

---

# Highly pathogenic avian influenza (HPAI) H5N8 outbreak in Northern Ireland

January 2021

---

Epidemiological Investigation Report



Department of  
**Agriculture, Environment  
and Rural Affairs**

[www.daera-ni.gov.uk](http://www.daera-ni.gov.uk)

## Contents

Executive summary.....	3
AI/35/2020- Clough, Co. Antrim.....	5
AI/01/2021-Lisburn, Co. Antrim.....	11
Zone related surveillance.....	16
Wild Bird infections.....	17
Conclusions.....	18
<b>Annex 1</b> .....	19
<i>Summary of the laboratory findings from samples tested from AI/35/2020 and the two linked dangerous contact sites</i>	
<b>Annex 2</b> .....	20
<i>Summary assessment of the source and spread findings from AI/35/2020 and the two linked dangerous contact flocks</i>	
<b>Annex 3</b> .....	22
<i>Summary assessment of the source and spread findings from AI/01/2021</i>	
<b>Annex 4</b> .....	24
<i>Definitions used for likelihood and uncertainty within the source and spread assessments</i>	
<b>Annex 5</b> .....	25
<i>Ornithological report - Waterbird distribution and abundance in Northern Ireland in relation to recent HPAI H5N8 disclosures in Northern Ireland (produced by NIEA)</i>	

## Executive Summary

1. Two outbreaks of HPAI H5N8 were disclosed in commercial poultry flocks in Northern Ireland during December 2020/January 2021 (the first near Ballymena, Co. Antrim and a later outbreak near Lisburn, Co. Antrim).
2. Clinical signs in the index case (AI/35/2020) were observed on 27 December 2020 in a commercial layer rearing unit with neurological signs and increased mortality in one of two houses. This site had two dangerous contact (DC) premises (a commercial layer site and another commercial layer rearing site) nearby that were managed by members of the same family. Serological evidence of H5N8 infection was found on the DC rearing site but H5N8 virus was only detected in House 1 of the infected premises.
3. Extensive epidemiological investigations were carried out on all three sites and it was concluded that the most likely source of infection was indirect introduction from wild birds.
4. Clinical signs were first detected on the second infected premises (AI/01/2021) on 3 January 2021 in a single house commercial egg layer site where there was a dramatic increase in bird mortality.
5. The epidemiological investigation concluded that vehicle movements from the index case was the most likely source of infection for this outbreak (AI/01/2021). No further spread of infection from either infected premises was disclosed through tracings arising from these outbreaks.
6. Surveillance within the zones surrounding both infected premises yielded negative findings (n = 504 premises).
7. During November and December 2020, eight isolates of HPAI H5N8 were disclosed in swans at various locations around the Lough Neagh/Lough Beg/River Bann basin. Analysis of the virus haemagglutinin (HA) cleavage site from these isolates and the isolates from the two poultry outbreaks showed they were identical. Further detailed genetic analysis indicated that both poultry outbreaks cluster together across all eight gene segments and they are closely related to other HPAI H5N8 viruses found in England, the Netherlands, Belgium and France in late 2020.

8. Ornithological information on waterbird distribution and abundance continues to indicate the importance of Lough Neagh/Lough Beg as the main location in Northern Ireland for these species.

## **AI/35/2020 - Clough, Co. Antrim**

### **Description of premises and clinical observations**

This commercial layer rearing site consisted of two deep-litter houses of 16,000 birds each (14 & 8 weeks old) with only the older birds showing clinical signs (House 1), with clinical signs first detected on 27/12/2020 (neurological signs, increased mortalities, abnormal vocalisation). Cases were spread throughout the house and mortalities steadily increased from 8 to 47 per day over a period of six days. The flock keeper reported that birds with clinical signs died within 12 hours of being detected. Birds were post-mortemed by a private poultry vet on 30/12/2020 who then reported it to the Department of Agriculture, Environment and Rural Affairs (DAERA) as a suspect case of avian influenza. Restrictions were placed on the site on 31/12/2020 and samples were taken from the flock.

The flock keeper also had a cattle herd with the dairy unit being in the same farmyard, which is situated adjacent to a public road.

The infected premises was approximately 11 miles from the River Bann at Kilrea, which was at the northern edge of the Lough Neagh/River Bann corridor where HPAI H5N8 wild bird infections have been recorded over recent months (see 'Wild bird infection' section). However, few wild birds were reportedly observed around the infected premises.

The premises is in an area of relatively high poultry density (34 recorded commercial poultry flocks within 3km and 98 commercial poultry flocks within 3-10km).

### **Dangerous contact premises**

A family member has a free range commercial egg layer flock (two houses of 16,000 birds each, which were 70 & 74 weeks-old). The site is located 200 metres from the infected premises and is accessed by a laneway which is directly opposite the main farmyard. Another family member also manages a rearing house (16,000 three week-old birds), which is situated approximately 0.8km away along the same road. This was the first batch of commercial layer rearers to be placed into this house since it was refurbished from an old turkey house.

All the operations appeared to be well managed with reasonable biosecurity measures in place and it was stated that the three sites functioned as separate dedicated operations. However, there is a degree of personal contact between the family members and they were determined to be dangerous contacts (DCs) because of epidemiological links. All three linked premises were placed under restriction.

No clinical signs or changes in production parameters were observed in the two DC flocks or in the second house (House 2) of the infected premises. However, all birds on the three sites were culled on 07/01/2021 because of the epidemiological links.

## Infection confirmation

A presumptive diagnosis of highly pathogenic avian influenza (HPAI) H5N8 was made by AFBI's Veterinary Sciences Division, Stormont on 01/01/2021 on the infected premises (AI/35/2020). This diagnosis was later confirmed by real-time PCR, on 06/01/2021 by the OIE and UK National Reference Laboratory (APHA Weybridge) and also the OIE/FAO and EU Reference Laboratory, Legnaro, Italy (IZSve).

Samples from each of the dangerous contact premises (20 cloacal and 20 oropharyngeal swabs along with five carcasses) taken around culling were negative for evidence of H5N8 (results from AFBI). However, low level serological titres (three @ 1/8 and three @ 1/16) were observed in six of 40 blood samples taken from the DC rearing site on 04/01/2021. Other blood samples from each of the houses from all three sites indicated no serological evidence of infection (Annex 1).

## Epidemiological investigations

Source and spread tracing windows were drafted following consideration of onset of clinical signs and the results from diagnostic sampling.

### **Source window:**

High risk period	24-26 December
Moderately high risk period	20-23 December
Moderate risk period	13-19 December

Precautionary period	06-12 December
----------------------	----------------

**Spread window:**

High risk period	24-31 December
------------------	----------------

Moderate risk period	13-23 December
----------------------	----------------

Precautionary period	06-12 December
----------------------	----------------

Visitors and all vehicle movements from the infected premises and the two DCs during the risk windows were traced and poultry premises inspected and restricted where deemed necessary (*Figure 1*). High risk tracings based on three visitors with direct contact with the infected birds during the risk period were restricted and monitored but showed no evidence of infection.

Annex 2 summarises the risk assessment findings regarding source and spread of infection to and from these premises.

The yard of the infected site is shared with the dairy unit with feed and milk collection lorries manoeuvring within the same space and the yard is situated alongside the public road. House 1 is closer to the public road than House 2 and the younger birds were always inspected before House 1. Both houses had separate entrances with no connecting corridor and there was no clinical evidence of infection entering House 2 on this site.

The possibility of fomite spread between the infected site and the DC layer site (200m from infected premises) and the DC rearing site (800m from infected premises) through common use of vehicles and accommodation, could not be ruled out and tracings from all three sites were fully investigated. This included extending the risk window relating to the DC rearing site back to 30/11/2020.

Serological evidence of avian influenza H5N8 on the DC rearing site provided a strong indication of fomite spread between the two rearing sites. The infected premises owner also had cattle in a house adjacent to the DC rearing unit, which are located close to the public road.

All three sites were affiliated with the same commercial egg production company. Given the ongoing COVID-19 guidelines/restrictions, none of the flock keepers left the premises during the risk period of source or spread.

During the risk period, there was increased traffic on the public road passing the farmyard due to a road closure. There was also a poultry manure spillage (approximately 0.5 tonnes over several 100m) on the road beside the main farmyard on 15 December. Investigations indicated that the flock of origin had no evidence of avian influenza infection.

Surveillance of flocks within the protection zone of this outbreak revealed no evidence of any other infection in the locality.

The flock owners state that very few wild birds were observed in the area (some starlings and small garden birds) even with the proximity of cattle housing. The sites are approximately 1 mile from the nearest pond and 11 miles from the River Bann, which forms the northern edge of the Lough Neagh/River Bann corridor where HPAI H5N8 infection has been reported in waterfowl over November/December 2020 (see 'Wild bird infections' section).



**Figure 1: Estimated timeline of source and spread risk windows for AI/35/2020 and events recorded as occurring on the infected premises and two DC sites during this time period**

Key	Description	Source	Spread	Event/Comments (Red=IP; Blue=DC layers; Green=DC rearers; black=all 3 sites)
	Source: high risk (3 days)	01-Dec		
	Source: high/moderate risk (4 days)	02-Dec		<i>*Milk collection occurred every second day throughout the risk period*</i>
	Source: moderate risk (7 days)	03-Dec		
	Source: precautionary (7 days)	04-Dec		
	Spread: high risk period	05-Dec		
	Spread: likely risk period	06-Dec		
	Spread: precautionary	07-Dec		Feed delivery; Egg collection
		08-Dec		
CS	1st clinical signs	09-Dec		Feed delivery (dairy)
Restrict	Permits restricted	10-Dec		Egg collection; Day old chicks delivered
IP	Infected premises	11-Dec		Feed delivery
DC	Dangerous contact	12-Dec		
		13-Dec		
		14-Dec		Egg collection
		15-Dec		Feed delivery; Poultry manure spillage on road from other site
		16-Dec		Feed delivery; Feed delivery; Advisor visit; Advisor visit
		17-Dec		RSPCA auditor; Egg collection
		18-Dec		Gas delivery; Gas delivery
		19-Dec		Veterinary visit (cattle)
		20-Dec		Egg collection
		21-Dec		Egg collection; Feed delivery; Manure removal; Feed delivery (dairy)
		22-Dec		
		23-Dec		Egg collection; Feed delivery; Dead bird collection
		24-Dec		Egg collection
		25-Dec		
		26-Dec		
		27-Dec	CS	
		28-Dec		Egg collection; Feed delivery (dairy)
		29-Dec		Feed delivery; Veterinary visit (dairy)
		30-Dec		Feed delivery; Advisor visit
		31-Dec	Restrict	Egg tray delivery; Suspicion reported/DAERA veterinary visit/sampling
		01-Jan		Flu A H5 detected by AFBI lab
		02-Jan		On-farm epidemiological investigations
		03-Jan		
		04-Jan		Blood samples; 3 of 40 show titre to H5N8; Seronegative; Seronegative
		05-Jan		
		06-Jan		APHA confirmation of HPAI H5N8
		07-Jan		Cull on all three sites; PCR samples all negative
		08-Jan		
		09-Jan		
		10-Jan		Preliminary cleansing and disinfection completed on all 3 sites

## Hypothesis for the infection source

The evidence collected would suggest that indirect introduction from wild birds was the source of infection for this HPAI H5N8 incursion. This was either primarily into the infected house and/or the DC rearing house with secondary fomite spread between the two premises.

## Evidence base for infection source

This assessment of the source of infection was based on the following evidence:

1. No evidence was found indicating any domestic flocks infected with avian influenza preceding the disclosure of this infected premises and its DC rearing house;
2. These sites are relatively close to pockets of HPAI H5N8 infection found in eight swans (Lough Neagh/River Bann corridor), which was disclosed prior to this outbreak in poultry (during November/December);
3. Sequencing has shown very close homology from this poultry isolate and that from an isolate obtained from a swan in Northern Ireland during November/December;
4. Inspection of the rearing houses on both sites showed them to be well maintained with no obvious deficits that would enable incursion by wild birds;
5. While there were good biosecurity procedures in place (for an enterprise of this type) for entry to houses on the different sites (dedicated footwear and boiler suits with well-maintained foot baths), there was shared vehicle and accommodation used by the three flock keepers;
6. There was increased opportunity of contamination of the environment proximal to the infected premises and the DC rearing unit through increased traffic on the public road and the manure spillage. Moreover, there was increased vehicular movements in the vicinity of the infected premises prior to incursion as a consequence of the approaching Christmas holidays.

## Depopulation

Poultry on all three sites were culled by whole house gassing on 07/01/2021 and preliminary cleansing and disinfection of each site was completed on 10/01/2021.

Secondary cleansing and disinfection of each site was completed on 22/03/2021.

## AV01/2021 – Lisburn, Co. Antrim

### Description of the premises and clinical observations

This outbreak was in a commercial egg layer site consisting of one house containing 31,000 birds (53 week old) accommodated in colony enriched cages. The yard also housed beef finishing cattle. Clinical signs first appeared in the middle-tier section, two-thirds of the way into the hen house with increased mortality and signs of depression observed on 03/01/2021. There was a rapid increase in mortalities with an estimated 50% of the birds dying by 07/01/2021.

The premises was restricted on 04/01/2021 and samples taken on that date later confirmed the presence of HPAI H5N8 infection in the flock.

### Infection confirmation

A presumptive diagnosis of HPAI H5N8 was made by AFBI's Veterinary Sciences Division, Stormont on 05/01/2021 on the infected premises (AV01/2021). This diagnosis was later confirmed by real-time PCR, on 12/01/2021 by the OIE and UK National Reference Laboratory (APHA Weybridge) and also the OIE/FAO and EU Reference Laboratory, Legnaro, Italy (IZSve). Serological samples obtained on 04/01/2021 showed no evidence of seroconversion.

### Epidemiological investigations

Source and spread tracing windows were drafted following consideration of onset of clinical signs and the results from diagnostic sampling.

#### **Source window:**

High risk period	31 December – 2 January
Moderately high risk period	27-30 December
Moderate risk period	20-26 December
Precautionary period	13-19 December

#### **Spread window:**

High risk period	31 December – 4 January
------------------	-------------------------

Moderate risk period 20-30 December

Precautionary period 13-19 December

Visitors and all vehicle movements from the infected premises during the risk windows were traced and poultry premises inspected and restricted where deemed necessary (*Figure 2*).

**Figure 2: Estimated timeline of source and spread risk windows for AI/01/2021 and events recorded as occurring on the infected premises during this time period**

Key	Description	Date	Source	Spread	Event/Comments
	Source: high risk (3 days)	10-Dec			
	Source: high/moderate risk (4 days)	11-Dec			
	Source: moderate risk (7 days)	12-Dec			<i>Feed delivery</i>
	Source: precautionary (7 days)	13-Dec			
	Spread: high risk period	14-Dec			
	Spread: likely risk period	15-Dec			<i>Egg collection</i>
	Spread: precautionary	16-Dec			<i>Egg collection, Feed delivery, Egg Inspector visit</i>
		17-Dec			
CS	1st clinical signs	18-Dec			<i>Egg collection</i>
Restrict	Premises restricted	19-Dec			
		20-Dec			
		21-Dec			<i>Egg collection</i>
		22-Dec			<i>Egg collection, Feed delivery</i>
		23-Dec			
		24-Dec			<i>Egg collection</i>
		25-Dec			
		26-Dec			
		27-Dec			
		28-Dec			<i>Egg collection</i>
		29-Dec			<i>Egg collection</i>
		30-Dec			<i>Feed delivery</i>
		31-Dec			<i>Egg collection</i>
		01-Jan			
		02-Jan			
		03-Jan	CS		
		04-Jan	Restrict		
		05-Jan			
		06-Jan			
		07-Jan			
		08-Jan			Flock culled

Egg collections and feed deliveries were the only vehicles on-site during the risk period along with one visit from an egg inspector. There was one full-time worker on the farm and they received some assistance from their father who lives off-site less than 1km away. Dedicated clothing (rubber boots & outer coverings) were available

upon entry to the house and biosecurity assessment of the site was considered good for a site of this nature. Rats were very occasionally observed in and around the hen house.

Waterfowl have not been observed on or near the site. Lough Neagh is approximately 7 miles from the premises where waterfowl are abundant.

This premises was affiliated with the same commercial egg company as the first outbreak (AI/35/2020) with the sites being 32 miles apart. The two sites utilised the same feed delivery lorry company (but use different feed suppliers/mills). The feed delivery lorry that visited the DC layer site linked with AI/35/2020 on 21 December also delivered poultry feed to this outbreak the following day (22 December). There were three feed deliveries by this lorry to other poultry sites between the aforementioned visits. The same egg collection lorry visited both premises (the DC layer site linked with AI/35/2020 followed by this outbreak) on the same egg collection round on 21 December. There were egg collections on two other premises between the aforementioned collections. This lorry also visited the DC layer site on 24 December and later that day to AI/01/2021 but this was on a separate egg collection round. Annex 3 summarises the risk assessment findings regarding source and spread of infection to and from this site.

## **Hypothesis for the infection source**

The evidence collected would suggest that fomite spread via a lorry visiting the vicinity of AI/35/2021 on 21 December and subsequently visiting AI/01/2021 was the most likely source of this HPAI H5N8 incursion. The same day egg collection from both sites would suggest that this was the most likely fomite vehicle. However, indirect introduction from wild birds and from other movements onto the site cannot be ruled out.

## **Evidence base for infection source**

This assessment of the source of infection was based on the following evidence:

1. The temporal relationship with the first outbreak and the crossover between source and spread risk windows from the two outbreaks are suggestive of a linkage (*Figure 3*).

2. Both outbreaks are affiliated with the same commercial egg production company and were visited by the same egg collection lorry on the same day (and also by the same feed delivery lorry on consecutive days) during the source risk window.
3. While both lorries only visited the DC layer site linked to AI/35/2020 (where no evidence of infection was disclosed), the end of the lane accessing this site is directly opposite the roadside location of the infected premises where potential contamination of the outside of these vehicles could have occurred. Moreover, the egg collection lorry driver does disinfect the lorry wheels at the end of the lane on entry and exit to the layer site next to the public road. This incorporates the possibility of contamination of the driver's foot-well at this location.
4. The stone covered yard in front of the hen house at of AI/01/2021 is not suitable for routine cleansing and disinfection.
5. No waterfowl and few wild birds are observed on or adjacent to this site. However, it is reasonably near (7 miles) to Lough Neagh which is at the south-east end of the corridor in which eight swan isolates of HPAI H5N8 were disclosed during November/December (see wild bird selection), so other movements onto this site may have introduced the infection indirectly.
6. All of the HPAI H5N8 isolates from Northern Ireland over this winter period have shown very high levels of homology so it is difficult to discern further detail from the phylogenetic trees.

## Depopulation

Poultry on the site was culled by whole house gassing on 08/01/2021 and preliminary cleansing and disinfection of the site was completed on 11/01/2021.

Secondary cleansing and disinfection of the site was completed on 21/04/2021.

**Figure 3: Estimated timelines of source and spread risk windows for the AI/35/2020 and AI/01/2021 HPAI H5N8 outbreaks**

Key	Description	Date	AI/35/2020		AI/01/2021	
			Source	Spread	Source	Spread
	Source: high risk (3 days)	01-Dec				
	Source: high/moderate risk (4 days)	02-Dec				
	Source: moderate risk (7 days)	03-Dec				
	Source: precautionary (7 days)	04-Dec				
	Spread: high risk period	05-Dec				
	Spread: likely risk period	06-Dec				
	Spread: precautionary	07-Dec				
		08-Dec				
CS	1st clinical signs	09-Dec				
Restrict	Premises restricted	10-Dec				
C&D	Cleansing & Disinfection	11-Dec				
		12-Dec				
		13-Dec				
		14-Dec				
		15-Dec				
		16-Dec				
		17-Dec				
		18-Dec				
		19-Dec				
		20-Dec				
		21-Dec				
		22-Dec				
		23-Dec				
		24-Dec				
		25-Dec				
		26-Dec				
		27-Dec	CS			
		28-Dec				
		29-Dec				
		30-Dec				
		31-Dec	Restrict			
		01-Jan				
		02-Jan				
		03-Jan			CS	
		04-Jan			Restrict	
		05-Jan				
		06-Jan				
		07-Jan	Culled			
		08-Jan			Culled	
		09-Jan				
		10-Jan	Preliminary C&D			
		11-Jan			Preliminary C&D	

## Zone related surveillance

Restrictions were placed on all poultry flocks within the protection (3km radius) and surveillance (10km radius) zones of the two outbreaks and 504 premises were investigated either by a clinical visit or by telephone enquiry (Table 1). There were also 296 poultry related licences issued for movements into and out of these areas while zones were in place (1 January – 12 February 2021).

**Table 1:** Number of poultry premises where disease investigation inspections were carried out within the zones of each outbreak.

<b>Zone</b>	<b>Total number of premises investigated</b>	<b>Number of premises with a clinical visit</b>	<b>Number of premises with a telephone investigation</b>
Protection Zone: AI/35/2020	34	33	1
Protection Zone: AI/01/2021	24	22	2
Surveillance Zone: AI/35/2020	156	12	144
Surveillance Zone: AI/01/2021	290	2	288
<b>Total</b>	<b>504</b>	<b>69</b>	<b>435</b>

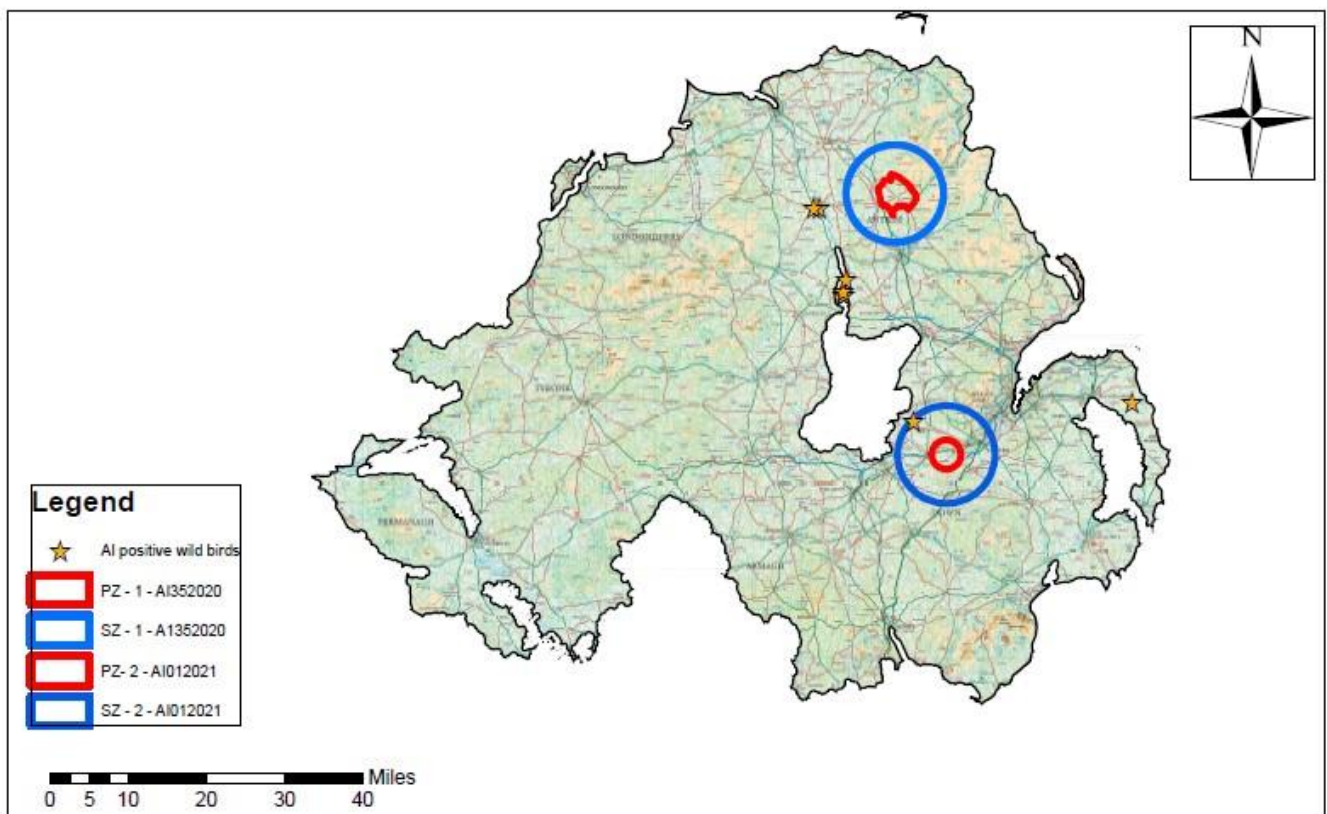
There were a further 70 premises investigated outside of the zones due mainly to vehicles that had been on the infected premises or DCs during the risk windows. This excludes the five relating to visitors that were in direct contact with the infected birds (n = 3) and two follow up flock investigations associated with the manure spillage beside AI/35/2020. There were also a further eleven suspect poultry premises investigated during this time period where suspicion of infection was reported by private veterinary surgeons or flock keepers.



## Wild bird infections

During November and December 2020, eight isolates of HPAI H5N8 were disclosed in swans at various locations around Lough Neagh/Lough Beg/River Bann basin (Figure 4; yellow stars). This area is one of the main locations for waterfowl in the country (see Annex 5 for detailed ornithological findings). A Peregrine falcon was found in January 2021 on the Newtownards peninsula which was confirmed as having HPAI H5N3 infection. The haemagglutinin cleavage site for all these wild bird isolates was identical (a PLREKRRKRGLF motif), which was also the motif obtained from the two poultry outbreaks, AI/35/2020 and AI/01/2021. More detailed genomic analysis was attempted (but failed) retrospectively from tissues from the different available isolates to see if any linkage could be further elucidated. However, other isolates from across Great Britain have shown very similar homology.

**Figure 4: Disclosures of HPAI H5N8 in wild birds (yellow stars) in Northern Ireland (November 2020 to January 2021) and the protection and surveillance zones placed around the two poultry outbreaks (AI/35/2020 & AI/01/2021).**



## Conclusions

The two H5N8 outbreaks in domestic poultry flocks in this report represent the first ever recorded cases of HPAI in Northern Ireland (with one previous case of a low pathogenic avian influenza outbreak in poultry in the 1990s). Cases of HPAI H5N8 have been widespread across Europe and further afield during recent months in both wild birds and domestic poultry/captive birds, which is indicative of the extensive level of environmental contamination with this virus over this winter season. It is therefore not surprising that these outbreaks have arisen despite the heightened levels of biosecurity being undertaken by poultry keepers.

Indirect introduction from wild birds would appear to be the route of incursion for AI/35/2020 and the DC rearing site. The temporal links and vehicle movements between the sites would suggest fomite spread as the mostly likely source of infection for the second outbreak (AI/01/2021). However, indirect introduction from wild birds cannot be ruled out as a source for the AI/01/2020 outbreak.

Extensive surveillance both within the zones, and through tracing of vehicle and personnel movements, did not disclose any evidence of infection nor did investigation of ongoing reported suspect cases by keepers and veterinary surgeons.

**Annex 1:** Summary of the laboratory findings from samples tested from A/35/2020 and the two linked dangerous contact sites

Site	House	Date sampled	Sample type & number	Test Type^	Result
Infected Premises	1	31/12/2020	5 carcasses, 20 cloacal & 20 tracheal swabs	PCR	Influenza A subtype H5N8 positive
	1	31/12/2020	Organ pool	Sequencing	HPAI; cleavage site motif 'PLREKRRKRGLF' detected
	1	31/12/2020	Organ pool	IVPI	HPAI (IVPI of 2.98)
	1	31/12/2020	20 blood samples	HIA	All negative
	1	04/01/2021	20 blood samples	HIA	All negative
	2	04/01/2021	20 blood samples	HIA	All negative
Dangerous contact rearing site	1	04/01/2021	40 blood samples	HIA	6 seropositive for H5N8 (3@1/8 & 3@1/16)
	1	07/01/2021	5 carcasses, 20 cloacal & 20 tracheal swabs	PCR	All negative
Dangerous contact Layer site	1	04/01/2021	51 blood samples	HIA	All negative
	2	04/01/2021	40 blood samples	HIA	All negative
	1	07/01/2021	5 carcasses, 20 cloacal & 20 tracheal swabs	PCR	All negative
	2	07/01/2021	5 carcasses, 20 cloacal & 20 tracheal swabs	PCR	All negative
<u>Test Type^</u>					
PCR = Polymerase chain reaction					
IVPI - intravenous pathogenicity index					
HIA = haemagglutinin inhibition assay					

**Annex 2: Summary assessment of the source and spread findings from AI/35/2020 and the two linked dangerous contact flocks**

**Source of infection assessment for AI/35/2020:**

<b>Pathway</b>	<b>Likelihood outcome</b>	<b>Actions taken</b>	<b>Conclusion</b>
Direct introduction by wild birds	Low likelihood with low uncertainty	Inspection of houses	No further action
Indirect introduction by wild birds	Medium likelihood with medium uncertainty	Inspection of sites and surrounding environment. Ornithological report	No further action
Direct introduction by purchased birds	Low likelihood with low uncertainty	Movement histories from all sites & follow up on DC rearing site day old delivery	No further action
Indirect introduction: Staff/Personnel	Medium likelihood with low uncertainty	Investigation of personnel movements and on-site vehicles/equipment	Sharing of vehicle between sites and living accommodation
Indirect introduction: Other residents	Not applicable		No further action
Indirect introduction: Visitors	Low likelihood with low uncertainty	Movement histories and resulting tracing investigations completed. No significant findings.	No further action
Indirect introduction: Feed delivery	Low likelihood with low uncertainty	Movement histories and resulting tracing investigations completed. No significant findings.	No further action
Indirect introduction: Water supply	Very low likelihood with low uncertainty		No further action
Indirect introduction: Dead bird collections	Low likelihood with low uncertainty	Movement histories and resulting tracing investigations completed. No significant findings.	No further action
Indirect introduction: Egg collections by packing company	Low likelihood with low uncertainty	On-site procedures investigated. Movement histories and resulting tracing investigations completed. No significant findings.	No further action
Indirect introduction: Bedding	Low likelihood with low uncertainty	No bedding delivered/used during the risk period	No further action
Indirect introduction: Farm equipment	Very low likelihood with low uncertainty	Equipment not shared with any other poultry unit	No further action
Indirect introduction: Other	Low likelihood with low to medium uncertainty	Cattle activities, including milk tanker and feed lorry movements, investigated and no significant findings. Vermin control good. Manure spill investigated and no significant findings.	No further action
Wind borne introduction	Very low likelihood with medium uncertainty	No other cases in the vicinity and no manure spread on nearby fields.	No further action

**Spread assessment for AI/35/2020:**

<b>Pathway</b>	<b>Likelihood outcome</b>	<b>Actions taken</b>	<b>Conclusion</b>
Direct spread by movement of birds	Very low likelihood with low uncertainty	No farmed birds moved off site. DC layers free range but never confirmed with infection. No nearby sites infected.	No further action
Indirect spread: Staff/Personnel	Low likelihood with medium uncertainty	No contact with any other poultry.	No further action
Indirect spread: Other residents	Not applicable		No further action
Indirect spread: Visitors	Medium likelihood with low uncertainty	Movement histories and resulting tracing investigations completed. No significant findings.	No further action
Indirect spread: Feed delivery	Medium likelihood with medium uncertainty	Movement histories and resulting tracing investigations completed. Same lorry did visit AI/01/2021. No other significant findings.	Temporal relationship cannot exclude this as a potential fomite for spread to AI/012020
Indirect spread: Manure disposal/bedding	Low likelihood with low uncertainty	Manure transported to arable farmer; stored in sealed shed. Manure was from DC layer site where no infection found.	No further action
Indirect spread: Dead bird collections	Low likelihood with low uncertainty	Movement histories and resulting tracing investigations completed. No significant findings.	No further action
Indirect spread: Egg collections by packing company	Medium likelihood with medium uncertainty	Movement histories and resulting tracing investigations completed. Same lorry did visit AI/01/2021; on same egg round on one occasion. Other occasions when same lorry was on both sites. No other significant findings.	Temporal relationships cannot exclude this as a potential fomite for spread to AI/012020
Indirect spread: Farm equipment	Very low likelihood with low uncertainty	Equipment not shared with any other poultry unit	No further action
Indirect spread: Other	Low likelihood with low to medium uncertainty	Cattle activities, including milk tanker and feed lorry movements, investigated and no significant findings. Vermin control good.	No further action
Wind borne spread	Very low likelihood with medium uncertainty	No other cases in the vicinity.	No further action

### Annex 3: Summary assessment of the source and spread findings from AI/01/2021

#### Source of infection assessment for AI/01/2021:

Pathway	Likelihood outcome	Actions taken	Conclusion
Direct introduction by wild birds	Low likelihood with low uncertainty	Inspection of houses	No further action
Indirect introduction by wild birds	Low likelihood with medium uncertainty	Inspection of sites and surrounding environment. Ornithological report	No further action
Direct introduction by purchased birds	Very low likelihood with low uncertainty	Movement histories from all sites & follow up on DC rearing site day old delivery	No further action
Indirect introduction: Staff/Personnel	Medium likelihood with medium uncertainty	Reasonable biosecurity. One person lives off-site. Stoned yard in front of hen house	No further action
Indirect introduction: Other residents	Low likelihood with low uncertainty	Other family members do not access the hen house.	No further action
Indirect introduction: Visitors	Low likelihood with low uncertainty	One visitor (egg inspector) during risk window. Movement history and resulting tracing investigations completed. No significant findings.	No further action
Indirect introduction: Feed delivery	Medium likelihood with medium uncertainty	Movement histories and resulting tracing investigations completed. Same lorry did visit DC layer site of AI/35/2020. No other significant findings.	Temporal relationship cannot exclude this as a potential fomite for spread from AI/35/2020
Indirect introduction: Water supply	Very low likelihood with low uncertainty	Mains water supply	No further action
Indirect introduction: Dead bird collections	Low likelihood with low uncertainty	No dead bird collections during the risk window.	No further action
Indirect introduction: Egg collections by packing company	Low likelihood with low uncertainty	Movement histories and resulting tracing investigations completed. Same lorry did visit AI/01/2021; on same egg round on one occasion. Other occasions when same lorry was on both sites. No other significant findings.	Temporal relationship cannot exclude this as a potential fomite for spread from AI/35/2020
Indirect introduction: Bedding	Negligible likelihood with low uncertainty	No bedding used	No further action
Indirect introduction: Farm equipment	Low likelihood with low uncertainty	Equipment not shared with any other poultry unit	No further action

Indirect introduction: Other	Low likelihood with low to medium uncertainty	Cattle activities on farm. No significant findings. Vermin control reasonable.	No further action
Wind borne introduction	Very low likelihood with medium uncertainty	No other cases in the vicinity and no manure spread on nearby fields.	No further action

**Spread assessment for AI/01/2021:**

Pathway	Likelihood outcome	Actions taken	Conclusion
Direct spread by movement of birds	Very low likelihood with low uncertainty	No farmed birds moved off site.	No further action
Indirect spread: Staff/Personnel	Low likelihood with medium uncertainty	No contact with any other poultry.	No further action
Indirect spread: Other residents	Low likelihood with low uncertainty	No contact with any other poultry/birds.	No further action
Indirect spread: Visitors	Low likelihood with low uncertainty	Robust biosecurity measures taken by visitor. Movement history completed and no significant findings.	No further action
Indirect spread: Feed delivery	Medium likelihood with medium uncertainty	Movement histories and resulting tracing investigations completed. Same lorry did visit AI/01/2021. No other significant findings.	No further action
Indirect spread: Manure disposal/bedding	Very low likelihood with low uncertainty	No manure spread or left the site during the risk period.	No further action
Indirect spread: Dead bird collections	Low likelihood with low uncertainty	No dead bird collections during the risk window.	No further action
Indirect spread: Egg collections by packing company	Medium likelihood with medium uncertainty	Movement histories and resulting tracing investigations completed. Same lorry did visit AI/01/2021; on same egg round on one occasion. Other occasions when same lorry was on both sites. No other significant findings.	No further action
Indirect spread: Farm equipment	Low likelihood with low uncertainty	Equipment not shared with any other poultry unit	No further action
Indirect spread: Other	Low likelihood with low uncertainty	Cattle activities investigated and no significant findings. Vermin control adequate.	No further action
Wind borne spread	Very low likelihood with medium uncertainty	No other cases in the vicinity.	No further action

## Annex 4: Definitions used for likelihood and uncertainty within the source and spread assessments

### Likelihood [based on OIE (2004) and EFSA (2006) definitions]

Negligible	So rare that it does not merit being considered;
Very low	Very rare but cannot be excluded;
Low	Rare but does occur;
Medium	Occurs regularly;
High	Occurs very often.

### Uncertainty categories [based on OIE (2004) and EFSA (2006) definitions]

Low	Solid and complete data available; strong evidence provided in multiple references; other authors report similar conclusions;
Medium	Some but incomplete data available; evidence provided in a small number of references; authors report conclusions that vary from one another;
High	Scarce or no data available; evidence not provided in references but rather in unpublished reports or based on observations or personal communications; authors report conclusions that vary considerably between them.



## Annex 5: Ornithological report - Waterbird distribution and abundance in Northern Ireland in relation to recent HPAI H5N8 disclosures in Northern Ireland (produced by NIEA)

The distribution of migratory waterbirds within Northern Ireland remains similar to previous years, with major concentrations centred on nine major waterbodies, wetlands and coastal areas (see map below). Figures in red associated with each site represent the most recent available (2018/19 or 2019/20) peak counts for the period September to March. Totals are for all waterbird species combined and include swans, geese, ducks, waders, gulls, rails, herons and cormorants.



Aggregations of waterbirds peaking at over 1,000 individuals also occur in most years at the Bann Estuary, Killough Harbour and Lower Lough Erne. Significant numbers of Whooper Swans and Greylag Geese usually winter in the Grange area on the River Foyle.

### **Lough Neagh and Lough Beg (Overview):**

Waterbird populations using Lough Neagh and Lough Beg and the surrounding area are of particular interest in the context of this winter's outbreaks of Avian Influenza. Unfortunately, due to restrictions associated with the COVID-19 pandemic, regular surveys of this area and all

other major waterbird sites were suspended after the December 2020 counts. December is, however, within the peak period for waterbird abundance at Lough Neagh and Lough Beg with the greatest numbers usually occurring either within this month or January. It is therefore possible to compare the numbers of the main species groupings and individual key species with corresponding figures for December 2019 (see below).

Comparisons between years were initially made using all available data:

<b>Total count</b>			
	<b>2019</b>	<b>2020</b>	<b>% change</b>
All Species	33312	30924	-7
Swans & Geese	2409	2528	5
Dabbling Ducks	4875	4026	-17
Diving Ducks	13390	9947	-26
Waders	7661	6428	-16

In both years a number of sections of the lough were not surveyed during December. In order to ensure maximum comparability between years, the figures were recalculated omitting all sections that were only covered in one year. While this procedure results in a greater underestimate of the total number of birds present, it is likely that it improves the accuracy of the estimate of change between years.

<b>Adjusted Total</b>			
	<b>2019</b>	<b>2020</b>	<b>% change</b>
All Species	31371	30420	-3
Swans & Geese	1823	2389	31
Dabbling Ducks	4091	3915	-4
Diving Ducks	13078	9940	-24
Waders	7658	6428	-16

It can be seen that the size and direction of change for all groups other than swans and geese are remarkably similar using either data set and therefore are likely to be reliable indicators of variation between years. A small decline in overall numbers was detected between years. In both cases, numbers of swans and geese were shown to have increased in 2020. Although the size of this increase is uncertain the upward trend is likely to be genuine. In contrast, both analyses show a decrease in all other groups, especially diving ducks.

The adjusted figures were also used to compare abundance of key species using Lough Neagh and Lough Beg between years:

<b>Species</b>	<b>2019</b>	<b>2020</b>	<b>% change</b>
Black-headed Gull	376	676	80
Coot	3228	5802	80
Cormorant	291	424	46
Curlew	263	290	10
Gadwall	148	76	-49
Golden Plover	3651	3151	-14
Goldeneye	796	242	-70
Great Crested Grebe	248	137	-45
Greylag Goose	141	200	42
Lapwing	3238	2938	-9
Little Grebe	332	251	-24
Mallard	2102	1411	-33
Mute Swan	763	773	1
Pochard	5043	3413	-32
Scaup	384	312	-19
Teal	619	1480	139
Tufted Duck	6855	5973	-13
Whooper Swan	913	1412	55
Wigeon	1165	921	-21

Amongst the results for individual species is an apparent increase of over 130% in Teal numbers. This should be treated with caution as the detectability of this species can vary substantially depending on count conditions and location.

#### Lough Beg:

##### **a) Open water and shoreline**

Data for Lough Beg are included in the tables above but are summarised below specifically for the open water and shoreline of the lough.

Surveys of all Lough Beg count sections were carried out in both 2019 and 2020.

	<b>2019</b>	<b>2020</b>	<b>% change</b>
All Species	8017	7473	-7
Swans & Geese	157	217	38
Dabbling Ducks	1657	2765	67
Diving Ducks	74	41	-45
Waders	5488	4115	-25

There was a small decline in overall numbers of waterbirds at Lough Beg in December 2020. This was principally due to fewer waders using the site. Dabbling ducks, particularly Teal, increased substantially and there was a smaller increase in usage of the site by swans and geese.

### **b) Swan Fields**

Several areas of pasture in the vicinity of Lough Beg are regularly used by wintering Whooper Swans (see maps below). Substantial numbers of waders, especially Lapwing and Golden Plover, may also be present.

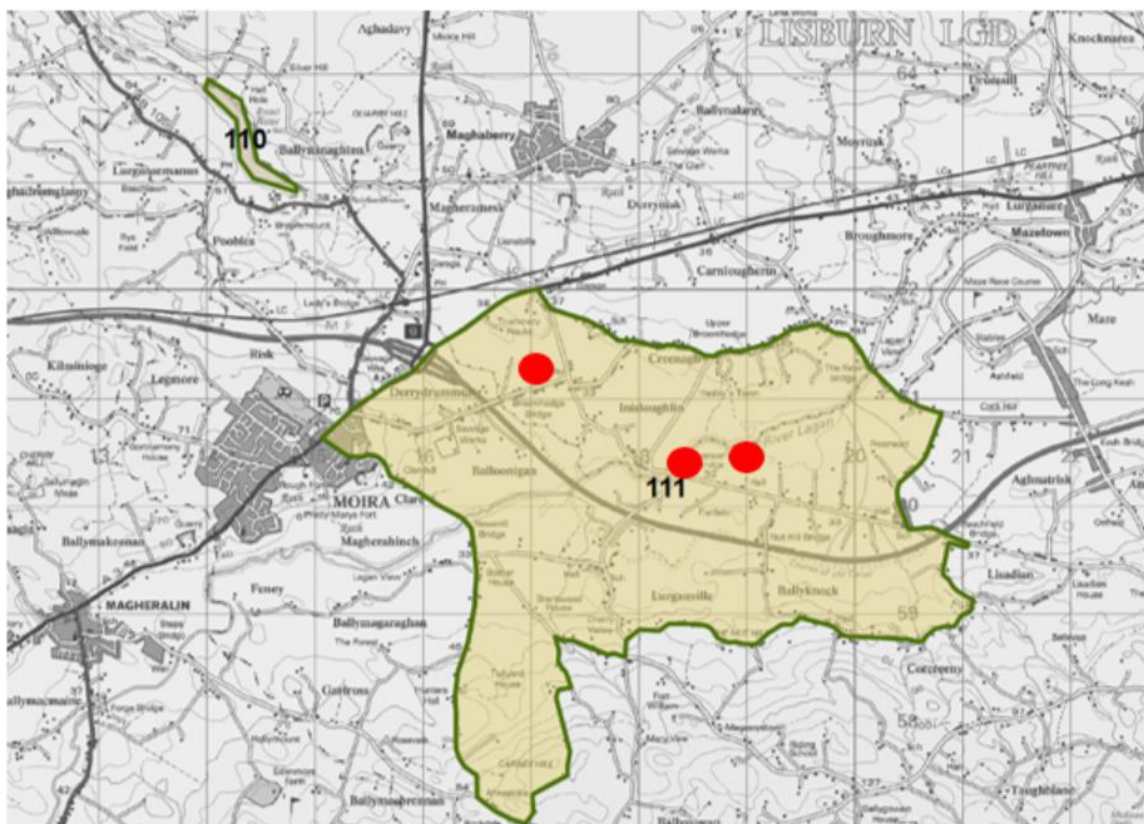


Combined counts for the Lough Beg swan fields (below) show increased usage by Whooper Swans in December 2020, predominantly in the Toome and Gortgill areas.

Species	2019	2020
Grey Heron	0	1
Mute Swan	0	4
Whooper Swan	378	638
Lapwing	160	50
Golden Plover	1070	0

### Moira – Lisburn Area:

Wetland Bird Surveys by DAERA staff regularly cover two sites in the Moira – Lisburn area: Broad Water (110 on map below) and Flatfields (111). Broad Water previously held a significant moulting flock of Mute Swans in late summer and autumn, occasionally numbering over 150 birds. This has declined substantially in recent years, however. Numbers of other waterbirds at Broad Water tend to be low but wintering Coot numbers can exceed 100, with similar numbers of Tufted Duck present on occasion. Flatfields is an important regular foraging site for Whooper Swans and waders, especially Lapwing and Golden Plover. Usage by swans tends to be related to levels of flooding of the River Lagan, with the greatest numbers occurring during wet conditions. The red dots on the map indicate the location of large aggregations of Whooper Swans recorded between October and December 2020, though these may wander widely throughout the area depending on sward conditions and other foraging opportunities.



The results of wetland bird surveys at the Broad Water and Flatfields between September and December 2020 are presented below.

**a) Broad Water**

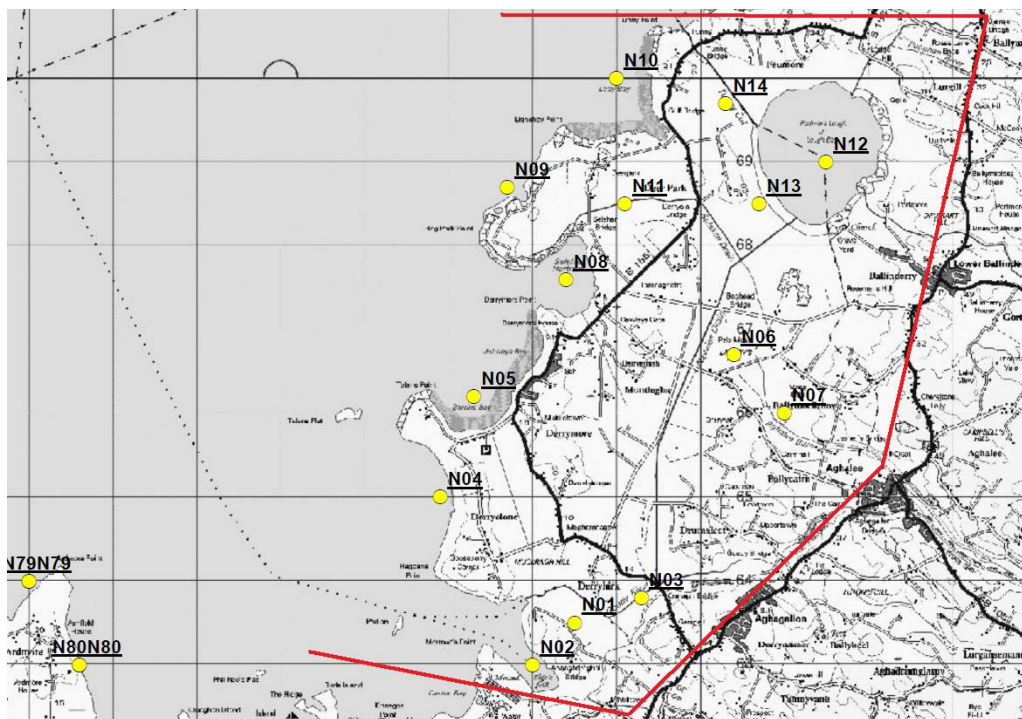
	<b>Month</b>			
<b>Species</b>	<b>SEP</b>	<b>OCT</b>	<b>NOV</b>	<b>DEC</b>
Coot	31	25	13	5
Cormorant	2	0	1	1
Gadwall	2	0	0	0
Grey Heron	1	1	3	1
Little Grebe	8	9	17	8
Mallard	28	75	0	4
Moorhen	10	7	8	10
Mute Swan	0	32	2	2
Tufted Duck	0	1	2	1
<b>All Species</b>	<b>82</b>	<b>150</b>	<b>46</b>	<b>32</b>

**b) Flatfields**

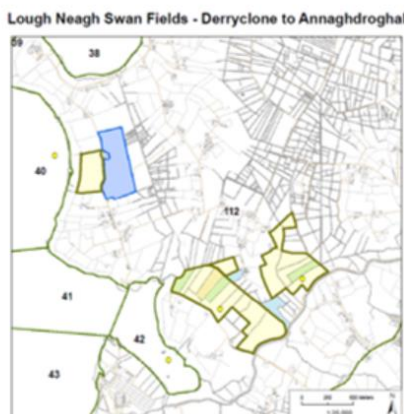
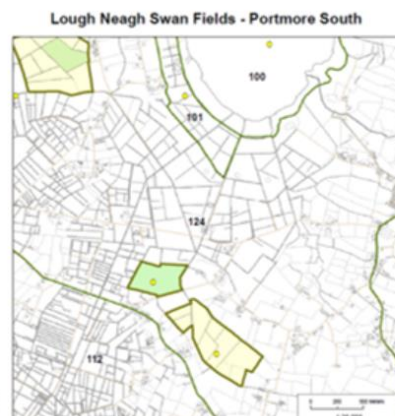
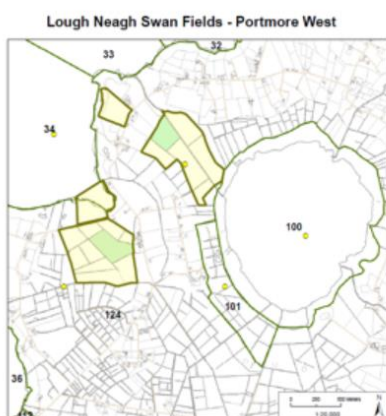
	<b>Month</b>			
<b>Species</b>	<b>SEP</b>	<b>OCT</b>	<b>NOV</b>	<b>DEC</b>
Black-headed Gull	0	0	62	0
Cattle Egret	0	0	0	1
Common Gull	0	0	6	0
Golden Plover	0	0	0	533
Grey Heron	0	0	1	2
Greylag Goose	0	0	0	130
Lapwing	0	0	27	100
Little Egret	0	0	0	1
Mallard	0	0	13	10
Mute Swan	0	22	30	0
Whooper Swan	0	0	98	80
Wigeon	0	0	12	0
<b>Grand Total</b>	<b>0</b>	<b>22</b>	<b>249</b>	<b>857</b>

## Ballinderry Area:

The Ballinderry area, here defined as the area lying between the Lough Neagh shoreline and Portmore Lough and extending from Sandy Bay in the north to Ellis's Gut in the south (see map below) contains several recorded foraging sites for Whooper Swans (yellow dots on map), particularly those birds roosting at Portmore Lough.



Areas traditionally favoured by Whooper Swans in the Ballinderry area are highlighted below.



No wetland bird surveys were carried out at the sites around Portmore Lough during September to December 2020 and no data are available for Portmore Lough itself. The southern sites were only surveyed in November and December. Results are presented below.

Species	Month	
	NOV	DEC
Grey Heron	0	1
Mute Swan	12	43
Whooper Swan	47	343

The peak count of Whooper Swans using the Portmore fields in the previous season was 401 individuals in February 2019.

**Kilrea area:**

NIEA is aware of only one traditional Whooper Swan foraging area in the vicinity of Kilrea (red dot on map below). There are no annual surveys at this location but it has been covered by the five-yearly International Migratory Swan Census. The results from the census suggest that the site is not regularly used at the present time as no swans have been recorded there on any of the last five census dates. Occasional use of fields in this area cannot be ruled out, however. No data are available for other waterbird species in this area.





