071 (99.8%)	0	2 (0.2%)	0	0	1073
Wigeon	222 (99.6%)	0	0	0	1 (0.4%)	223
<b>Key Species Total</b>	<b>7,875 (99.7%)</b>	<b>5 (&lt;0.1%)</b>	<b>12 (0.1%)</b>	<b>2 (&lt;0.1%)</b>	<b>2 (&lt;0.1%)</b>	<b>7,896</b>

**Table 6.5:** Reaction occurrences of Key Species to disturbances at Unit 6

	NR	A	W/S	FS	F	Total
Coot	361 (99.7%)	0	1 (0.3%)	0	0	362
Cormorant	358 (99.7%)	1 (0.3%)	0	0	0	359
Gadwall	276 (99.3%)	1 (0.4%)	0	1 (0.4%)	0	278
Great Crested Grebe	313 (100%)	0	0	0	0	313
Lapwing	138 (99.3%)	1 (0.7%)	0	0	0	139
Mallard	381 (99.5%)	1 (0.3%)	0	0	1 (0.3%)	383
Mute Swan	384 (99.5%)	1 (0.3%)	1 (0.3%)	0	0	386
Pochard	190 (100%)	0	0	0	0	190
Shoveler	271 (100%)	0	0	0	0	271
Tufted Duck	384 (99.5%)	0	1 (0.3%)	1 (0.3%)	0	386
Wigeon	151 (98.1%)	1 (0.6%)	0	2 (1.3%)	0	154
<b>Key Species Total</b>	<b>3,207 (99.6%)</b>	<b>6 (0.2%)</b>	<b>3 (0.1%)</b>	<b>4 (0.1%)</b>	<b>1 (&lt;0.1%)</b>	<b>3,221</b>



**Table 6.6:** Reaction occurrences of Key Species to disturbances at Unit 7

	NR	A	W/S	FS	F	Total
Coot	392 (99.7%)	0	1 (0.3%)	0	0	393
Cormorant	280 (100%)	0	0	0	0	280
Gadwall	370 (100%)	0	0	0	0	370
Great Crested Grebe	393 (99.7%)	1 (0.3%)	0	0	0	394
Mallard	334 (99.1%)	0	1 (0.3%)	1 (0.3%)	1 (0.3%)	337
Mute Swan	405 (100%)	0	0	0	0	405
Pochard	226 (100%)	0	0	0	0	226
Shoveler	89 (100%)	0	0	0	0	89
Tufted Duck	402 (99%)	0	4 (1%)	0	0	406
Wigeon	382 (99.7%)	0	1 (0.3%)	0	0	383
<b>Key Species Total</b>	<b>3,273 (99.7%)</b>	<b>1 (&lt;0.1%)</b>	<b>7 (0.2%)</b>	<b>1 (&lt;0.1%)</b>	<b>1 (&lt;0.1%)</b>	<b>3,283</b>

**Table 6.7:** Reaction occurrences of Key Species to disturbances at Unit 8

	NR	A	W/S	FS	F	Total
Coot	101 (95.3%)	0	3 (2.8%)	2 (1.9%)	0	106
Cormorant	33 (100%)	0	0	0	0	33
Gadwall	22 (84.6%)	1 (3.8%)	2 (7.7%)	0	1 (3.8%)	26
Great Crested Grebe	151 (88.3%)	2 (1.2%)	16 (9.4%)	1 (0.6%)	1 (0.6%)	171
Mallard	76 (93.8%)	0	4 (4.9%)	0	1 (1.2%)	81
Mute Swan	145 (93.5%)	1 (0.6%)	3 (1.9%)	0	6 (3.9%)	155
Tufted Duck	112 (81.2%)	2 (1.4%)	15 (10.9%)	4 (2.9%)	5 (3.6%)	138
Wigeon	1 (50%)	0	1 (50%)	0	0	2
<b>Key Species Total</b>	<b>641 (90%)</b>	<b>6 (0.1%)</b>	<b>44 (6.2%)</b>	<b>7 (0.1%)</b>	<b>14 (0.2%)</b>	<b>712</b>

### 5.4.2 Responses of key species to different activities

159. Tables 7.1 to 7.7 show the number of times each response to disturbance was exhibited by the key species at the seven sites. The percentage values display the proportion of times per disturbance category each response was shown by a species. Most severe responses of key species (where birds were displaced - walking/swimming, fly short, fly) were from disturbances involving dogs off leads.

#### Unit 1

**Table 7.1:** Number of disturbances caused to Key Species by each activity type at Unit 1

Activity Type	NR	A	W/S	FS	F	Total
Air-borne	0	0	0	0	1 (100%)	1
Birdwatching	8 (100%)	0	0	0	0	8
Cycling	21 (100%)	0	0	0	0	21
Cycling with Dog(s) on lead	1 (100%)	0	0	0	0	1
Canoeing	0	0	0	0	0	0
Dog walking with Dog(s) on lead	100 (97.1%)	0	0	0	3 (2.9%)	103
Dog walking with Dog(s) off lead	125 (77.6%)	0	10 (6.2%)	9 (5.6%)	17 (10.6%)	161
Fishing	0	0	0	0	0	0
Fishing with Dog off lead	0	0	0	0	0	0
Horse riding	0	0	0	0	0	0
Jogging	72 (98.6%)	0	1 (1.4%)	0	0	73
Jogging with Dog(s) on lead	1 (100%)	0	0	0	0	1



Activity Type	NR	A	W/S	FS	F	Total
Jogging with Dog(s) off lead	5 (100%)	0	0	0	0	5
Motor vehicle	7 (87.5%)	0	0	0	1 (12.5%)	8
Motor vehicle with Dog off lead	0	0	0	0	1 (100%)	1
Other/Unknown	0	0	0	0	1 (100%)	1
Raptor	4 (44.4%)	0	1 (11.1%)	2 (22.2%)	2 (22.2%)	9
Walking	286 (97.3%)	0	3 (1%)	1 (0.3%)	4 (1.4%)	294
Wildfowling	0	0	1 (20%)	1 (20%)	3 (60%)	5
<b>Total</b>	<b>630 (91%)</b>	<b>0</b>	<b>16 (2.3%)</b>	<b>13 (1.9%)</b>	<b>33 (4.8%)</b>	<b>692</b>

160. Dogs being walked off lead caused the greatest number of severe reactions at Unit 1. Compared to walking, dog walking with dogs off lead caused more than 20% of severe reactions from key species.
161. Wildfowling caused a response on every occasion it was recorded at Unit 1 with the majority of key species responding on each occasion. A minimum of 200 individual birds of key species were disturbed on all of these occasions. Flight response was exhibited on 80% of these disturbance events.



**Unit 2****Table 7.2:** Number of disturbances caused to Key Species by each activity type at Unit 2

Activity Type	NR	A	W/S	FS	F	Total
Air-borne	10 (76.9%)	0	0	0	3 (23.1%)	13
Birdwatching	0	0	0	0	0	0
Cycling	1 (100%)	0	0	0	0	1
Cycling with Dog(s) on lead	0	0	0	0	0	0
Canoeing	0	0	0	0	0	0
Dog walking with Dog(s) on lead	0	0	0	0	0	0
Dog walking with Dog(s) off lead	4 (66.7%)	0	2 (33.3%)	0	0	6
Fishing	0	0	1 (100%)	0	0	1
Fishing with Dog off lead	0	0	0	0	0	0
Horse riding	0	0	0	0	0	0
Jogging	0	0	0	0	0	0
Jogging with Dog(s) on lead	0	0	0	0	0	0
Jogging with Dog(s) off lead	0	0	0	0	0	0
Motor vehicle	81 (79.4%)	4 (3.9%)	12 (11.8%)	1 (1.0%)	4 (3.9%)	102
Motor vehicle with Dog off lead	0	0	0	0	0	0

Activity Type	NR	A	W/S	FS	F	Total
Other/Unknown	10 (58.8%)	0	4 (23.5%)	2 (11.8%)	1 (5.9%)	17
Raptor	27 (100%)	0	0	0	0	27
Walking	10 (71.4%)	0	3 (21.4%)	0	1 (7.1%)	14
Wildfowling	0	0	0	0	0	0
<b>Total</b>	<b>143 (79%)</b>	<b>4 (2.2%)</b>	<b>22 (12.2%)</b>	<b>3 (1.7%)</b>	<b>9 (5%)</b>	<b>181</b>

162. Motor vehicles and walking led to the majority of the most severe responses from key species at Unit 2.
163. The 'Other' activities include water-skiing at this site. Water-skiing elicited a response from key species on four occasions (100% of times this was recorded), including the majority of birds (35 of 37 key species individuals present) being flushed on one occasion at Unit 2.



## Unit 3

Table 7.3: Number of disturbances caused to Key Species by each activity type at Unit 3

Activity Type	NR	A	W/S	FS	F	Total
Air-borne	27 (96.4%)	1 (3.6%)	0	0	0	28
Birdwatching	9 (81.8%)	1 (9.1%)	0	0	1 (9.1%)	11
Cycling	1 (100%)	0	0	0	0	1
Cycling with Dog(s) on lead	0	0	0	0	0	0
Canoeing	1 (100%)	0	0	0	0	1
Dog walking with Dog(s) on lead	48 (98%)	0	0	0	1 (2%)	49
Dog walking with Dog(s) off lead	195 (94.2%)	2 (1%)	5 (2.4%)	0	5 (2.4%)	207
Fishing	3 (100%)	0	0	0	0	3
Fishing with Dog off lead	0	0	0	0	0	0
Horse riding	0	0	0	0	0	0
Jogging	3 (100%)	0	0	0	0	3
Jogging with Dog(s) on lead	1 (100%)	0	0	0	0	1
Jogging with Dog(s) off lead	2 (100%)	0	0	0	0	2
Motor vehicle	3 (100%)	0	0	0	0	3
Motor vehicle with Dog off lead	0	0	0	0	0	0



Activity Type	NR	A	W/S	FS	F	Total
Other/Unknown	3 (33.3%)	0	1 (11.1%)	0	5 (55.6%)	9
Raptor	36 (90%)	0	3 (7.5%)	0	1 (2.5%)	40
Walking	203 (100%)	0	0	0	0	203
Wildfowling	0	0	0	0	0	0
<b>Total</b>	<b>535 (95.4%)</b>	<b>4 (0.7%)</b>	<b>9 (1.6%)</b>	<b>0</b>	<b>13 (2.3%)</b>	<b>561</b>

164. Less than 5% of activity disturbances led to a response from key species. Most of these were caused by dogwalkers with dogs off leads with key species responding with a disturbed response (alert or more severe) on 12 occasions. Five of these occasions led to key species flying (a maximum of four individuals on two occasions).
165. Birdwatching was recorded to elicit one flight response when the surveyor briefly moved to adjust their scope during a survey at Vantage Point 1. This led to foraging 51 wigeon and two mallards flying in response.



**Unit 5****Table 7.4:** Number of disturbances caused to Key Species by each activity type at Unit 5

Activity Type	NR	A	W/S	FS	F	Total
Air-borne	1 (50%)	1 (50%)	0	0	0	2
Birdwatching	5 (100%)	0	0	0	0	5
Cycling	168 (100%)	0	0	0	0	168
Cycling with Dog(s) on lead	0	0	0	0	0	0
Canoeing	0	0	0	0	0	0
Dog walking with Dog(s) on lead	22 (100%)	0	0	0	0	22
Dog walking with Dog(s) off lead	318 (97%)	1 (0.3%)	7 (2.1%)	2 (0.6%)	0	328
Fishing	7 (100%)	0	0	0	0	7
Fishing with Dog off lead	0	0	0	0	0	0
Horse riding	0	0	0	0	0	0
Jogging	126 (100%)	0	0	0	0	126
Jogging with Dog(s) on lead	1 (100%)	0	0	0	0	1
Jogging with Dog(s) off lead	1 (100%)	0	0	0	0	1
Motor vehicle	3 (60%)	0	1	0	1	5



Activity Type	NR	A	W/S	FS	F	Total
Motor vehicle with Dog off lead	0	0	0	0	0	0
Other/Unknown	2 (100%)	0	0	0	0	2
Raptor	2 (100%)	0	0	0	0	2
Walking	503 (99.8%)	0	1 (0.2%)	0	0	504
Wildfowling	0	0	0	0	0	0
<b>Total</b>	<b>1159 (98.8%)</b>	<b>2 (0.2%)</b>	<b>9 (0.8%)</b>	<b>2 (0.2%)</b>	<b>1 (0.1%)</b>	<b>1173</b>

166. Disturbances at Unit 5 elicited very few responses from key species (1.2% of recorded responses). The most severe of these was a mini tractor causing 30 wigeon and four mallards to fly.

167. Regarding responses elicited by the public, dog walking with dogs off lead led to the most severe responses, but never caused key species to fly more than 50m. When dogs were let into the water at Lake L13, coot responded on two occasions with a flight shorter than 50m as shown in Table 7.4.

## Unit 6

**Table 7.5:** Number of disturbances caused to Key Species by each activity type at Unit 6

Activity Type	NR	A	W/S	FS	F	Total
Air-borne	0	0	0	0	0	0
Birdwatching	11 (100%)	0	0	0	0	11
Cycling	52 (100%)	0	0	0	0	52
Cycling with Dog(s) on lead	0	0	0	0	0	0
Canoeing	0	0	0	0	0	0



Activity Type	NR	A	W/S	FS	F	Total
Dog walking with Dog(s) on lead	104 (99%)	0	1 (1%)	0	0	105
Dog walking with Dog(s) off lead	7 (100%)	0	0	0	0	7
Fishing	0	0	0	0	0	0
Fishing with Dog off lead	0	0	0	0	0	0
Horse riding	2 (100%)	0	0	0	0	2
Jogging	42 (100%)	0	0	0	0	42
Jogging with Dog(s) on lead	0	0	0	0	0	0
Jogging with Dog(s) off lead	0	0	0	0	0	0
Motor vehicle	3 (75%)	1 (25%)	0	0	0	4
Motor vehicle with Dog off lead	0	0	0	0	0	0
Other/Unknown	1 (100%)	0	0	0	0	1
Raptor	22 (95.7%)	0	0	1 (4.3%)	0	23
Walking	160 (98.2%)	0	1 (0.6%)	1 (0.6%)	1 (0.6%)	163
Wildfowling	0	0	0	0	0	0
<b>Total</b>	<b>405 (98.8%)</b>	<b>0</b>	<b>2 (0.5%)</b>	<b>2 (0.5%)</b>	<b>1 (0.2%)</b>	<b>410</b>

168. Activity at Unit 6 elicited the fewest responses from key species at any of the seven sites with 98.8% of disturbances leading to no response from key species. The activity where a response from key species was most frequently recorded was

walking. Dog walking elicited only one response from key species, with a person with dog on the lead causing three tufted ducks and two coots to swim 100m.



**Unit 7****Table 7.6:** Number of disturbances caused to Key Species by each activity type at Unit 7

Activity Type	NR	A	W/S	FS	F	Total
Air-borne	0	0	0	0	0	0
Birdwatching	7 (100%)	0	0	0	0	7
Cycling	1 (100%)	0	0	0	0	1
Cycling with Dog(s) on lead	0	0	0	0	0	0
Canoeing	0	0	0	0	0	0
Dog walking with Dog(s) on lead	127 (100%)	0	0	0	0	127
Dog walking with Dog(s) off lead	110 (97.3%)	0	2 (1.8%)	1 (0.9%)	0	113
Fishing	13 (86.7%)	1 (6.7%)	1 (6.7%)	0	0	15
Fishing with Dog off lead	0	0	0	0	0	0
Horse riding	0	0	0	0	0	0
Jogging	1 (100%)	0	0	0	0	1
Jogging with Dog(s) on lead	0	0	0	0	0	0
Jogging with Dog(s) off lead	0	0	0	0	0	0
Motor vehicle	0	0	0	0	0	0
Motor vehicle with Dog off lead	0	0	0	0	0	0

Activity Type	NR	A	W/S	FS	F	Total
Other/Unknown	0	0	0	0	0	0
Raptor	27 (100%)	0	0	0	0	27
Walking	120 (97.6%)	1 (0.8%)	1 (0.8%)	0	1 (0.8%)	123
Wildfowling	0	0	0	0	0	0
<b>Total</b>	<b>405 (97.8%)</b>	<b>2 (0.5%)</b>	<b>4 (1.0%)</b>	<b>2 (0.5%)</b>	<b>1 (0.2%)</b>	<b>414</b>

169. Like at Unit 6, very few responses were elicited by key species from disturbance at Unit 7. Two flight responses were recorded at Unit 7, one to walking (two mallards flew more than 50m) and one to a dogwalker with a dog off the lead (four mallards flew a short distance).
170. Of all the responses elicited by key species, walking/swimming was recorded most, caused by dog walking with a dog off lead twice and walking and fishing once each.



## Unit 8

Table 7.7: Number of disturbances caused to Key Species by each activity type at Unit 8

Activity Type	NR	A	W/S	FS	F	Total
Air-borne	1 (25%)	0	1 (25%)	0	2 (50%)	4
Birdwatching	0	0	0	0	0	0
Cycling	1 (100%)	0	0	0	0	1
Cycling with Dog(s) on lead	0	0	0	0	0	0
Canoeing	0	0	0	0	0	0
Dog walking with Dog(s) on lead	13 (86.7%)	0	0	1 (6.7%)	1 (6.7%)	15
Dog walking with Dog(s) off lead	34 (79.1%)	0	6 (14%)	1 (2.3%)	2 (4.7%)	43
Fishing	66 (85.7%)	1 (1.3%)	6 (7.8%)	2 (2.6%)	2 (2.6%)	77
Fishing with Dog off lead	3 (100%)	0	0	0	0	3
Horse riding	0	0	0	0	0	0
Jogging	2 (100%)	0	0	0	0	2
Jogging with Dog(s) on lead	1 (100%)	0	0	0	0	1
Jogging with Dog(s) off lead	1 (100%)	0	0	0	0	1
Motor vehicle	1 (100%)	0	0	0	0	1
Motor vehicle with Dog off lead	0	0	0	0	0	0

Activity Type	NR	A	W/S	FS	F	Total
Other/Unknown	0	0	0	0	0	0
Raptor	3 (75%)	1 (25%)	0	0	0	4
Walking	49 (68.1%)	0	17 (23.6%)	1 (1.4%)	5 (6.9%)	72
Wildfowling	1 (100%)	0	0	0	0	1
<b>Total</b>	<b>176 (78.2%)</b>	<b>2 (0.9%)</b>	<b>30 (13.3%)</b>	<b>5 (2.2%)</b>	<b>12 (5.3%)</b>	<b>225</b>

171. Walking or in the case of Unit 8, movement of anglers, caused the most responses including six more severe responses when key species flew. The most severe of these resulted in 22 tufted ducks flying in response to this category of disturbance. Fishing from boats (category F) caused four flight responses, the most severe response being two mute swans flying 500m.
172. Excluding fishing activities, dog walking caused the highest level of responses from key species to disturbance at Unit 8. Dogs off leads elicited the most severe responses, resulting in key species walking/swimming six times and flying three times.

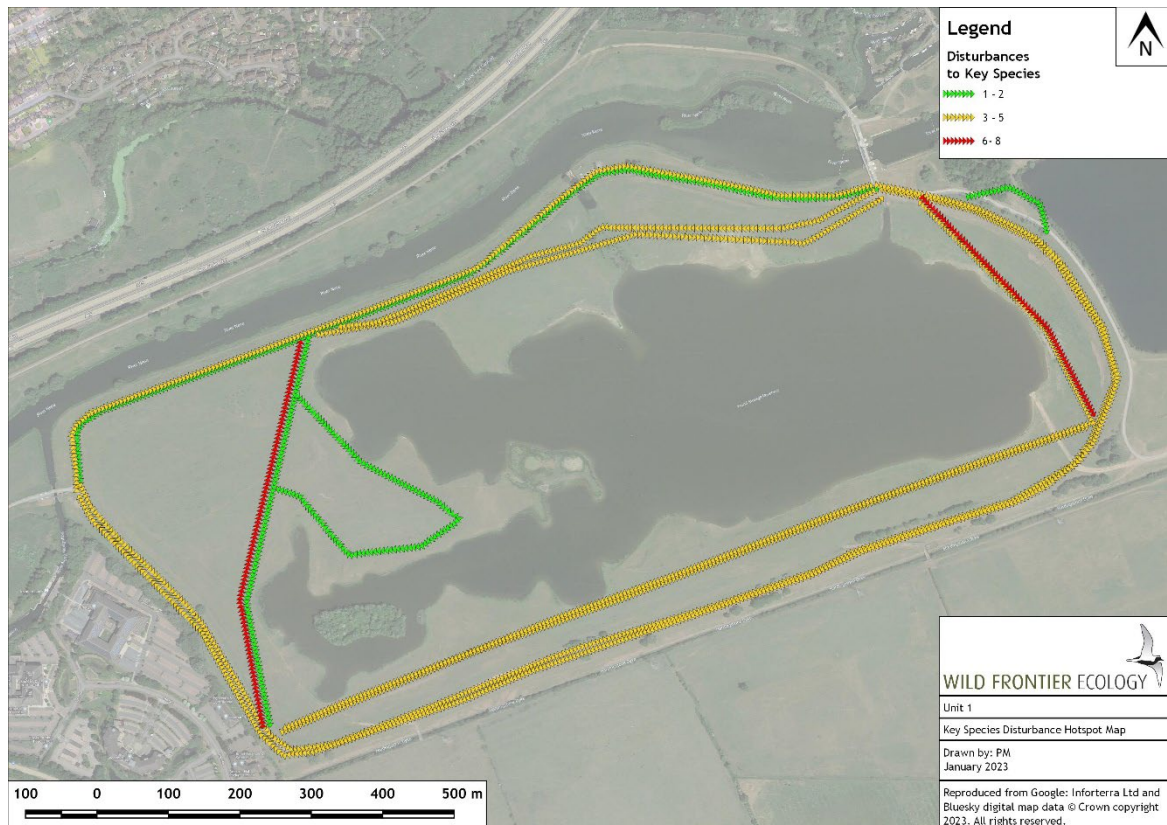


### 5.4.3 Key Species Disturbance Hotspots

173. Figures 7.1 to 7.7 show ground-based routes which caused key species to respond to disturbances, with green routes being responsible for the lowest number of disturbances to key species, and red the highest.

#### Unit 1

**Figure 7.1:** Areas of recorded ground-based disturbance to key species at Unit 1 (Lake D1)



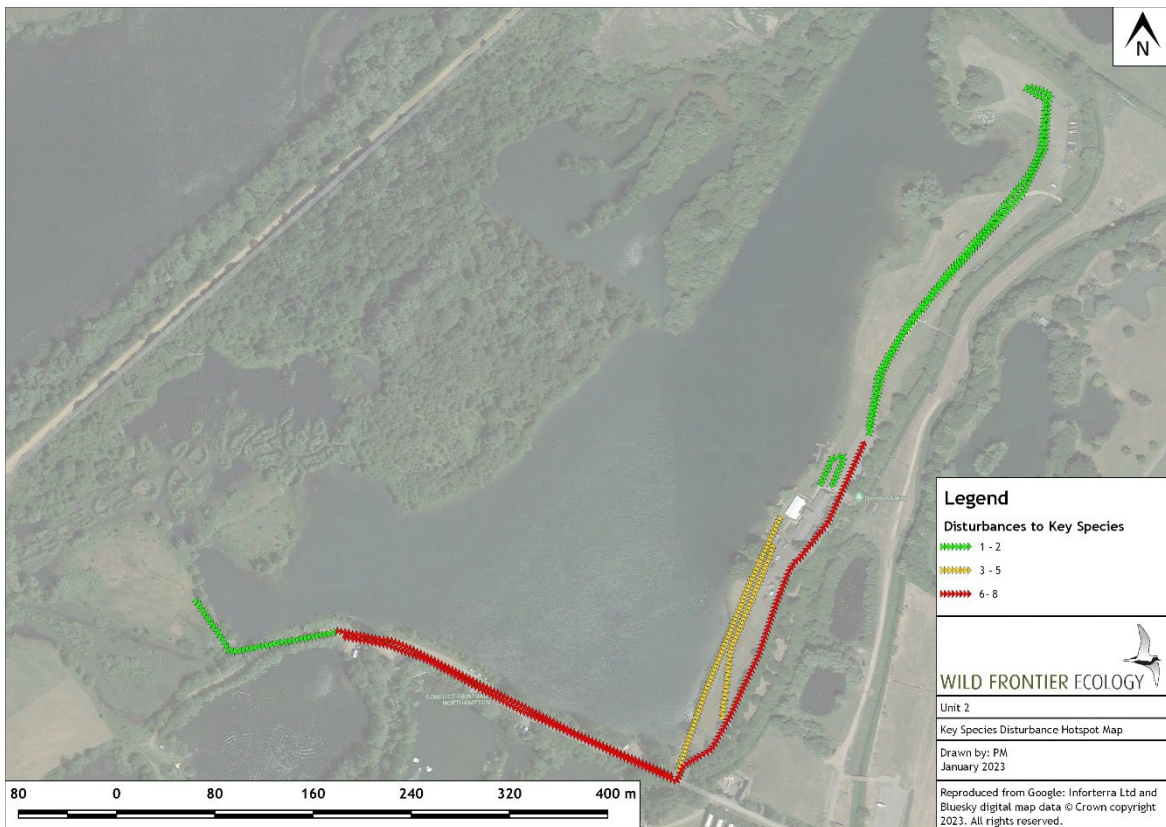
174. Despite the highest levels of activity occurring on the main circular path, the numbers of times key species were disturbed in different locations was generally higher closer to the water's edge, particularly at the western and eastern ends of Lake D1. When routes came closer to Lake D1, key species were disturbed on a total of ten occasions on the west side of the lake, nine times on the northern side, eleven times on the east side and six times on the southern side. Of the total recorded activity along these routes closer to Lake D1, 76.1% of these occurrences led to disturbance to key species compared to just 1.5% of the activity on the main circular path.





## Unit 2

**Figure 7.2:** Areas of recorded ground-based disturbance to key species at Unit 2 (Lake G7)

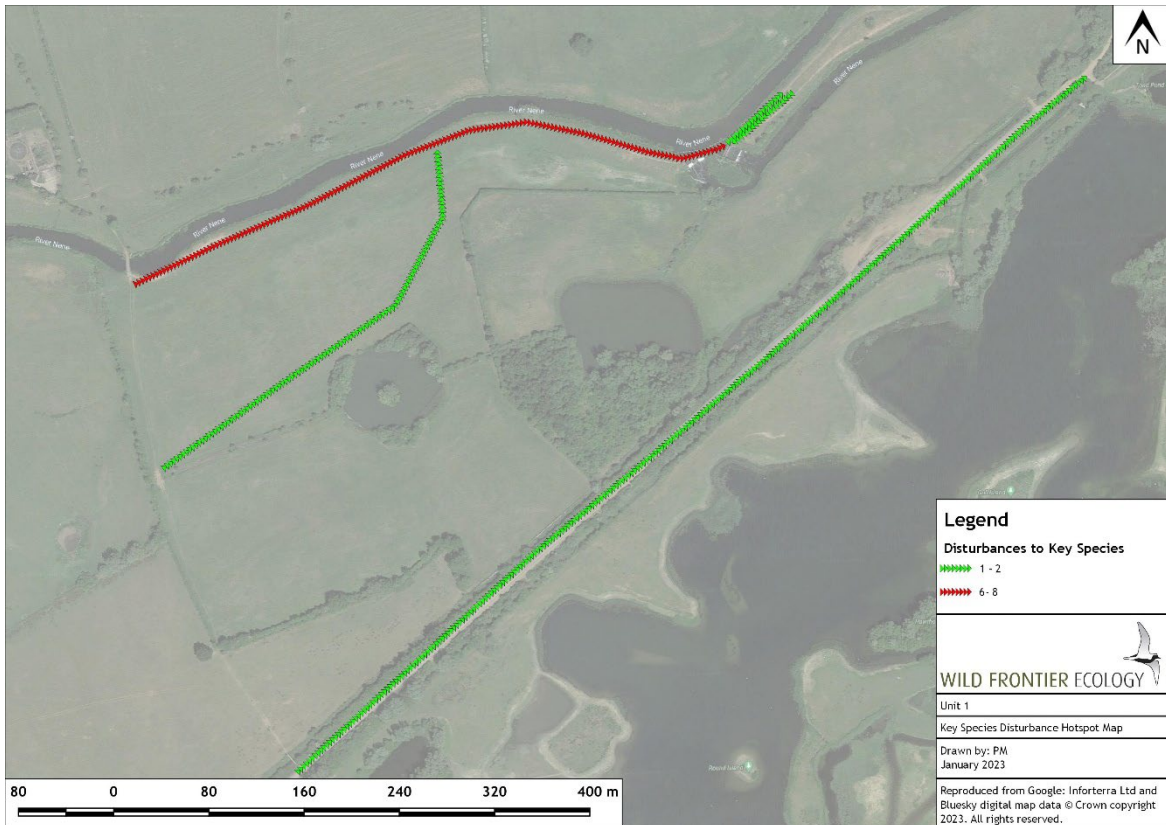


175. The highest levels of land-based disturbance to key species were from routes with the highest levels of activity, these being vehicles along the access tracks. There was also a moderate level of disturbance to key species when people walked close to the water's edge south of the clubhouse (seven out of the eight occasions activity was recorded here). On one occasion, this included a staff member mowing the grass.
176. Water-skiing was recorded covering most of the lake on two occasions, with 100% of these occurrences leading to disturbance to key species.



Unit 3

**Figure 7.3:** Areas of recorded ground-based disturbance to key species at Unit 3 (Lakes H9 and H10)

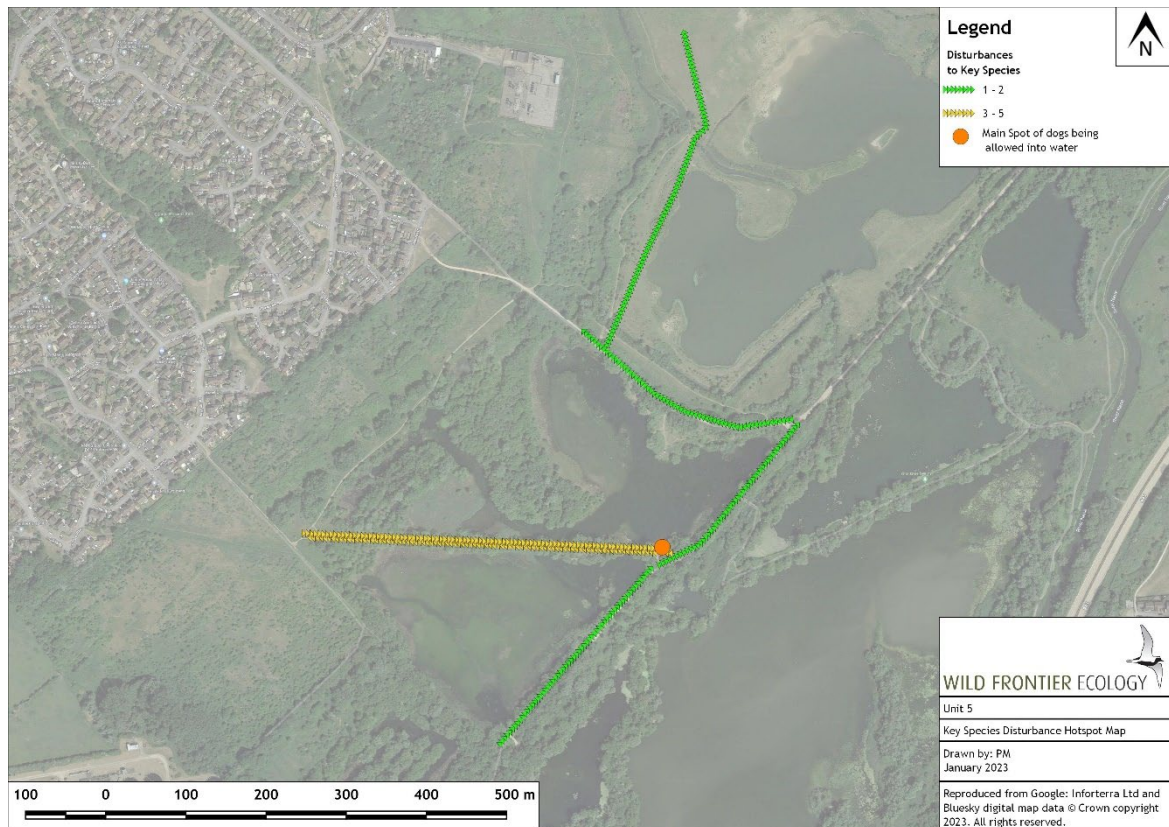


177. Disturbances to key species are particularly focused at Unit 3 on the path along the River Nene. One disturbance from the old railway path on the southern edge of the site was from a dog being allowed into the ditch in view of Lake H9, causing two mallards to walk away. A dog barking from the old railway despite being screened caused four wigeon to fly on one occasion.



## Unit 5

**Figure 7.4:** Areas of recorded ground-based disturbance to key species at Unit 5 (Lakes L12, L13 and L16)



178. The highest levels of disturbance were along the path between lakes L12 and L13. On a minimum of six occasions this was caused by dogs being allowed into the water, disturbing key species on four of these occasions. A particular hotspot for this is highlighted on Figure 7.4 at the eastern end of the path between Lakes L12 and L13. One identified route which was off public footpaths was characterised by a mini tractor driving along with a trailer.





### Unit 6

**Figure 7.5:** Areas of recorded ground-based disturbance to key species at Unit 6 (Lakes M11, M16, M21 and M23)





179. Disturbance was extremely low to key species at Unit 6 as illustrated in Figure 7.5. There were two disturbances to key species on the northeast side of Lake M16 in total, a minor incident involving a walker flushing two mallards. The other was caused by three motorbikes going across the field which at the time, elicited an alert response from a mute swan. No other key species were within 200m at this time.

## Unit 7

**Figure 7.6:** Areas of recorded ground-based disturbance to key species at Unit 7 (Lake N5)



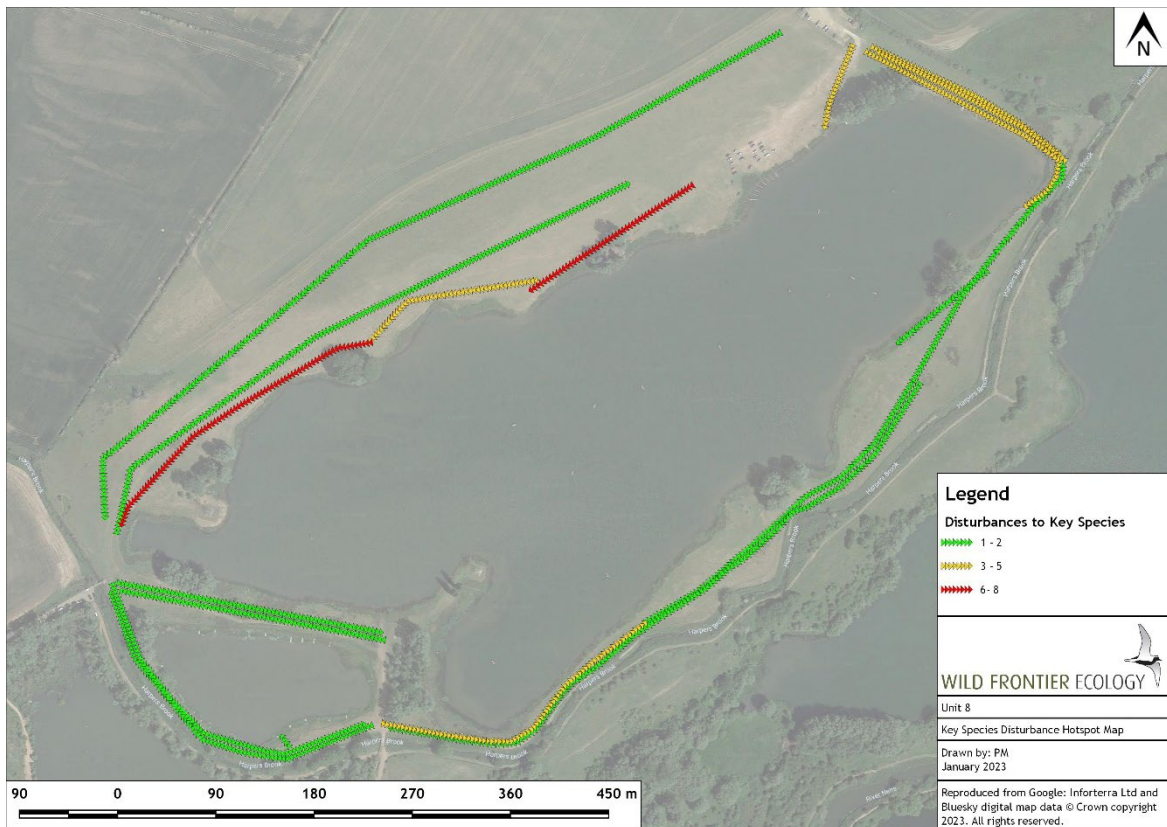
180. Like Unit 6, key species were disturbed on very few occasions (seven in total). A dog was recorded on one occasion from the path on the southern edge of Lake N5, going into the water. Another suspected dog in the water was heard but not seen, from the north-eastern bank of Lake N5.





## Unit 8

**Figure 7.7:** Areas of recorded ground-based disturbance to key species at Unit 8 (Lakes P5 and P9)



181. Particular hotspots of disturbance to key species are shown on the northern bank of Lake P5. Movement of anglers close to the banks and anglers moving into the shallows of the biggest lake caused most disturbance. There was one occasion where key species were disturbed from the static position of an angler. This was on the southern bank of the smaller P5 lake when the angler cast the rod.

## 6. Summary of Key Findings

### 6.1 Site Usage

182. Please refer to Table 2 for site usage, Tables 3.1 to 3.7 for comparison of weekday and weekend disturbance Tables 4.1 to 4.7 for disturbance occurrences at various times of day.
183. Across all publicly accessible sites (excludes Unit 2 and Unit 8), walking and dog-walking were the most frequently recorded human activity. The majority of dog walking events included at least one dog off the lead. Both these activities were expected to be frequent, with the Nene Valley Way running through or near to the seven study locations, though Unit 2 cannot be accessed from this public right of way. The 'motor vehicle' category was the highest recorded activity at Unit 2. Fishing was the highest recorded activity at Unit 8.
184. Mid-morning was the peak time for public use at many sites, and correspondingly birds were more likely to be disturbed at this time. More weekend disturbance was proportionately recorded at the publicly accessible sites (Units 1, 3, 5, 6 and 7).
185. The 2014 Visitor Access Study undertaken by Footprint Ecology<sup>14</sup> found Stanwick Lakes (Unit 6) to be the busiest site, however this study recorded higher footfall at Units 1, 3, 5 and 7 compared to Unit 6.

#### Unit 1

186. At Unit 1, the areas of most concern (as activity in these areas causes most disturbance) are routes taken closer to Lake D1, off the main circular route at the top of the basin. Despite the highest levels of activity being on the main circular path, these routes, particularly at the western and eastern end of Lake D1 can cause greater levels of disturbance to birds.
187. Walkers with and without dogs were the activities recorded most at Unit 1 overall, and both on weekdays and at the weekend. Numbers on weekdays and weekends of these two activities at Unit 1 were relatively similar. Unit 1 was used most on weekdays in the morning, particularly before 10am with usage across the day more evenly distributed at the weekend.
188. Wildfowling was recorded on four occasions and only on weekdays, with this being a weekly occurrence on Wednesdays during the winter<sup>15</sup>.

#### Unit 2

189. The tracks at Unit 2 to Grendon Lakes and the Paintball Sites stand out as a disturbance hot spot and from the south bank of Lake G7. Responses of key species to land based activity are relatively low so disturbance impacts are negligible in terms of impacts to the designation.
190. As Unit 2 is a private site, there are some different issues. There are dog walkers and walkers as with the other sites, but at lower levels, undertaken by people from Grendon Lakes Club House and the Paintball Sites. On one weekend, a wedding fair took place during which water-skiing was recorded on Lake G7. Most activity was on

<sup>14</sup> Liley, D., Floyd, L., Cruickshanks, K. & Fearnley, H. (2014). Visitor Access Study of the Upper Nene Valley Gravel Pits SPA. Footprint Ecology. Unpublished report for the NIA partnership

<sup>15</sup> Personal Communication with Robert Bullock - Surveyor (17<sup>th</sup> January 2022)



weekdays at Unit 2, but this was mainly from motor vehicles. As outlined in the results, motor vehicles are not a statistically significant disturbance factor, and therefore is not considered a major disturbance impact on waterbirds given the low numbers of key species responding to this disturbance category.

### Unit 3

191. The site was regularly used by dog walkers and walkers, particularly along the old railway and the path by the River Nene.
192. This site is used more at weekends, particularly by dog walkers and walkers with Summer Leys Nature Reserve (including parking) lying adjacent to the south and Great Doddington (village with population 1,123<sup>16</sup>) approximately 0.5km to the north. The site is well connected by a path from the village.
193. Fishing was recorded at weekends along the River Nene where this is permitted. Birdwatchers were recorded at this site, eight times on weekdays and four times on weekends, likely present on site to view birds using Summer Leys Nature Reserve adjacent to Unit 3 to the southeast.

### Unit 5

194. This site had the highest level of human activity recorded during the project. Activity was highest around Lakes L12 and L13. The path along the west side of Lake L12 was only recorded to be used on five occasions compared to over 100 records of use of the path along the south of Lake L12 and Lake L13 and between these two lakes, likely due to it often being muddy and wet.
195. Higher levels of activity were recorded at the weekend here which can be expected given this site is open to the public. Rushden Lakes is an approximately 1.5km walk from Unit 5 which includes The Wildlife Trust Visitor Centre.
196. Most activity here was recorded during mid-morning (10 am to midday) on both weekends and weekdays. Unlike other publicly accessible sites, activity before 10am was considerably higher at the weekend compared to on weekdays (171 records at the weekend compared to 66 on weekdays).

### Unit 6

197. This site has paid parking and rangers present. Very few dog walkers with dogs off lead were recorded compared to dogs on lead. Rangers on site ask dog walkers to ensure dogs are on leads<sup>16</sup>, which is likely to be the main reason for this.
198. Compared to Unit 5, the recreational usage of this site was considerably lower, likely due to the barrier system on entry and paid parking. As expected with a site that is advertised to attract visitors<sup>17</sup>, the majority of activity was recorded at weekends. The Nene Way does run through the site, but Stanwick Lakes is 2km from the nearest larger settlements, Irthlingborough (population 8,900<sup>18</sup>) and Higham Ferrers and Rushden (population 8,083<sup>15</sup>). Stanwick is within 1km, but has a smaller population (1,891<sup>19</sup>) and the main A45 road separates the village from Stanwick Lakes.
199. The greater risk of disturbance is to the more southern lakes, Lakes M11 and M21 at Unit 6, with most activity recorded closer to the car park and visitor centre at Stanwick Lakes as discussed above. However, there is another access point, as shown

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<sup>16</sup> Available at: <https://www.citypopulation.de> > northnorthamptonshire. Accessed 30<sup>th</sup> January 2023

by the red routes in Figure 4.5 between Lakes M11 and M21. This route is close to a layby on the west side of the A45 where a path runs into Stanwick Lakes.

### Unit 7

200. Activity was recorded on the path around the lake in relatively high numbers (over 100 records on the southern shore compared to even greater use recorded on the northern half of this path. This site is adjacent to the village of Ringstead and as with other public sites, dog walkers and walkers are the most frequently recorded users.
201. There were proportionately similar numbers of dog walkers recorded on weekdays and weekends and overall activity was similar between weekdays and weekends, probably due to the local accessibility from the settlement of Ringstead.
202. Like at Unit 5, most activity was recorded between 10am and midday on both weekdays and weekends, but at lower levels. This is likely due to Ringstead having a smaller population (1,461<sup>17</sup>) than Irthlingborough, which has easy access to paths at Unit 5.

### Unit 8

203. This site contains two private fisheries, Elinor Trout Fishery and Willowbrook Lake Fisheries. Fishing was the most recorded activity here with walking and dog walking also recorded, the majority of these being users of the sites, particularly anglers.
204. Weekends were busier in terms of disturbances at Unit 8, with fishing recorded more at weekends compared to weekdays. Dog walking was relatively similar on weekdays and weekends (31 weekdays records compared to 27 weekend records). Other usage of the site was low with any public footpaths running between and outside of the fisheries (seeing Figure 3.7).
205. Usage of the site was relatively even across the day with weekday peak being between 10am and midday compared to either side of this at weekends.

## 6.2 Key Species

206. Please refer to Figures 5.1 to 5.10 for key species distribution, and Tables 6.1 to 6.7 for reaction occurrences of key species to disturbances and Tables 7.1 to 7.7 for number of disturbances caused to key species by each activity type.
207. As the key species are the SPA qualifying features and occur in important numbers in the Upper Nene Valley, the results and discussion focus on these. Other waterfowl species were recorded in smaller numbers or exhibiting similar reactions as the key species to disturbance, for example moorhen which was recorded at all seven sites.
208. The majority of disturbances led to no response from key species. At most sites, the most acute responses were to dog walkers with at least one dog off the lead. This is a concern as birds will only react when a disturbance is seen as a threat. In the case of a loose dog being present, birds will expend more energy than necessary<sup>18</sup> in avoiding this perceived threat.

<sup>17</sup> Ringstead - North Northamptonshire - City Population. [https://www.citypopulation.de/en/uk/eastmidlands/northamptonshire/E34002136\\_\\_ringstead/](https://www.citypopulation.de/en/uk/eastmidlands/northamptonshire/E34002136__ringstead/). Accessed 30<sup>th</sup> January 2023

<sup>18</sup> Plateeuw, M. & Henkens, R.J.H.G. (1997) Possible Impacts of Disturbance to Waterbirds; Individuals, Carrying Capacity and Populations. Wildfowl & Wetlands Trust



209. Significant reactions to walkers were low at all sites. When a response was shown, most key species swam or walked away from a disturbance caused by walkers. This is not of greatest concern but would still impact key species due to the expending of energy unnecessarily<sup>19</sup>. Other disturbances occurred less often than dog walking/walking and elicited fewer responses from the waterfowl. Therefore, the impact of these incidents was lower.

### Unit 1

210. All key species recorded across the seven sites were recorded at Unit 1. They were distributed widely across Lake D1 but were recorded less frequently in the middle of the lake. This is likely due to the site being a basin and the water being too deep in the centre to forage effectively particularly for dabbling species such as gadwall and shoveler which were recorded closer to the banks. With no vegetation screening around the lake, this makes key species more susceptible to disturbance than at other sites. There are clusters of records around the tip of the peninsula on the western side of Lake D1 where key species were recorded to congregate, and this area could provide an important refuge for birds from disturbance. There are also additional areas of habitat (scrapes and vegetation) that have been created on the peninsula.

211. All of the twelve key species recorded at Unit 1 exhibited severe responses on more than three occasions with a maximum of 26 flight responses from wigeon (4.1% of their responses to disturbances). All of these twelve species were recorded to be flushed more often than other sites with a total of 113 flight responses recorded.

### Unit 2

212. The centre of Lake G7 stands out as a hot spot preferred by key species, particularly tufted duck and pochard which could be more susceptible to disturbance<sup>20</sup>, but were recorded less often and in smaller numbers than at Units 5, 6 and 7. The single shoveler recorded was shown to favour the western shore away from disturbance.

213. Less than 3% of responses by key species at Unit 2 were flight responses, but the highest number of walking/swimming responses across all sites were recorded here. Five key species, coot (34.8%), gadwall (88.9%), pochard (65%), shoveler (100%) and wigeon (60%) exhibited swimming away from disturbance behaviour on more occasions than other responses recorded at Unit 2. Cormorants were recorded flying most often in response to disturbance at Unit 2, but cormorants will likely take to another lake to feed or roost when disturbed<sup>21</sup> and this species was recorded returning to Lake G7 itself following a disturbance.

### Unit 3

214. This site had the lowest number of key species recorded, with most birds congregating on Lakes H9 and H10. However, wigeon were recorded foraging on site in a field with no public access and also in a similar field on the north side of the River Nene outside of the Unit Boundary, but comprising birds that are part of the

<sup>19</sup> Bechet, A., Giroux, J.F. & Gauthier, G. (2004). The effects of disturbance on behavior, habitat use and energy of spring staging snow geese. *Journal of Applied Ecology*, 41, 689-700

<sup>20</sup> Marsden, S.J. (2000). Impact of Disturbance on Waterfowl Wintering in a UK Dockland Redevelopment Area, *Environmental Management*, 26 (2): 207-213

<sup>21</sup> Plateeuw, M. & Henkens, R.J.H.G. (1997). Possible Impacts of Disturbance to Waterbirds; Individuals, Carrying Capacity and Populations. Wildfowl & Wetlands Trust





SPA waterbird assemblage. These areas provide important foraging areas for wigeon, which are away from the footpath along the River Nene where they would be susceptible to disturbance during their lengthy terrestrial foraging periods<sup>22</sup>. This was evident when foraging wigeon flew in response to the surveyor briefly moving during a survey at Vantage Point 1.

215. The majority of activity elicited no response, but when birds were disturbed, most key species flew as a result of a disturbance incident. However, with ten flight responses recorded in total (50% of these exhibited by mute swan) and low numbers of key species, these impacts are considered negligible to the SPA qualifying species as a whole.

### Unit 5

216. Lake L16 at Unit 5 appears to be an important wintering area for Lapwing in the Upper Nene Valley Gravel Pits, especially Lake P4 with the highest numbers of lapwing recorded on a survey and largest flock size of 300 individuals. Wigeon were also recorded foraging on grassland around Lake L16 with these areas being away from the most used routes at Unit 5.

217. Lakes L12 and L13 do not have suitable habitat for lapwing, but ten key species were recorded here including regular records of shoveler and pochard. These lakes are screened from sections of the paths around Lakes L12 and L13, but the low number of responses to disturbance also suggests birds are habituated to the high level of human activity. Key species exhibited no response during 99.7% of activity recorded. Flight response was only recorded four times with coot flying less than 50m twice and wigeon and mallard flushed off the lakes once each, both from the same disturbance, a mini tractor driving along the north edge of L16. This was only recorded once and is expected to be a rare occurrence and is therefore considered to have negligible impacts on key species.

### Unit 6

218. As well as Unit 5, Unit 6 also appears to be an important winter site for lapwing in the Upper Nene Valley Gravel Pits. The highest count of lapwing here was 219 individuals on Lake M21 (see Figure 5.6). This lake also held higher numbers of shoveler compared to other sites, so could be deemed an important area for key species. Lake M23 was the location of the highest count of pochard across all seven sites, and all four lakes at Unit 2 were used by at least nine key species. This suggests Unit 6 is a very important area in the Upper Nene Valley Gravel Pits for wintering waterbirds.

219. Key species also seem relatively habituated to the levels of activity with 99.6% of activity leading to no response here and only eight disturbance responses (walking/swimming, fly short, fly) recorded. The most disturbed species was wigeon which was recorded exhibiting alert response once and flying less than 50m twice, this being less than 2% of the number of disturbances wigeon were subject to on site during the surveys.

### Unit 7

220. High numbers of coot, gadwall, mute swan, pochard, tufted duck and wigeon were recorded at Unit 7. There was no outstanding preference in which areas were used

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<sup>22</sup> Känel, A. (2008). Winter Feeding Ecology of Wigeon *Anas penelope* at the Ouse Washes, England, *Ibis*, 123 (4): 438-449.



by key species, possibly due to all areas being screened by trees from recreational use of the path around Lake N5.

221. The majority of disturbance led to no response with most responses recorded being walking/swimming away from disturbance. The islands in the lake potentially provided a landmass to take refuge behind when a disturbance did occur, hence birds swimming away on most occasions when they were disturbed. Only two flight responses were recorded, both exhibited by mallard.

### Unit 8

222. The larger lake of Lake P5 appears to be the most important waterbody for key species at Unit 8. Six key species were recorded using this lake on more than 50% of surveys, with wigeon recorded once and gadwall also recorded. Key species were recorded in low numbers at Unit 8, particularly on the smaller lakes, one of which is located at the southern end of Lake P5, and the other is Lake P9.

223. The two bays at the southern end of the largest lake appear to be preferred by key species and could offer refuge away from more disturbed areas. Key species were disturbed more often at Unit 8 than at all of the other sites except Unit 1. Key species exhibited no response to 90% of disturbances with walking/swimming being the most recorded response. However, flight response was also high with coot, gadwall, great crested grebe, mallard, mute swan and tufted ducks all recorded as being flushed by disturbance. Mute swan and tufted duck were the only key species recorded to fly in response to disturbance on more than two occasions. These responses are of concern, but with the majority of responses (6.2%) being walking/swimming compared to flight (0.3% of responses), the birds here have the opportunity to find refuge in the bays discussed above.

### 6.3 Site Pressure Points

224. Please refer to Figures 4.1 to 4.7 for site usage and Figures 7.1 to 7.7 for the areas of disturbance to key species and Tables 6.1 to 6.7 for disturbance reactions by key species. A great pressure to all sites appears to be dogs off leads. Walkers without dogs can also cause disturbance, but levels are much lower than those with dogs.

### Unit 1

225. At Unit 1, the areas of most concern (as activity in these areas causes most disturbance) are routes taken closer to Lake D1, off the main circular route at the top of the basin.

226. Walking routes were used by the public all around Lake D1, but it was where routes were taken off the main path at the top of, and into the basin close to Lake D1 which led to the most severe responses of key species. Given the open nature of the site and that many key species are using the shallower water nearer the banks to forage, when site users come closer to the lake margins, key species respond proportionately and are more likely to exhibit acute behavioural responses (e.g. fly).

227. The use of routes on the northern bank and western peninsula of Lake D1 has the potential to have a significant impact on golden plover populations in particular as well as species such as wigeon and lapwing, and this should be considered as a high risk area to key species.

228. On Lake D1 itself, wildfowling creates disturbance pressure with large numbers of key species flying on each occasion. Despite this disturbance having an impact weekly



over the winter, the disturbance is not as constant as the pressure from the public coming off the main path and into the basin, closer to Lake D1.

## Unit 2

229. The greatest pressure on key species at Unit 2 is from water sports undertaken on the lake. On the few occasions water-skiing was recorded, it elicited severe responses from key species.
230. Motor vehicles were recorded most frequently, but as the probability of this activity causing birds to elicit a disturbed response was not statistically significant, motor vehicles are not deemed to cause as great an impact as other activities.
231. Generally, usage of Lake G7 is low by key species, therefore impacts to the SPA and SSSI from low level disturbance to this private site by motor vehicles and walkers or dog walkers are considered to be negligible.

## Unit 3

232. The main area of concern at Unit 3 is the route that follows the south side of the River Nene. High levels of disturbance occurred here compared to other areas of the site. However, this disturbance only affected small numbers of mallards and mute swan, therefore posing a likely negligible impact on the Upper Nene Valley Gravel Pits designation.

## Unit 5

233. Due to the separation distance of Lake P16 from paths and the screening by vegetation of this lake from the public footpath to the south, human disturbance to key species was found to be negligible on this waterbody.
234. Although Unit 5 experienced the highest levels of disturbance recorded during the entire project, key species are present in good numbers on Lakes L12 and 13 and appear to have developed a reasonable level of habituation to this disturbance. One disturbance 'hotspot' was noted between Lakes P12 and P13, an area where dogs are being allowed into the water at the southern end of Lake L13. Given the low number of severe responses elicited by key species, impacts from these activities are considered to be negligible and can reasonably be allowed to continue in this area, allowing more sensitive areas such as Lake L16 to remain relatively disturbance free.

## Unit 6

235. Despite being a site with high levels of recreational usage, the disturbance to key species recorded was negligible at the majority of sites with birds being habituated to disturbance here. These low disturbance levels can be attributed to the screening of the lakes by vegetation, but also the low numbers of dogs off leads. Rangers request the public for all dogs to be on leads at this site, and the majority of dog walkers were found to comply with this as evidenced by the survey results.

## Unit 7

236. Like at Unit 6, disturbance to key species recorded was negligible at the majority of sites. Birds appear habituated to activity at this site.
237. The high number of no responses elicited by key species (99.7% of disturbance elicited no response) here is aided by screening of many parts of Lake N5 by trees surrounding the paths around the lake.



## Unit 8

238. The main aggregation of key species at the south-west end of the largest lake of Lake P5 was close to major disturbances, and consequently at higher risk from disturbance from fishing activities.
239. The southern bay was found to be an area where aggregations of key species were also recorded, with less disturbance activity recorded here. This area is potentially an important refuge where birds can move to if disturbed, such as from the northern shore where a high level of human activity was recorded.

## 7. Recommendations

240. A variety of recommendations are outlined below and will need to be enacted in combination to be successful in reducing impacts of disturbance to the sites included within this study.

### 7.1 General Recommendations

241. The provision of signage would be advised to encourage the public to ensure disturbance impacts are kept to a minimum. Raising awareness of the species using the various sites through interpretation as well as the provision of rangers on site (particularly Unit 1) would highlight the importance of the designation (particularly Units 1, 5, 6 and 7 where larger numbers of key species were recorded) and aid in encouraging responsible use of the Upper Nene Valley Gravel Pits.

242. Ensuring that dogs are kept on leads will lower the severity of disturbances to birds across all the sites. As advised above, signage advising walkers to have dogs on leads would aid in lowering the number of loose dogs. Previous reports on bird disturbance have suggested the provision of special fenced off zones for dogs to be allowed off the lead.

243. Unit 5, Unit 6 and Unit 7 are good examples of sites with relatively high public usage where few responses to disturbance are elicited by birds. This is partly attributed to screening of lakes from access routes by vegetation such as trees and reedbeds, but Unit 6 also has rangers present on site to help keep disturbance levels to a minimum. This appears to have been successful, especially in terms of the relatively low numbers of dogs recorded off lead at Unit 6.

244. With the sites surveyed being in close proximity to a number of towns and villages, the majority of site users are likely to be local<sup>23</sup>. Talks and guided walks would be a useful method to educate site users, such as those which take place Unit 6, with the aim being to replicate the low disturbance impacts experienced at Unit 5 and Unit 7.

245. Re-engaging with site owners/managers throughout the SPA to explore opportunities for disturbance reduction is important, particularly at sites where there is a legacy of pre-designation activities, e.g. shooting (wildfowling) at Unit 1, watersports at Unit 2, and fishing at Unit 8<sup>24</sup>.

246. Additional habitat has been created in many areas of the Upper Nene Valley Gravel Pits, including at Unit 1 Lake D1, with evidence of the creation of shallow lagoons or scrapes having benefits to birds<sup>25</sup>. Habitat could also be created outside of the designated area where usage is established, and disturbance managed, as new sites are created. There is a lot of gravel extraction still happening between Billing and Earls Barton which is creating valuable new habitat for key species that could mitigate excessive disturbance at existing sites.

247. Finally, if individual offenders are repeatedly found to be deliberately engaging in activities which cause disturbance to key species at sites e.g. Unit 1, then test

<sup>23</sup> Liley, D., Floyd, L., Cruickshanks, K. & Fearnley, H. (2014). Visitor Access Study of the Upper Nene Valley Gravel Pits SPA. Footprint Ecology. Unpublished report for the NIA partnership

<sup>24</sup> Personal Communication with Steve Brayshaw, Ecological Consultant in Northamptonshire - Surveyor (30<sup>th</sup> January 2023)

<sup>25</sup> Giosa, E., Mammides, C. & Zotos, S. (2018). The importance of artificial wetlands for birds: A case study from Cyprus, *PLoS One*, 13(5): e0197286. doi: 10.1371/journal.pone.0197286. PMID: 29746545; PMCID: PMC5945047.



prosecution(s) for reckless disturbance of fauna should be enforced as stated in Section 28 of the Wildlife and Countryside Act.

## 7.2 Site Specific Recommendations

248. No site-specific recommendations are advised at Units 3, 5, 6 and 7 due to similar recreational use recorded across these sites and impacts of disturbance are low.

### Unit 1

249. Several methods in combination are likely to be required to deter or stop people coming off the main circular path and going down into the basin. These are as follows:

250. Review the signage and interpretation provision as the current provision does not seem to be effective (see Photos 6 to 8). Signs are already present in suitable locations at Unit 1, but the following additional methods are advised to be put in place to help in reducing disturbance impacts. Additional signage would be useful at the points where people come off the bank. There is no signage in the southwest corner where there is no formal access point, but it is still used. New signs will include a note on relevant legislation regards offences (see Photo 9).

251. Personnel on site - consistently in the short term e.g. every day for one month including weekends, then at varying (random) times beyond this. These rangers would speak to visitors as they arrive and give them a leaflet to take away to encourage responsible use of the site.

252. A barrier to stop access into the basin - a barrier such as a fence, subject to further discussion and approval from the Environment Agency, at the top of the bank inside most of the circular path except at the cradge bank (a section where the bank is lower than the adjacent bank to allow flow of flood water and prevent damage from flooding) in the northwest of the site where a line of posts can be erected with signage on fencing.

### Unit 2

253. Water-skiing caused the most severe disturbance to key species compared to other disturbance here. Temporal Zonation is therefore advised to exclude disturbing activities like watersports on Lake G7 between October and March inclusive.

### Unit 8

254. Continuing the off-season of fly fishing in January and early February at Elinor Trout Fishery<sup>26</sup> (Lake P5) will aid in avoiding disturbance to the peak numbers of key species.

255. When the fly-fishing season is operational, a refuge area where activity is restricted will be put in place in the south-west of the larger lake at Lake P5 where the largest aggregation of key species has been found to reduce the disturbance to an area where key species prefer. This will be discussed with the landowner as to the exact implementation of this.

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<sup>26</sup> Available at: <https://elinortf.co.uk/> (accessed 27<sup>th</sup> January 2023)



## **8. Constraints**

### **8.1 Constraints and Limitations of Survey**

256. Most sites contained areas with restricted views and therefore it was challenging to record all disturbances properly. Vantage Points were located to maximise visibility, but this was not 100% in all places. This inevitably led to some unseen disturbances being recorded and not all details could be recorded on every disturbance. However, the majority of disturbance incidents were recorded with an activity and the other relevant details to base an overview of disturbance at each site and the impact to birds present.
257. As mentioned in Section 5.2, surveys were slightly biased towards weekdays (58% of surveys on weekdays at all sites except Unit 2).

## 9. Conclusion

258. Wild Frontier Ecology was commissioned to carry out a disturbance study on seven locations in the Upper Nene Valley Gravel Pits SPA. The study found walking to be the commonest occurring activity at most sites. This activity incurred fewer severe reactions from key species at each site compared to dog-walking.
259. Other activities were found to have less impact across the sites. However, at Units 1 and 2, wildfowling and water-skiing activities were recorded respectively, both causing major disturbance to key species. Fishing occurred at some sites, but generally at low levels (excluding Unit 8) making it less significant as a standalone disturbance. Unit 8 includes two fisheries where disturbance impacts were not major but did cause key species to respond frequently.
260. Twelve qualifying features (waterfowl species) of the SPA were recorded at the seven sites during the study, with six of these at all seven sites. Unit 1 showed significant aggregations of wintering waterfowl such as coot and tufted duck and the two wader species designated as qualifying features, golden plover and lapwing. Wigeon were found to forage at four of the sites and were generally recorded in areas with lower risk from disturbance.
261. In line with similar studies at other SPAs around the country, general recommendations for mitigation based on the results of the fieldwork undertaken by Wild Frontier Ecology include signage to advise site users have dogs on a lead. Engagement with the public through interpretation and personnel on site regarding the qualifying features using the sites is also advised. Other specific sites measures have been advised which will involve discussion with site owners/manager. These include creation of a barrier at Unit 1 to deter or stop the public taking routes within the basin of Lake D1 and regards the legacy of pre-designation activities at several sites.
262. The success of any interventions put into place as a result of this study will likely need ongoing monitoring to be quantifiable.



## 10. Acknowledgements

263. Wild Frontier Ecology Ltd. gives thanks to Steve Brayshaw for advice throughout the project. Steve is a Northamptonshire-based Independent Ecologist and Environmental Consultant with a background in the management of publicly accessible sites with a high conservation value, biodiversity action planning and creative conservation.
264. This includes work in Northamptonshire on surveys, recommendations, and creation of areas of the Upper Nene Valley Gravel Pits and provided his local knowledge and experience on this project.
265. Thanks also go to the surveyors, which has included additional local knowledge at some sites.





## Appendix 1. Photographs

**Photo 1. View from Vantage Point 1 at Unit 1 (looking east)**



**Photo 2. View from Vantage Point 1 at Unit 1 (looking west)**







**Photo 3. View from Vantage Point 2 at Unit 1 (looking north)**



**Photo 4. View from Vantage Point 3 at Unit 1 (looking east)**







Photo 5. View from Vantage Point 3 at Unit 1 (looking west)



Photo 6. Signs at Unit 1 (provided by Robert Bullock)







Photo 7. Sign at Unit 1 (as provided by Steve Brayshaw)



Photo 8. Interpretation Board at Unit 1 (as provided by Robert Bullock)







**Photo 9. Legislation noted on Interpretation Board at Unit 1 (provided by Robert Bullock)**



**Photo 10. View from Vantage Point 1 at Unit 2 (looking southwest)**







**Photo 11. View from Vantage Point 2 at Unit 2 (looking west)**



**Photo 12. View from Vantage Point 3 at Unit 2 (looking east)**







**Photo 13. View from Vantage Point 1 at Unit 3 (looking southwest)**



**Photo 14. Lake H9**







**Photo 15. View from Vantage Point 2 at Unit 3 (looking south over lake H10)**



**Photo 16. View from Vantage Point 3 at Unit 3 (looking west)**







**Photo 17. View from Vantage Point 1 at Unit 5 (looking south over Lake L16)**



**Photo 18. View from Vantage Point 2 at Unit 5 (looking north over Lake L13) including spot where dogs are allowed into lake**







**Photo 19. View from Vantage Point 3 at Unit 5 (looking north-west over Lake L12)**



**Photo 20. View from Vantage Point 1 at Unit 6 (looking south over Lake M16)**







**Photo 21. View from Vantage Point 2 at Unit 6 (looking north over Lake M23)**



**Photo 22. View from Vantage Point 2 at Unit 6 (looking south over Lake M11)**







**Photo 23. View from Vantage Point 3 at Unit 6 (looking south over Lake M21)**



**Photo 24. View from Vantage Point 1 at Unit 7 (looking north-east)**





**Photo 25. View from Vantage Point 2 at Unit 7 (looking west)**



**Photo 26. View from Vantage Point 3 at Unit 7 (looking southwest)**







**Photo 27. View from Vantage Point 1 at Unit 8 (looking north over smaller Lake P5)**



**Photo 28. View from Vantage Point 2 at Unit 8 (looking north-east over larger Lake P5)**





**Photo 29. View from Vantage Point 3 at Unit 8 (looking southwest over larger Lake P5)**



## Appendix 2. Survey Details

**Table 8.1:** Details of January 2022 visits to each site (Surveyor Initials in brackets)

Site	Vantage Point	Visit 1	Visit 2
Unit 1 (Clifford Hills Gravel Pits) Lake D1	VP1	12 <sup>th</sup> January 2022 08:15-10:15 (RB)	29 <sup>th</sup> January 2022 07:45-09:45 (RB)
Unit 1 (Clifford Hills Gravel Pits) Lake D1	VP2	12 <sup>th</sup> January 2022 11:10-13:10 (RB)	29 <sup>th</sup> January 2022 11:00-13:00 (RB)
Unit 1 (Clifford Hills Gravel Pits) Lake D1	VP3	12 <sup>th</sup> January 2022 14:15-16:15 (RB)	29 <sup>th</sup> January 2022 14:10-16:10 (RB)
Unit 2 (Earls Barton West) Lake G7	VP1	11 <sup>th</sup> January 2022 09:00-11:00 (RT)	30 <sup>th</sup> January 2022 08:30-10:30 (RT)
Unit 2 (Earls Barton West) Lake G7	VP2	11 <sup>th</sup> January 2022 11:30-13:30 (RT)	30 <sup>th</sup> January 2022 11:00-13:00 (RT)
Unit 2 (Earls Barton West) Lake G7	VP3	11 <sup>th</sup> January 2022 13:45-15:45 (RT)	30 <sup>th</sup> January 2022 13:30-15:30 (RT)
Unit 3 (Earls Barton Central) Lakes H9 and H10	VP1	12 <sup>th</sup> January 2022 09:40-11:40 (PM)	29 <sup>th</sup> January 2022 12:35 -14:35 (PM)
Unit 3 (Earls Barton Central) Lakes H9 and H10	VP2	12 <sup>th</sup> January 2022 11:45-13:45 (PM)	29 <sup>th</sup> January 2022 10:30 -12:30 (PM)
Unit 3 (Earls Barton Central) Lakes H9 and H10	VP3	12 <sup>th</sup> January 2022 13:45-15:45 (PM)	29 <sup>th</sup> January 2022 08:30 -10:30 (PM)
Unit 5 (Ditchford East) Lakes L2, L13 and L16 (western half only)	VP1	10 <sup>th</sup> January 2022 09:00-11:00 (CG)	28 <sup>th</sup> January 2022 12:00-14:00 (CG)
Unit 5 (Ditchford East) Lakes L2, L13 and L16 (western half only)	VP2	10 <sup>th</sup> January 2022 11:10-12:10 (CG)	28 <sup>th</sup> January 2022 07:45-09:45 (CG)
Unit 5 (Ditchford East) Lakes L2, L13 and L16 (western half only)	VP3	10 <sup>th</sup> January 2022 13:10-15:10 (CG)	28 <sup>th</sup> January 2022 12:40-14:40 (CG)
Unit 6 (Stanwick Lakes) Lakes M11, M16, M21 and M23	VP1	6 <sup>th</sup> January 2022 09:20-11:20 (AM)	23 <sup>rd</sup> January 2022 09:15-11:15 (BC)
Unit 6 (Stanwick Lakes) Lakes M11, M16, M21 and M23	VP2	6 <sup>th</sup> January 2022 11:50-13:50 (AM)	23 <sup>rd</sup> January 2022 11:45-13:45 (BC)
Unit 6 (Stanwick Lakes) Lakes M11, M16, M21 and M23	VP3	6 <sup>th</sup> January 2022 14:00-16:00 (AM)	23 <sup>rd</sup> January 2022 14:00-16:00 (BC)
Unit 7 (Ringstead Gravel Pits) Lake N5	VP1	6 <sup>th</sup> January 2022 09:10-11:10 (BC)	23 <sup>rd</sup> January 2022 09:00-11:00 (AM)
Unit 7 (Ringstead Gravel Pits) Lake N5	VP2	6 <sup>th</sup> January 2022 11:35-13:35 (BC)	23 <sup>rd</sup> January 2022 11:30-13:30 (AM)
Unit 7 (Ringstead Gravel Pits) Lake N5	VP3	6 <sup>th</sup> January 2022 14:00-16:00 (BC)	23 <sup>rd</sup> January 2022 13:45-15:45 (AM)
Unit 8 (Thrapston and Titchmarsh) Lakes P5 and P9	VP1	12 <sup>th</sup> January 2022 13:20-15:20 (DF)	23 <sup>rd</sup> January 2022 10:20-12:20 (DF)
Unit 8 (Thrapston and Titchmarsh) Lakes P5 and P9	VP2	12 <sup>th</sup> January 2022 11:00-13:00 (DF)	23 <sup>rd</sup> January 2022 12:30-14:30 (DF)
Unit 8 (Thrapston and Titchmarsh) Lakes P5 and P9	VP3	12 <sup>th</sup> January 2022 08:30-10:30 (DF)	23 <sup>rd</sup> January 2022 08:00-10:00 (DF)

**Table 8.2:** Details of February 2022 visits to each site (Surveyor Initials in brackets)

Site	Vantage Point	Visit 1	Visit 2
Unit 1 (Clifford Hills Gravel Pits) Lake D1	VP1	17 <sup>th</sup> February 2022 08:30-10:30 (RB)	26 <sup>th</sup> February 2022 14:15-16:15 (RB)
Unit 1 (Clifford Hills Gravel Pits) Lake D1	VP2	17 <sup>th</sup> February 2022 11:15-13:15 (RB)	26 <sup>th</sup> February 2022 08:10-10:10 (RB)
Unit 1 (Clifford Hills Gravel Pits) Lake D1	VP3	17 <sup>th</sup> February 2022 14:25-16:25 (RB)	26 <sup>th</sup> February 2022 11:08-13:08 (RB)
Unit 2 (Earls Barton West) Lake G7	VP1	15 <sup>th</sup> February 2022 08:15-10:15 (RT)	26 <sup>th</sup> February 2022 08:00-10:00 (RT)
Unit 2 (Earls Barton West) Lake G7	VP2	15 <sup>th</sup> February 2022 10:30-12:30 (RT)	26 <sup>th</sup> February 2022 10:15-12:15 (RT)
Unit 2 (Earls Barton West) Lake G7	VP3	15 <sup>th</sup> February 2022 12:40-14:40 (RT)	26 <sup>th</sup> February 2022 12:30-14:30 (RT)
Unit 3 (Earls Barton Central) Lakes H9 and H10	VP1	10 <sup>th</sup> February 2022 11:55-13:55 (PM)	24 <sup>th</sup> February 2022 10:15-12:15 (PM)
Unit 3 (Earls Barton Central) Lakes H9 and H10	VP2	10 <sup>th</sup> February 2022 09:45-11:45 (PM)	24 <sup>th</sup> February 2022 14:20-16:20 (PM)
Unit 3 (Earls Barton Central) Lakes H9 and H10	VP3	10 <sup>th</sup> February 2022 13:55-15:55 (PM)	24 <sup>th</sup> February 2022 12:20-14:20 (PM)
Unit 5 (Ditchford East) Lakes L2, L13 and L16 (western half only)	VP1	12 <sup>th</sup> February 2022 10:45-12:45 (CG)	23 <sup>rd</sup> February 2022 08:10-10:10 (CG)
Unit 5 (Ditchford East) Lakes L2, L13 and L16 (western half only)	VP2	12 <sup>th</sup> February 2022 13:00-15:00 (CG)	23 <sup>rd</sup> February 2022 10:15-12:15 (CG)
Unit 5 (Ditchford East) Lakes L2, L13 and L16 (western half only)	VP3	12 <sup>th</sup> February 2022 08:30-10:30 (CG)	23 <sup>rd</sup> February 2022 12:20-14:20 (CG)
Unit 6 (Stanwick Lakes) Lakes M11, M16, M21 and M23	VP1	7 <sup>th</sup> February 2022 09:30-11:30 (AM)	24 <sup>th</sup> February 2022 13:45-15:45 (BC)
Unit 6 (Stanwick Lakes) Lakes M11, M16, M21 and M23	VP2	7 <sup>th</sup> February 2022 12:00-14:00 (AM)	24 <sup>th</sup> February 2022 11:20-13:20 (BC)
Unit 6 (Stanwick Lakes) Lakes M11, M16, M21 and M23	VP3	7 <sup>th</sup> February 2022 14:15-16:15 (AM)	24 <sup>th</sup> February 2022 09:15-11:15 (BC)
Unit 7 (Ringstead Gravel Pits) Lake N5	VP1	7 <sup>th</sup> February 2022 09:10-11:10 (BC)	24 <sup>th</sup> February 2022 13:40-15:40 (AM)
Unit 7 (Ringstead Gravel Pits) Lake N5	VP2	7 <sup>th</sup> February 2022 11:25-13:25 (BC)	24 <sup>th</sup> February 2022 11:25-13:25 (AM)
Unit 7 (Ringstead Gravel Pits) Lake N5	VP3	7 <sup>th</sup> February 2022 14:00-16:00 (BC)	24 <sup>th</sup> February 2022 09:15-11:15 (AM)
Unit 8 (Thrapston and Titchmarsh) Lakes P5 and P9	VP1	3 <sup>rd</sup> February 2022 10:16-12:16 (DF)	17 <sup>th</sup> February 2022 12:00-14:00 (DF)
Unit 8 (Thrapston and Titchmarsh) Lakes P5 and P9	VP2	3 <sup>rd</sup> February 2022 12:45-14:45 (DF)	22 <sup>nd</sup> February 2022 09:50-11:50 (DF)
Unit 8 (Thrapston and Titchmarsh) Lakes P5 and P9	VP3	3 <sup>rd</sup> February 2022 07:46-09:46 (DF)	22 <sup>nd</sup> February 2022 07:35-09:35 (DF)

**Table 8.3:** Details of March 2022 visits to each site (Surveyor Initials in brackets)

Site	Vantage Point	Visit 1	Visit 2
Unit 1 (Clifford Hills Gravel Pits) Lake D1	VP1	8 <sup>th</sup> March 2022 08:05-10:05 (RB)	29 <sup>th</sup> March 2022 08:00-10:00 (RB)
Unit 1 (Clifford Hills Gravel Pits) Lake D1	VP2	8 <sup>th</sup> March 2022 11:05-13:05 (RB)	29 <sup>th</sup> March 2022 11:10-13:10 (RB)
Unit 1 (Clifford Hills Gravel Pits) Lake D1	VP3	8 <sup>th</sup> March 2022 14:15-16:15 (RB)	29 <sup>th</sup> March 2022 15:15-17:15 (RB)
Unit 2 (Earls Barton West) Lake G7	VP1	13 <sup>th</sup> March 2022 09:30-11:30 (RT)	28 <sup>th</sup> March 2022 15:15-17:15 (RT)
Unit 2 (Earls Barton West) Lake G7	VP2	13 <sup>th</sup> March 2022 11:35-13:35 (RT)	28 <sup>th</sup> March 2022 13:10-15:10 (RT)
Unit 2 (Earls Barton West) Lake G7	VP3	13 <sup>th</sup> March 2022 13:35-15:35 (RT)	28 <sup>th</sup> March 2022 11:00-13:00 (RT)
Unit 3 (Earls Barton Central) Lakes H9 and H10	VP1	6 <sup>th</sup> March 2022 13:40-15:40 (PM)	31 <sup>st</sup> March 2022 11:55-13:55 (PM)
Unit 3 (Earls Barton Central) Lakes H9 and H10	VP2	6 <sup>th</sup> March 2022 09:30-11:30 (PM)	31 <sup>st</sup> March 2022 14:10-16:10 (PM)
Unit 3 (Earls Barton Central) Lakes H9 and H10	VP3	6 <sup>th</sup> March 2022 11:30-13:30 (PM)	31 <sup>st</sup> March 2022 09:50-11:50 (PM)
Unit 5 (Ditchford East) Lakes L2, L13 and L16 (western half only)	VP1	13 <sup>th</sup> March 2022 14:00-16:00 (CG)	17 <sup>th</sup> March 2022 11:40-13:40 (CG)
Unit 5 (Ditchford East) Lakes L2, L13 and L16 (western half only)	VP2	13 <sup>th</sup> March 2022 09:45-11:45 (CG)	17 <sup>th</sup> March 2022 13:50-15:50 (CG)
Unit 5 (Ditchford East) Lakes L2, L13 and L16 (western half only)	VP3	13 <sup>th</sup> March 2022 11:50-13:50 (CG)	17 <sup>th</sup> March 2022 09:30-11:30 (CG)
Unit 6 (Stanwick Lakes) Lakes M11, M16, M21 and M23	VP1	12 <sup>th</sup> March 2022 13:35-15:35 (AM)	30 <sup>th</sup> March 2022 13:45-15:45 (BC)
Unit 6 (Stanwick Lakes) Lakes M11, M16, M21 and M23	VP2	12 <sup>th</sup> March 2022 09:00-11:00 (AM)	30 <sup>th</sup> March 2022 11:25-13:25 (BC)
Unit 6 (Stanwick Lakes) Lakes M11, M16, M21 and M23	VP3	12 <sup>th</sup> March 2022 11:15-13:15 (AM)	30 <sup>th</sup> March 2022 09:15-11:15 (BC)
Unit 7 (Ringstead Gravel Pits) Lake N5	VP1	8 <sup>th</sup> March 2022 13:45-15:45 (BC)	30 <sup>th</sup> March 2022 13:40-15:40 (AM)
Unit 7 (Ringstead Gravel Pits) Lake N5	VP2	8 <sup>th</sup> March 2022 08:50-10:50 (BC)	30 <sup>th</sup> March 2022 11:25-13:25 (AM)
Unit 7 (Ringstead Gravel Pits) Lake N5	VP3	8 <sup>th</sup> March 2022 11:05-13:05 (BC)	30 <sup>th</sup> March 2022 09:10-11:10 (AM)
Unit 8 (Thrapston and Titchmarsh) Lakes P5 and P9	VP1	12 <sup>th</sup> March 2022 13:20-15:20 (DF)	23 <sup>rd</sup> March 2022 10:20-12:20 (DF)
Unit 8 (Thrapston and Titchmarsh) Lakes P5 and P9	VP2	12 <sup>th</sup> March 2022 11:00-13:00 (DF)	23 <sup>rd</sup> March 2022 11:10-13:10 (DF)
Unit 8 (Thrapston and Titchmarsh) Lakes P5 and P9	VP3	12 <sup>th</sup> March 2022 08:30-10:30 (DF)	23 <sup>rd</sup> March 2022 08:00-10:00 (DF)



**Table 8.4:** Details of October 2022 visits to each site (Surveyor Initials in brackets)

Site	Vantage Point	Visit 1	Visit 2
Unit 1 (Clifford Hills Gravel Pits) Lake D1	VP1	12 <sup>th</sup> October 2022 08:05-10:05 (RB)	22 <sup>nd</sup> October 2022 08:00-10:00 (RB)
Unit 1 (Clifford Hills Gravel Pits) Lake D1	VP2	12 <sup>th</sup> October 2022 11:00-13:00 (RB)	22 <sup>nd</sup> October 2022 11:00-13:00 (RB)
Unit 1 (Clifford Hills Gravel Pits) Lake D1	VP3	12 <sup>th</sup> October 2022 14:55-16:55 (RB)	22 <sup>nd</sup> October 2022 15:00-17:00 (RB)
Unit 2 (Earls Barton West) Lake G7	VP1	16 <sup>th</sup> October 2022 13:30-15:30 (RT)	28 <sup>th</sup> October 2022 14:50-16:50 (PM)
Unit 2 (Earls Barton West) Lake G7	VP2	16 <sup>th</sup> October 2022 11:10-13:10 (RT)	28 <sup>th</sup> October 2022 10:30-12:30 (PM)
Unit 2 (Earls Barton West) Lake G7	VP3	16 <sup>th</sup> October 2022 09:10-11:10 (RT)	28 <sup>th</sup> October 2022 12:35-14:35 (PM)
Unit 3 (Earls Barton Central) Lakes H9 and H10	VP1	13 <sup>th</sup> October 2022 09:10-11:10 (PM)	29 <sup>th</sup> October 2022 12:15-14:15 (PM)
Unit 3 (Earls Barton Central) Lakes H9 and H10	VP2	13 <sup>th</sup> October 2022 11:15-13:15 (PM)	29 <sup>th</sup> October 2022 10:10-12:10 (PM)
Unit 3 (Earls Barton Central) Lakes H9 and H10	VP3	13 <sup>th</sup> October 2022 13:15-15:15 (PM)	29 <sup>th</sup> October 2022 08:10-10:10 (PM)
Unit 5 (Ditchford East) Lakes L2, L13 and L16 (western half only)	VP1	14 <sup>th</sup> October 2022 08:00-10:00 (CG)	22 <sup>nd</sup> October 2022 10:45-12:45 (CG)
Unit 5 (Ditchford East) Lakes L2, L13 and L16 (western half only)	VP2	14 <sup>th</sup> October 2022 10:15-12:15 (CG)	22 <sup>nd</sup> October 2022 13:00-15:00 (CG)
Unit 5 (Ditchford East) Lakes L2, L13 and L16 (western half only)	VP3	14 <sup>th</sup> October 2022 12:20-14:20 (CG)	22 <sup>nd</sup> October 2022 08:30-10:30 (CG)
Unit 6 (Stanwick Lakes) Lakes M11, M16, M21 and M23	VP1	6 <sup>th</sup> October 2022 09:20-11:20 (AM)	30 <sup>th</sup> October 2022 13:40-15:40 (BC)
Unit 6 (Stanwick Lakes) Lakes M11, M16, M21 and M23	VP2	6 <sup>th</sup> October 2022 11:40-13:40 (AM)	30 <sup>th</sup> October 2022 09:05-11:05 (BC)
Unit 6 (Stanwick Lakes) Lakes M11, M16, M21 and M23	VP3	6 <sup>th</sup> October 2022 13:45-15:45 (AM)	30 <sup>th</sup> October 2022 11:15-13:15 (BC)
Unit 7 (Ringstead Gravel Pits) Lake N5	VP1	6 <sup>th</sup> October 2022 08:05-10:05 (BC)	30 <sup>th</sup> October 2022 13:45-15:45 (AM)
Unit 7 (Ringstead Gravel Pits) Lake N5	VP2	6 <sup>th</sup> October 2022 11:00-13:00 (BC)	30 <sup>th</sup> October 2022 09:00-11:00 (AM)
Unit 7 (Ringstead Gravel Pits) Lake N5	VP3	6 <sup>th</sup> October 2022 14:55-16:55 (BC)	30 <sup>th</sup> October 2022 11:15-13:15 (AM)
Unit 8 (Thrapston and Titchmarsh) Lakes P5 and P9	VP1	4 <sup>th</sup> October 2022 12:15-14:15 (DF)	27 <sup>th</sup> October 2022 09:05-11:05 (GR)
Unit 8 (Thrapston and Titchmarsh) Lakes P5 and P9	VP2	4 <sup>th</sup> October 2022 07:50-09:50 (DF)	27 <sup>th</sup> October 2022 11:20-13:20 (GR)
Unit 8 (Thrapston and Titchmarsh) Lakes P5 and P9	VP3	4 <sup>th</sup> October 2022 10:00-12:00 (DF)	27 <sup>th</sup> October 2022 13:30-15:30 (GR)

**Table 8.5:** Details of November 2022 visits to each site (Surveyor Initials in brackets)

Site	Vantage Point	Visit 1	Visit 2
Unit 1 (Clifford Hills Gravel Pits) Lake D1	VP1	12 <sup>th</sup> November 2022 11:05-13:05 (RB)	29 <sup>th</sup> November 2022 10:40-12:40 (PF)
Unit 1 (Clifford Hills Gravel Pits) Lake D1	VP2	12 <sup>th</sup> November 2022 14:08-16:08 (RB)	29 <sup>th</sup> November 2022 08:30-10:30 (PF)
Unit 1 (Clifford Hills Gravel Pits) Lake D1	VP3	12 <sup>th</sup> November 2022 08:00-10:00 (RB)	29 <sup>th</sup> November 2022 12:50-14:50 (PF)
Unit 2 (Earls Barton West) Lake G7	VP1	8 <sup>th</sup> November 2022 09:35-11:35 (PM)	12 <sup>th</sup> November 2022 08:30-10:30 (RT)
Unit 2 (Earls Barton West) Lake G7	VP2	8 <sup>th</sup> November 2022 13:55-15:55 (PM)	12 <sup>th</sup> November 2022 10:35-12:35 (RT)
Unit 2 (Earls Barton West) Lake G7	VP3	8 <sup>th</sup> November 2022 11:50-13:50 (PM)	12 <sup>th</sup> November 2022 13:00-15:00 (RT)
Unit 3 (Earls Barton Central) Lakes H9 and H10	VP1	6 <sup>th</sup> November 2022 12:05-14:05 (PM)	22 <sup>nd</sup> November 2022 10:55-12:55 (RY)
Unit 3 (Earls Barton Central) Lakes H9 and H10	VP2	6 <sup>th</sup> November 2022 10:00-12:00 (PM)	22 <sup>nd</sup> November 2022 13:00-15:00 (RY)
Unit 3 (Earls Barton Central) Lakes H9 and H10	VP3	6 <sup>th</sup> November 2022 14:10-16:10 (PM)	22 <sup>nd</sup> November 2022 08:45-10:45 (RY)
Unit 5 (Ditchford East) Lakes L2, L13 and L16 (western half only)	VP1	6 <sup>th</sup> November 2022 11:05-13:05 (CG)	22 <sup>nd</sup> November 2022 11:05-13:05 (LH)
Unit 5 (Ditchford East) Lakes L2, L13 and L16 (western half only)	VP2	6 <sup>th</sup> November 2022 14:08-16:08 (CG)	22 <sup>nd</sup> November 2022 14:08-16:08 (LH)
Unit 5 (Ditchford East) Lakes L2, L13 and L16 (western half only)	VP3	6 <sup>th</sup> November 2022 08:00-10:00 (CG)	22 <sup>nd</sup> November 2022 08:00-10:00 (LH)
Unit 6 (Stanwick Lakes) Lakes M11, M16, M21 and M23	VP1	11 <sup>th</sup> November 2022 08:10-10:10 (GR)	20 <sup>th</sup> November 2022 13:20-15:20 (AM)
Unit 6 (Stanwick Lakes) Lakes M11, M16, M21 and M23	VP2	11 <sup>th</sup> November 2022 12:35-14:35 (GR)	20 <sup>th</sup> November 2022 11:00-13:00 (AM)
Unit 6 (Stanwick Lakes) Lakes M11, M16, M21 and M23	VP3	11 <sup>th</sup> November 2022 10:25-12:25 (GR)	20 <sup>th</sup> November 2022 08:50-10:50 (AM)
Unit 7 (Ringstead Gravel Pits) Lake N5	VP1	6 <sup>th</sup> November 2022 09:10-11:10 (BC)	30 <sup>th</sup> November 2022 13:45-14:45 (AM)
Unit 7 (Ringstead Gravel Pits) Lake N5	VP2	6 <sup>th</sup> November 2022 11:25-13:25 (BC)	30 <sup>th</sup> November 2022 09:00-11:00 (AM)
Unit 7 (Ringstead Gravel Pits) Lake N5	VP3	6 <sup>th</sup> November 2022 13:35-15:35 (BC)	30 <sup>th</sup> November 2022 11:15-13:15 (AM)
Unit 8 (Thrapston and Titchmarsh) Lakes P5 and P9	VP1	12 <sup>th</sup> November 2022 13:40-15:40 (RY)	27 <sup>th</sup> November 2022 08:18-10:18 (LH)
Unit 8 (Thrapston and Titchmarsh) Lakes P5 and P9	VP2	12 <sup>th</sup> November 2022 11:35-13:35 (RY)	27 <sup>th</sup> November 2022 10:23-12:23 (LH)
Unit 8 (Thrapston and Titchmarsh) Lakes P5 and P9	VP3	12 <sup>th</sup> November 2022 09:25-11:25 (RY)	27 <sup>th</sup> November 2022 12:36-14:36 (LH)

**Table 8.6:** Details of December 2022 visits to each site (Surveyor Initials in brackets)

Site	Vantage Point	Visit 1	Visit 2
Unit 1 (Clifford Hills Gravel Pits) Lake D1	VP1	7 <sup>th</sup> December 2022 10:51-12:51 (LH)	17 <sup>th</sup> December 2022 13:30-15:30 (RB)
Unit 1 (Clifford Hills Gravel Pits) Lake D1	VP2	7 <sup>th</sup> December 2022 08:32-10:32 (LH)	17 <sup>th</sup> December 2022 07:50-09:50 (RB)
Unit 1 (Clifford Hills Gravel Pits) Lake D1	VP3	7 <sup>th</sup> December 2022 13:01-15:01 (LH)	17 <sup>th</sup> December 2022 10:45-12:45 (RB)
Unit 2 (Earls Barton West) Lake G7	VP1	3 <sup>rd</sup> December 2022 10:30-12:30 (RT)	21 <sup>st</sup> December 2022 11:30-13:30 (PM)
Unit 2 (Earls Barton West) Lake G7	VP2	3 <sup>rd</sup> December 2022 08:30-10:30 (RT)	21 <sup>st</sup> December 2022 13:35-15:35 (PM)
Unit 2 (Earls Barton West) Lake G7	VP3	3 <sup>rd</sup> December 2022 12:40-14:40 (RT)	21 <sup>st</sup> December 2022 09:20-11:20 (PM)
Unit 3 (Earls Barton Central) Lakes H9 and H10	VP1	8 <sup>th</sup> December 2022 12:30-14:30 (PM)	17 <sup>th</sup> December 2022 09:10-11:10 (PM)
Unit 3 (Earls Barton Central) Lakes H9 and H10	VP2	8 <sup>th</sup> December 2022 08:20-10:20 (PM)	17 <sup>th</sup> December 2022 13:20-15:20 (PM)
Unit 3 (Earls Barton Central) Lakes H9 and H10	VP3	8 <sup>th</sup> December 2022 10:20-12:20 (PM)	17 <sup>th</sup> December 2022 11:20-13:20 (PM)
Unit 5 (Ditchford East) Lakes L2, L13 and L16 (western half only)	VP1	4 <sup>th</sup> December 2022 08:00-10:00 (CG)	22 <sup>nd</sup> December 2022 08:15-10:15 (PF)
Unit 5 (Ditchford East) Lakes L2, L13 and L16 (western half only)	VP2	4 <sup>th</sup> December 2022 10:10-12:10 (CG)	22 <sup>nd</sup> December 2022 12:30-14:30 (PF)
Unit 5 (Ditchford East) Lakes L2, L13 and L16 (western half only)	VP3	4 <sup>th</sup> December 2022 12:15-14:15 (CG)	22 <sup>nd</sup> December 2022 10:25-12:25 (PF)
Unit 6 (Stanwick Lakes) Lakes M11, M16, M21 and M23	VP1	13 <sup>th</sup> December 2022 08:26-10:26 (LH)	17 <sup>th</sup> December 2022 13:25-15:25 (BC)
Unit 6 (Stanwick Lakes) Lakes M11, M16, M21 and M23	VP2	13 <sup>th</sup> December 2022 10:40-12:40 (LH)	17 <sup>th</sup> December 2022 09:00-11:00 (BC)
Unit 6 (Stanwick Lakes) Lakes M11, M16, M21 and M23	VP3	13 <sup>th</sup> December 2022 12:43-14:43 (LH)	17 <sup>th</sup> December 2022 11:05-13:05 (BC)
Unit 7 (Ringstead Gravel Pits) Lake N5	VP1	14 <sup>th</sup> December 2022 12:35-14:35 (GR)	17 <sup>th</sup> December 2022 09:00-11:00 (AM)
Unit 7 (Ringstead Gravel Pits) Lake N5	VP2	14 <sup>th</sup> December 2022 10:25-12:25 (GR)	17 <sup>th</sup> December 2022 13:30-15:30 (AM)
Unit 7 (Ringstead Gravel Pits) Lake N5	VP3	14 <sup>th</sup> December 2022 08:15-10:15 (GR)	17 <sup>th</sup> December 2022 11:15-13:15 (AM)
Unit 8 (Thrapston and Titchmarsh) Lakes P5 and P9	VP1	3 <sup>rd</sup> December 2022 10:32-12:32 (LH)	9 <sup>th</sup> December 2022 10:05-12:05 (PF)
Unit 8 (Thrapston and Titchmarsh) Lakes P5 and P9	VP2	3 <sup>rd</sup> December 2022 12:36-14:36 (LH)	9 <sup>th</sup> December 2022 08:00-10:00 (PF)
Unit 8 (Thrapston and Titchmarsh) Lakes P5 and P9	VP3	3 <sup>rd</sup> December 2022 08:25-10:25 (LH)	9 <sup>th</sup> December 2022 12:15-14:15 (PF)