FEHILY TIMONEY

DESIGNING AND DELIVERING
A SUSTAINABLE FUTURE

APPENDIX 10

ORNITHOLOGY

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Appendix 10.5 - Collision Risk Model

APPENDIX 10.1

Species List

Appendix I0-1 Bird Species Lists

Table 1: Target species identified for the proposed Derrynadarragh Wind Farm site (includes some species not record during field surveys).

Target Species	Conservation Status
*Barn Owl (*Tyto alba*)	Red Listed
*Bewick's Swan (*Cygnus columbianus*)	Red Listed
Buzzard (*Buteo buteo*)	Green Listed
*Redshank (*Tringa totanus*)	Red Listed
*Cormorant (*Phalacrocorax carbo*)	Amber Listed
Curlew (*Numenius arquata*)	Red Listed
*Dunlin *(Calidris alpina)*	Red Listed; Annex I EU Birds Directive
Golden Plover (*Pluvialis apricaria*)	Red Listed; Annex I
Grey Heron (*Ardea cinerea*)	Green Listed
*Grey Partridge (*Perdix perdix*)	Red Listed
Grey Wagtail (*Motacilla cinerea*)	Red Listed
Hen Harrier (*Circus cyaneus*)	Amber Listed; Annex I EU Birds Directive
Kestrel (*Falco tinnunculus*)	Red Listed
Kingfisher (*Alcedo atthis*)	Amber Listed; Annex I EU Birds Directive
Lapwing (*Vanellus vanellus*)	Red Listed
*Little Egret (*Egretta garzetta*)	Green Listed; Annex I EU Birds Directive
Mallard (*Anas platyrhynchos*)	Amber Listed
Meadow Pipit (*Anthus pratensis*)	Red Listed
Merlin (*Falco columbarius*)	Amber Listed; Annex I EU Birds Directive
Peregrine Falcon (*Falco peregrinus*)	Green Listed; Annex I EU Birds Directive
*Red Grouse (*Lagopus lagopus*)	Red Listed
Redwing (*Turdus iliacus*)	Red Listed
Snipe (*Gallinago gallinago*)	Red Listed
Sparrowhawk (*Accipiter nisus*)	Green Listed
Swift (*Apus apus*)	Red Listed
Whooper Swan (*Cygnus cygnus*)	Amber Listed; Annex I EU Birds Directive
Woodcock (*Scolopax rusticola*)	Red Listed
Yellowhammer (*Emberiza citrinella*)	Red Listed

*Species not observed during field surveys undertaken within and surrounding wind farm site.

Table 2: Species recorded during surveys undertaken at Dereenadarragh Wind Farm from October 2021 to September 2023 within Study Area.

Target Species	Conservation Status
Buzzard (*Buteo buteo*)	Green Listed
Redshank (*Tringa totanus*)	Red Listed
Cormorant (*Phalacrocorax carbo*)	Amber Listed
Curlew (*Numenius arquata*)	Red Listed
Golden Plover (*Pluvialis apricaria*)	Red Listed; Annex I
Grey Heron (*Ardea cinerea*)	Green Listed
Grey Wagtail (*Motacilla cinerea*)	Red Listed
Hen Harrier (*Circus cyaneus*)	Amber Listed; Annex I EU Birds Directive
Kestrel (*Falco tinnunculus*)	Red Listed
Kingfisher (*Alcedo atthis*)	Amber Listed; Annex I EU Birds Directive
Lapwing (*Vanellus vanellus*)	Red Listed
Little Egret (*Egretta garzetta*)	Green Listed; Annex I EU Birds Directive
Mallard (*Anas platyrhynchos*)	Amber Listed
Meadow Pipit (*Anthus pratensis*)	Red Listed
Merlin (*Falco columbarius*)	Amber Listed; Annex I EU Birds Directive
Peregrine Falcon (*Falco peregrinus*)	Green Listed; Annex I EU Birds Directive
Red Grouse (*Lagopus lagopus*)	Red Listed
Redwing (*Turdus iliacus*)	Red Listed
Snipe (*Gallinago gallinago*)	Red Listed
Sparrowhawk (*Accipiter nisus*)	Green Listed
Swift (*Apus apus*)	Red Listed
Whooper Swan (*Cygnus cygnus*)	Amber Listed; Annex I EU Birds Directive
Woodcock (*Scolopax rusticola*)	Red Listed
Yellowhammer (*Emberiza citrinella*)	Red Listed

Table 3: Additional species recorded during surveys

Species	Conservation Status	Note
Cuckoo (*Cuculus canorus*)	Green Listed	Heard off-site, May 2022
Grater Spotted Woodpecker (*Dendrocopus major*)	Green Listed	Heard off-site, May 2022
Skylark (*Alauda arvensis*)	Amber Listed	
Cattle Egret (*Bubulcus ibis*)	Green Listed	Seen off-site during VP survey.
Linnet (*Linaria cannabina*)	Amber Listed	
Lesser Black-backed Gull (*Larus fuscus*)	Amber Listed	Seen off-site during VP survey.

APPENDIX 10.2

Vantage Point Surveys

Appendix 10-2

Ornithology Survey details at Derrynadarragh Wind Farm to inform Environmental Impact Assessment

Table 1: Details of Vantage Point Surveys undertaken at Derrynadarragh Wind Farm October 2021 to September 2023.

Date	Survey type	Survey Location	Duration (hrs)	Start time	End time	Weather	Surveyor	Comments (general)
11/10/2021	Vantage Point Survey	VP2	3	08:00	11:00	Dry, moderate visibility, WNW wind F2	GW	
11/10/2021	Vantage Point Survey	VP1	3	14:30	17:30	Dry, good visibility, no wind	GW	
12/10/2021	Vantage Point Survey	VP1	3	08:00	11:00	Dry, good visibility, no wind	GW	
12/10/2021	Vantage Point Survey	VP2	3	11:30	14:30	Dry, good visibility, no wind	GW	
08/11/2021	Vantage Point Survey	VP2	3	07:30	10:30	Dry, good visibility, SSE wind F2	GW	
08/11/2021	Vantage Point Survey	VP1	3	13:30	16:30	Dry, good visibility, SSW wind F4	GW	
09/11/2021	Vantage Point Survey	VP1	3	07:30	10:30	Dry, good visibility, W wind F2	GW	
09/11/2021	Vantage Point Survey	VP2	3	13:00	16:00	Dry, excellent visibility, W wind F1	GW	
02/12/2021	Vantage Point Survey	VP1	3	08:30	11:35	Dry, good visibility, S wind F1	GW	
02/12/2021	Vantage Point Survey	VP2	3	13:45	16:35	Dry, good visibility, S wind F1	GW	
03/12/2021	Vantage Point Survey	VP2	3	08:15	11:15	Dry, good visibility, WSW wind F2	GW	
03/12/2021	Vantage Point Survey	VP1	3	13:40	16:40	Dry, good visibility, SSW wind F1	GW	
03/01/2022	Vantage Point Survey	VP2	3	08:15	11:15	Light rain, good visibility, NNE wind F2	GW	
03/01/2022	Vantage Point Survey	VP1	3	13:30	16:30	Light rain, good visibility, NNE wind F3	GW	
04/01/2022	Vantage Point Survey	VP1	3	08:30	11:30	Dry, good visibility, SSE wind F2	GW	
04/01/2022	Vantage Point Survey	VP2	3	13:45	16:45	Dry, good visibility, SE wind F2	GW	
21/02/2022	Vantage Point Survey	VP1	3	07:30	10:30	Dry, good visibility, SE wind F6	GW	
21/02/2022	Vantage Point Survey	VP2	3	13:00	16:00	Dry, good visibility, SE wind F3	GW	
22/02/2022	Vantage Point Survey	VP2	3	08:00	11:00	Dry, good visibility, NE wind F2	GW	
22/02/2022	Vantage Point Survey	VP1	3	13:45	16:45	Dry, good visibility, NE wind F2	GW	
07/03/2022	Vantage Point Survey	VP1	3	07:30	10:30	Dry, moderate visibility, NW wind F2	GW	
07/03/2022	Vantage Point Survey	VP2	3	13:30	16:30	Dry, good visibility, NW wind F2	GW	

Date	Survey type	Survey Location	Duration (hrs)	Start time	End time	Weather	Surveyor	Comments (general)
08/03/2022	Vantage Point Survey	VP2	3	07:30	10:30	Light rain, good visibility, NW wind F4	GW	
08/03/2022	Vantage Point Survey	VP1	3	13:30	16:30	Light rain, good visibility, NW wind F2	GW	
05/04/2022	Vantage Point Survey	VP3	3	15:55	18:55	Dry, good visibility, S wind F5	BD	No obs
07/04/2022	Vantage Point Survey	VP2	3	09:30	12:30	Dry, good visibility, NW wind F5	BD	
07/04/2022	Vantage Point Survey	VP3	3	10:30	13:30	Dry, good visibility, NW wind F5	GW	
10/04/2022	Vantage Point Survey	VP1	3	14:05	17:05	Dry, good visibility, S wind F4	BD	
10/04/2022	Vantage Point Survey	VP2	3	17:25	20:25	Dry, good visibility, S wind F3	BD	No obs
11/04/2022	Vantage Point Survey	VP1	3	08:10	11:10	Heavy rain showers, good visibility, SW wind F3	BD	No obs
11/04/2022	Vantage Point Survey	VP3	3	11:30	14:30	Light showers, good visibility, SE wind F4	BD	
12/04/2022	Vantage Point Survey	VP2	3	06:45	09:45	Dry, good visibility, S wind F1	BD	
12/04/2022	Vantage Point Survey	VP1	3	15:20	18:20	Dry, good visibility, NW wind F1	BD	
13/04/2022	Vantage Point Survey	VP3	3	09:55	12:55	Dry, good visibility, W wind F1	BD	
12/05/2022	Vantage Point Survey	VP2	3	06:30	09:30	Dry, good visibility, NE wind F1	GW	No obs
19/05/2022	Vantage Point Survey	VP3	3	09:30	12:30	Dry, good visibility, SW wind F3	BD	
19/05/2022	Vantage Point Survey	VP1	3	12:50	15:50	Dry, good visibility, S wind F3	BD	
19/05/2022	Vantage Point Survey	VP2	3	16:20	19:20	Dry, good visibility, S wind F2	BD	
21/05/2022	Vantage Point Survey	VP1	3	09:40	12:40	Dry, good visibility, S wind F2	BD	Cuckoo & woodpecker heard off-site
21/05/2022	Vantage Point Survey	VP3	3	14:30	17:30	Dry, good visibility, S wind F2	BD	
22/05/2022	Vantage Point Survey	VP2	3	10:25	13:25	Dry, good visibility, SW wind F2	BD	
22/05/2022	Vantage Point Survey	VP1	3	13:55	16:55	Dry, good visibility, SW wind F3	BD	
24/05/2022	Vantage Point Survey	VP1	3	15:30	18:30	Dry, good visibility, SE wind F3	GW	No obs
31/05/2022	Vantage Point Survey	VP2	3	08:55	11:55	Dry, good visibility, NW wind F3	BD	
31/05/2022	Vantage Point Survey	VP3	3	18:20	21:20	Dry, good visibility, N wind F1	BD	
01/06/2022	Vantage Point Survey	VP1	3	05:50	08:50	Dry, good visibility, W wind F2	BD	Cattle Egret seen off site.
02/06/2022	Vantage Point Survey	VP3	3	05:30	08:30	Dry, good visibility, SE wind F1	BD	
02/06/2022	Vantage Point Survey	VP2	3	08:55	11:55	Dry, good visibility, SE wind F2	BD	No obs
29/06/2022	Vantage Point Survey	VP1	3	17:20	20:20	Dry, good visibility, W wind F1	BD	
30/06/2022	Vantage Point Survey	VP2	3	13:20	16:20	Dry, good visibility, W wind F3	BD	

Date	Survey type	Survey Location	Duration (hrs)	Start time	End time	Weather	Surveyor	Comments (general)
30/06/2022	Vantage Point Survey	VP3	3	17:15	20:15	Dry, good visibility, SW wind F1	BD	No obs
02/07/2022	Vantage Point Survey	VP3	3	13:30	16:30	Dry, good visibility, S wind F2	BD	
02/07/2022	Vantage Point Survey	VP2	3	16:55	19:55	Dry, good visibility, S wind F2	BD	
03/07/2022	Vantage Point Survey	VP2	3	11:25	14:25	Dry, good visibility, W wind F2	BD	No obs
03/07/2022	Vantage Point Survey	VP1	3	15:00	18:00	Dry, good visibility, W wind F2	BD	
05/07/2022	Vantage Point Survey	VP3	3	07:15	10:15	Dry, good visibility, W wind F2	BD	No obs
05/07/2022	Vantage Point Survey	VP1	3	10:45	13:45	Dry, good visibility, W wind F2	BD	No obs
09/08/2022	Vantage Point Survey	VP3	3	18:00	21:00	Dry, good visibility, W wind F1	BD	No obs
10/08/2022	Vantage Point Survey	VP2	3	09:55	12:55	Dry, good visibility, SW wind F1	BD	
10/08/2022	Vantage Point Survey	VP1	3	13:20	16:20	Dry, good visibility, SW wind F1	BD	
24/10/2022	Vantage Point Survey	VP1	3	16:10	19:10	Dry, Good visibility, SW wind F2	MD	
25/10/2022	Vantage Point Survey	VP1	3	07:20	10:20	Dry, Good visibility, SE wind F3	MD	
25/10/2022	Vantage Point Survey	VP1	6	10:50	17:20	Drizzle, good visibility, SE wind F4	MD	Large flock of Golden Plover (ca 8k birds) circling to the east of study area (11:30 to 16:40) at approx. height between 150 and 300m. Number of birds dropping periodically due to presumed foraging.
26/10/2022	Vantage Point Survey	VP3	6	09:00	15:30	Light showers, good visibility, SSW wind F5	MD	
26/10/2022	Vantage Point Survey	VP3	3	16:00	19:00	Drizzle, good visibility, SW wind F4	MD	
27/10/2022	Vantage Point Survey	VP3	3	07:20	10:20	Light showers, moderate visibility, SSE wind F3	MD	Visibility declined as mist moved in.
27/10/2022	Vantage Point Survey	VP2	6	10:50	17:20	Light showers, good visibility, SE wind F3	MD	
10/11/2022	Vantage Point Survey	VP3	6	07:55	14:25	Drizzle, good visibility, SW wind F5	MD	
10/11/2022	Vantage Point Survey	VP1	3	14:40	17:40	Drizzle, moderate visibility, SW wind F6	MD	No obs
11/11/2022	Vantage Point Survey	VP2	6	08:00	14:30	Drizzle, good visibility, SSW wind F6	MD	
11/11/2022	Vantage Point Survey	VP2	3	14:40	17:40	Drizzle, good visibility, SW wind F3	MD	

Date	Survey type	Survey Location	Duration (hrs)	Start time	End time	Weather	Surveyor	Comments (general)
12/11/2022	Vantage Point Survey	VP2	3	06:50	09:50	Drizzle, moderate visibility, SE wind F3	MD	No obs
12/11/2022	Vantage Point Survey	VP1	6	10:20	16:50	Drizzle, good visibility, SE wind F3	MD	
13/11/2022	Vantage Point Survey	VP1	3	06:50	09:50	Drizzle, good visibility, SE wind F2	MD	
04/12/2022	Vantage Point Survey	VP3	6	09:00	15:30	Light showers, good visibility, NE wind F2	MD	
05/12/2022	Vantage Point Survey	VP1	6	10:00	16:40	Light showers, good visibility, NE wind F3	MD	
06/12/2022	Vantage Point Survey	VP2	6	09:10	15:40	Dry, good visibility, NE wind F2	MD	
09/01/2023	Vantage Point Survey	VP3	6	09:10	15:40	Light showers, good visibility, W wind F5	MD	No obs
10/01/2023	Vantage Point Survey	VP2	6	09:00	15:30	Dry, good visibility, W wind F3	MD	
11/01/2023	Vantage Point Survey	VP1	6	08:50	15:20	Light showers, moderate visibility, SW wind F5	MD	
03/02/2023	Vantage Point Survey	VP1	6	08:45	15:15	Dry, good visibility, SW wind F2	MD	
04/02/2023	Vantage Point Survey	VP3	6	09:10	15:40	Light showers, moderate visibility, SW wind F3	MD	No obs
07/02/2023	Vantage Point Survey	VP2	6	11:00	17:30	Dry, good visibility, SW wind F2	MD	
02/03/2023	Vantage Point Survey	VP1	3	16:00	19:00	Dry, Good visibility, W wind F2	MD	
03/03/2023	Vantage Point Survey	VP1	3	06:20	09:20	Dry, Good visibility, WNW wind F2	MD	
03/03/2023	Vantage Point Survey	VP3	6	10:00	16:30	Dry, good visibility, W wind F2	MD	No obs
10/03/2023	Vantage Point Survey	VP2	3	06:20	09:20	Dry, Good visibility, WSW wind F2	MD	No obs
10/03/2023	Vantage Point Survey	VP1	6	09:55	16:25	Drizzle, good visibility, WSW wind F2	MD	
12/03/2023	Vantage Point Survey	VP2	6	08:50	15:20	Drizzle, good visibility, SSW wind F2	MD	
12/03/2023	Vantage Point Survey	VP2	3	16:10	19:10	Drizzle, good visibility, SSW wind F2	MD	No obs
22/05/2023	Vantage Point Survey	VP1	6	09:40	16:10	Dry, good visibility, WNW wind F2	MD	
24/05/2023	Vantage Point Survey	VP2	6	11:20	17:50	Dry, good visibility, WNW wind F3	MD	

Date	Survey type	Survey Location	Duration (hrs)	Start time	End time	Weather	Surveyor	Comments (general)
25/05/2023	Vantage Point Survey	VP3	6	08:10	14:40	Dry, good visibility, NNW wind F3	MD	
01/06/2023	Vantage Point Survey	VP1	6	09:00	15:30	Dry, good visibility, ESE wind F2	MD	No obs
02/06/2023	Vantage Point Survey	VP2	6	08:50	15:20	Dry, good visibility, SE wind F3	MD	
21/06/2023	Vantage Point Survey	VP3	6	05:00	11:30	Dry, good visibility, SW wind F2	MD	
01/07/2023	Vantage Point Survey	VP3	6	10:00	16:30	Heavy showers, good visibility, WNW wind F2	MD	No obs
04/07/2023	Vantage Point Survey	VP2	6	08:30	15:00	Light showers, good visibility, WSW wind F3	MD	
06/07/2023	Vantage Point Survey	VP1	6	10:10	16:40	Light showers, good visibility, S wind F3	MD	
08/07/2023	Vantage Point Survey	VP2	6	14:40	21:10	Dry, good visibility, SSE wind F3	MD	
09/07/2023	Vantage Point Survey	VP1	6	09:50	16:20	Heavy showers, good visibility, SSE wind F3	MD	
10/07/2023	Vantage Point Survey	VP3	6	06:30	13:00	Light showers, good visibility, SSE wind F2	MD	No obs
06/08/2023	Vantage Point Survey	VP1	6	11:20	17:50	Drizzle, good visibility, WNW wind F3	MD	No obs
07/08/2023	Vantage Point Survey	VP2	6	06:50	13:20	Dry, good visibility, SW wind F2	MD	
08/08/2023	Vantage Point Survey	VP3	6	07:00	13:30	Light showers, good visibility, NNE wind F3	MD	
12/09/2023	Vantage Point Survey	VP2	6	09:40	16:10	Dry, good visibility, N wind F3	MD	
12/09/2023	Vantage Point Survey	VP2	3	17:45	20:45	Dry, Good visibility, NNE wind F2	MD	dusk
13/09/2023	Vantage Point Survey	VP3	3	06:20	09:20	Dry, Good visibility, SSW wind F1	MD	No obs (dawn)
13/09/2023	Vantage Point Survey	VP1	6	10:00	16:30	Light showers, moderate visibility, S wind F3	MD	
14/09/2023	Vantage Point Survey	VP3	6	08:10	14:40	Dry, moderate visibility, SW wind F2	MD	No obs
14/09/2023	Vantage Point Survey	VP3	3	17:40	20:40	Dry, Good visibility, SW wind F2	MD	dusk
15/09/2023	Vantage Point Survey	VP2	3	06:20	09:20	Light showers, NW wind F3	MD	No obs (dawn)

Table 2: Details of Winter Walkover Surveys undertaken at Derrynadarragh Wind Farm October 2021 to September 2023.

Date	Survey type	Survey Location	Duration (hrs)	Start time	End time	Weather	Surveyor	Comments (general)
11/10/2021	Winter Walkover	Walkover transect 1	2	15:00	17:00	Dry, moderate visibility, calm	GW	
12/10/2021	Winter Walkover	Walkover transect 1	2	16:00	18:00	Dry, good visibility, calm	GW	
08/11/2021	Winter Walkover	Walkover transect 1	2	11:00	13:00	Dry, good visibility, S wind F1	GW	
09/11/2021	Winter Walkover	Walkover transect 1	2	10:30	12:30	Dry, good visibility, WSW wind F1	GW	
02/12/2021	Winter Walkover	Walkover transect 1	2	11:35	13:35	Dry, good visibility, S wind F2	GW	
03/12/2021	Winter Walkover	Walkover transect 1	2	11:30	13:30	Light rain, good visibility, WSW wind F2	GW	
03/01/2022	Winter Walkover	Walkover transect 1	2	11:25	13:25	Dry, good visibility, NNE wind F2	GW	
04/01/2022	Winter Walkover	Walkover transect 1	2	11:35	13:35	Dry, good visibility, SE wind F1	GW	
21/02/2022	Winter Walkover	Walkover transect 1	2	10:45	12:45	Dry, good visibility, SE wind F5	GW	Site flooded, no obs
22/02/2022	Winter Walkover	Walkover transect 1	2	11:30	13:30	Dry, good visibility, E wind F1	GW	Site flooded, no obs
07/03/2022	Winter Walkover	Walkover transect 1	2	11:00	11:30	Dry, good visibility, NW wind F2	GW	
08/03/2022	Winter Walkover	Walkover transect 1	2	10:45	12:45	Dry, good visibility, NW wind F5	GW	
31/10/2022	Winter Walkover	Walkover transect 2	6	09:15	15:05	Light showers, SW wind F3	MD	
13/11/2022	Winter Walkover	Walkover transect 2	6.2	10:00	16:20	Drizzle, good visibility, SE wind F3	MD	
07/12/2022	Winter Walkover	Walkover transect 2	6.0	08:40	14:40	Dry, Good visibility, NW wind F2	MD	
12/01/2023	Winter Walkover	Walkover transect 2	6.0	09:30	15:30	Drizzle, good visibility, SW wind F2	MD	
02/02/2023	Winter Walkover	Walkover transect 2	6.0	09:00	15:00	Dry, Good visibility, WSW wind F3	MD	
02/03/2023	Winter Walkover	Walkover transect 2	5.75	09:15	15:00	Drizzle, good visibility, WNW wind F2	MD	

Table 3: Details of Breeding Walkover Surveys undertaken at Derrynadarragh Wind Farm October 2021 to September 2023.

Date	Survey type	Survey Location	Duration (hrs)	Start time	End time	Weather	Surveyor	Comments (general)
07/04/2022	Breeding Walkover	Walkover transect 1	3	14:00	17:00	Dry, good visibility, SE wind F4	GW	
08/04/2022	Breeding Walkover	Walkover transect 1	3	10:30	13:30	Dry, good visibility, NE wind F1	GW	
21/04/2022	Breeding Walkover	Walkover transect 1	3	07:30	10:30	Dry, good visibility, NW wind F1	GW	
21/04/2022	Breeding Walkover	Walkover transect 1	3	11:00	14:00	Dry, good visibility, NW wind F1	GW	
12/05/2022	Breeding Walkover	Walkover transect 1	3	09:30	12:30	Dry, good visibility, NE wind F3	GW	
13/05/2022	Breeding Walkover	Walkover transect 1	3	11:00	14:00	Dry, good visibility, NE wind F4	GW	
23/05/2022	Breeding Walkover	Walkover transect 1	3	13:30	16:30	Light rain, good visibility, SE wind F3	GW	
24/05/2022	Breeding Walkover	Walkover transect 1	3	10:00	13:00	Dry, good visibility, SE wind F3	GW	
09/06/2022	Breeding Walkover	Walkover transect 1	3	14:30	17:30	Dry, good visibility, NE wind F3	GW	
09/06/2022	Breeding Walkover	Walkover transect 1	3	19:30	22:30	Dry, good visibility, NE wind F3	GW	
10/06/2022	Breeding Walkover	Walkover transect 1	3	04:30	07:30	Dry, good visibility, NE wind F3	GW	
10/06/2022	Breeding Walkover	Walkover transect 1	3	10:00	13:00	Dry, good visibility, NE wind F3	GW	
27/05/2023	Breeding Walkover	Walkover transect 2	5.4	08:00	13:40	Dry, Good visibility, SE wind F2	MD	
03/06/2023	Breeding Walkover	Walkover transect 2	5.4	08:00	13:40	Dry, Good visibility, SW wind F3	MD	
10/07/2023	Breeding Walkover	Walkover transect 2	5.2	13:30	19:10	Drizzle, good visibility, SE wind F3	MD	
05/08/2023	Breeding Walkover	Walkover transect 2	0.2	09:30	13:50	Dry, Good visibility, NNW wind F2	MD	
15/09/2023	Breeding Walkover	Walkover transect 2	5.4	10:00	15:40	Drizzle, good visibility, NW wind F3	MD	

Table 4: Details of Breeding Raptor Surveys undertaken at Derrynadarragh Wind Farm (and surrounding area + 2.5km) during breeding season 2023.

Date	Survey type	Survey Location	Duration (hrs)	Start time	End time	Weather	Surveyor	Comments (general)
22/05/2023	Breeding Raptor	BR VP 1	3	06:00	09:00	Dry, Good visibility, NW wind F1	MD	No obs
24/05/2023	Breeding Raptor	BR VP 2	3	07:50	10:50	Dry, Good visibility, WNW wind F1	MD	No obs
01/06/2023	Breeding Raptor	BR VP 3	3	05:30	08:30	Dry, Good visibility, SE wind F1	MD	
02/06/2023	Breeding Raptor	BR VP 4	3	16:00	19:00	Dry, Good visibility, SE wind F3	MD	No obs
06/07/2023	Breeding Raptor	BR VP 3	3	06:30	09:30	Light showers, S wind F2	MD	
09/07/2023	Breeding Raptor	BR VP 5	3	06:20	09:20	Heavy showers, moderate visibility	MD	No obs

Table 5: Details of breeding wader (curlew) surveys (and surrounding area within 2km) during breeding season 2022 and 2025.

Date	Survey type	Survey Location	Duration (hrs)	Start time	End time	Weather	Surveyor	Comments (general)
13/04/2022	Breeding Wader Survey (VP)	BW VP1	3	06:45	09:45	Dry, good visibility, 0 wind F0	BD	
21/05/2022	Breeding Wader Survey (VP)	BW VP1	3	06:10	09:10	Dry, good visibility, SE wind F2	BD	
31/05/2022	Breeding Wader Survey (VP)	BW VP1	2	12:30	14:30	Dry, good visibility, W wind F4	BD	
01/06/2022	Breeding Wader Survey (VP)	BW VP1	3	09:35	12:35	Dry, good visibility, W wind F1	BD	No obs
20/04/2025	Breeding Wader Survey (walkover)	BW T1	3	14:15	17:15	Dry, Good visibility, ESE wind F3	MD	
27/05/2025	Breeding Wader Survey (walkover)	BW T1	3	07:00	10:00	Light showers, moderate visibility, WS wind F1	MD	No obs
17/06/2025	Breeding Wader Survey (walkover)	BW T1	3	07:10	10:00	Dry, Good visibility, SW wind F3	MD	No obs

Table 6: Details of breeding woodcock survey undertaken during breeding season 2025.

Date	Survey type	Survey Location	Duration (hrs)	Start time	End time	Weather	Surveyor	Comments (general)
23/06/2025	Breeding Woodcock Survey	Woodcock habitat	3.0	21:00	00:00	Drizzle, limited visibility (dusk), SW wind F3	MD	dusk / nocturnal

APPENDIX 10.3

Summary Data

Appendix 10-3

Ornithology summary data at Derrynadarragh Wind Farm to inform Environmental Impact Assessment

Table 1: Number of observations and flight duration per species per month from VP Surveys undertaken at Derrynadarragh Wind Farm October 2021 to September 2023.

Species	Year	Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Buzzard	2021	Observations										8	6	6
		Flight duration (sec)										292	150	287
	2022	Observations	11	10	9	7	10	4	3	4		5	6	3
		Flight duration (sec)	690	436	579	479	4995	1098	89	3330		324	276	150
	2023	Observations		4	3		8	8	11	3	10			
		Flight duration (sec)		172	284		958	469	1598	281	1227			
Curlew	2021	Observations												
		Flight duration (sec)												
	2022	Observations				1	1							
		Flight duration (sec)				525	18							
	2023	Observations												
		Flight duration (sec)												
Golden Plover	2021	Observations											1	
		Flight duration (sec)											87	
	2022	Observations		5	4	9						12	2	1
		Flight duration (sec)		121	121	67						6915	125	50
	2023	Observations			3									
		Flight duration (sec)			205									
Hen Harrier	2021	Observations											1	
		Flight duration (sec)											87	
	2022	Observations						1	1					
		Flight duration (sec)						15	5					
	2023	Observations		2										
		Flight duration (sec)		60										
Kestrel	2021	Observations										3	2	4
		Flight duration (sec)										196	86	333
	2022	Observations	3	2	2		1					1	4	2
		Flight duration (sec)	211	231	233		33					75	483	550
	2023	Observations	2		3			1	3	2				

Species	Year	Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
		Flight duration (sec)	275		661			86	417	202				
Lapwing	2021	Observations											1	
		Flight duration (sec)											123	
	2022	Observations	1			2								1
		Flight duration (sec)	107			27								35
	2023	Observations	1		1									
		Flight duration (sec)	40		13									
Mallard	2021	Observations												
		Flight duration (sec)												
	2022	Observations											1	
		Flight duration (sec)											19	
	2023	Observations												
		Flight duration (sec)												
Merlin	2021	Observations												1
		Flight duration (sec)												23
	2022	Observations			1									
		Flight duration (sec)			23									
	2023	Observations												
		Flight duration (sec)												
Peregrine	2021	Observations											1	
		Flight duration (sec)											41	
	2022	Observations			1									
		Flight duration (sec)			38									
	2023	Observations												
		Flight duration (sec)												
Snipe	2021	Observations											4	2
		Flight duration (sec)										82	19	
	2022	Observations												
		Flight duration (sec)												
	2023	Observations												
		Flight duration (sec)												
Sparrowhawk	2021	Observations											2	
		Flight duration (sec)											51	

Species	Year	Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
	2022	Observations			1	3	2		2			4	5	4
		Flight duration (sec)			58	745	255		16			66	133	84
	2023	Observations	4	3	2				1	1	1			
		Flight duration (sec)	93	31	42				13	12	22			
Whooper Swan	2021	Observations											1	
		Flight duration (sec)											51	
	2022	Observations												1
		Flight duration (sec)												65
	2023	Observations			1									
		Flight duration (sec)			40									
Woodcock	2021	Observations										1		
		Flight duration (sec)										15		
	2022	Observations												1
		Flight duration (sec)												9
	2023	Observations												
		Flight duration (sec)												

Table 2: Summary data from winter walkover surveys undertaken at Derrynadarragh Wind Farm October 2021 to September 2023.

Species	Year	Parameter	Oct	Nov	Dec	Jan	Feb	Mar
Buzzard	2021-2022	Observations	2					
	2021-2022	Number	2					
	2022- 2023	Observations	3			1	1	2
	2022- 2023	Number	3			1	1	2
Golden Plover	2021-2022	Observations						
	2021-2022	Number						
	2022- 2023	Observations	2		1		1	
	2022- 2023	Number	1700		18		30	
Grey Heron	2021-2022	Observations						
	2021-2022	Number						
	2022- 2023	Observations					1	1
	2022- 2023	Number					1	1
Grey Wagtail	2021-2022	Observations						
	2021-2022	Number						
	2022- 2023	Observations		2				
	2022- 2023	Number		2				
Kestrel	2021-2022	Observations	1		1			1
	2021-2022	Number	1		1			1
	2022- 2023	Observations	1	1	1			1
	2022- 2023	Number	1	1	1			1
Kingfisher	2021-2022	Observations			1			
	2021-2022	Number			1			
	2022- 2023	Observations						
	2022- 2023	Number						
Linnet	2021-2022	Observations	1		1			
	2021-2022	Number	18		12			
	2022- 2023	Observations						
	2022- 2023	Number						
Mallard	2021-2022	Observations						
	2021-2022	Number						
	2022- 2023	Observations	1		1			2
	2022- 2023	Number	3		2			5

Species	Year	Parameter	Oct	Nov	Dec	Jan	Feb	Mar
Meadow Pipit	2021-2022	Observations	2	1	1			1
	2021-2022	Number	23	15	17			1
	2022- 2023	Observations	6	5	3	1	3	8
	2022- 2023	Number	30	17	11	4	8	26
Redwing	2021-2022	Observations						
	2021-2022	Number						
	2022- 2023	Observations	5	5	7	6	6	4
	2022- 2023	Number	44	40	35	37	63	29
Skylark	2021-2022	Observations	1					
	2021-2022	Number	1					
	2022- 2023	Observations						
	2022- 2023	Number						
Snipe	2021-2022	Observations	1	1		1		
	2021-2022	Number	2	1		1		
	2022- 2023	Observations	2		3	3	1	2
	2022- 2023	Number	6		6	5	3	3
Sparrowhawk	2021-2022	Observations						1
	2021-2022	Number						1
	2022- 2023	Observations	1	2	1		1	
	2022- 2023	Number	1	2	1		1	
Woodcock	2021-2022	Observations	1					
	2021-2022	Number	1					
	2022- 2023	Observations						
	2022- 2023	Number						
Yellowhammer	2021-2022	Observations	1	1	1	2		1
	2021-2022	Number	9	5	2	2		1
	2022- 2023	Observations			1	2	2	1
	2022- 2023	Number			1	5	4	3

Table 3: Summary data from breeding walkover surveys undertaken at Derrynadarragh Wind Farm October 2021 to September 2023.

Species	Year	Parameter	Apr	May	Jun	Jul	Aug	Sept
Buzzard	2022	Observations						
	2022	Number						
	2023	Observations		3	2	2	1	1
	2023	Number		5	2	2	1	1
Curlew	2022	Observations						
	2022	Number						
	2023	Observations			1			
	2023	Number			2			
Golden Plover	2022	Observations						1
	2022	Number						8
	2023	Observations						
	2023	Number						
Grey Heron	2022	Observations						
	2022	Number						
	2023	Observations		1			1	
	2023	Number		1			1	
Grey Wagtail	2022	Observations	1					
	2022	Number	1					
	2023	Observations						
	2023	Number						
Kestrel	2022	Observations	2	2				
	2022	Number	2	2				
	2023	Observations		1				
	2023	Number		1				
Lapwing	2022	Observations						
	2022	Number						
	2023	Observations		1				
	2023	Number		2				
Mallard	2022	Observations						
	2022	Number						
	2023	Observations		3	2	1		2
	2023	Number		5	7	3		4

Species	Year	Parameter	Apr	May	Jun	Jul	Aug	Sept
Meadow Pipit	2022	Observations	3	4	3			
	2022	Number	13	30	14			
	2023	Observations		8	6	6	5	7
	2023	Number		28	19	28	33	26
Snipe	2022	Observations						
	2022	Number						
	2023	Observations						3
	2023	Number						3
Sparrowhawk	2022	Observations						
	2022	Number						
	2023	Observations						1
	2023	Number						1
Swift	2022	Observations		1				
	2022	Number		1				
	2023	Observations		2	2	2	1	
	2023	Number		4	7	5	2	
Yellowhammer	2022	Observations	5	4	4			
	2022	Number	9	22	16			
	2023	Observations		7	7	4	3	5
	2023	Number		11	15	8	4	6

Table 4: Summary data from Breeding Raptor Surveys undertaken at Derrynadarragh Wind Farm (and surrounding area + 2.5km) during breeding season 2023.

Species	Year	Parameter	May	Jun	Jul
Buzzard	2023	Observations	0	1	0
	2023	Number	0	1	0
Kestrel	2023	Observations	0	1	0
	2023	Number	0	1	0
Sparrowhawk	2023	Observations	0	0	1
	2023	Number	0	0	1

Date	VP No	Observation No	GIS ID	Species	BTO code	Number	Time	Activity	Comments
01/06/2023	3	1	48	Buzzard	BZ	1	08:18	Travelling	Adult female BZ flying SE at approx 60 metres. Lost behind forestry
01/06/2023	3	2	49	Kestrel	K	1	07:52	Hunting	Adult male K hunting. Made one unsuccessful kill attempt.
01/06/2023	3	3	50	Buzzard	BZ	1	08:15	Soaring	BZ rising on thermal to over 150 metres . Drifted South.
06/07/2023	3	1	51	Sparrowhawk	SH	1	07:16	Carrying prey	Adult male SH carrying passerine prey into forestry. Nest with chick likely in forestry.

Table 5: Summary data from breeding wader (Curlew) surveys (and surrounding area within 2km) during breeding season 2022 and 2025.

Species	Year	Parameter	Apr	May	Jun
Curlew	2022	Observations	0	2	0
	2022	Number	0	4	0
Curlew	2025	Observations	2	0	0
	2025	Number	2	0	0

Table 6: Summary data from breeding woodcock survey undertaken during breeding season 2025.

Species	Year	Parameter	Jun
Woodcock	2025	Observations	7
	2025	Number	9

APPENDIX 10.4.i

VP Data and Maps

Appendix 4a

Vantage Point Survey Data and Maps

Date	VP No	Map label	Species	Number	Time	Flight Duration	Band 1 (0-25m)	Total flight time Band 1	Band 2 (25-180m)	Total flight time Band 2	Band 3 (>180m)	Total flight time Band 3	Total Flight Time	Proportion of flightline in viewshed	Time flight / In viewshed	Activity	Comments
11/10/2021	2	1	Buzzard	1	10:35	42		0	42	42		0	42	100	42		
11/10/2021	1	4	Buzzard	1	12:05	10		0	10	10		0	10	100	10		
11/10/2021	1	6	Buzzard	1	13:35	25		0	25	25		0	25	100	25		
12/10/2021	1	8	Buzzard	1	08:25	58		0	15	15	43	43	58	100	58		
12/10/2021	1	9	Buzzard	1	09:10	38	8	8	30	30		0	38	100	38		
12/10/2021	1	12	Buzzard	1	10:15	45		0	45	45		0	45	100	45		
12/10/2021	2	13	Buzzard	1	12:25	41		0	41	41		0	41	100	41		
12/10/2021	2	14	Buzzard	1	13:45	33		0	33	33		0	33	100	33		
08/11/2021	2	22	Buzzard	1	10:11	23		0		0	23	23	23	100	23		
08/11/2021	1	25	Buzzard	1	15:36	23	23	23		0		0	23	100	23		
08/11/2021	1	26	Buzzard	1	15:44	4	4	4		0		0	4	100	4		
09/11/2021	1	28	Buzzard	1	08:36	32		0		0	32	32	32	100	32		
09/11/2021	2	30	Buzzard	1	14:35	22		0	22	22		0	22	0	0		
09/11/2021	2	33	Buzzard	1	14:05	46		0	46	46		0	46	100	46		
02/12/2021	1	31	Buzzard	1	09:20	23		0	23	23		0	23	0	0		
02/12/2021	1	32	Buzzard	1	10:05	86		0	60	60	26	26	86	100	86		
02/12/2021	2	34	Buzzard	1	15:15	41		0	41	41		0	41	100	41		
02/12/2021	2	36	Buzzard	1	15:52	22	22	22		0		0	22	100	22		
03/12/2021	1	40	Buzzard	3	14:10	88	15	45	30	90	43	129	264	100	264		
03/12/2021	1	41	Buzzard	1	16:10	27		0	27	27		0	27	100	27		
03/01/2022	2	42	Buzzard	1	10:55	88		0		0	88	88	88	100	88		
03/01/2022	1	43	Buzzard	1	13:40	122		0		0	122	122	122	100	122		
03/01/2022	1	46	Buzzard	1	15:36	28	28	28		0		0	28	100	28		
03/01/2022	1	47	Buzzard	1	15:40	35	35	35		0		0	35	100	35		
04/01/2022	1	49	Buzzard	1	09:25	43	15	15	28	28		0	43	100	43		
04/01/2022	1	51	Buzzard	1	10:58	58		0	58	58		0	58	100	58		
04/01/2022	2	52	Buzzard	2	14:57	103		0		0	103	206	206	100	206		
04/01/2022	2	53	Buzzard	1	15:04	16		0	16	16		0	16	100	16		
04/01/2022	2	55	Buzzard	1	15:35	38		0	38	38		0	38	100	38		
04/01/2022	2	56	Buzzard	1	15:46	11	11	11		0		0	11	100	11		
04/01/2022	2	58	Buzzard	1	16:05	148	45	45	103	103		0	148	100	148		
21/02/2022	1	60	Buzzard	1	09:10	69		0	69	69		0	69	100	69		
21/02/2022	2	62	Buzzard	1	14:47	21		0	21	21		0	21	100	21		
22/02/2022	2	63	Buzzard	2	08:40	102		0	102	204		0	204	100	204		
22/02/2022	2	65	Buzzard	1	08:35	22		0	22	22		0	22	100	22		
22/02/2022	2	67	Buzzard	1	09:05	18	18	18		0		0	18	18	3		
22/02/2022	2	68	Buzzard	3	09:50	48		0	48	144		0	144	100	144		
22/02/2022	2	69	Buzzard	1	09:55	23		0	23	23		0	23	100	23		

Date	VP No	Map label	Species	Number	Time	Flight Duration	Band 1 (0-25m)	Total flight time Band 1	Band 2 (25-180m)	Total flight time Band 2	Band 3 (>180m)	Total flight time Band 3	Total Flight Time	Proportion of flightline in viewshed	Time flight / In viewshed	Activity	Comments
22/02/2022	1	72	Buzzard	1	15:22	28	28	28		0		0	28	0	0		
22/02/2022	1	73	Buzzard	1	15:30	40		0	40	40		0	40	100	40		
22/02/2022	1	74	Buzzard	1	16:08	65		0	65	65		0	65	100	65		
07/03/2022	1	79	Buzzard	1	08:21	8		0	8	8		0	8	100	8		
07/03/2022	1	80	Buzzard	2	08:27	118		0		0	118	236	236	100	236		
07/03/2022	1	81	Buzzard	1	09:10	52		0	52	52		0	52	100	52		
07/03/2022	2	82	Buzzard	1	13:45	153		0		0	153	153	153	100	153		
08/03/2022	1	87	Buzzard	1	13:46	66		0	66	66		0	66	100	66		
08/03/2022	1	88	Buzzard	1	13:55	28	28	28		0		0	28	0	0		
08/03/2022	1	90	Buzzard	1	15:15	101		0		0	101	101	101	100	101		
08/03/2022	1	91	Buzzard	1	15:37	42		0	42	42		0	42	100	42		
08/03/2022	1	93	Buzzard	1	16:10	11		0	11	11		0	11	100	11		
10/04/2022	1	4	Buzzard	1	15:18	19		0	19	19		0	19	100	19		Calling
10/04/2022	1	6	Buzzard	2	16:58	175		0		0	175	350	350	53	185		Soaring over north end of site
11/04/2022	3	9	Buzzard	1	13:53	38		0	38	38		0	38	0	0		
12/04/2022	2	12	Buzzard	1	08:14	22		0	22	22		0	22	56	12		
12/04/2022	2	13	Buzzard	1	08:15	15		0	15	15		0	15	10	2		
13/04/2022	3	16	Buzzard	1	11:04	200	140	140	60	60		0	200	6	12		Resident pair moved to north of site.
13/04/2022	3	17	Buzzard	1	12:01	10		0	10	10		0	10	0	0		Calling female
19/05/2022	3	19	Buzzard	1	09:30	1340		0	1340	1340		0	1340	0	0		Soaring & Hunting male bird
19/05/2022	3	20	Buzzard	1	10:27	775		0	775	775		0	775	0	0		Soaring & Hunting male bird
19/05/2022	3	21	Buzzard	1	11:49	310		0	310	310		0	310	43	134		Soaring & Hunting male bird
19/05/2022	2	22	Buzzard	1	17:34	430		0	430	430		0	430	0	0		Soaring & Hunting male bird
21/05/2022	3	23	Buzzard	1	14:38	300		0	300	300		0	300	0	0		Soaring & Hunting male bird, mobbed by Hooded Crows.
21/05/2022	3	24	Buzzard	1	15:03	390		0	390	390		0	390	0	0		Soaring & Hunting male bird
21/05/2022	3	25	Buzzard	1	16:59	240		0	120	120	120	120	240	0	0		Soaring & Hunting male bird
31/05/2022	2	29	Buzzard	1	09:19	30	30	30		0		0	30	0	0		Carrying prey
31/05/2022	2	31	Buzzard	1	10:13	240	15	15	225	225		0	240	0	0		Hunting through site
31/05/2022	2	32	Buzzard	1	10:59	940		0		0	940	940	940	0	0		Soaring, Calling & displaying bird.
02/06/2022	3	33	Buzzard	1	06:27	36	36	36		0		0	36	0	0		Flew to perch
02/06/2022	3	34	Buzzard	1	07:38	32	32	32		0		0	32	44	14		Flew from perch
29/06/2022	1	35	Buzzard	1	17:46	1030		0		0	1030	1030	1030	79	818		High soaring
30/06/2022	2	NA	Buzzard	2	13:55	0		0		0		0	0		0		Two young in nest
02/07/2022	2	39	Buzzard	1	18:02	63	15	15	48	48		0	63	0	0		Adult female alarm calling at Sparrowhawk
02/07/2022	2	40	Buzzard	1	19:42	13	13	13		0		0	13	0	0		Adult bringing in food.
02/07/2022	3	41	Buzzard	1	14:36	13	13	13		0		0	13	0	0		

Date	VP No	Map label	Species	Number	Time	Flight Duration	Band 1 (0-25m)	Total flight time Band 1	Band 2 (25-180m)	Total flight time Band 2	Band 3 (>180m)	Total flight time Band 3	Total Flight Time	Proportion of flightline in viewshed	Time flight / In viewshed	Activity	Comments
10/08/2022	2	44	Buzzard	2	10:46	175		0	175	350		0	350	0	0		Calling and soaring over site
10/08/2022	2	45	Buzzard	1	12:28	95		0		0	95	95	95	0	0		Chick calling for food high ove site
10/08/2022	1	46	Buzzard	1	13:34	1440		0		0	1440	1440	1440	46	664		Soaring high over site
10/08/2022	1	47	Buzzard	1	15:01	1620		0		0	1620	1620	1620	47	755		Soaring high over site
24/10/2022	1	69	Buzzard	1	18:28	45	20	20	25	25	0	0	45	100	45	Hunting	perched on tree for one minute
25/10/2022	1	1	Buzzard	1	11:35	75	30	30	45	45	0	0	75	100	75	Travelling	Mobbed by Hooded Crows
25/10/2022	1	2	Buzzard	1	14:52	110	15	15	95	95	0	0	110	69	76	Hunting	
26/10/2022	3	14	Buzzard	1	14:16	14	11	11	3	3	0	0	14	100	14	Travelling	Flying low along treeline.
27/10/2022	2	10	Buzzard	1	15:30	80	0	0	80	80	0	0	80	100	80	Soaring	
10/11/2022	3	24	Buzzard	1	09:31	37	5	5	32	32	0	0	37	100	37	Travelling	
11/11/2022	2	22	Buzzard	1	11:38	55	55	55	0	0	0	0	55	100	55	Travelling	
11/11/2022	2	23	Buzzard	1	13:07	45	34	34	11	11	0	0	45	5	2	Travelling	
11/11/2022	2	76	Buzzard	1	14:58	16	4	4	12	12	0	0	16	100	16	Travelling	
12/11/2022	1	15	Buzzard	1	11:44	105	0	0	105	105	0	0	105	100	105	Circling	
12/11/2022	1	18	Buzzard	1	13:54	18	5	5	13	13	0	0	18	100	18	Travelling	
04/12/2022	3	38	Buzzard	1	14:23	45	10	10	35	35	0	0	45	100	45	Travelling	Adult
05/12/2022	1	27	Buzzard	1	12:09	40	0	0	40	40	0	0	40	100	40	Travelling	
06/12/2022	2	35	Buzzard	1	14:28	65	65	65	0	0	0	0	65	100	65	Travelling	Adult
03/02/2023	1	47	Buzzard	1	12:31	70	12	12	58	58	0	0	70	82	57	Travelling	
07/02/2023	2	49	Buzzard	1	13:11	25	25	25	0	0	0	0	25	100	25	Travelling	Female adult Perched on tree for 24 mins. Flushed off by tractors
07/02/2023	2	50	Buzzard	1	13:16	37	37	37	0	0	0	0	37	93	34	Travelling	Male adultPerched on tree for 19 mins before flushjed off by tractors.
07/02/2023	2	51	Buzzard	1	16:23	40	40	40	0	0	0	0	40	100	40	Travelling	Flying low along hedgerow.
10/03/2023	1	58	Buzzard	1	12:28	25	10	10	15	15	0	0	25	96	24	Travelling	Lost view behind treeline
10/03/2023	1	59	Buzzard	1	13:45	240	0	0	240	240	0	0	240	32	77	Soaring	Rising on thermals travelling east
12/03/2023	2	60	Buzzard	1	10:13	19	19	19	0	0	0	0	19	0	0	Travelling	
22/05/2023	1	1	Buzzard	2	09:02	175	0	0	90	180	85	170	350	0	0	Soaring	Two BZ rising on thermal and mobbing each other
22/05/2023	1	2	Buzzard	1	10:32	110	0	0	110	110	0	0	110	89	97	Travelling	Circled on thermal then flew NE
22/05/2023	1	3	Buzzard	1	13:12	48	6	6	42	42	0	0	48	100	48	Travelling	Dropped low over bog
22/05/2023	1	4	Buzzard	1	14:25	75	0	0	75	75	0	0	75	45	34	Travelling	
24/05/2023	2	5	Buzzard	2	13:57	200	40	80	160	320	0	0	400	76	302	Soaring	M & F pair mobbing Corvids over treeline then dropped behind it
24/05/2023	2	6	Buzzard	1	15:04	42	5	5	37	37	0	0	42	21	9	Travelling	Adult Buzzard flew up from below treeline then flew East.

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24/05/2023	2	7	Buzzard	2	16:17	165	15	30	150	300	0	0	330	82	271	Soaring	M&F pair flew out of treeline to mob Ravens, then soared before dropping behind treeline
25/05/2023	3	8	Buzzard	2	10:28	143	0	0	143	286	0	0	286	100	286	Soaring	F&M pair soaring together
02/06/2023	2	9	Buzzard	1	09:23	22	4	4	18	18	0	0	22	100	22	Travelling	Male adult flew north out of trees
02/06/2023	2	11	Buzzard	1	11:17	70	5	5	65	65	0	0	70	100	70	Travelling	male adult Circled before flying into trees
02/06/2023	2	12	Buzzard	1	12:25	55	0	0	55	55	0	0	55	100	55	Travelling	female adult Flew out of trees circled and travelled north over bog
02/06/2023	2	13	Buzzard	1	12:59	34	0	0	34	34	0	0	34	93	32	Travelling	male adult
02/06/2023	2	14	Buzzard	1	14:06	62	8	8	54	54	0	0	62	41	26	Soaring	Pair soaring together then dropped behind treeline
02/06/2023	2	15	Buzzard	1	14:45	27	4	4	23	23	0	0	27	100	27	Travelling	female adult Dropped into trees
21/06/2023	3	16	Buzzard	1	09:45	9	9	9	0	0	0	0	9	100	9	Travelling	Male adult flying low west along hedgerow
21/06/2023	3	17	Buzzard	1	09:52	190	0	0	190	190	0	0	190	72	137	Soaring	Male adult circling on thermal and displaying. Lost view behind forestry flying SW
04/07/2023	2	28	Buzzard	1	10:28	19	12	12	7	7	0	0	19	100	19	Travelling	
04/07/2023	2	29	Buzzard	1	13:11	120	0	0	120	120	0	0	120	0	0	Soaring	BZ rising on thermal. Lost view behind trees as bird dropped lower flying West
06/07/2023	1	18	Buzzard	1	11:22	65	0	0	65	65	0	0	65	100	65	Travelling	Flew at 50 metres NE over bog
06/07/2023	1	20	Buzzard	1	12:41	50	0	0	50	50	0	0	50	100	50	Travelling	Flew West along forestry, then lost view travelling NW over forestry.
06/07/2023	1	21	Buzzard	1	16:10	190	0	0	190	190	0	0	190	93	177	Soaring	
08/07/2023	2	30	Buzzard	1	16:44	235	0	0	235	235	0	0	235	100	235	Soaring	Circling at 30 Metres before climbing to 100 metres plus, then dropped to join female and Juvenile
08/07/2023	2	31	Buzzard	2	16:46	70	0	0	70	140	0	0	140	100	140	Travelling	Adult female and Juvenile fledgling joined male in flight South
09/07/2023	1	22	Buzzard	2	10:20	340	35	70	110	220	195	390	680	78	532	Soaring	Adult female and fledged Juvenile soared on thermal to over 200 metres out of view.
09/07/2023	1	23	Buzzard	1	10:22	155	0	0	155	155	0	0	155	100	155	Circling	Circled over bog travelling North
09/07/2023	1	25	Buzzard	2	13:29	180	0	0	50	100	130	260	360	0	0	Soaring	
09/07/2023	1	27	Buzzard	1	13:56	174	0	0	174	174	0	0	174	0	0	Soaring	
07/08/2023	2	34	Buzzard	2	09:34	168	0	0	168	336	0	0	336	0	0	Soaring	

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07/08/2023	2	35	Buzzard	2	11:07	63	0	0	63	126	0	0	126	84	106	Travelling	Adult female flying with Juvenile
07/08/2023	2	36	Buzzard	1	12:05	50	0	0	50	50	0	0	50	77	39	Travelling	Lost from view behind trees over bog
12/09/2023	2	41	Buzzard	1	11:50	33	7	7	26	26	0	0	33	100	33	Travelling	Lost view behind trees
12/09/2023	2	42	Buzzard	1	12:02	405	0	0	330	330	75	75	405	85	345	Soaring	Joined female and Juvenile rising on thermal in Westerly direction
12/09/2023	2	43	Buzzard	2	12:04	370	0	0	310	620	60	120	740	77	568	Soaring	Adult female and Juvenile Joined second adult in flight
12/09/2023	2	44	Buzzard	1	13:18	71	14	14	57	57	0	0	71	100	71	Travelling	
12/09/2023	2	45	Buzzard	1	13:25	120	46	46	74	74	0	0	120	100	120	Hunting	Circled and hovered over field then travelled South
12/09/2023	2	46	Buzzard	1	15:43	49	39	39	10	10	0	0	49	63	31	Travelling	
12/09/2023	2	47	Buzzard	1	16:01	70	0	0	70	70	0	0	70	100	70	Travelling	
12/09/2023	2	52	Buzzard	1	18:08	27	10	10	17	17	0	0	27	91	25	Travelling	
13/09/2023	1	39	Buzzard	2	11:09	70	0	0	70	140	0	0	140	100	140	Travelling	Adult female and Juvenile flying South together
13/09/2023	1	40	Buzzard	1	15:20	12	0	0	12	12	0	0	12	0	0	Travelling	
11/04/2022	3	8	Curlew	1	12:44	525	0	0	300	300	225	225	525	50	264	Displaying bird	Either displaying or disturbed, lot of BZ activity seen in that area on S1 search
22/05/2022	1	28	Curlew	1	16:49	18	0	0	18	18	0	0	18	0	0		Escorting Lesser Black backed Gulls out of the conservation area
09/11/2021	2	32	Golden Plover	1000	14:31	87		0		0	87	87000	87000	100	87000		
21/02/2022	1	61	Golden Plover	70	10:36	34		0	34	2380		0	2380	100	2380		
21/02/2022	1	59	Golden Plover	150	07:52	18		0	18	2700		0	2700	100	2700		
22/02/2022	1	75	Golden Plover	100	16:35	23		0	23	2300		0	2300	100	2300		
22/02/2022	2	64	Golden Plover	100	08:53	14		0	14	1400		0	1400	100	1400		
22/02/2022	2	66	Golden Plover	200	09:01	32		0	32	6400		0	6400	100	6400		
07/03/2022	1	77	Golden Plover	25	08:02	48		0	48	1200		0	1200	100	1200		
07/03/2022	1	78	Golden Plover	110	08:15	42		0	42	4620		0	4620	100	4620		
08/03/2022	1	94	Golden Plover	100	16:11	23		0	23	2300		0	2300	90	2064		
08/03/2022	1	92	Golden Plover	200	16:05	8	8	1600		0		0	1600	100	1600		
07/04/2022	3	2	Golden Plover	11	13:16	8		0	8	88		0	88	0	0		
07/04/2022	2	1	Golden Plover	20	11:51	18		0	18	360		0	360	0	0		
10/04/2022	1	5	Golden Plover	20	15:32	5	5	100		0		0	100	100	100		
11/04/2022	3	10	Golden Plover	8	13:53	13		0	13	104		0	104	0	0		
11/04/2022	3	7	Golden Plover	14	11:58	5		0	5	70		0	70	0	0		
12/04/2022	1	14	Golden Plover	4	18:01	18		0		0	18	72	72	100	72		Small flock joining larger flock of 500+ off site
24/10/2022	1	68	Golden Plover	400	17:08	550	0	0	0	0	550	220000	220000	0	0	Travelling	
25/10/2022	1	66	Golden Plover	75	08:24	45	0	0	45	3375	0	0	3375	18	603	Travelling	
26/10/2022	3	72	Golden Plover	300	16:37	150	0	0	120	36000	30	9000	45000	100	45000	Travelling	

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26/10/2022	3	71	Golden Plover	500	16:43	95	0	0	95	47500	0	0	47500	100	47500	Travelling	
26/10/2022	3	74	Golden Plover	1500	18:20	485	0	0	50	75000	435	652500	727500	41	295201	Travelling	
26/10/2022	3	12	Golden Plover	2500	09:05	1800	0	0	1800	4500000	0	0	4500000	100	4500000	Circling	Similar flights observed throughout the entire duration of the survey.
26/10/2022	3	73	Golden Plover	4000	17:59	750	0	0	100	400000	650	2600000	3000000	99	2976920	Travelling	
27/10/2022	2	7	Golden Plover	75	11:29	40	0	0	40	3000	0	0	3000	26	780	Travelling	joined existing flock
27/10/2022	2	6	Golden Plover	250	11:23	45	0	0	0	0	45	11250	11250	72	8125	Travelling	joined existing flock
27/10/2022	2	8	Golden Plover	400	11:44	75	0	0	75	30000	0	0	30000	100	30000	Travelling	joined existing flock
27/10/2022	3	70	Golden Plover	400	10:02	180	0	0	180	72000	0	0	72000	100	72000	Travelling	Lost view due to heavy mist.
27/10/2022	2	4	Golden Plover	2500	10:51	2700	0	0	1350	3375000	1350	3375000	6750000	23	1583715	Travelling	Flock of 2500 GP circling. Similar flights and numbers observed throughout the entire duration of the survey. Referenced on map two by hatched area.
12/11/2022	1	19	Golden Plover	50	14:52	55	0	0	55	2750	0	0	2750	100	2750	Travelling	
12/11/2022	1	17	Golden Plover	120	12:23	70	0	0	70	8400	0	0	8400	90	7585	Travelling	
06/12/2022	2	34	Golden Plover	45	12:00	50	0	0	50	2250	0	0	2250	99	2227	Travelling	
02/03/2023	1	84	Golden Plover	60	17:28	85	0	0	85	5100	0	0	5100	89	4525	Travelling	
03/03/2023	1	82	Golden Plover	35	07:11	55	0	0	55	1925	0	0	1925	71	1371	Travelling	Flying north at approx. 120 metres
10/03/2023	1	56	Golden Plover	16	10:10	65	0	0	65	1040	0	0	1040	62	646	Travelling	
09/11/2021	2	29	Hen Harrier	1	13:48	87	0	0	87	87	0	0	87	100	87		
30/06/2022	2	37	Hen Harrier	1	15:14	15	15	15	0	0	0	0	15	0	0		
05/07/2022	3	43	Hen Harrier	1	08:37	5	5	5	0	0	0	0	5	68	3		First of the turf cutters arrived shortly before sighting.
07/02/2023	2	52	Hen Harrier	1	17:10	32	32	32	0	0	0	0	32	100	32	Travelling	Adult male flying low NE. Dropped low into scrub/ rushes possibly to roost.
07/02/2023	2	54	Hen Harrier	1	17:29	28	28	28	0	0	0	0	28	100	28	Hunting	Adult female hunting along field margins.
11/10/2021	1	5	Kestrel	1	12:15	91		0	91	91		0	91	100	91		
12/10/2021	1	10	Kestrel	1	09:45	82		0	30	30	52	52	82	100	82		
12/10/2021	2	15	Kestrel	1	13:45	23		0	23	23		0	23	0	0		
08/11/2021	2	23	Kestrel	1	10:12	86		0	86	86		0	86	100	86		
09/11/2021	2	31	Kestrel	1	14:16			0		0		0	0	100	0		
02/12/2021	1	33	Kestrel	1	10:15	72		0	45	45	27	27	72	100	72		
02/12/2021	2	35	Kestrel	1	15:45	68	45	45	15	15	8	8	68	100	68		
02/12/2021	2	37	Kestrel	1	16:13	92		0	90	90	2	2	92	100	92		
03/12/2021	2	39	Kestrel	1	09:51	101		0	30	30	71	71	101	122	123		
03/01/2022	1	48	Kestrel	1	15:48	112	35	35	77	77		0	112	89	99		
04/01/2022	2	54	Kestrel	1	15:15	58		0	58	58		0	58	31	18		
04/01/2022	2	57	Kestrel	1	16:00	41		0	41	41		0	41	93	38		
22/02/2022	2	70	Kestrel	1	10:32	105	45	45	60	60		0	105	100	105		

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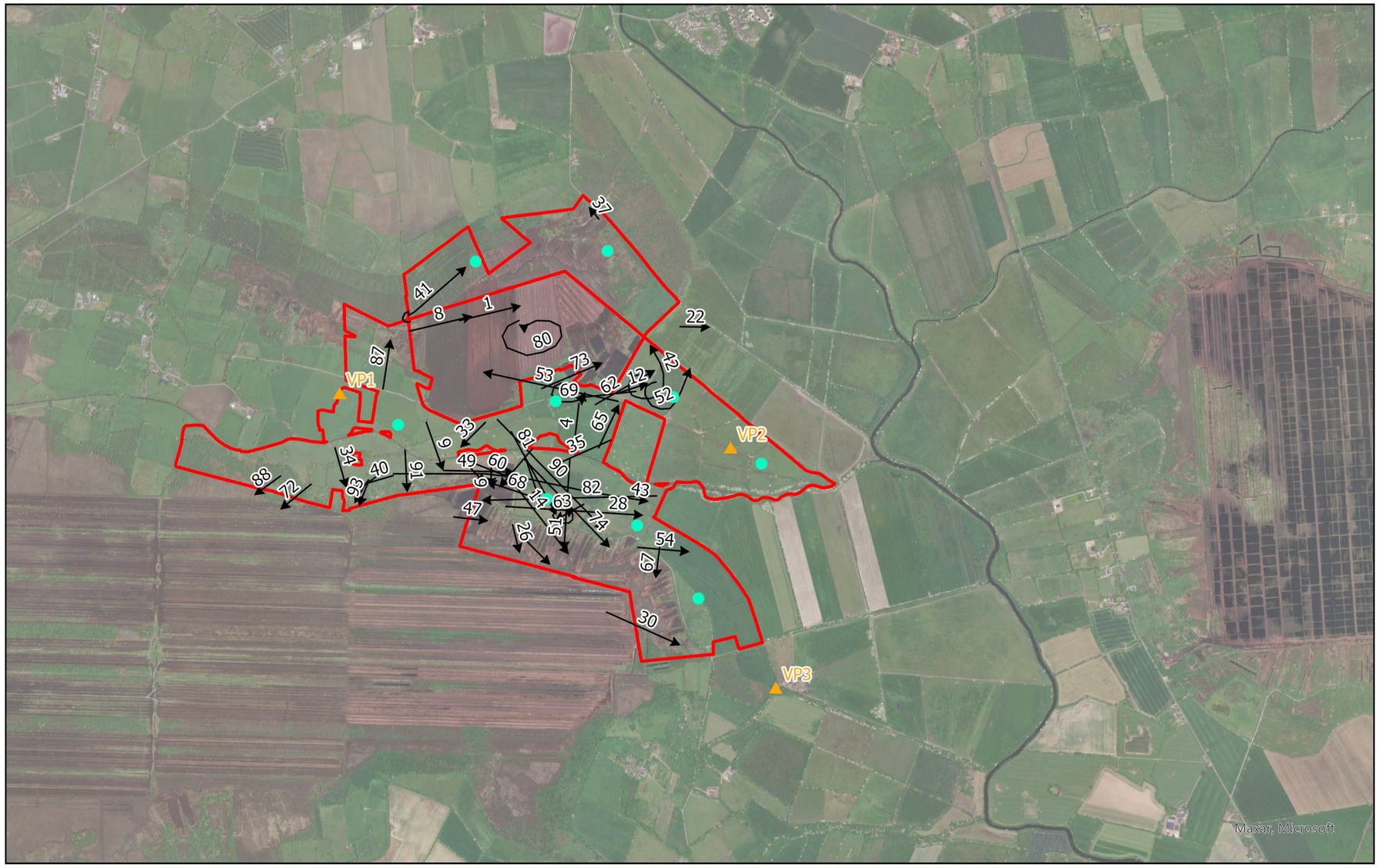
22/02/2022	1	71	Kestrel	1	14:05	126		0		0	126	126	126	100	126		
07/03/2022	2	83	Kestrel	1	14:01	127		0	127	127		0	127	79	101		
08/03/2022	1	95	Kestrel	1	16:12	106		0	106	106		0	106	100	106		
22/05/2022	2	27	Kestrel	1	11:53	33	18	18	15	15		0	33	0	0		Flying through, no behaviour displayed
26/10/2022	3	13	Kestrel	1	12:40	75	10	10	65	65	0	0	75	100	75	Hunting	
10/11/2022	3	25	Kestrel	1	12:10	80	4	4	76	76	0	0	80	100	80	Hunting	
11/11/2022	2	21	Kestrel	1	1135	245	155	155	90	90	0	0	245	100	245	Hunting	
11/11/2022	2	75	Kestrel	1	14:46	150	150	150	0	0	0	0	150	100	150	Hunting	Made two failed kill attempts
11/11/2022	2	79	Kestrel	1	16:43	8	8	8	0	0	0	0	8	100	8	Travelling	
06/12/2022	2	33	Kestrel	1	11:55	390	340	340	50	50	0	0	390	100	390	Hunting	Male adult made two failed kill attempts
06/12/2022	2	36	Kestrel	1	14:43	160	140	140	20	20	0	0	160	100	160	Hunting	male adult
10/01/2023	2	44	Kestrel	1	13:17	190	140	140	50	50	0	0	190	100	190	Hunting	M/A made a successful kill and carried off prey.
11/01/2023	1	39	Kestrel	1	09:03	85	70	70	15	15	0	0	85	100	85	Hunting	
10/03/2023	1	55	Kestrel	1	10:07	140	55	55	85	85	0	0	140	100	140	Hunting	Dropped behind forestry
12/03/2023	2	63	Kestrel	1	13:27	510	170	170	340	340	0	0	510	100	510	Hunting	Adult male hunting between 15 and 35 metres.
12/03/2023	2	64	Kestrel	1	14:54	11	11	11	0	0	0	0	11	100	11	Travelling	Perched on tree for 20 seconds.
02/06/2023	2	10	Kestrel	1	10:14	86	71	71	15	15	0	0	86	15	13	Hunting	female adult
06/07/2023	1	19	Kestrel	1	12:04	142	32	32	110	110	0	0	142	100	142	Hunting	
08/07/2023	2	32	Kestrel	1	19:20	258	173	173	85	85	0	0	258	100	258	Hunting	Adult male perched on tree for 40 seconds
09/07/2023	1	24	Kestrel	1	12:11	17	0	0	17	17	0	0	17	100	17	Hunting	
07/08/2023	2	33	Kestrel	1	08:25	185	133	133	52	52	0	0	185	100	185	Hunting	Male adult perched on tree for 2 mins
08/08/2023	3	37	Kestrel	1	08:17	17	0	0	17	17	0	0	17	100	17	Travelling	Male Adult
08/11/2021	1	27	Lapwing	150	15:55	123		0		0	123	18450	18450	62	11469		
03/01/2022	1	45	Lapwing	30	14:20	107		0		0	107	3210	3210	100	3210		
07/04/2022	3	3	Lapwing	1	13:25	27		0	15	15	12	12	27	0	0		
06/12/2022	2	32	Lapwing	13	10:27	35	0	0	35	455	0	0	455	4	16	Travelling	
11/01/2023	1	40	Lapwing	17	09:53	40	0	0	40	680	0	0	680	90	610	Travelling	
12/03/2023	2	62	Lapwing	8	12:35	13	8	64	5	40	0	0	104	0	0	Travelling	Flock circled south and dropped behind treeline
13/11/2022	1	81	Mallard	2	08:40	19	0	0	19	38	0	0	38	100	38	Travelling	Male and female flying NE over bog.
02/12/2021	2	38	Merlin	1	16:35	23	15	15	8	8	0	0	23	100	23		
08/03/2022	2	84	Merlin	1	08:43	23	23	23	0	0	0	0	23	100	23		
08/11/2021	2	19	Peregrine	1	08:53	41	15	15	26	26	0	0	41	100	41		
08/03/2022	2	86	Peregrine	1	09:49	38	0	0	30	30	8	8	38	0	0		
11/10/2021	2	2	Snipe	1	09:05	28	0	0	28	28	0	0	28	0	0		
11/10/2021	1	7	Snipe	1	13:20	34	15	15	15	15	4	4	34	100	34		
12/10/2021	1	11	Snipe	1	10:15	16	0	0	16	16	0	0	16	100	16		
12/10/2021	2	16	Snipe	1	13:50	4	0	0	4	4	0	0	4	59	2		

Date	VP No	Map label	Species	Number	Time	Flight Duration	Band 1 (0-25m)	Total flight time Band 1	Band 2 (25-180m)	Total flight time Band 2	Band 3 (>180m)	Total flight time Band 3	Total Flight Time	Proportion of flightline in viewshed	Time flight / In viewshed	Activity	Comments
08/11/2021	2	17	Snipe	1	07:57	8	0	0	8	8	0	0	8	100	8		
08/11/2021	2	18	Snipe	1	08:25	11	0	0	11	11	0	0	11	100	11		
03/01/2022	1	44	Snipe	1	13:43	8	0	0	8	8	0	0	8	100	8		
04/01/2022	1	50	Snipe	1	09:31	22	15	15	7	7	0	0	22	100	22		
07/03/2022	1	76	Snipe	1	07:40	11	0	0	11	11	0	0	11	100	11		
08/03/2022	2	85	Snipe	2	09:48	12	12	24	0	0	0	0	24	96	23		
25/10/2022	1	65	Snipe	4	07:47	33	0	0	33	132	0	0	132	100	132	Travelling	
25/10/2022	1	67	Snipe	11	08:30	28	0	0	28	308	0	0	308	96	295	Travelling	
12/09/2023	2	53	Snipe	2	19:54	21	21	42	0	0	0	0	42	17	7	Travelling	
14/09/2023	3	55	Snipe	2	19:50	15	0	0	15	30	0	0	30	100	30	Travelling	
14/09/2023	3	56	Snipe	1	20:02	18	0	0	18	18	0	0	18	59	11	Travelling	
08/11/2021	2	20	Sparrowhawk	1	09:15	23	23	23	0	0	0	0	23	100	23		
08/11/2021	1	24	Sparrowhawk	1	14:40	28	0	0	28	28	0	0	28	100	28		
08/03/2022	1	89	Sparrowhawk	1	13:57	58	58	58	0	0	0	0	58	100	58		
11/04/2022	3	11	Sparrowhawk	1	14:07	20	0	0	0	0	20	20	20	0	0		Hunting high over site
13/04/2022	3	15	Sparrowhawk	1	10:47	695	0	0	0	0	695	695	695	20	141		Soaring / displaying female
13/04/2022	3	18	Sparrowhawk	1	12:28	30	30	30	0	0	0	0	30	0	0		Low flight at speed into forest, probable nest area.
21/05/2022	3	26	Sparrowhawk	1	16:59	240	0	0	0	0	240	240	240	0	0		Soaring bird
31/05/2022	2	30	Sparrowhawk	1	09:47	15	15	15	0	0	0	0	15	0	0		Hunting through site
02/07/2022	2	38	Sparrowhawk	1	17:58	9	9	9	0	0	0	0	9	0	0		
03/07/2022	1	42	Sparrowhawk	1	16:44	7	7	7	0	0	0	0	7	100	7		
25/10/2022	1	3	Sparrowhawk	1	16:10	12	12	12	0	0	0	0	12	100	12	Travelling	
26/10/2022	3	11	Sparrowhawk	1	09:01	17	17	17	0	0	0	0	17	100	17	Hunting	Observed on approach to VP (Female Adult)
27/10/2022	2	5	Sparrowhawk	1	11:06	14	14	14	0	0	0	0	14	100	14	Hunting	Female Adult
27/10/2022	2	9	Sparrowhawk	1	13:48	23	23	23	0	0	0	0	23	21	5	Hunting	Female Adult
11/11/2022	2	20	Sparrowhawk	1	10:02	40	40	40	0	0	0	0	40	22	9	Hunting passerines	
11/11/2022	2	77	Sparrowhawk	1	15:23	27	27	27	0	0	0	0	27	71	19	Travelling	
11/11/2022	2	78	Sparrowhawk	1	15:41	33	33	33	0	0	0	0	33	100	33	Travelling	Perched on post for 50 seconds
12/11/2022	1	16	Sparrowhawk	1	12:07	12	12	12	0	0	0	0	12	79	10	Travelling	
13/11/2022	1	80	Sparrowhawk	1	07:52	21	21	21	0	0	0	0	21	100	21	Travelling	
04/12/2022	3	37	Sparrowhawk	1	10:17	10	10	10	0	0	0	0	10	98	10	Hunting	Hunting passerines along hedgerow (male adult)
05/12/2022	1	26	Sparrowhawk	1	10:34	25	25	25	0	0	0	0	25	99	25	Hunting	Hunting passerines (Female adult)
05/12/2022	1	28	Sparrowhawk	1	13:55	25	25	25	0	0	0	0	25	100	25	Travelling	Male adult
06/12/2022	2	31	Sparrowhawk	1	10:03	24	24	24	0	0	0	0	24	49	12	Hunting	Hunting passerines along hedgerow (female adult)
10/01/2023	2	42	Sparrowhawk	1	09:40	16	16	16	0	0	0	0	16	37	6	Travelling	F/A
10/01/2023	2	43	Sparrowhawk	1	12:46	30	30	30	0	0	0	0	30	40	12	Travelling	F/A
10/01/2023	2	45	Sparrowhawk	1	13:23	28	28	28	0	0	0	0	28	83	23	Hunting	F/A Chased flock of Linnet

Date	VP No	Map label	Species	Number	Time	Flight Duration	Band 1 (0-25m)	Total flight time Band 1	Band 2 (25-180m)	Total flight time Band 2	Band 3 (>180m)	Total flight time Band 3	Total Flight Time	Proportion of flightline in viewshed	Time flight / In viewshed	Activity	Comments
11/01/2023	1	41	Sparrowhawk	1	13:22	19	19	19	0	0	0	0	19	100	19	Hunting	
03/02/2023	1	46	Sparrowhawk	1	09:13	9	9	9	0	0	0	0	9	97	9	Hunting	Male adult Chasing Passerines
03/02/2023	1	48	Sparrowhawk	1	13:10	15	15	15	0	0	0	0	15	71	11	Travelling	Male adult Flying low NW along hedgerow
07/02/2023	2	53	Sparrowhawk	1	17:10	7	7	7	0	0	0	0	7	100	7	Mobbing	Mobbe male HH.
02/03/2023	1	83	Sparrowhawk	1	16:34	20	20	20	0	0	0	0	20	100	20	Travelling	
12/03/2023	2	61	Sparrowhawk	1	12:33	22	22	22	0	0	0	0	22	82	18	Travelling	Female adult flying low along fence line
09/07/2023	1	26	Sparrowhawk	1	13:31	13	13	13	0	0	0	0	13	97	13	Travelling	Female adult brief chase of passerines
08/08/2023	3	38	Sparrowhawk	1	12:02	12	12	12	0	0	0	0	12	100	12	Travelling	Female Adult
14/09/2023	3	54	Sparrowhawk	1	17:55	22	22	22	0	0	0	0	22	85	19	Travelling	Female Juvenile perched on tree then flew West into forestry
08/11/2021	2	21	Whooper Swan	4	10:05	51	51	204	0	0	0	0	204	100	204		
05/12/2022	1	29	Whooper Swan	7	16:21	65	0	0	65	455	0	0	455	56	253	Travelling	
10/03/2023	1	57	Whooper Swan	8	10:16	40	0	0	40	320	0	0	320	0	0	Travelling	Flying at approz 90 metres
11/10/2021	2	3	Woodcock	1	08:55	15	7	7	8	8		0	15	100	15		
05/12/2022	1	30	Woodcock	1	16:28	9	9	9	0	0	0	0	9	80	7	Travelling	flying low over hedgerow

Buzzard: Winter 2021-22



Vantage Point Locations

Proposed Turbine Locations

Buzzard flightline

Propsoed Windfarm Boundary

0 0.4 0.8 1.6 km

N

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Buzzard: Summer 2022

Vantage Point Locations
Proposed Turbine Locations
Buzzard
Propsoed Windfarm Boundary

0 0.4 0.8 1.6 km

N

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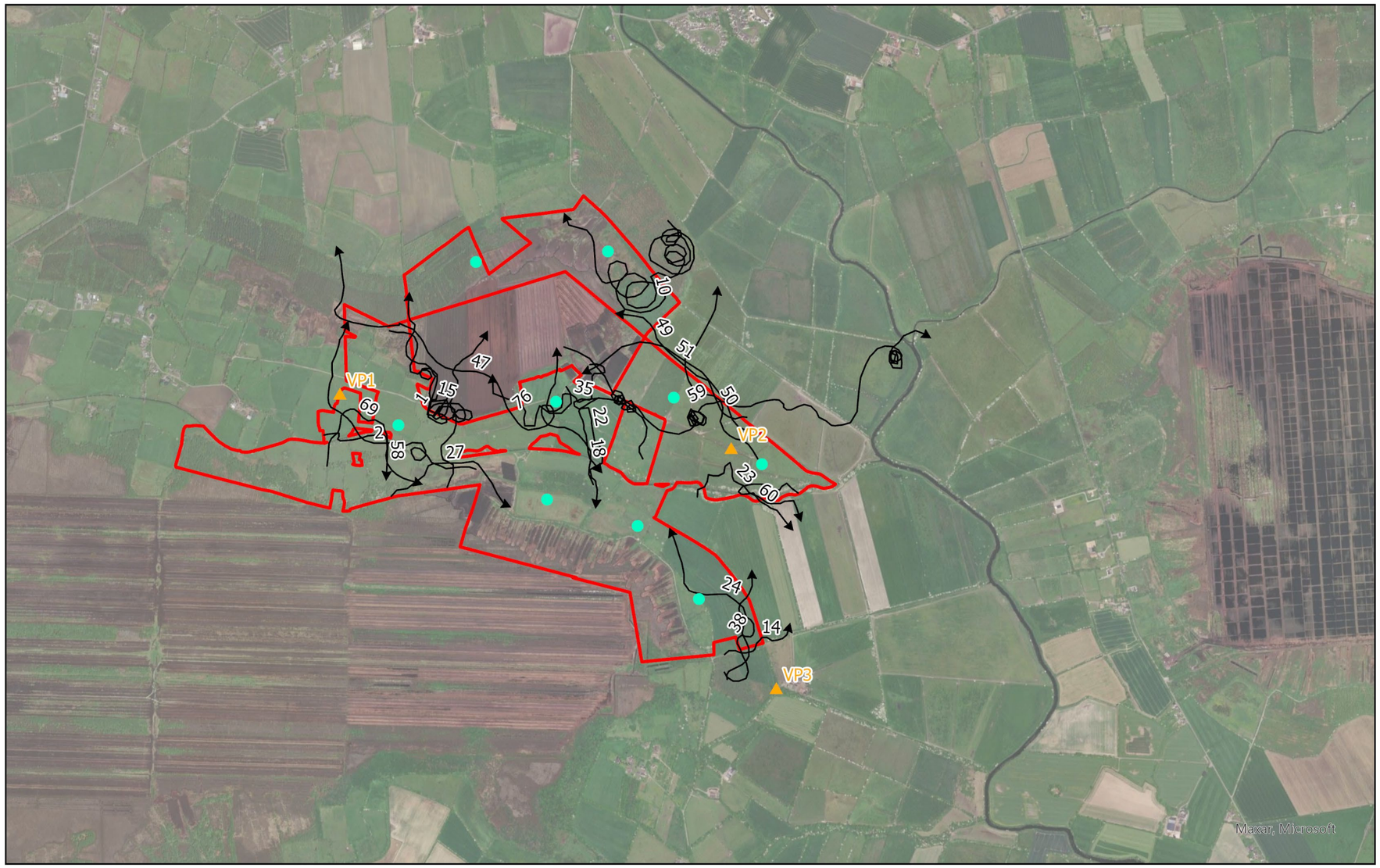
WetlandSurveys.ie

Buzzard: Winter 2022-23



Vantage Point Locations
Proposed Turbine Locations
Buzzard
Propsoed Windfarm Boundary

0 0.4 0.8 1.6 km

N

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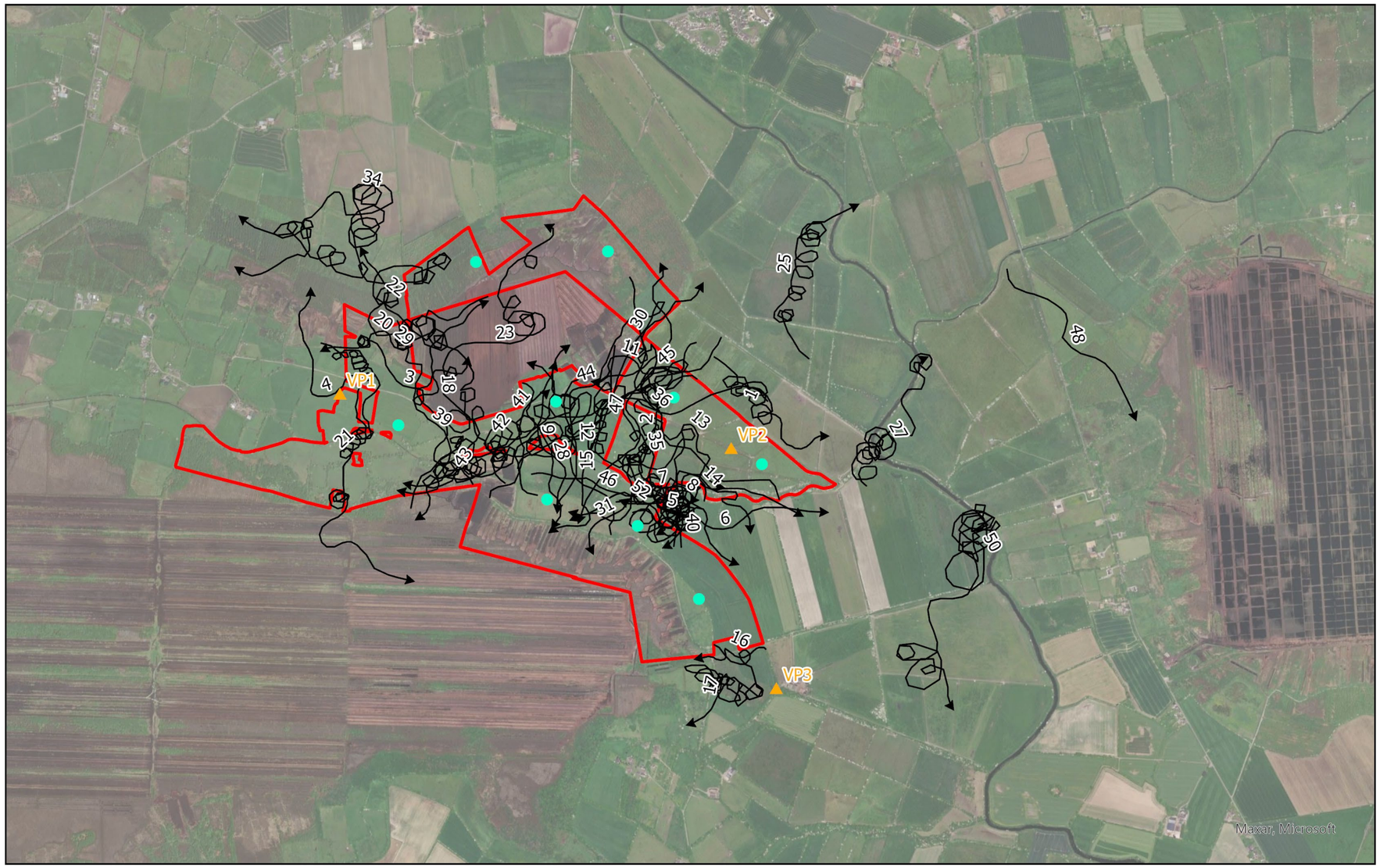
WetlandSurveys.ie

Buzzard: Summer 2023



Vantage Point Locations
Proposed Turbine Locations
Buzzard
Propsoed Windfarm Boundary

0 0.4 0.8 1.6 km

N

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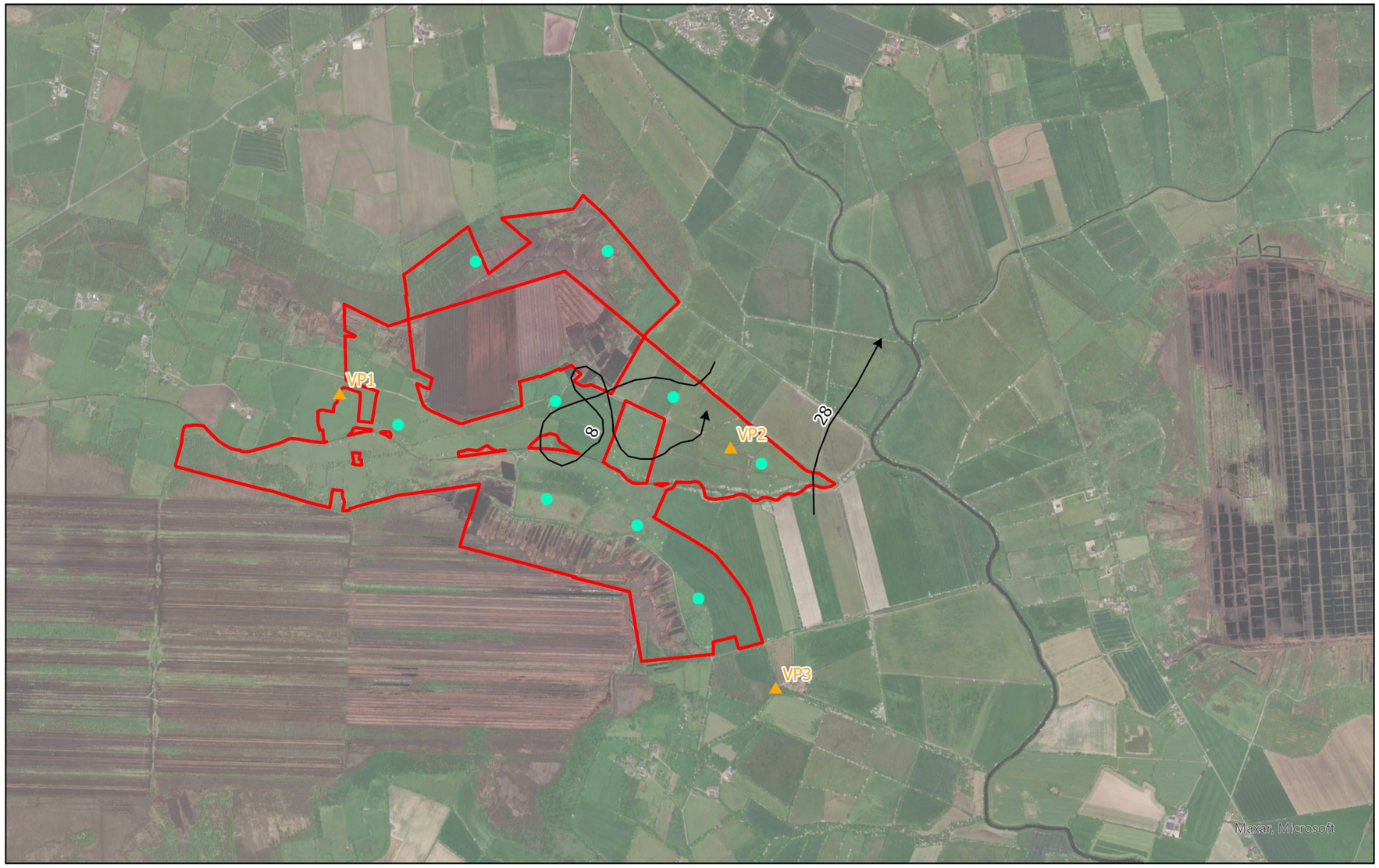
WetlandSurveys.ie

Curlew: Summer 2022



Vantage Point Locations
Proposed Turbine Locations
Curlew
Propsoed Windfarm Boundary

0 0.4 0.8 1.6 km

N

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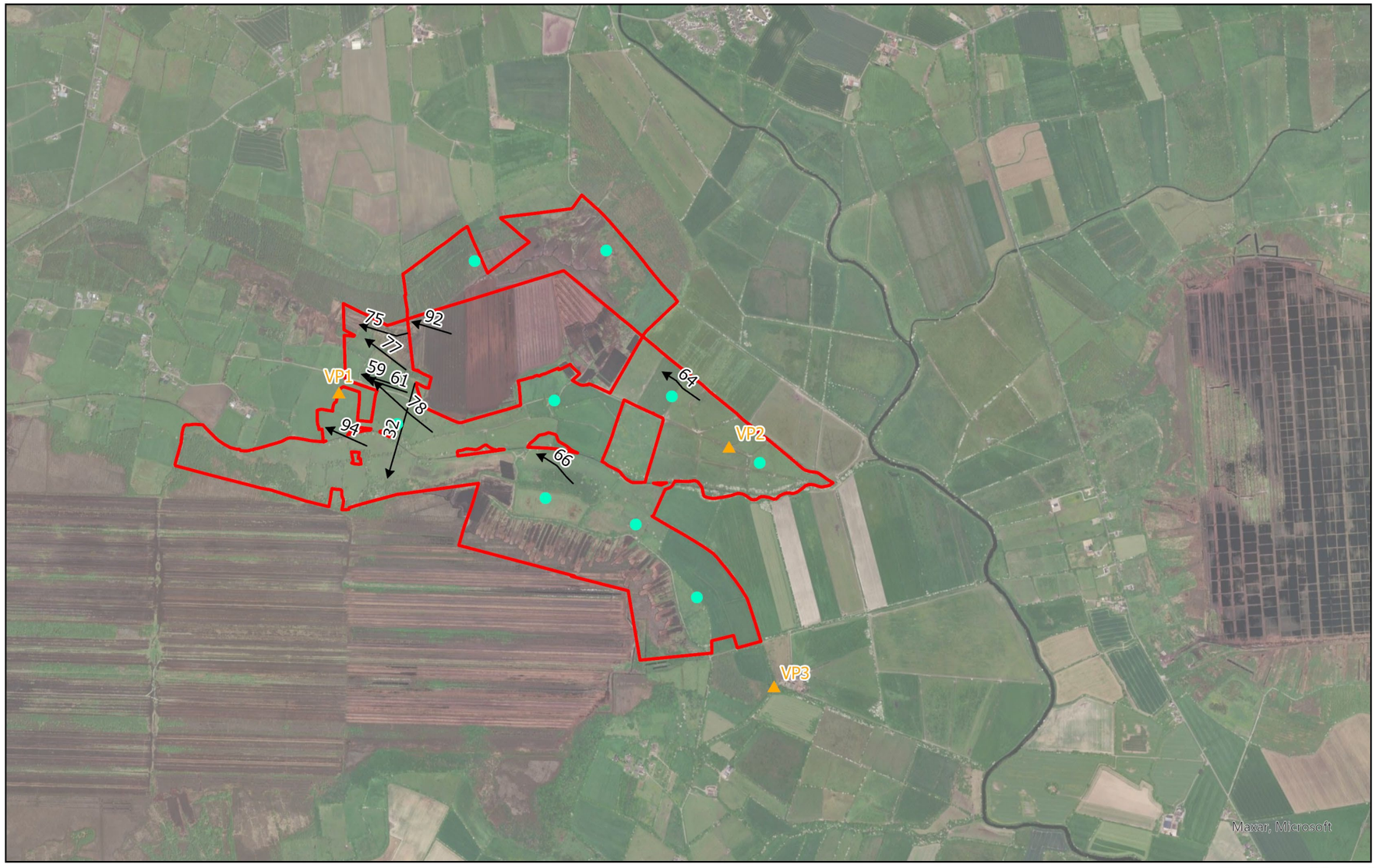
WetlandSurveys.ie

Golden Plover: Winter 2021-22



Vantage Point Locations
Proposed Turbine Locations
Golden Plover flightline
Propsoed Windfarm Boundary

0 0.4 0.8 1.6 km

N

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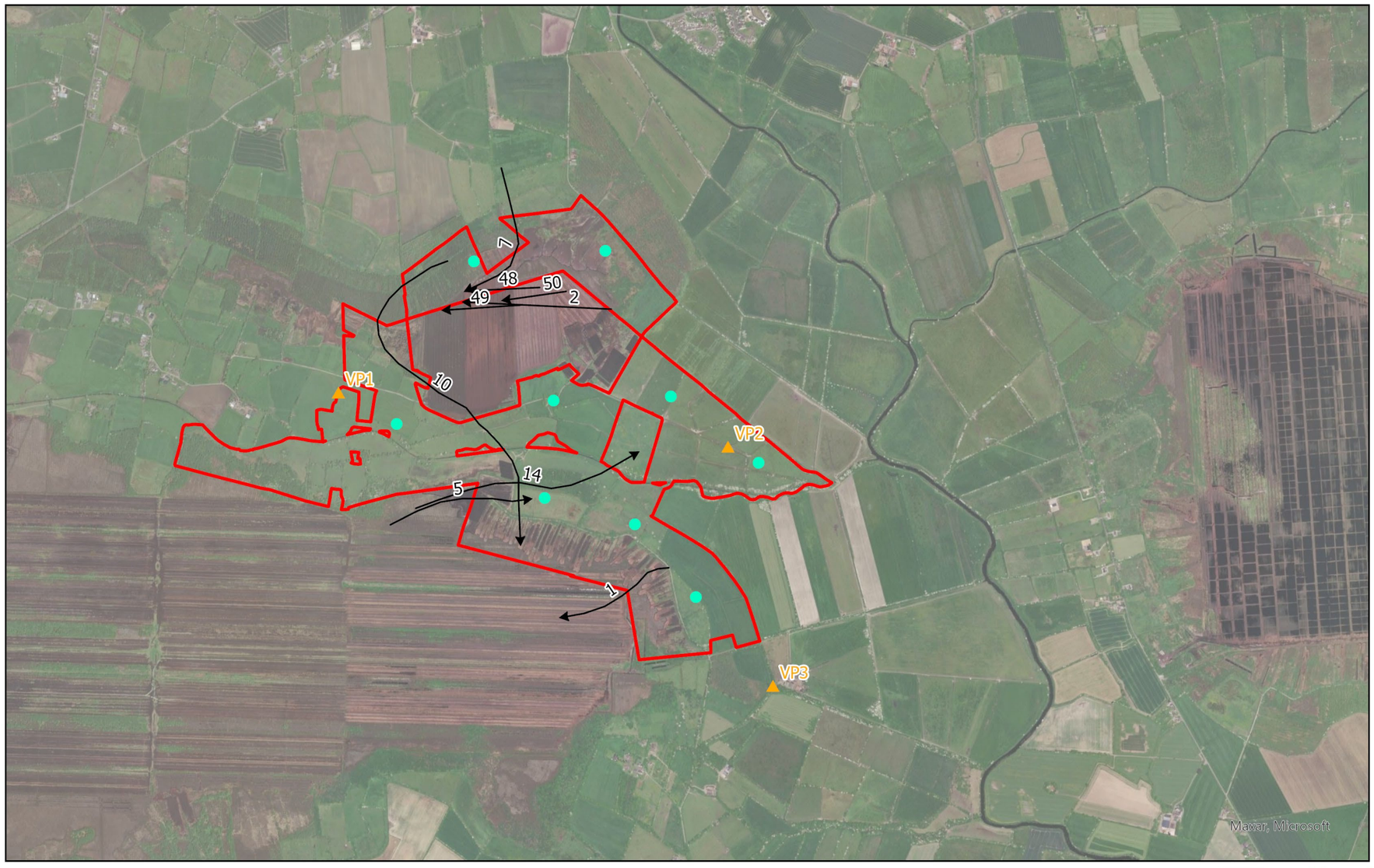
Golden Plover (wintering): Summer 2022 (April)



Vantage Point Locations
Proposed Turbine Locations
Golden Plover
Propsoed Windfarm Boundary

0 0.4 0.8 1.6 km

N

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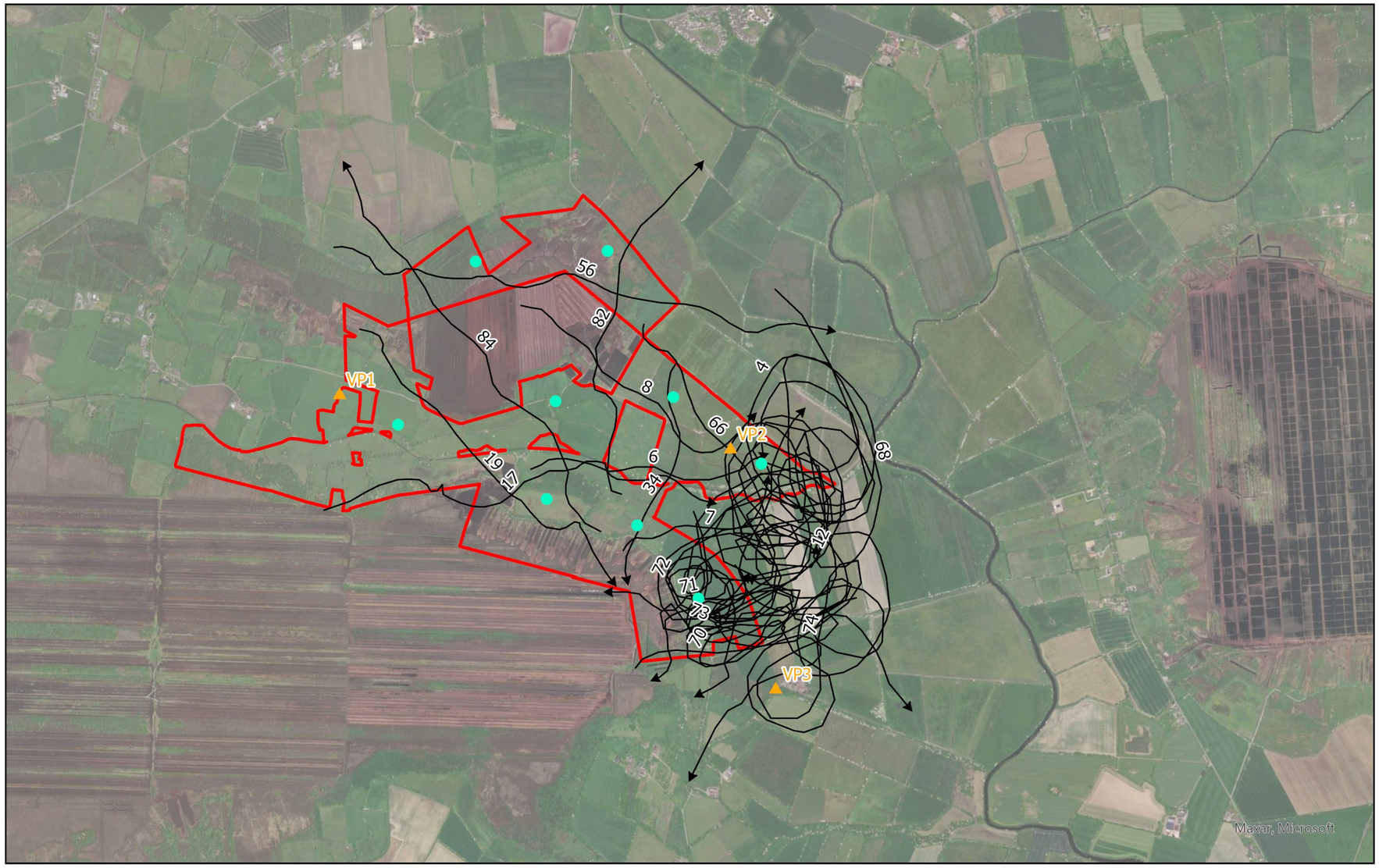
Golden Plover (wintering): Winter 22-23



Vantage Point Locations
Proposed Turbine Locations
Golden Plover
Propsoed Windfarm Boundary

0 0.4 0.8 1.6 km

N

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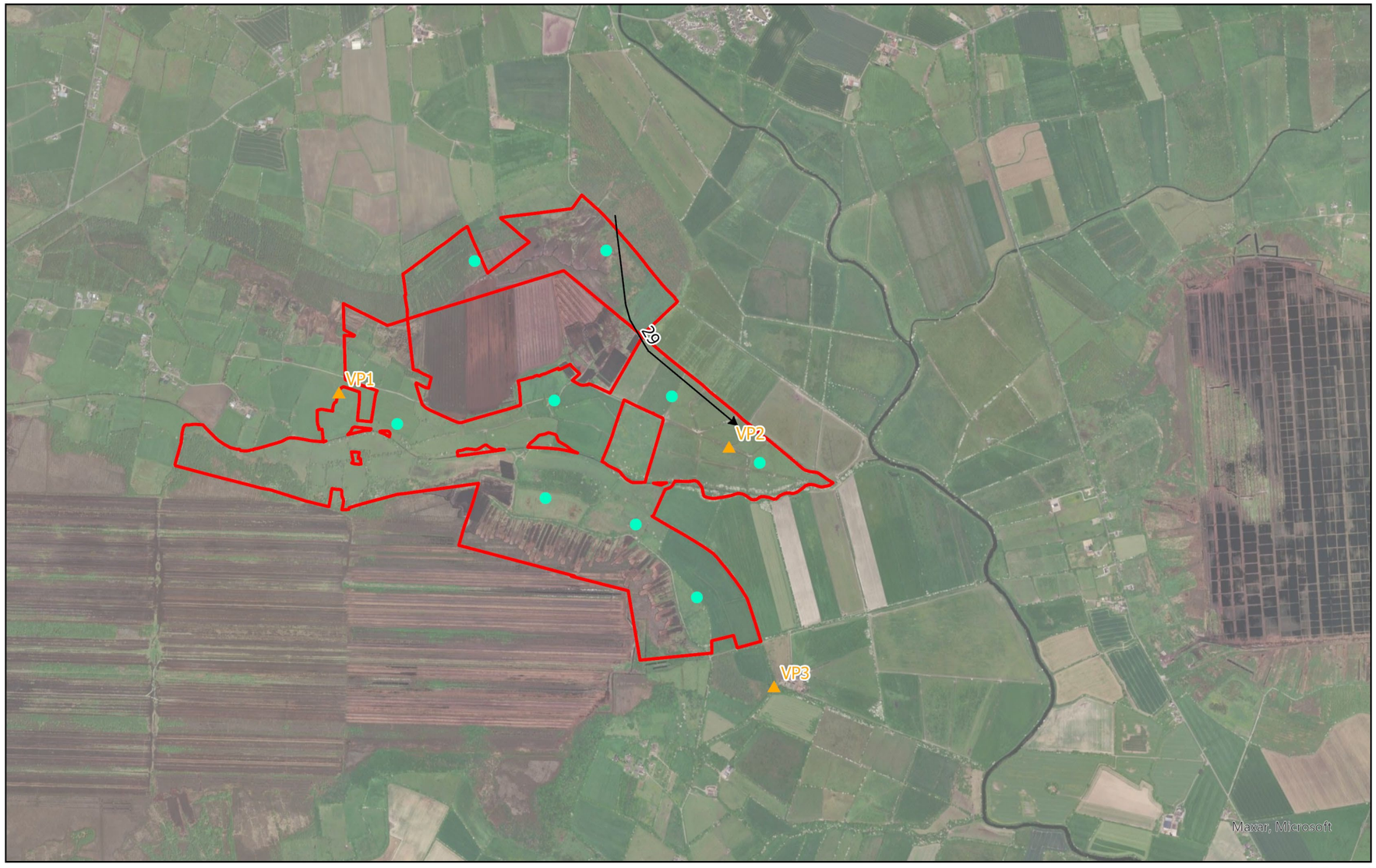
WetlandSurveys.ie

Hen Harrier: Winter 21-22



Vantage Point Locations
Proposed Turbine Locations
Hen Harrier flightline
Propsoed Windfarm Boundary

0 0.4 0.8 1.6 km

N

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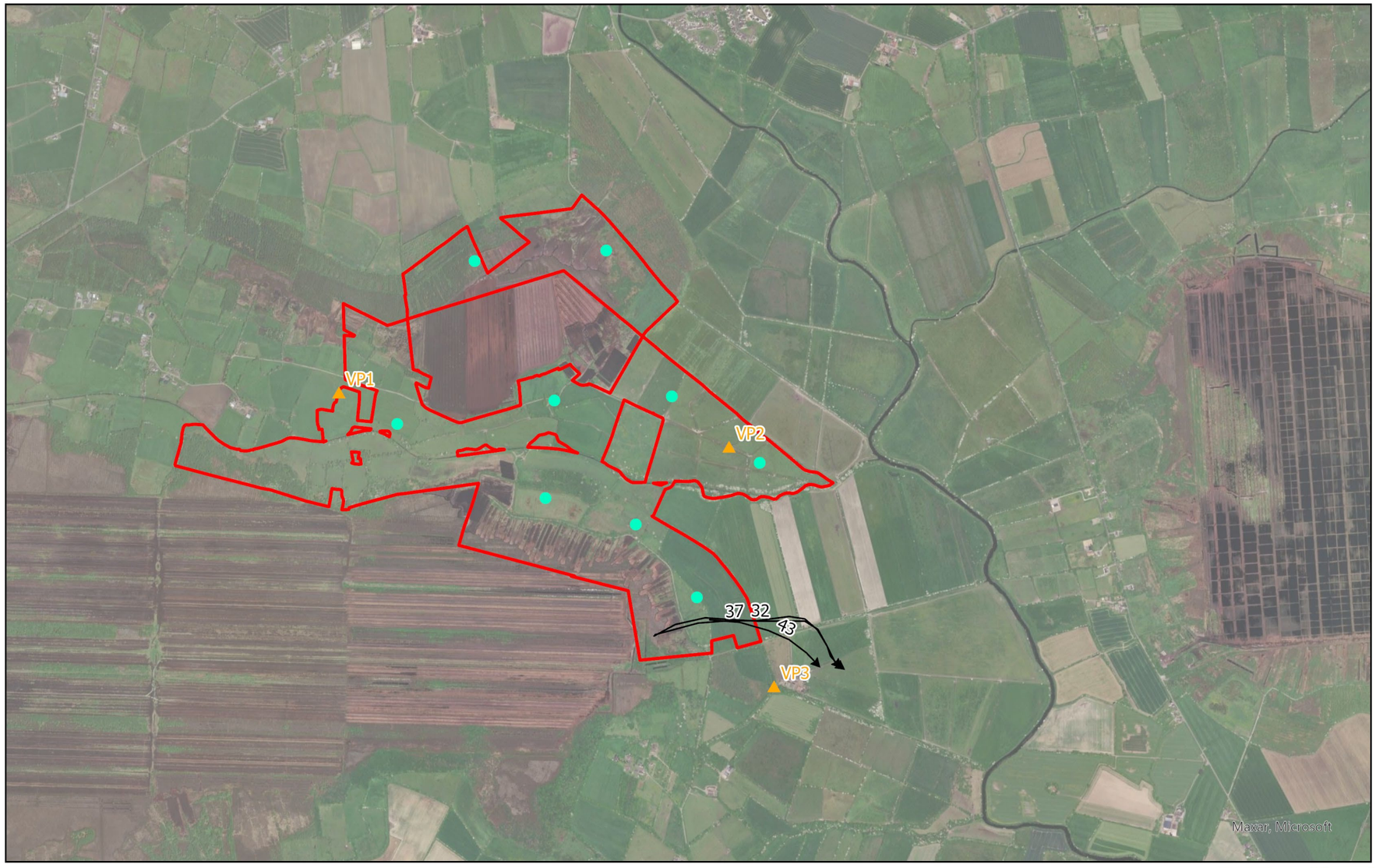
Hen Harrier: Summer 22



Vantage Point Locations

Proposed Turbine Locations

Hen Harrier

Propsoed Windfarm Boundary

0 0.4 0.8 1.6 km

N

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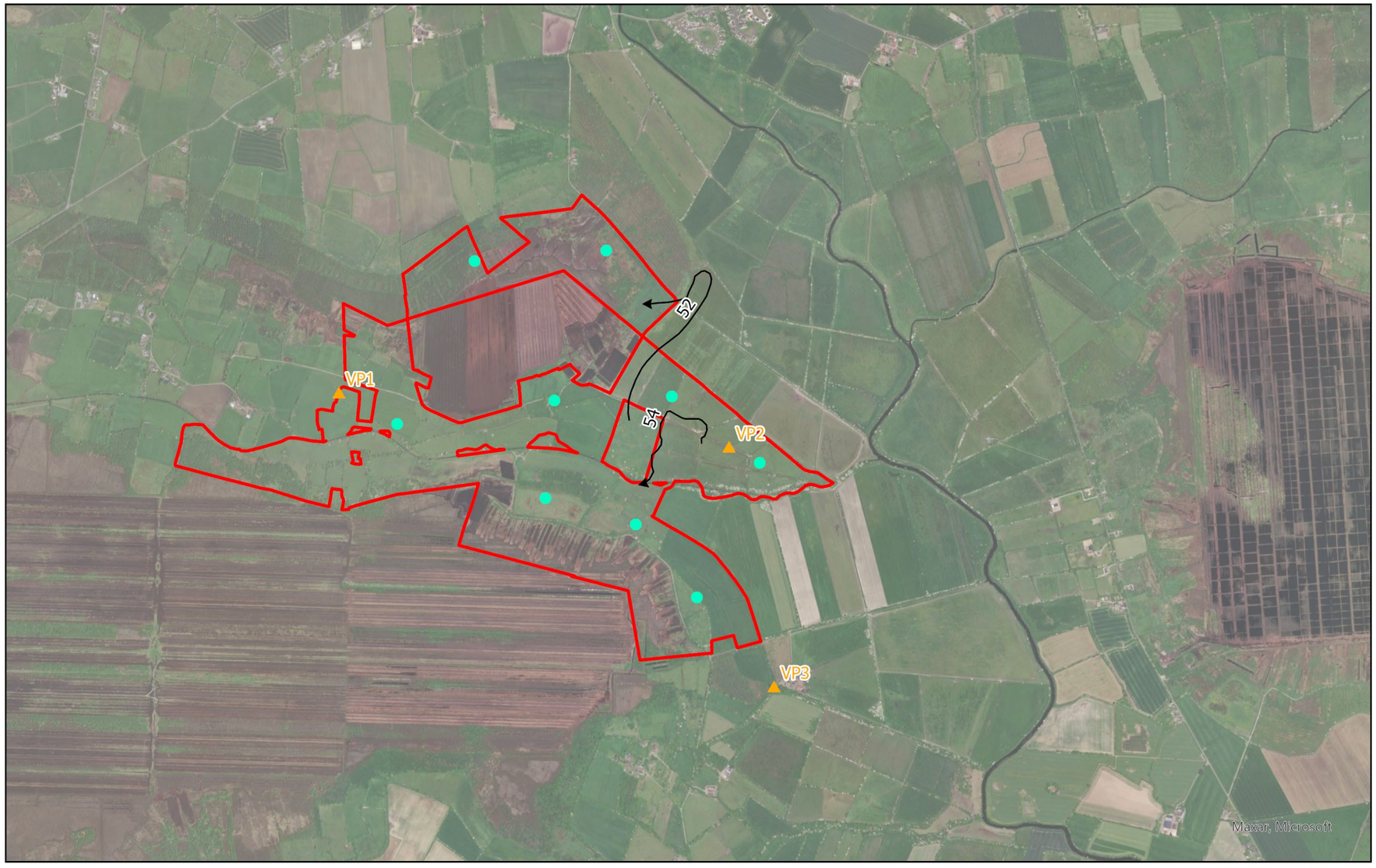
Hen Harrier: Winter 22-23



Vantage Point Locations

Proposed Turbine Locations

Hen Harrier

Propsoed Windfarm Boundary

0 0.4 0.8 1.6 km

N

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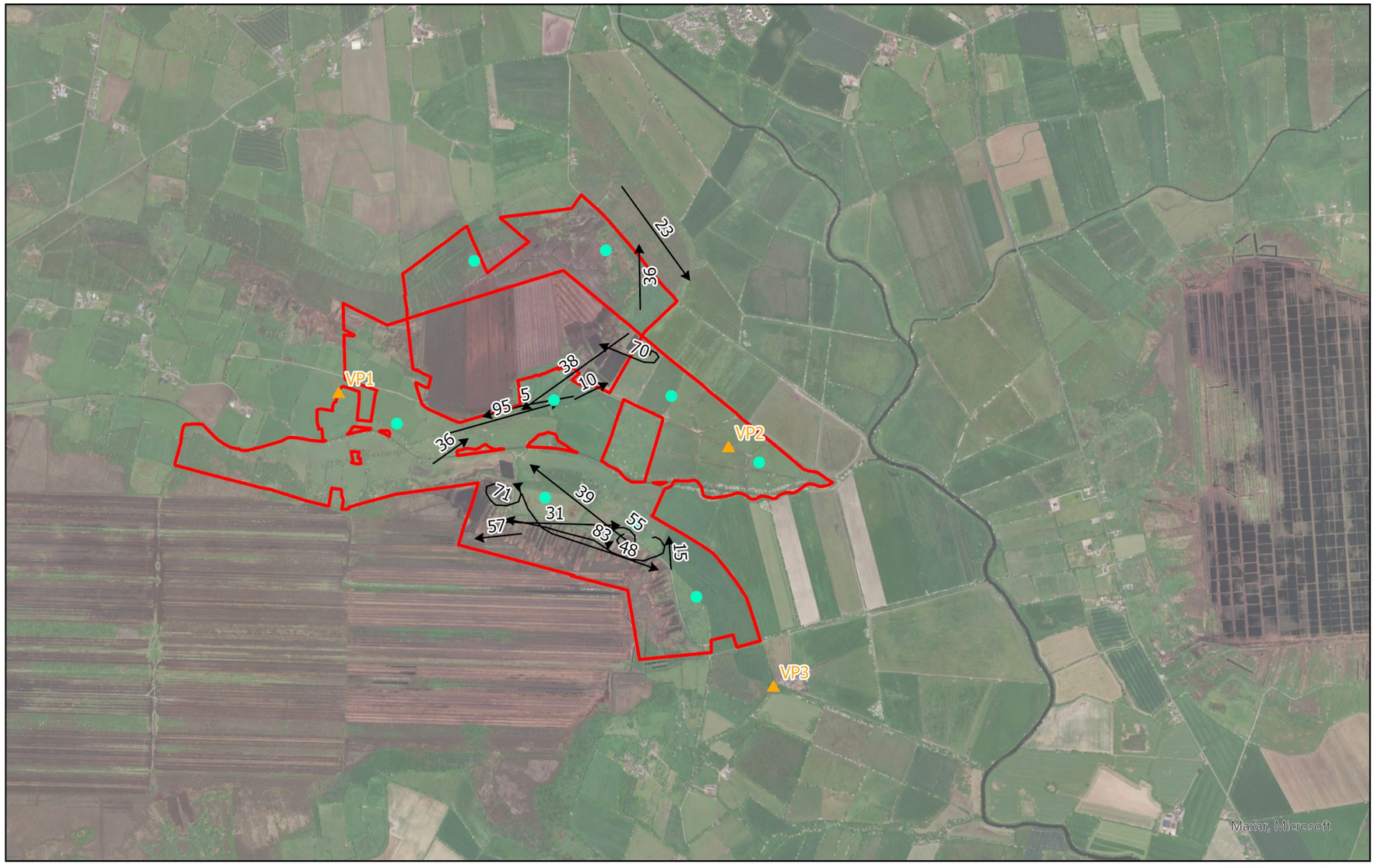
WetlandSurveys.ie

Kestrel: Winter 2021-22



Vantage Point Locations
Proposed Turbine Locations
Kestrel flightline
Propsoed Windfarm Boundary

0 0.4 0.8 1.6 km

N

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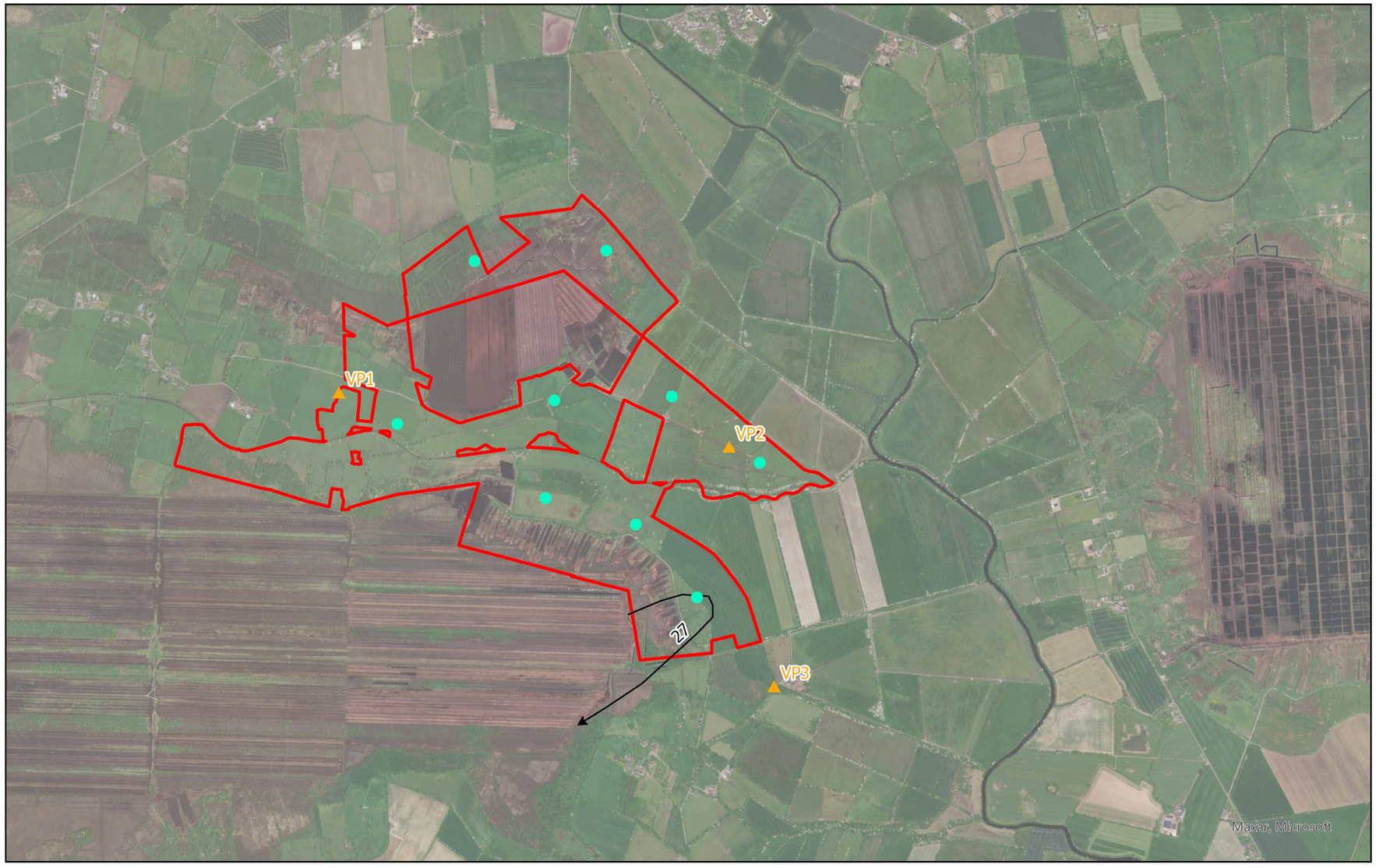
WetlandSurveys.ie

Kestrel: Summer 2022



Vantage Point Locations
Proposed Turbine Locations
Kestrel
Propsoed Windfarm Boundary

0 0.4 0.8 1.6 km

N

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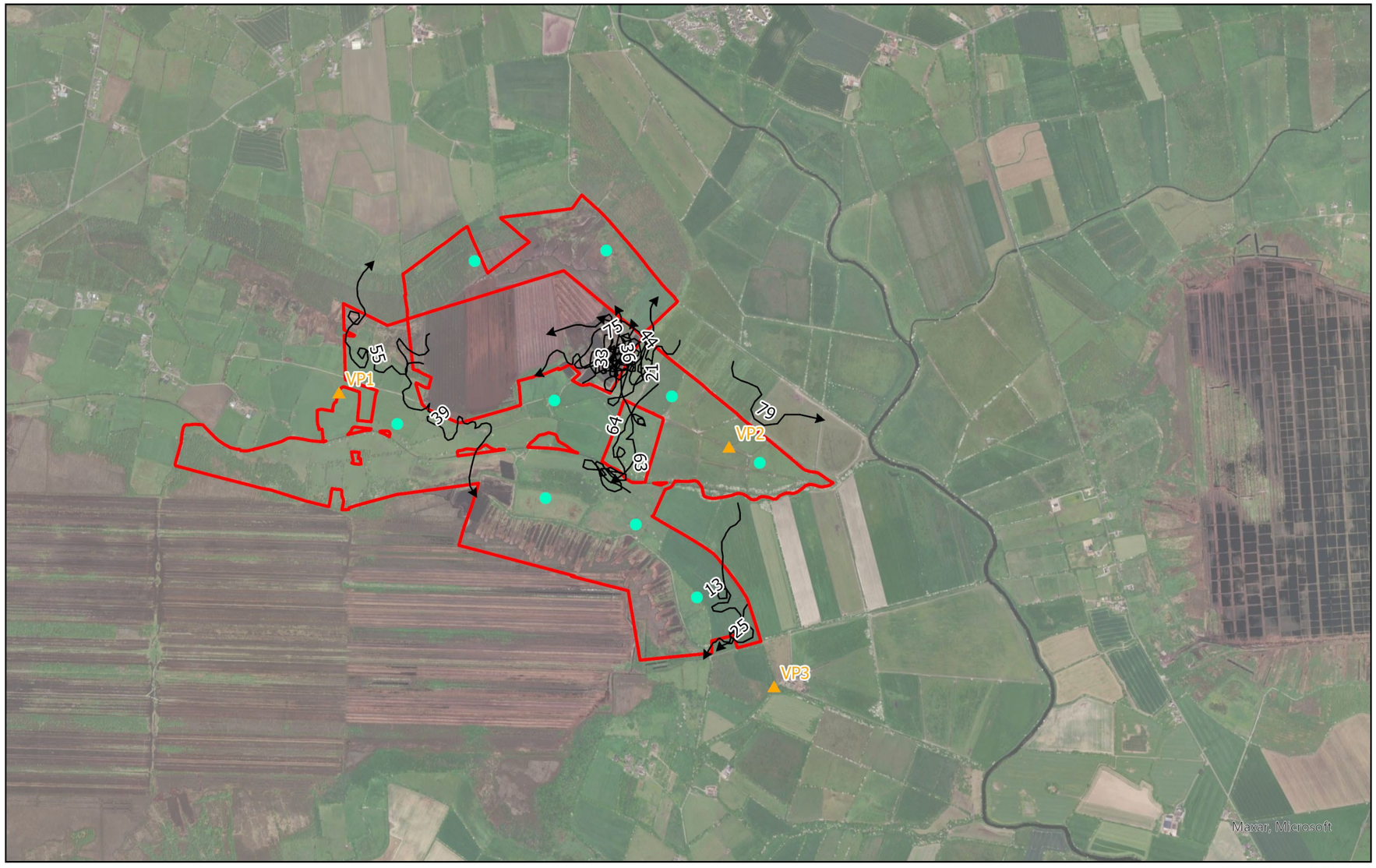
WetlandSurveys.ie

Kestrel: Winter 2022-23



Vantage Point Locations
Proposed Turbine Locations
Kestrel
Propsoed Windfarm Boundary

0 0.4 0.8 1.6 km

N

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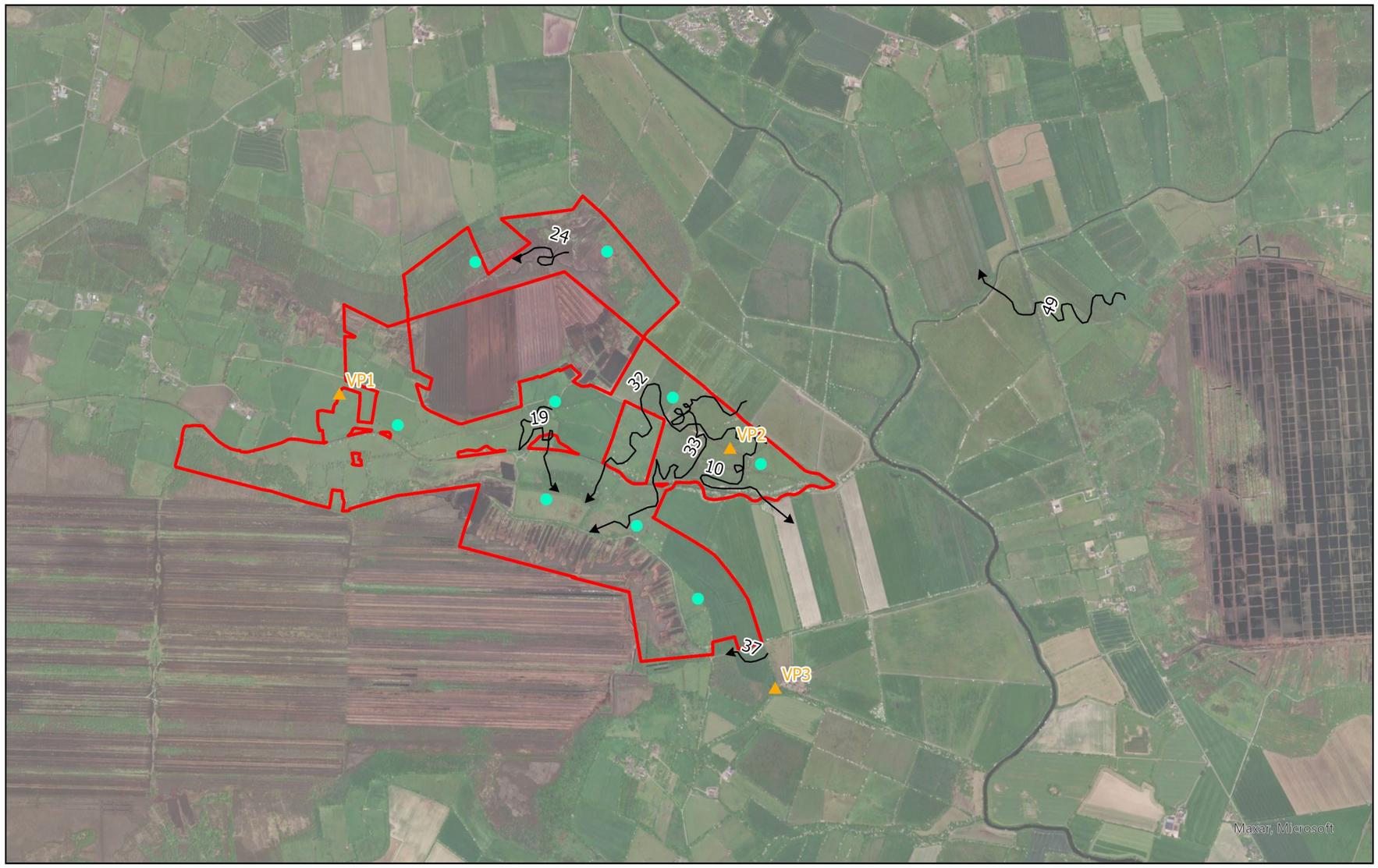
Kestrel: Winter 2023



Vantage Point Locations
Proposed Turbine Locations
Kestrel
Propsoed Windfarm Boundary

0 0.4 0.8 1.6 km

N

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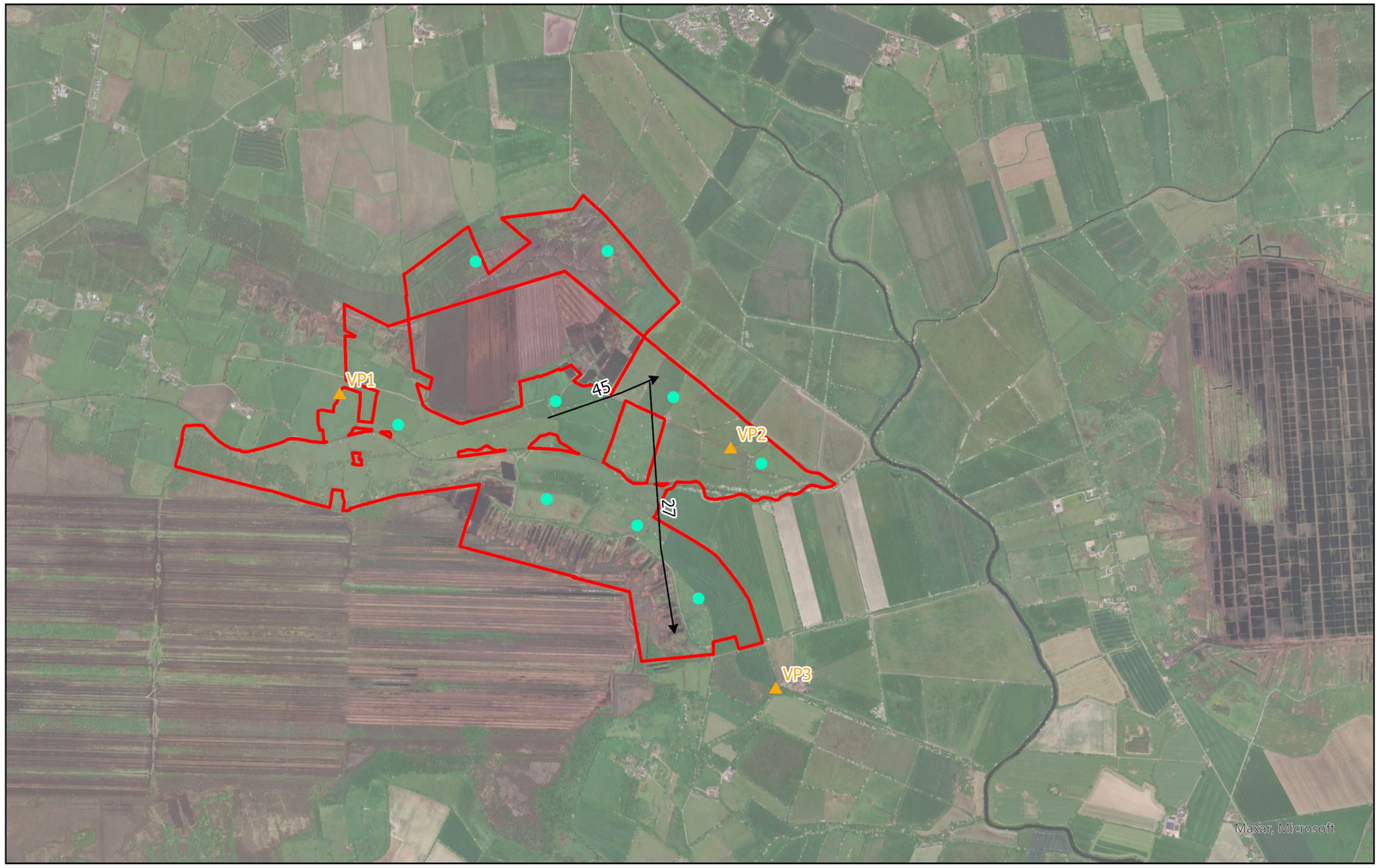
Lapwing: Winter 2021-22



Vantage Point Locations
Proposed Turbine Locations
Lapwing flightline
Propsoed Windfarm Boundary

0 0.4 0.8 1.6 km

N

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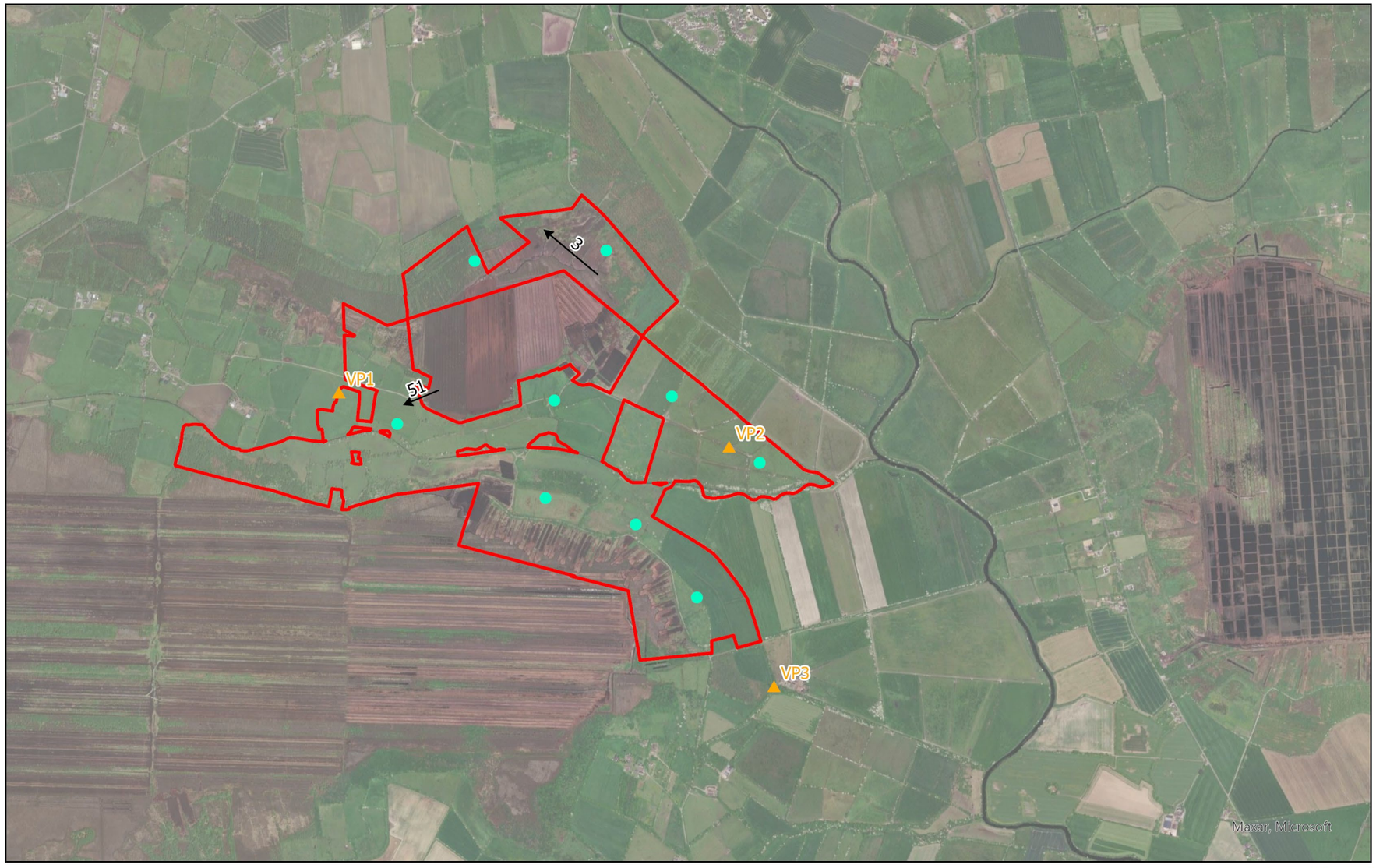
Lapwing: Summer 2022



▲ Vantage Point Locations
● Proposed Turbine Locations
→ Lapwing
▭ Propsoed Windfarm Boundary

0 0.4 0.8 1.6 km

N

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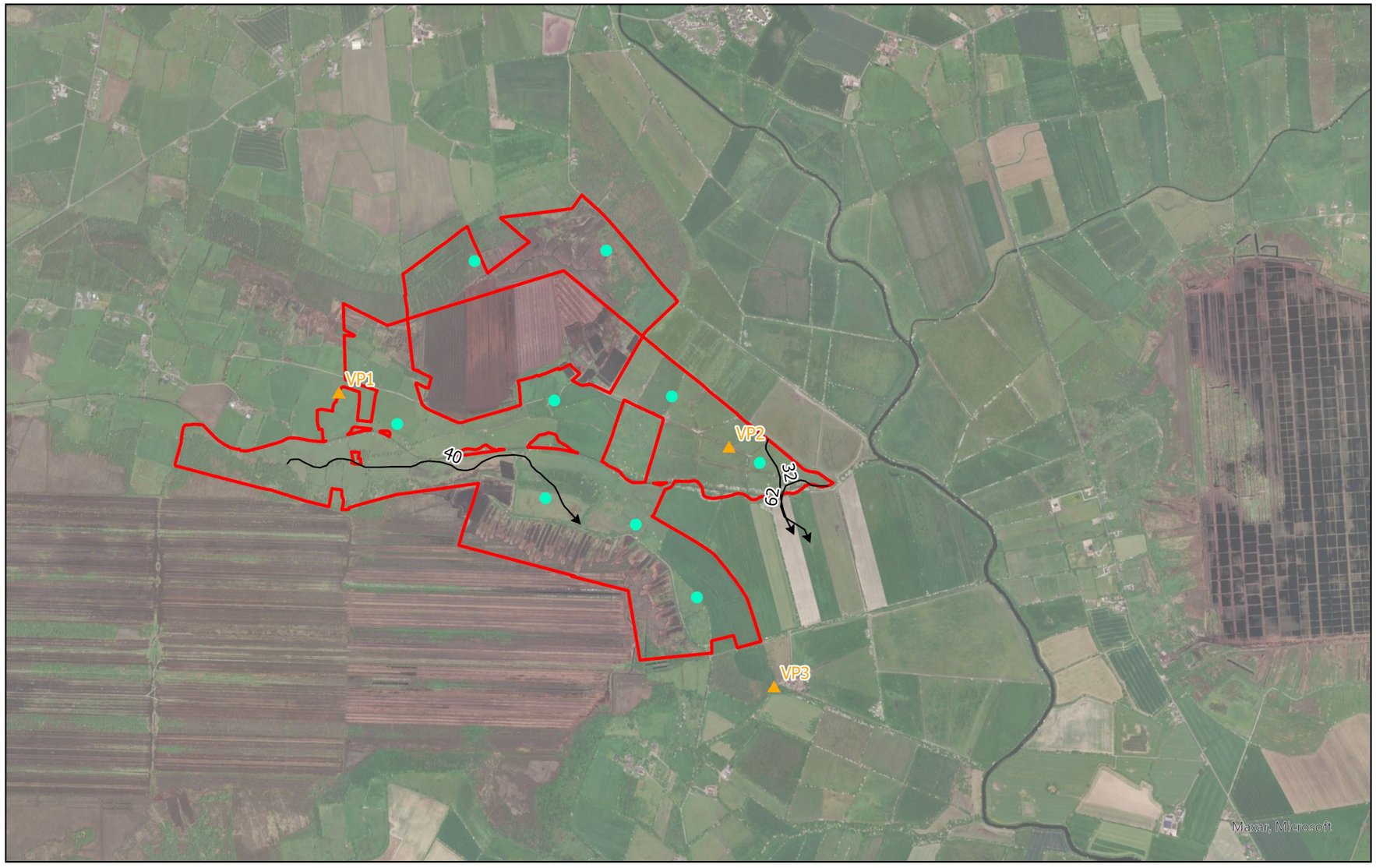
WetlandSurveys.ie

Lapwing: Winter 2022-23



Vantage Point Locations
Proposed Turbine Locations
Lapwing
Propsoed Windfarm Boundary

0 0.4 0.8 1.6 km

N

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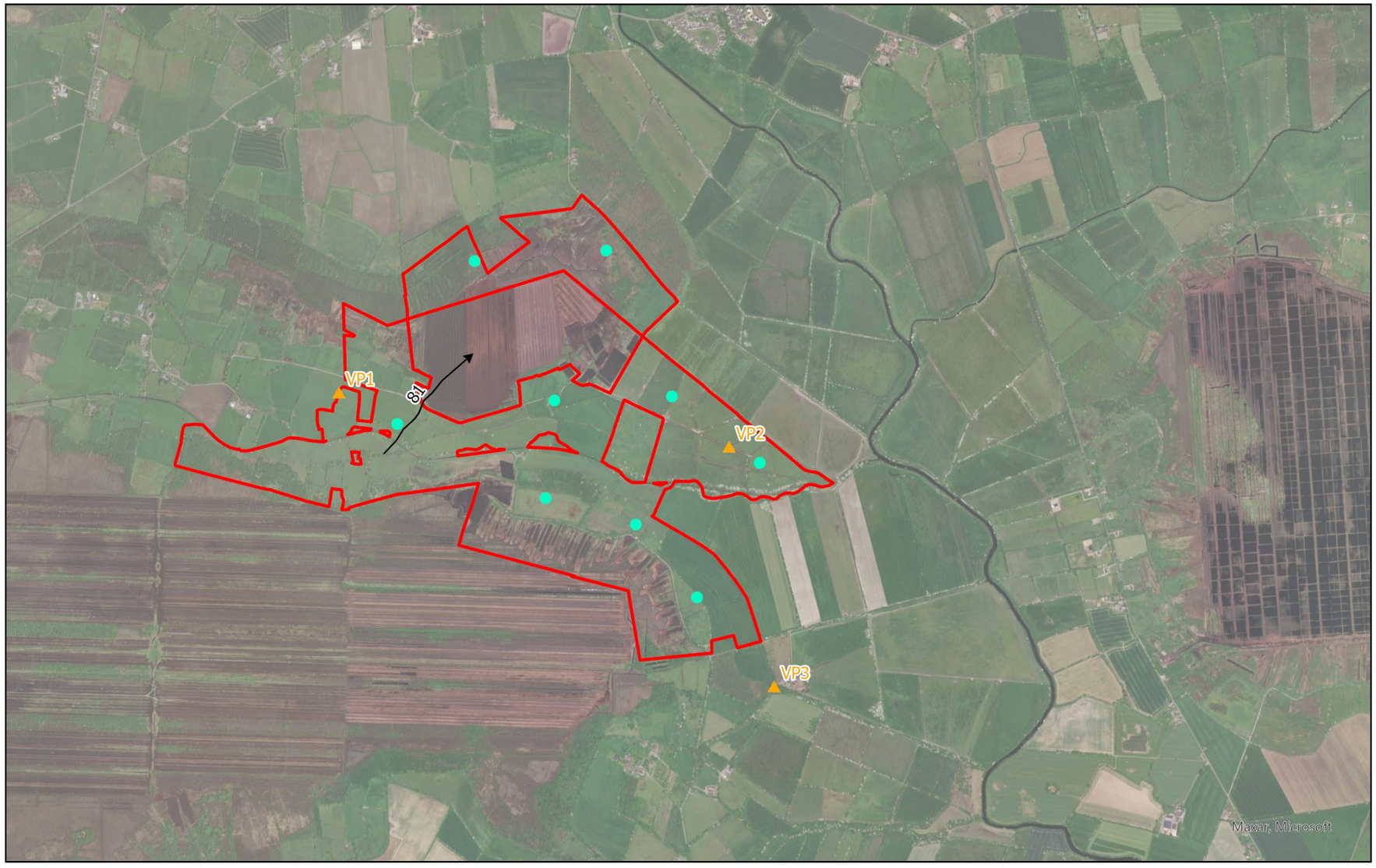
WetlandSurveys.ie

Mallard: Winter 2022-23



Vantage Point Locations
Proposed Turbine Locations
Mallard
Propsoed Windfarm Boundary

0 0.4 0.8 1.6 km

N

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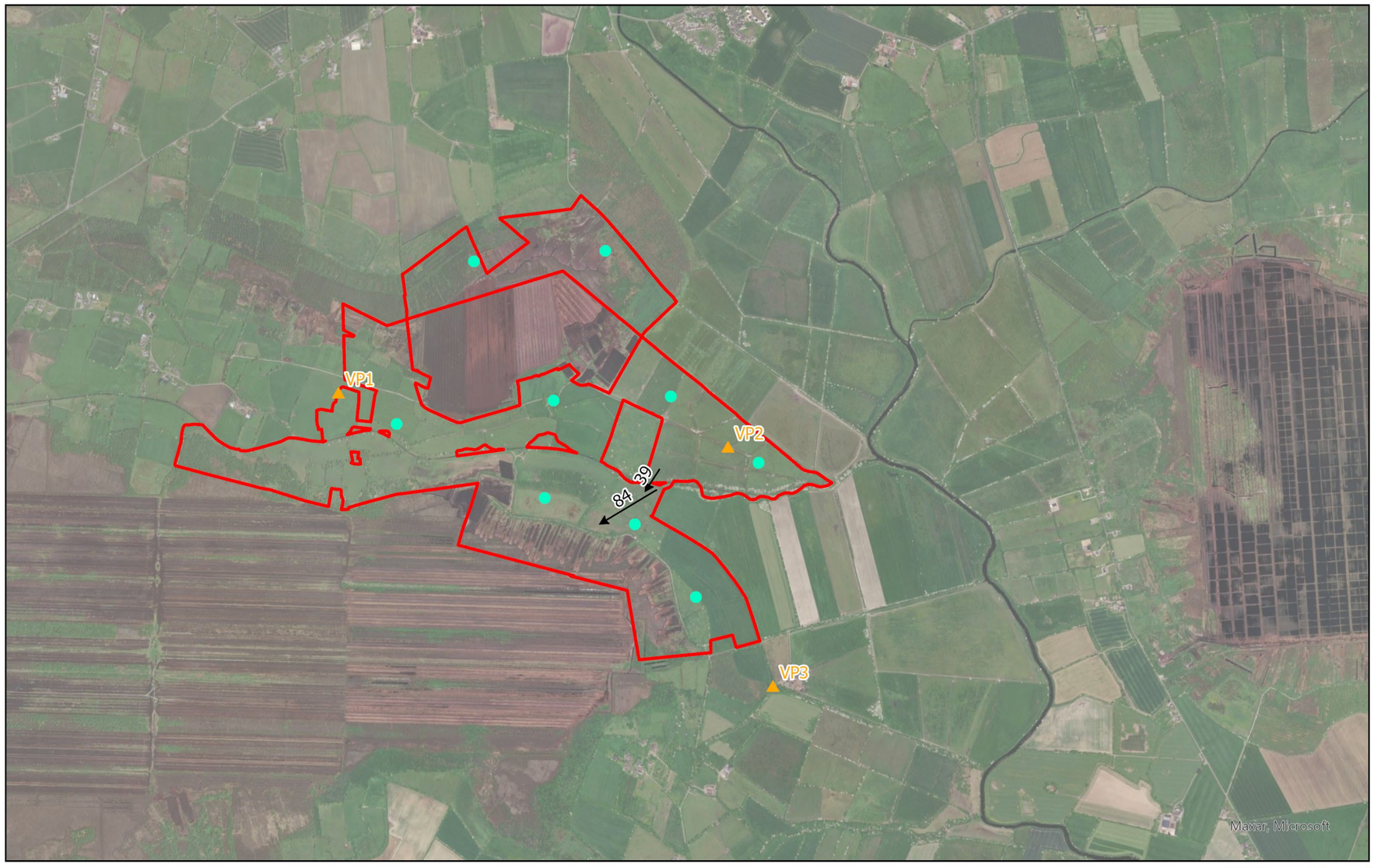
Merlin: Winter 2021-22



Vantage Point Locations
Proposed Turbine Locations
Merlin flightline
Propsoed Windfarm Boundary

0 0.4 0.8 1.6 km

N

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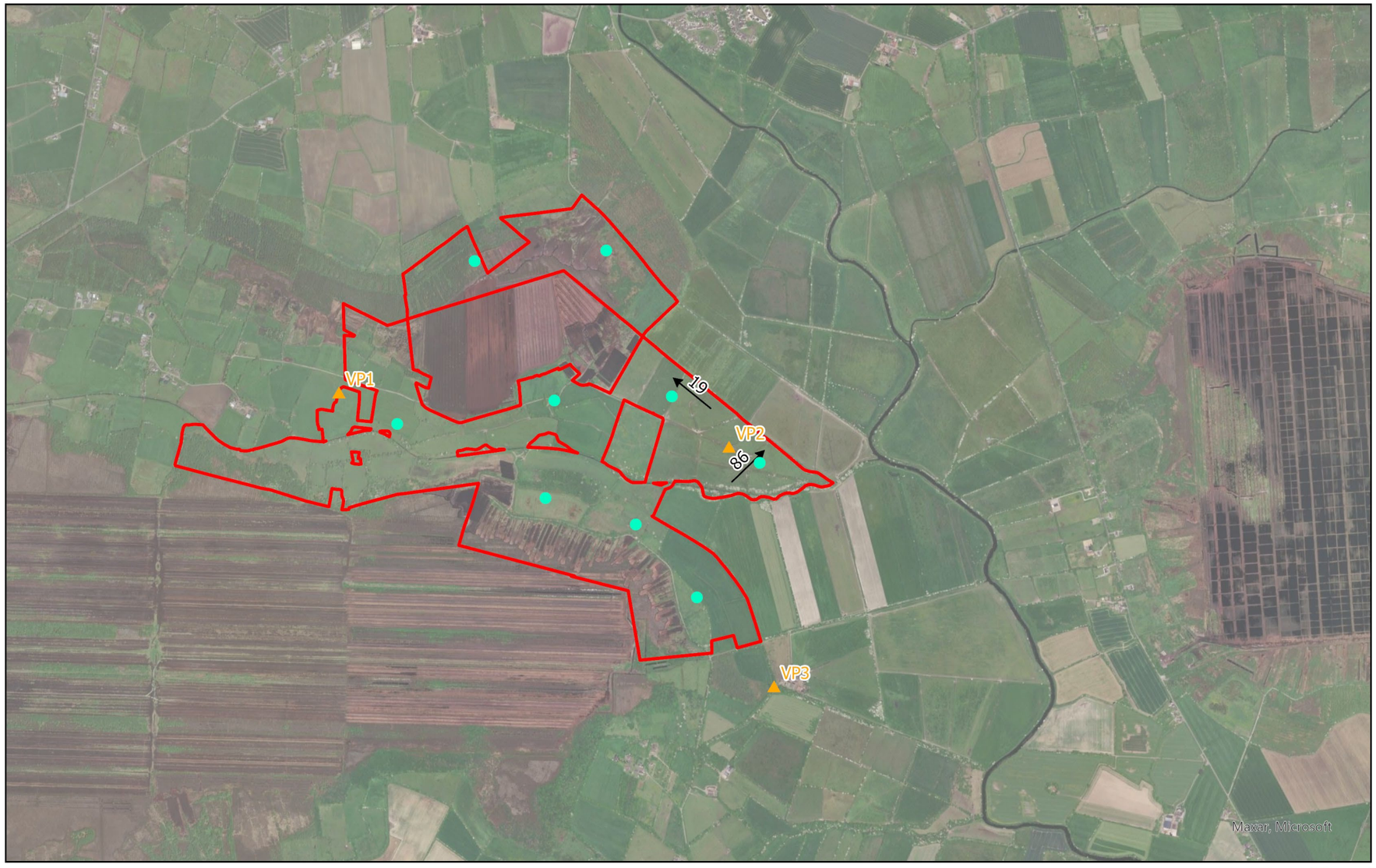
Peregrine: Winter 2021-22



Vantage Point Locations
Proposed Turbine Locations
Peregrine flightline
Propsoed Windfarm Boundary

0 0.4 0.8 1.6 km

N

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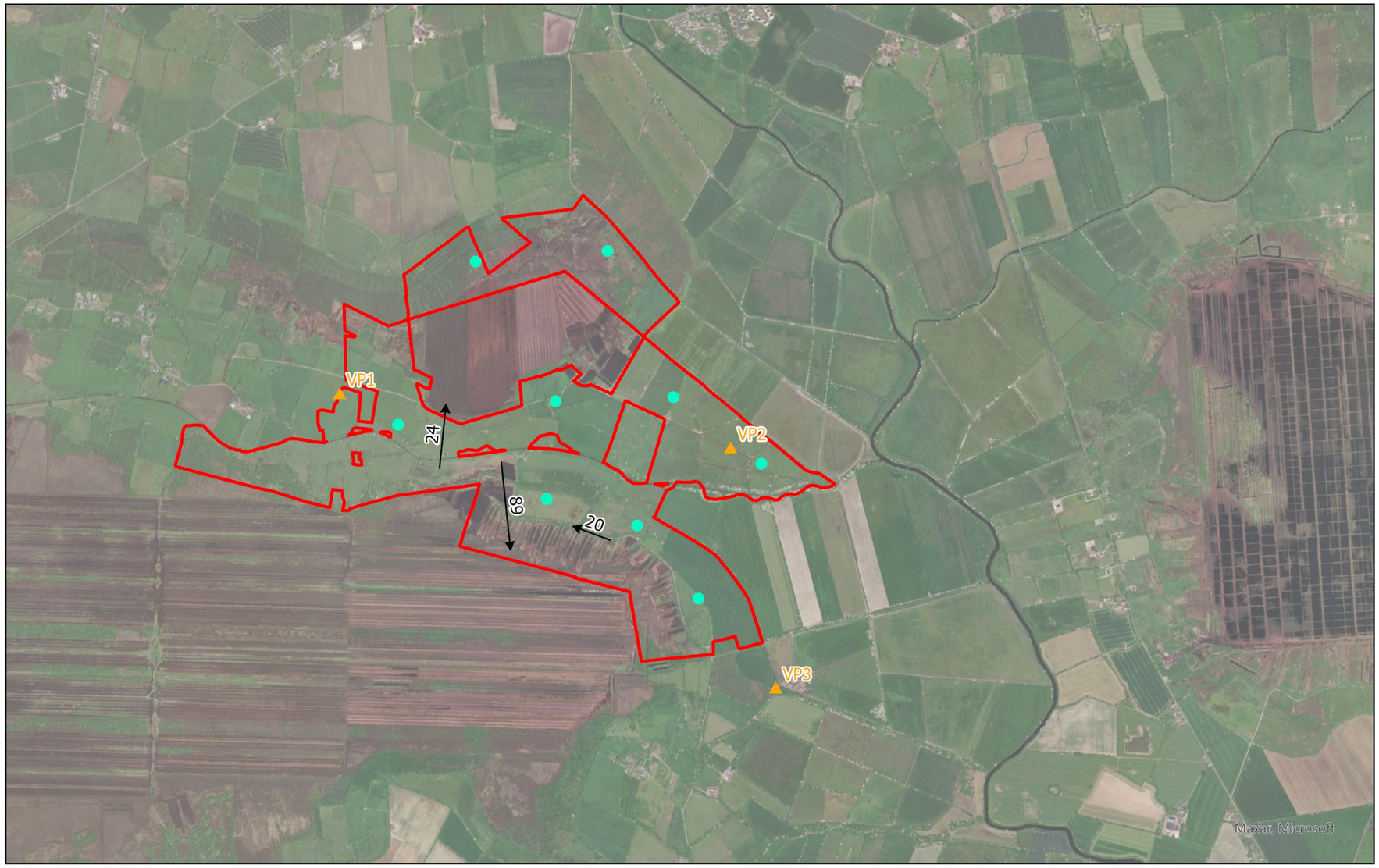
Sparrowhawk: Winter 2021-22



Vantage Point Locations
Proposed Turbine Locations
Sparrowhawk flightline
Propsoed Windfarm Boundary

0 0.4 0.8 1.6 km

N

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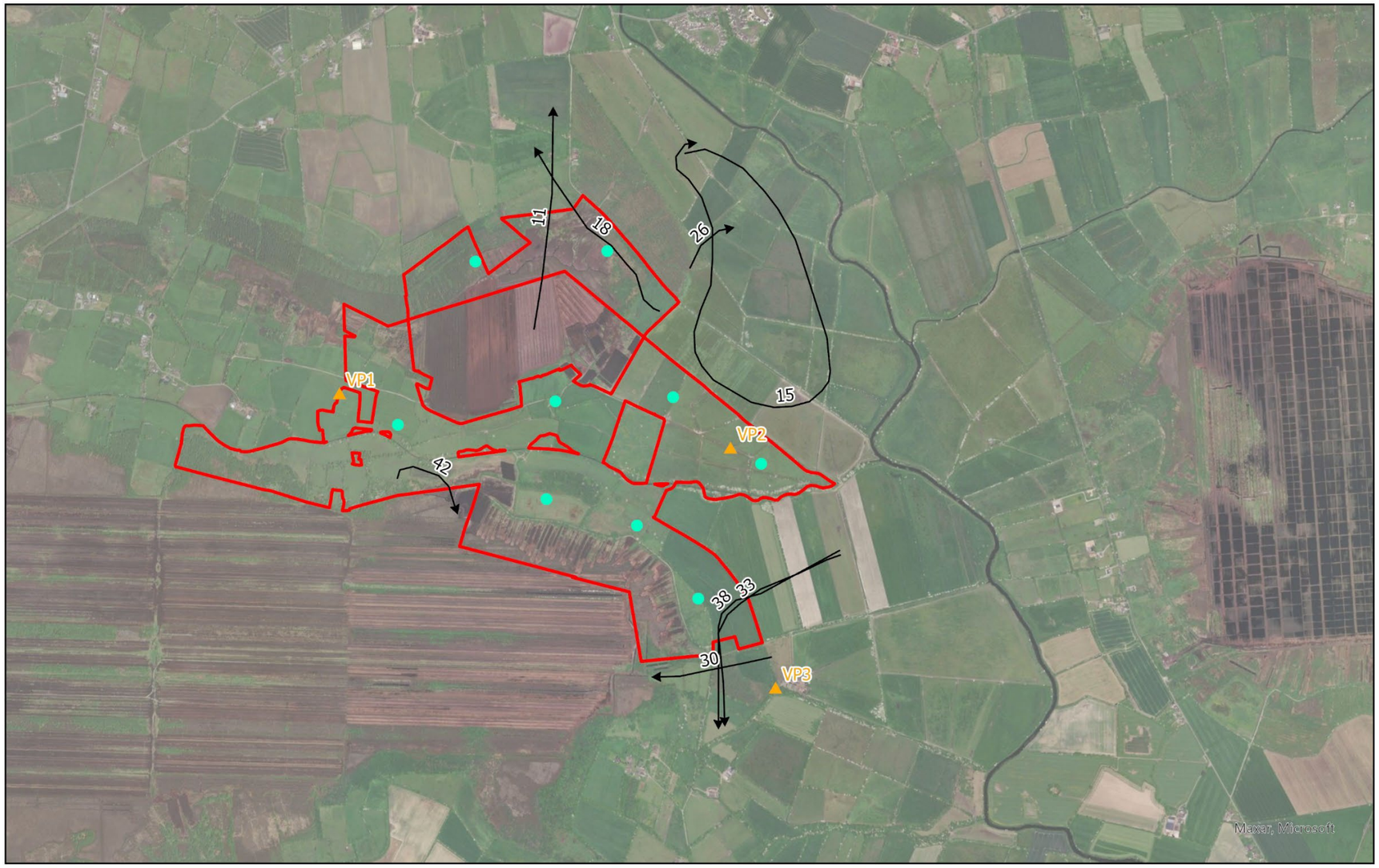
Sparrowhawk: Summer 2022



Vantage Point Locations
Proposed Turbine Locations
Sparrowhawk
Propsoed Windfarm Boundary

0 0.4 0.8 1.6 km

N

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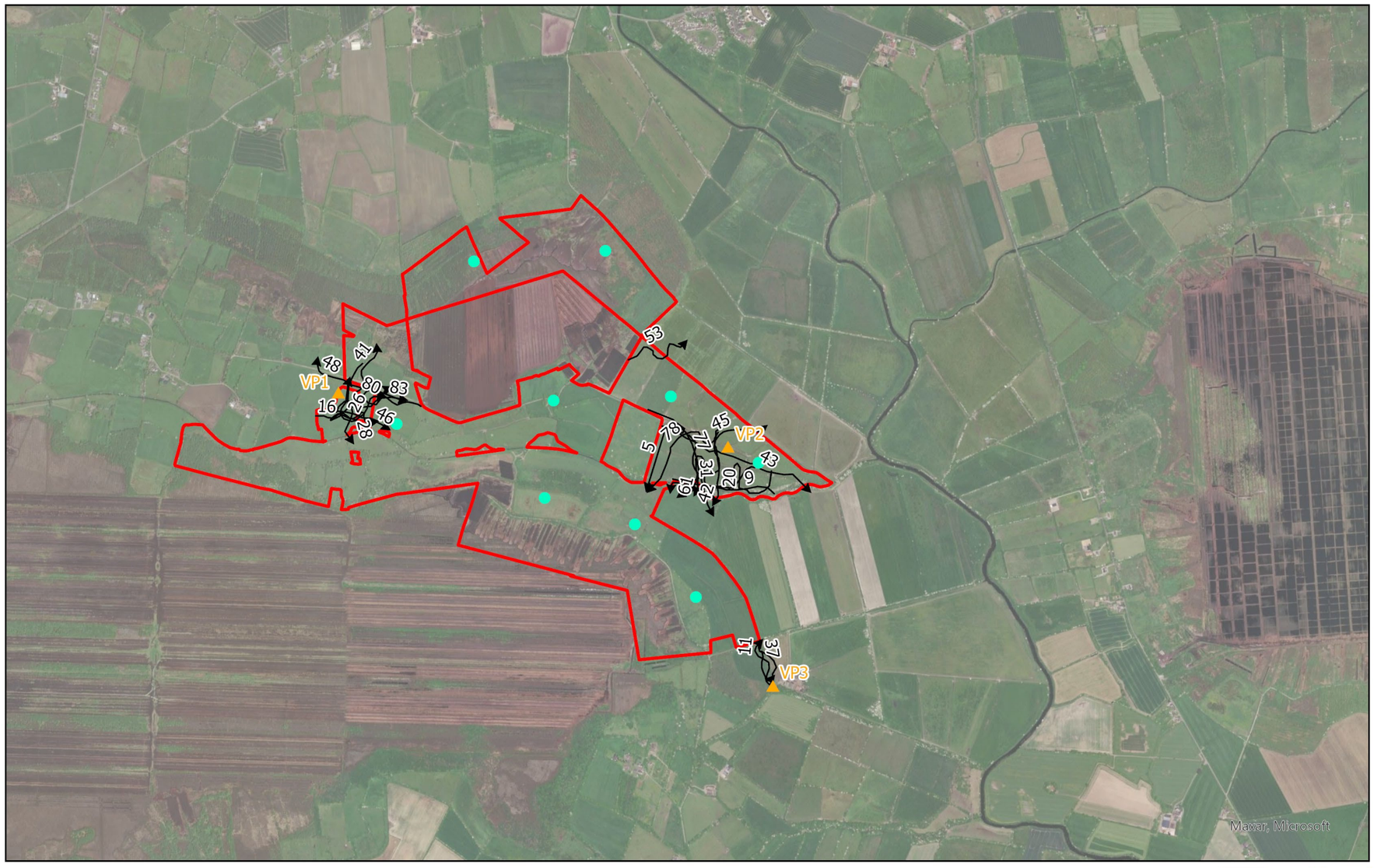
Sparrowhawk: Winter 2022-23



Vantage Point Locations
Proposed Turbine Locations
Sparrowhawk
Propsoed Windfarm Boundary

0 0.4 0.8 1.6 km

N

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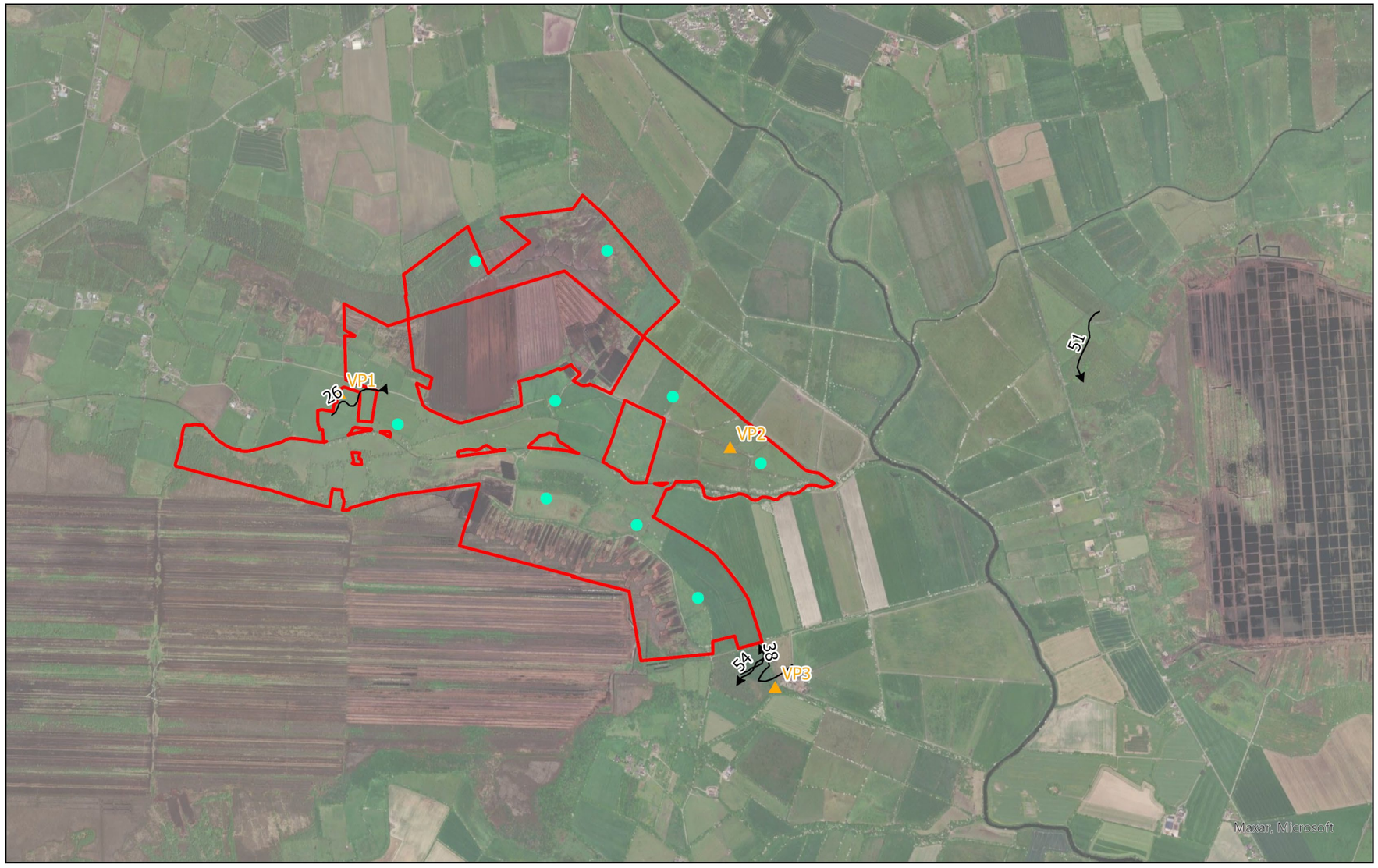
WetlandSurveys.ie

Sparrowhawk: Summer 2023



Vantage Point Locations
Proposed Turbine Locations
Sparrowhawk
Propsoed Windfarm Boundary

0 0.4 0.8 1.6 km

N

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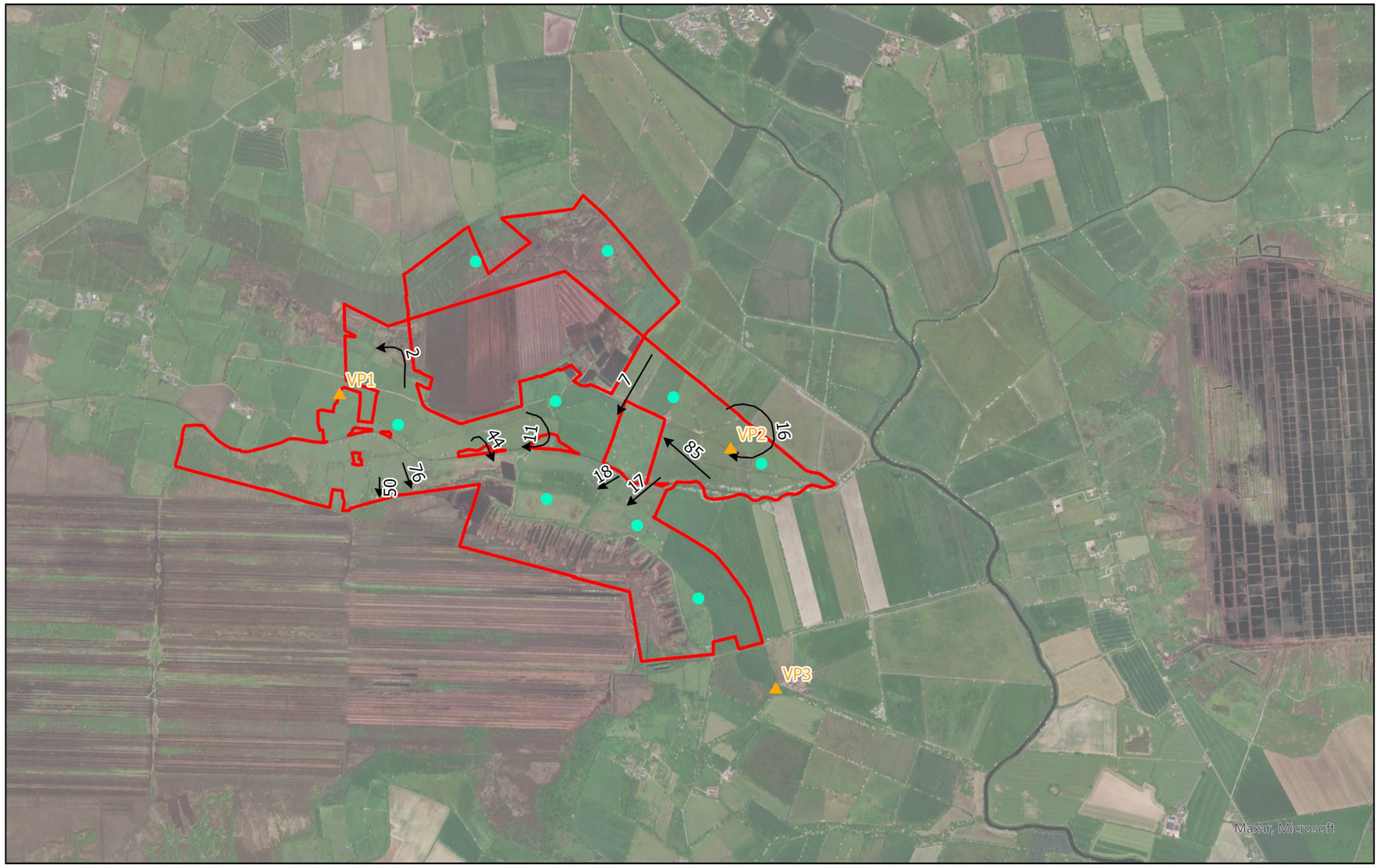
WetlandSurveys.ie

Snipe: Winter 2021-22



Vantage Point Locations
Proposed Turbine Locations
Snipe flightline
Propsoed Windfarm Boundary

0 0.4 0.8 1.6 km

N

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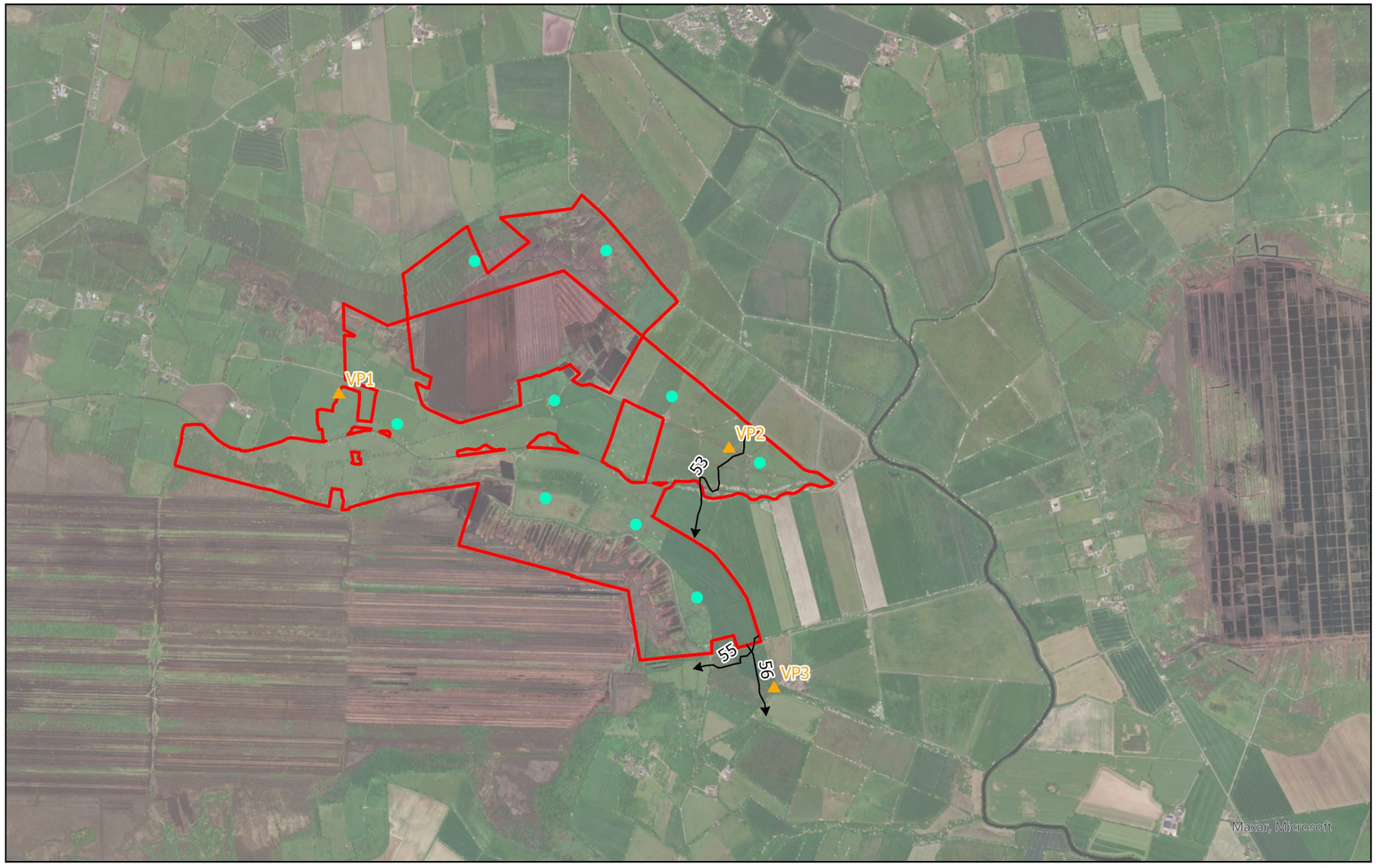
WetlandSurveys.ie

Snipe: Summer 2023



Vantage Point Locations
Proposed Turbine Locations
Snipe
Propsoed Windfarm Boundary

0 0.4 0.8 1.6 km

N

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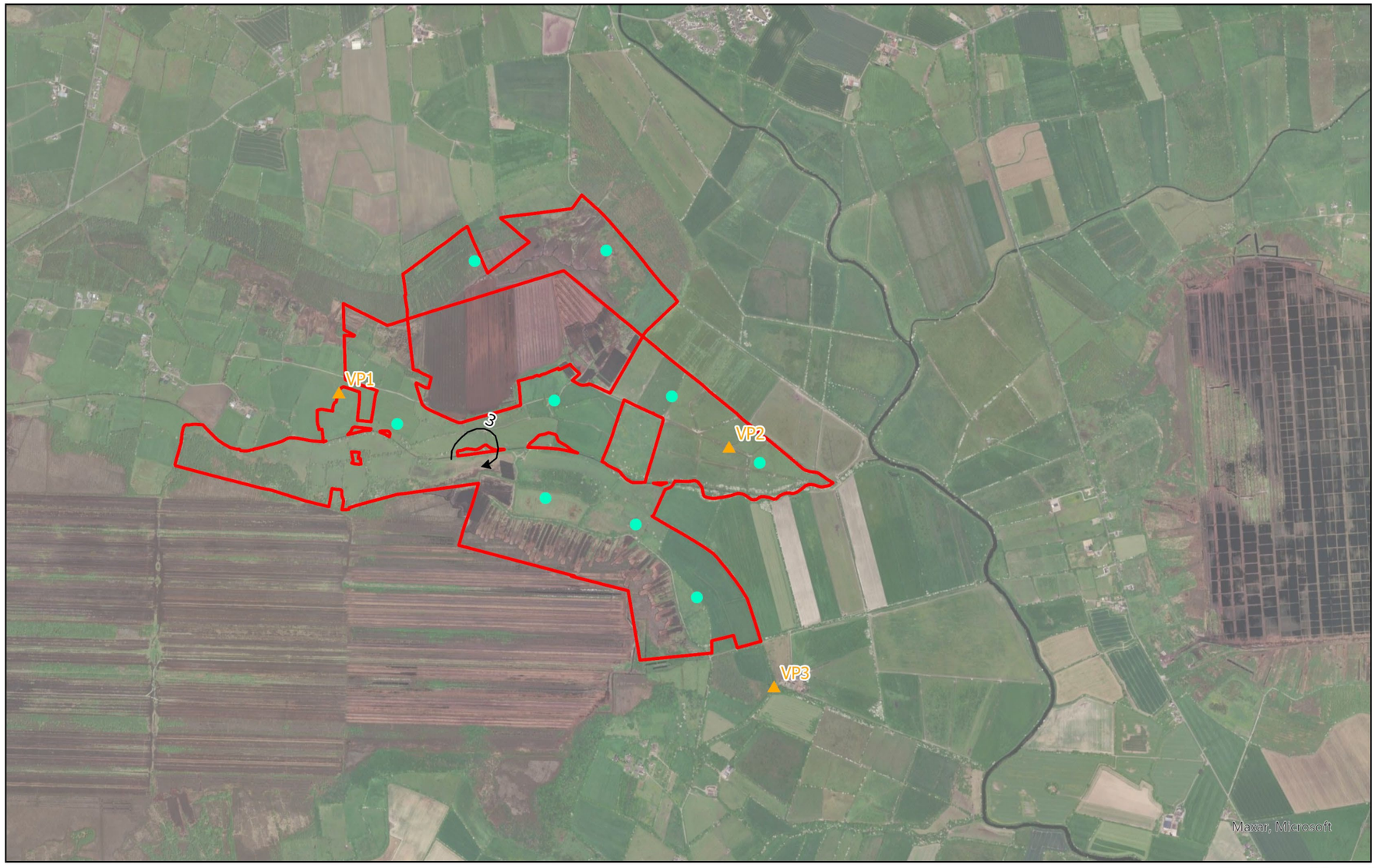
WetlandSurveys.ie

Woodcock: Winter 21-22



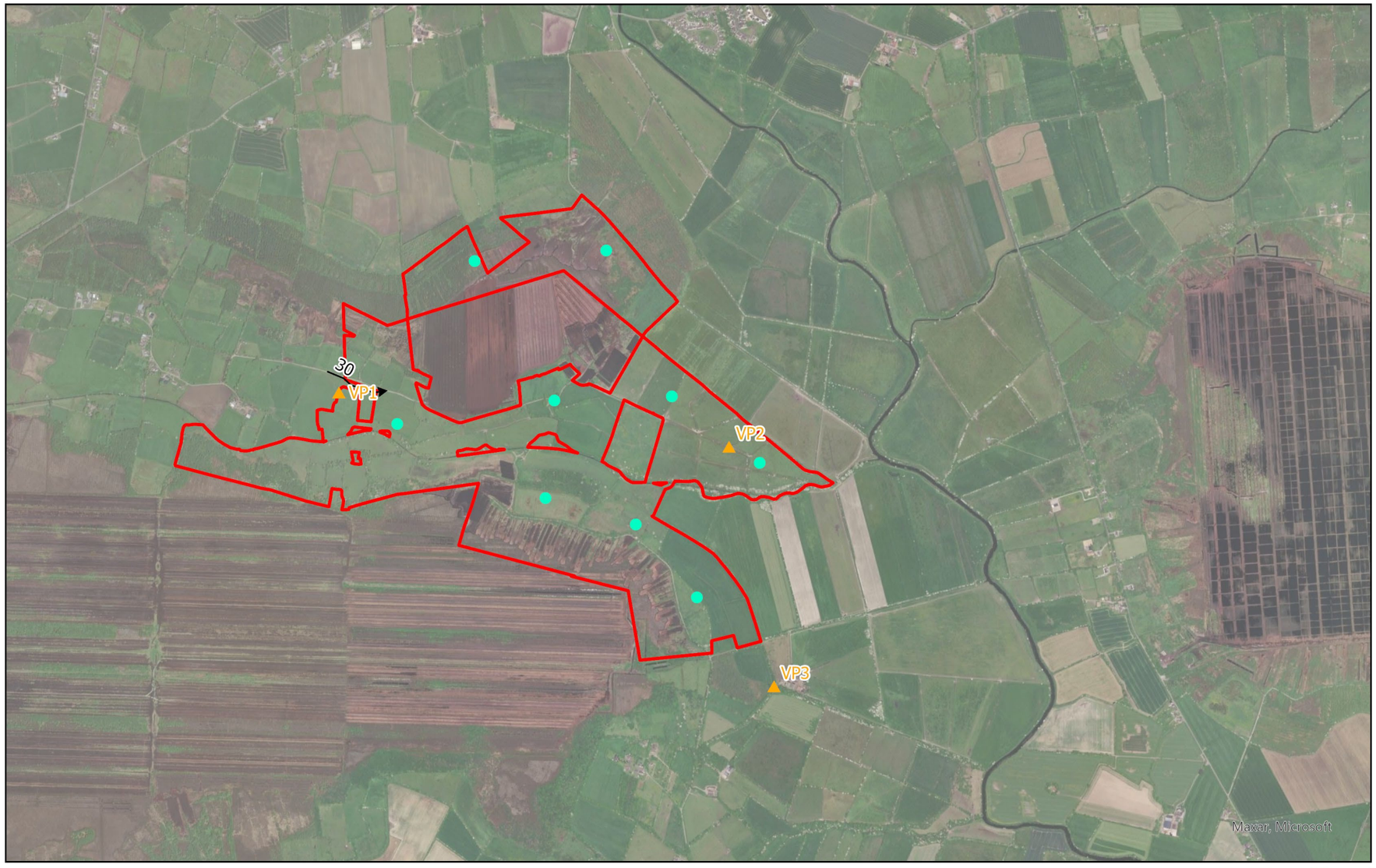
▲ Vantage Point Locations
● Proposed Turbine Locations
→ Woodcock flightline
▭ Propsoed Windfarm Boundary

0 0.4 0.8 1.6 km

N

wetland surveys ireland
WetlandSurveys.ie

Woodcock: Winter 2022-23



Vantage Point Locations
Proposed Turbine Locations
Woodcock
Propsoed Windfarm Boundary

0 0.4 0.8 1.6 km

N

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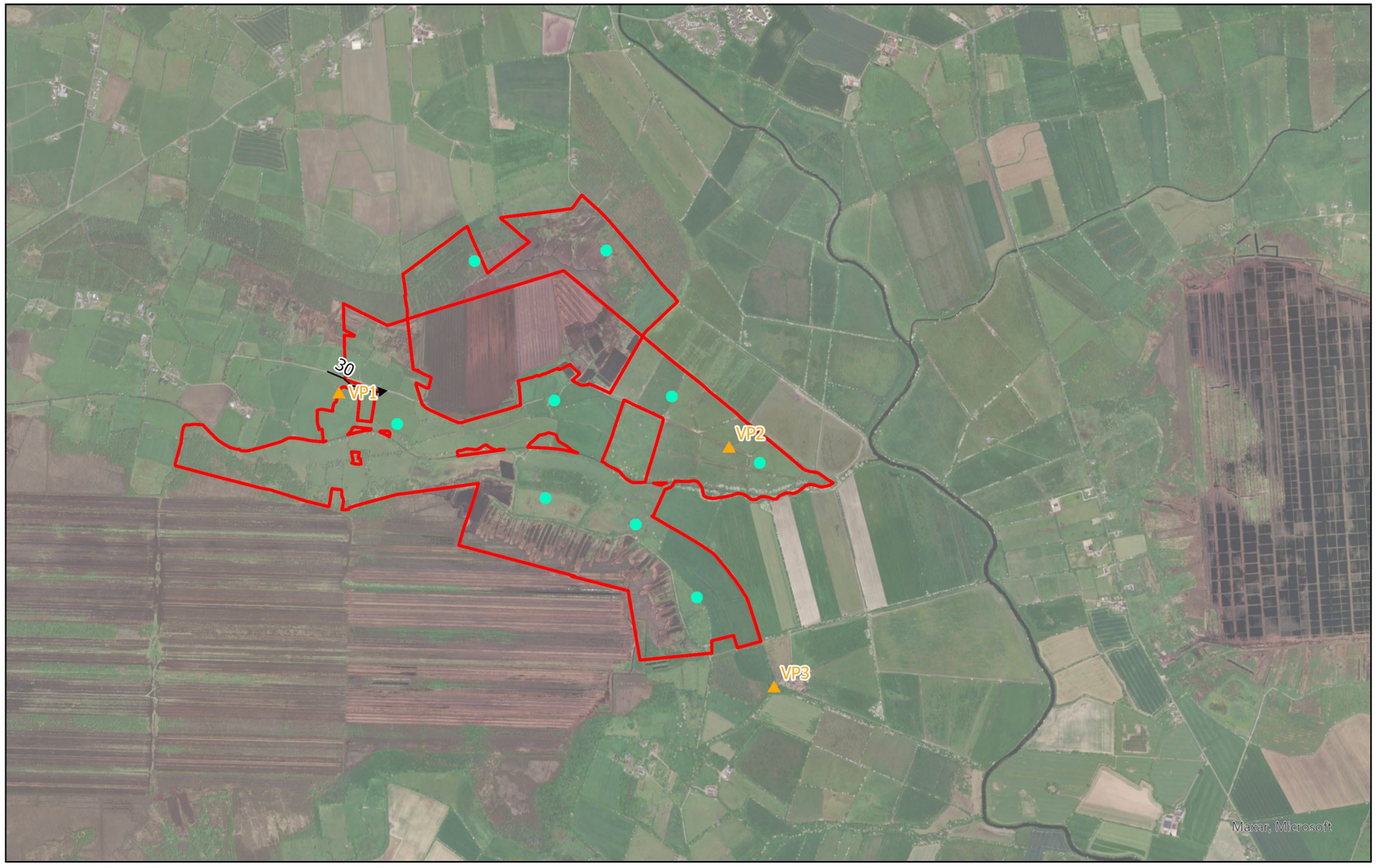
WetlandSurveys.ie

Whooper Swan: Winter 21-22



Vantage Point Locations
Proposed Turbine Locations
Woodcock
Propsoed Windfarm Boundary

0 0.4 0.8 1.6 km

N

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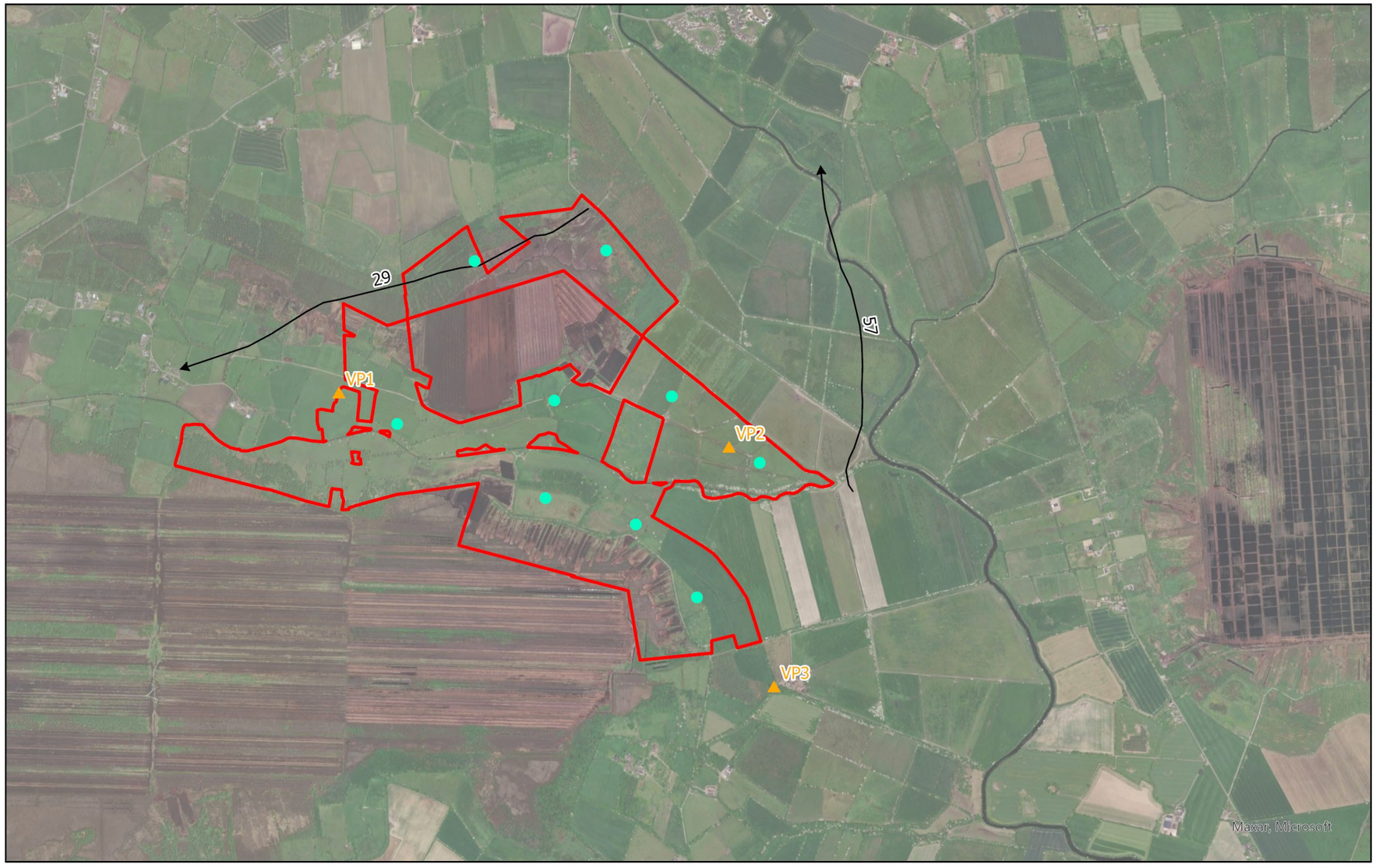
WetlandSurveys.ie

Whooper Swan: Winter 22-23



Vantage Point Locations

Proposed Turbine Locations

Whooper Swan

Propsoed Windfarm Boundary

0 0.4 0.8 1.6 km

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APPENDIX 10.4.ii

Walkover Surveys Data and Maps

Appendix 4a

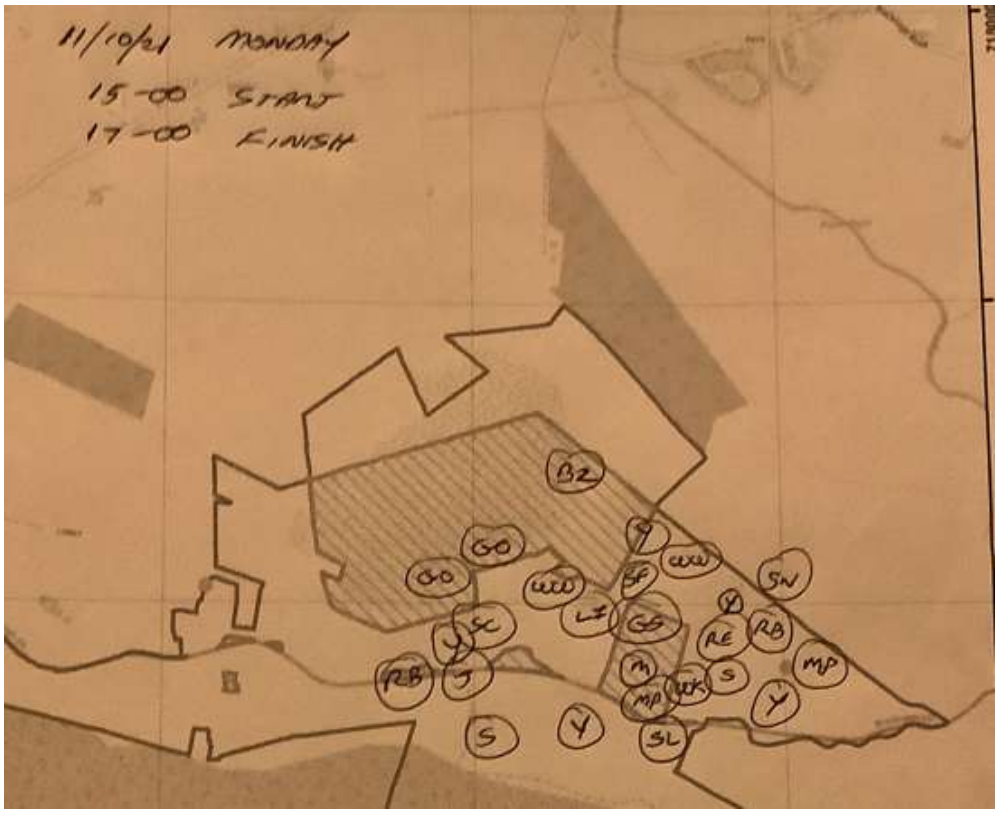
Winter Walkover Survey Data and Maps

Survey date	Map Label	Species	Number	Habitat	Comments	Age / Sex
11/10/2021	2	Buzzard	1			
11/10/2021	1	Linnet	18			
11/10/2021	6	Meadow Pipit	4			
11/10/2021	4	Snipe	2			
11/10/2021	5	Woodcock	1			
11/10/2021	3	Yellowhammer	9			
12/10/2021	5	Buzzard	1			
12/10/2021	2	Kestrel	1			
12/10/2021	1	Meadow Pipit	19			
12/10/2021	4	Skylark	1			
08/11/2021	2	Meadow Pipit	15			
08/11/2021	1	Snipe	1			
09/11/2021	1	Yellowhammer	5			
02/12/2021	2	Linnet	12			
02/12/2021	1	Yellowhammer	2			
03/12/2021	1	Kestrel	1			
03/12/2021	2	Kingfisher	1			
03/12/2021	3	Meadow Pipit	17			
03/01/2022	2	Snipe	1			
03/01/2022	1	Yellowhammer	1			
04/01/2022	1	Yellowhammer	1			
07/03/2022	1	Yellowhammer	1			
08/03/2022	3	Kestrel	1			
08/03/2022	2	Meadow Pipit	1			
08/03/2022	1	Sparrowhawk	1			
31/10/2022	6	Buzzard	1	GA1	Soaring	A
31/10/2022	18	Buzzard	1	PB	Soaring	A
31/10/2022	19	Buzzard	1	GA1	Travelling	A
31/10/2022	3	Golden Plover	1500	GA1	Circling	
31/10/2022	21	Golden Plover	200	PB	Circling	
31/10/2022	9	Kestrel	1	GA1	Hunting	M/A
31/10/2022	20	Mallard	3	GA1	Travelling	
31/10/2022	2	Meadow Pipit	8	GS	Foraging/ Flushed	
31/10/2022	5	Meadow Pipit	3	GA1	Foraging	
31/10/2022	7	Meadow Pipit	5	GA1	Foraging/ flushed	
31/10/2022	10	Meadow Pipit	3	GA1/WLI	Foaging	
31/10/2022	13	Meadow Pipit	7	GS	Foraging	
31/10/2022	16	Meadow Pipit	4	GA1	Foraging	
31/10/2022	1	Redwing	11	WLI	Foraging	
31/10/2022	4	Redwing	4	GA1	Foraging/ Travelling	
31/10/2022	8	Redwing	2	GA1	Travelling	
31/10/2022	15	Redwing	2	WLI	Travelling	
31/10/2022	17	Redwing	25	GA1	Foraging/ Travelling	
31/10/2022	11	Snipe	1	GA1	Flushed	

Survey date	Map Label	Species	Number	Habitat	Comments	Age / Sex
31/10/2022	12	Snipe	5	PB	Travelling	
31/10/2022	14	Sparrowhawk	1	WLI	Hunting	F/A
13/11/2022	6	Grey Wagtail	1	FW2	Foraging	A
13/11/2022	15	Grey Wagtail	1	GA1	Foraging	A
13/11/2022	4	Kestrel	1	GA1	Hunting	M/A
13/11/2022	3	Meadow Pipit	3	GS	Foraging	A
13/11/2022	5	Meadow Pipit	3	GA1	Foraging/ Flushed	A
13/11/2022	7	Meadow Pipit	2	GS	Foraging	A
13/11/2022	9	Meadow Pipit	1	PB4	Flushed	A
13/11/2022	13	Meadow Pipit	8	GA1	Foraging	A
13/11/2022	1	Redwing	4	WLE	Foraging	A
13/11/2022	2	Redwing	11	GA1	Foraging	A
13/11/2022	8	Redwing	6	GA1	Foraging	A
13/11/2022	10	Redwing	5	WS1	Foraging	A
13/11/2022	14	Redwing	14	FGA1	Foraging	A
13/11/2022	11	Sparrowhawk	1	WS1	Hunting	F/A
13/11/2022	12	Sparrowhawk	1	WS1	Travelling	F/A
07/12/2022	14	Golden Plover	18	GA1	Travelling	
07/12/2022	13	Kestrel	1	PB	Hunting	M/A
07/12/2022	8	Mallard	2	FW2	Flushed	
07/12/2022	3	Meadow Pipit	4	PB	Foraging	
07/12/2022	5	Meadow Pipit	2	GA1	Foraging/ Flushed	
07/12/2022	12	Meadow Pipit	5	GS	Foraging/ Flushed	
07/12/2022	1	Redwing	7	WL1	Foraging	
07/12/2022	4	Redwing	12	GA1	Foraging	
07/12/2022	7	Redwing	4	GA1	Foraging	
07/12/2022	9	Redwing	5	GA1	For	
07/12/2022	11	Redwing	3	WS1	Foraging	
07/12/2022	15	Redwing	2	WS1	Foraging	
07/12/2022	16	Redwing	2	GA1	Foraging	
07/12/2022	2	Snipe	3	PB	Flushed	
07/12/2022	10	Snipe	1	PB	Flushed	
07/12/2022	18	Snipe	2	GA1	Travelling	
07/12/2022	17	Sparrowhawk	1	GA1	Hunting	F/A
07/12/2022	6	Yellowhammer	1	WL1	Perched	M/A
12/01/2023	11	Buzzard	1	GA1	Travelling	
12/01/2023	3	Meadow Pipit	4	GA1	Foraging	
12/01/2023	1	Redwing	8	GA1	Foraging	
12/01/2023	5	Redwing	5	WL1	Foraging	
12/01/2023	6	Redwing	2	WL1	Foraging	
12/01/2023	9	Redwing	4	WS1	Travelling	
12/01/2023	10	Redwing	7	WS1	Foraging	
12/01/2023	12	Redwing	11	GA1	Foraging	
12/01/2023	2	Snipe	3	PB	Flushed	
12/01/2023	4	Snipe	1	GA1	Flushed	
12/01/2023	7	Snipe	1	GA1	Flushed	
12/01/2023	8	Yellowhammer	3	WL1	Foraging	
12/01/2023	13	Yellowhammer	2	WL1	Perched	

Survey date	Map Label	Species	Number	Habitat	Comments	Age / Sex
02/02/2023	11	Buzzard	1	WL2	Perched	
02/02/2023	14	Golden Plover	30	GA1	Travelling	
02/02/2023	9	Grey Heron	1	FW2	Flushed	
02/02/2023	4	Meadow Pipit	4	GS	Foraging	
02/02/2023	5	Meadow Pipit	2	GS	Flushed	
02/02/2023	7	Meadow Pipit	2	GA1	Foraging	
02/02/2023	1	Redwing	12	GA1	Foraging	
02/02/2023	6	Redwing	7	GA1	Foraging	
02/02/2023	8	Redwing	17	GA1	Foraging	
02/02/2023	13	Redwing	8	GA1	Foraging	
02/02/2023	15	Redwing	4	GA1	Foraging	
02/02/2023	16	Redwing	15	GA1	Foraging	
02/02/2023	3	Snipe	3	PB	Flushed	
02/02/2023	10	Sparrowhawk	1	WL1	Hunting	
02/02/2023	2	Yellowhammer	1	WL1	Perched	
02/02/2023	12	Yellowhammer	3	WL1	Foraging	
02/03/2023	19	Buzzard	1	GA1	Hunting	
02/03/2023	21	Buzzard	1	WL2	Perched	
02/03/2023	16	Grey Heron	1	GA1	Foraging	
02/03/2023	7	Kestrel	1	GA1	Hunting	
02/03/2023	14	Mallard	2	FW2	Flushed	
02/03/2023	15	Mallard	3	FS	Flushed	
02/03/2023	1	Meadow Pipit	3	GA1	Foraging	
02/03/2023	4	Meadow Pipit	4	PB	Foraging/Displaying	
02/03/2023	6	Meadow Pipit	2	GA1	Displaying	
02/03/2023	8	Meadow Pipit	2	GA1	Displaying	
02/03/2023	10	Meadow Pipit	4	GA1	Foraging	
02/03/2023	12	Meadow Pipit	2	GS	Foraging	
02/03/2023	17	Meadow Pipit	5	GA1	Foraging/Displaying	
02/03/2023	20	Meadow Pipit	4	GA1	Foraging	
02/03/2023	5	Redwing	9	GA1	Travelling	
02/03/2023	11	Redwing	5	WS1	Foraging	
02/03/2023	13	Redwing	4	WL1	Foraging	
02/03/2023	18	Redwing	11	GA1	Travelling	
02/03/2023	2	Snipe	1	PB	Flushed	
02/03/2023	3	Snipe	2	PB	Flushed	
02/03/2023	9	Yellowhammer	3	WL1	Perched	

Winter walkover: 11/10/21



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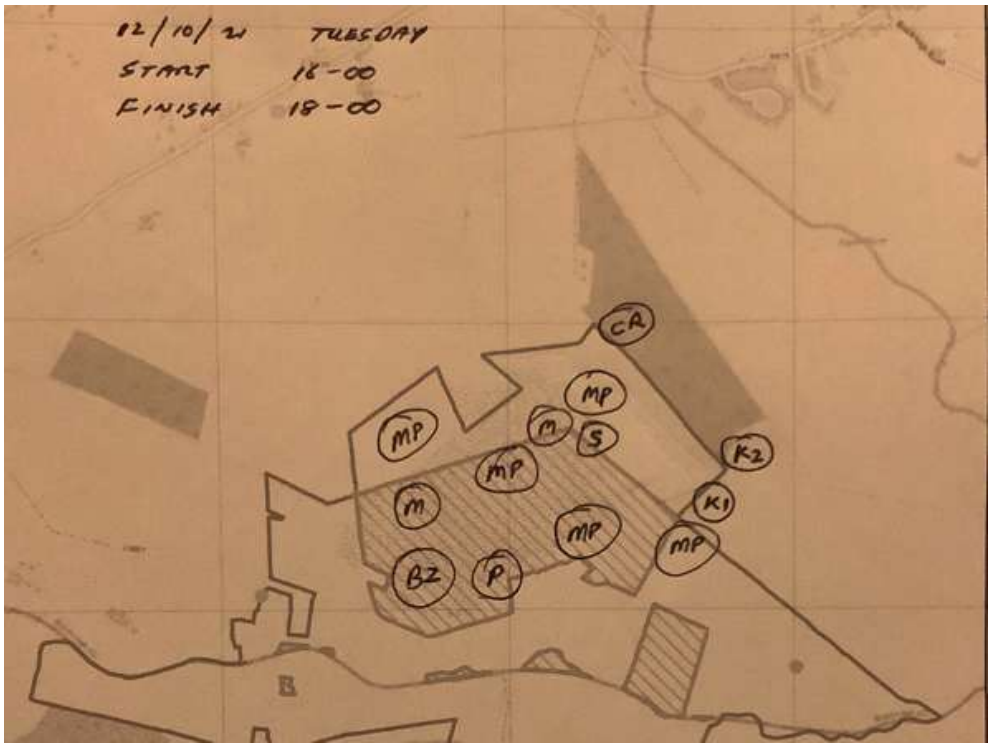
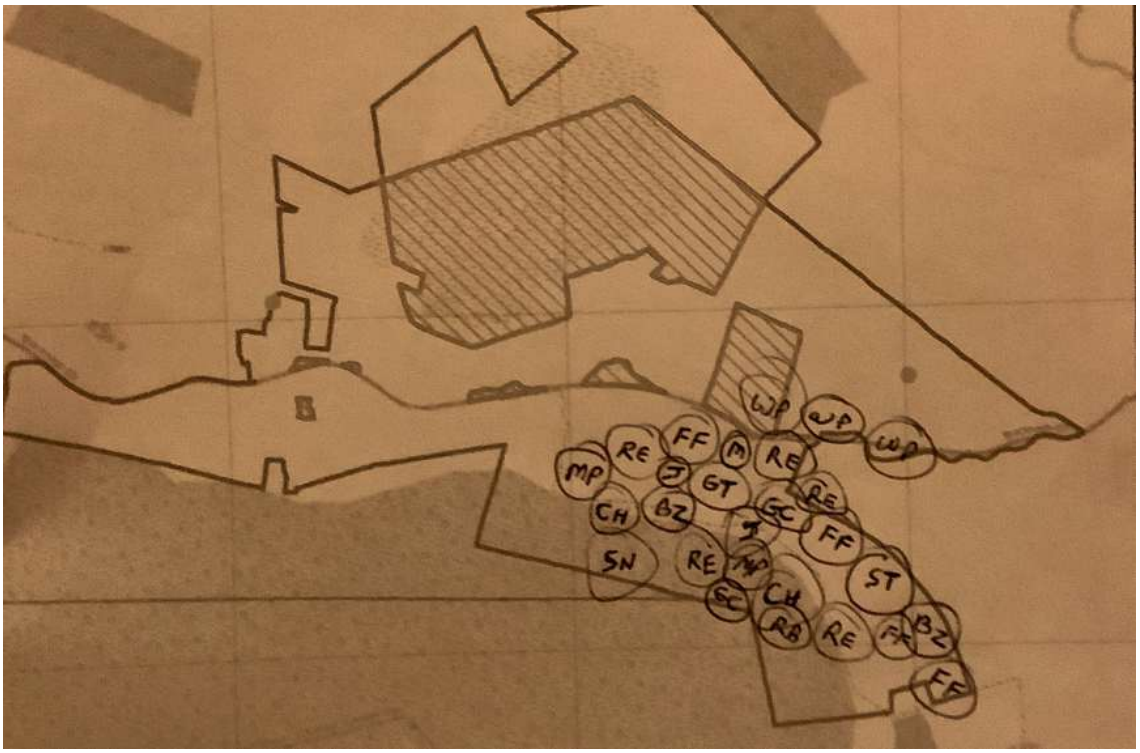
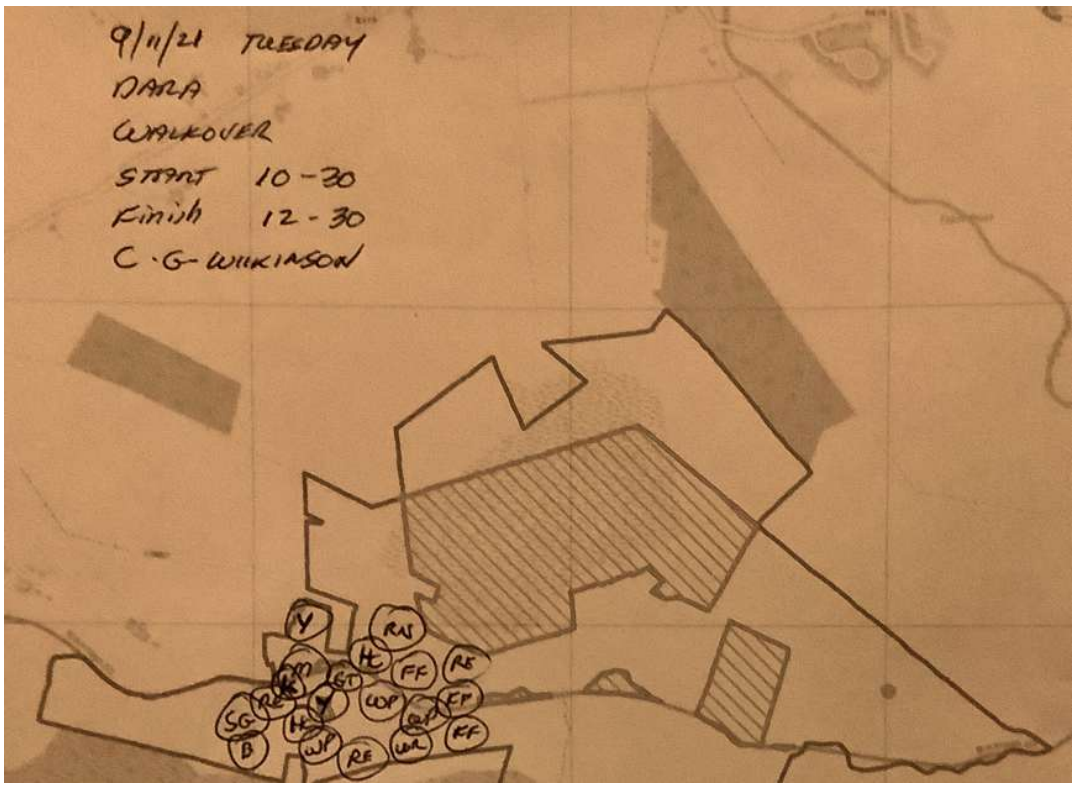


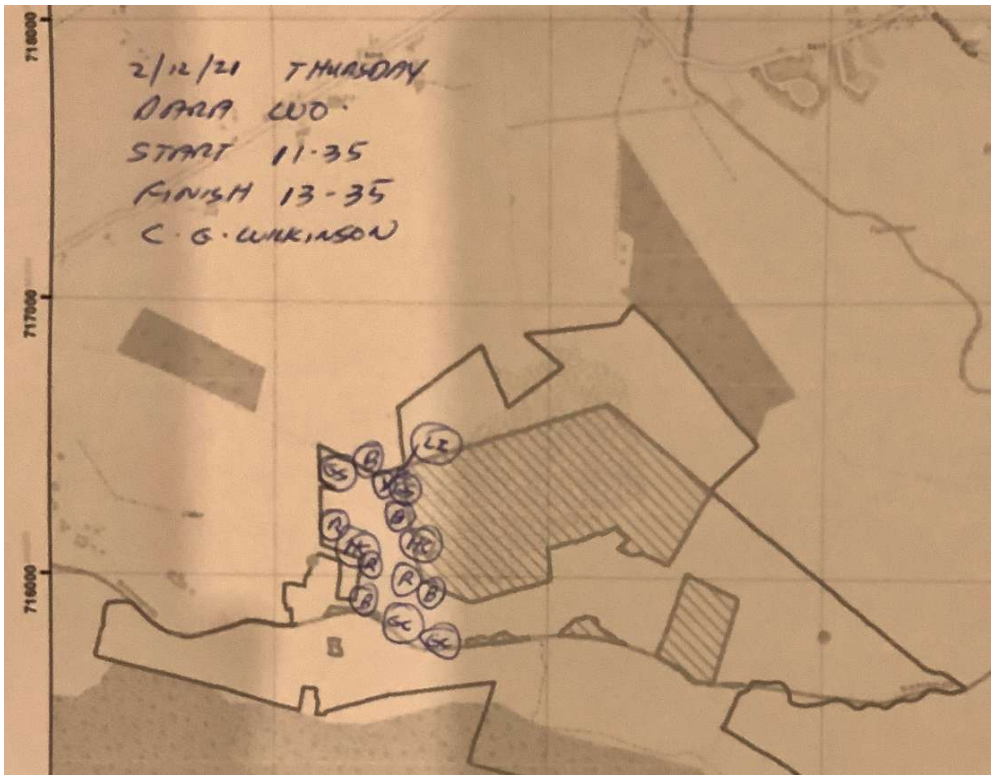
Winter walkover: 08/11/21



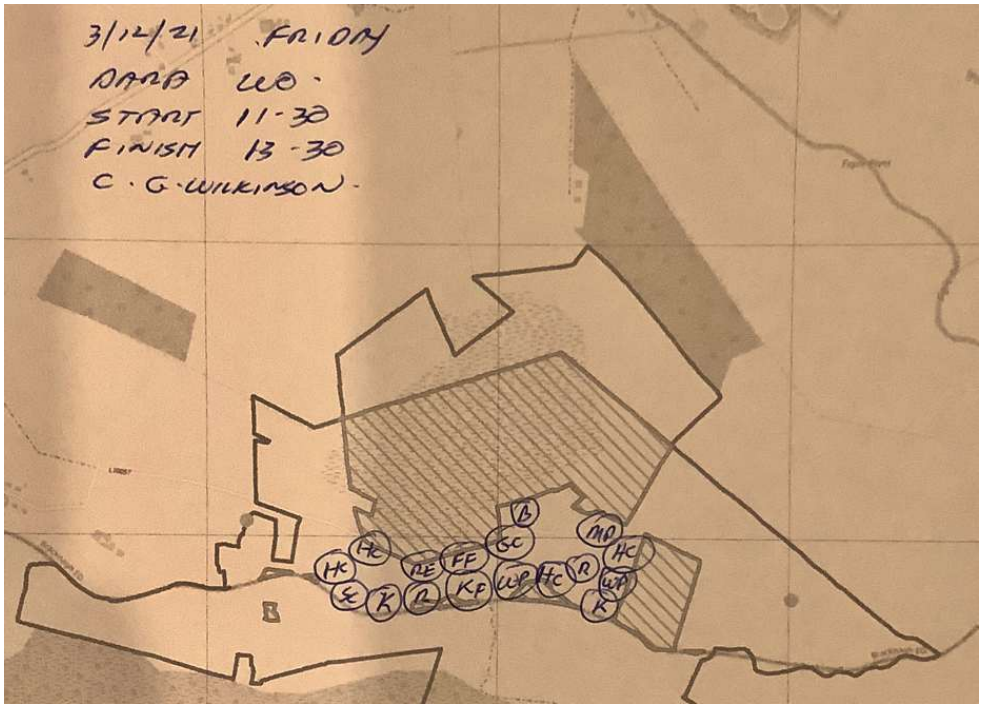
Winter walkover: 9/11/21



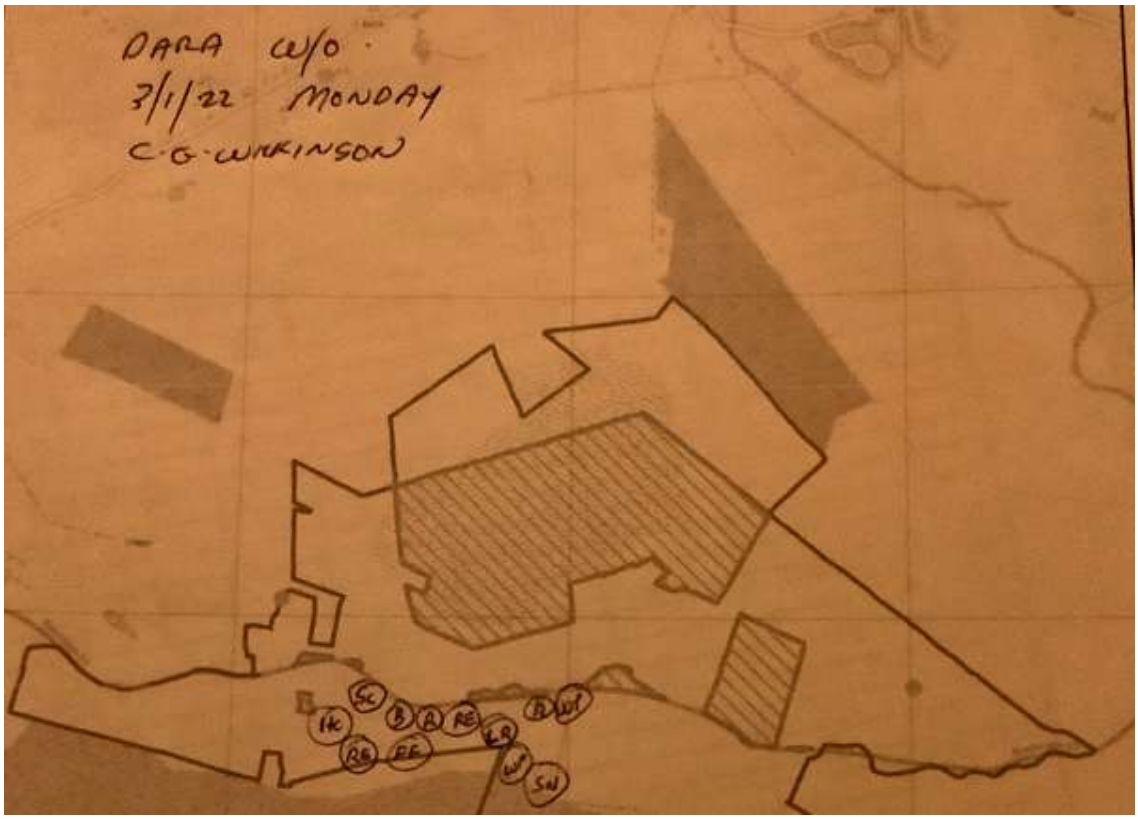
Winter walkover: 02/12/21



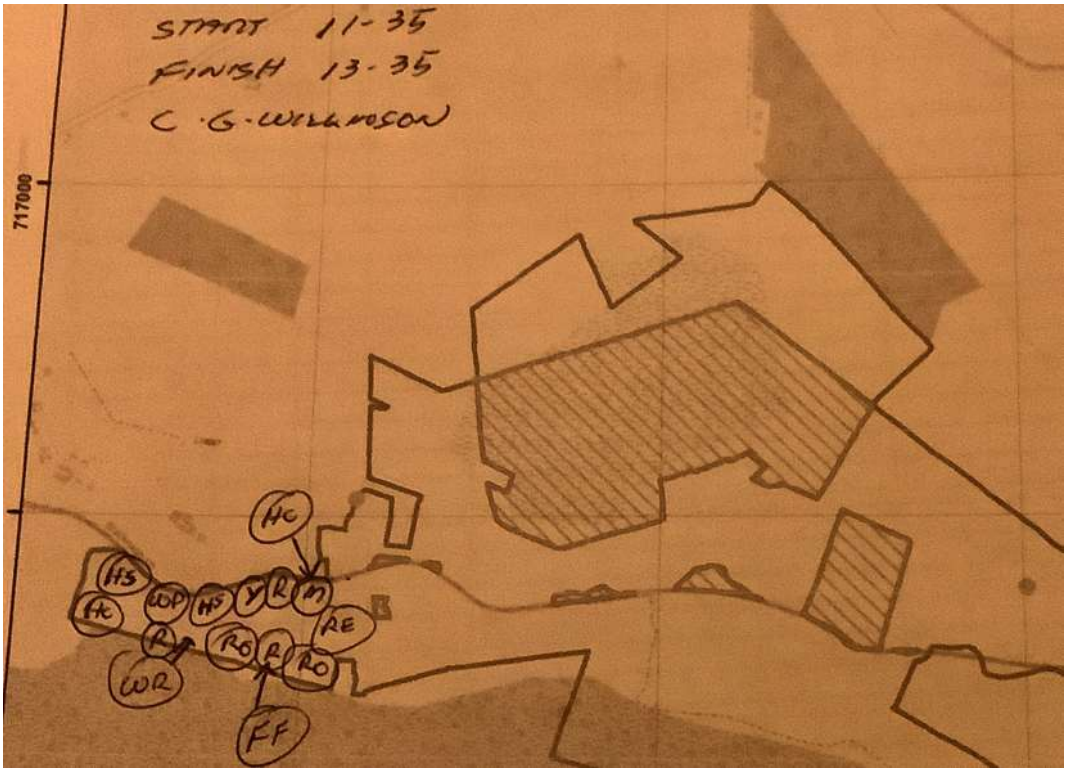
Winter walkover: 3/12/21



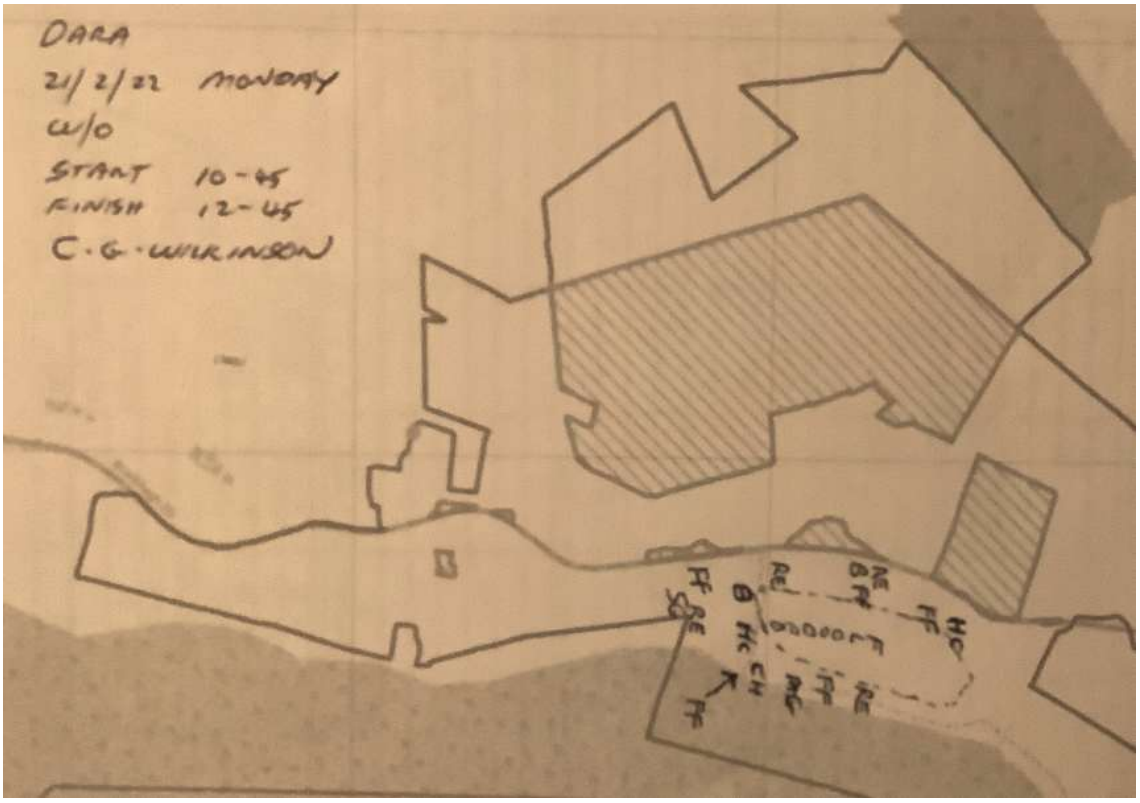
Winter walkover: 3/1/22



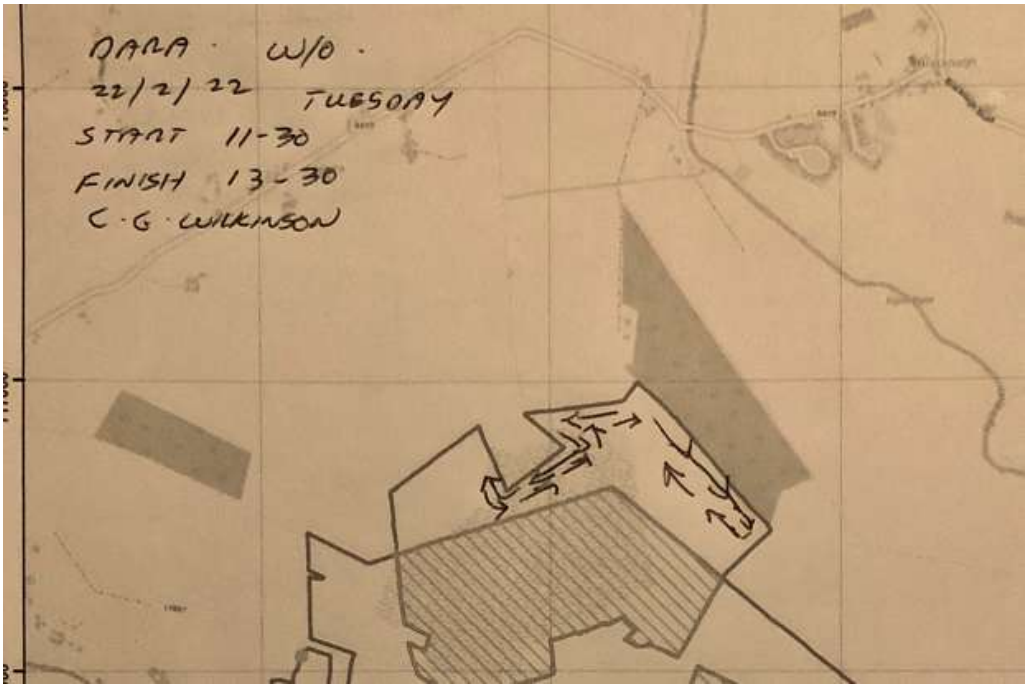
Winter walkover: 4/1/22



Winter walkover: 21/2/22

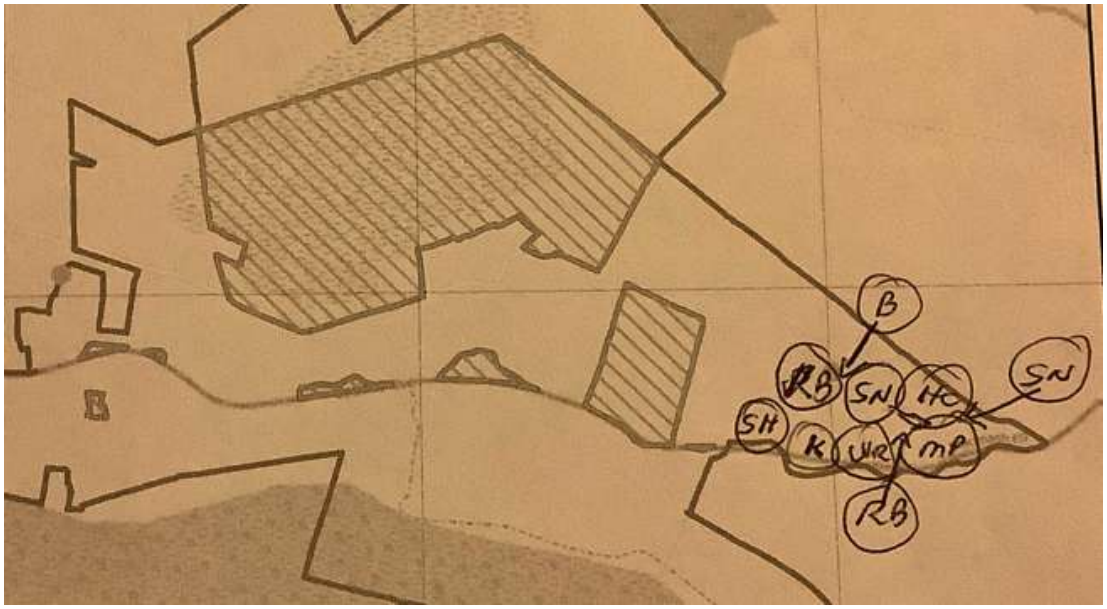


Winter walkover: 22/2/22

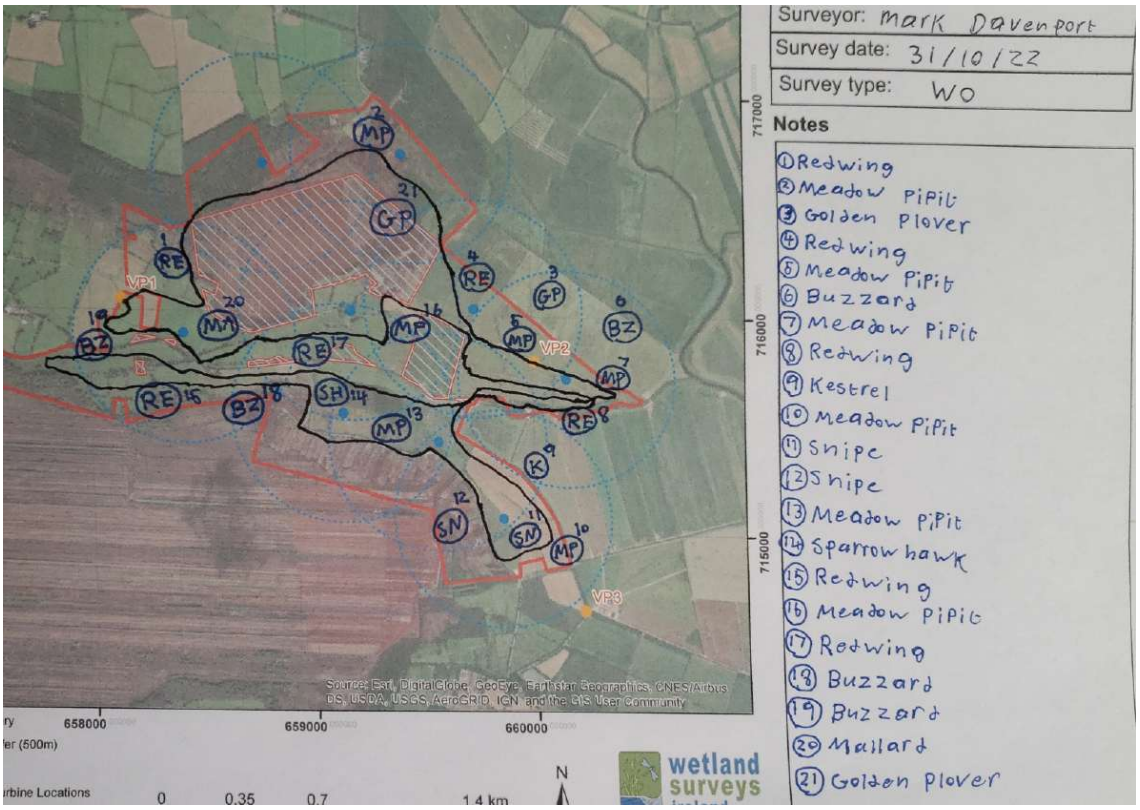


Winter walkover: 7/3/22

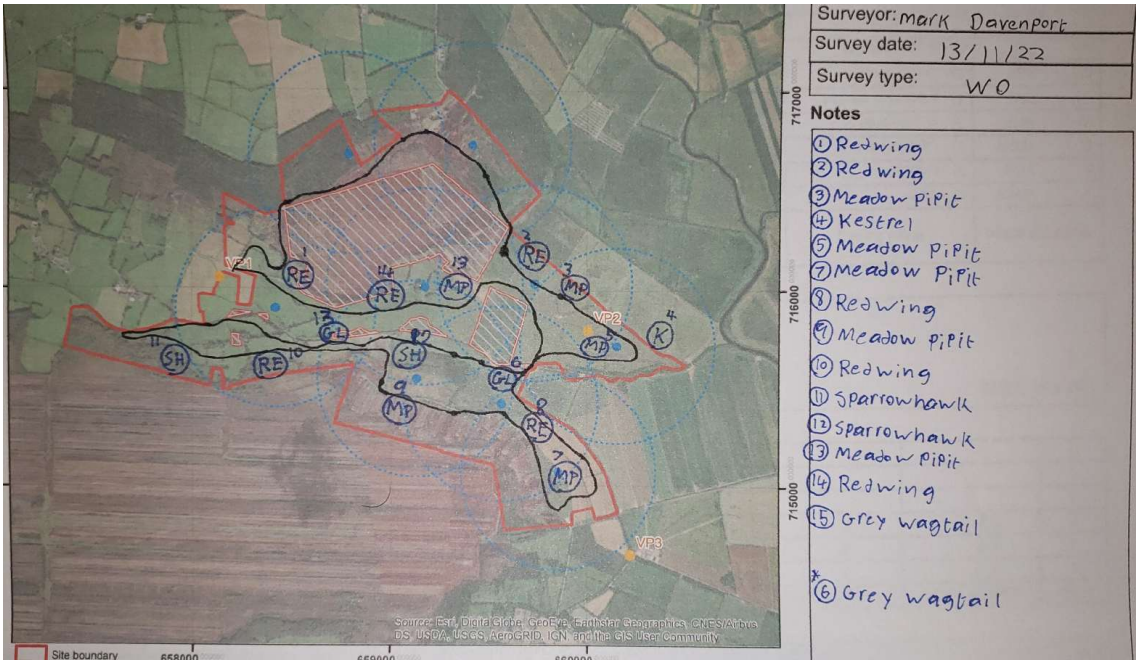
Winter walkover: 8/3/22



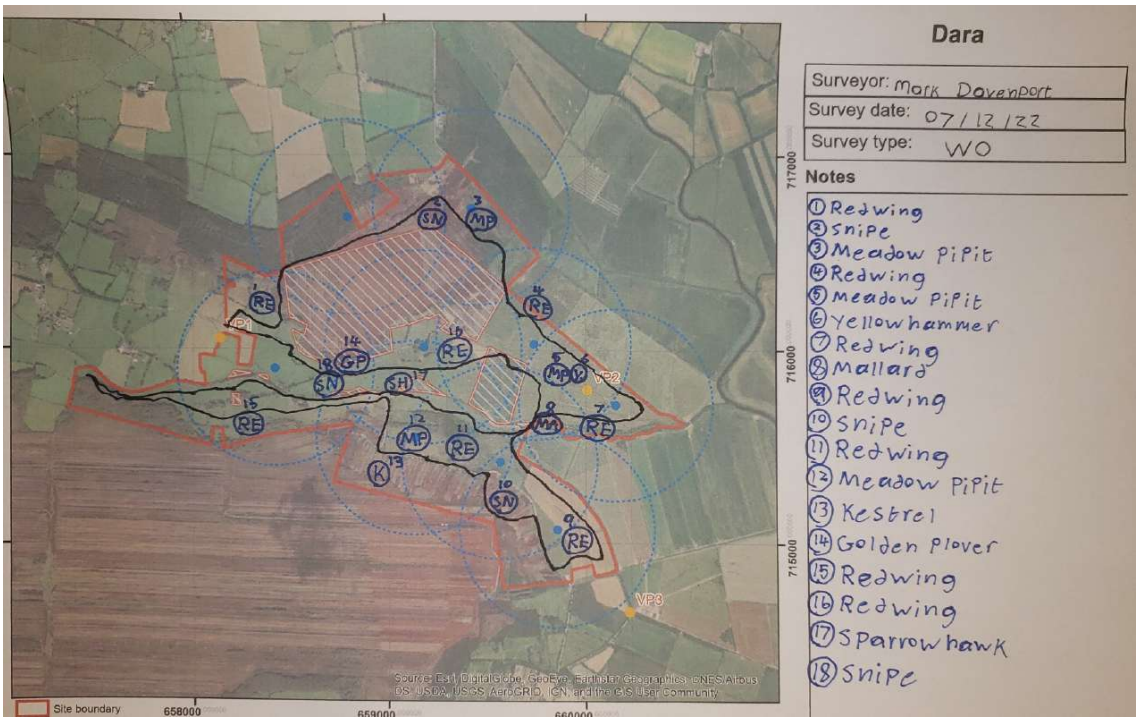
Winter Walkover - 31/10/2022



Winter Walkover - 31/11/22

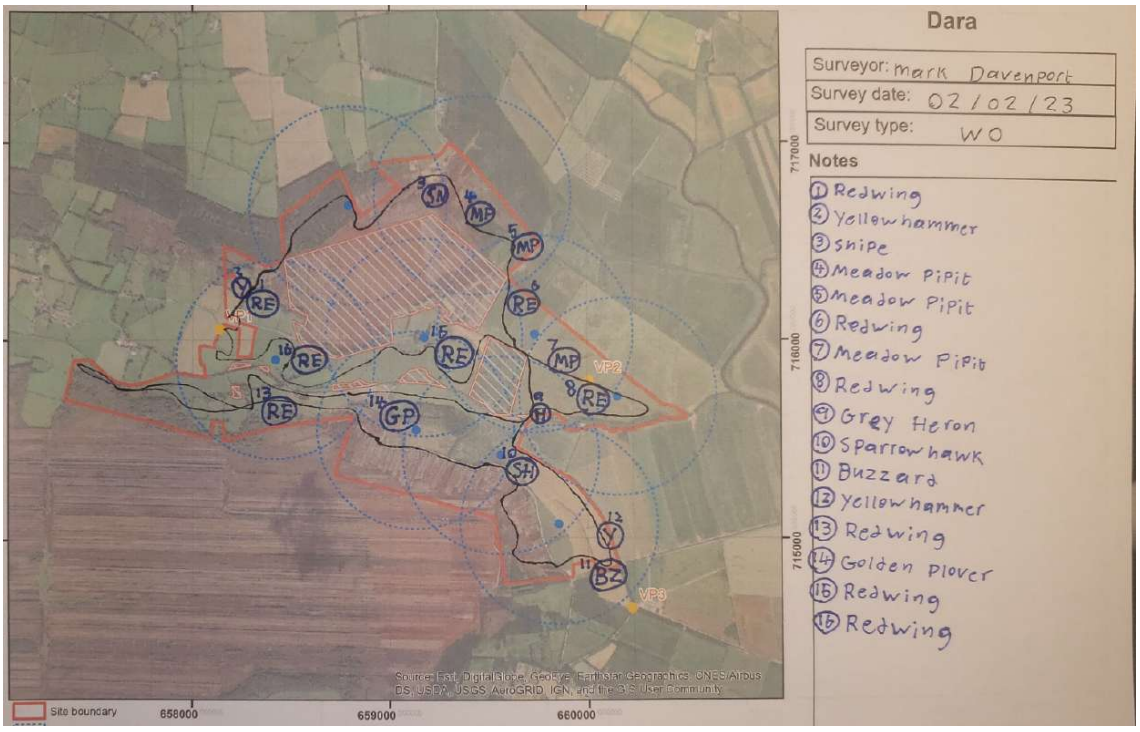


Winter Walkover – 7/12/22

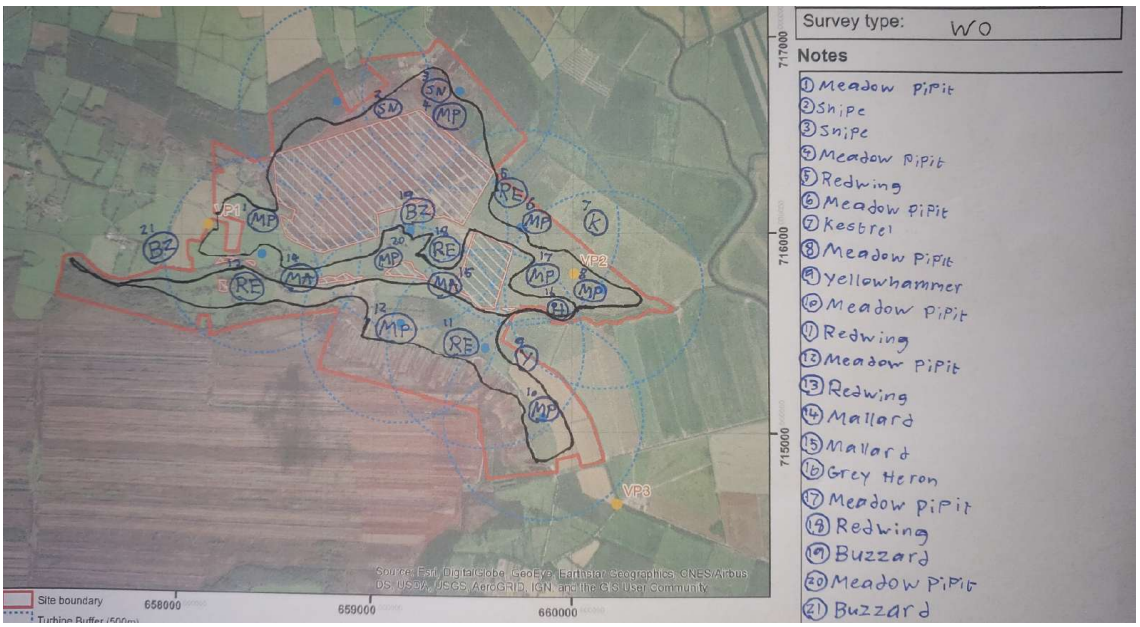


Winter Walkover - 12/01/2023

Winter Walkover – 2/2/23



Winter Walkover - 02/03/23



Breeding Walkover Survey Data and Maps

Survey date	Surveyor	Map label	Species	Number	Sex/ age	Habitat	Comments
07/04/2022	GW		Meadow Pipit	6	Mixed		Ground feeding
07/04/2022	GW		Yellowhammer	1			Ground feeding
08/04/2022	GW		Kestrel	1	Male		Hunting
08/04/2022	GW		Meadow Pipit	1	Adult		
08/04/2022	GW		Yellowhammer	4	Mixed		
21/04/2022	GW		Grey Wagtail	1	Male		Carrying food
21/04/2022	GW		Kestrel	1	Female		Hunting
21/04/2022	GW		Meadow Pipit	6	Mixed		
21/04/2022	GW		Yellowhammer	1	Male		Singing
21/04/2022	GW		Yellowhammer	2	Pair		Pair present
21/04/2022	GW		Yellowhammer	1	Male		Singing
12/05/2022	GW		Meadow Pipit	6	Mixed		Family party
12/05/2022	GW		Yellowhammer	5	Pair		2 pairs plus 1 adult male singing
13/05/2022	GW		Meadow Pipit	9	Mixed		Family party
13/05/2022	GW		Yellowhammer	9	Mixed		Family party
23/05/2022	GW		Kestrel	1	Male		Hunting
23/05/2022	GW		Meadow Pipit	12	Mixed		Adults with food
23/05/2022	GW		Swift	1	Adult		In flight
23/05/2022	GW		Yellowhammer	5	Mixed		
24/05/2022	GW		Kestrel	1	Male		Hunting
24/05/2022	GW		Meadow Pipit	3	Mixed		
24/05/2022	GW		Yellowhammer	3	Mixed		Family party
09/06/2022	GW		Meadow Pipit	6	Mixed		
09/06/2022	GW		Yellowhammer	1	Male		
09/06/2022	GW		Yellowhammer	4	Mixed		
10/06/2022	GW		Meadow Pipit	1	Male		
10/06/2022	GW		Meadow Pipit	7	Mixed		
10/06/2022	GW		Yellowhammer	4	Mixed		
10/06/2022	GW		Yellowhammer	7	Mixed		
27/05/2023	MD	1	Buzzard	2		WD4	Soaring pair
27/05/2023	MD	11	Buzzard	2		WS	pair soaring
27/05/2023	MD	22	Buzzard	1		PB	soaring
27/05/2023	MD	12	Grey Heron	1		FW2	travelling
27/05/2023	MD	16	Kestrel	1		PB	hunting
27/05/2023	MD	7	Lapwing	2		GS	breeding pair/ chick alarm call
27/05/2023	MD	6	Mallard	1		PB	flushed
27/05/2023	MD	19	Mallard	2		FW2	flushed
27/05/2023	MD	20	Mallard	2		FW2	foraging
27/05/2023	MD	4	Meadow Pipit	3		GS	foraging
27/05/2023	MD	5	Meadow Pipit	2		PB	flushed
27/05/2023	MD	8	Meadow Pipit	4		GS	flushed/ carrying food
27/05/2023	MD	10	Meadow Pipit	6		GA1	flushed/ carrying food
27/05/2023	MD	15	Meadow Pipit	4		GS	foraging
27/05/2023	MD	17	Meadow Pipit	2		GS	flushed
27/05/2023	MD	21	Meadow Pipit	5		GA1	flushed carrying food
27/05/2023	MD	24	Meadow Pipit	2		GA1	adult and fledgeling
27/05/2023	MD	23	Swift	1		GA1	foraging

Survey date	Surveyor	Map label	Species	Number	Sex/ age	Habitat	Comments
27/05/2023	MD	26	Swift	3		PB	foraging
27/05/2023	MD	2	Yellowhammer	2		WL1	foraging
27/05/2023	MD	3	Yellowhammer	1		WL1	perched/ singing
27/05/2023	MD	9	Yellowhammer	1		WL1	singing
27/05/2023	MD	13	Yellowhammer	1		WL1	perched
27/05/2023	MD	14	Yellowhammer	2		GA1	foraging
27/05/2023	MD	18	Yellowhammer	3		GA1	foraging
27/05/2023	MD	25	Yellowhammer	1		GA1	singing
03/06/2023	MD	11	Buzzard	1	F/A & Juv	GA1	Soaring
03/06/2023	MD	17	Buzzard	1	M/A	GA1	Soaring
03/06/2023	MD	8	Curlew	2	A	GA1	2 Possible adult Curlew calling and alarm calling on possible breeding ground
03/06/2023	MD	9	Mallard	5	F/A & Juv	WFW2	Adult female / 4 Juv
03/06/2023	MD	16	Mallard	2	M/A	FW2	Flushed
03/06/2023	MD	2	Meadow Pipit	2	A	GS	Foraging
03/06/2023	MD	3	Meadow Pipit	2	A & Juv	PB	Foraging
03/06/2023	MD	4	Meadow Pipit	5		GA1	Foraging
03/06/2023	MD	6	Meadow Pipit	3	A	GA1	Foraging
03/06/2023	MD	14	Meadow Pipit	2	A	GS	Foraging
03/06/2023	MD	19	Meadow Pipit	5	A	GA1	Foraging
03/06/2023	MD	10	Swift	4	A	GA1	Foraging
03/06/2023	MD	18	Swift	3	A	GA1	Foraging
03/06/2023	MD	1	Yellowhammer	4	m& f/ A	WL1	Perched
03/06/2023	MD	5	Yellowhammer	2	M/A	WL1	Calling
03/06/2023	MD	7	Yellowhammer	1	M/A	GA1	Calling
03/06/2023	MD	12	Yellowhammer	2	M&F/ A	GA1	Foraging
03/06/2023	MD	13	Yellowhammer	1	M/A	FW1	Calling
03/06/2023	MD	15	Yellowhammer	3	M&F/ A	WL1	Perched
03/06/2023	MD	20	Yellowhammer	2	M&F/ A	GA1	Foraging
10/07/2023	MD	5	Buzzard	1	F/A	GA1	Travelling
10/07/2023	MD	11	Buzzard	1	A	GA1	Saoring
10/07/2023	MD	9	Mallard	3	M&F A	GA1	Travelling
10/07/2023	MD	2	Meadow Pipit	3	A	PB	Foraging/ Displaying
10/07/2023	MD	3	Meadow Pipit	4	A& JUV	PB	Foraging
10/07/2023	MD	4	Meadow Pipit	2	A	PB	Travelling
10/07/2023	MD	6	Meadow Pipit	6	A&JUV	GA1	Foraging/ travelling
10/07/2023	MD	12	Meadow Pipit	4	A	PB	Foraging
10/07/2023	MD	14	Meadow Pipit	9	A& JUV	GA1	Foraging/ Displaying
10/07/2023	MD	8	Swift	3	A	GA1	Foraging
10/07/2023	MD	10	Swift	2	A	GA1	Foraging
10/07/2023	MD	1	Yellowhammer	2	M/A	WL1	Calling
10/07/2023	MD	7	Yellowhammer	1	F/A	GA1	Foraging
10/07/2023	MD	13	Yellowhammer	3	M&F A	WL1	Foraging
10/07/2023	MD	15	Yellowhammer	2	M/A	WL1	Calling
05/08/2023	MD	6	Buzzard	1	A	WL1	Perched
05/08/2023	MD	9	Grey Heron	1	A	FW2	Flushed
05/08/2023	MD	3	Meadow Pipit	6	A	GA1	Foraging
05/08/2023	MD	4	Meadow Pipit	11	A	GA1	Foraging
05/08/2023	MD	7	Meadow Pipit	5	A	GA1	Foraging/ Travelling

Survey date	Surveyor	Map label	Species	Number	Sex/ age	Habitat	Comments
05/08/2023	MD	8	Meadow Pipit	4	A	GA1	Travelling/ Perched
05/08/2023	MD	10	Meadow Pipit	7	A	GA1	Foraging/ flushed
05/08/2023	MD	2	Swift	2	A	GA1	Foraging
05/08/2023	MD	1	Yellowhammer	2	M&F A	WL2	Foraging
05/08/2023	MD	5	Yellowhammer	1	M/A	GA1	Foraging
05/08/2023	MD	11	Yellowhammer	1	M/A	GA1	Calling
15/09/2023	MD	12	Buzzard	1	JUV	WS	Perched
15/09/2023	MD	20	Golden Plover	8		PB	Travelling
15/09/2023	MD	7	Mallard	3	M&F A	FW2	Flushed
15/09/2023	MD	15	Mallard	1	M/A	FW2	Flushed
15/09/2023	MD	2	Meadow Pipit	4	A	PB	Foraging/ Travelling
15/09/2023	MD	5	Meadow Pipit	7	A	GA1	Foraging/ Flushed
15/09/2023	MD	9	Meadow Pipit	5		PB	Travelling
15/09/2023	MD	11	Meadow Pipit	2	A	PB	Foraging
15/09/2023	MD	14	Meadow Pipit	1	A	GA1	Flushed
15/09/2023	MD	16	Meadow Pipit	5	A	GA1	Foraging/ Flushed
15/09/2023	MD	18	Meadow Pipit	2	A	GA1	Foraging
15/09/2023	MD	3	Snipe	1		PB	Flushed
15/09/2023	MD	4	Snipe	1		PB	Flushed
15/09/2023	MD	8	Snipe	1		GA1	Flushed
15/09/2023	MD	10	Sparrowhawk	1	M/A	WS	Hunting
15/09/2023	MD	1	Yellowhammer	1	F/A	GA1	Foraging
15/09/2023	MD	6	Yellowhammer	1		WL1	Perched
15/09/2023	MD	13	Yellowhammer	2	M&F A	GA1	Foraging
15/09/2023	MD	17	Yellowhammer	1	A	GA1	Travelling
15/09/2023	MD	19	Yellowhammer	1	M/A	WL1	Perched

Breeding Walkover - 7/4/2022

Breeding Walkover - 8/4/2022

Breeding Walkover - 21/4/22 (early AM)

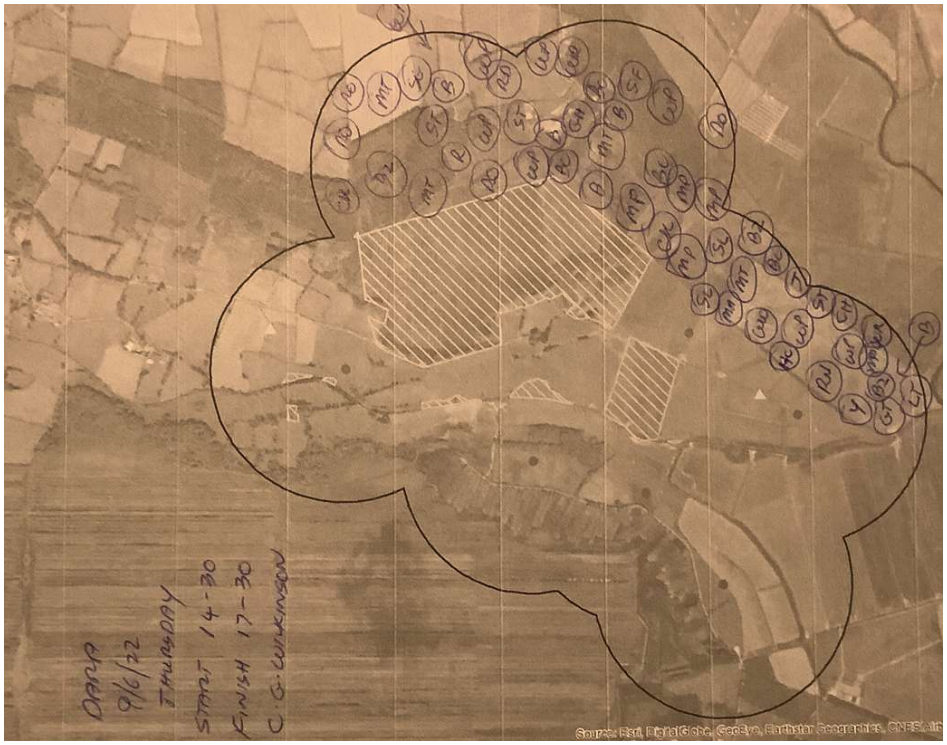
Breeding Walkover - 21/4/22 (late AM)

Breeding Walkover - 13/5/22

Breeding Walkover - 23/5/22

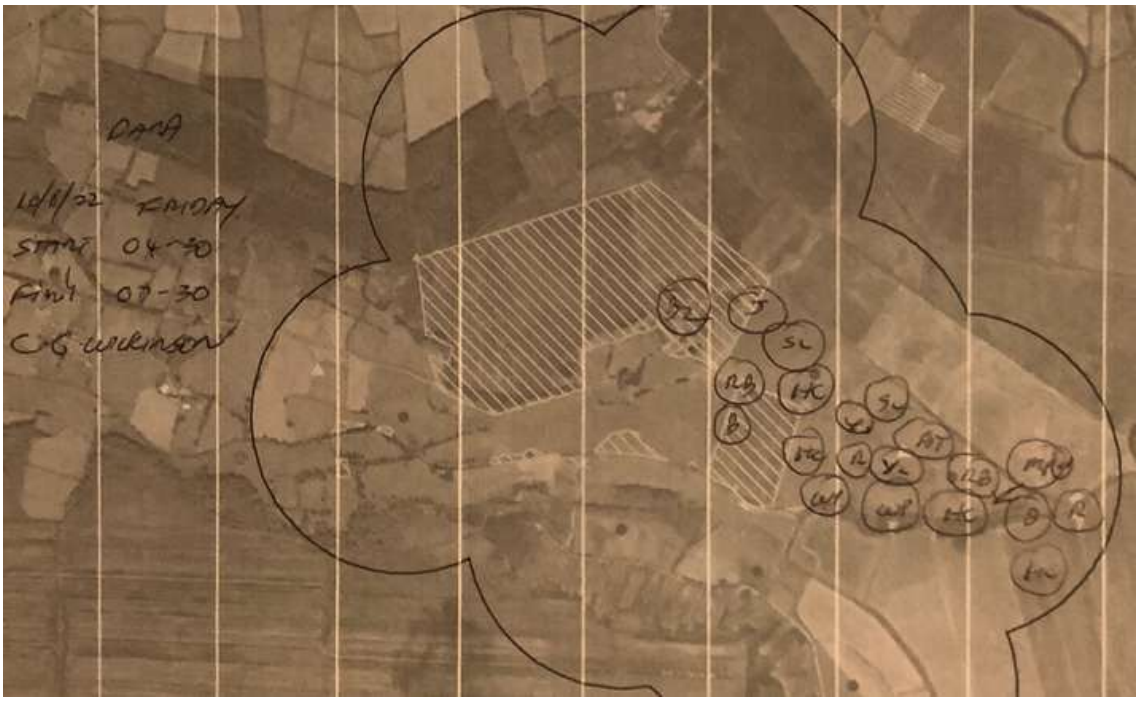
Breeding Walkover - 24/5/22

Breeding Walkover - 9/6/22 (PM)

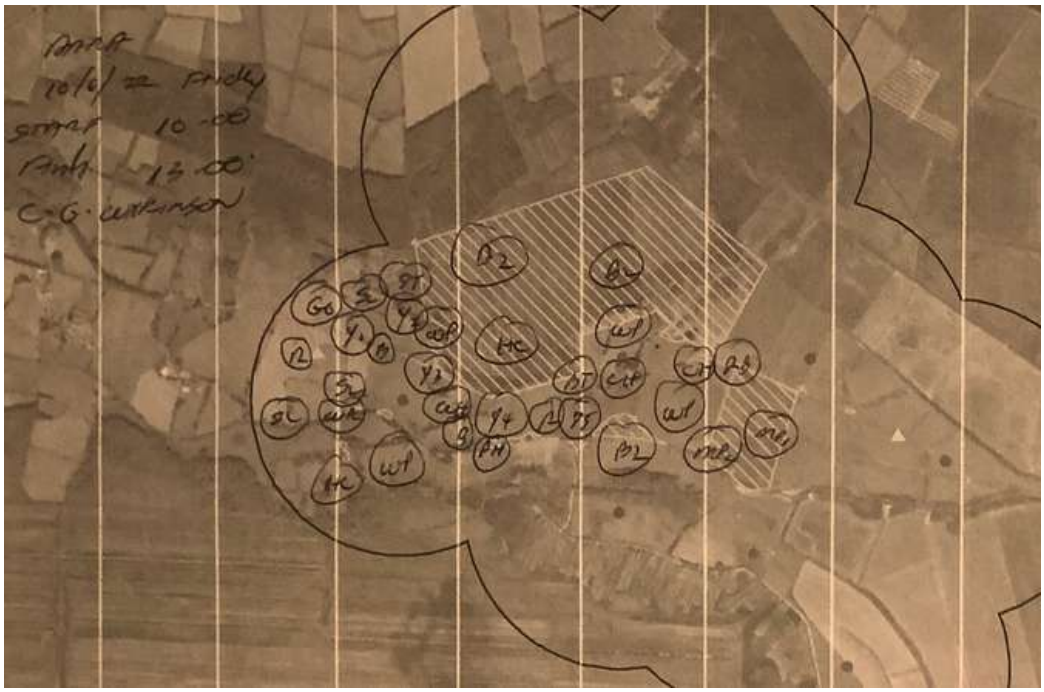


Breeding Walkover - 9/6/22 (Dusk)

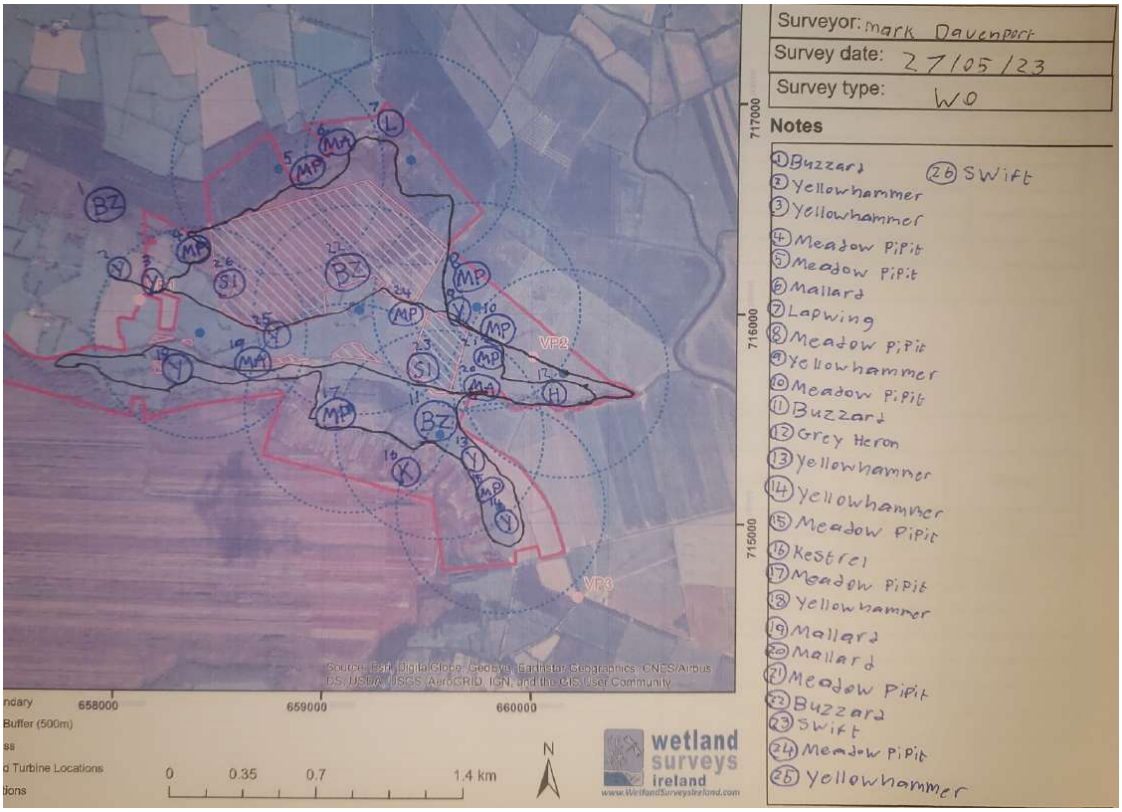
Breeding Walkover - 10/6/22 (Dawn)



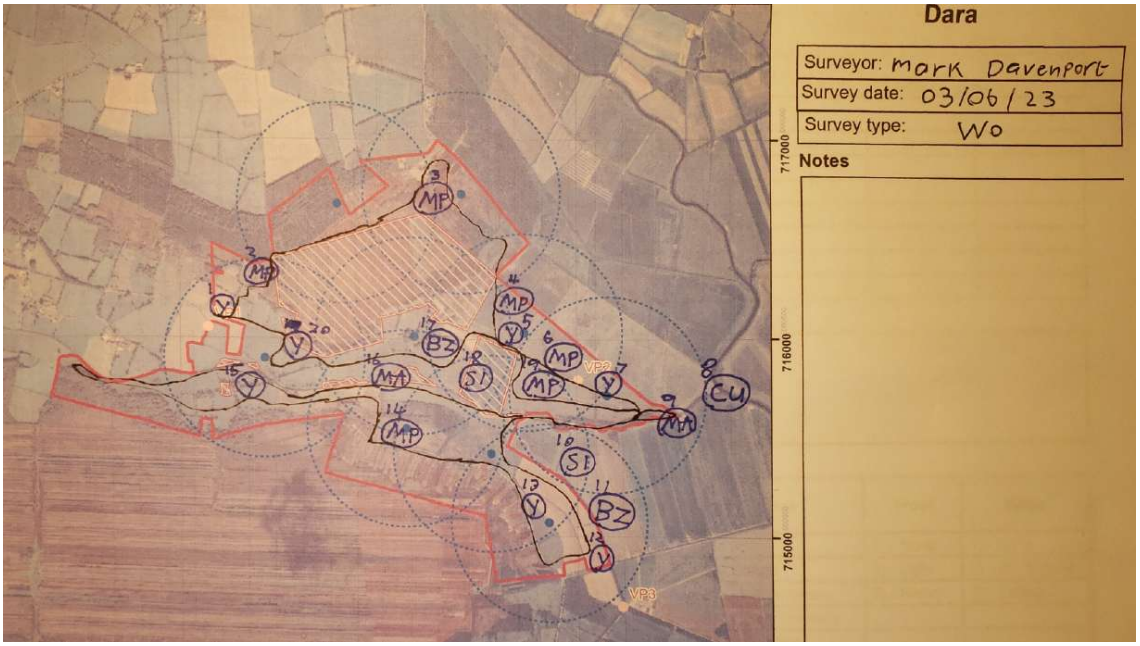
Breeding Walkover - 10/6/22 AM (late)



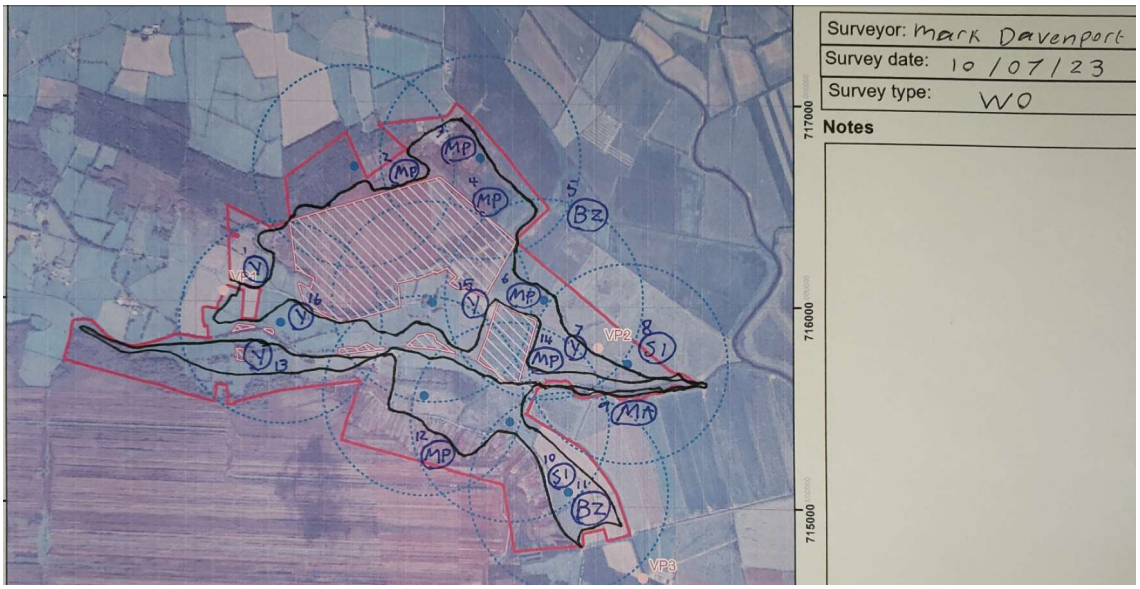
Breeding Walkover - 27/05/23



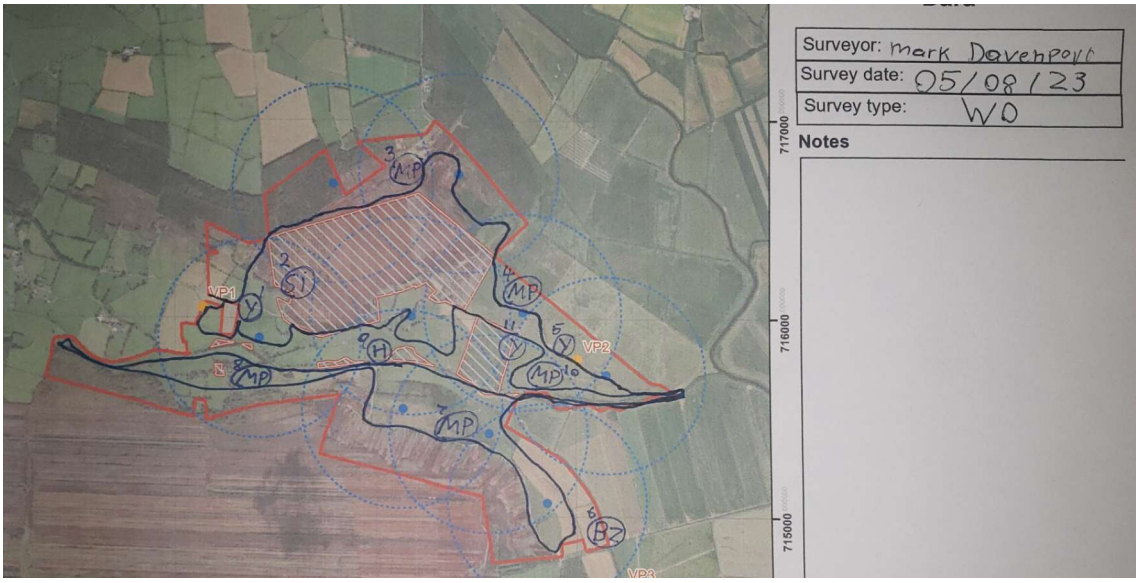
Breeding Walkover - 03/06/23



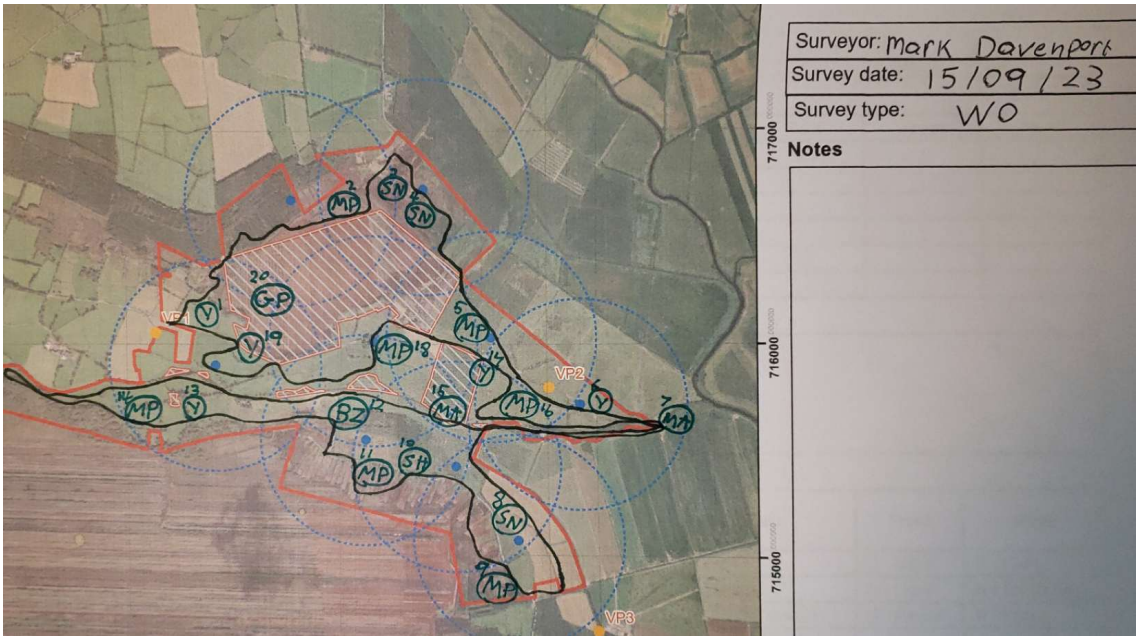
Breeding Walkover - 10/07/23



Breeding Walkover - 05/08/23



Breeding Walkover - 15/09/23



APPENDIX 10.4.iii

Sensitive Species Survey Confidential Information Internal Use Only

Appendix 4a III with Maps

Confidential information

For internal use only

Sensitive Species Survey Data and Maps

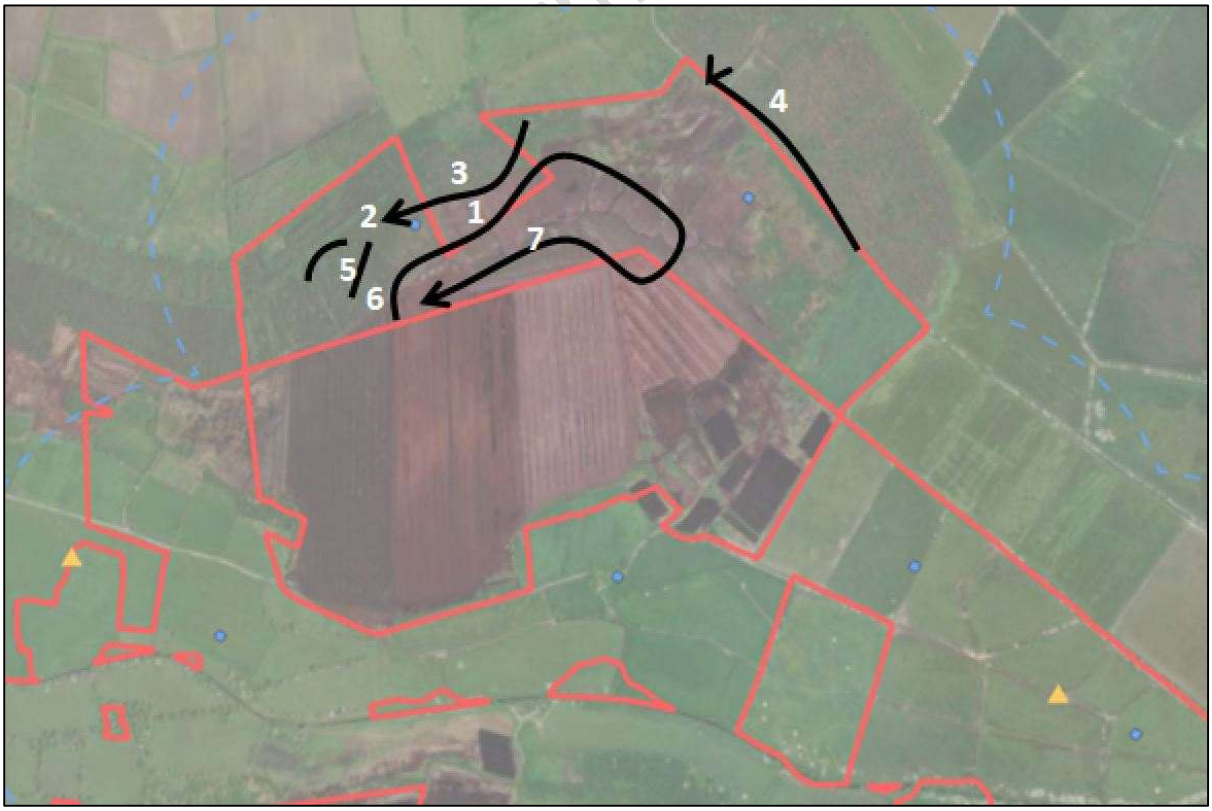
Maps showing exact location data of breeding sites of sensitive species are confidential and have been submitted to the planning Authorities, National Parks and Wildlife service and marked as confidential information and for internal use only, and additional version of the appendix has been prepared without maps for public file.

Woodcock Survey Data and Maps

June 2025

Survey date	Transect	Observation No	Species	BTO code	Number	Sex/ age	Activity	Comments
23/06/2025	1	1	Woodcock	WK	2	A M&F	Roding	Male displaying and calling over forestry. Followed closely by second WK, likely female
23/06/2025	1	2	Woodcock	WK	1	A/M	Roding	Male roding NE over forestry
23/06/2025	1	3	Woodcock	WK	1	A/M	Roding	Male roding SW over forestry
23/06/2025	1	4	Woodcock	WK	1	A/M	Roding	Male roding SE over forestry
23/06/2025	1	5	Woodcock	WK	1	A/M	Roding	Male roding NE over forestry
23/06/2025	1	6	Woodcock	WK	1	A/M	Roding	Male roding NE over forestry
23/06/2025	1	7	Woodcock	WK	2	A M&F	Roding	Male roding SW over foorestry followed closely by female

Woodcock Survey: 23/06/2025



Breeding Wader (Curlew) Surveys Data and Maps

April to June 2022
and
April to June 2025

Survey date	Transect / VP	Observation No	Species	Number	Sex/ age	Habitat	Comments
13/04/2022	VP	1	Curlew	0		GS	No obs
21/05/2022	VP	1	Curlew	3		GS	Three curlew observed in flight
31/05/2022	VP	2	Curlew	1		GS	Adult female feeding
01/06/2022	VP	na	Curlew	0		GS	No obs
20/04/2025	1	1	Curlew	1	F/A	GS	Foraging
20/04/2025	1	2	Curlew	1	M/A	GS	Flushed then displayed before landing to forage
27/05/2025	1	na	Curlew	0		GS	No curlew recorded, Curlew last audio recorded on 7th May. Two snipe drumming.
17/06/2025	1	na	Curlew				No obs

Breeding Curlew Survey: 13/04/2022

Breeding Curlew Survey: 21/05/2022

Breeding Curlew Survey: 31/05/2022

Breeding Curlew Survey: 20/04/2025

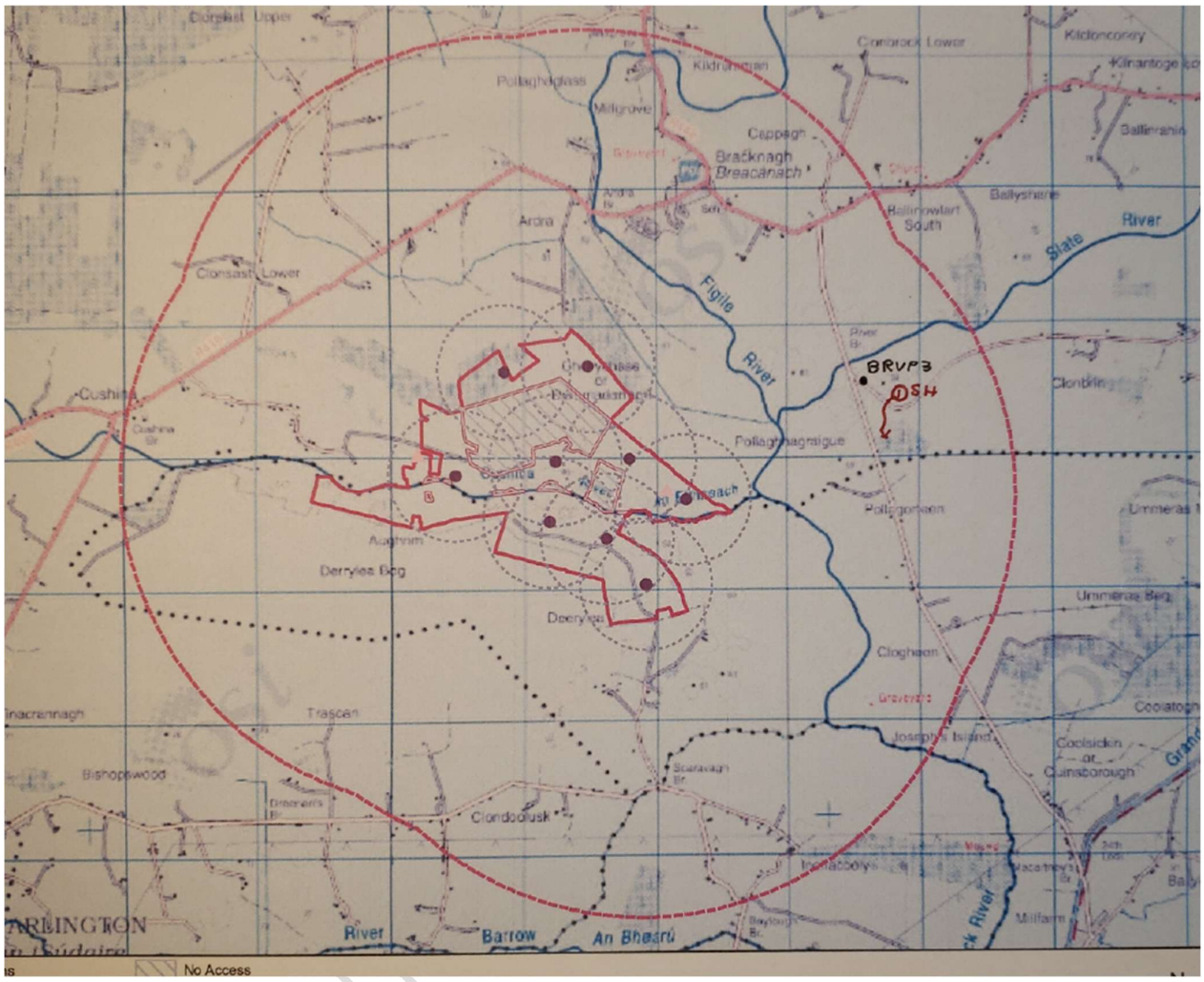
Breeding Raptor Surveys Data and Maps

May to July 2023

Date	Map reference	VP	Species	BTO code	Number	Time	Activity	Comments
01/06/2023	1	BRVP3	Buzzard	BZ	1	08:18	Travelling	Adult female BZ flying SE at approx 60 metres. Lost behind forestry
01/06/2023	2	BRVP3	Kestrel	K	1	07:52	Hunting	Adult male K hunting. Made one unsuccessful kill attempt.
01/06/2023	3	BRVP3	Buzzard	BZ	1	08:15	Soaring	BZ rising on thermal to over 150 metres . Drifted South
06/07/2023	1	BRVP3	Sparrowhawk	SH	1	07:16	Carrying prey	Adult male SH carrying passerine prey into forestry. Nest with chick likely in forestry

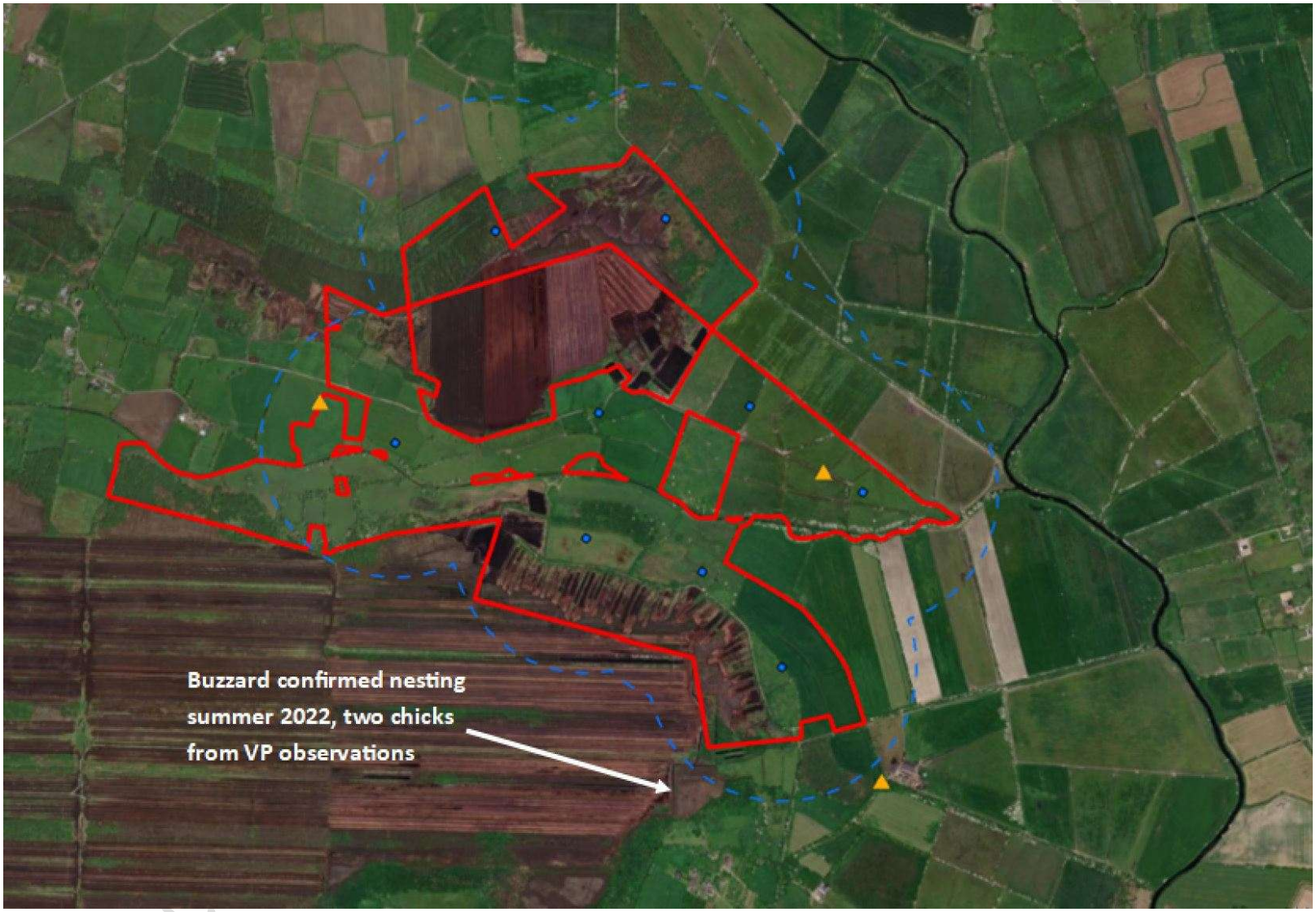
Breeding Raptor Survey: 1/06/2023

Breeding Raptor Survey: 6/07/2023



Breeding Lapwing Nest Location:

Buzzard Nest Location: Summer 2022



APPENDIX 10.4.iii

Walkover Surveys Data without Maps

Appendix 4a III without Maps

Woodcock Survey Data

June 2025

Survey date	Transect	Observation No	Species	BTO code	Number	Sex/ age	Activity	Comments
23/06/2025	1	1	Woodcock	WK	2	A M&F	Roding	Male displaying and calling over forestry. Followed closely by second WK, likely female
23/06/2025	1	2	Woodcock	WK	1	A/M	Roding	Male roding NE over forestry
23/06/2025	1	3	Woodcock	WK	1	A/M	Roding	Male roding SW over forestry
23/06/2025	1	4	Woodcock	WK	1	A/M	Roding	Male roding SE over forestry
23/06/2025	1	5	Woodcock	WK	1	A/M	Roding	Male roding NE over forestry
23/06/2025	1	6	Woodcock	WK	1	A/M	Roding	Male roding NE over forestry
23/06/2025	1	7	Woodcock	WK	2	A M&F	Roding	Male roding SW over forestry followed closely by female

Note: Maps showing exact location data of breeding sites of sensitive species are confidential and have been submitted to the planning Authorities, National Parks and Wildlife service and marked as confidential information and for internal use only.

Breeding Wader (Curlew) Surveys Data

April to June 2022
and
April to June 2025

Survey date	Transect / VP	Observation No	Species	Number	Sex/ age	Habitat	Comments
13/04/2022	VP	1	Curlew	0		GS	No obs
21/05/2022	VP	1	Curlew	3		GS	Three curlew observed in flight
31/05/2022	VP	2	Curlew	1		GS	Adult female feeding
01/06/2022	VP	na	Curlew	0		GS	No obs
20/04/2025	1	1	Curlew	1	F/A	GS	Foraging
20/04/2025	1	2	Curlew	1	M/A	GS	Flushed then displayed before landing to forage
27/05/2025	1	na	Curlew	0		GS	No curlew recorded, Curlew last audio recorded on 7th May. Two snipe drumming.
17/06/2025	1	na	Curlew				No obs

Note: Maps showing exact location data of breeding sites of sensitive species are confidential and have been submitted to the planning Authorities, National Parks and Wildlife service and marked as confidential information and for internal use only.

Breeding Raptor Surveys Data

May to July 2023

Date	Map reference	VP	Species	BTO code	Number	Time	Activity	Comments
01/06/2023	1	BRVP3	Buzzard	BZ	1	08:18	Travelling	Adult female BZ flying SE at approx 60 metres. Lost behind forestry
01/06/2023	2	BRVP3	Kestrel	K	1	07:52	Hunting	Adult male K hunting. Made one unsuccessful kill attempt.
01/06/2023	3	BRVP3	Buzzard	BZ	1	08:15	Soaring	BZ rising on thermal to over 150 metres . Drifted South
06/07/2023	1	BRVP3	Sparrowhawk	SH	1	07:16	Carrying prey	Adult male SH carrying passerine prey into forestry. Nest with chick likely in forestry

Note: Maps showing exact location data of breeding sites of sensitive species are confidential and have been submitted to each Planning Authorities, National Parks and Wildlife service and marked as confidential information and internal use only.

APPENDIX 10.5

Collision Risk Model

Derrynadarragh Wind Farm

Collision Risk Modelling

Prepared for:

Dara Energy Limited

September 2025

By

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1 INTRODUCTION

Wind Farm Developments have the potential to impact bird species in a number of ways, including displacement, barrier effects, habitat effects, and collision risk. Collison risk can be assessed using Collision Risk Modelling (CRM). *Wetland Surveys Ireland Ltd.* were commissioned by *Dara Energy Limited Ltd.* to assess the collision risk for bird species at the proposed Derrynadarragh Wind Farm, Co. Offaly and Co. Kildare.

CRM is a method to estimate the number of birds likely to collide with turbines at a proposed wind farm site. This method uses vantage point data collected during field surveys to calculate the risk of collision. In this case, vantage point data collected over two years (two breeding seasons and two winter seasons) at the proposed Derrynadarragh Wind Farm site was used. The vantage point surveys were undertaken over a 24-month period from October 2021 to September 2023 at two vantage point locations (VP1 and VP2). A third vantage point, VP3, was established in April 2022 and was surveyed along with VP1 and VP2 from then until September 2023 (see Figure 1). For the purposes of the CRM, the parameters used to inform turbine characteristics are based on the Vestas V-162 model of turbine.

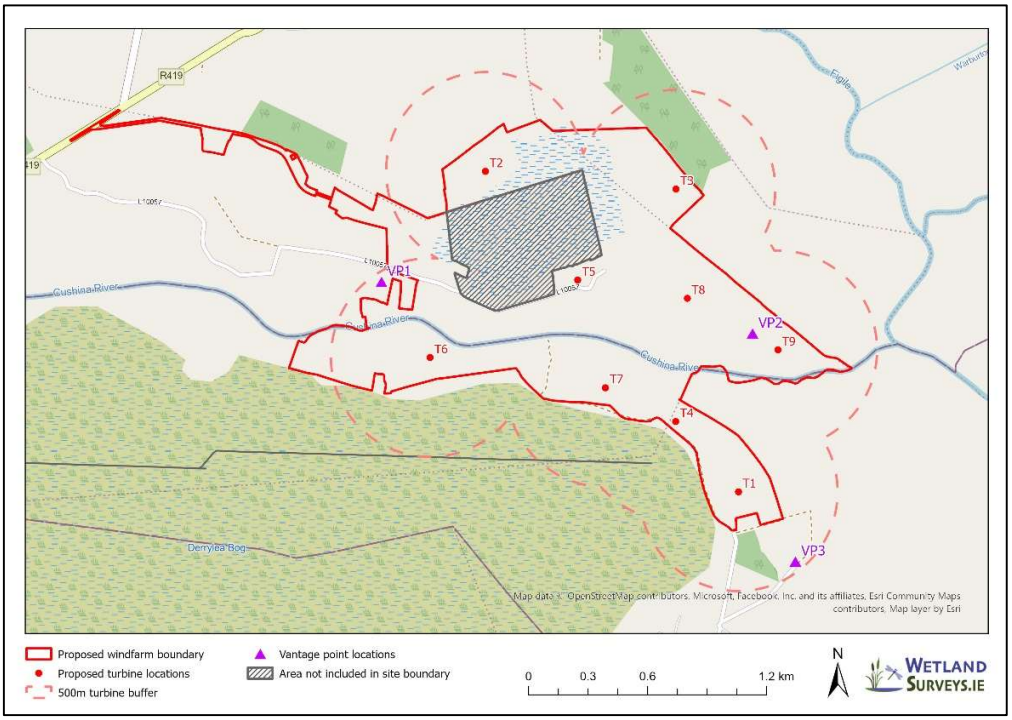

Figure 1: Layout of Derrynadarragh Windfarm showing site boundary, turbine location (No. 9), bird survey area and Vantage Point locations.

2 METHODOLOGY

The vantage point surveys were carried out following Scottish Natural Heritage guidelines (SNH 2017). CRM uses a mathematical model to estimate the number of birds of a particular species that are likely to collide with the proposed turbines. The CRM method followed here is that of Scottish Natural Heritage, which is also known as the Band Model (Band 2000, Band *et al.* 2007) as updated in 2024 (Band 2024). The excel calculation sheet available for download from the SNH website[1] was used for the current CRM and follows the updated approach of Band (2024). The Collision Risk sheet within the calculation excel requires data to be input relating to the target bird species, the wind farm, and the turbines. These data are then used within Stages A - E of the collision risk calculation, which are clearly delineated within the excel. Additional data input is also required for Stages A, D, and E within the calculation excel.

2.1 BIRD DATA

For each target species several parameters must be entered into the excel calculation sheet including bird length, wingspan, and bird flight speed. Bird biometric data were obtained from the Royal Society for the Protection of Birds[2]. It is recommended (Band 2024) that bird biometrics are obtained from standard reference works (e.g. Cramp & Simmons 1983) or from British Trust for Ornithology (BTO) Bird Facts. BTO Bird Facts[3] were consulted in February 2025, however the required biometric data was not displayed for the bird species required. This data was found on the Royal Society for the Protection of Birds website and so was used in place of BTO data (Table 1).

The calculation excel requires a nocturnal activity ranking to be selected for each target species. The ranking ranges from 1-5, where 1 represents no nocturnal activity (birds are inactive at night) and 5 represents high levels of nocturnal activity (birds are as active at night as they are during the day). A ranking of 1 was assigned to all target bird species recorded, except for Golden Plover, Snipe, and Lapwing which were given a nocturnal activity ranking of 2, which represents 25% nocturnal activity (birds are 25% as active at night as they are during the daytime).

For all target bird species it was assumed that flight speed was the same upwind and downwind. The calculations were run for both gliding and or flapping flight depending on the typical flight of each species. Where both gliding and flapping are calculated then the two values are averaged.

[1] https://www.nature.scot/doc/collision-risk-model-onshore-wind-farms-spreadsheet-2024

[2] https://www.rspb.org.uk/birds-and-wildlife

[3] https://www.bto.org/understanding-birds/welcome-birdfacts

For each target species 'normal approach' or 'birds on migration' needed to be specified in the calculation excel. All species recorded during regular vantage point watches were selected as 'normal approach'.

To account for a bird's ability to detect and avoid turbines, an avoidance factor is applied to the annual collision mortality rate. Based on empirical evidence and ongoing studies, avoidance rates for most species are typically 98-99% or higher (SNH, 2018). For Golden Plover, an avoidance rate of 99.8% was used as it was determined by Gittings (2022) to be appropriate based on a review of four onshore windfarms in the UK. The avoidance rate used for Hen Harrier was 99%, Whooper Swan was 99.5%, and Kestrel was 95%. For the other species included in this collision risk, the SNH guidance specifies a default avoidance rate of 98% (see Table 1).

Table 1: Bird biometrics and seasonal data for target species.

Species	Period	Avoidance Rates (%)	Length (m)	Wingspan (m)	Average speed (m/s)
Buzzard	All	98	0.54	1.21	11.6
Curlew	All	98	0.55	0.9	16.3
Golden Plover	Sept to Apr	99.8	0.28	0.72	17.9
Hen Harrier	All	99	0.48	1.1	9.1
Kestrel	All	95	0.34	0.76	10.1
Lapwing	All	98	0.3	0.85	12.8
Mallard	All	98	0.57	0.9	18.5
Merlin	All	98	0.28	0.56	11.2
Peregrine	All	98	0.45	1.05	12.1
Snipe	All	98	0.26	0.42	17.1
Sparrowhawk	All	98	0.33	0.63	11.3
Whooper Swan	Oct to Mar	99.5	1.5	2.2	17.3
Woodcock	All	98	0.34	0.6	17.1

Length and wingspan from RSPB. Flight speed from Alerstam et al. (2007); for Golden plover, value for grey plover was used; for woodcock, value for snipe was used

2.2 WINDFARM DATA

The latitude of Derrynadarragh windfarm is 53.2 degrees (at its most northerly point). This value was entered into the calculation excel which then automatically calculated the total daylight hours per month for the windfarm site. The number of proposed turbines for the site is 9 and this value was also entered into the calculation excel.

2.2.1 Turbine Data

The turbine model used to inform the CRM is the Vestas V-162. The turbine parameters as per the manufacturer's specifications are presented in Table 2 were used in the CRM. Blade profile

data (a separate sheet in the calculation excel) were not altered and default values were used, as the specific data for the turbine model was not available.

Table 2: Turbine parameters for the proposed turbine model at Derrynadarragh Wind Farm.

Turbine Model	**V-162 (Vestas)**
Number of turbines	9
Hub height	105m
Rotor radius	81m
Number of blades	3
Rotation speed[4]	12.1rpm
Maximum blade width	4.3m
Blade pitch	15 degrees[5]

2.3 STAGES OF COLLISION RISK ASESSMENT

The five stages (A to E) involved in CRM (as per Band 2024) are as follows:

Stage A Flight Activity:
Vantage point survey data of birds flying in the study area are used to determine the density of birds flying in the vicinity of the proposed turbines and the proportion flying at risk height (between the lowest and highest points of the rotors).

Bird Density
Two years of survey data (October 2021 – September 2023) were used for this CRM analysis. Data was collected at dedicated vantage point (VP) locations overlooking the proposed windfarm site as illustrated in Figure 1 above. A total of 162 hours of survey effort was carried out at VP1 and VP2 individually over the entire survey period. The total survey effort at VP3 was 120 hours. The survey effort at VP3 was lower than that at VP1 and VP2 as VP3 was only established in Summer 2022. Survey effort per season is summarised in Table 3.

The three VP locations afforded views over the proposed wind farm site and a 500 m buffer around each proposed turbine. The viewshed from each VP is illustrated in Figure 2 - Figure 4 below. The viewsheds were determined by surveyors and confirmed using spatial analyst GIS software tools. Both a 0m (ground level) and 20m (above ground level) viewshed were established for each VP. The viewsheds were used to calculate the area visible from each VP. The cumulative coverage of the survey area by the 20m elevation viewshed from all VPs is illustrated in Figure 5 below.

[4] *The dynamic operation range (the rate at which the blades rotate) of the turbines is approximately 4-12.1 revolutions per minute (rpm) which is influenced by wind speed. Taking a precautionary approach the higher rate of 12.1 is used in the CRM.*
[5] *A pitch value of 15 degrees was used as this is accepted as a recognised average when a turbine is operating at around its mean rotational speed (Band 2024).*

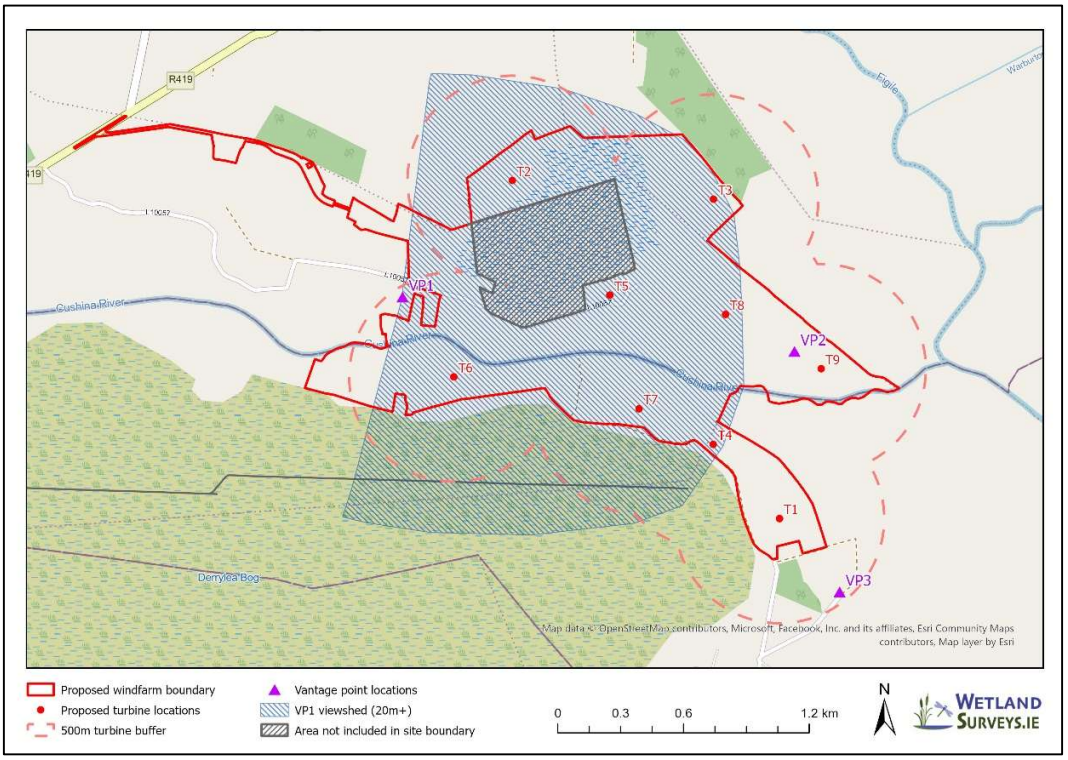

Figure 2: Viewshed from VP1 (20m height).

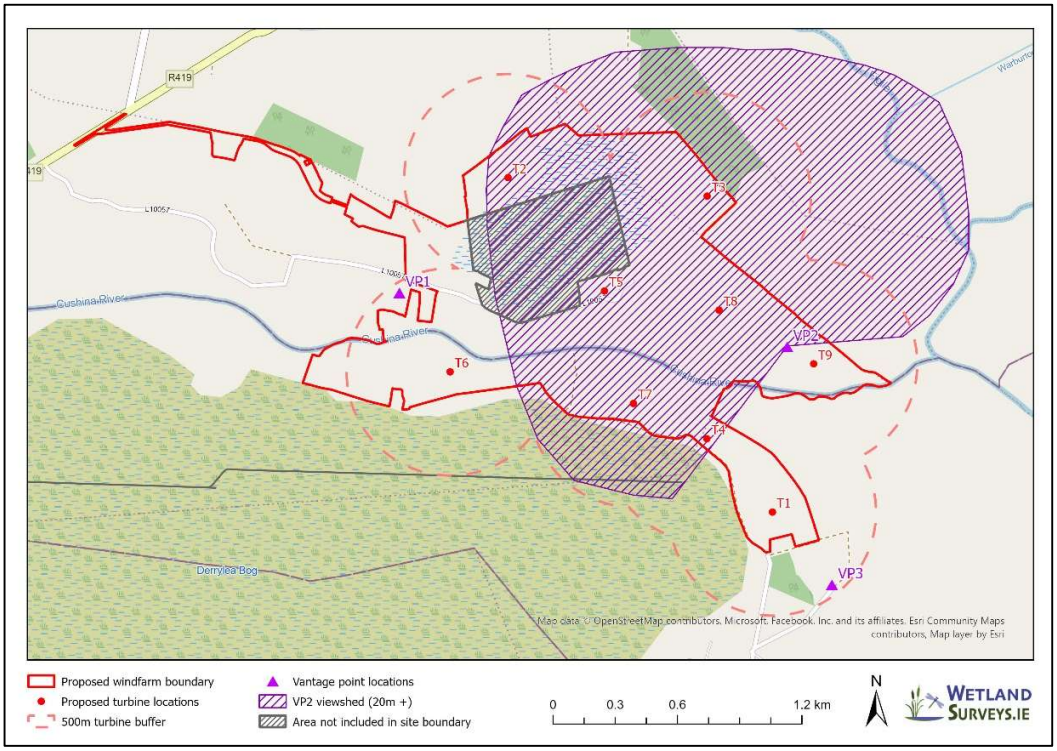

Figure 3: Viewshed from VP2 (20m height).

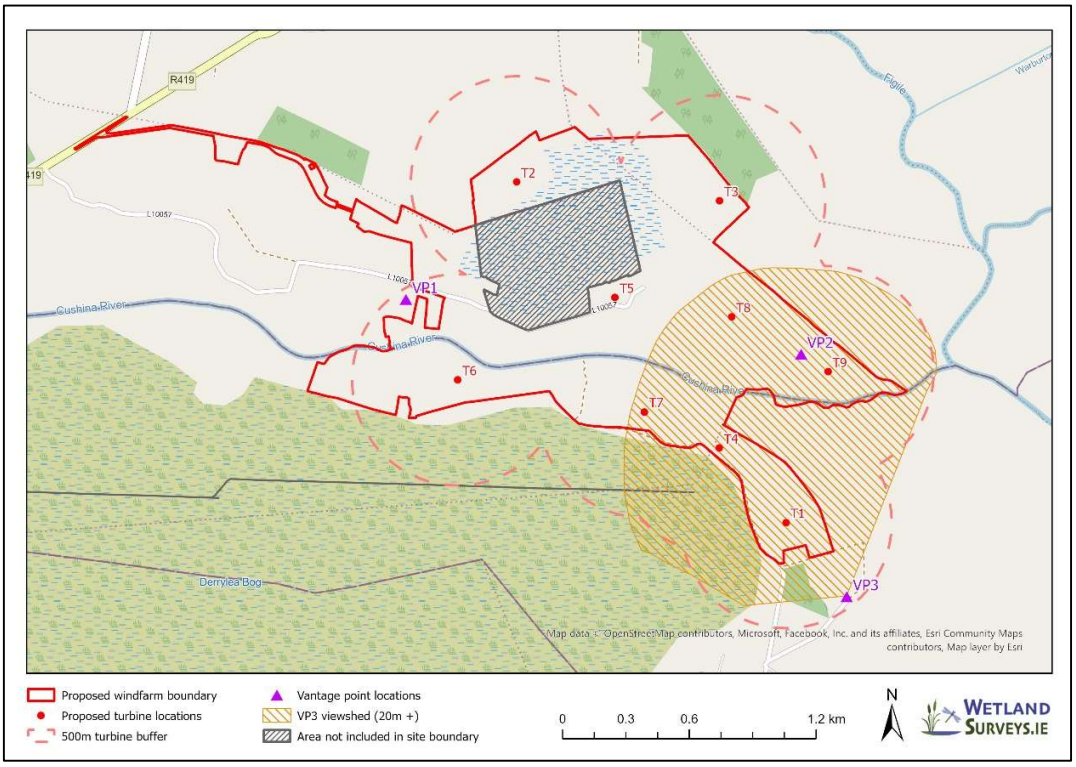

Figure 4: Viewshed from VP3 (20m height).

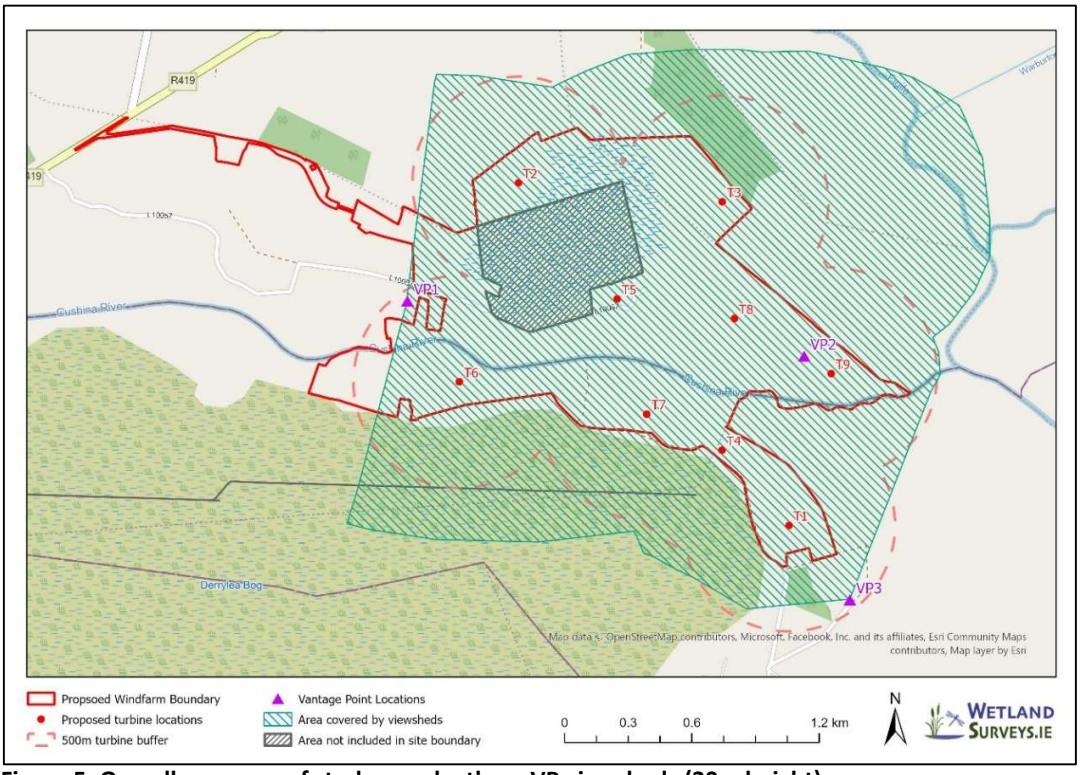

Figure 5: Overall coverage of study area by three VP viewsheds (20m height).

Table 3: Details of vantage point watches carried out at Derrynadarragh Wind Farm

	Viewshed area (km^2)	Seasonal surveys	Total survey effort (hrs)	VP Location
VP1	3.24	Winter (Oct 21 – Mar 22): 36hrs Summer (Apr – Sep 22): 36hrs Winter (Oct 22 – Mar 23): 54hrs Summer (Apr – Sep 23): 36hrs	162	658138, 716055
VP2	3.65	Winter (Oct 21 – Mar 22): 36hrs Summer (Apr – Sep 22): 36hrs Winter (Oct 22 – Mar 23): 48hrs Summer (Apr – Sep 23): 42hrs	162	660008, 715795
VP3	1.79	Winter (Oct 21 – Mar 22): na Summer (Apr – Sep 22): 36hrs Winter (Oct 22 – Mar 23): 42hrs Summer (Apr – Sep 23): 42hrs	120	660224, 714647

** VP3 has a lower survey effort compared to VP1 and VP2 as it was not established until April 2022*

** A number of additional watches were undertaken during winter 2022-23 and summer 2023 to increase coverage of the Spring and Autumn migration periods.*

Flightlines were recorded during each VP survey, noting the species of bird, number of individuals and time spent flying at various height bands[6]. Any flightlines that occurred entirely outside of the relevant viewshed were excluded from the analysis. Flightlines that partly occurred within the relevant viewshed were clipped to the viewshed and the duration of the flight was recalculated using the proportion of the original flightline occurring within the viewshed. This recalculation assumes that flight height distribution and flight speed were similar in the segments inside and outside of the viewshed.

Multiplying the number of birds by the time recorded flying for each species of interest provided the total flying time for that species during a given season in bird-seconds. This total flying time was then divided by the total watch time (s) and the area surveyed (viewshed) (km^2) to calculate the average density of birds in flight per km^2.

Vantage Point data was aggregated into two periods: winter season (October - March) and breeding season (April – September) for each year following the approach used in Band (2024). In the case of Golden Plover and Whooper Swan, which are present only during winter, the relevant periods which correspond with their presence in the study area are September to April and October to March respectively, and these periods have been used for the purposes of CRM. As there is no major difference in habitat covered by each of the VP locations, the data for all VPs were also aggregated. There were variations in the level of flight activity recorded for individual species between years, however activity was not consistently higher in one year for all

[6] Three flight bands were used to record flightlines during bird surveys at Derrynadarragh: 0-25m, 25-180m, and >180m

species. Therefore, data for the two years at all VPs was aggregated, resulting in mean bird density values for the winter season and the breeding season. These average values were used to populate daytime bird density values in the calculation excel for their corresponding months. Calculations for bird density are presented in Appendix I.

Proportion flying at risk height

In order to determine the proportion of birds flying at risk height the proportion of flight time recorded within each of the flight height bands is calculated using the height range of the proposed turbine model.

The risk height range of the selected turbine is 24-186m above ground. The following flight bands were used to record flightlines during VP surveys: Band A: 0-25m, Band B: 25-180m, and Band C >180m. These bands were established in advance of knowing the turbine dimensions and hence the risk height range differs slightly from Band B. In order to determine the proportion of birds within B and A and Band C that may be at height risk, a proportion of flights in each band were assigned as occurring within the flight risk height.

It is assumed that flight heights were distributed uniformly within each of the height bands that were used to record flightline data.

An upper ceiling of 400m was applied to Band C as this is likely to represent the upper height that most birds were observed. The risk height range for the proposed turbine models is 24-186m (hub height = 105m and rotor radius = 81m). For the flight height bands used, 1m of the rotor height span falls within the 0-25m band, 155m falls within the 25-180m band, and 6m falls within the 180-400m band. The flight time recorded within each flight height band for each species was expressed as a percentage of the total flight time for each species to determine the proportion of time spent within each flight height band for each species. This value was then multiplied by the proportion of the rotor height within the flight band, and this value for each flight band was summed to obtain the total proportion of flights falling within rotor risk height. The outcome of these calculations are presented in Table 6.

Stage B Number of flights through rotors: *Using bird density and proportion of birds at risk height (Stage A), an estimate is made of the number of bird passages through the turbine rotors over a given time period. At this stage it is assumed that birds will continue to make flights within the windfarm area at the same intensity as prior to the establishment of the windfarm.*

The potential number of flights through turbine rotors depends on turbine size. The rotor radius for turbines is 81m and nine turbines are proposed for the site. Bird flight speed is also required for this calculation. Values for each species were obtained from Alerstam *et al.* (2007).

The result of this calculation at stage B as produced by the excel spreadsheet is the projected number of rotor transits per month and per year. Projected number of transits per year are presented in Table 7.

Stage C Probability of collision for a single transit: *The probability of a collision during a single rotor transit by a bird is calculated.*

In this stage, the projected number of rotor transits calculated in Stage B are used to determine the single transit collision risk for each target species as presented in Table 7.

Stage D Expected collisions per year: *The outputs of Stage B and Stage C are multiplied to give the potential collision rate for each bird species. Current levels of bird usage at the site are still assumed at this stage, but an adjustment is made to allow for the amount of time that the turbines are operational.*

In this case a value of 85% was used as the actual percentage of operational time for the proposed windfarm site is unknown. It is known that wind turbines are not active 100% of the time and 85% is seen as an upper limit for time that a wind turbine is typically active (Wind Europe).

Stage E Allowing for avoidance and attraction: *This stage takes into account the proportion of birds likely to avoid the windfarm or turbines, either due to displacement, evasive action, or attraction to the windfarm site.*

For this part of the CRM analysis avoidance rates as presented in SNH (2018) were used (see Table 1). An exception however is in relation to Golden Plover, rather than applying the default 98% avoidance rate, a species specific rate of 99.8% was used. This approach is informed by a study by Gittings (2022) based on a review of collision data relating to four onshore wind farms.

In the case of all target bird species it was assumed that there is no reason for the proposed windfarm site to attract a higher number of species than that already present.

As the proposed windfarm comprises nine turbines, the large array correction was not applied (required for sites with 50 turbines or more).

Birds on Migration

There were peak counts of Golden Plover recorded around the Autumn migration period in both years with a flock of 4,000 birds observed in Autumn 2022. It was determined that the flights did not represent migration flights but represent staging behaviour. The migration approach was therefore not applied to the bird observations at the site.

3 RESULTS

A total of 13 target bird species were recorded during VP watches (Table 4).

Table 4: Bird species recorded during VP watches at the proposed Derrynadarragh Wind Farm. Annex I refers to whether the species is listed in Annex I of the EU Birds Directive.

Species	Conservation Status	Annex I
Buzzard	Green Listed	No
Curlew	Red Listed	No
Golden Plover	Red Listed	Yes
Hen Harrier	Amber Listed	Yes
Kestrel	Red Listed	No
Mallard	Amber Listed	No
Lapwing	Red Listed	No
Merlin	Amber Listed	Yes
Peregrine	Green Listed	Yes
Snipe	Red Listed	No
Sparrowhawk	Green Listed	No
Whooper Swan	Amber Listed	Yes
Woodcock	Red Listed	No

The average bird density value calculated for each species recorded during VP watches is presented in Table 5 below.

Table 5: Average bird density (birds / km^2) of bird species recorded during VP watches at the proposed Derrynadarragh Wind Farm

Species	*Winter average*	*Breeding average*	Birds / km^2 (all year)
Buzzard	*0.00165*	*0.0027*	0.00431
Curlew	*0.00000*	*0.0002*	0.00019
Golden Plover (winter only)	*5.01733*	*n/a*	5.01733
Hen Harrier	*0.00006*	*0.0000*	0.00006
Kestrel	*0.00125*	*0.0002*	0.00147
Lapwing	*0.00719*	*0.0000*	0.00719
Mallard	*0.00001*	*0.0000*	0.00001
Merlin	*0.00002*	*0.0000*	0.00002
Peregrine	*0.00002*	*0.0000*	0.00002
Snipe	*0.00020*	*0.0000*	0.00022
Sparrowhawk	*0.00017*	*0.0001*	0.00030
Whooper Swan	*0.00017*	*n/a*	0.00017
Woodcock	*0.00001*	*0.0000*	0.00001

Summary results for the calculation of proportion of birds at risk height are presented in Table 6 below (for more details see Appendix III) and were input as Proportion at risk height (Q_{2R}) for each species in the excel spreadsheet.

Table 6: Proportion of birds flying at risk height

Species	Proportion at risk height (24-186m)
Buzzard	57.0
Curlew	59.7
Golden Plover (winter only)	59.8
Hen Harrier	54.0
Kestrel	50.6
Lapwing	29.5
Mallard	100.0
Merlin	20.7
Peregrine	71.9
Snipe	76.1
Sparrowhawk	4.9
Whooper Swan	68.6
Woodcock	36.0

The outcome of the collision risk modelling (number of expected collisions per year with avoidance behaviour) is presented in Table 7. All input data and calculations are presented in Appendix I-III.

Table 7: Expected number of collisions per year (assuming avoidance behaviour) for bird species at the proposed Derrynadarragh Wind Farm.

Species	Projected number of rotor transits per year	Collision Risk (single transit risk)			Annual Collision Rate			Estimated collisions over a 30-year period
		Flapping	Gliding	Average	Without avoidance	Avoidance rate	With avoidance	
Buzzard	281	6.87	6.8	6.84	16	98	0.3	9
Curlew	22	5.53	5.47	5.5	1.03	98	0.021	0.63
Golden Plover (Sep - Apr)	566,588	4.96	N/A	N/A	23878	98.6	47.8	1,434
Hen Harrier	2	7.85	7.8	7.83	0.14	99	0.001	0.03
Kestrel	57	6.37	6.32	6.35	3	95	0.2	6
Lapwing	267	5.28	N/A	N/A	12	98	0.2	6
Mallard	1	5.26	N/a	N/A	0.06	98	0.001	0.03
Merlin	0	0	0	0	0.02	98	0.0003	0.0009
Peregrine	1	6.21	6.14	6.18	0.06	98	0.001	0.03
Snipe	26	4.3	4.27	4.29	0.93	98	0.019	0.57
Sparrowhawk	1	5.8	5.76	5.78	0.06	98	0.001	0.03
Whooper Swan (Oct - Mar)	14	8.82	n/a	N/A	1.07	99.5	0.005	0.15
Woodcock	0	4.62	4.57	4.6	0.02	98	0.0003	0.0009

3.1 OVERVIEW OF UNCERTAINTIES

It should be noted that CRM makes the following assumptions:

- That a bird can be modelled by a simple cruciform shape
- That a turbine blade has a width and pitch, but no thickness
- That birds fly through turbines in straight lines
- That a bird's flight will be unaffected by a near miss, despite the slipstream around a turbine blade
- That no action is taken by a bird to avoid collision and so the figures represent worst case scenarios.

It is also accepted that there are uncertainties with the input data which should be considered to give an overall level of uncertainty regarding the estimated collision risk. Following Band (2024) there are five error sources within collision risk modelling:

1. **Uncertainty in bird density (e_1)**

Survey data shows that there are variations in bird density between surveys.

The standard deviation of survey results has been calculated for the winter and breeding seasons. The square root of the sum of these values was then determined to allow for the fact that errors in one season may be offset by errors in the other direction in the other period. This standard deviation value was then applied to the sum of the average bird density values for the winter and breeding seasons to determine the associated percentage value and e value as presented in Table 8.

Table 8: Uncertainty value associated with bird density for each target species.

Species	e_1 value
Buzzard	0.07
Curlew	0.01
Golden Plover	1.59
Hen Harrier	0.01
Kestrel	0.04
Lapwing	0.06
Mallard	0.00
Merlin	0.00
Peregrine	0.00
Snipe	0.01
Sparrowhawk	0.02
Whooper Swan	0.01
Woodcock	0.00

2. Uncertainty in level of nocturnal activity (e_2)

The actual nocturnal activity of bird species is unknown due to the absence of nighttime survey data.

The number of daylight hours used in the calculation is assumed to be accurate. However there is uncertainty regarding nocturnal activity. It was assumed that none of the target species were active at night, with the exception of Golden Plover, Snipe, and Lapwing, which were assumed to be 25% as active at night as during the day (nocturnal activity factor = 2 in the excel spreadsheet). While it cannot be entirely ruled out due to the absence of data, it is not seen that it would be greater than 5%. Therefore the level of uncertainty for all species is e_2=0.05, with the exception of Golden Plover, Lapwing and Snipe where e_2=0 (as nocturnal activity is already accounted for in the calculations for this species.

3. Uncertainty in proportion flying at risk height (e_3)

Despite bird surveyors being fully trained and very experienced, it is possible that bird flights can be recorded within the wrong flight height bands.

In particular, it is possible that birds recorded in the 0-25m flight band may actually have been in the 25-180m flight band and vice versa. If the visual estimate was out by ±5m at the two lowest flight bands this would have implications for the proportion of birds flying at risk height for the proposed turbine model. The flight patterns of raptors and Whooper Swan make it unlikely that there would be errors in recording flight heights, so a low uncertainty level (e_3 = 0.05) has been assigned to these species, with a slightly higher uncertainty level (e_3 = 0.1) being assigned to the remaining species (Curlew, Golden Plover, Lapwing, Snipe).

4. Uncertainty in estimating numbers of individuals in large flocks (e_4)

Some species of birds often fly in large flocks, making an accurate estimation of the number of individuals present in the flock difficult.

Golden Plover was the only species recorded in large flocks during vantage point watches with a maximum of 4,000 birds recorded in one flock. Given the large size and mobile nature of these flocks it is likely that under or overestimates regarding the number of birds were made. Lapwing was the only other bird species recorded in significant flocks (maximum of 150 birds). Given the smaller size of the flocks there is less chance of uncertainty regarding the estimate, however a small level of uncertainty does remain.

For all other target bird species an uncertainty value of e_4 = 0 was assigned as these species typically occur singly or in very low numbers, eliminating the chance of making an incorrect estimate of numbers. For Lapwing, an uncertainty of 5% (e_4 = 0.05) was assigned due to the occurrence of some smaller flocks. The very large numbers of Golden Plover increases the

uncertainty of making accurate estimates of numbers, therefore an uncertainty of 20% (e_4 = 0.20) is assigned to Golden Plover.

5. **Uncertainty due to distance effects (e_5)**

It has been found that higher densities of flightlines are recorded in proximity to vantage point locations, while very few flightlines are recorded in the more distant parts of viewsheds.

Analysis of vantage point data has revealed that there are very strong distance effects on bird detection rates with very low detection rates at distances over 1km from the vantage point location. It has been suggested that correcting for under-detection due to distance could increase collision risk by a factor of 1.6 – 6.3 times (Gittings 2024). Three vantage points were used to gain comprehensive views over the proposed wind farm site, with some overlap in viewshed areas. In addition, the furthest limit of the 500m turbine buffer from each vantage point location is not greater than 1.5km, increasing the likelihood of all birds being recorded. The underestimation of bird activity at the outer limits of the viewsheds is estimated to be approximately 15% (reduced from the estimates provided by Gittings (2024)) due to the presence of three vantage points with some overlap in viewsheds and the proximity of the vantage points to the outer limits of the 500m turbine buffers. Therefore, e_5 = 0.15 for all target species, with the exception of Whooper Swan and Golden Plover. The large size of Whooper Swan and the large flock size of Golden Plover reduce the chance of under recording these species, even at the outer limits of a viewshed. Therefore the uncertainty for this species is reduced to 5% (e_5 = 0.05) for these two species.

6. **Uncertainty in operational time (e_6)**

An estimate of the operational time of the turbines is used as the actual operational time is unknown

A value of 85% was used in the calculation as an upper limit of operational time as provided by Wind Energy Europe. Although this value is subject to some variation it is reasonably precise and so no uncertainty is assigned (e_6=0 for all species).

7. **Uncertainty due to simplifications in the model (e_7)**

The collision risk model involves a number of simplifications such as assuming that a bird can be modelled by a simple cruciform shape, that birds fly through turbines in straight lines, and the use of an average pitch for turbine blades.

Following the worked example presented in Band (2024) an uncertainty of ± 20% is assumed (e_7=0.20 for all species).

The combined uncertainty values for each target species and each proposed turbine model is presented in Table 9 below. These uncertainty values can be applied to the relevant calculated collision risk values presented in Table 10.

Table 9: Combined uncertainty values for each target species.

Species	1	2	3	4	5	6	7	Combined uncertainty value (factor)
Buzzard	0.07	0.05	0.05	0	0.15	0	0.2	0.52
Curlew	0.01	0.05	0.1	0	0.15	0	0.2	0.51
Golden Plover	1.59	0	0.1	0.2	0.05	0	0.2	2.14
Hen Harrier	0.01	0.05	0.05	0	0.15	0	0.2	0.46
Kestrel	0.04	0.05	0.05	0	0.15	0	0.2	0.49
Lapwing	0.06	0	0.1	0	0.15	0	0.2	0.51
Mallard	0.00	0.05	0.05	0	0.15	0	0.2	0.45
Merlin	0.00	0.05	0.1	0	0.15	0	0.2	0.5
Peregrine	0.00	0.05	0.05	0	0.15	0	0.2	0.45
Snipe	0.01	0	0.1	0	0.15	0	0.2	0.46
Sparrowhawk	0.02	0.05	0.1	0	0.15	0	0.2	0.52
Whooper Swan	0.01	0.05	0.05	0	0.05	0	0.2	0.36
Woodcock	0.00	0.05	0.1	0	0.15	0	0.2	0.5

Table 10: Estimated number of collisions per year with uncertainty values

Species	Estimated number of collisions per year with avoidance and associated uncertainty values	
Buzzard	0.3 +/-	0.1560
Curlew	0.021 +/-	0.0107
Golden Plover	47.8 +/-	102.2920
Hen Harrier	0.001 +/-	0.0005
Kestrel	0.2 +/-	0.0980
Lapwing	0.2 +/-	0.1020
Mallard	0.001 +/-	0.0005
Merlin	0.0003 +/-	0.0002
Peregrine	0.001 +/-	0.0005
Snipe	0.019 +/-	0.0087
Sparrowhawk	0.001 +/-	0.0005
Whooper Swan	0.005 +/-	0.0018
Woodcock	0.0003 +/-	0.0002

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Appendix I

Calculating bird density for use in Stage A calculations

1. Total time in flight (bird seconds) for each target species recorded at each VP during the four surveys seasons

	Year 1						Year 2					
	Winter 1			Breeding 1			Winter 2			Breeding 2		
	VP1	VP2	VP3	VP1	VP2	VP3	VP1	VP2	VP3	VP1	VP2	VP3
Buzzard	1588	1325	0	2441	14	159	518	318	96	1299	2614	432
Curlew	0	0	0	0	0	264	0	0	0	0	0	0
Golden Plover (Sep to Apr)	17036	94800	0	0	0	0	17480	1624847	7936621	0	0	0
Hen Harrier	0	87	0	0	0	3	0	60	0	0	0	0
Kestrel	576	630	0	0	0	0	225	1664	155	159	456	17
Lapwing	14679	0	0	0	0	0	610	16	0	0	0	0
Mallard	0	0	0	0	0	0	38	0	0	0	0	0
Merlin	0	46	0	0	0	0	0	0	0	0	0	0
Peregrine	0	41	0	0	0	0	0	0	0	0	0	0
Snipe	91	44	0	0	0	0	427	0	0	0	7	41
Sparrowhawk	86	23	0	7	0	141	151	158	27	13	0	31
Whooper Swan (Oct to Mar)	0	204	0	0	0	0	253	0	0	0	0	0
Woodcock	0	15	0	0	0	0	7	0	0	0	0	0

2. Time in flight (total watch time divided by total watch time)

	Year 1						Year 2					
	Winter 1			Breeding 1			Winter 2			Breeding 2		
	VP1	VP2	VP3	VP1	VP2	VP3	VP1	VP2	VP3	VP1	VP2	VP3
Buzzard	0.0123	0.0102		0.0188	0.0001	0.0012	0.0027	0.0018	0.0006	0.0100	0.0173	0.0029
Curlew	0.0000	0.0000		0.0000	0.0000	0.0020	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Golden Plover (Sep to Apr)	0.1052	0.5852		0.0000	0.0000	0.0000	0.0809	7.5224	40.8262	0.0000	0.0000	0.0000
Hen Harrier	0.0000	0.0007		0.0000	0.0000	0.0000	0.0000	0.0003	0.0000	0.0000	0.0000	0.0000
Kestrel	0.0044	0.0049		0.0000	0.0000	0.0000	0.0012	0.0096	0.0010	0.0012	0.0030	0.0001
Lapwing	0.1133	0.0000		0.0000	0.0000	0.0000	0.0031	0.0001	0.0000	0.0000	0.0000	0.0000
Mallard	0.0000	0.0000		0.0000	0.0000	0.0000	0.0002	0.0000	0.0000	0.0000	0.0000	0.0000
Merlin	0.0000	0.0004		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Peregrine	0.0000	0.0003		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Snipe	0.0007	0.0003		0.0000	0.0000	0.0000	0.0022	0.0000	0.0000	0.0000	0.0000	0.0003
Sparrowhawk	0.0007	0.0002		0.0001	0.0000	0.0011	0.0008	0.0009	0.0002	0.0001	0.0000	0.0002
Whooper Swan (Oct to Mar)	0.0000	0.0016		0.0000	0.0000	0.0000	0.0013	0.0000	0.0000	0.0000	0.0000	0.0000
Woodcock	0.0000	0.0001		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

3. Bird Density (time in flight divided by area)

	Year 1						Year 2					
	Winter 1			Breeding 1			Winter 2			Breeding 2		
	VP1	VP2	VP3	VP1	VP2	VP3	VP1	VP2	VP3	VP1	VP2	VP3
Buzzard	0.0038	0.0028		0.0058	0.0000	0.0007	0.0008	0.0005	0.0004	0.0031	0.0047	0.0016
Curlew	0.0000	0.0000		0.0000	0.0000	0.0011	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Golden Plover (Sep to Apr)	0.0325	0.1603		0.0000	0.0000	0.0000	0.0250	2.0609	22.8080	0.0000	0.0000	0.0000
Hen Harrier	0.0000	0.0002		0.0000	0.0000	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000
Kestrel	0.0014	0.0013		0.0000	0.0000	0.0000	0.0004	0.0026	0.0006	0.0004	0.0008	0.0001
Lapwing	0.0350	0.0000		0.0000	0.0000	0.0000	0.0010	0.0000	0.0000	0.0000	0.0000	0.0000
Mallard	0.0000	0.0000		0.0000	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000
Merlin	0.0000	0.0001		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Peregrine	0.0000	0.0001		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Snipe	0.0002	0.0001		0.0000	0.0000	0.0000	0.0007	0.0000	0.0000	0.0000	0.0000	0.0002
Sparrowhawk	0.0002	0.0000		0.0000	0.0000	0.0006	0.0002	0.0003	0.0001	0.0000	0.0000	0.0001
Whooper Swan (Oct to Mar)	0.0000	0.0004		0.0000	0.0000	0.0000	0.0004	0.0000	0.0000	0.0000	0.0000	0.0000
Woodcock	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

4. Mean bird density according to season for birds recorded during Vantage Point watches

	Winter season		**Breeding Season**	
	Average	Standard Deviation	Average	Standard Deviation
Buzzard	0.00165	0.00154	0.0027	0.00230
Curlew	0.00000	0.00000	0.0002	0.00046
Kestrel	5.01733	9.98261	0.0000	0.00000
Golden Plover	0.00006	0.00008	0.0000	0.00001
Hen Harrier	0.00125	0.00090	0.0002	0.00034
Lapwing	0.00719	0.01553	0.0000	0.00000
Mallard	0.00001	0.00003	0.0000	0.00000
Merlin	0.00002	0.00004	0.0000	0.00000
Peregrine	0.00002	0.00004	0.0000	0.00000
Snipe	0.00020	0.00028	0.0000	0.00006
Sparrowhawk	0.00017	0.00009	0.0001	0.00024
Whooper Swan	0.00017	0.00023	0.0000	0.00000
Woodcock	0.00001	0.00001	0.0000	0.00000

Appendix II

Calculations for proportion of birds flying at risk height for use in Stage A calculations

Species	Proportion observed 0-25m	Proportion observed 25-180m	Proportion observed 180-200m	At Rotor Height			Proportion between 24-186m (based on proportion of flight time in risk zone) as percentage
				Proportion of birds at >24 in Band A	Proportion in flight band B (25-180)	Proportion of birds at <185 in Band C	
Buzzard	6	57	37	0.3	55.7	1.0	57.0
Curlew	0	59	41	0.0	58.6	1.1	59.7
Golden Plover	0	55	45	0.0	58.7	1.1	59.8
Hen Harrier	48	52	0	1.9	52.1	0.0	54.0
Kestrel	42	51	7	1.8	48.6	0.2	50.6
Lapwing	0.5	5	94.5	0.1	27.5	1.9	29.5
Mallard	0	100	0	0.0	100.0	0.0	100.0
Merlin	83	17	0	3.3	17.4	0.0	20.7
Peregrine	19	71	10	0.8	70.9	0.3	71.9
Snipe	33	65	2	0.9	75.1	0.0	76.1
Sparrowhawk	34	2	64	1.6	1.7	1.6	4.9
Whooper Swan	21	79	0	1.3	67.3	0.0	68.6
Woodcock	67	33	0	2.7	33.3	0.0	36.0

Appendix III

Collision probability

Outcome of Stage A – Stage E in collision risk model

Species	Projected number of rotor transits per year	Collision Risk (single transit risk)			Annual Collision Rate			Estimated collisions over a 30-year period
		Flapping	Gliding	Average	Without avoidance	Avoidance rate %	With avoidance	
Buzzard	281	6.87	6.8	6.84	16	98	0.3 ± 0.1560	9 ± 4.68
Curlew	22	5.53	5.47	5.5	1.03	98	0.021 ± 0.0107	0.63 ± 0.32
Golden Plover	566,588	4.96	N/A	N/A	23878	98.6	47.8 ± 102	1,434 ± 3068
Hen Harrier	2	7.85	7.8	7.83	0.14	99	0.001 ± 0.0005	0.03 ± 0.01
Kestrel	57	6.37	6.32	6.35	3	95	0.2 ± 0.0980	6 ± 2.94
Lapwing	267	5.28	N/A	N/A	12	98	0.2 ± 0.1020	6 ± 3.06
Mallard	1	5.26	N/a	N/A	0.06	98	0.001 ± 0.0005	0.03 ± 0.01
Merlin	0	0	0	0	0.02	98	0.0003 ± 0.0002	0.001 ± 0.00
Peregrine	1	6.21	6.14	6.18	0.06	98	0.001 ± 0.0005	0.03 ± 0.01
Snipe	26	4.3	4.27	4.29	0.93	98	0.019 ± 0.0087	0.57 ± 0.26
Sparrowhawk	1	5.8	5.76	5.78	0.06	98	0.001 ± 0.0005	0.03 ± 0.02
Whooper Swan	14	8.82	n/a	N/A	1.07	99.5	0.005 ± 0.0018	0.15 ± 0.05
Woodcock	0	4.62	4.57	4.6	0.02	98	0.0003 ± 0.0002	0.0009 ± 0.00

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