7

Ornithology

7 Ornithology Appendices

Appendix 7.1: Details of Moorland Bird Survey Visits

Date	Time Start	Duration (hours)	Weather / Remarks
08/04/2020	0700	9	all of survey area
28/04/2020	0700	9	all of survey area
28/05/2020	0500	7	all of survey area
16/06/2020	0600	8	all of survey area
09/07/2020	0700	6	all of survey area
03/04/2021	0830	5	southern area
12/04/2021	0600	5	northern area
14/05/2021	0630	4	southern area
25/05/2021	0500	5	northern area
19/06/2021	0800	6	northern area
24/06/2021	0800	4.5	southern area
05/07/2021	0600	7	all of survey area

Appendix 7.2: Details of Winter Bird Survey Visits

Date	Time Start	Duration (hours)	Weather / Remarks
14/11/2019	0830	8	all of survey area
20/12/2019	0845	7.5	all of survey area
05/02/2020	0800	9	all of survey area
20/03/2020	0800	8.5	all of survey area
28/10/2020	1100	6	northern area
16/11/2020	0800	6	northern area
24/12/2020	1200	4	southern area
20/01/2021	0830	5	northern area
31/01/2021	1000	4	southern area
06/02/2021	0830	4	southern area
17/03/2021	0830	5	southern area

Date	Time Start	Duration (hours)	Weather / Remarks
24/03/2021	0800	5	northern area

Appendix 7.3: Details of Vantage Point Watches

Appendix 7.3.1: Details of Vantage Point Watches in Baseline Year 1

Date	VP	Time Start	Duration (hours)	Weather / Remarks
15/11/2019	1	0800	2	sunrise at 0754
21/11/2019	1	0800	4	sunrise at 0805
02/12/2019	1	0830	3	sunrise 0825
31/12/2019	1	0900	3	sunrise at 0850
03/01/2020	1	1300	3	
27/01/2020	1	1200	3	
06/02/2020	1	0900	3	
13/02/2020	1	0800	3	sunrise at 0755
11/03/2020	1	1330	3	
16/03/2020	1	0800	3	
06/04/2020	1	0800	3	
22/04/2020	1	1000	3	
11/05/2020	1	1400	3	
27/05/2020	1	0730	3	
13/06/2020	1	0800	3	
14/06/2020	1	1300	4	
11/07/2020	1	0800	4	
12/07/2020	1	1000	4	
19/08/2020	1	1630	3	
24/09/2020	1	1015	3	
24/09/2020	1	1400	3	
15/11/2019	2	1015	3	
02/12/2019	2	1200	4	sunset at 1601
31/12/2019	2	1300	3	sunset at 1605
27/01/2020	2	0830	3	sunrise at 0825

Date	VP	Time Start	Duration (hours)	Weather / Remarks
06/02/2020	2	1300	3	
13/02/2020	2	1430	3	sunset at 1725
11/03/2020	2	0800	4	
16/03/2020	2	1500	2	
06/04/2020	2	1200	3	
22/04/2020	2	1400	3	
11/05/2020	2	0930	3	
30/05/2020	2	1600	3	
01/06/2020	2	1600	3	
13/06/2021	2	1130	3	
25/06/2020	2	1800	3	
06/08/2020	2	0830	3	
19/08/2020	2	1300	3	
01/09/2020	2	1500	3	
14/09/2020	2	0930	3	
14/09/2020	2	1300	3	
15/11/2019	3	1330	3	sunset at 1622
29/11/2019	3	0830	3	sunrise at 0820
29/11/2019	3	1230	4	sunset at 1604
15/12/2019	3	0900	3.5	
27/01/2020	3	1545	1.5	sunset at 1650
31/01/2020	3	0830	4	
31/01/2020	3	1300	2	
13/02/2020	3	1130	2	
23/03/2020	3	0800	4	
23/03/2020	3	1300	3	
06/04/2020	3	1600	2	
22/04/2020	3	1730	3	
11/05/2020	3	1800	3	
27/05/2020	3	1130	3	
30/05/2020	3	1200	3	

Date	VP	Time Start	Duration (hours)	Weather / Remarks
01/06/2020	3	0800	3	
16/06/2020	3	1500	3	
25/06/2020	3	1400	3	
11/07/2020	3	1300	4	
06/08/2020	3	1200	4	
01/09/2020	3	1100	3	
29/09/2020	3	1800	2	
21/11/2019	4	1230	4	sunset at 1613
15/12/2019	4	1330	2	
22/12/2019	4	1000	3	
03/01/2020	4	0900	3	
22/02/2020	4	1000	3	wintry showers
22/02/2020	4	1330	3	wintry showers
01/03/2020	4	1000	3	
16/03/2020	4	1130	3	
27/05/2020	4	1600	3	
30/05/2020	4	0800	3	
01/06/2020	4	1200	3	
13/06/2020	4	1600	3	
14/06/2020	4	0800	4	
09/07/2020	4	1330	3	
12/07/2020	4	1500	3	
19/07/2020	4	1000	3	
19/07/2020	4	1330	3	
06/08/2020	4	1630	2	
29/09/2020	4	1000	3	
29/09/2020	4	1330	3	

Appendix 7.3.2: Details of Vantage Point Watches in Baseline Year 2

Date	VP	Time Start	Duration (hours)	Remarks
14/10/2020	1	0830	3	
15/10/2020	1	1030	3	
05/11/2020	1	0800	3	sunrise at 0740
19/11/2020	1	0830	3	
30/11/2020	1	0930	2	
15/12/2020	1	1315	3	sunset at 1555
21/01/2021	1	0830	4	sunrise at 0835
30/01/2021	1	1300	3	
10/02/2021	1	0800	4	sunrise at 0800
16/02/2021	1	0830	2	
06/03/2021	1	0845	4	
26/03/2021	1	1600	2	
12/04/2021	1	1500	3	
29/04/2021	1	1130	3	
25/05/2021	1	1730	3	
07/06/2021	1	0700	4	
19/06/2021	1	1500	3	
05/07/2021	1	1400	4	
20/07/2021	1	0600	4	sunrise at 0520
22/07/2021	1	1230	3	
10/08/2021	1	1430	3	
01/09/2021	1	1130	3	
14/09/2021	1	0800	3	
14/10/2020	2	1200	3	
15/10/2020	2	1400	3	
05/11/2020	2	1130	4	
30/11/2020	2	1200	2	
17/12/2020	2	0900	3	
17/12/2020	2	1300	3	sunset at 1600
21/01/2021	2	1300	3	patchy lying snow above 250m

Date	VP	Time Start	Duration (hours)	Remarks
30/01/2021	2	0915	3	
10/02/2021	2	1330	4	sunset at 1720
16/02/2021	2	1130	3	
01/03/2021	2	1300	2	
06/03/2021	2	1530	2	
26/03/2021	2	1330	2	
29/04/2021	2	0800	3	
30/04/2021	2	1030	3	
16/05/2021	2	0800	3	
22/05/2021	2	0700	3	
29/06/2021	2	0800	4	
21/07/2021	2	1800	4	sunset at 2140
22/07/2021	2	0900	3	
07/08/2021	2	0800	4	
10/08/2021	2	1800	3	
01/09/2021	2	0800	3	
22/09/2021	2	1500	3	
14/10/2020	3	1530	3	
19/11/2020	3	1230	4	sunset at 1615
30/11/2020	3	1430	2	sunset at 1605
14/12/2020	3	0900	3	sunrise at 0845
14/12/2020	3	1215	4	sunset at 1555
18/01/2021	3	0900	3	sunrise at 0830
18/01/2021	3	1215	3	Cloud base 340m
06/02/2021	3	1500	2	
16/02/2021	3	1530	2	sunset at 1735
17/02/2021	3	1600	2	sunset at 1735
25/02/2021	3	1630	2	sunset at 1750
01/03/2021	3	1515	2	
06/03/2021	3	1300	2	
17/03/2021	3	1330	2	
03/04/2021	3	1400	3	

Date	VP	Time Start	Duration (hours)	Remarks
29/04/2021	3	1500	3	
22/05/2021	3	1430	3	
25/05/2021	3	1400	3	
07/06/2021	3	1200	3	
29/06/2021	3	1300	3	
20/07/2021	3	1100	4	
21/07/2021	3	1200	2	
17/08/2021	3	1300	3	
17/08/2021	3	1630	3	
01/09/2021	3	1600	3	
14/09/2021	3	1130	3	
29/10/2020	4	1030	3	very mild
29/10/2020	4	1345	3	
23/11/2020	4	0830	3	sunrise 0815
23/11/2020	4	1200	3	Cloud base 340m
15/12/2020	4	0945	3	
24/12/2020	4	0845	3	sunrise at 0850
12/01/2021	4	0900	3	air temp. freezing
12/01/2021	4	1230	4	sunset at 1625
17/02/2021	4	0900	3	
17/02/2021	4	1230	3	
26/03/2021	4	0800	2	
27/03/2021	4	0830	4	thaw of lying snow
02/04/2021	4	1600	3	
06/04/2021	4	1430	3	
16/05/2021	4	1130	3	
16/05/2021	4	1500	3	
31/05/2021	4	0700	3	
29/06/2021	4	1630	3	
20/07/2021	4	1500	3	
21/07/2021	4	1430	3	

Date	VP	Time Start	Duration (hours)	Remarks
22/08/2021	4	0830	3	
22/08/2021	4	1200	3	
22/09/2021	4	0800	3	
22/09/2021	4	1130	3	
24/10/2020	5	0830	3	
25/10/2020	5	1300	4	
01/11/2020	5	0900	3	
08/11/2020	5	0930	3	
06/12/2020	5	0900	4	
02/01/2021	5	1000	3	lying snow above 300m
02/01/2021	5	1330	2	lying snow above 300m
25/02/2021	5	0800	3	
27/02/2021	5	0730	3	sunrise at 0720
27/02/2021	5	1100	3	
01/03/2021	5	1030	2	
17/03/2021	5	1500	2	
24/03/2021	5	1730	1	
30/04/2021	5	0700	3	
29/05/2021	5	1000	3	
31/05/2021	5	1200	3	
31/05/2021	5	1530	3	
20/06/2021	5	0830	4	
26/06/2021	5	0830	4	
22/07/2021	5	1600	3	very warm (28C)
22/08/2021	5	1600	4	
25/08/2021	5	1400	3	
07/09/2021	5	1700	3	
14/09/2021	5	1500	3	
24/10/2020	6	1200	4	
25/10/2020	6	0800	4	
01/11/2020	6	1230	3	
08/11/2021	6	1300	3	

Date	VP	Time Start	Duration (hours)	Remarks
06/12/2020	6	1330	3	sunset at 1615
03/01/2021	6	0900	3	lying snow above 300m
03/01/2021	6	1230	3	lying snow above 300m
25/02/2021	6	1200	4	
27/02/2021	6	1430	3	sunset at 1755
24/03/2021	6	1300	4	
26/03/2021	6	1030	2	
29/04/2021	6	1830	3	
14/05/2021	6	1300	3	
22/05/2021	6	1030	3	
07/06/2021	6	1530	3	
20/06/2021	6	1400	4	
26/06/2021	6	1300	4	
17/07/2021	6	0800	3	
10/08/2021	6	1030	3	
25/08/2021	6	0930	4	
07/09/2021	6	1000	3	
07/09/2021	6	1330	3	

Appendix 7.4: Details of Vantage Point Locations

VP#	Lat.	Long.	Principal Viewing Bearing (Degrees)	Viewing Arc (Degrees)	Extent of View
1	54.96857	-6.02749	NNW (330)	180	2 km
2	54.96584	-6.02976	SSW (210)	180	2 km
3	54.96354	-6.04477	NNE (30)	180	2 km
4	54.96277	-6.05839	N (0)	180	2 km
5	54.9444	-6.03526	NW (315)	180	2 km
6	54.94184	-6.05243	N (0)	180	2 km

Appendix 7.5: IEEM Probability Table

The IEEM probability scale used in the Assessment of Effects is given below:

- Certain / near-certain – probability estimated at 95% or higher
- Likely – probability estimated at above 50% but below 95%
- Unlikely – probability estimated at above 5% but below 50%
- Highly unlikely – probability estimated at less than 5%

Appendix 7.6: Details of Red Grouse Observation

Date	Total No. Birds	Remarks
30/04/21	1	Male bird calling from ground

Appendix 7.7: Details of Curlew Observations

Appendix 7.7.1: Details of Curlew Observations in Baseline Year 1

Date	Method	Total No. Birds	No. Birds within 1 km extent from turbines	Remarks
09/07/20	MBS	0	0	-
16/06/20	MBS	5	5	Flock of adult curlews (failed breeders)
01/06/20	VP	3	3	Two apparent pairs
28/5/20	MBS	7	5	Four apparent pairs (three pairs within 1 km extent from turbines)
28/4/20	MBS	3	3	Two apparent pairs
22/04/20	VP	4	4	Two pairs
08/04/20	MBS	5	4	Three apparent pairs (two pairs within 1 km extent from turbines)
06/04/20	VP	2	1	One pair
23/3/20	VP	3	3	Two apparent pairs
20/3/20	MBS	3	3	Two apparent pairs
16/03/20	VP	4	4	Two pairs
11/03/20	VP	5	5	Three apparent pairs

Appendix 7.7.2: Details of Curlew Observations in Baseline Year 2

Date	Method	Total No. Birds	No. Birds within 1 km extent from turbine array	Remarks
05/07/21	MBS	1	1	Single adult curlew
29/06/21	VP	1	1	Single adult curlew
24/06/21	MBS	3	3	Two apparent pairs
19/06/21	MBS	2	2	One pair
07/06/21	VP	1	1	One apparent pair
25/05/21	MBS	0	0	-
22/05/21	VP	2	2	One pair
14/05/21	MBS	4	4	Two pairs
29/04/21	VP	4	4	Two pairs
12/04/21	MBS	0	0	-
03/04/21	MBS	8	6	Four pairs (three pairs within 1 km extent from turbine array)
24/03/21	MBS	2	2	One pair
17/03/21	MBS	4	4	Two pairs

Appendix 7.8: Details of Snipe Observations

Date	Total No. Birds	No. Birds within 500m extent from turbines	Remarks
05/07/21	2	1	Territorial birds calling from ground
24/06/21	3	1	Territorial birds calling from ground
19/06/21	3	2	Territorial birds calling from ground
25/05/21	2	1	Territorial birds calling from ground
14/05/21	0	0	-
12/04/21	1	1	Territorial birds calling from ground
03/04/21	0	0	-
09/07/20	2	2	Territorial birds calling from ground
16/06/20	3	2	Territorial birds calling from ground
28/05/20	3	2	Territorial birds calling from ground
28/04/20	2	2	Territorial birds calling from ground
08/04/20	0	0	-

Appendix 7.9: Details of Moorland Bird Survey Observations

Date	Species	Count	Remarks
05/02/2020	crossbill	1	in flight
28/05/2020	cuckoo	2	singing males, mobile
24/03/2021	fieldfare	100	flock
17/03/2021	fieldfare	20	flock
16/02/2021	fieldfare	100	flock
20/01/2021	fieldfare	60	flock
28/10/2021	fieldfare	20	flock
05/02/2020	fieldfare	20	flock
06/04/2020	fieldfare	40	flock
16/03/2020	fieldfare	100	flock
17/03/2021	golden plover	20	in flight
06/02/2021	golden plover	5	on ground
16/11/2020	golden plover	1	in flight
28/10/2020	golden plover	12	in flight
14/11/2019	golden plover	2	on ground
14/11/2019	golden plover	120	in flight
20/01/2021	goldfinch	2	
24/12/2020	goldfinch	12	
06/08/2020	goldfinch	100	flock
02/12/2019	goldfinch	20	flock
24/03/2021	great black-backed gull	11	at sheep carcass
17/03/2021	great black-backed gull	2	at sheep carcass
31/01/2021	great black-backed gull	5	in flight
20/01/2021	great black-backed gull	1	in flight
16/11/2020	great black-backed gull	1	in flight
28/10/2020	great black-backed gull	1	in flight
16/06/2020	great black-backed gull	4	on grass
05/02/2020	great black-backed gull	1	in flight
20/12/2019	great black-backed gull	2	on ground
16/11/2020	grey heron	1	along stream
20/12/2019	herring gull	1	in flight
24/03/2021	hooded crow	2	at sheep carcass

Date	Species	Count	Remarks
17/03/2021	hooded crow	50	at sheep carcass
06/02/2021	hooded crow	80	flock
20/01/2021	hooded crow	6	
16/11/2020	hooded crow	10	
28/10/2020	hooded crow	10	
06/08/2020	hooded crow	20	flock
28/05/2020	hooded crow	12	flock
01/03/2021	hooded crow	20	flock
01/09/2020	house martin	50	flock
02/12/2019	jack snipe	1	flushed
16/06/2020	jackdaw	100	flock
16/06/2020	lesser black-backed gull	20	on grass
14/09/2020	linnet	20	flock
06/02/2021	magpie	4	
20/01/2021	magpie	2	
26/03/2021	mallard	2	pair along ditch
07/06/2021	mistle thrush	45	flock
05/02/2020	pied wagtail	2	
29/11/2019	pied wagtail	2	
24/03/2021	raven	2	at sheep carcass
17/03/2021	raven	10	at sheep carcass
06/02/2021	raven	6	
20/01/2021	raven	12	
16/11/2020	raven	10	
28/10/2020	raven	6	
05/02/2020	raven	6	
06/02/2021	raven	10	at sheep carcass
08/04/2020	redpoll	1	in flight
16/06/2020	rook	300	flock
28/05/2020	sand martin	2	pair (nest burrow at borrow-pit)
25/06/2020	sand martin	2	pair and nest at borrow-pit (photos)
05/02/2020	siskin	1	in flight

Date	Species	Count	Remarks
24/03/2021	skylark	20	flock
01/03/2021	skylark	21	flock
17/03/2021	snipe	6	
20/01/2021	snipe	4	
24/12/2020	snipe	2	
28/10/2020	snipe	10	singly
14/11/2019	snipe	4	
20/12/2019	snow bunting	12	in flight
14/11/2019	snow bunting	12	in flight
29/11/2019	snow bunting	130	flock
29/11/2019	snow bunting	11	flock
30/11/2020	song thrush	4	flock
24/03/2021	starling	50	flock
17/03/2021	starling	50	flock
20/01/2021	starling	40	flock
05/02/2020	starling	600	flock
17/03/2021	starling	150	flock
16/03/2020	starling	200	flock
01/09/2021	swallow	20	flock
01/09/2020	swift	2	feeding
09/07/2020	swift	2	feeding
14/11/2019	woodcock	1	disturbed from ground
05/02/2020	woodpigeon	20	flock

Appendix 7.10: Details of Observations of Birds at Loughs[1]

Date	Method	Species	Count	Remarks
08/04/2020	MBS	cormorant	1	resting
06/04/2020	incidental	cormorant	1	resting
28/05/2020	MBS	great black-backed gull	1	resting
28/04/2020	MBS	great black-backed gull	1	resting

[1] All observations are from lough location 2 and include the Moorland Bird Surveys and also incidental observations made during the course of other survey work (e.g. vantage point surveys)

Date	Method	Species	Count	Remarks
08/04/2020	MBS	great black-backed gull	15	resting
22/04/2020	incidental	great black-backed gull	8	resting
06/04/2020	incidental	great black-backed gull	18	resting
23/03/2020	incidental	great black-backed gull	10	immatures
16/03/2020	incidental	great black-backed gull	12	resting
11/03/2020	incidental	great black-backed gull	4	
06/08/2020	incidental	green sandpiper	1	
16/11/2021	MBS	grey heron	1	
06/08/2020	incidental	grey heron	1	
16/06/2020	MBS	grey heron	1	
11/05/2020	MBS	grey heron	1	
08/04/2020	MBS	grey heron	2	
01/09/2021	incidental	grey heron	1	
11/05/2020	incidental	grey heron	1	
21/11/2019	incidental	grey heron	1	
20/01/2021	MBS	greylag goose	5	
11/05/2020	MBS	greylag goose	2	pair
28/04/2020	MBS	greylag goose	2	pair
22/05/2021	incidental	greylag goose	2	pair
11/05/2020	incidental	greylag goose	2	pair
16/03/2020	incidental	herring gull	2	resting
28/04/2020	MBS	lesser black-backed gull	1	resting
08/04/2020	MBS	lesser black-backed gull	5	resting
22/02/2020	incidental	lesser black-backed gull	2	resting
24/03/2021	MBS	little grebe	1	
28/05/2020	MBS	little grebe	1	
11/05/2020	MBS	little grebe	1	
08/04/2020	MBS	little grebe	1	
06/03/2021	incidental	little grebe	2	
01/03/2021	incidental	little grebe	1	
22/04/2020	incidental	little grebe	2	pair
24/03/2021	MBS	mallard	2	pair

Date	Method	Species	Count	Remarks
16/02/2021	MBS	mallard	2	
06/08/2020	incidental	mallard	6	
16/06/2020	MBS	mallard	2	pair
28/05/2020	MBS	mallard	1	male
28/04/2020	MBS	mallard	2	pair
08/04/2020	MBS	mallard	2	pair
05/02/2020	MBS	mallard	6	
22/05/2021	incidental	mallard	6	brood of ducklings
25/06/2020	incidental	mallard	4	
22/04/2020	incidental	mallard	2	pair
06/04/2020	incidental	mallard	2	
11/03/2020	incidental	mallard	2	pair
31/01/2020	incidental	mallard	2	pair
31/12/2019	incidental	mallard	2	
29/11/2019	incidental	mallard	2	pair
16/02/2021	MBS	moorhen	1	
01/09/2020	MBS	moorhen	1	
06/08/2020	incidental	moorhen	1	
16/06/2020	MBS	moorhen	2	pair
28/05/2020	MBS	moorhen	1	
28/04/2020	MBS	moorhen	2	pair
08/04/2020	MBS	moorhen	2	pair
22/05/2021	incidental	moorhen	2	
06/03/2021	incidental	moorhen	1	
01/03/2021	incidental	moorhen	1	
25/06/2020	incidental	moorhen	1	
22/04/2020	incidental	moorhen	2	pair
11/03/2020	incidental	moorhen	1	
06/02/2021	MBS	none	0	
14/09/2020	MBS	none	0	
18/01/2021	incidental	none	0	
12/01/2021	incidental	none	0	lough frozen
19/11/2020	incidental	none	0	

Date	Method	Species	Count	Remarks
24/09/2020	incidental	none	0	
01/03/2021	incidental	snipe	2	flushed by hen harrier
16/02/2021	MBS	teal	18	
31/01/2021	MBS	teal	12	
20/01/2021	MBS	teal	20	
24/12/2020	MBS	teal	4	
28/10/2020	MBS	teal	1	
01/09/2020	MBS	teal	5	
06/08/2020	incidental	teal	3	
28/05/2020	MBS	teal	3	two males, one female
11/05/2020	MBS	teal	4	two pairs
28/04/2020	MBS	teal	4	two pairs
08/04/2020	MBS	teal	4	two pairs
05/02/2020	MBS	teal	14	
22/09/2021	incidental	teal	3	
07/06/2021	incidental	teal	1	male
22/05/2021	incidental	teal	2	pair
26/03/2021	incidental	teal	14	
06/03/2021	incidental	teal	24	
01/03/2021	incidental	teal	21	
17/02/2021	incidental	teal	12	
15/12/2020	incidental	teal	30	
25/06/2020	incidental	teal	1	female
11/05/2020	incidental	teal	4	two pairs
22/04/2020	incidental	teal	8	four pairs
23/03/2020	incidental	teal	20	
11/03/2020	incidental	teal	10	
31/01/2020	incidental	teal	24	in pairs
31/12/2019	incidental	teal	14	in pairs
29/11/2019	incidental	teal	2	pair
01/09/2021	incidental	water rail	1	calling from fen

Appendix 7.11: Details of Records of Annex 1 Raptor Species

Species	Date	Time	VP	No. Birds	Age / Sex	Duration at Risk Height (s)	Total Duration (s)
golden eagle	27/01/2020	1330	1	1	adult	600	600
golden eagle	23/11/2020	1500	4	1	adult	0	40
golden eagle	14/12/2020	1500	3	1	adult	54	1550
white-tailed eagle	29/04/2021	1230	1	1	immature	0 (perched)	0 (perched)
red kite	03/04/2021	1515	3	1	-	400	450
red kite	07/07/2021	1650	1	1	-	210	517
hen harrier	15/11/2019	1430	3	1	male	0	70
hen harrier	03/01/2020	1345	1	1	male	0	30
hen harrier	27/01/2020	1515	1	1	male	0	130
hen harrier	06/02/2020	1345	2	1	ringtail	0	450
hen harrier	22/04/2020	1400	2	1	male	0	395
hen harrier	06/08/2020	1650	4	1	female	0	120
hen harrier	01/09/2020	1400	3	1	1CY	0	330
hen harrier	19/11/2020	1500	3	1	juvenile	0	450
hen harrier	30/11/2020	1205	2	1	ringtail	0	65
hen harrier	30/11/2020	1320	2	1	male	0	325
hen harrier	15/12/2020	1530	1	1	ringtail	0	315
hen harrier	16/02/2021	1635	3	1	2CY	0	330
hen harrier	01/03/2021	1530	3	1	ringtail	85	205
hen harrier	29/04/2021	1835	6	1	male	60	120
hen harrier	14/05/2021	1500	6	1	male	0	150
hen harrier	14/05/2021	1515	6	1	male	92	127
hen harrier	21/07/2021	1500	4	1	female	0	125
hen harrier	25/08/2021	1155	6	1	male	0	615
hen harrier	07/09/2021	1130	6	1	male	0	65
hen harrier	14/09/2021	1305	3	1	male	0	65
hen harrier	28/05/2020	-	MBS	1	male	-	-
hen harrier	16/11/2020	-	MBS	1	1CY	-	-
merlin	13/02/2020	1525	2	1	female	-	-
merlin	23/03/2020	1100	3	1	female	-	-

Species	Date	Time	VP	No. Birds	Age / Sex	Duration at Risk Height (s)	Total Duration (s)
merlin	08/04/2020	1000	MBS	1	female	-	-
merlin	14/12/2020	1515	3	1		-	-
merlin	21/01/2021	1540	2	1	female	-	-
merlin	06/02/2021		MBS	1	female	-	-
merlin	10/02/2021	1455	2	1	female	-	-
merlin	25/02/2021	1205	6	1	female	-	-
merlin	27/03/2021		incidental observation	1	female	-	-
merlin	22/09/2021	1450	2	1	1CY	-	-
peregrine	21/11/2019	1120	1	1	-	100	100
peregrine	29/11/2019	1200	3	1	adult	0	0
peregrine	22/04/2020	1425	2	1	2CY	62	62
peregrine	16/06/2020	1500	3	1	adult	65	65
peregrine	19/08/2020	1605	2	1	1CY	0	65
peregrine	01/09/2020	1545	3	1	1CY	120	230
peregrine	18/01/2021	1130	3	1	adult	0	184
peregrine	30/01/2021	1530	1	2	pair	32	437
peregrine	06/03/2021	1140	1	1	adult	0	125
peregrine	26/03/2021	1040	6	1	-	0	100
peregrine	29/04/2021	1510	3	1	adult	51	61
peregrine	19/06/2021	1615	1	2	pair	0	320
peregrine	05/07/2021	1430	1	1	adult	110	110
peregrine	01/09/2021	1700	3	1	-	105	105
peregrine	05/02/2020	-	incidental observation	1	adult	-	-
peregrine	09/07/2020	-	incidental observation	2	pair	-	-
peregrine	20/01/2021	-	incidental observation	1	-	-	-

Appendix 7.12: Details of Records of Non-Annex 1 Raptor Species

Species	Date	Time	VP	No. Birds	Age / Sex	Duration at Risk Height (s)	Total Duration (s)
buzzard	15/10/2020	1200	1	1	-	0	65
buzzard	30/01/2021	1340	1	1	-	0	323
buzzard	16/02/2021	1015	1	1	-	0	65
buzzard	06/03/2021	1210	1	1	-	350	1150
buzzard	26/03/2021	1605	1	1	-	95	95
buzzard	26/03/2021	1610	1	2	-	90	420
buzzard	12/04/2021	1530	1	2	-	0	65
buzzard	29/04/2021	1325	1	1	-	150	300
buzzard	25/05/2021	1500	1	1	-	32	32
buzzard	19/06/2021	1600	1	1	-	0	310
buzzard	05/07/2021	1505	1	1	-	0	220
buzzard	05/07/2021	1630	1	1	-	65	65
buzzard	10/08/2021	1430	1	1	-	195	195
buzzard	01/09/2021	1320	1	1	1CY	76	253
buzzard	30/11/2020	1430	2	1	-	0	171
buzzard	16/02/2021	1400	2	1	-	0	187
buzzard	16/02/2021	1245	2	2	-	120	512
buzzard	22/05/2021	1000	2	1	-	50	50
buzzard	22/07/2021	1110	2	1	-	410	410
buzzard	06/02/2021	1530	3	1	-	0	150
buzzard	01/03/2021	1610	3	1	-	45	180
buzzard	17/03/2021	1400	3	1	-	0	125
buzzard	03/04/2021	1405	3	2	-	0	65
buzzard	03/04/2021	1440	3	1	-	320	320
buzzard	29/04/2021	1530	3	1	-	0	260
buzzard	07/06/2021	1330	3	2	-	90	90
buzzard	07/06/2021	1350	3	1	-	70	70
buzzard	07/06/2021	1430	3	1	-	0	160
buzzard	29/06/2021	1430	3	1	-	0	150
buzzard	29/06/2021	1445	3	1	-	225	225

Species	Date	Time	VP	No. Birds	Age / Sex	Duration at Risk Height (s)	Total Duration (s)
buzzard	20/07/2021	1200	3	1	Adult	540	1080
buzzard	20/07/2021	1215	3	2	Adult	59	445
buzzard	14/09/2021	1305	3	1	-	120	240
buzzard	29/10/2020	1100	4	1	-	0	82
buzzard	23/11/2020	1400	4	2	-	0	95
buzzard	27/03/2021	1000	4	2	Adult	120	305
buzzard	20/07/2021	1500	4	1	Adult	0	155
buzzard	27/02/2021	950	5	1	-	0	60
buzzard	01/03/2021	1100	5	2	-	60	60
buzzard	25/02/2021	1320	6	2	-	170	620
buzzard	25/02/2021	1425	6	1	-	0	135
buzzard	25/02/2021	1440	6	1	-	65	345
buzzard	24/03/2021	1355	6	1	-	0	145
buzzard	26/03/2021	1120	6	1	-	130	130
buzzard	22/05/2021	1210	6	1	-	0	65
buzzard	07/06/2021	1650	6	1	-	0	65
buzzard	10/08/2021	1130	6	1	1CY	65	65
buzzard	25/08/2021	950	6	1	-	0	65
buzzard	25/08/2021	1205	6	1	-	160	160
kestrel	29/09/2020	1340	4	1	1CY	0	176
kestrel	29/09/2020	1425	4	1	1CY	0	315
kestrel	14/09/2020	1540	2	1	1CY	0	145
kestrel	01/09/2020	1300	3	1	1CY	25	125
kestrel	19/08/2020	1640	1	1	1CY	0	185
kestrel	06/08/2020	1330	3	1	1CY	0	220
kestrel	06/08/2020	1500	2	2	1CY	0	600
kestrel	09/07/2020	1450	4	1	female	0	160
kestrel	20/03/2020	1635	4	1	female	0	300
kestrel	08/04/2020	-	MBS	1	male	-	-
kestrel	22/07/2021	1230	1	1	male	300	650
kestrel	22/07/2021	1430	1	2	1CY	150	450

Species	Date	Time	VP	No. Birds	Age / Sex	Duration at Risk Height (s)	Total Duration (s)
kestrel	01/09/2021	1300	1	3	1CY	0	350
kestrel	17/12/2020	1505	2	1	male	30	90
kestrel	22/07/2021	1005	2	1		0	130
kestrel	17/03/2021	1340	3	1	female	0	90
kestrel	29/04/2021	1700	3	1	male	0	240
kestrel	20/07/2021	1240	3	1	1CY	0	255
kestrel	20/07/2021	1350	3	1	male	0	320
kestrel	14/05/2021	1330	6	1	female	0	165
kestrel	17/03/2021	-	MBS	1	male	-	-
kestrel	19/06/2021	-	MBS	1		-	-

Appendix 7.13: Details of Observations of Secondary Species

Date	VP	Species	No. Birds	Remarks
06/08/2020	3	curlew	1	migrating southwest
30/04/2021	6	golden plover	12	
06/03/2021	3	golden plover	1	
14/12/2020	3	golden plover	30	flock flying fast and direct
29/09/2020	4	golden plover	5	
24/09/2020	1	golden plover	15	circling
23/03/2020	3	golden plover	30	circling then flew south
06/03/2021	3	golden plover	1	calls high overhead
22/09/2021	2	great black-backed gull	2	
06/03/2021	3	great black-backed gull	2	
27/02/2021	5	great black-backed gull	3	
25/02/2021	6	great black-backed gull	2	
06/02/2021	3	great black-backed gull	2	
31/01/2020	3	great black-backed gull	4	
27/01/2020	1	great black-backed gull	2	
03/01/2020	1	great black-backed gull	2	
29/11/2019	3	greylag goose	3	flying south

Date	VP	Species	No. Birds	Remarks
21/11/2019	1	herring gull	1	
16/06/2020	3	house martin	2	
10/08/2021	6	house martin	30	feeding
27/02/2021	5	lapwing	12	
11/05/2020	4	lesser black-backed gull	1	flying north
16/06/2020	3	sand martin	2	
10/02/2021	2	snipe	1	
23/03/2020	3	snow bunting	1	
06/02/2020	2	snow bunting	8	
07/09/2021	6	swallow	1	
16/06/2020	3	swallow	2	
20/07/2021	3	swallow	100	feeding
07/06/2021	6	swift	6	
11/05/2020	2	swift	2	heading north
29/06/2021	3	swift	12	feeding
10/08/2021	6	swift	30	feeding

Appendix 7.14 – Details of Collision Risk Model

General Comment

The SNH Collision Risk Model (CRM) has been completed for hen harrier, peregrine, buzzard and kestrel using the vantage point observations made during baseline year two (twelve month period October 2020 to September 2021 inclusive).

Wind Farm Parameters

The wind farm parameters input to the CRM are given in Table A.

Table A – Wind Farm Parameters Input to the Collision Risk Model

Parameter	Input Value	Remarks
Size of wind farm envelope	1	Optional input (a value of 1 or more must be entered) - this value has no effect on collision risk
Number of turbines	14	
Rotor diameter (m)	136	
Hub height (m)	112	
Rotor depth (m)	-	Not available – optional input
Rotor chord (m)	4.1	

Parameter	Input Value	Remarks
Rotor pitch (degrees)	Variable	Value of 6 is assumed for CRM spreadsheet
Rotation period (seconds)	4.29	
Turbine operation time (%)	90.15	Value is rounded to 90 by the CRM spreadsheet

Bird Parameters

The bird parameters input to the CRM are given in Table B. In line with SNH guidance[2], flight speeds and wing-spans are taken from Alerstam *et al.*[3] Bird lengths are taken from Forsman[4], which is the standard published reference for raptor identification in Europe. [*Note: some input values are rounded by the CRM spreadsheet.]*

Table B - Bird Parameters Input to the Collision Risk Model

Species	Wing-span (m)	Length (m)	Flight speed (m / s)
Buzzard	1.24	0.54	12.5 (range 11.6 - 13.3)
Kestrel	0.73	0.32	10.1
Peregrine	1.02	0.44	12.1
Hen harrier	1.1	0.48	9.1

Band Used To Define Risk Height

The band used to define risk height in the CRM is:

- Maximum height 180 m;
- Minimum height 44 m

Duration at Risk Height

Total flight durations and durations at risk height input to the CRM are taken from Appendices 7.11 and 7.12 and are summarized in Table C.

Table C - Total Durations and Durations at Risk Height

Species	Total Duration (s)	Duration at Risk Height (s)
Hen harrier	2957	237
Peregrine	1442	298
Buzzard	9245	3872
Kestrel	2290	480

[2] SNH (2014): Flight Speeds and Biometrics for Collision Risk Modelling (SNH Guidance Note, October 2014)

[3] Alerstam, T. *et al.* (2007): Flight Speeds Among Bird Species – Allometric and Phylogenetic Effects (PLoS Biol. 5)

[4] Forsman, D. (1999): The Raptors of Europe and the Middle East – A Handbook of Field Identification (Poyser)

Watch Data

The watch data input to the CRM are given in Table D. The time spent at each vantage point is taken from Table 7.3 in the Ornithology Chapter. Areas visible at the minimum risk height (44 m) were calculated from the viewpoint coverage shown in Figure 7.1.

Table D - Watch Data Input to the Collision Risk Model

Vantage Point	Area Visible at Risk Height (ha)	Total Observation Time (hours)
VP1	390.1	72
VP2	215.6	72
VP3	342.3	72
VP4	264.6	72
VP5	210.3	72
VP6	216.9	72
Total	1639.8	432

Summary of Collision Risk Model Results

The results of the CRM are summarized in Table E. The avoidance rates for each species follow the published SNH guidance[5] except for hen harrier for which a slightly more precautionary value has been used. For all species it has been assumed that birds are potentially present within the survey area year-round for an average of 12 hours per day.

Table E - Summary of Results of the Collision Risk Model

Species	Days Assumed Present	Hours Assumed Present	Avoidance Rate	Equivalent Collision Rate
Hen harrier	365	12	98%	one bird every 56.9 years
Peregrine	365	12	99%	one bird every 97.8 years
Buzzard	365	12	98%	one bird every 3.4 years
Kestrel	365	12	95%	one bird every 13.9 years

[5] SNH (2016): Avoidance rates for the SNH onshore wind farm Collision Risk Model (SNH Guidance Note, October 2016)

Appendix 7.15 – Details of Density Reduction Calculations for Curlew and Snipe

Density Reduction Calculation for Curlew

Area within 1 km extent of turbine array = 1,605 ha

Baseline curlew population within 1 km extent of turbine array = 3 pairs

Baseline density = 3 / 1,605 = 0.002 pairs / ha

Assume 30% reduction in density within 1 km extent = 0.002 x 0.7 = 0.0014

Post-construction curlew population = 0.0014 x 1,605 = 2.2 pairs (0.8 pairs lost)

Therefore potential displacement of one curlew pair is indicated

Density Reduction Calculation for Snipe

Area within 500 m extent of turbine array = 787 ha

Baseline snipe population within 500 m extent of turbine array = 3 pairs

Baseline density = 3 / 787 = 0.004 pairs / ha

Assume 47.5% reduction in density within 500 m extent = 0.004 x 0.53 = 0.002

Post-construction snipe population = 0.002 x 787 = 1.6 pairs (1.4 pairs lost)

Therefore potential displacement of 1 – 2 pairs of snipe is indicated