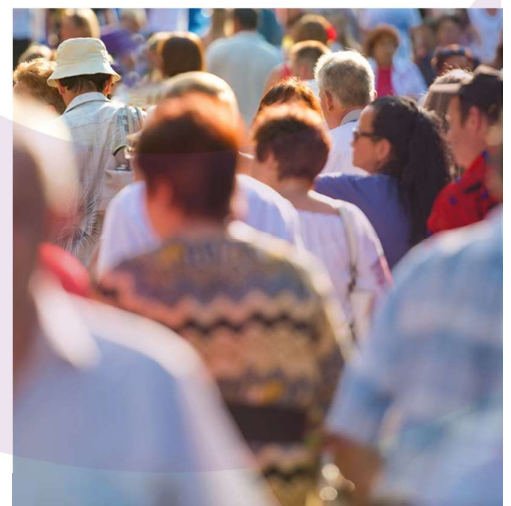
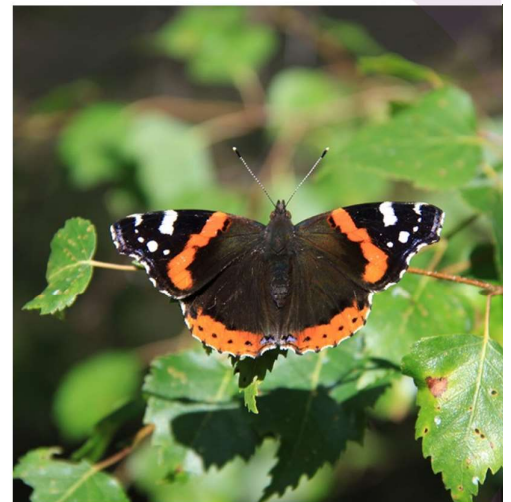




E.ON Climate & Renewables

Lorg Wind Farm

Baseline Ornithology Report -
2018 Bird Breeding Season



Report for

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Document revisions

No.	Details	Date
1	Draft for client review	25/01/2019
2	Final	29/11/2019

Executive summary

Purpose of this report

- This report documents the methods and results of a suite of bird surveys undertaken between April and August 2018 at the site of the proposed Lorg Wind Farm in Dumfries and Galloway;
- The Site is located 13 kilometres to the north-west of the town of Moniaive, within Dumfries and Galloway. The Site is bisected by the Water of Ken with steep hills dominated by white moor managed for upland sheep grazing and is surrounded on three sides by commercial forestry plantations;
- Survey work during the 2018 breeding season comprised of vantage point (VP) surveys (four VP locations with 42 hours observation per VP), two black grouse survey visits of the Consented Site plus 1.5km buffer, four raptor survey visits of the Consented Site plus a 2km buffer and four Moorland Bird Survey (MBS) visits of the Consented Site plus a 500m buffer. Access was restricted to the Site and the open areas within the buffer to the north;
- The Muirkirk and North Lowther Uplands Special Protection Area (SPA) is the only SPA or ornithological Ramsar site located within 20km of the Site, located approximately 13km to the north and is designated for breeding hen harrier, short-eared owl, golden plover, merlin and peregrine, and overwintering hen harrier. Survey results do not indicate that there is connectivity with individuals utilising the Muirkirk and North Lowther SPA (or any other SPA or Ramsar site) but hen harrier, golden plover, merlin and peregrine have all been recorded on the Site;
- During the VP surveys a total of 91 flights of 12 target species were observed, 8 of which were recorded at 30-150m height comprising of greylag goose (2 flights totalling 121 seconds at 30-150m), osprey (5 flights, 424 seconds), golden eagle (1 flight, 58 seconds), red kite (59 flights, 2130 seconds), hen harrier (4 flights, 205 seconds), goshawk (8 flights, 205 seconds), peregrine (3 flights, 99 seconds) and merlin (4 flights, 31 seconds);
- No Annex I and/or Schedule 1 listed raptor/owl nests were recorded within the survey area although there was evidence of breeding attempts by goshawk, barn owl and merlin within the 2km buffer. Target species recorded on Site during raptor surveys were osprey, red kite, goshawk and peregrine;
- A single displaying male black grouse was recorded within the survey area at High Countam although extensive droppings were recorded along the Site boundary between Coronbae and Cairn Hill;
- Oystercatcher (1 territory), golden plover (1), curlew (7), snipe (13) and common sandpiper (2) were recorded during the MBS;
- In addition, there were incidental records of five target species: greylag goose (1 record), goshawk (2), red kite (7), barn owl (1) and peregrine (1).

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1. Introduction

1.1 About this document

Wood E&IS UK (Wood) was commissioned by E.ON Climate & Renewables (EC&R) to undertake bird surveys during the 2018 breeding season (April to August inclusive) for a proposed wind farm development at Lorg, Dumfries and Galloway, hereafter referred to as 'the Site'. It is located approximately 12 kilometres north-east of Carsphairn and 13 kilometres south of New Cumnock. This report describes the methods and results of the surveys, which were designed to be suitable to update the baseline breeding bird information for the Site. This work supplements breeding bird surveys that were undertaken at the Site by Wood in 2013 and 2014 with winter bird surveys carried out during the 2010-11, 2012-13 and 2013-14 seasons. Additionally, there were breeding bird surveys undertaken by Natural Power at the Site during 2012.

1.2 Site Description

The Site is located around Lorg Farmhouse within the region of Dumfries and Galloway whilst the access track, from the north is in East Ayrshire. The Site and survey areas are illustrated in **Figure 1.1**.

The Site is bisected by the Water of Ken with steep grass-dominated hillsides on either side of the river. Lorg Farmhouse and associated outbuildings are located in the centre of the Site in the valley bottom. The area around this unoccupied dwelling is surrounded by dry stone walls and a small area of deciduous scrub. The Site is surrounded on three sides by commercial forestry plantations. Open grassland areas similar to those on Site are present to the west. Afton Reservoir is located approximately 1.5km to the north-west.

1.3 Background and Scope

The key issues relating to birds and wind farms are as follows:

- The effects of direct habitat loss due to land take by wind turbine bases, tracks and ancillary structures;
- The effects of disturbance and displacement of birds from the proximity of the wind turbines. Such disturbance may occur as a consequence of construction work, or due to the presence of the wind farm close to nest sites or feeding areas or on habitual flight routes; and
- The effects of collision with rotating turbine blades (i.e. killing or injury of birds), which is of particular relevance for sites located in areas with high raptor activity or which support large concentrations of waterfowl.

With regards to the first issue, total land take by wind farm infrastructure generally represents a small proportion of a site. Therefore, the permanent loss of nesting and foraging habitat for birds tends to be small and will generally have little effect on bird populations. At most wind farm sites, it is the latter two issues, collision risk and displacement, which may potentially be more significant.

A range of guidance documents have been produced relating to the assessment of bird/wind farm interactions and the following publications and guidelines in particular have been influential in determining the scope of the works at the Site:

- Scottish Natural Heritage [SNH] (2017). *Recommended bird survey methods to inform impact assessment of onshore wind farms*. SNH, Battleby; and

- SNH (2018). *Assessing significance of impacts from onshore wind farms on birds outwith designated areas*. SNH, Battleby.

SNH (2017) guidance recommends that field surveys should be focussed on 'target species' which will generally be limited to those which are afforded a higher level of legislative protection; though some species may also be considered as such, as a result of their behaviour, which makes them more likely to be subject to impact from wind farms. There are three overarching species lists from which target species are generally derived¹:

- Species for which Special Protection Areas (SPA) are designated and those listed under Annex I of the Directive 2009/147/EC on the conservation of wild birds (commonly referred to as the Birds Directive);
- Species listed under Schedule 1 of the Wildlife & Countryside Act 1981 (as amended); and
- Red listed birds of conservation concern (BoCC) (with reference to Eaton *et al.*, 2015).

In addition, consideration should be given to species identified within Local Biodiversity Action Plans (LBAP), though target species should be limited to those likely to be affected by wind farms. As research indicates that most passerine species are not significantly affected by wind farms, many species included on the LBAPs and BoCC are not included as target species. Two LBAPs are considered when selecting target species: Dumfries and Galloway and East Ayrshire, as the Site straddles both.

Target species were selected following a data and literature review, and with regard to the results of previous survey work undertaken at the Site.

1.4 Desk Study

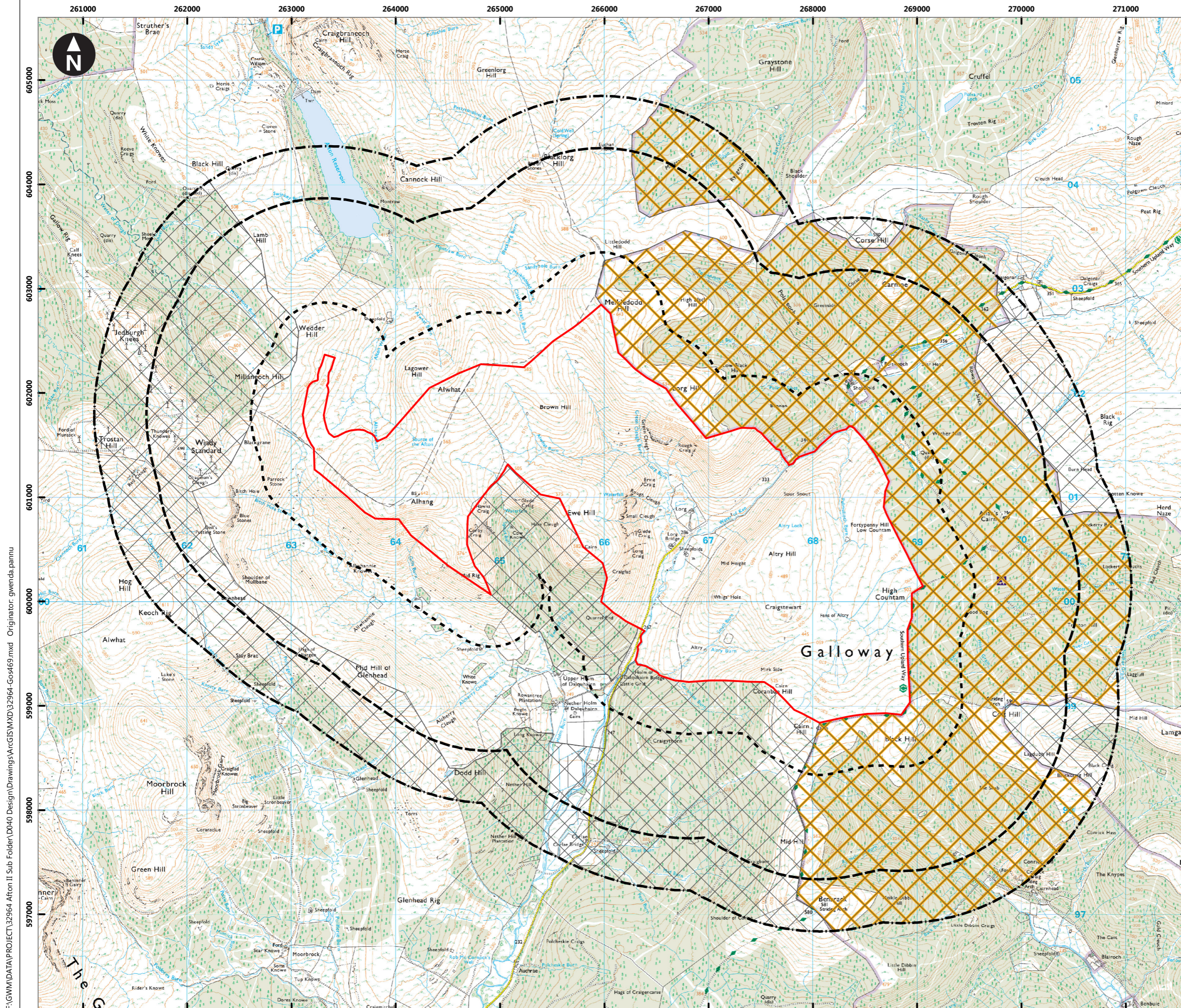
A literature search and review was carried out for the 2015 ES in order to gain an insight into the ecology and behaviour of key species that could be affected by the now Consented Development. The RSPB and Dumfries and Galloway Raptor Study Group (RSG) were contacted to request the provision of data relating to black grouse records within 1.5km of the Site as well as protected raptors and other species of designated conservation concern within 2km (including eagles within 6km). Both the RSG and the RSPB have been contacted to update the data search. In addition, informal liaison has occurred with Chris Rollie throughout the breeding season to relay sightings of Schedule 1 species to the RSG.

1.5 Target Species







The following key species of conservation concern (i.e. 'target species') were identified:

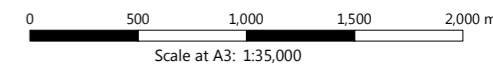
- Relevant SPA qualifying interests: hen harrier, golden plover, short-eared owl, merlin and peregrine;
- Annex I and/or Schedule 1 listed raptors, waders and owls, including species known to be present in the surrounding area: red kite, goshawk, osprey, dotterel, dunlin and barn owl;
- Waterfowl and waders on spring and early autumn passage, including pink-footed goose, whooper swan, other goose species, but excluding feral and introduced breeding species (e.g. Canada goose); and

¹ It may also be appropriate to collect information on non-target species during surveys and desk studies, particularly those of regional conservation concern. However, recording of such species is subsidiary to the recording of target species.



Key

-  Site boundary
-  Raptor survey area
-  Black grouse survey area
-  Moorland bird survey area
-  No access - private land
-  No access - Forestry Commission Scotland land ownership



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Figure 1.1
Site overview and survey area

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- Other species of conservation concern such as: black grouse and long-eared owl.

2. Survey Methods

2.1 Surveyors

All surveys were undertaken by experienced WSP Ornithologists, all of whom have extensive field experience and a detailed understanding of the key methodologies recommended within SNH guidance and experience of monitoring bird activity and distribution at proposed wind farm sites. Surveys were undertaken by James Spencer ACIEEM, Pete Clark ACIEEM, Paul Massey MCIEEM, Paul Rowntree MCIEEM, Damian Bubb and Daniel Neill.

2.2 Vantage Point Surveys

Vantage Point (VP) watches were conducted in accordance with SNH 2017 guidance and undertaken throughout the survey period. This method focuses on identifying flight-paths of target species and allows any regularly used flight lines to be identified, allowing turbine locations to be altered where necessary to reduce collision risk to birds. The data generated can also be used to estimate the theoretical risk of collision with turbines by incorporation into a suitable model.

The SNH guidance is that VPs should be chosen parsimoniously to achieve maximum visibility from the minimum number of locations such that all parts of the survey area are within two kilometres of a VP. Four vantage points were selected (VP locations and view-sheds are shown in **Figure 2.1**) as being sufficient to survey the turbine layout, the locations of which were:

- VP6 – NS 63310 02387, view bearing 135°;
- VP7 – NS 65429 01955, view bearing 230°;
- VP8 – NS 65591 02003, view bearing 50°; and
- VP9 – NX 67651 99278 – view bearing 65°.

The view-shed illustration in **Figure 2.1** shows a visible area at a height of 30m and above, as a middle height band of 30-150m was used. The VP locations were altered from previous years based on previous experience of the topography and the permission of vehicle access through Afton Wind Farm which facilitated access to the western side of the Site.

Flights were classified using the following three height bands:

- Band 1: 0 - 29m;
- Band 2: 30 – 150m; and
- Band 3: >150m.

A total of 168 hours of VP observation was undertaken between April 2018 and August 2018: 42 hours from each VP. The methodology to minimise observer disturbance was to allow ten minutes before starting each watch and to remain as inconspicuous as possible (a bivvy bag and camouflaged clothing was used). A 180° arc was scanned alternately by eye and with binoculars until a target species was detected. Flight times of a target species were then recorded with a stopwatch with an audible timer (times were synchronised with other surveyors on Site when undertaking simultaneous watches from separate VPs). Vantage point surveys were spread across the full range of daylight hours targeting diurnal raptors such as hen harrier, merlin, peregrine and goshawk as well as crepuscular species such as golden plover, short-eared owl and barn owl. Only flights

within the 2 km view-shed were recorded, with all other target species flights out-with this zone noted as incidental records.

SNH (2017) guidance advises that VP surveys should be undertaken in good visibility and can be undertaken on showery days providing the showers are not too frequent or prolonged. The cloud base should be high enough to allow observation of the collision risk volume. Ideally observations should be undertaken in a range of wind conditions. Watches should be aimed to target heightened activity periods for the target species likely to be present and the survey programme adhered to this with surveys planned for periods of suitable weather. The dates, times and weather conditions of the VP watches are provided in **Appendix A, Table A.1**.

2.3 Distribution and Abundance Surveys

Moorland Bird Survey

The moorland bird assemblage was surveyed using an adapted version of the Brown and Shepherd (1993) methodology. SNH (2017) recommend four visits, each at least seven days apart, covering the whole breeding season between mid-April and early July, each completed between 08:30 and 18:00 hours. Surveys covered the Consented Site, plus a 500m buffer where access was available.

Surveys were undertaken in wind speeds of Beaufort force 4 or less and dry weather. The method involved a search effort of approximately 20-25 minutes within each 500 x 500m quadrat of open land and 1 minute per hectare for enclosed fields. Habitats within the survey area were assessed for their suitability to host breeding waders and areas with unsuitable land use such as plantations or with extreme gradients were scoped out. All suitable parts of each quadrat were approached to within 100m. Survey routes were varied between visits. Stops were made at regular intervals to scan and listen for birds and the identities and activities of birds were recorded using standard BTO notation. The focus of the surveys was breeding waders, but all species of conservation concern were mapped aside from meadow pipit and skylark, which were present throughout areas of open grassland within the Site.

Dates, times and weather conditions during the MBS visits are provided in **Appendix Table A.2**.

Raptor Survey

Raptor survey visits were undertaken in April, May, June and July 2018 and followed guidance detailed within Hardey *et al.*, (2013), focussing on those species identified in the desk-based review including through survey work undertaken previously.

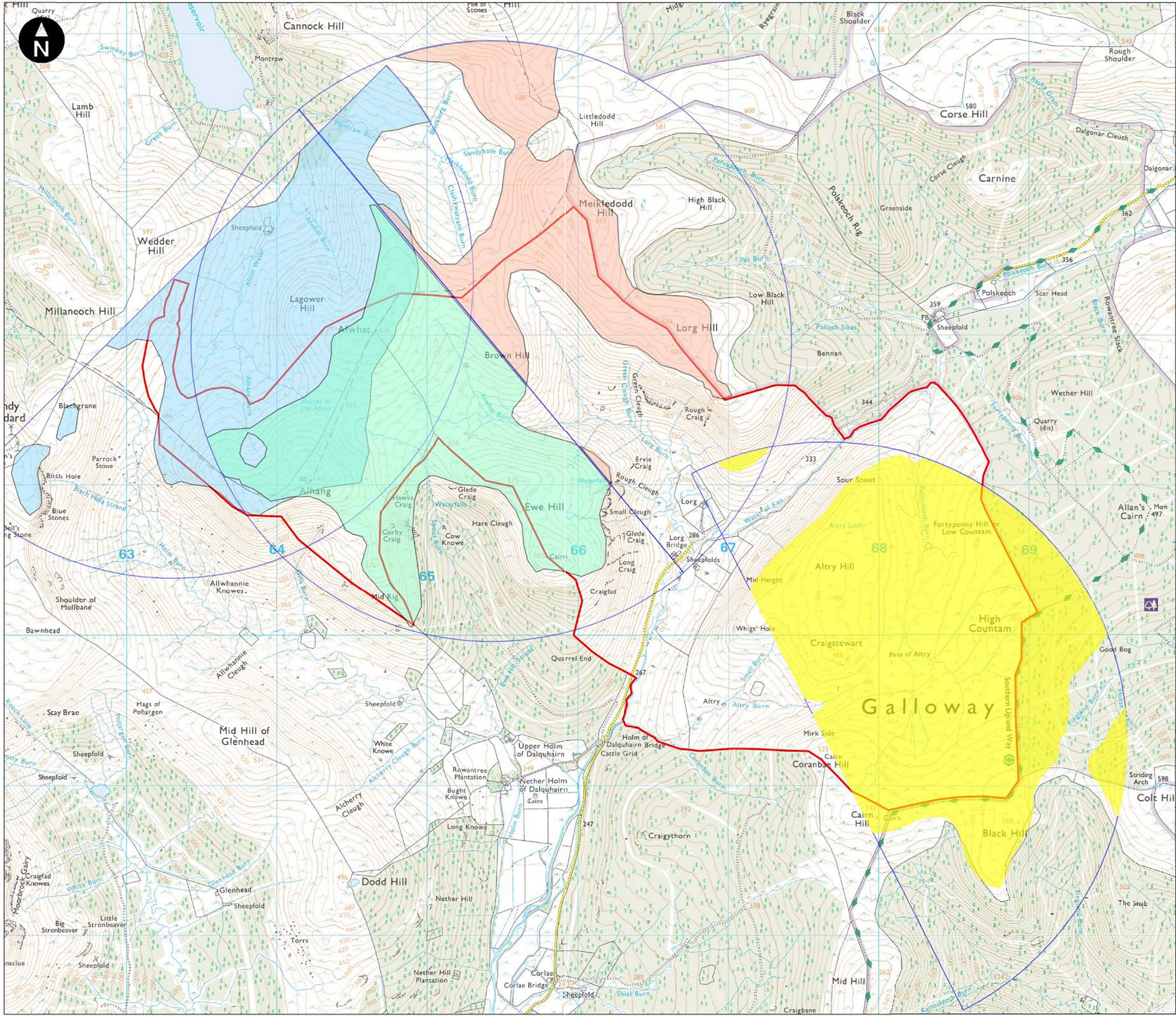
On the basis of the habitats present within the survey area and previous survey it was considered that there was potential for six species of Schedule 1/Annex I moorland breeding raptors/owls to breed within the Consented Site plus a 2km buffer (1km for goshawk): red kite, hen harrier, goshawk, short-eared owl, peregrine and merlin. Barns within the survey area were also deemed suitable to hold breeding barn owl. Surveys were therefore tailored to these species and were focussed on potentially suitable habitat within the survey area.

All surveys were undertaken under an appropriate Schedule 1 licence. Dates, times and weather conditions during the raptor surveys are provided in **Appendix Table A.3**.

Black Grouse Survey

Black grouse activity was recorded within the survey area during the surveys conducted by Natural Power (2012) and Wood (2013-14) following the methodology described in Gilbert *et al.*, (1998). Surveys of the Consented Site plus a 1.5km buffer where access was available were undertaken during the 2018 breeding season, in line with SNH (2017) guidance. This specifies the need for two survey visits between late March and mid-May.

\\ed13-fs1global.amec.com\shared\data\Projects\32964 SUB EON Lorg Sub Folder\DC040\Mapinfo\32964 Gos483b Figure 2.1 Vantage Point Viewsheds 30m.wor Tim Doggett



- Key
- Site boundary
 - 2km viewshed area
 - VP6 Viewshed (view bearing 135 degrees)
 - VP 7 Viewshed (view bearing 230 degrees)
 - VP8 Viewshed (view bearing 50 degrees)
 - VP9 Viewshed (view bearing 65 degrees)

Note: Viewsheds calculated with a lower blade sweep of 30m and a vantage height of 1.8m

0 km 1.5 km
Scale 1:25,000 @ A3

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Figure 2.1
Vantage Point Viewsheds

December 2018



The surveys were undertaken as a fresh search, with each visit beginning an hour before sunrise and finishing two hours after sunrise. Surveyors aimed to get within 500m of all suitable habitat to detect lekking black grouse, primarily through listening for the distinctive sounds made by lekking males, but also through scanning from appropriate observation points to visually detect birds. Surveys avoided conditions of high winds and/or moderate to heavy precipitation.

Dates, times and weather conditions during the black grouse surveys are provided in **Appendix A, Table A.4.**

2.4 'Incidental' Records

Birds seen outside of formal survey periods were also recorded (i.e. those observed during walks on and off Site, on walks between VPs and during other breaks in survey work). Detailed notes of activity of highly protected or 'target' species were made and flights mapped.

2.5 Limitations

Access to VP6, positioned on Wedder Hill, was only feasible when accessed via the Afton Wind Farm. Vehicular access to Afton Wind Farm was restricted to 07:00 to 19:00.

3. Survey Results

3.1 Vantage Point Surveys

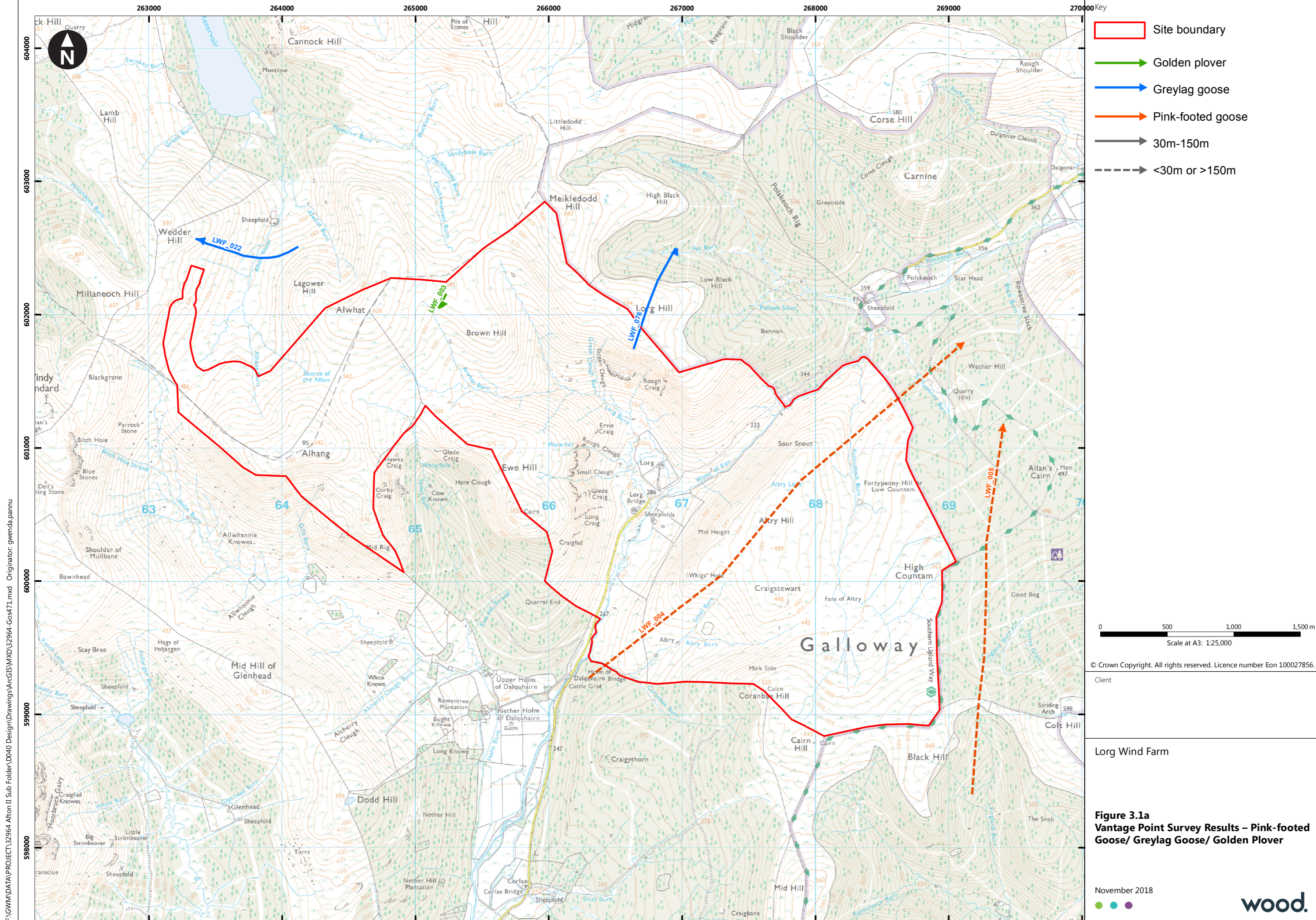
The following target species were recorded during VP surveys: pink-footed goose, greylag goose, osprey, golden eagle, red kite, black kite, goshawk, hen harrier, golden plover, dunlin, peregrine and merlin. Details of target species flights are provided in **Appendix B, Table B.1** and **Table 3.1** below presents a summary of flight activity, including reference to the duration of flight time between 30-150m height. The flight lines are illustrated in **Figures 3.1a-e** and within the **Confidential Appendix** for goshawk and merlin.

Table 3.1 Summary of Target Species Flight Activity

Species	No. Of Observations	Month of Observation	Total flight duration at 30-150m height over the Site (seconds)
Pink-footed goose	2	April 2018	0
Greylag goose	2	May, July 2018	121
Osprey	5	June-July 2018	424
Golden eagle	1	June 2018	58
Red kite	59	April-August 2018	2130
Black kite	1	June 2018	0
Goshawk	8	May-August 2018	205
Hen harrier	4	May, August 2018	205
Golden plover	1	April 2018	0
Dunlin	1	July 2018	0
Peregrine	3	May, July-August 2018	99
Merlin	4	June-July 2018	31

Secondary Species

Other notable species recorded during the vantage point watches were: grey heron, sparrowhawk, buzzard, herring gull, lesser black-backed gull, kestrel and raven. Buzzard and raven foraged widely across the Site throughout the breeding season. Kestrels were observed hunting across the Site from June onwards with two family groups noted. Sparrowhawk were seen sporadically throughout the breeding season soaring over hills in the north of the Site as well as over High Countam to the south-east. A grey heron was noted flying over the Site in April with herring and lesser black-backed gulls commuting over later in the breeding season.



- Site boundary
- ➔ Golden plover
- ➔ Greylag goose
- ➔ Pink-footed goose
- ➔ 30m-150m
- - - ➔ <30m or >150m

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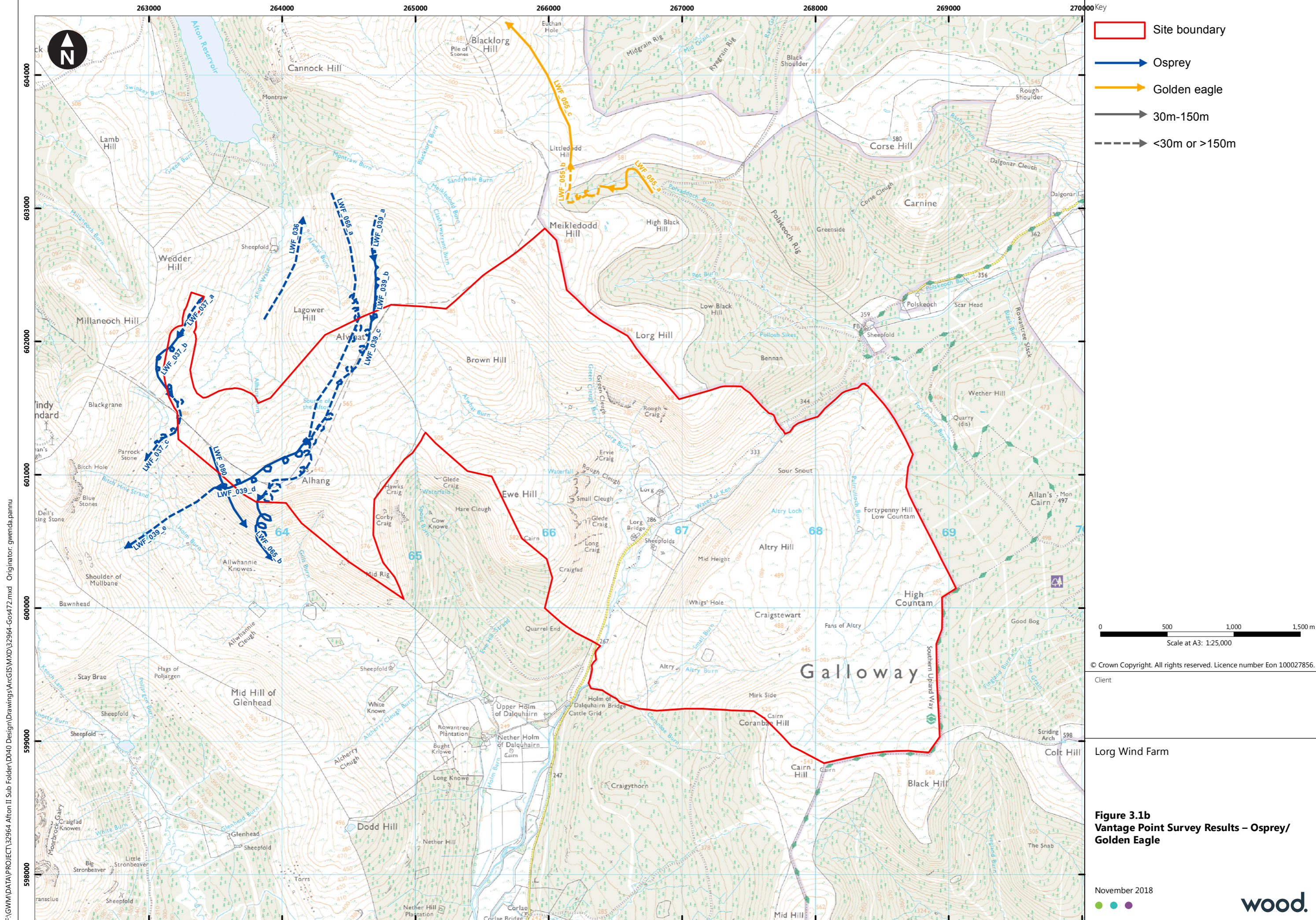
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Figure 3.1a
Vantage Point Survey Results – Pink-footed
Goose/ Greylag Goose/ Golden Plover

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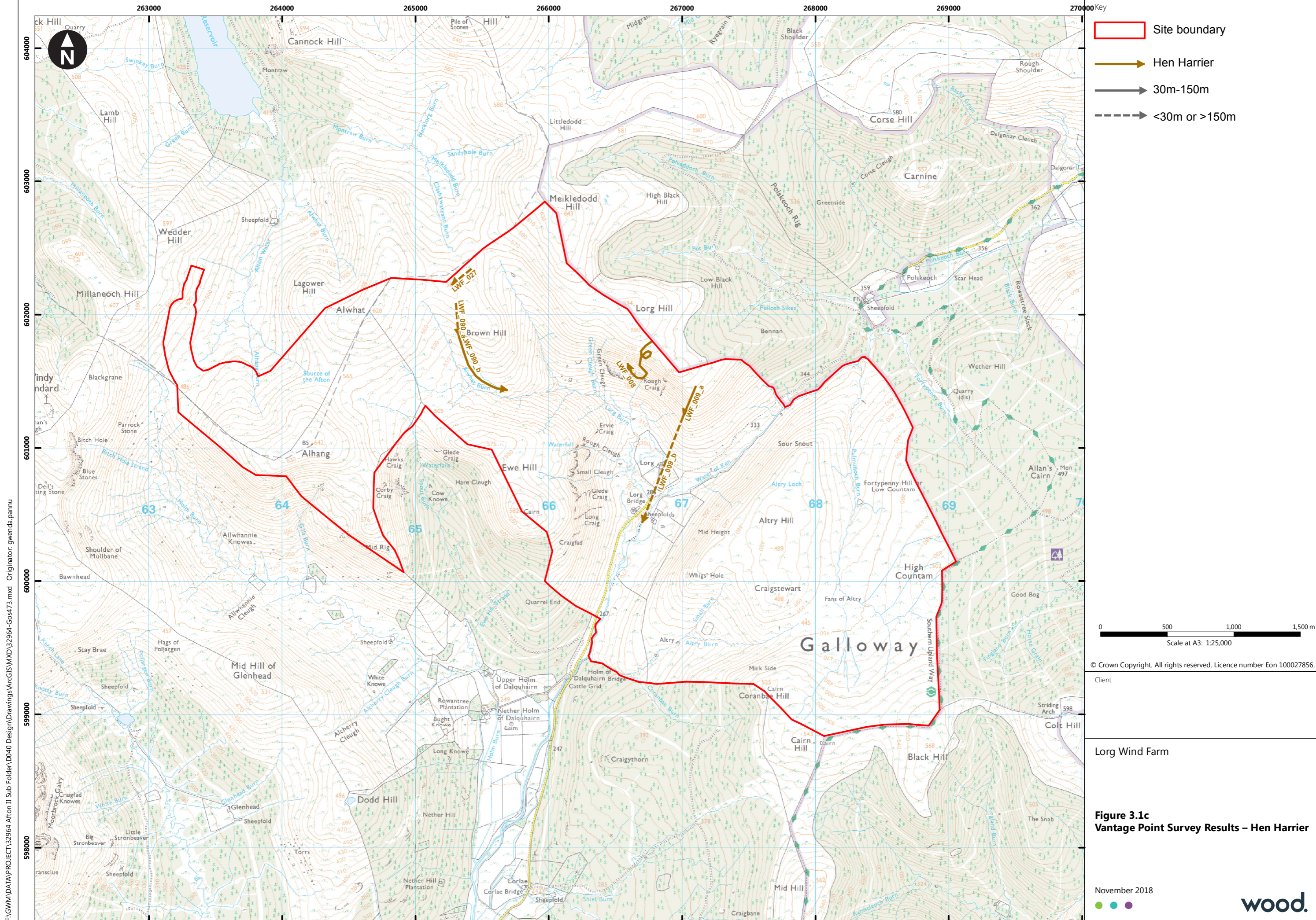
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Figure 3.1b
Vantage Point Survey Results – Osprey/ Golden Eagle

November 2018

wood.



- Key**
- Site boundary
 - Hen Harrier
 - 30m-150m
 - - - → <30m or >150m

0 500 1,000 1,500 m
Scale at A3: 1:25,000

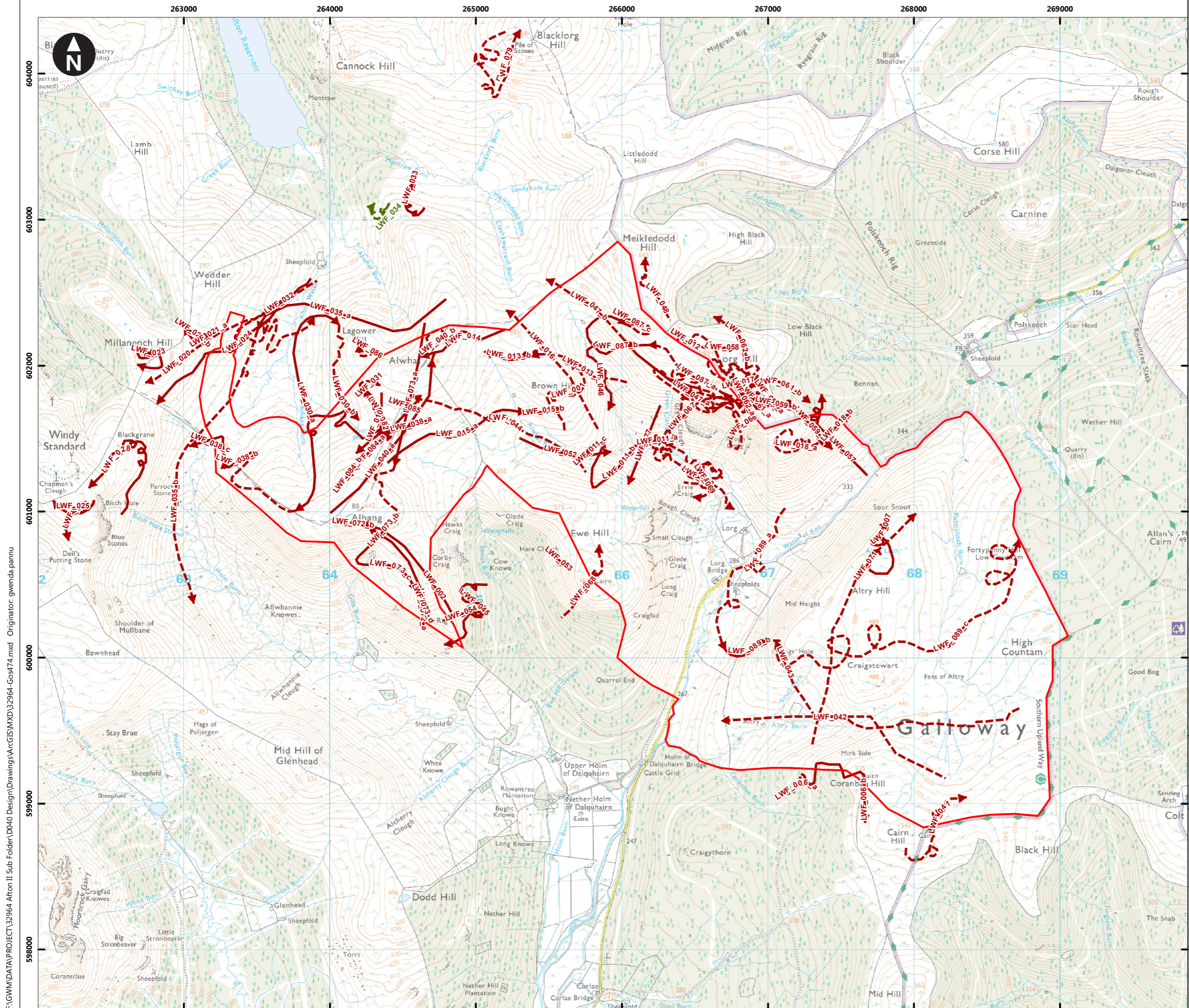
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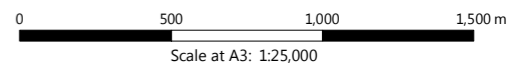
Figure 3.1c
Vantage Point Survey Results – Hen Harrier

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Key

- Site boundary
- ➔ Red kite
- ➔ Black kite
- ➔ 30m-150m
- <30m or >150m



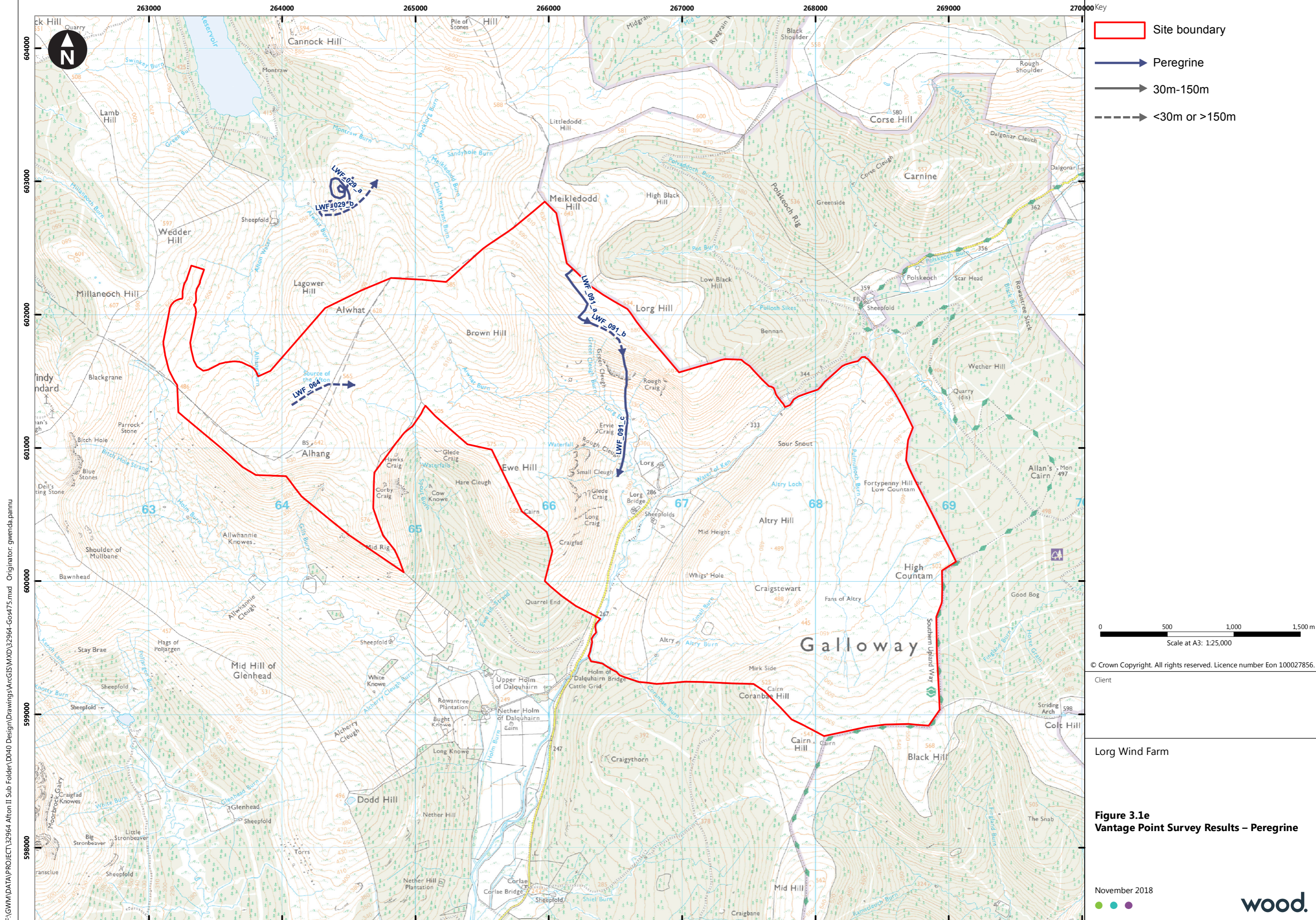
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Log Wind Farm

Figure 3.1d
Vantage Point Survey Results – Red Kite/
Black Kite

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- Site boundary
- Peregrine
- 30m-150m
- <30m or >150m

0 500 1,000 1,500 m
Scale at A3: 1:25,000

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Figure 3.1e
Vantage Point Survey Results – Peregrine

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3.2 Distribution and Abundance

Moorland Bird Survey

Five wader species were recorded as holding territory within the survey area, comprising (number of territories in parentheses): oystercatcher (1); golden plover (1); snipe (13); curlew (7); and common sandpiper (2). Details of the numbers of territories of each species are provided in **Table 3.2**.

Indicative breeding wader territory locations are illustrated in:

- **Figure 3.2a:** Oystercatcher, golden plover and common sandpiper;
- **Figure 3.2b:** Curlew; and
- **Figure 3.2c:** Snipe.

Table 3.2 Distribution and Abundance of Breeding Wader Territories

Species	Number of territories within survey area	Notes
Oystercatcher	1	Bred in pastures adjacent to Water of Ken.
Golden plover	1	Single bird recorded widely on tops of hills to the north of Site in April and May. Likely unpaired.
Snipe	13	Nine territories in the south-east surrounding Altry, one territory along Afton Water and three territories between Alwhat and Alhang.
Curlew	7	One territory on Alwhat, with two between Brown Hill and Meikledodd Hill. Further territories near Afton Water, Lorg House, Black Hill and on the Altry Burn. No juveniles seen and no records beyond June.
Common Sandpiper	2	Two territories along the Water of Ken.

Raptor Survey

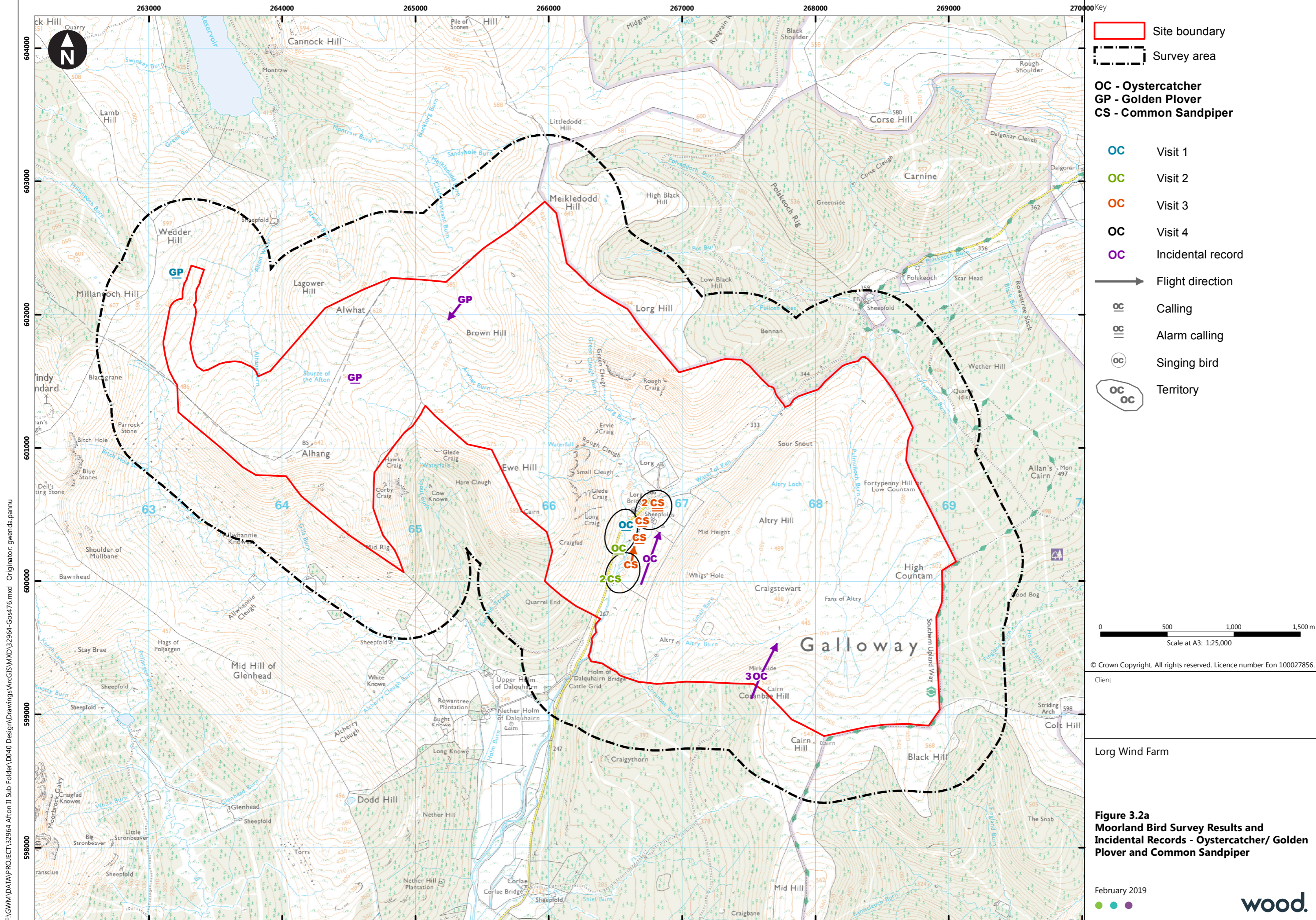
There were breeding attempts by two Schedule 1 species, goshawk and merlin within the 2km Site buffer. Full details are contained within the **Confidential Appendix**.

Only a single pair of 'raptors' bred within the Site boundary, a pair of ravens on Rough Cleugh which failed early in the breeding season. There were two additional pairs of raven breeding in the buffer, with a pair in shelterbelts at the west of the Site and a further pair breeding in the forest at the east between Allan's Cairn and Fortypenny Hill.

Seven pairs of buzzard bred in the buffer with successful pairs in Spout Burn and at Quarrel End to the south-west of the Site. In the same area a pair bred on the north side of Craigythorn. In the north-west of the Site there were two pairs, at Millianeaoch Hill and at the south end of Afton Reservoir. In the east there were two pairs, between Fortypenny Hill and Allan's Cairn and at Bennan. All these birds bred in Sitka spruce plantation and foraged over the Site.

There were two pairs of kestrel breeding in the 2km survey buffer, both fledging three young. One bred in a shelterbelt plantation at White Knowe and the family party foraged over Ewe Hill and Mid Rig once fledged. The second bred in the forest at Low Black Hill and foraged over Lorg Hill once the young had fledged.

There were two pairs of sparrowhawk that bred within the buffer, one at High Countam in the east and a second at Quarrel End in the west. The outcome of these breeding attempts is unknown.



Site boundary
Survey area

OC - Oystercatcher
GP - Golden Plover
CS - Common Sandpiper

- OC Visit 1
- OC Visit 2
- OC Visit 3
- OC Visit 4
- OC Incidental record
- Flight direction
- OC Calling
- OC Alarm calling
- OC Singing bird
- OC Territory

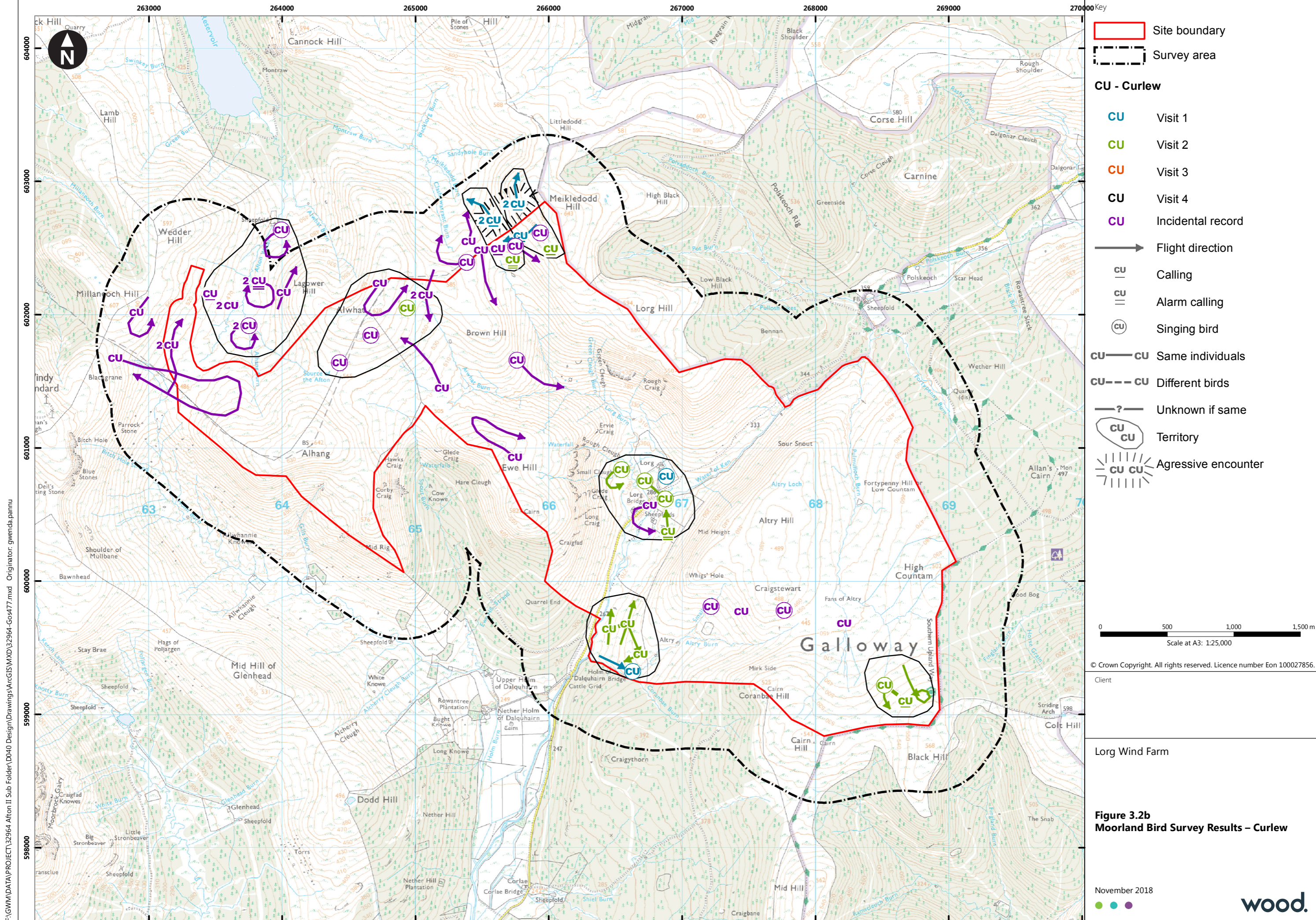
0 500 1,000 1,500 m
Scale at A3: 1:25,000

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Client
Lorg Wind Farm

Figure 3.2a
Moorland Bird Survey Results and
Incidental Records - Oystercatcher/ Golden
Plover and Common Sandpiper

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- Site boundary
- Survey area
- CU - Curlew**
- CU Visit 1
- CU Visit 2
- CU Visit 3
- CU Visit 4
- CU Incidental record
- Flight direction
- = Calling
- = Alarm calling
- CU Singing bird
- CU — CU Same individuals
- CU - - - CU Different birds
- CU - ? - CU Unknown if same
- CU
CU Territory
- CU
CU Aggressive encounter

0 500 1,000 1,500 m
Scale at A3: 1:25,000

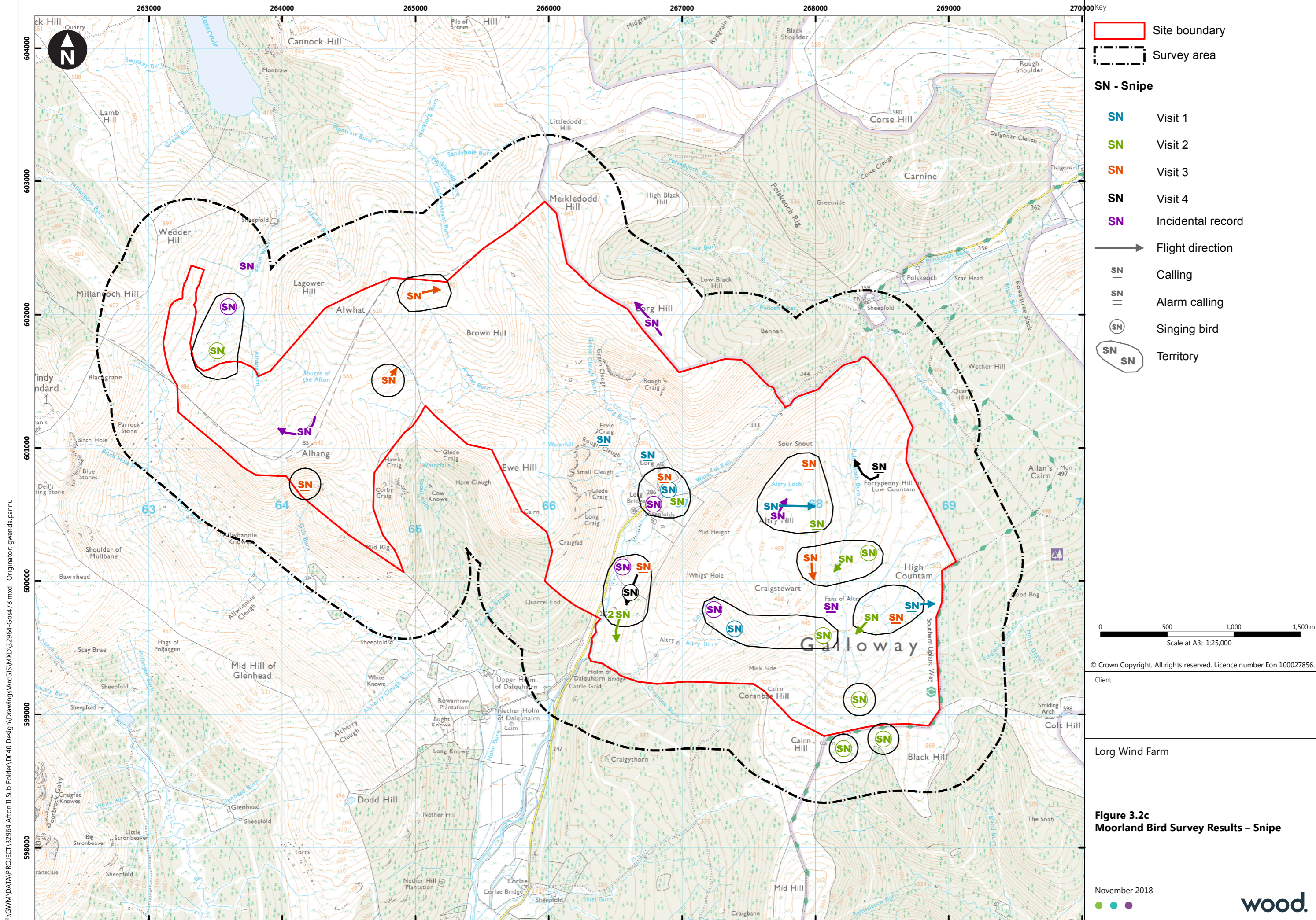
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Client

Long Wind Farm

Figure 3.2b
Moorland Bird Survey Results – Curlew

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- Key**
- Site boundary
 - Survey area
 - SN - Snipe**
 - SN Visit 1
 - SN Visit 2
 - SN Visit 3
 - SN Visit 4
 - SN Incidental record
 - Flight direction
 - Calling
 - Alarm calling
 - SN Singing bird
 - SN SN Territory

0 500 1,000 1,500 m
Scale at A3: 1:25,000

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Client

Lorg Wind Farm

Figure 3.2c
Moorland Bird Survey Results – Snipe

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During raptor surveys other target species were seen which did not breed on Site. Ospreys, fishing on Afton Reservoir were observed commuting over the north-west of the Site in June. Peregrine, which was confirmed to breed outwith the buffer, was encountered hunting over the Site on three occasions. Red kites were seen foraging over the Site on seven occasions.

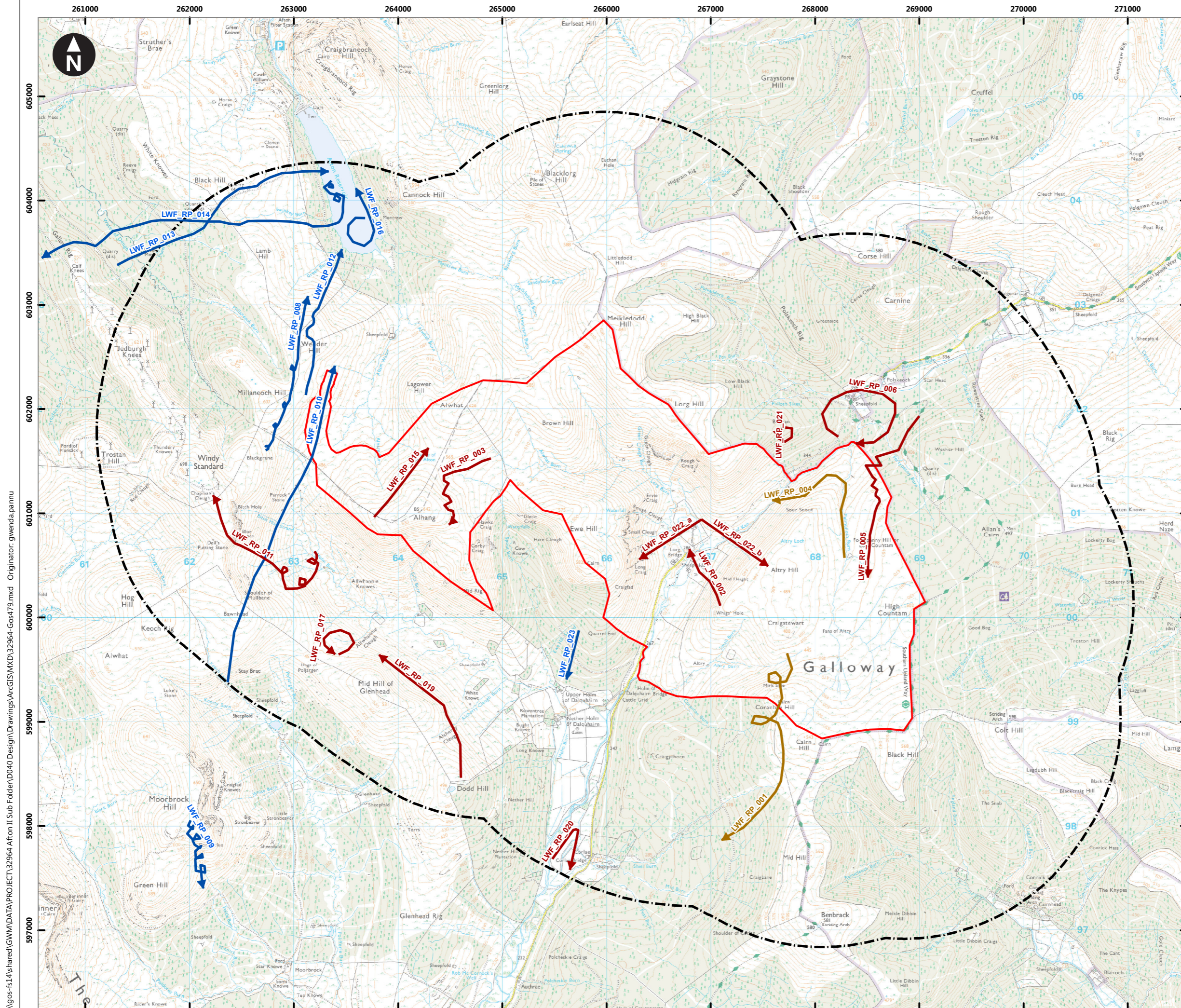
The raptor survey data is presented in **Appendix Table B.2a-b** and illustrated in **Figure 3.3**.

Black Grouse Survey

A single male black grouse was encountered lekking for seven minutes at NS 69062 00157 near High Countam at the edge of a forestry plantation on 27 April 2018 at 06:20, with the location illustrated in **Figure 3.4**. This represents the only observation of black grouse during the surveys. This area was subsequently revisited on 4 May but no birds were recorded although large amounts of black grouse droppings were found on the Site boundary between Coronbae and Cairn Hill. In this area immediately outside the boundary the ground flora is suitable for foraging black grouse as there is less grazing pressure from livestock. The black grouse survey data is presented in **Appendix Table B.3**.

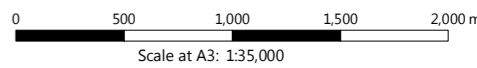
'Incidental' records

There were twelve incidental records of target species. A single record of barn owl and two records of goshawk are discussed in the **Confidential Appendix**. Three greylag geese flew north along the Water of Ken during a raptor survey on 11 April. There were seven incidental records of Red kite with birds seen foraging widely over the Site. All records up to and including 6 June refer to a distinctive third calendar year bird which had been seen during VP and raptor surveys. Additionally, there was a single record of a distant peregrine outwith the viewshed from VP6 which was seen beyond Alhang before dropping below the skyline. All non-confidential 'incidental' records are presented in **Appendix Table B.4** and illustrated in **Figure 3.5**.



Key

- Site boundary
- Survey area
- Red Kite flightline
- Osprey flightline
- Peregrine flightline



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Client

Lorg Wind Farm

Figure 3.3
Raptor Survey Results

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4. Summary

A summary of target species activity and a review of their status is presented in the sections below.

4.1 Target Species

Pink-footed goose

Pink-footed goose is BoCC amber-listed based upon its non-breeding localisation in the UK (Eaton et al. 2015). The current UK wintering population is estimated at 481,341 birds (Mitchell & Brides, 2017). The Western Southern Uplands and Inner Solway Natural Heritage Zone (NHZ) population is estimated at 34,621 wintering birds (Wilson *et al.*, 2015). Pink-footed goose is a casual breeder in the UK with most pairs referring to injured or escaped birds. No pairs were recorded to have bred in the UK in 2015 (Holling *et al.* 2017).

There were two records of migrating pink-footed geese flying north on 27 April seen from VP9. This totalled 283 birds in two skeins all above 150m.

Greylag goose

Greylag goose is BoCC amber-listed based upon its non-breeding localisation in the UK (Eaton et al. 2015). The current UK wintering population is estimated at 139,387 birds (Frost *et al.* 2018) with 2,959 the peak count in Dumfries and Galloway. Greylag goose is a widespread naturalised breeding bird in the UK with a population of 46,000 breeding pairs (Musgrove *et al.* 2013).

There were two flights of greylag goose, a single bird and a group of four birds, during VP watches totalling 121 seconds at 30-150m height. Additionally an incidental record of three birds flying north along the Water of Ken on 11 April was noted during a raptor survey. It is likely that all three records refer to naturalised birds rather than Icelandic or re-established birds. There was no evidence of breeding within the Site or on adjacent land.

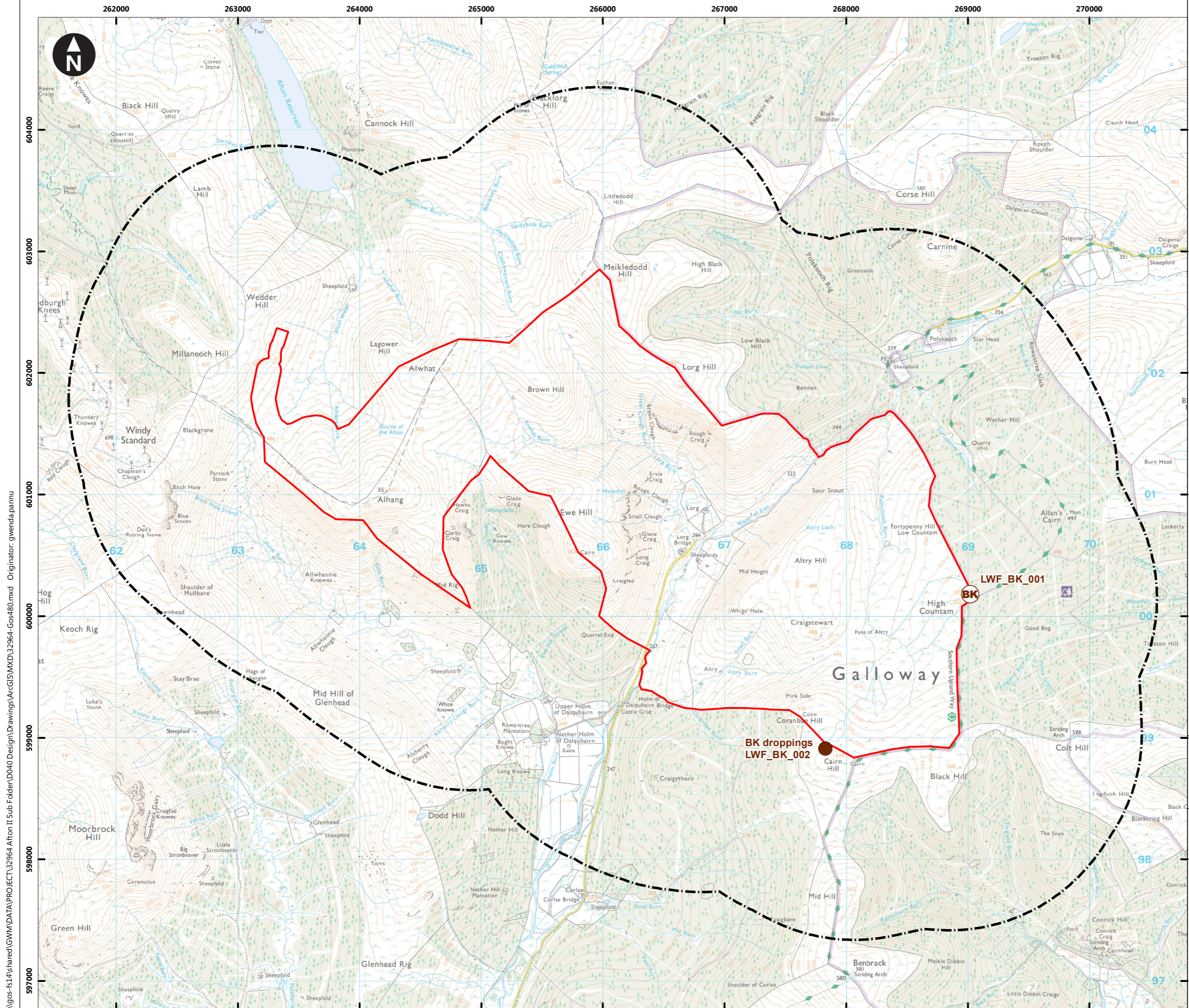
Black grouse

Black Grouse is BoCC red-listed based on its severe breeding population decline (Eaton et al., 2015). This species is also on the Scottish Biodiversity List (SBL). The current UK population is estimated at 5,100 lekking males; 3,344 of which were in Scotland and 800 in South-West Scotland (Musgrove *et al.*, 2013). The Western Southern Uplands and Inner Solway Natural Heritage Zone (NHZ) population is estimated at 121 displaying males (Wilson *et al.*, 2015).

There was a single male recorded lekking from near High Countam on 27 April at 06:20 for 7 minutes. This represents the only black grouse record for the season although it appears that usage of the Site occurred along the southern boundary as droppings were recorded between Coronbae and Cairn Hill.

Osprey

Osprey is an Annex I and Schedule 1 listed species and is also on the SBL. The species is Amber listed based on its categorisation as a Species of European Conservation Concern and also as a result of its breeding rarity i.e. less than 300 pairs within UK (Eaton *et al.* 2015). The British population in 2015 was estimated at 225 pairs (Holling *et al.*, 2017). The Western Southern Uplands and Inner Solway NHZ population is estimated at six pairs (Wilson *et al.*, 2015). The Dumfries and Galloway Raptor Study Group monitors ospreys across the

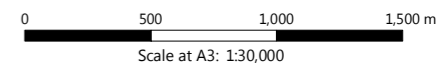


Key

- Site boundary
- Survey area

BK - Black Goose

- Lekking bird



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Client

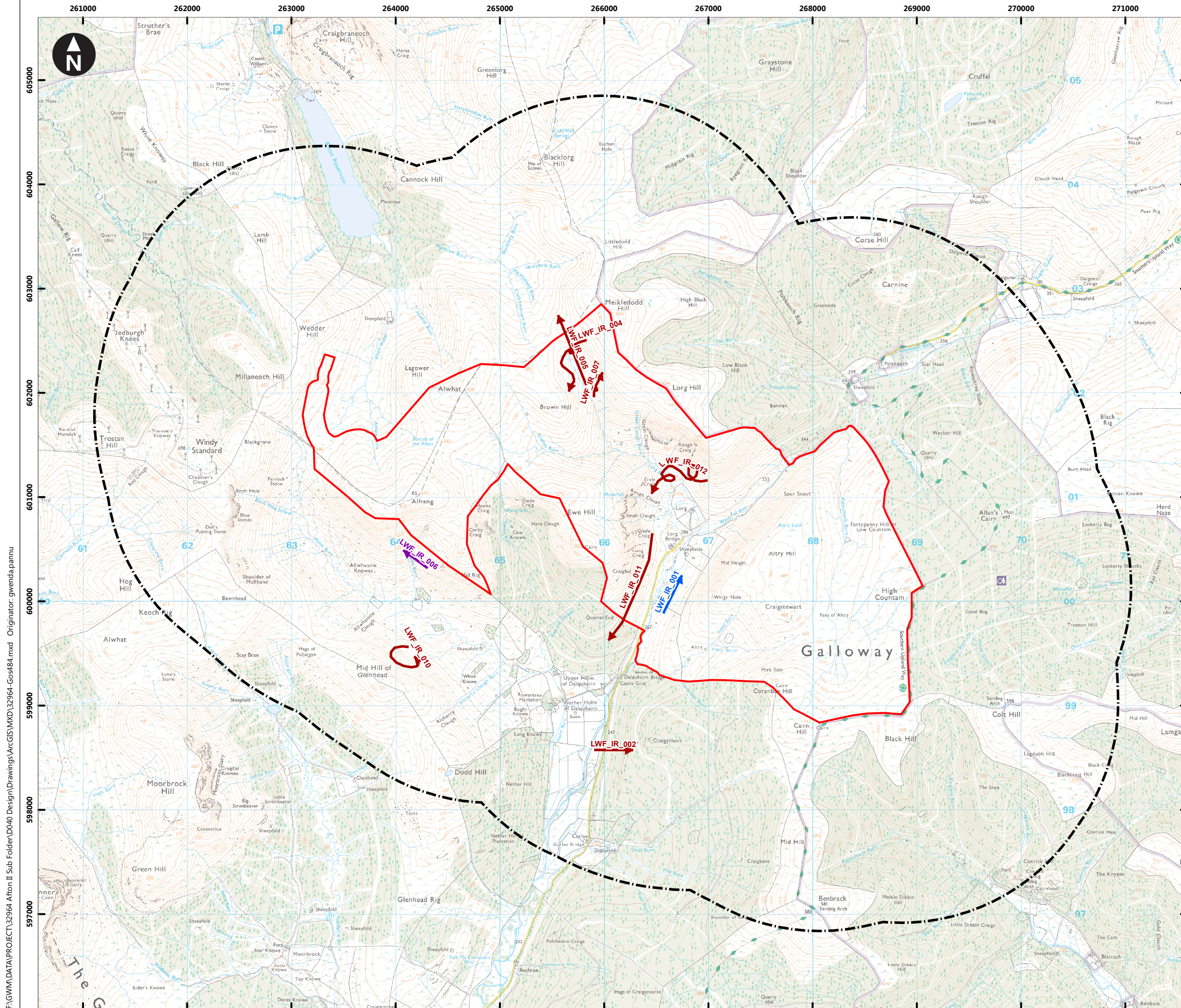
Lorg Wind Farm

Figure 3.4
Black Grouse Survey Results

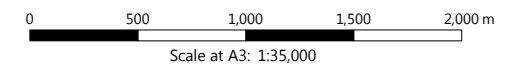
November 2018



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- Key
- Site boundary
 - Survey area
 - ➔ Peregrine flightline
 - ➔ Red kite flightline
 - ➔ Greylag goose flightline



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Client

Lorg Wind Farm

Figure 3.5
Incidental records

November 2018



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region with nine pairs recorded in 2016 (Challis *et al.* 2018) from 15 home ranges monitored along with two pairs in Ayrshire.

Osprey was not found to breed on Site but was observed commuting across the north-western hills to fish at Afton Reservoir, within the 2km buffer, on a number of occasions. The closest known nesting sites are 13km and 15km from the Site (C. Rollie, pers. comm.). There were five flights recorded during VP surveys totalling 424 seconds at 30-150m height, four of which were recorded from VP6 with the last, over Alhang from VP7. Of the five flights, four were heading south-west carrying fish whilst the fifth was heading north-east, towards Afton reservoir immediately prior to presumably the same bird returning. Osprey was recorded seven times during raptor surveys with a similar general pattern of commuting through the Site although some of these flights were an east-west bearing from Afton reservoir. All flights were in June and July presumably referring to male birds foraging to provision nests.

Golden eagle

Golden eagle is an Annex I and Schedule 1 listed species and is also on the SBL. It is BoCC green-listed as being at favourable conservation status. The UK population was estimated at 508 pairs in 2015 (Holling *et al.* 2017) all of which were within Scotland. The Western Southern Uplands and Inner Solway NHZ population is estimated at two pairs (Wilson *et al.*, 2015). The Dumfries and Galloway population was estimated to be 2 pairs in 2016 (Challis *et al.* 2018).

A single flight of an immature golden eagle within the 2km buffer was recorded from VP8 on 29 June 2018 totalling 58 seconds at 30-150m height. After initially being detected over Meikledodd Hill it was mobbed by other raptors before flying north to Black Lorg Hill and being lost to view over the ridge.

Red kite

Red kite is an Annex I and Schedule 1 listed species and is also on the SBL. It is BoCC green listed being in a favourable conservation status. The UK population is estimated to be over 5,000 pairs (Smith & NERF, 2018) although over 4,500 pairs breed in Southern England and Wales. The Scottish population was estimated at a minimum of 273 pairs in 2016 (Challis *et al.* 2018). The Western Southern Uplands and Inner Solway NHZ population is estimated at 83 pairs (Wilson *et al.*, 2015). In 2016, 108 pairs fledged 120 young in Dumfries and Galloway (Challis *et al.* 2018).

Red kite was recorded widely across the Site throughout the breeding season although there was no indication of breeding within the Site or the 2km buffer. There were 59 flights noted during VP surveys, spread throughout the survey area, and a total of 2,130 seconds of time spent at 30-150m height. There were an additional 12 records of red kite during raptor surveys. There were also seven incidental records of red kite again widely distributed across the Site. The majority of sightings early in the breeding season seemingly refer to the same non-breeding sub-adult bird but in June, July and August adults were noted and are likely to comprise of foraging birds which bred away from the Site.

Black kite

Black kite is an Annex I listed bird and a sub-Saharan migrant. It is an overshoot migrant to the UK, chiefly in spring with an average of 23 records per year (White & Kehoe, 2018). Hybridisation with red kite has been recorded in Northern Scotland.

There was a single record of black kite on 6th June from VP6 circling to the south of Afton reservoir.

Hen harrier

Hen harrier is an Annex 1, Schedule 1, BoCC Red and SBL species. It is a designated feature of the Muirkirk and North Lowther Uplands SPA with 30 breeding pairs and up to 10 wintering individuals cited. In 2015, the

British population was estimated at 545 breeding pairs (Holling *et al.* 2017). The Scottish population was estimated at 431 pairs in 2016 (Challis *et al.* 2018) with nine pairs in Dumfries and Galloway and seven pairs in Ayrshire fledging a total of 31 chicks. The Western Southern Uplands and Inner Solway NHZ population is estimated at 18 pairs (Wilson *et al.*, 2015). This species is of significant conservation concern due to its historical decline, which has been attributed to extensive illegal persecution, resulting in local extinction of the species from many parts of the UK (Balmer *et al.*, 2013).

There were four sightings of hen harrier during VP observation. Of these, three refer to a ringtail bird, in May 2018 whilst the final record of a sub-adult male was recorded on 16th August. All records may refer to the same bird, progressing through its post-juvenile moult. In total hen harriers were recorded at 30-150m height for 205 seconds.

Oystercatcher

Oystercatcher is included on the BoCC amber list as it is considered 'Vulnerable' in Europe, at least 50% of the UK non-breeding population is found in ten or fewer sites, and at least 20% of the European non-breeding and breeding population is found within the UK (Eaton *et al.*, 2015). The British breeding population was estimated at 110,000 pairs (Musgrove *et al.*, 2013).

A single pair of oystercatchers bred on pasture adjacent to the Water of Ken. There is an incidental record of three birds flying north over Coronbae on 13 July.

Golden plover

Golden Plover is an Annex I, SBL and BoCC amber-listed species. It is a designated feature of the Muirkirk and North Lowther Uplands SPA with 175 pairs cited as breeding. The British breeding population is estimated at 38,000-59,000 pairs (Musgrove *et al.*, 2013). The Scottish breeding population is c.15,000 pairs (Forrester *et al.*, 2007). The Western Southern Uplands and Inner Solway NHZ population is estimated at 778 pairs (Wilson *et al.* 2015).

A single bird was recorded from VP7 flying south from Brown Hill and landing, on 26 April 2018. There was a record of a calling bird from Wedder Hill during the MBS on 10 April. In addition, a calling bird was recorded during a black grouse survey on 3 May 2018. It seems likely that an unpaired male held territory at the north of the Site and moved on after failing to attract a mate.

Snipe

Snipe is BoCC amber-listed based on the species breeding range decline (Eaton *et al.*, 2015), although this is mainly limited to lowland areas (Balmer *et al.*, 2013). The current UK population is estimated at 80,000 breeding pairs (Musgrove *et al.*, 2013). The Western Southern Uplands and Inner Solway NHZ population is estimated at 1,252 breeding pairs and the total Scottish population is estimated at 34,594 breeding pairs (Wilson *et al.*, 2015).

Snipe were recorded widely across the Site with a minimum of 13 pairs identified through territory analysis of the MBS and incidental records. There was a concentration in the south-east of the Site where 9 pairs bred. There were two further pairs on Alwhat, with another on Alhang and one on the Alhang Burn.

Curlew

Curlew is BoCC red-listed based on the species' long-term population decline (Eaton *et al.*, 2015). This species is also on the Scottish Biodiversity List. The current UK population is estimated at 68,000 breeding pairs (Musgrove *et al.*, 2013). The Western Southern Uplands and Inner Solway NHZ population is estimated at 4,284 breeding pairs and the total Scottish population is estimated at 30,194 breeding pairs (Wilson *et al.*, 2015).

Seven pairs of curlew were identified as breeding within the survey area, all on Site. Four pairs bred at the north of the Site on Meikledodd Hill (2 pairs), Alhang (1) and on Afton Water. There were further pairs at Lorg House, on the Altry Burn and on Black Hill. Productivity appeared to be low with no sightings of juveniles and no records beyond June indicating that most, if not all, pairs failed.

Dunlin

Dunlin is protected as an Annex I listed species and is also listed on the BoCC red list as it is a European species of conservation concern, it has undergone a severe decline in its overwintering numbers in both the short and longer term, it is found in internationally important numbers during the non-breeding season in the UK, and at least 50% of the breeding population of dunlin is found in ten or fewer sites (Eaton *et al.*, 2015). Dunlin is listed on the Scottish Biodiversity List. The Scottish breeding population is estimated at 13,313 pairs (Wilson *et al.*, 2015) with 36 pairs thought to breed in the Western Southern Uplands and Inner Solway NHZ.

There was a single record of one dunlin from VP surveys flying south-east over Brown Hill on the 25th July 2018.

Common sandpiper

Common sandpiper is BoCC amber-listed for moderate breeding population decline in the UK. The UK population is estimated to be 15,000 pairs (Musgrove *et al.* 2013).

Two pairs of common sandpiper bred along the Water of Ken and their territories met to the south of Lorg House. Birds were recorded from April to June during the MBS, perhaps indicating that both breeding attempts failed.

Peregrine

Peregrine is listed on the Muirkirk and North Lowther Uplands SPA citation, with a population of nine breeding pairs. The species is listed on Annex I, Schedule 1 and SBL. There was an estimated 1,701 breeding pairs in the UK in 2015 (Holling *et al.* 2017). The Ayrshire population is 25 pairs (of 46 home ranges checked) and the adjacent Dumfries and Galloway population is 52 pairs (of 111 home ranges checked) (Challis *et al.*, 2016). The Western Southern Uplands and Inner Solway NHZ population is estimated at 34 breeding pairs and the total Scottish population is estimated at 485 (435-603) breeding pairs (Wilson *et al.*, 2015). The UK population of peregrine continues to increase, probably because of reduced persecution, abundant prey and increased tolerance of humans (Balmer *et al.*, 2013).

A single pair bred at a known eerie outside of the 2km buffer and birds were recorded on three occasions during VP surveys, hunting over the Site, with a total of 99 seconds of flight time at 30-150m height. There were two sightings during raptor surveys on 2 May 2018 over the south of the Site and a sighting to the north of the Site on 6 June with a further incidental record from 6th June over Alhang.

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Appendix A

Survey Conditions

Table A.1 Dates, times and weather conditions during the VP watches

Date	Observer initials	Start	Finish	Length of VP Watch (hrs)	Weather conditions (wind using Beaufort scale)
VP6 (NS 63310 02387)					
25/04/2018	PRM	10:00	11:00	1	Moderate rain; Wind W F4; Cloud Cover 8/8; Visibility >2km; Temp 4c.
26/04/2018	DN	11:55	13:55	2	Light showers in first hour then dry; Wind W F2-3; Cloud Cover 7/8; Visibility >2km; Temp 3c.
27/04/2018	DN	08:00	11:00	3	Dry; Wind NW F2; Cloud Cover 4-3/8; Visibility >2km; Temp 3-5c.
27/04/2018	DN	11:15	14:15	3	Dry; Wind NW F2; Cloud Cover 3-5/8; Visibility >2km; Temp 5-6c.
16/05/2018	PRM	14:25	17:25	3	Dry; Wind NNE F0-1; Cloud Cover 3-4/8; Visibility >2km; Temp 13-11c.
18/05/2018	PRM	07:15	10:15	3	Dry; Wind SSE F1-3; Cloud Cover 2-3/8; Visibility >2km; Temp 6c.
18/05/2018	PRM	10:50	13:50	3	Dry; Wind SSE-SE F3-2; Cloud Cover 3-4/8; Visibility >2km; Temp 7-9c.
06/06/2018	PC	10:25	13:25	3	Dry; Wind N-NW F2-1; Cloud Cover 1/8; Visibility >2km; Temp 13-18c.
06/06/2018	PC	13:55	16:55	3	Dry; Wind NW F1-3; Cloud Cover 1-2/8; Visibility >2km; Temp 18-19c.
08/06/2018	PC	07:45	10:45	3	Dry; Wind Still to E F1; Cloud Cover 8-7/8; Visibility >2km; Temp 10-13c.
11/07/2018	JS	10:10	13:10	3	Dry; Wind SW F0-1; Cloud Cover 7-6/8; Visibility >2km; Temp 15-16c.
11/07/2018	JS	13:40	16:40	3	Dry; Wind N F2; Cloud Cover 8-5/8; Visibility >2km; Temp 17-18c.
13/07/2018	JS	09:10	12:10	3	Dry; Wind S F0-2; Cloud Cover 8/8; Visibility >2km; Temp 12-17c.
15/08/2018	JS	08:25	11:25	3	Occ. drizzle; Wind WSW F3-4; Cloud Cover 7-8/8; Visibility >2km; Temp 12-14c.
15/08/2018	JS	11:55	14:55	3	Dry; Wind WSW F5-7; Cloud Cover 6-7/8; Visibility >2km; Temp 14c.
Total				42	
VP7 (NS 65429 01955)					
25/04/2018	PRM	11:35	14:35	3	Occasional heavy rain / hail showers in first hour then dry; Wind W F4-5; Cloud Cover 4-6/8; Visibility >2km; Temp 4c.



Date	Observer initials	Start	Finish	Length of VP Watch (hrs)	Weather conditions (wind using Beaufort scale)
25/04/2018	DN	15:00	17:00	2	Hail/rain showers then abandoned after two hours due to thunder and lightning; Wind W F3-4; Cloud Cover 6-7/8; Visibility >2km; Temp 3c.
26/04/2018	DN	16:30	19:30	3	Dry; Wind W F3-5; Cloud Cover 5-4/8; Visibility >2km; Temp 2-3c.
01/05/2018	JS	11:15	14:15	3	Showers in final hour; Wind SW F5-6; Cloud Cover 5-8/8; Visibility >2km; Temp 5c.
03/05/2018	JS	08:00	10:00	2	Dry; Wind SW F2-3; Cloud Cover 8/8; Visibility >2km; Temp 3c.
03/05/2018	PC	10:25	12:25	2	Showers; Wind SW F4; Cloud Cover 8/8; Visibility c.1-2km then >2km; Temp 5c.
16/05/2018	DN	10:32	13:32	3	Dry; Wind NE F1; Cloud Cover 6/8; Visibility >2km; Temp 6c.
27/06/2018	PM	12:10	15:10	3	Dry; Wind SSE F0-1; Cloud Cover 1/8; Visibility >2km; Temp 23-24c.
27/06/2018	DB	15:40	18:40	3	Dry; Wind SE F1; Cloud Cover 0/8; Visibility >2km; Temp 20-18c.
29/06/2018	DB	09:40	12:40	3	Dry; Wind SE F1; Cloud Cover 0/8; Visibility >2km; Temp 20c.
25/07/2018	PRM	15:00	18:00	3	Dry; Wind S-SSW F3-5; Cloud Cover 7-3/8; Visibility >2km; Temp 15c.
25/07/2018	PC	18:30	21:30	3	Dry; Wind SW F2-3; Cloud Cover 3-1/8; Visibility >2km; Temp 15-9c.
26/07/2018	PRM	06:40	08:10	1.5	Dry; Wind SW F2-3; Cloud Cover 1/8; Visibility >2km; Temp 8-9c.
26/07/2018	PC	08:20	09:50	1.5	Dry; Wind SSE F3-5; Cloud Cover 1-3/8; Visibility >2km; Temp 11-12c.
16/08/2018	PR	10:10	13:10	3	Light showers; Wind S F3-4; Cloud Cover 7-6/8; Visibility >2km; Temp 13c.
16/08/2018	JS	13:55	16:55	3	Showers; Wind W F4-5; Cloud Cover 5-7/8; Visibility >2km; Temp 10-11c.
Total				42	
VP8 (NS 65429 01955)					
25/04/2018	DN	11:30	14:30	3	Light showers in first hour then dry; Wind W F3-4; Cloud Cover 8-5/8; Visibility >2km; Temp 4c.
25/04/2018	PRM	15:00	17:00	2	Occasional heavy rain / hail showers in second hour then abandoned due to thunder and lightning; Wind W F5; Cloud Cover 6-8/8; Visibility >2km; Temp 4-3c.
26/04/2018	PRM	16:30	19:30	3	Moderate to heavy showers; Wind SW F5-6; Cloud Cover 6/8; Visibility >2km; Temp 3c.
01/05/2018	PC	11:15	14:15	3	Showers; Wind SSW F6-7; Cloud Cover 4-8/8; Visibility >2km; Temp 2c.

Date	Observer initials	Start	Finish	Length of VP Watch (hrs)	Weather conditions (wind using Beaufort scale)
03/05/2018	PC	07:55	09:55	2	Dry; Wind SW F2-3; Cloud Cover 8/8; Visibility c.2km; Temp 5c.
03/05/2018	JS	10:30	12:30	2	Dry; Wind SW F4; Cloud Cover 8/8; Visibility >2km, Temp 3c.
16/05/2018	PRM	10:30	13:30	3	Dry; Wind NNE F2; Cloud Cover 2-4/8; Visibility >2km; Temp 13-12c.
27/06/2018	DB	12:10	15:10	3	Dry; Wind SE F1; Cloud Cover 0/8; Visibility >2km; Temp 20c.
27/06/2018	PM	15:40	18:40	3	Dry; Wind SSE F0-1; Cloud Cover 1/8; Visibility >2km; Temp 25-26c.
29/06/2018	PM	09:40	12:40	3	Dry; Wind SE F0-1; Cloud Cover 0/8; Visibility >2km; Temp 22-29c.
25/07/2018	PC	15:00	18:00	3	Dry; Wind SW F2-3; Cloud Cover 7-4/8; Visibility >2km; Temp 21-18c.
25/07/2018	PRM	18:30	21:30	3	Dry; Wind S-SSE F3-4; Cloud Cover 2-1/8; Visibility >2km; Temp 15-13c.
26/07/2018	PC	06:40	08:10	1.5	Dry, Wind SE-SSE F3-4; Cloud Cover 1/8; Visibility >2km; Temp 9-10c.
26/07/2018	PRM	08:20	09:50	1.5	Dry, Wind SW F2-3; Cloud Cover 1-2/8; Visibility >2km; Temp 14c.
16/08/2018	JS	10:25	13:25	3	Occ. showers; Wind SW F3-4; Cloud Cover 5-6/8; Visibility >2km; Temp 12-9c.
16/08/2018	PR	13:40	16:40	3	Moderate showers at start; Wind S F3-4; Cloud Cover 7-6/8; Visibility >2km; Temp 13c.
Total				42	
VP9 (NX 67642 99247)					
26/04/2018	PRM	11:50	14:50	3	Moderate to heavy showers; Wind WSW-SW F5; Cloud Cover 8-6/8; Visibility >2km; Temp 4c.
27/04/2018	PRM	07:55	10:55	3	Dry; Wind W F2; Cloud Cover 2-4/8; Visibility >2km; Temp 1-7c.
27/04/2018	PRM	11:30	14:30	3	Dry; Wind NW F3-2; Cloud Cover 4-5/8; Visibility >2km; Temp 5-6c.
16/05/2018	DN	15:05	17:35	2.5	Dry; Wind NW-N F0-1; Cloud Cover 5-6/8; Visibility >2km; Temp 8-6c.
18/05/2018	DN	06:55	09:55	3	Dry; Wind S-SW F0-1; Cloud Cover 1-6/8; Visibility >2km; Temp 4-6c.
18/05/2018	DN	10:10	13:40	3.5	Dry; Wind S F1; Cloud Cover 7-8/8; Visibility >2km; Temp 8-9c.
06/06/2018	PRM	10:45	13:45	3	Dry; Wind Still to SE F2; Cloud Cover 0-1/8; Visibility >2km; Temp 14-19c.
06/06/2018	PRM	14:30	17:30	3	Dry; Wind Still to ENE F1; Cloud Cover 1-2/8; Visibility >2km; Temp 19-21c.
08/06/2018	PRM	08:30	11:30	3	Dry; Still; Cloud Cover 8-7/8; Visibility >2km; Temp 13-16c.

Date	Observer initials	Start	Finish	Length of VP Watch (hrs)	Weather conditions (wind using Beaufort scale)
11/07/2018	PRM	10:20	13:20	3	Dry; Wind SW F0-2; Cloud Cover 7-8/8; Visibility >2km; Temp 16-18c.
11/07/2018	PRM	13:50	16:50	3	Dry (brief shower at start); Wind SW F0 - NW F3; Cloud Cover 8-6/8; Visibility >2km; Temp 14-17c.
13/07/2018	PRM	09:30	12:30	3	Dry; Wind SE F0-2; Cloud Cover 8/8; Visibility >2km; Temp 15-16c.
15/08/2018	PR	10:05	13:05	3	Light rain at start; Wind S F5; Cloud Cover 8-4/8; Visibility >2km; Temp 12c.
15/08/2018	PR	13:35	16:35	3	Dry; Wind S F5-6; Cloud Cover 4-5/8; Visibility >2km; Temp 15c.
Total				42	

Table A.2 Dates, times and weather conditions during the MBS visits

Date	Observer	Start & Finish Time	Area Covered	Weather
Visit 1				
10/04/2018	Paul Massey	09:00-15:15	North-west of Site	Dry then moderate to heavy rain; Wind NE F2-5; Cloud Cover 8/8; Visibility >2km to 500-2km; Temp 6-2c. Survey curtailed when weather deteriorated.
10/04/2018	Dan Neill	09:00-14:30	South-east of Site	Dry then heavy rain; Wind NE-ENE F3-6; Cloud Cover 8/8; Visibility >2km; Temp 3c. Survey curtailed when weather deteriorated.
Visit 2				
17/05/2018	Paul Massey	08:50-17:00	East of Site	Dry; Wind E F1-2; Cloud Cover 2-4/8; Visibility >2km; Temp 12-16c.
17/05/2018	Dan Neill	09:00-16:10	West of Site	Dry; Wind NW F1; Cloud Cover 1/8; Visibility >2km; Temp 9-11c.
Visit 3				
27/06/2018	Damian Bubb	08:45-15:15	South-east of Site	Dry; Wind SE F1-2; Cloud Cover 0/8; Visibility >2km; Temp 25c.
27/06/2018	Paul Massey	08:30-17:00	North-west of Site	Dry; Wind SE F1-2; Cloud Cover 1-2/8; Visibility >2km; Temp 23-30c.
Visit 4				
11/07/2018	James Spencer	09:00-17:00	North-west of Site	Dry; Wind SW F1; Cloud Cover 6/8; Visibility >2km; Temp 15c.
11/07/2018	Paul Massey	08:30-17:00	South-east of Site	Dry; SW F2 - NW F2-3; Cloud Cover 6-7/8; Visibility >2kml Temp 15-18c.



Table A.3 Dates, times and weather conditions during the raptor surveys

Date	Observer	Start & Finish Time	Transect / Obs Pts Route	Weather
Visit 1				
11/04/2018	Paul Massey	09:15-16:30	Central area	Dry; Wind E F2-3; Cloud Cover 5-6/8; Visibility >2km; Temp 4-6c.
11/04/2018	Dan Neill	08:45-15:20	Western area	Dry; Wind ENE F2-3; Cloud Cover 8/8; Visibility 100m to 2km; Temp 5-6c.
12/04/2018	Paul Massey	08:30-12:15	Central area	Dry; Wind Still to NE F1; Cloud Cover 8-4/8; Visibility <50m to >2km; Temp 5c.
12/04/2018	Dan Neill	07:30-11:30	North-western and central area	Dry; Wind NE F2-3; Cloud Cover 8/8; Visibility 500m to 1km then >2km; Temp 3-12c.
Visit 2				
01/05/2018	Pete Clark	09:45-11:15 & 14:15-15:15	North-western area	Dry then moderate rain; Wind SSW F4-7; Cloud Cover 3-8/8; Visibility >2km to c.1km; Temp 5-2c.
01/05/2018	James Spencer	09:45-11:00 & 14:15-15:15	North-western area	Dry then moderate rain; Wind SSW F4-7; Cloud Cover 3-8/8; Visibility >2km to c.1km; Temp 5-2c.
02/05/2018	Pete Clark	09:30-17:15	East of Water of Ken valley	Dry (some brief light showers); Wind NW F6-8; Cloud Cover 4-8/8; Visibility >2km; Temp 6c.
02/05/2018	James Spencer	09:30-17:15	Central area	Dry (some brief light showers); Wind NW F6-8; Cloud Cover 4-8/8; Visibility >2km; Temp 6c.
Visit 3				
06/06/2018	Pete Clark	17:05-19:10	Western area	Dry; Wind NW F1-2; Cloud Cover 1/8; Visibility >2km; Temp 17c.
07/06/2018	Pete Clark	07:45-18:00	South-western area	Dry; Wind NE F2-3; Cloud Cover 0-4/8; Visibility >2km; Temp 14-21c.
07/06/2018	Paul Massey	07:30-18:00	Eastern, Northern and South-eastern areas	Dry; Wind SSE F1-2; Cloud Cover 1-3/8; Visibility >2km; Temp 13-24c.
Visit 4				
24/07/2018	Pete Clark	10:00-18:45	South-western area	Dry; Wind W F2-3; Cloud Cover 8-5/8; Visibility >2km; Temp 17-18c.
24/07/2018	Paul Massey	10:30-18:30	North-eastern area	Dry; Wind NW F2; Cloud Cover 8-7/8; Visibility >2km; Temp 17-19c.
26/07/2018	Pete Clark	11:00-12:45	South-western area	Dry; Wind SSE F3-4; Cloud Cover 3/8; Visibility >2km; Temp 20-23c.



Table A.4 Dates, times and weather conditions during the black grouse surveys

Date	Observer	Start & Finish Time	Duration	Area Covered	Weather
Visit 1					
12/04/2018	Paul Massey	05:30-08:30	3hrs	South-western Area	Dry; Still; Cloud Cover 8/8; Visibility <50m (mist); Temp 5c.
12/04/2018	Dan Neill	05:20-08:30	3hrs 10m	North-central Area	Dry; Wind NE F2-3; Cloud Cover 8/8; Visibility > 1km to <200m; Temp 3c.
13/04/2018	Paul Massey	05:20-08:30	3hrs 10m	South-central Area.	Heavy rain; Wind NE F2-3; Cloud Cover 8/8; Visibility 500m to 2km; Temp 4c.
13/04/2018	Dan Neill	05:20-07:30	2hrs 10m	South-eastern Area	Moderate to persistent rain; Wind NE F3-4; Cloud Cover 8/8; Visibility >500m; Temp 3-4c.
27/04/2018	Paul Massey	04:45-07:45	3hrs	North-eastern Area	Dry; Wind W F1-2; Cloud Cover 2/8; Visibility >2km; Temp 0c.
Visit 2					
03/05/2018	Pete Clark	04:30-07:30	3hrs	North-western Area	Dry; Wind SW F2-4; Cloud Cover 8/8; Visibility c.1-2km; Temp 2-6c.
03/05/2018	James Spencer	04:30-07:30	3hrs	Western Area	Dry; Wind SW F3-4; Cloud Cover 8/8; Visibility >2km; Cloud Base; Temp 3-5c.
04/05/2018	Pete Clark	04:15-07:30	3hrs 15m	North-eastern Area	Dry; Wind SW F2; Cloud Cover 8-5/8; Visibility c.500m to >2km; Temp 5-8c.
04/05/2018	James Spencer	04:30-07:30	3hrs	South-western Area	Dry; Wind SW F2-4; Cloud Cover 8-4/8; Visibility c.500m to >2km; Temp 5-8c.



Appendix B

Survey Results

Table B.1 Vantage point survey results

Flight reference no.	BTO species code	Date	Time	VP	No. of birds	Flight behaviour / age of bird	Time at risk height (30-150m) for flight in secs	Total time at risk height (multiplied where more than one bird involved in the flight)
Pink-footed goose								
LWF_004	PG	27/04/18	09:25	9	163	Passage birds, returning north.	0	0
LWF_005	PG	27/04/18	11:42	9	120		0	0
Greylag goose								
LWF_022	GJ	18/05/18	09:02	6	1	Flew out of viewshed.	21	21
LWF_076	GJ	25/07/18	21:27	8	4	Lost over brow of Lorg Hill.	25	100
Osprey								
LWF_036	OP	06/06/18	12:49	6	1	Lost from view behind hill.	30	30
LWF_037_a	OP	06/06/18	13:00	6	1	Carrying fish. Lost from view high in bright sky when at 400m height. Gained height rapidly with tight, spiralling flight on thermals.	0	0
LWF_037_b	OP	06/06/18	13:00	6	1		40	40
LWF_037_c	OP	06/06/18	13:00	6	1		0	0
LWF_039_a	OP	06/06/18	15:28	6	1	Carrying fish.	0	0
LWF_039_b	OP	06/06/18	15:28	6	1		150	150
LWF_039_c	OP	06/06/18	15:28	6	1		0	0
LWF_039_d	OP	06/06/18	15:28	6	1		120	120
LWF_039_e	OP	06/06/18	15:28	6	1	Left viewshed.	0	0
LWF_065_a	OP	11/07/18	16:32	6	1	Carrying fish. Circled up high and left viewshed.	0	0
LWF_065_b	OP	11/07/18	16:32	6	1		75	75



Flight reference no.	BTO species code	Date	Time	VP	No. of birds	Flight behaviour / age of bird	Time at risk height (30-150m) for flight in secs	Total time at risk height (multiplied where more than one bird involved in the flight)
LWF_080	OP	25/07/18	18:39	7	1	Lost behind Alhang. Appeared to be carrying a fish.	9	9
Golden eagle								
LWF_055_a	EA	29/06/18	10:12	8	1	Immature (?3CY) EA picked up NE of Meikledodd Hill being mobbed by ML.	17	17
LWF_055_b	EA	29/06/18	10:12	8	1	Gained height and drifted off round back of Black Lorg Hill flushing all LBs and RN.	0	0
LWF_055_c	EA	29/06/18	10:12	8	1		41	41
Red kite								
LWF_001	KT	25/04/18	12:35	7	1	Foraging over Site.	0	0
LWF_002	KT	25/04/18	14:02	7	1	Foraging over Site.	117	117
LWF_006_a	KT	27/04/18	13:10	9	1	Adult.	77	77
LWF_006_b	KT	27/04/18	13:10	9	1		0	0
LWF_007	KT	27/04/18	14:28	9	1	Adult.	35	35
LWF_010	KT	01/05/18	12:20	7	1	Probable adult. Lost over ridge.	26	26
LWF_011_a	KT	01/05/18	12:42	7	1	Immature, possibly 3CY. Landed.	0	0
LWF_011_b	KT	01/05/18	12:42	7	1		51	51
LWF_011_c	KT	01/05/18	12:42	7	1		0	0
LWF_012	KT	16/05/18	10:58	8	1	Seen briefly over ridge before lost behind ridge.	0	0
LWF_013_a	KT	16/05/18	11:05	8	1	Mobbed by pair of CU nesting to north of VP. Left viewshed.	0	0
LWF_013_b	KT	16/05/18	11:05	8	1		26	26
LWF_014	KT	16/05/18	11:05	7	1	Same bird as LWF_013, hunting over Site. Adult.	39	39
LWF_015_a	KT	16/05/18	11:34	7	1	Same bird as LWF_013, hunting over Site. Adult. Lost from view as dropped over brow of hill.	27	27

Flight reference no.	BTO species code	Date	Time	VP	No. of birds	Flight behaviour / age of bird	Time at risk height (30-150m) for flight in secs	Total time at risk height (multiplied where more than one bird involved in the flight)
LWF_015_b	KT	16/05/18	11:34	7	1		0	0
LWF_016	KT	16/05/18	11:34	8	1	Same bird as LWF_013. Lost to view behind Brown Hill, hunting.	0	0
LWF_017	KT	16/05/18	12:54	8	1	Hunting along southern slopes of Lorg Hill.	0	0
LWF_018_a	KT	16/05/18	13:08	8	1	Circling above Rough Craig before dropping down out of viewshed.	0	0
LWF_018_b	KT	16/05/18	13:08	8	1		6	6
LWF_020	KT	18/05/18	08:46	6	1	Lost from view. 3CY with moulted inner primaries.	0	0
LWF_021_a	KT	18/05/18	08:50	6	1	Same bird as LWF_018. Left viewshed.	0	0
LWF_021_b	KT	18/05/18	08:50	6	1		19	19
LWF_023	KT	18/05/18	09:10	6	1	Same bird as LWF_018. Soaring over Millaneoch Hill, briefly in viewshed.	12	12
LWF_024	KT	18/05/18	09:39	6	1	Same bird as LWF_018. Hunting along hillside then lost to view.	48	48
LWF_025	KT	18/05/18	09:49	6	1	Soaring with LW_026 then flew south. Lost to view. Too distant to see if bird was the 3CY seen earlier in the day.	29	29
LWF_026	KT	18/05/18	09:49	6	1	Soaring with LW_025 then flew northwest. Lost to view. Too distant to see if bird was the 3CY seen earlier in the day.	29	29
LWF_028	KT	18/05/18	12:37	6	1	Hunting along edge of Blackgrane, then lost to view. 3CY with moulted inner primaries.	47	47
LWF_030_a	KT	06/06/18	10:32	6	1	3CY with moulted inner primaries. Mobbed briefly by pair of CU. Lost from view over hill. Hunting.	75	75
LWF_030_b	KT	06/06/18	10:32	6	1		0	0

Flight reference no.	BTO species code	Date	Time	VP	No. of birds	Flight behaviour / age of bird	Time at risk height (30-150m) for flight in secs	Total time at risk height (multiplied where more than one bird involved in the flight)
LWF_031	KT	06/06/18	10:36	6	1	Presumably same bird as LWF_028. Lost from view. Hunting.	0	0
LWF_032	KT	06/06/18	10:59	6	1	Same bird as LWF_028. Mobbed by pair of CU when hunting. Lost from view in dip.	0	0
LWF_033	KT	06/06/18	11:03	6	1	Same bird as LWF_028. Mobbed by BZ above plantation and then lost to view.	50	50
LWF_035_a	KT	06/06/18	11:31	6	1	Same bird as LWF_028. Mobbed by BZ. Left viewshed.	90	90
LWF_035_b	KT	06/06/18	11:31	6	1		0	0
LWF_038_a	KT	06/06/18	14:44	6	1	Bird in heavy moult, mobbed by male K. Different to LWF_028.	300	300
LWF_038_b	KT	06/06/18	14:44	6	1		0	0
LWF_038_c	KT	06/06/18	14:44	6	1		30	30
LWF_040_a	KT	06/06/18	15:59	6	1	Lost from view behind Alwhat.	180	180
LWF_040_b	KT	06/06/18	15:59	6	1		0	0
LWF_041	KT	06/06/18	10:59	9	1	Adult / 3CY with moulted inner primaries. Lost over ridge.	0	0
LWF_042	KT	06/06/18	16:08	9	1	In front of VP9 and then down Altry Burn into Water of Ken valley. <30m. 3CY with moulted inner primaries.	0	0
LWF_043	KT	08/06/18	10:04	9	1	Flew west past VP9 and then lost to view behind Whigs' Hole. Adult / 3CY with moulted inner primaries.	0	0
LWF_044	KT	27/06/18	12:21	7	1	Lost to view behind Alwhat. Adult / 3CY.	0	0
LWF_045	KT	27/06/18	14:38	7	1	Soaring over Spout Burn before being lost behind Mid Rig.	22	22

Flight reference no.	BTO species code	Date	Time	VP	No. of birds	Flight behaviour / age of bird	Time at risk height (30-150m) for flight in secs	Total time at risk height (multiplied where more than one bird involved in the flight)
LWF_046	KT	27/06/18	12:24	8	1	Lost to view.	26	26
LWF_047_a	KT	27/06/18	13:19	8	1		93	93
LWF_047_b	KT	27/06/18	13:19	8	1	Lost to view.	30	30
LWF_048	KT	27/06/18	17:08	8	1	Along top of ridge of Meikledodd Hill & then lost to view over other side. Ad/3CY.	0	0
LWF_052	KT	29/06/18	12:02	7	1		12	12
LWF_053	KT	29/06/18	12:23	7	1		5	5
LWF_054	KT	29/06/18	12:33	7	1		8	8
LWF_057	KT	29/06/18	10:50	8	1	Drifted in from southeast. Started gaining height before being lost behind Lorg Hill.	31	31
LWF_058	KT	29/06/18	10:56	8	1	Adult / 3CY with moulted outer primaries. Lost behind Lorg Hill.	0	0
LWF_059_a	KT	29/06/18	11:03	8	1	Same bird as LWF_057. Gained height and soared; before flying southeast and out of viewshed.	0	0
LWF_059_b	KT	29/06/18	11:03	8	1		9	9
LWF_059_c	KT	29/06/18	11:03	8	1		0	0
LWF_060	KT	29/06/18	11:18	8	1	Same bird as LWF_057/059. Hunting before lost to view.	0	0
LWF_061_a	KT	29/06/18	12:29	8	1	Soaring with LWF_062. Adult / 3CY with moulted outer primaries. Lost to view.	21	21
LWF_061_b	KT	29/06/18	12:29	8	1		0	0
LWF_062_a	KT	29/06/18	12:29	8	1	Soaring with LWF_061. Adult / 3CY with moulted mid-primaries. Lost to view.	18	18
LWF_062_b	KT	29/06/18	12:29	8	1		0	0
LWF_066	KT	11/07/18	10:56	9	1	Lost behind hill.	0	0

Flight reference no.	BTO species code	Date	Time	VP	No. of birds	Flight behaviour / age of bird	Time at risk height (30-150m) for flight in secs	Total time at risk height (multiplied where more than one bird involved in the flight)
LWF_067	KT	11/07/18	11:41	9	1	Too distant to age. Possibly same bird as LWF_066. Lost to view.	0	0
LWF_068	KT	11/07/18	11:45	9	1	Adult / 3CY with no obvious moult in wing. Different to LWF_066. Lost from view behind Ewe Hill.	0	0
LWF_069	KT	11/07/18	12:32	9	1	Possibly same bird as LWF_066/067. Lost in valley.	0	0
LWF_071	KT	11/07/18	13:51	9	1	Adult / 3CY with no obvious moult in wing. Lost from view behind Altry Hill.	0	0
LWF_072_a	KT	25/07/18	15:00	7	1	Lost from view behind Alhang.	43	43
LWF_072_b	KT	25/07/18	15:00	7	1		0	0
LWF_073_a	KT	25/07/18	17:43	7	1	Hunting / quartering over Alwhat and Alhang. Lost from view behind Mid Rig. Rather clean individual showing no sign of moult.	90	90
LWF_073_b	KT	25/07/18	17:43	7	1		0	0
LWF_073_c	KT	25/07/18	17:43	7	1		153	153
LWF_073_d	KT	25/07/18	17:43	7	1		0	0
LWF_077	KT	25/07/18	15:57	8	1	Lost to view behind Brown Hill.	8	8
LWF_079	KT	25/07/18	17:27	8	1	Hunting over western slopes of Black Lorg Hill, interacting with BZ.	0	0
LWF_082	KT	13/07/18	11:42	6	1	Landed.	0	0
LWF_084_a	KT	15/08/18	12:37	6	1		55	55
LWF_084_b	KT	15/08/18	12:37	6	1	Landed on hillside.	0	0
LWF_085	KT	15/08/18	13:03	6	1	Briefly over ridge.	0	0
LWF_086	KT	15/08/18	13:34	6	1	Briefly over Lagower Hill.	0	0
LWF_087_a	KT	16/08/18	13:36	8	1	Adult.	0	0
LWF_087_b	KT	16/08/18	13:36	8	1		58	58

Flight reference no.	BTO species code	Date	Time	VP	No. of birds	Flight behaviour / age of bird	Time at risk height (30-150m) for flight in secs	Total time at risk height (multiplied where more than one bird involved in the flight)
LWF_087_c	KT	16/08/18	13:36	8	1	Landed.	0	0
LWF_089_a	KT	15/08/18	11:23	9	1	Slow soaring flight across viewshed.	0	0
LWF_089_b	KT	15/08/18	11:23	9	1		135	135
LWF_089_c	KT	15/08/18	11:23	9	1	Lost high and distant to the NE	0	0
Black kite								
LWF_034	KB	06/06/18	11:20	6	1	Lost high in sky.	0	0
Hen harrier								
LWF_008	HH	01/05/18	11:29	8	1	Ringtail. Lost from view when recording flight details. Possible immature male.	120	120
LWF_009_a	HH	01/05/18	11:49	8	1	Ringtail. Probable same bird as above. Left viewshed.	40	40
LWF_009_b	HH	01/05/18	11:49	8	1		0	0
LWF_027	HH	18/05/18	10:54	6	1	Ringtail. Seen briefly and distantly; and then lost to view.	0	0
LWF_090_a	HH	16/08/18	11:33	7	1	Male - prob 2CY low over VP.	0	0
LWF_090_b	HH	16/08/18	11:33	7	1	High around Brown Hill and lost to view.	45	45
Golden plover								
LWF_003	GP	26/04/18	17:53	7	1	Observed flying briefly before landing and lost from view.	0	0
Dunlin								
LWF_081	DN	25/07/18	21:21	7	1	Calling.	0	0
Peregrine								
LWF_029_a	PE	18/05/18	13:47	6	1	Adult male. Soaring over northern edge of Lagower Hill then headed off northeast. Lost to view.	14	14
LWF_029_b	PE	18/05/18	13:47	6	1		0	0

Flight reference no.	BTO species code	Date	Time	VP	No. of birds	Flight behaviour / age of bird	Time at risk height (30-150m) for flight in secs	Total time at risk height (multiplied where more than one bird involved in the flight)
LWF_064	PE	11/07/18	14:46	6	1	Female.	0	0
LWF_091_a	PE	16/08/18	16:36	8	1	Adult male. Hanging in wind over hill.	40	40
LWF_091_b	PE	16/08/18	16:36	8	1	Dived at a BZ.	0	0

Table B.2 Raptor survey results

Date	Surveyor	Species
11/04/2018	PM	No target species recorded. Buzzard & raven present (raven nest near Fortypenny Burn).
11/04/2018	DN	No target species recorded. Buzzard & raven present (raven nest on Ewe Hill crags).
12/04/2018	PM	No target species recorded. Raven present.
12/04/2018	DN	No target species recorded. Raven present.
01/05/2018	PC	One immature red kite active between Alwhat and Alhang peat hags at 14:23. Pair of raven & one buzzard present.
01/05/2018	JS	No target species recorded. 2 raven feeding on sheep on Alwhat and buzzard foraging on shoulder of Ewe Hill.
02/05/2018	JS	Adult male peregrine flew south-east, circling along ridge at 12:08. Probable 3CY red kite flew north-west over the Water of Ken at 12:09. Raven pair from Reugh Clough seen widely. Further bird seen displaying over Mid Rig. Pair of sparrowhawk seen over forestry near Upper Holm of Dalquhairn. Pair of buzzard near Coronbae Burn. Further territory near Quarrel end and also near Pellos Sikes.
02/05/2018	PC	Adult male peregrine flew east past Sour Snout at 11:04; probable 3CY red kite foraging around Fortypenny & Low Countam at 11:19 & 13:10 (moulted inner primaries). Raven pairs around Rough Cleugh & Fortypenny; 1-2 buzzard active in area but no nesting areas noted; one male kestrel active in area with poss. second bird and again no nesting areas noted.
06/06/2018	PC	See confidential appendix.
07/06/2018	PC	At least two osprey fishing Afton Reservoir, neither of which carried fish to sites within the survey area. At least one possibly two red kite active in the area. Other raptors noted comprised: one kestrel, c.10-12 raven (eight birds over Moorbrock - probably one nest here) and 6-8 buzzard (one nest in Millaneoch Burn area and a second by Afton Reservoir).
07/06/2018	PM	Three red kite in area (all 3CY / adult) but no sign of breeding; pair of raven in Rough Cleugh area (failed site) and second pair circling over Mid Hill of Glenhead; kestrel nest at White Knowe (both adults present as well as calling young); and pair of buzzard in Craigythorn, Spout Burn & Quarrel End. Further pairs of buzzard at Bennan and Fortypenny. Sparrowhawk nesting in High Countam.
24/07/2018	PC	Tawny owl territory in Spout Burn (male calling from conifers); Buzzard nests at NX 65254 99859 (1 young) and NX 65995 99733; moulted buzzard feathers noted at three distinct locations (Quarrel End, southeast of block & north of block) in Spout Burn so likely three pairs; male kestrel

Date	Surveyor	Species
		carrying prey towards known site in Holm Burn Valley. Raven, red kite and osprey also seen during surveys.
24/07/2018	PM	No target species recorded. Buzzard and raven seen during surveys.
26/07/2018	PC	Buzzard agitated throughout survey around southwestern nest site.

Table B.3 Black grouse (BK) survey results

Unique ID	Date	Sex / Age	Grid Ref	Notes (behaviour etc)
-	12/04/2018	-	-	No BK recorded.
-	13/04/2018	-	-	No BK recorded.
LWF_BK_001	27/04/2018	Male	NS 96062 00157	Single male lekking for 7 mins on plantation edge at 06:20.
-	03/05/2018	-	-	No BK recorded.
-	04/05/2018	-	-	No BK recorded. Droppings on Cairn Hill.

Table B.4 'Incidental' records

Unique ID	Species	Date	Notes
LWF_IR_001	GJ	11/04/2018	Three birds flew north along the Water of Ken during a raptor survey.
LWF_IR_002	KT	13/04/2018	Flew east over Craigythorn (plantation to south of Site) during a BK survey.
LWF_IR_004	KT	17/05/2018	Moulting bird seen hunting between Meikledodd Hill and Brown Hill. Same bird recorded yesterday during VP watches.
LWF_IR_005	KT	06/06/2018	Probable 3CY seen during watch from VP6 at 10:53 over Brown Hill, outwith viewshed.
LWF_IR_006	PE	06/06/2018	Possible PE dived behind Alhang during watch from VP6 at 13:25, outwith viewshed.
LWF_IR_007	KT	06/06/2018	Seen during watch from VP6 at 16:08 over Brown Hill, outwith viewshed.
LWF_IR_010	KT	26/07/2018	Seen during watch from VP7 at 08:30 over Holm Burn valley, outwith viewshed.
LWF_IR_011	KT	16/08/2018	Seen whilst accessing Lorg House near Reugh Cleugh at 08:30.
LWF_IR_012	KT	16/08/2018	Seen whilst egressing over Lorg House at 17:30.

