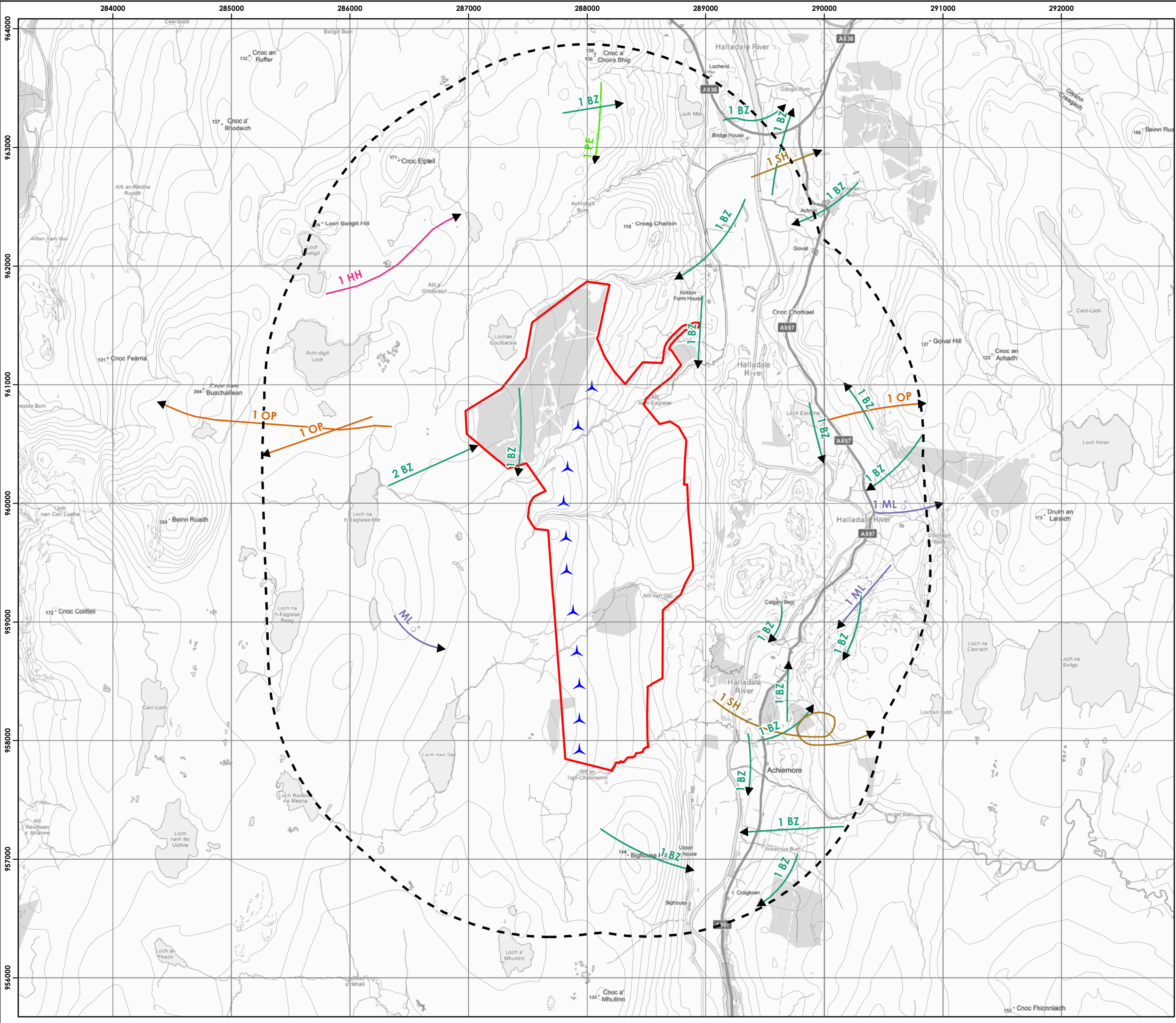




Kirkton
Energy Park

Kirkton Wind
Farm Ltd

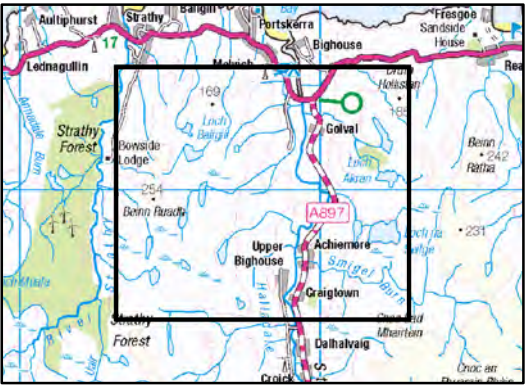
Figure 9.1.13
Breeding Raptor Survey Results
2020

Key

- Site boundary
- Proposed turbine
- Survey area

Raptor flight observation

- Buzzard
- Hen harrier
- Merlin
- Osprey
- Peregrine
- Sparrowhawk



0 0.25 0.5 1
Kilometres

Scale @ A3:
1:30,000

N

URS
UKAS

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Appendix B. Vantage Point Survey Visit Details

Table 32: VP Survey Information – Timing and Duration of Surveys (September 2019 - February 2020)

Survey Date	Start Time	Finish Time	Duration	Surveyor	VP Type	VP Number
20/09/2019	10:30	13:30	03:00:00	P Stagg	Diurnal	1
20/09/2019	14:30	17:30	03:00:00	P Stagg	Diurnal	2
23/09/2019	10:40	13:40	03:00:00	P Stagg	Diurnal	3
23/09/2019	14:10	17:10	03:00:00	P Stagg	Diurnal	3
24/09/2019	10:00	13:00	03:00:00	P Stagg	Diurnal	2
24/09/2019	14:00	17:00	03:00:00	P Stagg	Diurnal	1
08/10/2019	09:40	12:40	03:00:00	G Campbell	Diurnal	3
08/10/2019	13:10	16:10	03:00:00	G Campbell	Diurnal	2
09/10/2019	09:15	12:15	03:00:00	G Campbell	Diurnal	1
09/10/2019	13:15	16:15	03:00:00	G Campbell	Diurnal	3
10/10/2019	08:30	11:30	03:00:00	G Campbell	Diurnal	2
10/10/2019	12:00	15:00	03:00:00	G Campbell	Diurnal	1
19/11/2019	08:45	11:45	03:00:00	G Campbell	Diurnal	3
19/11/2019	12:00	15:00	03:00:00	G Campbell	Diurnal	3
20/11/2019	08:45	11:45	03:00:00	G Campbell	Diurnal	1
20/11/2019	12:00	15:00	03:00:00	G Campbell	Diurnal	1
21/11/2019	08:45	11:45	03:00:00	G Campbell	Diurnal	2
21/11/2019	12:00	15:00	03:00:00	G Campbell	Diurnal	2
10/12/2019	08:50	11:50	03:00:00	C Mckinnie	Diurnal	2
10/12/2019	12:20	15:20	03:00:00	C Mckinnie	Diurnal	2
11/12/2019	08:45	11:45	03:00:00	C Mckinnie	Diurnal	3
11/12/2019	12:00	15:00	03:00:00	C Mckinnie	Diurnal	3
12/12/2019	09:00	12:00	03:00:00	C Mckinnie	Diurnal	1
12/12/2019	12:00	15:00	03:00:00	C Mckinnie	Diurnal	1
14/01/2020	09:00	12:00	03:00:00	G Campbell	Diurnal	2
14/01/2020	12:40	15:40	03:00:00	G Campbell	Diurnal	1
15/01/2020	09:30	12:30	03:00:00	G Campbell	Diurnal	3
15/01/2020	12:40	15:40	03:00:00	G Campbell	Diurnal	3
16/01/2020	08:50	11:50	03:00:00	G Campbell	Diurnal	1
16/01/2020	12:30	15:30	03:00:00	G Campbell	Diurnal	2
18/02/2020	12:00	15:00	03:00:00	S Lashley	Diurnal	1
19/02/2020	09:00	12:00	03:00:00	S Lashley	Diurnal	3
19/02/2020	12:00	15:00	03:00:00	S Lashley	Diurnal	3
20/02/2020	09:00	12:00	03:00:00	S Lashley	Diurnal	2
20/02/2020	12:00	15:00	03:00:00	S Lashley	Diurnal	2

Table 33: VP Survey Information – Timing and Duration of Surveys (March – August 2020)

Survey Date	Start Time	Finish Time	Duration	Surveyor	VP Type	VP Number
03/03/2020	09:15	12:15	03:00:00	G Campbell	Diurnal	1
03/03/2020	12:20	15:20	03:00:00	G Campbell	Diurnal	1
04/03/2020	09:15	12:15	03:00:00	G Campbell	Diurnal	3
04/03/2020	12:20	15:20	03:00:00	G Campbell	Diurnal	3
05/03/2020	09:15	12:15	03:00:00	G Campbell	Diurnal	1
05/03/2020	13:00	16:00	03:00:00	G Campbell	Diurnal	2
06/03/2020	09:00	12:00	03:00:00	G Campbell	Diurnal	2
22/04/2020	09:00	12:00	03:00:00	P Higson	Diurnal	1
22/04/2020	12:30	15:30	03:00:00	P Higson	Diurnal	2
27/04/2020	14:00	17:00	03:00:00	P Higson	Diurnal	3
30/04/2020	06:30	09:30	03:00:00	P Higson	Diurnal	2
01/05/2020	14:30	17:30	03:00:00	P Higson	Diurnal	1
02/05/2020	06:30	09:30	03:00:00	P Higson	Diurnal	3
15/05/2020	08:30	11:30	03:00:00	P Higson	Diurnal	2
15/05/2020	12:00	15:00	03:00:00	P Higson	Diurnal	3
17/05/2020	15:00	18:00	03:00:00	P Higson	Diurnal	1
18/05/2020	06:00	09:00	03:00:00	P Higson	Diurnal	3
20/05/2020	06:00	09:00	03:00:00	P Higson	Diurnal	1
30/05/2020	13:30	16:30	03:00:00	P Higson	Diurnal	2
15/06/2020	17:00	20:00	03:00:00	C Mckinnie	Diurnal	2
15/06/2020	20:20	23:20	03:00:00	C Mckinnie	Dusk	2
17/06/2020	03:10	06:10	03:00:00	C Mckinnie	Dawn	1
17/06/2020	06:30	09:30	03:00:00	C Mckinnie	Diurnal	1
18/06/2020	17:20	20:20	03:00:00	G Campbell	Diurnal	3
18/06/2020	20:25	23:25	03:00:00	G Campbell	Dusk	3
19/06/2020	03:05	06:05	03:00:00	C Mckinnie	Dawn	2
19/06/2020	06:30	09:30	03:00:00	C Mckinnie	Diurnal	2
22/06/2020	17:30	20:30	03:00:00	G Campbell	Diurnal	1
22/06/2020	20:30	23:30	03:00:00	G Campbell	Dusk	1
24/06/2020	03:15	06:15	03:00:00	G Campbell	Dawn	3
24/06/2020	06:15	09:15	03:00:00	G Campbell	Diurnal	3
28/06/2020	06:00	09:00	03:00:00	P Higson	Diurnal	4
28/06/2020	10:00	13:00	03:00:00	P Higson	Diurnal	5
30/06/2020	06:30	09:30	03:00:00	P Higson	Diurnal	5
30/06/2020	10:30	13:30	03:00:00	P Higson	Diurnal	4
02/07/2020	03:15	06:15	03:00:00	C Mckinnie	Dawn	1
02/07/2020	06:45	09:45	03:00:00	C Mckinnie	Diurnal	1
03/07/2020	03:10	06:10	03:00:00	C Mckinnie	Dawn	2
03/07/2020	06:40	09:40	03:00:00	C Mckinnie	Diurnal	2
11/07/2020	14:30	17:30	03:00:00	P Higson	Diurnal	4
12/07/2020	06:30	09:30	03:00:00	P Higson	Diurnal	4
13/07/2020	16:50	19:50	03:00:00	C Mckinnie	Diurnal	2
13/07/2020	20:15	23:15	03:00:00	C Mckinnie	Dusk	3

Survey Date	Start Time	Finish Time	Duration	Surveyor	VP Type	VP Number
14/07/2020	17:00	20:00	03:00:00	C Mckinnie	Diurnal	3
14/07/2020	20:15	23:15	03:00:00	C Mckinnie	Dusk	1
16/07/2020	17:00	20:00	03:00:00	C Mckinnie	Diurnal	1
16/07/2020	20:20	23:20	03:00:00	C Mckinnie	Dusk	2
18/07/2020	15:00	18:00	03:00:00	P Higson	Diurnal	4
19/07/2020	06:00	09:00	03:00:00	P Higson	Diurnal	4
25/07/2020	06:00	09:00	03:00:00	P Higson	Diurnal	5
25/07/2020	09:45	12:45	03:00:00	P Higson	Diurnal	4
26/07/2020	10:00	13:00	03:00:00	P Higson	Diurnal	4
26/07/2020	14:00	17:00	03:00:00	P Higson	Diurnal	5
29/07/2020	04:00	07:00	03:00:00	S Lashley	Dawn	3
29/07/2020	07:00	10:00	03:00:00	S Lashley	Diurnal	3
15/08/2020	06:00	09:00	03:00:00	P Higson	Diurnal	4
15/08/2020	09:45	12:45	03:00:00	P Higson	Diurnal	5
16/08/2020	08:00	11:00	03:00:00	P Higson	Diurnal	5
16/08/2020	11:45	14:45	03:00:00	P Higson	Diurnal	4
20/08/2020	07:00	10:00	03:00:00	P Higson	Diurnal	4
20/08/2020	10:45	13:45	03:00:00	P Higson	Diurnal	5
21/08/2020	10:00	13:00	03:00:00	P Higson	Diurnal	5
21/08/2020	13:45	16:45	03:00:00	P Higson	Diurnal	4
22/08/2020	14:30	17:30	03:00:00	P Higson	Diurnal	1
22/08/2020	18:30	21:30	03:00:00	P Higson	Dusk	3
24/08/2020	15:05	18:05	03:00:00	C Mckinnie	Diurnal	3
24/08/2020	18:35	21:35	03:00:00	C Mckinnie	Dusk	2
26/08/2020	05:05	08:05	03:00:00	C Mckinnie	Dawn	2
26/08/2020	08:45	11:45	03:00:00	C Mckinnie	Diurnal	1
28/08/2020	05:05	08:05	03:00:00	C Mckinnie	Dawn	1
28/08/2020	08:45	11:45	03:00:00	C Mckinnie	Diurnal	2
29/08/2020	14:15	17:15	03:00:00	P Higson	Diurnal	2
29/08/2020	18:00	21:00	03:00:00	P Higson	Dusk	1
31/08/2020	05:30	08:30	03:00:00	P Higson	Dawn	3
31/08/2020	09:00	12:00	03:00:00	P Higson	Diurnal	3

Table 34: VP Survey Information – Timing and Duration of Surveys (September 2020 – February 2021)

Survey Date	Start Time	Finish Time	Duration	Surveyor	VP Type	VP Number
15/09/2020	09:00	12:00	03:00:00	M Doherty	Diurnal	2
15/09/2020	12:30	15:30	03:00:00	M Doherty	Diurnal	3
17/09/2020	09:30	12:30	03:00:00	M Doherty	Diurnal	1
17/09/2020	13:00	16:00	03:00:00	M Doherty	Diurnal	2
06/10/2020	09:45	12:45	03:00:00	C Mckinnie	Diurnal	3
06/10/2020	14:00	17:00	03:00:00	C Mckinnie	Diurnal	1
28/10/2020	08:15	11:15	03:00:00	M Doherty	Diurnal	1
28/10/2020	12:10	15:10	03:00:00	M Doherty	Diurnal	3
29/10/2020	08:00	11:00	03:00:00	M Doherty	Diurnal	2
29/10/2020	11:45	14:45	03:00:00	M Doherty	Diurnal	1
30/10/2020	08:40	11:40	03:00:00	M Doherty	Diurnal	3
30/10/2020	12:00	15:00	03:00:00	M Doherty	Diurnal	2
24/11/2020	08:30	11:30	03:00:00	M Doherty	Diurnal	3
24/11/2020	12:00	15:00	03:00:00	M Doherty	Diurnal	2
25/11/2020	08:10	11:10	03:00:00	M Doherty	Diurnal	1
25/11/2020	12:00	15:00	03:00:00	M Doherty	Diurnal	3
26/11/2020	08:30	11:30	03:00:00	M Doherty	Diurnal	2
26/11/2020	12:15	15:15	03:00:00	M Doherty	Diurnal	1
08/12/2020	09:00	12:00	03:00:00	P Higson	Diurnal	3
08/12/2020	12:30	15:30	03:00:00	P Higson	Diurnal	2
09/12/2020	08:30	11:30	03:00:00	P Higson	Diurnal	1
09/12/2020	12:00	15:00	03:00:00	P Higson	Diurnal	2
10/12/2020	08:30	11:30	03:00:00	P Higson	Diurnal	3
10/12/2020	12:15	15:15	03:00:00	P Higson	Diurnal	1
14/01/2021	12:00	15:00	03:00:00	C Mckinnie	Diurnal	2
20/01/2021	11:15	14:15	03:00:00	S Lashley	Diurnal	1
21/01/2021	08:45	11:45	03:00:00	S Lashley	Diurnal	2
22/01/2021	09:00	12:00	03:00:00	S Lashley	Diurnal	3
28/01/2021	12:30	15:30	03:00:00	C Mckinnie	Diurnal	3
29/01/2021	10:00	13:00	03:00:00	C Mckinnie	Diurnal	1
16/02/2021	12:45	15:45	03:00:00	C Mckinnie	Diurnal	1
17/02/2021	09:00	12:00	03:00:00	C Mckinnie	Diurnal	1
17/02/2021	12:30	15:30	03:00:00	C Mckinnie	Diurnal	3
18/02/2021	09:00	12:00	03:00:00	C Mckinnie	Diurnal	3

18/02/2021	12:45	15:45	03:00:00	C Mckinnie	Diurnal	2
19/02/2021	09:00	12:00	03:00:00	C Mckinnie	Diurnal	2

Table 35: VP Survey Information – Timing and Duration of Surveys (March – August 2021)

Survey Date	Start Time	Finish Time	Duration	Surveyor	VP Type	VP Number
08/03/2021	12:15	15:15	03:00:00	S Lashley	Diurnal	1
09/03/2021	09:25	12:25	03:00:00	S Lashley	Diurnal	3
09/03/2021	12:45	15:45	03:00:00	S Lashley	Diurnal	2
10/03/2021	08:45	11:45	03:00:00	S Lashley	Diurnal	2
10/03/2021	12:15	15:15	03:00:00	S Lashley	Diurnal	3
11/03/2021	09:15	12:15	03:00:00	S Lashley	Diurnal	1
16/03/2021	16:30	19:30	03:00:00	S Lashley	Dusk	2
17/03/2021	05:25	08:25	03:00:00	S Lashley	Dawn	3
17/03/2021	16:25	19:25	03:00:00	S Lashley	Dusk	1
18/03/2021	05:25	08:25	03:00:00	S Lashley	Dawn	1
18/03/2021	16:20	19:20	03:00:00	S Lashley	Dusk	3
19/03/2021	05:20	08:20	03:00:00	S Lashley	Dawn	2
10/04/2021	08:00	11:00	03:00:00	P Higson	Diurnal	1
10/04/2021	11:30	14:30	03:00:00	P Higson	Diurnal	1
11/04/2021	05:00	08:00	03:00:00	P Higson	Dawn	2
11/04/2021	08:30	11:30	03:00:00	P Higson	Diurnal	3
18/04/2021	04:30	07:30	03:00:00	P Higson	Dawn	1
18/04/2021	08:00	11:00	03:00:00	P Higson	Diurnal	1
20/04/2021	09:00	12:00	03:00:00	P Higson	Diurnal	2
20/04/2021	12:30	15:30	03:00:00	P Higson	Diurnal	3
24/04/2021	04:30	07:30	03:00:00	P Higson	Dawn	3
24/04/2021	08:00	11:00	03:00:00	P Higson	Diurnal	2
28/04/2021	08:00	11:00	03:00:00	P Higson	Diurnal	3
28/04/2021	11:30	14:30	03:00:00	P Higson	Diurnal	2
01/05/2021	15:10	18:10	03:00:00	P Higson	Diurnal	1
01/05/2021	18:50	21:50	03:00:00	P Higson	Dusk	2
05/05/2021	04:15	07:15	03:00:00	P Higson	Dawn	2
05/05/2021	08:00	11:00	03:00:00	P Higson	Diurnal	1
08/05/2021	04:00	07:00	03:00:00	P Higson	Dawn	3
08/05/2021	07:30	10:30	03:00:00	P Higson	Diurnal	3
14/05/2021	16:00	19:00	03:00:00	P Higson	Diurnal	3
14/05/2021	19:30	22:30	03:00:00	P Higson	Dusk	3
21/05/2021	03:30	06:30	03:00:00	P Higson	Dawn	1
21/05/2021	07:00	10:00	03:00:00	P Higson	Diurnal	2

23/05/2021	06:00	09:00	03:00:00	P Higson	Diurnal	4
23/05/2021	09:30	12:30	03:00:00	P Higson	Diurnal	5
29/05/2021	16:30	19:30	03:00:00	P Higson	Diurnal	2
29/05/2021	20:00	23:00	03:00:00	P Higson	Dusk	1
06/06/2021	03:00	06:00	03:00:00	P Higson	Dawn	2
06/06/2021	06:30	09:30	03:00:00	P Higson	Diurnal	3
09/06/2021	17:00	20:00	03:00:00	P Higson	Diurnal	1
09/06/2021	20:30	23:30	03:00:00	P Higson	Dusk	1
12/06/2021	02:45	05:45	03:00:00	P Higson	Dawn	3
12/06/2021	06:15	09:15	03:00:00	P Higson	Diurnal	2
18/06/2021	17:15	20:15	03:00:00	P Higson	Diurnal	3
18/06/2021	20:45	23:45	03:00:00	P Higson	Dusk	2
20/06/2021	05:00	08:00	03:00:00	P Higson	Diurnal	4
20/06/2021	08:30	11:30	03:00:00	P Higson	Diurnal	5
26/06/2021	02:45	05:45	03:00:00	P Higson	Dawn	1
26/06/2021	06:15	09:15	03:00:00	P Higson	Diurnal	1
27/06/2021	17:15	20:15	03:00:00	P Higson	Diurnal	2
27/06/2021	20:45	23:45	03:00:00	P Higson	Dusk	3
30/06/2021	11:00	14:00	03:00:00	P Higson	Diurnal	5
30/06/2021	14:30	17:30	03:00:00	P Higson	Diurnal	4
03/07/2021	17:00	20:00	03:00:00	P Higson	Diurnal	2
03/07/2021	20:40	23:40	03:00:00	P Higson	Dusk	3
11/07/2021	05:00	08:00	03:00:00	P Higson	Diurnal	4
11/07/2021	08:30	11:30	03:00:00	P Higson	Diurnal	5
16/07/2021	16:45	19:45	03:00:00	P Higson	Diurnal	1
16/07/2021	20:15	23:15	03:00:00	P Higson	Dusk	1
17/07/2021	03:30	06:30	03:00:00	P Higson	Dawn	2
17/07/2021	07:00	10:00	03:00:00	P Higson	Diurnal	3
23/07/2021	03:45	06:45	03:00:00	P Higson	Dawn	3
23/07/2021	07:15	10:15	03:00:00	P Higson	Diurnal	2
24/07/2021	03:45	06:45	03:00:00	P Higson	Dawn	1
24/07/2021	07:15	10:15	03:00:00	P Higson	Diurnal	1
25/07/2021	16:15	19:15	03:00:00	P Higson	Diurnal	3
25/07/2021	19:50	22:50	03:00:00	P Higson	Dusk	2
31/07/2021	08:30	11:30	03:00:00	P Higson	Diurnal	4
31/07/2021	12:00	15:00	03:00:00	P Higson	Diurnal	5
02/08/2021	15:25	18:25	03:00:00	K Hedderwick	Diurnal	4
02/08/2021	18:35	21:35	03:00:00	K Hedderwick	Dusk	4

03/08/2021	05:10	08:10	03:00:00	K Hedderwick	Dawn	4
03/08/2021	08:10	11:10	03:00:00	K Hedderwick	Diurnal	4
04/08/2021	15:30	18:30	03:00:00	K Hedderwick	Diurnal	5
04/08/2021	18:30	21:30	03:00:00	K Hedderwick	Dusk	5
05/08/2021	05:15	08:15	03:00:00	K Hedderwick	Dawn	5
05/08/2021	08:15	11:15	03:00:00	K Hedderwick	Diurnal	5
09/08/2021	15:18	18:18	03:00:00	K Hedderwick	Diurnal	1
09/08/2021	18:18	21:18	03:00:00	K Hedderwick	Dusk	1
10/08/2021	15:13	18:13	03:00:00	K Hedderwick	Diurnal	2
10/08/2021	18:15	21:15	03:00:00	K Hedderwick	Dusk	2
11/08/2021	05:29	08:29	03:00:00	K Hedderwick	Dawn	2
11/08/2021	08:29	11:29	03:00:00	K Hedderwick	Diurnal	2
12/08/2021	15:09	18:09	03:00:00	K Hedderwick	Diurnal	3
12/08/2021	18:09	21:09	03:00:00	K Hedderwick	Dusk	3
13/08/2021	05:33	08:33	03:00:00	K Hedderwick	Dawn	1
13/08/2021	08:33	11:33	03:00:00	K Hedderwick	Diurnal	1
18/08/2021	05:44	08:44	03:00:00	K Hedderwick	Dawn	3
18/08/2021	08:44	11:44	03:00:00	K Hedderwick	Diurnal	3

Appendix C. Vantage Point Survey Summary of Weather Conditions

Table 36: Vantage Point Weather Summary (September 2019 – February 2020)

Survey Date	VP Number	VP Type	Mean Cloud Cover (eights)	Modal Visibility	Modal Precipitation	Mean Temperature (°C)	Mean Wind Speed (Beaufort Scale)	Modal Wind Direction
20/09/2019	1	Diurnal	8	> 2km	None	12	1	S
	2	Diurnal	0	> 2km	None	15	2	SW
23/09/2019	3	Diurnal	6	> 2km	None	12	2	SE
			4	> 2km	None	13	2	SE
24/09/2019	1	Diurnal	7	> 2km	None	11	3	SE
	2	Diurnal	8	> 2km	None	10	3	SE
08/10/2019	2	Diurnal	7	> 2km	Light Intermittent	9	1	S
	3	Diurnal	7	> 2km	Light Intermittent	8	2	S
09/10/2019	1	Diurnal	7	> 2km	Light Intermittent	8	3	SSW
	3	Diurnal	7	> 2km	Light Intermittent	8	2	SSW
10/10/2019	1	Diurnal	7	> 2km	None	8	2	WSW
	2	Diurnal	7	> 2km	None	8	1	W
19/11/2019	3	Diurnal	6	> 2km	None	-2	1	SSE
			6	> 2km	None	0	1	SE
20/11/2019	1	Diurnal	7	> 2km	None	1	2	SSE
			7	> 2km	None	0	2	SSE
21/11/2019	2	Diurnal	7	> 2km	None	3	1	S
			4	> 2km	None	3	2	SSE
10/12/2019	2	Diurnal	7	> 2km	Light Intermittent	6	3	N
			7	> 2km	Light Persistent	6	3	N
11/12/2019	3	Diurnal	5	> 2km	Light Intermittent	3	3	NE
			6	> 2km	Light Persistent	4	5	NE
12/12/2019	1	Diurnal	1	> 2km	None	0	1	NNE
			2	> 2km	None	3	1	NNE
14/01/2020	1	Diurnal	6	> 2km	None	0	2	SSW
	2	Diurnal	5	> 2km	Light Intermittent	1	2	SSW
15/01/2020	3	Diurnal	5	> 2km	None	0	2	S

Survey Date	VP Number	VP Type	Mean Cloud Cover (eights)	Modal Visibility	Modal Precipitation	Mean Temperature (°C)	Mean Wind Speed (Beaufort Scale)	Modal Wind Direction
			6	> 2km	Light Intermittent	0	2	SSW
16/01/2020	1	Diurnal	8	> 2km	Light Intermittent	1	1	S
	2	Diurnal	7	> 2km	None	1	1	S
18/02/2020	1	Diurnal	4	> 2km	None	6	4	N
19/02/2020	3	Diurnal	0	> 2km	None	6	2	E
			7	> 2km	None	6	3	N
20/02/2020	2	Diurnal	1	> 2km	None	6	3	NE
			5	1km - 2km	Light Intermittent	5	4	N

Table 37: Vantage Point Weather Summary (March – August 2020)

Survey Date	VP Number	VP Type	Mean Cloud Cover (eights)	Modal Visibility	Modal Precipitation	Mean Temperature (°C)	Mean Wind Speed (Beaufort Scale)	Modal Wind Direction
03/03/2020	1	Diurnal	6	> 2km	None	4	1	WNW
			5	> 2km	None	3	1	WNW
04/03/2020	3	Diurnal	2	> 2km	None	0	1	SSW
			6	> 2km	None	0	1	SSW
05/03/2020	1	Diurnal	5	> 2km	None	-1	1	S
	2	Diurnal	6	> 2km	None	2	1	SSW
06/03/2020	2	Diurnal	4	> 2km	None	0	1	S
22/04/2020	1	Diurnal	1	> 2km	None	10	3	E
	2	Diurnal	3	> 2km	None	10	3	E
27/04/2020	3	Diurnal	4	> 2km	None	7	3	NE
30/04/2020	2	Diurnal	2	> 2km	None	7	3	E
01/05/2020	1	Diurnal	4	> 2km	None	9	4	NW
02/05/2020	3	Diurnal	5	> 2km	None	8	3	N
15/05/2020	2	Diurnal	5	> 2km	None	10	4	W
	3	Diurnal	5	> 2km	None	11	4	W
17/05/2020	1	Diurnal	7	> 2km	Light Intermittent	7	3	NE
18/05/2020	3	Diurnal	6	> 2km	Light Intermittent	8	3	SW
20/05/2020	1	Diurnal	4	> 2km	None	9	3	ESE
30/05/2020	2	Diurnal	2	> 2km	None	13	3	ESE
15/06/2020	2	Diurnal	1	> 2km	None	17	2	NW
		Dusk	2	> 2km	None	14	1	NNW
17/06/2020	1	Dawn	8	200m - 1km	None	11	2	E
		Diurnal	8	> 2km	None	12	0	ESE
18/06/2020	3	Diurnal	6	> 2km	None	12	2	ESE
		Dusk	8	> 2km	None	9	2	ESE
19/06/2020	2	Dawn	8	1km - 2km	None	10	2	W
		Diurnal	7	> 2km	None	11	2	WNW
22/06/2020	1	Diurnal	7	> 2km	None	10	1	SSW
		Dusk	7	> 2km	Light Intermittent	9	1	ENE
24/06/2020	3	Dawn	6	> 2km	Light Intermittent	12	0	SE

Survey Date	VP Number	VP Type	Mean Cloud Cover (eights)	Modal Visibility	Modal Precipitation	Mean Temperature (°C)	Mean Wind Speed (Beaufort Scale)	Modal Wind Direction
		Diurnal	7	> 2km	None	13	1	SSW
02/07/2020	1	Dawn	7	> 2km	None	3	1	SE
		Diurnal	6	> 2km	None	8	2	E
03/07/2020	2	Dawn	7	> 2km	None	8	0	
		Diurnal	6	> 2km	None	10	0	
13/07/2020	2	Diurnal	7	> 2km	None	14	2	SSE
	3	Dusk	7	> 2km	None	11	2	NE
14/07/2020	1	Dusk	6	> 2km	None	11	0	SSE
	3	Diurnal	5	> 2km	None	13	1	SE
16/07/2020	1	Diurnal	8	> 2km	None	18	4	NNE
	2	Dusk	7	> 2km	None	15	1	ESE
29/07/2020	3	Dawn	8	> 2km	Light Intermittent	11	2	E
		Diurnal	8	> 2km	Light Persistent	12	3	SE
15/08/2020	4	Diurnal	3	> 2km	None	12	3	ESE
	5	Diurnal	3	> 2km	None	13	2	ESE
16/08/2020	4	Diurnal	6	> 2km	Light Intermittent	18	4	E
	5	Diurnal	3	> 2km	None	12	3	E
20/08/2020	4	Diurnal	4	> 2km	Light Intermittent	15	2	SE
	5	Diurnal	3	> 2km	None	18	2	SE
21/08/2020	4	Diurnal	4	> 2km	None	16	3	SE
	5	Diurnal	4	> 2km	None	16	3	SE
22/08/2020	1	Diurnal	5	> 2km	None	15	3	NW
	3	Dusk	6	> 2km	None	13	3	W
24/08/2020	2	Dusk	5	> 2km	None	11	0	
	3	Diurnal	4	> 2km	None	13	1	SSE
26/08/2020	1	Diurnal	8	> 2km	None	12	0	W
	2	Dawn	6	> 2km	None	10	0	WNW
28/08/2020	1	Dawn	7	> 2km	None	10	1	NW
	2	Diurnal	7	> 2km	None	11	2	SSE
29/08/2020	1	Dusk	5	> 2km	None	9	3	W
	2	Diurnal	5	> 2km	None	11	3	NW
31/08/2020	3	Dawn	3	> 2km	None	11	2	SE
		Diurnal	2	> 2km	None	12	2	SE

Please note there is no weather data for VP surveys from VPs 4 and 5 for the months of June and July.

Table 38: Vantage Point Weather Summary (September 2020 – February 2021)

Survey Date	VP Number	VP Type	Mean Cloud Cover (eighths)	Modal Visibility	Modal Precipitation	Mean Temperature (°C)	Mean Wind Speed (Beaufort Scale)	Modal Wind Direction
15/09/2020	2	Diurnal	8	> 2km	Light Intermittent	13	1	S
	3	Diurnal	8	> 2km	None	17	1	WNW
17/09/2020	1	Diurnal	4	> 2km	None	14	2	S
	2	Diurnal	5	> 2km	None	18	3	SW
06/10/2020	1	Diurnal	7	> 2km	None	13	0	
	3	Diurnal	6	1km - 2km	None	11	0	
28/10/2020	1	Diurnal	1	> 2km	None	4	3	S
	3	Diurnal	5	> 2km	None	8	2	S
29/10/2020	1	Diurnal	6	> 2km	None	8	5	SSE
	2	Diurnal	1	> 2km	None	4	2	S
30/10/2020	2	Diurnal	4	> 2km	Light Intermittent	8	4	WSW
	3	Diurnal	5	> 2km	Light Intermittent	8	3	WSW
24/11/2020	2	Diurnal	8	> 2km	Light Intermittent	6	1	S
	3	Diurnal	7	> 2km	Light Intermittent	5	1	S
25/11/2020	1	Diurnal	1	> 2km	None	3	2	S
	3	Diurnal	3	> 2km	None	5	1	S
26/11/2020	1	Diurnal	2	> 2km	None	3	2	S
	2	Diurnal	3	> 2km	None	1	1	S
08/12/2020	2	Diurnal	5	> 2km	None	7	3	SE
	3	Diurnal	6	> 2km	None	6	3	E
09/12/2020	1	Diurnal	5	> 2km	None	7	3	SE
	2	Diurnal	5	> 2km	None	7	3	SE
10/12/2020	1	Diurnal	6	> 2km	None	8	4	SE
	3	Diurnal	6	> 2km	None	7	4	SE
14/01/2021	2	Diurnal	8	> 2km	Light Intermittent	3	2	N
20/01/2021	1	Diurnal	7	> 2km	Light Intermittent	3	1	S
21/01/2021	2	Diurnal	8	> 2km	Light Intermittent	4	5	SW

22/01/2021	3	Diurnal	7	> 2km	None	5	3	S
28/01/2021	3	Diurnal	8	> 2km	None	2	1	WNW
29/01/2021	1	Diurnal	2	> 2km	None	3	2	SW
16/02/2021	1	Diurnal	5	> 2km	None	8	3	N
17/02/2021	1	Diurnal	6	> 2km	None	5	3	NNE
	3	Diurnal	1	> 2km	None	6	2	NNE
18/02/2021	2	Diurnal	4	> 2km	None	8	3	NW
	3	Diurnal	6	> 2km	None	8	3	NNW
19/02/2021	2	Diurnal	8	> 2km	None	6	3	N
08/03/2021	1	Diurnal	8	> 2km	Light Intermittent	8	1	SE
09/03/2021	2	Diurnal	8	> 2km	None	7	3	N
	3	Diurnal	6	> 2km	None	8	3	N
10/03/2021	2	Diurnal	4	> 2km	None	6	3	N
	3	Diurnal	7	> 2km	None	6	3	N
11/03/2021	1	Diurnal	6	> 2km	None	6	4	E
16/03/2021	2	Dusk	3	> 2km	None	7	4	E
17/03/2021	1	Dusk	7	1km - 2km	Light Intermittent	8	2	SE
	3	Dawn	7	> 2km	None	7	3	E
18/03/2021	1	Dawn	7	> 2km	None	7	3	E
	3	Dusk	7	1km - 2km	Light Persistent	7	3	SE
19/03/2021	2	Dawn	8	1km - 2km	Light Persistent	7	2	S

Table 39: Vantage Point Weather Summary (March – August 2021)

Survey Date	VP Number	VP Type	Mean Cloud Cover (eighths)	Modal Visibility	Modal Precipitation	Mean Temperature (°C)	Mean Wind Speed (Beaufort Scale)	Modal Wind Direction
08/03/2021	1	Diurnal	8	> 2km	Light Intermittent	8	1	SE
09/03/2021	2	Diurnal	8	> 2km	None	7	3	N
	3	Diurnal	6	> 2km	None	8	3	N
10/03/2021	2	Diurnal	4	> 2km	None	6	3	N
	3	Diurnal	7	> 2km	None	6	3	N
11/03/2021	1	Diurnal	6	> 2km	None	6	4	E
16/03/2021	2	Dusk	3	> 2km	None	7	4	E
17/03/2021	1	Dusk	7	1km - 2km	Light Intermittent	8	2	SE
	3	Dawn	7	> 2km	None	7	3	E
18/03/2021	1	Dawn	7	> 2km	None	7	3	E
	3	Dusk	7	1km - 2km	Light Persistent	7	3	SE
19/03/2021	2	Dawn	8	1km - 2km	Light Persistent	7	2	S
10/04/2021	1	Diurnal	5	> 2km	None	0	2	NW
			5	> 2km	None	1	2	NW
11/04/2021	2	Dawn	6	> 2km	None	1	3	NW
	3	Diurnal	5	> 2km	None	2	3	NW
18/04/2021	1	Dawn	5	> 2km	None	6	3	SE
		Diurnal	4	> 2km	None	7	3	SE
20/04/2021	2	Diurnal	3	> 2km	Light Intermittent	9	3	WNW
	3	Diurnal	3	> 2km	None	9	3	WNW
24/04/2021	2	Diurnal	1	> 2km	None	6	1	SE
	3	Dawn	1	> 2km	None	4	1	SE
28/04/2021	2	Diurnal	4	> 2km	None	7	2	N
	3	Diurnal	5	> 2km	None	7	3	N
01/05/2021	1	Diurnal	6	> 2km	None	6	2	NE
	2	Dusk	6	> 2km	None	5	2	NE
05/05/2021	1	Diurnal	5	> 2km	None	8	3	NW
	2	Dawn	5	> 2km	None	7	3	NW
08/05/2021	3	Dawn	1	> 2km	None	1	2	SE

		Diurnal	2	> 2km	None	5	2	SE
14/05/2021	3	Diurnal	6	> 2km	None	8	3	N
		Dusk	5	> 2km	None	6	2	NE
21/05/2021	1	Dawn	6	> 2km	Light Intermittent	7	4	NE
	2	Diurnal	6	> 2km	Light Intermittent	7	4	NE
23/05/2021	4	Diurnal	5	> 2km	None	8	3	S
	5	Diurnal	6	> 2km	None	8	3	SSW
29/05/2021	2	Diurnal	6	> 2km	None	8	2	SE
06/06/2021	2	Dawn	6	> 2km	None	11	3	WNW
	3	Diurnal	5	> 2km	None	11	2	WNW
09/06/2021	1	Diurnal	2	1km - 2km	None	17	2	S
		Dusk	2	> 2km	None	16	2	S
12/06/2021	2	Diurnal	4	> 2km	None	10	3	W
	3	Dawn	5	> 2km	None	9	2	SW
18/06/2021	2	Dusk	5	> 2km	None	9	2	W
	3	Diurnal	6	> 2km	None	11	3	W
20/06/2021	4	Diurnal	2	> 2km	None	11	3	SE
	5	Diurnal	3	> 2km	None	11	3	SE
26/06/2021	1	Dawn	5	> 2km	None	5	2	W
		Diurnal	4	> 2km	None	8	2	NW
27/06/2021	2	Diurnal	3	> 2km	None	12	2	E
	3	Dusk	3	> 2km	None	12	2	E
30/06/2021	4	Diurnal	5	> 2km	None	12	3	NE
	5	Diurnal	5	> 2km	None	13	2	NE
03/07/2021	2	Diurnal	3	> 2km	None	14	3	SE
	3	Dusk	4	> 2km	None	13	3	SE
11/07/2021	4	Diurnal	6	> 2km	None	12	2	E
	5	Diurnal	5	> 2km	None	14	2	E
16/07/2021	1	Diurnal	2	> 2km	None	21	3	WSW
		Dusk	2	> 2km	None	18	3	W
17/07/2021	2	Dawn	2	> 2km	None	16	3	W
	3	Diurnal	2	> 2km	None	18	3	W
23/07/2021	2	Diurnal	3	> 2km	None	12	3	E
	3	Dawn	6	> 2km	None	12	2	E
24/07/2021	1	Dawn	6	> 2km	None	11	2	E
		Diurnal	5	> 2km	None	12	2	E
25/07/2021	2	Dusk	4	> 2km	None	14	2	NE
	3	Diurnal	3	> 2km	None	17	2	E

31/07/2021	4	Diurnal	5	> 2km	None	11	3	NW
	5	Diurnal	6	> 2km	None	13	3	NW
02/08/2021	4	Diurnal	7	> 2km	None	11	1	NE
		Dusk	2	> 2km	None	11	1	ENE
03/08/2021	4	Dawn	7	> 2km	None	8	2	S
		Diurnal	8	> 2km	None	10	2	S
04/08/2021	5	Diurnal	7	> 2km	Light Intermittent	16	1	ENE
		Dusk	7	> 2km	Light Intermittent	15	1	SSE
05/08/2021	5	Dawn	8	> 2km	Light Persistent	12	1	SSE
		Diurnal	8	> 2km	None	13	2	SE
09/08/2021	1	Diurnal	8	> 2km	None	15	4	N
		Dusk	8	1km - 2km	Light Persistent	14	4	N
10/08/2021	2	Diurnal	7	> 2km	None	13	3	NW
		Dusk	5	> 2km	None	12	1	WNW
11/08/2021	2	Dawn	5	> 2km	None	10	1	ESE
		Diurnal	7	> 2km	None	13	3	SE
12/08/2021	3	Diurnal	6	> 2km	None	16	4	S
		Dusk	4	> 2km	None	14	4	S
13/08/2021	1	Dawn	7	> 2km	Light Intermittent	12	4	S
		Diurnal	6	> 2km	None	13	4	S
18/08/2021	3	Dawn	7	> 2km	Light Intermittent	11	5	W
		Diurnal	8	> 2km	Light Intermittent	12	6	WNW

Appendix D. Vantage Point Survey Target Species Flights

Table 40: VP Flight Line Details (September 2019 – February 2020)

Date	Species	VP Number	Time First Observed	Number of Birds	Height Band	Time in Height Band (s)	No. of Bird Seconds at Risk height	Average Height (m)	Record Type
20/09/2019	Golden eagle	1	11:15	1	B	403	403	70	Standard
20/09/2019	Golden eagle	1	11:39	1	B	82	82	40	Standard
23/09/2019	Hen harrier	3	11:13	1	A	70	0	10	Standard
09/10/2019	Golden eagle	3	14:18	1	B	30	30	80	Standard
09/10/2019	Golden eagle	3	14:18	1	C	40	0	160	Standard
09/10/2019	Golden eagle	3	14:18	1	C	25	0	180	Standard
09/10/2019	Golden eagle	3	14:37	1	B	60	60	80	Standard
09/10/2019	Golden eagle	3	14:37	1	B	10	10	100	Standard
09/10/2019	Golden eagle	3	14:37	1	C	360	0	200	Standard
09/10/2019	Golden eagle	3	14:37	1	C	50	0	180	Standard
09/10/2019	Pink-footed goose	1	08:42	45	B	35	1575	130	Incidental
09/10/2019	Teal	1	10:23	14	A	3	0	10	Standard
10/10/2019	Greylag goose	2	08:16	140	B	55	7700	120	Incidental
10/10/2019	Greylag goose	2	08:47	140	C	35	0	200	Incidental
10/10/2019	Greylag goose	2	08:53	91	C	40	0	180	Incidental
10/10/2019	Greylag goose	2	08:55	42	C	65	0	180	Incidental
10/10/2019	Greylag goose	2	09:12	45	C	50	0	160	Incidental
10/10/2019	Greylag goose	2	09:29	100	C	180	0	250	Incidental
10/10/2019	Pink-footed goose	2	08:47	60	C	35	0	200	Incidental
10/10/2019	Pink-footed goose	2	08:53	39	C	40	0	180	Incidental
10/10/2019	Pink-footed goose	2	08:55	18	C	65	0	180	Incidental
10/10/2019	Pink-footed goose	2	09:14	30	C	60	0	160	Incidental
19/11/2019	Red-breasted merganser	3	09:43	1	A	25	0	15	Standard
20/11/2019	Teal	1	13:58	1	A	5	0	10	Standard
21/11/2019	Fieldfare	2	11:21	3	A	5	0	10	Standard
21/11/2019	Fieldfare	2	11:21	3	B	5	15	25	Standard
21/11/2019	Fieldfare	2	11:21	3	B	10	30	30	Standard
21/11/2019	Fieldfare	2	12:15	34	A	30	0	15	Standard
21/11/2019	Fieldfare	2	12:15	34	B	35	1190	40	Standard
21/11/2019	Fieldfare	2	12:15	34	B	20	680	40	Standard
10/12/2019	Shelduck	2	11:14	1	B	25	25	60	Standard

Date	Species	VP Number	Time First Observed	Number of Birds	Height Band	Time in Height Band (s)	No. of Bird Seconds at Risk height	Average Height (m)	Record Type
14/01/2020	Greylag goose	2	10:40	6	B	145	870	80	Standard

* Standard record type means that the bird was observed during the duration of the vantage point watch and was within the viewshed of the VP (formed from a 180° arc centred on a predetermined view bearing out to a distance of 2km.

Incidental record type means that the bird was observed outwith the duration of the vantage point watch and / or was beyond the 2km limit.

Table 41: VP Flight Line Details (March – August 2020)

Date	Species	VP Number	Time First Observed	Number of Birds	Height Band	Time in Height Band (s)	No. of Bird Seconds at Risk height	Average Height (m)	Record Type*
03/03/2020	Greylag goose	1	09:21	15	A	20	0	15	Standard
03/03/2020	Greylag goose	1	09:21	15	B	40	600	65	Standard
03/03/2020	Hen harrier	1	14:34	1	B	25	25	20	Standard
03/03/2020	Whooper swan	1	09:16	12	B	20	240	60	Standard
04/03/2020	Barnacle goose	3	15:16	4	A	5	0	15	Standard
04/03/2020	Barnacle goose	3	15:16	4	B	10	40	40	Standard
04/03/2020	Barnacle goose	3	15:16	4	C	35	0	180	Standard
04/03/2020	Greylag goose	3	14:03	110	B	180	19800	120	Standard
04/03/2020	Greylag goose	3	14:11	60	B	100	6000	130	Standard
04/03/2020	Hen harrier	3	09:58	1	A	280	0	10	Standard
05/03/2020	Dunlin	2	14:14	23	B	10	230	25	Standard
05/03/2020	Greylag goose	1	10:45	12	A	10	0	15	Standard
05/03/2020	Greylag goose	1	10:45	12	B	50	600	50	Standard
05/03/2020	Greylag goose	1	10:45	12	B	30	360	60	Standard
05/03/2020	Greylag goose	1	11:52	23	B	35	805	100	Standard
22/04/2020	Golden plover	2	13:32	1	A	5	0	5	Standard
22/04/2020	Greylag goose	1	10:44	2	A	30	0	15	Standard
22/04/2020	Merlin	1	09:26	1	A	5	0	2	Standard
22/04/2020	Whimbrel	1	10:50	7	C	30	0	200	Standard
27/04/2020	Golden plover	3	15:06	11	B	15	165	100	Standard
30/04/2020	Golden plover	2	09:04	1	A	5	0	2	Standard
30/04/2020	Greylag goose	2	09:13	2	A	25	0	15	Standard
01/05/2020	Golden plover	1	14:44	2	A	15	0	2	Standard
01/05/2020	Golden plover	1	16:38	1	A	10	0	1	Standard
01/05/2020	Greylag goose	1	15:51	2	A	20	0	10	Standard
01/05/2020	Merlin	1	15:36	1	A	10	0	5	Standard
01/05/2020	Peregrine	1	16:09	1	C	45	0	150	Standard
02/05/2020	Greylag goose	3	08:51	2	B	45	90	30	Standard
15/05/2020	Curlew	2	08:44	1	A	30	0	15	Standard
15/05/2020	Curlew	2	10:09	1	A	15	0	15	Standard
15/05/2020	Curlew	2	11:09	1	A	25	0	15	Standard
15/05/2020	Curlew	3	12:17	2	B	20	40	25	Standard
15/05/2020	Curlew	3	14:46	1	A	25	0	15	Standard
15/05/2020	Dunlin	3	14:02	1	A	5	0	5	Standard
15/05/2020	Golden plover	2	09:21	2	A	15	0	10	Standard
15/05/2020	Golden plover	2	09:38	1	A	15	0	5	Standard
15/05/2020	Golden plover	2	10:52	1	A	10	0	10	Standard
15/05/2020	Golden plover	3	12:40	2	A	15	0	10	Standard
15/05/2020	Golden plover	3	13:27	1	A	15	0	5	Standard
15/05/2020	Golden plover	3	13:51	1	A	10	0	3	Standard

Date	Species	VP Number	Time First Observed	Number of Birds	Height Band	Time in Height Band (s)	No. of Bird Seconds at Risk at height	Average Height (m)	Record Type*
17/05/2020	Curlew	1	15:09	1	A	35	0	5	Standard
17/05/2020	Curlew	1	17:15	1	A	20	0	15	Standard
17/05/2020	Dunlin	1	15:38	1	A	10	0	10	Standard
17/05/2020	Golden plover	1	15:33	2	A	10	0	3	Standard
17/05/2020	Golden plover	1	16:29	2	A	30	0	10	Standard
17/05/2020	Golden plover	1	17:17	1	A	10	0	5	Standard
17/05/2020	Golden plover	1	17:44	1	A	15	0	3	Standard
17/05/2020	Lapwing	1	17:42	1	A	10	0	5	Standard
18/05/2020	Curlew	3	06:19	1	A	30	0	15	Standard
18/05/2020	Curlew	3	08:28	1	A	12	0	10	Standard
18/05/2020	Golden plover	3	06:53	1	A	10	0	5	Standard
18/05/2020	Golden plover	3	08:42	1	A	10	0	3	Standard
18/05/2020	Merlin	3	07:28	1	A	10	0	3	Standard
18/05/2020	Oystercatcher	3	08:34	1	A	20	0	5	Standard
20/05/2020	Curlew	1	07:07	1	B	20	20	25	Standard
20/05/2020	Golden plover	1	06:51	1	A	10	0	3	Standard
20/05/2020	Golden plover	1	08:22	1	A	10	0	2	Standard
20/05/2020	Greylag goose	1	06:20	2	A	15	0	15	Standard
20/05/2020	Lapwing	1	08:41	1	A	10	0	10	Standard
20/05/2020	Merlin	1	07:32	1	A	5	0	5	Standard
20/05/2020	Oystercatcher	1	07:51	1	A	10	0	5	Standard
20/05/2020	Oystercatcher	1	09:08	1	A	15	0	15	Standard
30/05/2020	Curlew	2	14:14	1	A	10	0	10	Standard
30/05/2020	Curlew	2	14:57	1	A	25	0	15	Standard
30/05/2020	Curlew	2	16:08	1	A	10	0	5	Standard
30/05/2020	Golden plover	2	13:38	1	A	12	0	2	Standard
30/05/2020	Golden plover	2	15:18	1	A	10	0	5	Standard
30/05/2020	Lapwing	2	16:11	1	A	10	0	10	Standard
30/05/2020	Snipe	2	14:22	2	A	10	0	15	Standard
15/06/2020	Cuckoo	2	16:42	2	A	7	0	5	Incidental
15/06/2020	Greylag goose	2	19:27	5	B	30	150	45	Standard
15/06/2020	Hen harrier	2	18:46	1	A	206	0	8	Standard
15/06/2020	Hen harrier	2	21:23	1	A	30	0	6	Standard
15/06/2020	Hen harrier	2	21:23	1	A	116	0	8	Standard
15/06/2020	Hen harrier	2	21:24	1	A	5	0	4	Standard
15/06/2020	Hen harrier	2	21:59	1	A	147	0	10	Standard
15/06/2020	Lapwing	2	19:11	1	A	4	0	4	Incidental
15/06/2020	Lapwing	2	19:11	1	A	11	0	4	Standard
15/06/2020	Snipe	2	20:24	1	A	9	0	7	Standard
17/06/2020	Greenshank	1	05:08	1	A	7	0	8	Standard
17/06/2020	Greenshank	1	05:08	1	B	20	20	40	Standard

Date	Species	VP Number	Time First Observed	Number of Birds	Height Band	Time in Height Band (s)	No. of Bird Seconds at Risk at height	Average Height (m)	Record Type*
17/06/2020	Greenshank	1	09:14	1	B	15	15	30	Standard
17/06/2020	Greenshank	1	09:14	1	C	20	0	160	Standard
17/06/2020	Oystercatcher	1	08:54	4	C	55	0	150	Standard
18/06/2020	Curlew	3	19:01	1	B	12	12	35	Standard
18/06/2020	Hen harrier	3	18:01	1	A	193	0	15	Standard
18/06/2020	Short-eared owl	3	23:41	1	A	46	0	15	Incidental
19/06/2020	Curlew	2	08:24	2	A	4	0	6	Incidental
19/06/2020	Hen harrier	2	05:40	1	A	16	0	2	Standard
28/06/2020	Red-throated diver	4	07:39	2	B	45	90	70	Standard
30/06/2020	Black-throated diver	5	09:08	4	B	30	120	75	Standard
30/06/2020	Red-throated diver	4	11:36	3	B	90	270	60	Standard
02/07/2020	Curlew	1	04:51	1	A	10	0	6	Standard
02/07/2020	Curlew	1	04:51	1	A	12	0	10	Standard
02/07/2020	Curlew	1	04:51	1	B	35	35	40	Standard
03/07/2020	Curlew	2	07:21	1	A	7	0	5	Incidental
11/07/2020	Red-throated diver	4	15:45	1	B	54	54	60	Standard
12/07/2020	Red-throated diver	4	06:59	1	B	75	75	50	Standard
12/07/2020	Black-throated diver	4	08:11	3	B	20	60	60	Standard
13/07/2020	Curlew	2	18:29	1	B	10	10	25	Standard
16/07/2020	Curlew	2	21:14	1	A	7	0	8	Standard
16/07/2020	Curlew	2	21:14	1	A	16	0	6	Standard
16/07/2020	Curlew	2	21:14	1	A	5	0	3	Standard
16/07/2020	Curlew	2	21:14	1	B	12	12	25	Standard
16/07/2020	Curlew	2	22:23	1	A	45	0	18	Standard
16/07/2020	Hen harrier	1	17:11	1	A	170	0	4	Standard
16/07/2020	Hen harrier	1	17:11	1	B	10	10	20	Standard
16/07/2020	Hen harrier	1	18:24	1	A	20	0	4	Standard
16/07/2020	Hen harrier	1	18:24	1	A	25	0	4	Standard
16/07/2020	Hen harrier	1	18:24	1	B	8	8	45	Standard
18/07/2020	Red-throated diver	4	16:11	1	B	175	175	100	Standard
18/07/2020	Osprey	4	17:32	1	A		0	10	Standard
19/07/2020	Red-throated diver	4	06:38	1	B	64	64	50	Standard
19/07/2020	Black-throated diver	4	08:09	2	B	45	90	70	Standard
25/07/2020	Hen harrier	4	10:27	1	A		0	5	Standard

Date	Species	VP Number	Time First Observed	Number of Birds	Height Band	Time in Height Band (s)	No. of Bird Seconds at Risk at height	Average Height (m)	Record Type*
25/07/2020	Red-throated diver	4	10:28	2	B	140	280	70	Standard
26/07/2020	Red-throated diver	5	15:32	2	B	220	440	60	Standard
16/08/2020	Black-throated diver	5	08:19	2	B	20	40	70	Standard
16/08/2020	Red-throated diver	4	13:36	1	B	40	40	60	Standard
20/08/2020	Red-throated diver	5	13:06	2	B	95	190	70	Standard
21/08/2020	Red-throated diver	5	11:36	1	B	32	32	60	Standard
22/08/2020	Curlew	1	14:47	2	B	12	24	40	Standard
22/08/2020	Curlew	3	18:51	1	B	32	32	30	Standard
22/08/2020	Curlew	3	19:36	1	B	20	20	25	Standard
22/08/2020	Golden plover	1	15:36	1	A	5	0	5	Standard
22/08/2020	Greylag goose	1	15:12	2	B	20	40	25	Standard
24/08/2020	Greylag goose	2	20:59	42	B	35	1470	80	Standard
24/08/2020	Hen harrier	3	15:08	1	A	5	0	10	Standard
26/08/2020	Greylag goose	2	06:07	84	B	110	9240	70	Standard
28/08/2020	Greylag goose	1	06:01	17	B	168	2856	70	Standard
29/08/2020	Curlew	1	18:12	2	B	55	110	40	Standard
29/08/2020	Curlew	1	19:18	1	A	23	0	15	Standard
29/08/2020	Curlew	2	14:36	1	A	32	0	15	Standard
29/08/2020	Curlew	2	16:07	2	B	25	50	25	Standard
29/08/2020	Dunlin	2	14:49	2	A	5	0	10	Standard
29/08/2020	Golden plover	2	15:30	1	A	8	0	10	Standard
29/08/2020	Lapwing	1	18:52	5	B	16	80	35	Standard
29/08/2020	Snipe	1	20:37	1	A	10	0	10	Standard
29/08/2020	Snipe	2	16:33	1	A	6	0	5	Standard
31/08/2020	Curlew	3	06:42	1	A	23	0	15	Standard
31/08/2020	Curlew	3	07:11	2	B	28	56	35	Standard
31/08/2020	Curlew	3	08:12	2	B	38	76	25	Standard
31/08/2020	Curlew	3	09:06	1	A	12	0	15	Standard
31/08/2020	Curlew	3	09:52	1	B	10	10	50	Standard
31/08/2020	Curlew	3	11:36	2	A	27	0	15	Standard
31/08/2020	Golden plover	3	07:39	1	A	10	0	10	Standard

* Standard record type means that the bird was observed during the duration of the vantage point watch and was within the viewshed of the VP (formed from a 180° arc centred on a predetermined view bearing out to a distance of 2km.

Incidental record type means that the bird was observed outwith the duration of the vantage point watch and / or was beyond the 2km limit.

Table 42: VP Flight Line Details (September 2020 – February 2021)

Date	Species	VP Number	Time First Observed	Number of Birds	Height Band	Time in Height Band (s)	No. of Bird Seconds at Risk height	Average Height (m)	Record Type*
15/09/2020	Hen harrier	2	10:53	1	A	88	0	15	Standard
15/09/2020	Hen harrier	2	10:53	1	A	544	0	10	Standard
17/09/2020	Pink-footed goose	2	15:16	26	C	46	0	700	Standard
06/10/2020	Greylag goose	1	15:54	12	C	112	0	300	Standard
06/10/2020	Hen harrier	1	16:01	1	A	103	0	5	Standard
30/10/2020	Jack snipe	3	11:46	1	A	5	0	1	Incidental
30/10/2020	Whooper swan	3	11:47	1	C	68	0	300	Incidental
24/11/2020	Hen harrier	2	12:00	1	A	46	0	1	Standard
09/12/2020	Merlin	2	12:13	1	A	12	0	4	Standard
09/12/2020	Peregrine	1	11:09	1	C	75	0	200	Standard
10/12/2020	Greylag goose	3	08:56	17	B	29	493	40	Standard
10/12/2020	Snipe	1	14:46	3	A	7	0	15	Standard
21/01/2021	Greylag goose	2	09:27	2	B	47	94	100	Standard
22/01/2021	Hen harrier	3	09:12	1	A	86	0	10	Standard
29/01/2021	Snow bunting	1	09:45	8	A	15	0	8	Incidental

* Standard record type means that the bird was observed during the duration of the vantage point watch and was within the viewshed of the VP (formed from a 180° arc centred on a predetermined view bearing out to a distance of 2km).

Incidental record type means that the bird was observed outwith the duration of the vantage point watch and / or was beyond the 2km limit.

Table 43: VP Flight Line Details (March – August 2021)

Date	Species	VP Number	Time First Observed	Number of Birds	Height Band	Time in Height Band (s)	No. of Bird Seconds at Risk height	Average Height (m)	Record Type*
08/03/2021	Greylag goose	1	14:46	4	B	19	76	100	Incidental
11/03/2021	Hen harrier	1	11:41	1	A	20	0	3	Standard
11/03/2021	Hen harrier	1	11:41	1	B	23	23	60	Standard
17/03/2021	Greylag goose	3	06:19	1	B	32	32	20	Standard
17/03/2021	Greylag goose	3	07:40	1	B	55	55	170	Standard
17/03/2021	Hen harrier	1	17:32	1	B	25	25	30	Incidental
17/03/2021	Hen harrier	1	17:32	1	B	10	10	30	Standard
18/03/2021	Curlew	1	07:23	1	B	12	12	50	Standard
18/03/2021	Greylag goose	1	07:50	2	B	22	44	100	Standard
18/03/2021	Whooper swan	1	06:33	8	B	27	216	80	Standard
18/03/2021	Whooper swan	1	06:33	8	B	20	160	80	Incidental
10/04/2021	Pink-footed goose	1	08:19	150	C	50	0	150	Standard
10/04/2021	Pink-footed goose	1	08:19	150	C	8	0	150	Incidental
10/04/2021	Pink-footed goose	1	09:07	41	C	10	0	150	Incidental
10/04/2021	Pink-footed goose	1	09:07	41	C	10	0	150	Standard
11/04/2021	Curlew	2	05:31	1	A	23	0	15	Standard
11/04/2021	Curlew	3	08:07	1	A	13	0	15	Standard
11/04/2021	Golden plover	3	08:51	1	A	10	0	5	Standard
11/04/2021	Greylag goose	3	10:36	2	A	20	0	10	Standard
18/04/2021	Curlew	1	07:22	1	A	15	0	5	Standard
18/04/2021	Curlew	1	10:38	2	B	12	24	30	Standard
18/04/2021	Golden plover	1	05:16	1	A	7	0	10	Standard
18/04/2021	Golden plover	1	10:00	1	A	10	0	10	Standard
18/04/2021	Greylag goose	1	08:31	2	A	20	0	17	Standard
18/04/2021	Pink-footed goose	1	09:14	52	C	56	0	200	Standard
18/04/2021	Pink-footed goose	1	10:31	18	C	35	0	200	Standard
18/04/2021	Pink-footed goose	1	10:31	18	C	5	0	200	Incidental
20/04/2021	Curlew	2	10:34	1	A	18	0	15	Standard
20/04/2021	Golden plover	2	11:16	2	A	7	0	5	Standard
20/04/2021	Greylag goose	2	09:41	2	A	20	0	15	Standard
20/04/2021	Pink-footed goose	2	09:26	26	C	60	0	200	Standard
20/04/2021	Pink-footed goose	2	10:22	75	C	73	0	200	Standard

Date	Species	VP Number	Time First Observed	Number of Birds	Height Band	Time in Height Band (s)	No. of Bird Seconds at Risk at height	Average Height (m)	Record Type*
24/04/2021	Peregrine	2	08:47	1	B	25	25	120	Standard
24/04/2021	Pink-footed goose	2	09:15	52	C	50	0	175	Standard
24/04/2021	Pink-footed goose	2	09:33	85	C	97	0	175	Standard
24/04/2021	Pink-footed goose	3	06:15	34	B	42	1428	100	Standard
24/04/2021	Snipe	3	05:09	2	A	7	0	10	Standard
24/04/2021	Whimbrel	3	07:03	9	B	38	342	40	Standard
28/04/2021	Curlew	3	09:26	1	A	25	0	15	Standard
28/04/2021	Golden plover	2	11:23	2	A	7	0	5	Standard
28/04/2021	Greylag goose	2	13:09	2	B	32	64	30	Standard
01/05/2021	Curlew	1	16:11	1	A	21	0	15	Standard
01/05/2021	Curlew	2	20:36	1	A	10	0	8	Standard
01/05/2021	Golden plover	1	17:52	1	A	10	0	5	Standard
01/05/2021	Golden plover	2	20:12	1	A	6	0	10	Standard
01/05/2021	Greylag goose	1	15:51	2	B	17	34	25	Standard
01/05/2021	Greylag goose	2	19:14	2	B	18	36	30	Standard
05/05/2021	Curlew	1	09:19	1	B	32	32	30	Standard
05/05/2021	Golden plover	1	09:36	1	A	12	0	2	Standard
05/05/2021	Golden plover	1	10:26	1	A	6	0	2	Standard
05/05/2021	Greylag goose	1	10:14	1	A	10	0	15	Standard
05/05/2021	Greylag goose	2	05:39	2	B	27	54	30	Standard
08/05/2021	Curlew	3	04:18	1	A	4	0	15	Incidental
08/05/2021	Curlew	3	04:18	1	A	8	0	15	Standard
08/05/2021	Curlew	3	06:36	1	A	8	0	10	Standard
08/05/2021	Curlew	3	06:36	1	A	4	0	10	Incidental
08/05/2021	Curlew	3	06:59	1	A	5	0	10	Incidental
08/05/2021	Curlew	3	06:59	1	A	12	0	10	Standard
08/05/2021	Curlew	3	07:51	1	A	10	0	5	Standard
08/05/2021	Curlew	3	10:06	1	B	24	24	30	Standard
08/05/2021	Curlew	3	10:06	1	B	4	4	30	Incidental
08/05/2021	Golden plover	3	05:36	1	A	8	0	5	Standard
08/05/2021	Golden plover	3	09:41	2	A	12	0	5	Standard
08/05/2021	Greylag goose	3	09:42	2	B	12	24	25	Standard
08/05/2021	Greylag goose	3	09:42	2	B	5	10	25	Incidental
08/05/2021	Lapwing	3	06:06	2	B	10	20	25	Standard
08/05/2021	Lapwing	3	08:11	1	B	4	4	25	Incidental
08/05/2021	Lapwing	3	08:11	1	B	6	6	25	Standard
14/05/2021	Curlew	3	17:09	1	A	13	0	15	Standard
14/05/2021	Curlew	3	17:09	1	A	4	0	15	Incidental
14/05/2021	Curlew	3	19:58	1	A	19	0	15	Standard

Date	Species	VP Number	Time First Observed	Number of Birds	Height Band	Time in Height Band (s)	No. of Bird Seconds at Risk at height	Average Height (m)	Record Type*
14/05/2021	Curlew	3	20:12	1	A	26	0	10	Standard
14/05/2021	Golden plover	3	17:42	1	A	7	0	5	Standard
14/05/2021	Greylag goose	3	18:21	2	B	7	14	25	Standard
14/05/2021	Greylag goose	3	18:21	2	B	3	6	25	Incidental
14/05/2021	Greylag goose	3	20:43	2	B	22	44	25	Standard
14/05/2021	Snipe	3	16:22	1	A	7	0	10	Standard
14/05/2021	Snipe	3	16:22	1	A	5	0	10	Incidental
21/05/2021	Curlew	1	05:19	2	B	50	100	30	Standard
21/05/2021	Curlew	2	08:08	1	A	10	0	15	Standard
21/05/2021	Golden plover	1	06:10	1	A	8	0	5	Standard
21/05/2021	Golden plover	2	08:59	1	A	11	0	5	Standard
21/05/2021	Greylag goose	2	07:36	2	B	20	40	25	Standard
21/05/2021	Greylag goose	2	07:36	2	B	4	8	25	Incidental
23/05/2021	Red-throated diver	5	10:17	2	B	92	184	70	Standard
29/05/2021	Curlew	1	21:18	1	A	15	0	10	Standard
29/05/2021	Curlew	2	17:19	1	B	3	3	30	Incidental
29/05/2021	Curlew	2	17:19	1	B	9	9	30	Standard
29/05/2021	Golden plover	1	20:46	1	A	10	0	3	Standard
29/05/2021	Golden plover	2	16:48	2	A	5	0	3	Standard
29/05/2021	Greylag goose	1	21:48	2	A	22	0	15	Standard
06/06/2021	Curlew	2	04:16	1	A	18	0	15	Standard
06/06/2021	Curlew	3	07:19	1	B	37	37	30	Standard
06/06/2021	Curlew	3	08:50	2	A	15	0	10	Standard
06/06/2021	Curlew	3	08:50	2	A	5	0	10	Incidental
06/06/2021	Curlew	3	09:10	1	A	6	0	10	Standard
06/06/2021	Curlew	3	09:10	1	A	4	0	10	Incidental
06/06/2021	Golden plover	2	03:58	1	A	10	0	15	Standard
06/06/2021	Golden plover	3	08:11	1	A	11	0	3	Standard
06/06/2021	Lapwing	2	04:44	1	B	49	49	30	Standard
06/06/2021	Lapwing	3	07:47	2	B	43	86	30	Standard
06/06/2021	Lapwing	3	08:28	1	B	6	6	25	Standard
09/06/2021	Curlew	1	18:52	2	B	32	64	30	Standard
09/06/2021	Golden plover	1	17:59	3	B	28	84	25	Standard
09/06/2021	Greylag goose	1	20:41	2	B	22	44	25	Standard
09/06/2021	Greylag goose	1	21:52	2	B	21	42	20	Standard
09/06/2021	Greylag goose	1	21:52	2	B	5	10	20	Incidental
09/06/2021	Lapwing	1	17:34	6	B	20	120	25	Standard
09/06/2021	Lapwing	1	17:34	6	B	6	36	25	Incidental
09/06/2021	Lapwing	1	21:37	5	B	26	130	30	Standard
09/06/2021	Lapwing	1	21:37	5	B	4	20	30	Incidental

Date	Species	VP Number	Time First Observed	Number of Birds	Height Band	Time in Height Band (s)	No. of Bird Seconds at Risk at height	Average Height (m)	Record Type*
09/06/2021	Snipe	1	19:07	2	A	2	0	15	Incidental
09/06/2021	Snipe	1	19:07	2	A	3	0	15	Standard
09/06/2021	Snipe	1	22:19	1	A	6	0	10	Standard
12/06/2021	Curlew	2	08:11	1	A	23	0	10	Standard
12/06/2021	Dunlin	2	09:06	1	A	1	0	15	Incidental
12/06/2021	Dunlin	2	09:06	1	A	4	0	15	Standard
12/06/2021	Golden plover	2	06:59	2	A	15	0	3	Standard
12/06/2021	Golden plover	3	05:10	1	A	2	0	5	Incidental
12/06/2021	Golden plover	3	05:10	1	A	8	0	5	Standard
12/06/2021	Lapwing	3	04:16	4	B	13	52	30	Standard
12/06/2021	Snipe	3	03:01	1	A	15	0	15	Standard
18/06/2021	Golden plover	2	20:51	1	A	10	0	2	Standard
18/06/2021	Golden plover	3	17:37	1	A	10	0	3	Standard
18/06/2021	Golden plover	3	19:10	1	B	13	13	25	Standard
18/06/2021	Lapwing	2	21:36	1	A	3	0	5	Incidental
18/06/2021	Lapwing	2	21:36	1	A	4	0	5	Standard
20/06/2021	Red-throated diver	5	10:37	2	B	85	170	50	Standard
26/06/2021	Curlew	1	05:09	1	B	40	40	25	Standard
26/06/2021	Curlew	1	08:09	2	A	7	0	15	Standard
26/06/2021	Curlew	1	08:09	2	A	3	0	15	Incidental
26/06/2021	Golden plover	1	06:52	1	A	8	0	5	Standard
26/06/2021	Greylag goose	1	04:14	2	B	5	10	30	Incidental
26/06/2021	Greylag goose	1	04:14	2	B	8	16	30	Standard
27/06/2021	Curlew	2	19:17	1	A	27	0	10	Standard
27/06/2021	Curlew	3	22:15	1	A	28	0	10	Standard
27/06/2021	Golden plover	2	18:19	1	A	11	0	3	Standard
27/06/2021	Golden plover	2	18:53	1	A	9	0	5	Standard
27/06/2021	Golden plover	3	20:58	1	A	16	0	2	Standard
27/06/2021	Greylag goose	2	17:50	2	B	37	74	30	Standard
27/06/2021	Greylag goose	2	19:46	2	A	3	0	12	Incidental
27/06/2021	Greylag goose	2	19:46	2	A	7	0	12	Standard
27/06/2021	Greylag goose	3	22:06	2	A	23	0	15	Standard
27/06/2021	Snipe	2	20:03	1	A	3	0	15	Incidental
27/06/2021	Snipe	2	20:03	1	A	9	0	15	Standard
27/06/2021	Snipe	3	21:20	1	A	5	0	2	Standard
03/07/2021	Curlew	3	21:26	1	A	11	0	10	Standard
03/07/2021	Curlew	3	21:26	1	A	5	0	10	Incidental
03/07/2021	Golden plover	2	17:51	2	A	13	0	5	Standard
03/07/2021	Golden plover	3	21:19	2	A	2	0	15	Incidental
03/07/2021	Golden plover	3	21:19	2	A	15	0	15	Standard

Date	Species	VP Number	Time First Observed	Number of Birds	Height Band	Time in Height Band (s)	No. of Bird Seconds at Risk at height	Average Height (m)	Record Type*
03/07/2021	Snipe	3	23:00	2	B	8	16	25	Standard
11/07/2021	Red-throated diver	5	10:39	1	B	40	40	45	Standard
16/07/2021	Curlew	1	18:09	2	B	24	48	30	Standard
16/07/2021	Golden plover	1	17:15	1	A	11	0	2	Standard
16/07/2021	Lapwing	1	21:06	2	B	38	76	30	Standard
16/07/2021	Snipe	1	19:11	1	A	7	0	10	Incidental
16/07/2021	Snipe	1	19:11	1	A	3	0	10	Standard
17/07/2021	Curlew	2	05:06	1	B	30	30	25	Standard
17/07/2021	Curlew	3	07:23	1	B	38	38	30	Standard
17/07/2021	Curlew	3	09:42	1	A	17	0	15	Standard
17/07/2021	Golden plover	2	04:52	1	A	9	0	2	Standard
17/07/2021	Golden plover	2	06:17	2	A	10	0	2	Standard
17/07/2021	Golden plover	3	08:38	1	A	12	0	5	Standard
17/07/2021	Greylag goose	2	06:09	2	B	32	64	25	Standard
17/07/2021	Snipe	2	04:11	1	A	5	0	10	Standard
17/07/2021	Snipe	3	08:11	1	A	5	0	2	Standard
23/07/2021	Curlew	2	07:53	1	A	14	0	10	Standard
23/07/2021	Golden plover	2	08:19	2	A	9	0	2	Standard
23/07/2021	Golden plover	2	09:11	1	A	18	0	2	Standard
23/07/2021	Golden plover	3	04:49	3	A	10	0	2	Standard
23/07/2021	Greylag goose	2	09:49	2	A	19	0	15	Standard
23/07/2021	Greylag goose	3	06:09	2	B	30	60	25	Standard
23/07/2021	Snipe	2	08:52	1	A	3	0	5	Standard
24/07/2021	Curlew	1	09:33	1	B	5	5	35	Incidental
24/07/2021	Curlew	1	09:33	1	B	17	17	35	Standard
24/07/2021	Golden plover	1	05:09	1	A	9	0	15	Standard
24/07/2021	Golden plover	1	05:09	1	A	3	0	15	Incidental
24/07/2021	Golden plover	1	06:10	1	A	16	0	3	Standard
24/07/2021	Golden plover	1	07:56	1	A	17	0	2	Standard
24/07/2021	Golden plover	1	08:17	1	A	19	0	3	Standard
24/07/2021	Greylag goose	1	10:08	11	B	14	154	30	Standard
24/07/2021	Greylag goose	1	10:08	11	B	4	44	30	Incidental
24/07/2021	Lapwing	1	08:14	2	B	24	48	30	Standard
25/07/2021	Golden plover	2	20:57	1	A	12	0	5	Standard
25/07/2021	Golden plover	3	17:51	2	A	11	0	5	Standard
25/07/2021	Snipe	3	18:40	2	B	9	18	25	Standard
03/08/2021	Red-throated diver	4	09:05	1	B	55	55	40	Standard
05/08/2021	Red-throated diver	5	05:35	1	B	185	185	50	Standard
05/08/2021	Red-throated	5	05:56	2	B	167	334	60	Standard

Date	Species	VP Number	Time First Observed	Number of Birds	Height Band	Time in Height Band (s)	No. of Bird Seconds at Risk at height	Average Height (m)	Record Type*
	diver								
05/08/2021	Red-throated diver	5	05:56	2	B	30	60	60	Incidental
10/08/2021	Merlin	2	18:44	1	A	45	0	5	Standard
11/08/2021	Greylag goose	2	06:27	16	C	170	0	160	Standard
11/08/2021	Greylag goose	2	06:32	12	B	37	444	70	Standard
11/08/2021	Merlin	2	06:34	1	A	32	0	10	Standard
12/08/2021	Merlin	3	20:14	1	A	36	0	5	Standard

* Standard record type means that the bird was observed during the duration of the vantage point watch and was within the viewshed of the VP (formed from a 180° arc centred on a predetermined view bearing out to a distance of 2km.

Incidental record type means that the bird was observed outwith the duration of the vantage point watch and / or was beyond the 2km limit.

Appendix E. Conservation Status of all Recorded Bird Species

Table 44: Full List of Species Recorded on Site

Species	Scientific Name	Annex 1	Schedule 1	Scottish Priority Species	Birds of Conservation Concern	Vantage Point
Barnacle goose	<i>Branta leucopsis</i>	Yes		Yes	Amber	Yes
Blackbird	<i>Turdus merula</i>				Green	
Blackcap	<i>Sylvia atricapilla</i>				Green	
Black-throated diver	<i>Gavia arctica</i>	Yes	Yes	Yes	Amber	Yes
Buzzard	<i>Buteo buteo</i>				Green	Yes
Carrion crow	<i>Corvus corone</i>				Green	Yes
Chaffinch	<i>Fringilla coelebs</i>				Green	
Coal tit	<i>Periparus ater</i>				Green	
Common gull	<i>Larus canus</i>				Amber	Yes
Common sandpiper	<i>Actitis hypoleucos</i>				Amber	
Cuckoo	<i>Cuculus canorus</i>			Yes	Red	Yes
Curlew	<i>Numenius arquata</i>			Yes	Red	Yes
Dunlin	<i>Calidris alpina</i>		Yes	Yes	Amber	Yes
Dunnock	<i>Prunella modularis</i>			Yes	Amber	
Fieldfare	<i>Turdus pilaris</i>		Yes		Red	Yes
Goldcrest	<i>Regulus regulus</i>				Green	
Golden eagle	<i>Aquila chrysaetos</i>	Yes	Yes	Yes	Green	Yes
Golden plover	<i>Pluvialis apricaria</i>	Yes		Yes	Green	Yes
Goldfinch	<i>Carduelis carduelis</i>				Green	
Great Black-backed gull	<i>Larus marinus</i>				Amber	Yes
Great tit	<i>Parus major</i>				Green	
Greenfinch	<i>Carduelis chloris</i>				Green	
Greenshank	<i>Tringa nebularia</i>		Yes		Amber	Yes
Grey heron	<i>Ardea cinerea</i>				Green	Yes
Greylag goose	<i>Anser anser</i>				Amber	Yes
Hen harrier	<i>Circus cyaneus</i>	Yes	Yes	Yes	Red	Yes
Herring gull	<i>Larus argentatus</i>			Yes	Red	Yes
Hooded crow	<i>Corvus cornix</i>			Yes	Green	Yes
Jack snipe	<i>Lymnocyptes minimus</i>				Green	Yes
Kestrel	<i>Falco tinnunculus</i>			Yes	Amber	Yes
Lapwing	<i>Vanellus vanellus</i>			Yes	Red	Yes

Lesser Black-backed gull	<i>Larus fuscus</i>				Amber	Yes
Lesser redpoll	<i>Acanthis cabaret</i>			Yes	Red	
Linnet	<i>Linaria cannabina</i>			Yes	Red	
Mallard	<i>Anas platyrhynchos</i>				Amber	Yes
Meadow pipit	<i>Anthus pratensis</i>				Amber	
Merlin	<i>Falco columbarius</i>	Yes	Yes	Yes	Red	Yes
Mistle thrush	<i>Turdus viscivorus</i>				Red	
Osprey	<i>Pandion haliaetus</i>	Yes	Yes	Yes	Amber	Yes
Oystercatcher	<i>Haematopus ostralegus</i>				Amber	Yes
Peregrine	<i>Falco peregrinus</i>	Yes	Yes	Yes		Yes
Pheasant	<i>Phasianus colchicus</i>					
Pied wagtail	<i>Motacilla alba</i>					
Pink-footed goose	<i>Anser brachyrhynchus</i>				Amber	Yes
Raven	<i>Corvus corax</i>					Yes
Red grouse	<i>Lagopus lagopus scoticus</i>			Yes	Amber	Yes
Red-breasted merganser	<i>Mergus serrator</i>					Yes
Red-legged partridge	<i>Alectoris rufa</i>					Yes
Red-throated diver	<i>Gavia stellata</i>	Yes	Yes	Yes	Amber	Yes
Redwing	<i>Turdus iliacus</i>		Yes	Yes	Red	
Reed bunting	<i>Emberiza schoeniclus</i>			Yes	Amber	
Robin	<i>Erithacus rubecula</i>					
Sand martin	<i>Riparia riparia</i>				Amber	
Sedge warbler	<i>Acrocephalus schoenobaenus</i>					
Shelduck	<i>Tadorna tadorna</i>				Amber	Yes
Short-eared owl	<i>Asio flammeus</i>	Yes		Yes	Amber	Yes
Siskin	<i>Spinus spinus</i>			Yes		
Skylark	<i>Alauda arvensis</i>			Yes	Red	
Snipe	<i>Gallinago gallinago</i>				Amber	Yes
Snow bunting	<i>Plectrophenax nivalis</i>		Yes	Yes	Amber	Yes
Song thrush	<i>Turdus philomelos</i>			Yes	Red	
Sparrowhawk	<i>Accipiter nisus</i>					Yes
Stonechat	<i>Saxicola rubicola</i>					
Swallow	<i>Hirundo rustica</i>				Amber	
Teal	<i>Anas crecca</i>				Amber	Yes
Wheatear	<i>Oenanthe oenanthe</i>				Amber	
Whimbrel	<i>Numenius phaeopus</i>		Yes		Red	Yes
Whinchat	<i>Saxicola rubetra</i>				Red	
Whooper swan	<i>Cygnus Cygnus</i>	Yes	Yes	Yes	Amber	Yes
Willow warbler	<i>Phylloscopus trochilus</i>				Amber	
Woodpigeon	<i>Columba palumbus</i>					

Wren	<i>Troglodytes troglodytes</i>					
Yellowhammer	<i>Emberiza citrinella</i>			Yes	Red	

Appendix F. Vantage Point Survey Ground and Heard-Only Registrations of Target Species

Table 45: Point Registrations from VP Surveys (September 2019 – February 2020)

Date	Species	VP Number	Time First Observed	Number of Birds	Height Band	Time in Height Band (s)	Average Height (m)	Record Type
10/10/2019	Teal	1	12:21	2	Ground	Present	-1	Standard
20/11/2019	Teal	1	13:58	1	Ground	Present	-1	Standard
12/12/2019	Greylag goose	1	09:11	25	Ground	Present	-1	Standard
12/12/2019	Whooper swan	1	14:50	2	Ground	Present	-1	Standard

* Standard record type means that the bird was observed during the duration of the vantage point watch and was within the viewshed of the VP (formed from a 180° arc centred on a predetermined view bearing out to a distance of 2km).

Incidental record type means that the bird was observed outwith the duration of the vantage point watch and / or was beyond the 2km limit.

Table 46: Point Registrations from VP Surveys (March – August 2020)

Date	Species	VP Number	Time First Observed	Number of Birds	Height Band	Time in Height Band (s)	Average Height (m)	Record Type
22/04/2020	Golden plover	2	13:10	1	Heard only	Present	-1	Standard
22/04/2020	Golden plover	2	13:32	1	Ground	Present	-1	Standard
22/04/2020	Greenshank	1	10:02	1	Heard only	Present	-1	Standard
22/04/2020	Greenshank	1	11:26	1	Heard only	Present	-1	Standard
22/04/2020	Greenshank	2	12:59	1	Heard only	Present	-1	Standard
22/04/2020	Greenshank	2	14:19	1	Heard only	Present	-1	Standard
22/04/2020	Red grouse	2	15:20	1	Heard only	Present	-1	Standard
30/04/2020	Golden plover	2	06:38	1	Heard only	Present	-1	Standard
30/04/2020	Golden plover	2	09:04	1	Ground	Present	-1	Standard
30/04/2020	Greenshank	2	08:19	1	Heard only	Present	-1	Standard
01/05/2020	Greenshank	1	15:11	1	Heard only	Present	-1	Standard
02/05/2020	Golden plover	3	06:41	1	Heard only	Present	-1	Standard
02/05/2020	Snipe	3	06:44	1	Heard only	Present	-1	Standard
15/05/2020	Snipe	3	14:55	1	Heard only	Present	-1	Standard
17/05/2020	Greenshank	1	16:04	1	Heard only	Present	-1	Standard
20/05/2020	Snipe	1	08:53	1	Heard only	Present	-1	Standard
30/05/2020	Greenshank	2	15:31	1	Heard only	Present	-1	Standard
15/06/2020	Cuckoo	2	19:22	1	Heard only	Present	-1	Standard
15/06/2020	Curlew	2	18:03	1	Heard only	Present	-1	Standard
15/06/2020	Curlew	2	21:20	1	Heard only	Present	-1	Standard
15/06/2020	Hen harrier	2	21:23	1	Ground	Present	-1	Standard
15/06/2020	Snipe	2	19:20	1	Heard only	Present	-1	Standard
17/06/2020	Cuckoo	1	03:12	1	Heard only	Present	-1	Standard
17/06/2020	Cuckoo	1	04:53	1	Heard only	Present	-1	Standard
17/06/2020	Cuckoo	1	05:29	1	Ground	Present	2	Standard
17/06/2020	Cuckoo	1	06:31	2	Heard only	Present	-1	Standard
17/06/2020	Cuckoo	1	07:07	1	Ground	Present	2	Standard
17/06/2020	Cuckoo	1	07:35	2	Ground	Present	2	Standard
17/06/2020	Curlew	1	03:34	1	Heard only	Present	-1	Standard
17/06/2020	Curlew	1	03:34	1	Heard only	Present	-1	Standard
17/06/2020	Golden plover	1	08:37	2	Heard only	Present	-1	Standard
17/06/2020	Greylag goose	1	05:02	2	Heard only	Present	-1	Standard
17/06/2020	Lapwing	1	09:11	1	Heard only	Present	-1	Standard
17/06/2020	Red grouse	1	03:32	1	Heard only	Present	-1	Standard
17/06/2020	Snipe	1	03:20	1	Heard only	Present	-1	Standard
17/06/2020	Snipe	1	08:06	1	Heard only	Present	-1	Standard
18/06/2020	Curlew	3	17:46	1	Heard only	Present	-1	Standard
18/06/2020	Curlew	3	18:54	1	Heard only	Present	-1	Standard
19/06/2020	Golden plover	2	06:51	1	Heard only	Present	-1	Standard
24/06/2020	Curlew	3	07:41	1	Heard only	Present	-1	Standard

Date	Species	VP Number	Time First Observed	Number of Birds	Height Band	Time in Height Band (s)	Average Height (m)	Record Type
28/06/2020	Red-throated diver	5	10:02	1	Ground	10680	-1	Standard
02/07/2020	Curlew	1	03:33	1	Heard only	Present	-1	Incidental
02/07/2020	Curlew	1	04:51	1	Ground	Present	-1	Standard
02/07/2020	Lapwing	1	03:35	1	Heard only	Present	-1	Incidental
03/07/2020	Curlew	2	04:39	1	Heard only	Present	-1	Incidental
03/07/2020	Curlew	2	07:21	1	A	7	5	Incidental
03/07/2020	Snipe	2	03:21	1	Heard only	Present	-1	Incidental
03/07/2020	Snipe	2	06:36	1	Heard only	Present	-1	Incidental
13/07/2020	Curlew	3	20:39	1	Heard only	Present	-1	Standard
14/07/2020	Curlew	1	20:17	1	Heard only	Present	-1	Standard
14/07/2020	Lapwing	1	21:21	1	Heard only	Present	-1	Incidental
14/07/2020	Snipe	1	20:24	1	Heard only	Present	-1	Standard
14/07/2020	Snipe	3	17:11	1	Heard only	Present	-1	Standard
14/07/2020	Snipe	3	19:07	1	Heard only	Present	-1	Standard
16/07/2020	Curlew	2	21:14	1	Ground	Present	-1	Standard
16/07/2020	Curlew	2	21:14	1	Ground	Present	-1	Standard
16/07/2020	Golden plover	2	22:48	1	Heard only	Present	-1	Standard
16/07/2020	Hen harrier	1	18:24	1	Ground	Present	-1	Standard
28/08/2020	Dunlin	1	06:43	1	Heard only	Present	-1	Standard

* Standard record type means that the bird was observed during the duration of the vantage point watch and was within the viewshed of the VP (formed from a 180° arc centred on a predetermined view bearing out to a distance of 2km).

Incidental record type means that the bird was observed outwith the duration of the vantage point watch and / or was beyond the 2km limit.

Table 47: Point Registrations from VP Surveys (September 2020 – February 2021)

Date	Species	VP Number	Time First Observed	Number of Birds	Height Band	Time in Height Band (s)	Average Height (m)	Record Type
15/09/2020	Hen harrier	2	10:53	1	Ground	Present	-1	Standard
06/10/2020	Dunlin	1	16:40	1	Heard only	Present	-1	Standard
29/01/2021	Snow bunting	1	10:09	1	Heard only	Present	-1	Standard

* Standard record type means that the bird was observed during the duration of the vantage point watch and was within the viewshed of the VP (formed from a 180° arc centred on a predetermined view bearing out to a distance of 2km).

Incidental record type means that the bird was observed outwith the duration of the vantage point watch and / or was beyond the 2km limit.

Table 48: Point Registrations from VP surveys (March – August 2021)

Date	Species	VP Number	Time First Observed	Number of Birds	Height Band	Time in Height Band (s)	Average Height (m)	Record Type
17/03/2021	Snipe	1	18:56	1	Heard only	Present	-1	Standard
11/04/2021	Golden plover	2	06:08	1	Heard only	Present	-1	Standard
11/04/2021	Snipe	2	07:14	1	Heard only	Present	-1	Standard
28/04/2021	Snipe	3	10:14	1	Heard only	Present	-1	Standard
01/05/2021	Snipe	1	17:19	1	Heard only	Present	-1	Standard
05/05/2021	Snipe	1	08:11	1	Heard only	Present	-1	Standard
08/05/2021	Snipe	3	04:19	1	Heard only	Present	-1	Standard
14/05/2021	Snipe	3	21:39	1	Heard only	Present	-1	Standard
21/05/2021	Golden plover	1	03:58	1	Heard only	Present	0	Standard
23/05/2021	Black-throated diver	4	06:01	1	Ground	Present	-1	Standard
23/05/2021	Black-throated diver	4	06:02	1	Ground	Present	-1	Standard
06/06/2021	Snipe	2	03:11	1	Heard only	20	0	Standard
06/06/2021	Snipe	3	06:50	1	Heard only	Present	-1	Standard
12/06/2021	Snipe	3	03:21	1	Heard only	Present	-1	Standard
18/06/2021	Snipe	2	20:57	1	Heard only	Present	-1	Standard
18/06/2021	Snipe	2	23:06	1	Heard only	Present	-1	Standard
20/06/2021	Black-throated diver	4	05:00	1	Ground	Present	-1	Standard
20/06/2021	Black-throated diver	4	05:00	1	Ground	Present	-1	Standard
26/06/2021	Snipe	1	03:21	1	Heard only	Present	-1	Standard
27/06/2021	Snipe	3	23:02	1	Heard only	Present	-1	Standard
30/06/2021	Black-throated diver	4	14:30	1	Ground	Present	-1	Standard
03/07/2021	Snipe	2	18:21	1	Heard only	Present	-1	Standard
11/07/2021	Black-throated diver	4	05:00	1	Ground	Present	-1	Standard
03/08/2021	Black-throated diver	4	05:40	2	Ground	Present	-1	Standard
03/08/2021	Black-throated diver	4	08:10	2	Ground	Present	-1	Standard

* Standard record type means that the bird was observed during the duration of the vantage point watch and was within the viewshed of the VP (formed from a 180° arc centred on a predetermined view bearing out to a distance of 2km.

Incidental record type means that the bird was observed outwith the duration of the vantage point watch and / or was beyond the 2km limit.

Appendix G. Examples of CRM Calculation

Collision Risk Model Calculations for Greylag goose

Stage 1: Number of birds flying through the rotors per year

Calculate the time the site was observed for and how long birds (as a % area-time activity) were seen in the observation area during this time and bird activity for each vantage point

The survey period for this species is taken as the whole year.

VP	Area (Ha)	Time (hours)	Ha hours	Ha seconds (hours x 3600)	Flight time observed in risk window (s)	Bird Activity (flight time/ha-s)
1	546.9939	90	49229.45	177226019.3	5261	2.9685E-05
2	512.99	90	46169.10	166208760	11730	7.0574E-05
3	428.5813	90	38572.31	138860325	25890	1.8645E-04
Total	1488.565	270	401912.59	1446885313	42881	2.8671E-04

Calculate the average bird observation activity in all areas and the percentage of time birds active within the overall observed area

Mean bird activity = Total bird activity / number of VPs

Mean bird activity = $0.000286705499506384 / 3 = 9.557E-05$

Overall area covered by VPs (excluding overlap) = 1238.3 ha

Proportion of time birds active in the area = Overall area (excluding overlaps) in ha x mean bird activity

Proportion of time birds active in area = $1238.3 \times 9.55684998354614E-05 = 1.1834E-01$

Correct for differences between the recording height band and the actual height swept by the rotors

Corrected bird activity = Proportion of actual height band x Proportion of time birds active in the area

Hub height = 83.4 m

Observed height band max = 150 m

Rotor radius = 66.5 m

Observed height band min = 20 m

Rotor max height = hub height + rotor radius

Rotor min height = hub height - rotor radius

Rotor max height = 149.9 m

Rotor min height = 16.9 m

Proportion of actual height band = $(\text{Rotor max height} - \text{rotor min height}) / (\text{observed height band max} - \text{observed height band min})$

Proportion of actual height band = $(149.9 - 16.9) / (150 - 20)$

Proportion of actual height band = 1.0230769

Corrected bird activity = 1.211E-01

Calculate the number of hours per day the birds are potentially active over a year and the number of hours of bird occupancy in the airspace per year

Hours potentially active are taken as daylight hours only for the year and then calculated where the day length is a function of latitude and day of the year[1]

Hours potentially active = 4517.57436166885

No. of hours of bird occupancy in the airspace per year = hours potentially active x bird activity

No. of hours of bird occupancy in the airspace per year = $4517.57436166885 \times 0.121073453500396$

No. of hours of bird occupancy = 546.95833

Calculate the flight risk volume

Flight risk volume (Vw) = Overall area (ha) x 10000 x rotor radius (m) x 2
Vw = 1238.3 x 10000 x 66.5 x 2
Vw = 1646939000 m³

Calculate the combined rotor swept volume

Number of turbines = 11
Maximum chord = 3.7 m
Bird length = 0.82 m

Combined rotor swept volume (Vr) = number of turbines (N) x Pi x r² x (maximum chord + bird length)
Vr = 11 x Pi x 66.5 x 66.5 x (3.7 + 0.82)
Vr = 690755.391 m³

Calculate the bird occupancy in the rotor swept volume

No. of hours of bird occupancy (converted to seconds) x Combined rotor swept volume/Flight risk volume = n x (Vr/Vw)
Bird occupancy in rotor swept volume = 546.958329412096 x 3600 x 690755.39/1646939000
Bird occupancy in rotor swept volume = 825.8544433

Calculate the bird transit time through the rotors and the potential number of transits per year

Bird speed = 17.1 m/s

Bird transit time through the rotors = (maximum chord + bird length) / bird speed
Bird transit time through the rotors = (3.7 + 0.82)/17.1
Bird transit time through the rotors = 0.264327485380117 s

No. of transits = bird occupancy in the rotor swept volume/bird transit time
No. of transits = 825.854443/0.264327485380117
No. of transits = 3124.360836

Stage 2: Collision risk for bird passing through rotor area (assuming no avoidance)

Convert pitch of chord into radians

K: 1D or 3D (0 or 1)	1
No. of blades	3
Maximum chord	3.7 m
Pitch (degrees)	15
Rotor radius	66.5 m
Rotation Period	4 s

Pitch in radians = pitch (degrees) x Pi/180
Pitch in radians = 15 x Pi/180
Pitch in radians = 0.2618

Calculate the bird aspect ratio

Bird length	0.82 m
Wingspan	1.64 m
Bird speed	17.1 m/s
F:Flapping	1

Bird aspect ratio (b) = bird length/wingspan
Bird aspect ratio (b) = 0.82/1.64
Bird aspect ratio (b) = 0.5

Calculation of alpha and p(collision) as a function of radius

r/R radius	c/C chord	a alpha	Upwind:			Downwind:			check area total
			collide length	p(collision)	contribution from radius r	collide length	p(collision)	contribution from radius r	
0.025	0.575	6.548089	24.7459	1	0.00125	23.6446	1	0.00125	0.00125
0.075	0.575	2.182696	8.61572	0.3778823	0.002834117	7.51444	0.3295808	0.00247186	0.0075
0.125	0.7015	1.309618	6.10291	0.2676713	0.003345891	4.75935	0.2087434	0.00260929	0.0125
0.175	0.8601	0.935441	5.23327	0.2295292	0.004016761	3.58595	0.1572785	0.00275237	0.0175
0.225	0.99435	0.727565	4.731	0.2075	0.00466875	2.82656	0.123972	0.00278937	0.0225
0.275	0.94665	0.595281	3.89679	0.1709118	0.004700075	2.08371	0.0913907	0.00251324	0.0275
0.325	0.89895	0.503699	3.3052	0.1449651	0.004711364	1.58348	0.0694509	0.00225715	0.0325
0.375	0.85125	0.436539	2.96327	0.1299679	0.004873796	1.3329	0.0584606	0.00219227	0.0375
0.425	0.80355	0.385182	2.69568	0.1182316	0.005024841	1.15667	0.0507312	0.00215608	0.0425
0.475	0.75585	0.344636	2.47481	0.1085442	0.005155852	1.02716	0.0450508	0.00213991	0.0475
0.525	0.70815	0.311814	2.28731	0.1003205	0.005266827	0.93102	0.040834	0.00214379	0.0525
0.575	0.66045	0.2847	2.12447	0.0931786	0.005357768	0.85954	0.037699	0.00216769	0.0575
0.625	0.61275	0.261924	1.98038	0.0868588	0.005428675	0.8332	0.0365437	0.00228398	0.0625
0.675	0.56505	0.242522	1.85087	0.0811785	0.005479546	0.87135	0.0382171	0.00257965	0.0675
0.725	0.51735	0.225796	1.73292	0.0760053	0.005510383	0.89794	0.0393833	0.00285529	0.0725
0.775	0.46965	0.211229	1.6243	0.0712411	0.005521186	0.91521	0.0401406	0.00311089	0.0775
0.825	0.42195	0.198427	1.5233	0.0668116	0.005511954	0.92484	0.0405632	0.00334646	0.0825
0.875	0.37425	0.187088	1.42863	0.0626593	0.005482687	0.92815	0.0407085	0.003562	0.0875
0.925	0.32655	0.176975	1.33926	0.0587393	0.005433385	0.92617	0.0406216	0.0037575	0.0925
0.975	0.27885	0.1679	1.25436	0.0550159	0.005364049	0.91971	0.0403381	0.00393296	0.0975
Overall p(collision)			Upwind		0.09493791	Downwind		0.05287177	0.99875

Average probability of collision = (upwind collision total + downwind collision total)/2

Average probability of collision = (0.0949379085779592 + 0.0528717696932024)/2

Average probability of collision = 0.073905

Annual collision risk for Greylag goose assuming no avoidance

Annual collision risk = no. of transits per year through the rotors x the average probability of collision

Annual collision risk = 3124.36083622768 x 0.073905

Annual collision risk = 230.905385 birds

Corrected annual collision risk assuming avoidance

Greylag goose avoidance rate = 0.998

Annual collision risk, with avoidance = annual collision risk x (1 - avoidance rate)

Annual collision risk, with avoidance = 230.905385002916 x (1 - 0.998)

Annual collision risk, with avoidance = 0.461810770005832 birds

Corrected for assumed operational downtime of the rotors

Proportion of time wind turbines operational = 0.85

Corrected annual risk = annual risk, with avoidance x proportion of time wind turbines operational

Corrected annual risk = 0.392539 birds

Calculate number of years per collision

Number of years per collision for Greylag goose = 1/corrected annual risk

Number of years per collision for Greylag goose = 1/0.392539154504957

Number of years per collision for Greylag goose = 2.5475

[1] Forsythe, W. C., Rykiel, E. J., Stahl, R. S., Wu, H. and Schoolfield, R. M.,1995. A model comparison for daylength as a function of latitude and day of year. *Ecological Modelling Vol 80, Issue 1, 87-95*

Collision Risk Model Calculations for Greylag goose

Stage 1: Number of birds flying through the rotors per year

Calculate the time the site was observed for and how long birds (as a % area-time activity) were seen in the observation area during this time and bird activity for each vantage point

The survey period for this species is taken as the whole year.

VP	Area (Ha)	Time (hours)	Ha hours	Ha seconds (hours x 3600)	Flight time observed in risk window (s)	Bird Activity (flight time/ha-s)
1	546.9939	108	59075.34	212671223.1	334	1.5705E-06
2	512.99	108	55402.92	199450512	870	4.3620E-06
3	428.5813	108	46286.78	166632390	667	4.0028E-06
Total	1488.565	324	482295.10	1736262375	1871	9.9353E-06

Calculate the average bird observation activity in all areas and the percentage of time birds active within the overall observed area

Mean bird activity = Total bird activity / number of VPs

Mean bird activity = $9.935306777211E-06 / 3 = 3.312E-06$

Overall area covered by VPs (excluding overlap) = 1238.3 ha

Proportion of time birds active in the area = Overall area (excluding overlaps) in ha x mean bird activity

Proportion of time birds active in area = $1238.3 \times 3.31176892590703E-06 = 4.1010E-03$

Correct for differences between the recording height band and the actual height swept by the rotors

Corrected bird activity = Proportion of actual height band x Proportion of time birds active in the area

Hub height = 83.4 m Observed height band max = 150 m

Rotor radius = 66.5 m Observed height band min = 20 m

Rotor max height = hub height + rotor radius

Rotor min height = hub height - rotor radius

Rotor max height = 149.9 m

Rotor min height = 16.9 m

Proportion of actual height band = (Rotor max height - rotor min height) / (observed height band max - observed height band min)

Proportion of actual height band = $(149.9 - 16.9) / (150 - 20)$

Proportion of actual height band = 1.0230769

Corrected bird activity = 4.196E-03

Calculate the number of hours per day the birds are potentially active over a year and the number of hours of bird occupancy in the airspace per year

Hours potentially active are taken as daylight hours only for the year and then calculated where the day length is a function of latitude and day of the year[1]

Hours potentially active = 4511.14097714848

No. of hours of bird occupancy in the airspace per year = hours potentially active x bird activity

No. of hours of bird occupancy in the airspace per year = $4511.14097714848 \times 0.00419560107928031$

No. of hours of bird occupancy = 18.92695

Calculate the flight risk volume

Flight risk volume (Vw) = Overall area (ha) x 10000 x rotor radius (m) x 2
Vw = 1238.3 x 10000 x 66.5 x 2
Vw = 1646939000 m³

Calculate the combined rotor swept volume

Number of turbines = 11
Maximum chord = 3.7 m
Bird length = 0.82 m

Combined rotor swept volume (Vr) = number of turbines (N) x Pi x r² x (maximum chord + bird length)
Vr = 11 x Pi x 66.5 x 66.5 x (3.7 + 0.82)
Vr = 690755.391 m³

Calculate the bird occupancy in the rotor swept volume

No. of hours of bird occupancy (converted to seconds) x Combined rotor swept volume/Flight risk volume = n x (Vr/Vw)
Bird occupancy in rotor swept volume = 18.9269479525098 x 3600 x 690755.39/1646939000
Bird occupancy in rotor swept volume = 28.57787006

Calculate the bird transit time through the rotors and the potential number of transits per year

Bird speed = 17.1 m/s

Bird transit time through the rotors = (maximum chord + bird length) / bird speed
Bird transit time through the rotors = (3.7 + 0.82)/17.1
Bird transit time through the rotors = 0.264327485380117 s

No. of transits = bird occupancy in the rotor swept volume/bird transit time
No. of transits = 28.57787/0.264327485380117
No. of transits = 108.115393

Stage 2: Collision risk for bird passing through rotor area (assuming no avoidance)

Convert pitch of chord into radians

K: 1D or 3D (0 or 1)	1
No. of blades	3
Maximum chord	3.7 m
Pitch (degrees)	15
Rotor radius	66.5 m
Rotation Period	4 s

Pitch in radians = pitch (degrees) x Pi/180
Pitch in radians = 15 x Pi/180
Pitch in radians = 0.2618

Calculate the bird aspect ratio

Bird length	0.82 m
Wingspan	1.64 m
Bird speed	17.1 m/s
F:Flapping	1

Bird aspect ratio (b) = bird length/wingspan
Bird aspect ratio (b) = 0.82/1.64
Bird aspect ratio (b) = 0.5

Calculation of alpha and p(collision) as a function of radius

r/R radius	c/C chord	a alpha	Upwind:			Downwind:			check area total
			collide length	p(collision)	contribution from radius r	collide length	p(collision)	contribution from radius r	
0.025	0.575	6.548089	24.7459	1	0.00125	23.6446	1	0.00125	0.00125
0.075	0.575	2.182696	8.61572	0.3778823	0.002834117	7.51444	0.3295808	0.00247186	0.0075
0.125	0.7015	1.309618	6.10291	0.2676713	0.003345891	4.75935	0.2087434	0.00260929	0.0125
0.175	0.8601	0.935441	5.23327	0.2295292	0.004016761	3.58595	0.1572785	0.00275237	0.0175
0.225	0.99435	0.727565	4.731	0.2075	0.00466875	2.82656	0.123972	0.00278937	0.0225
0.275	0.94665	0.595281	3.89679	0.1709118	0.004700075	2.08371	0.0913907	0.00251324	0.0275
0.325	0.89895	0.503699	3.3052	0.1449651	0.004711364	1.58348	0.0694509	0.00225715	0.0325
0.375	0.85125	0.436539	2.96327	0.1299679	0.004873796	1.3329	0.0584606	0.00219227	0.0375
0.425	0.80355	0.385182	2.69568	0.1182316	0.005024841	1.15667	0.0507312	0.00215608	0.0425
0.475	0.75585	0.344636	2.47481	0.1085442	0.005155852	1.02716	0.0450508	0.00213991	0.0475
0.525	0.70815	0.311814	2.28731	0.1003205	0.005266827	0.93102	0.040834	0.00214379	0.0525
0.575	0.66045	0.2847	2.12447	0.0931786	0.005357768	0.85954	0.037699	0.00216769	0.0575
0.625	0.61275	0.261924	1.98038	0.0868588	0.005428675	0.8332	0.0365437	0.00228398	0.0625
0.675	0.56505	0.242522	1.85087	0.0811785	0.005479546	0.87135	0.0382171	0.00257965	0.0675
0.725	0.51735	0.225796	1.73292	0.0760053	0.005510383	0.89794	0.0393833	0.00285529	0.0725
0.775	0.46965	0.211229	1.6243	0.0712411	0.005521186	0.91521	0.0401406	0.00311089	0.0775
0.825	0.42195	0.198427	1.5233	0.0668116	0.005511954	0.92484	0.0405632	0.00334646	0.0825
0.875	0.37425	0.187088	1.42863	0.0626593	0.005482687	0.92815	0.0407085	0.003562	0.0875
0.925	0.32655	0.176975	1.33926	0.0587393	0.005433385	0.92617	0.0406216	0.0037575	0.0925
0.975	0.27885	0.1679	1.25436	0.0550159	0.005364049	0.91971	0.0403381	0.00393296	0.0975
Overall p(collision)			Upwind		0.09493791	Downwind		0.05287177	0.99875

Average probability of collision = (upwind collision total + downwind collision total)/2

Average probability of collision = (0.0949379085779592 + 0.0528717696932024)/2

Average probability of collision = 0.073905

Annual collision risk for Greylag goose assuming no avoidance

Annual collision risk = no. of transits per year through the rotors x the average probability of collision

Annual collision risk = 108.115393353097 x 0.073905

Annual collision risk = 7.990251 birds

Corrected annual collision risk assuming avoidance

Greylag goose avoidance rate = 0.998

Annual collision risk, with avoidance = annual collision risk x (1 - avoidance rate)

Annual collision risk, with avoidance = 7.99025075384064 x (1 - 0.998)

Annual collision risk, with avoidance = 0.0159805015076813 birds

Corrected for assumed operational downtime of the rotors

Proportion of time wind turbines operational = 0.85

Corrected annual risk = annual risk, with avoidance x proportion of time wind turbines operational

Corrected annual risk = 0.013583 birds

Calculate number of years per collision

Number of years per collision for Greylag goose = 1/corrected annual risk

Number of years per collision for Greylag goose = 1/0.0135834262815291

Number of years per collision for Greylag goose = 73.6191

[1] Forsythe, W. C., Rykiel, E. J., Stahl, R. S., Wu, H. and Schoolfield, R. M., 1995. A model comparison for daylength as a function of latitude and day of year. *Ecological Modelling Vol 80, Issue 1*, 87-95